

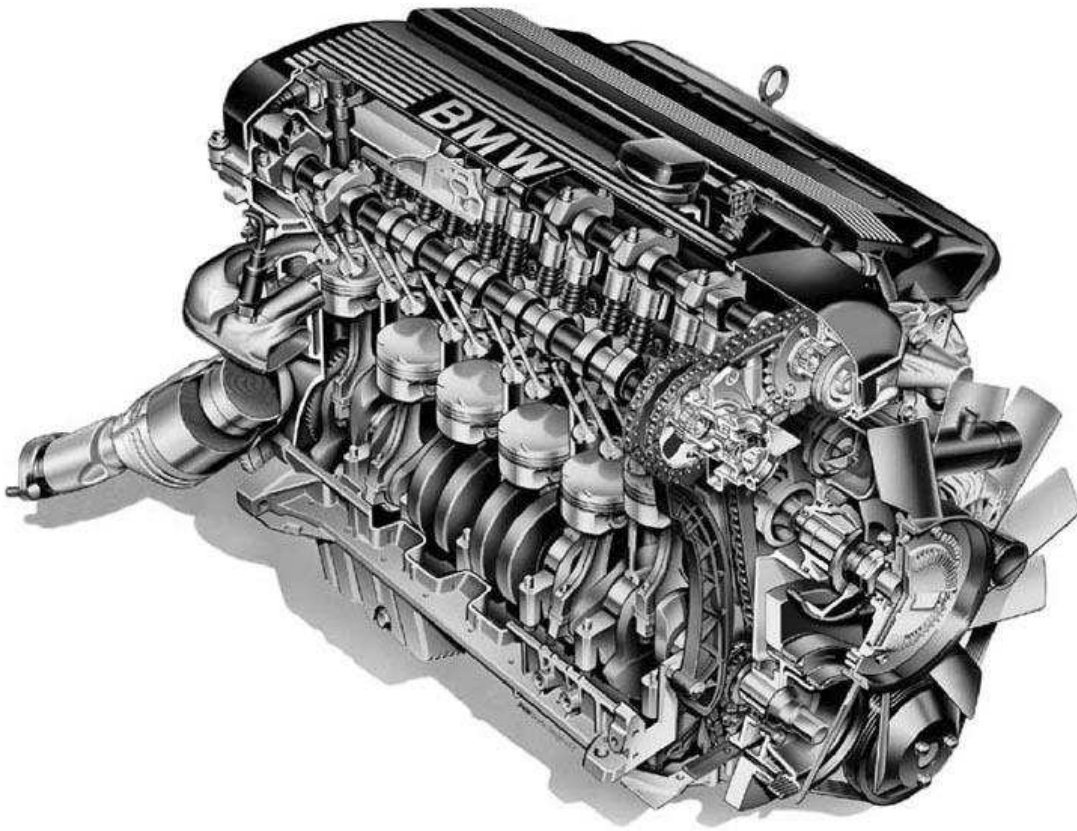
GENERAL INFORMATION

Basic Engine Measuring Techniques - Overview

BASIC MEASURING TECHNIQUES

BASIC ENGINE MEASUREMENTS

During the course of engine repairs some basic engine measurements are required to verify engine diagnosis as well as to complete proper repairs. These measurements are made by precision measuring tools such as micrometers, Vernier calipers, cylinder bore gauges and dial indicators.



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Fig. 1: Sectional View Of Engine

Courtesy of BMW OF NORTH AMERICA, INC.

Also, a working knowledge of the metric system is also a vital skill that is needed by the technician. All BMW engine measurements consist of metric specifications. Some of the routine engine measurements performed include:

- Valve Guide Wear (Tilt Angle K)

- Cylinder Bore Measurements (Taper and Out-of-Round)
- Cylinder Head Warpage and Thickness
- Axial and Radial Endplay Measurements (Crankshaft/Camshaft etc).

Among all of the skills possessed by a modern technician, basic measuring techniques are perhaps the most overlooked and least used. This is why it is important to review these skills from time to time as a refresher.

Also, it is necessary to access technical data to obtain the proper specifications for these measurements. This course is designed to review measuring techniques to assist in engine diagnosis.

Vernier Measurement

The Vernier scale is used on various measuring tools such as the Vernier caliper and the Depth Gauge. The Vernier scale can be used with Fractional (US) and Metric systems. For the purposes of this training module we will always refer to the Metric Vernier scale.

The Vernier scale consists of a fixed scale and a sliding scale. The fixed scale is divided with graduations in 1 millimeter increments. The sliding scale has 10 graduations in increments of .5.

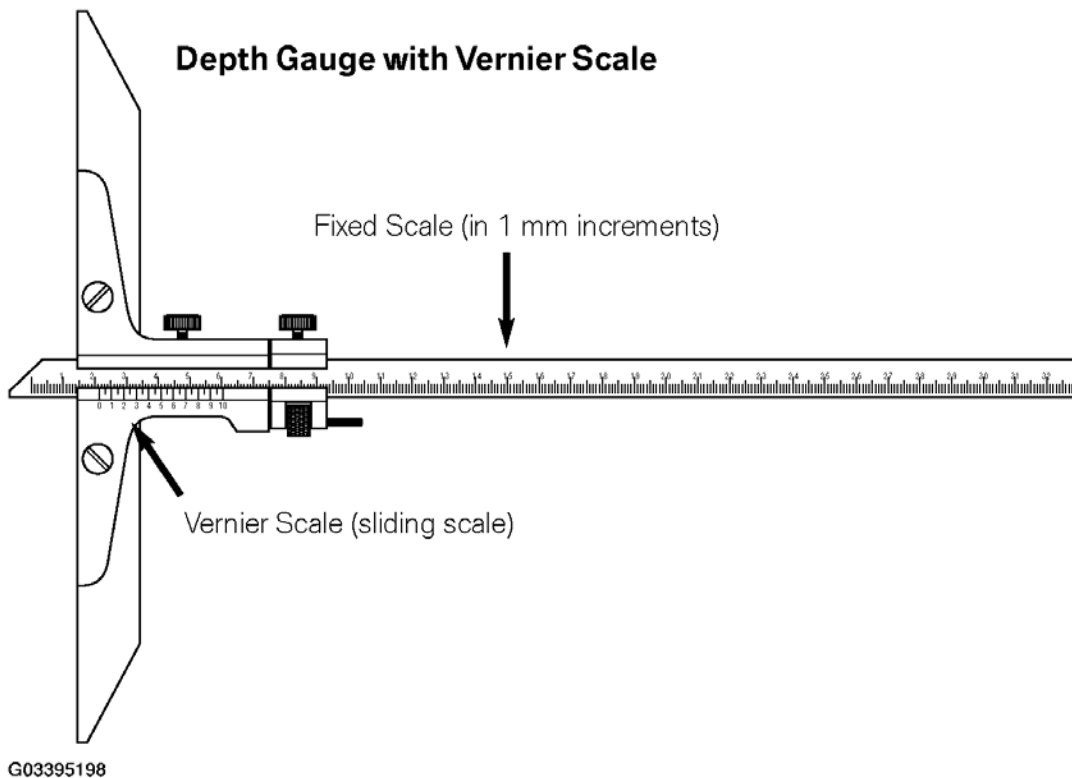


Fig. 2: Identifying Depth Gauge
 Courtesy of BMW OF NORTH AMERICA, INC.

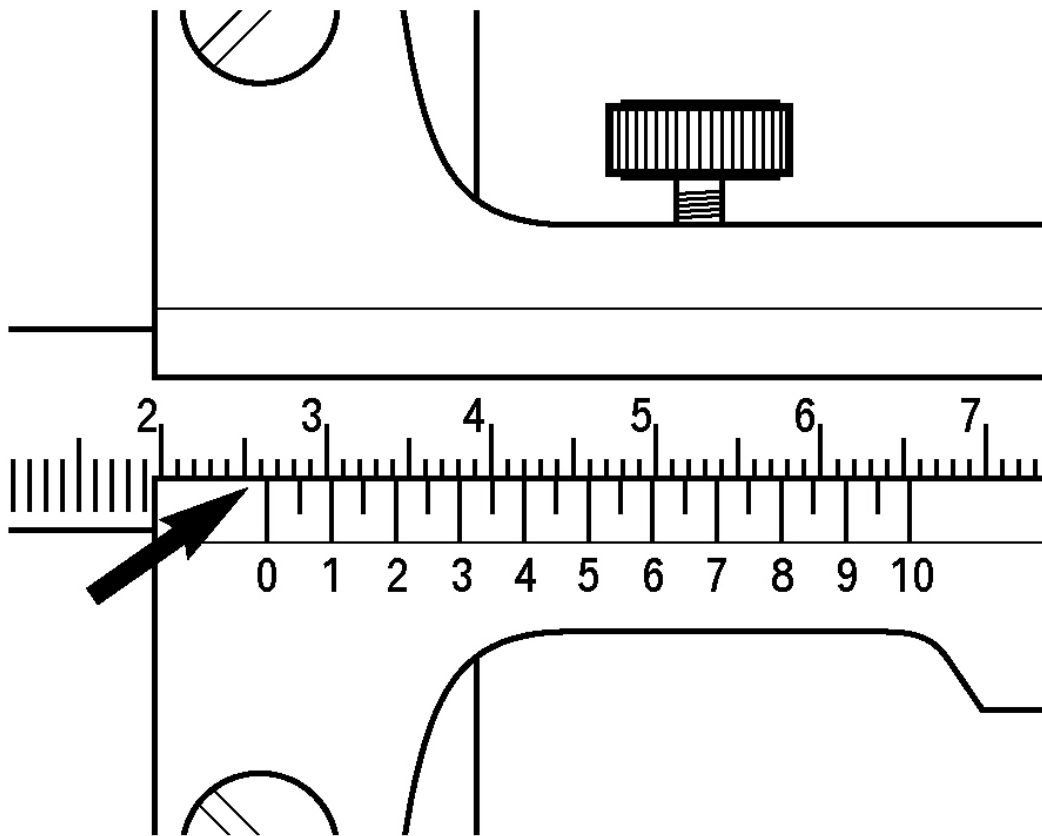
In order to read a measurement, use the zero mark on the left end of the vernier scale to use as a guide to read a measurement on the fixed scale.

In the example shown at the right, the zero mark is resting between 26 and 27 mm. Therefore the base measurement is 26 mm.

Next, the decimal measurement must be taken. For this, find a line on the Vernier that most closely matches any line on the fixed scale.

Using the example drawing, the "4" on the Vernier scale is lining up directly with a line on the fixed scale.

Combining the previous reading with this reading, the result would be 26.4 mm.



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Fig. 3: Locating Vernier Scale Reading
Courtesy of BMW OF NORTH AMERICA, INC.

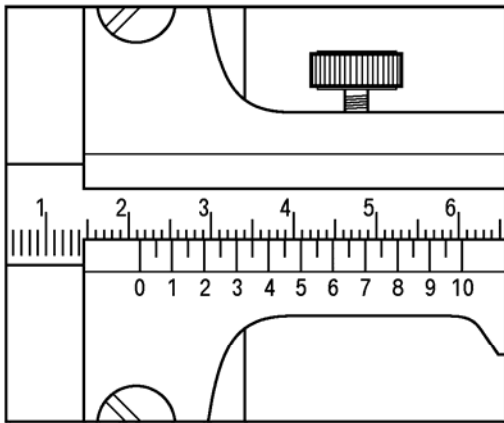
The designations on the Vernier scale are in increments of .5. For example, if a reading on the Vernier scale falls on the .5 (i.e. 2.5, 3.5 etc) designation this would indicate 5/100th's of a millimeter.



Classroom Exercise - Vernier Readings

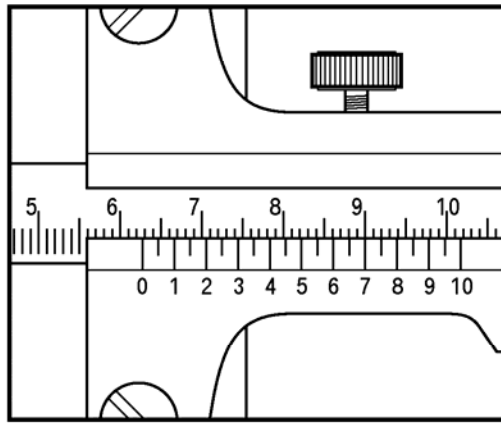
Fill in the correct Vernier scale readings in the spaces provided below.

Vernier 1



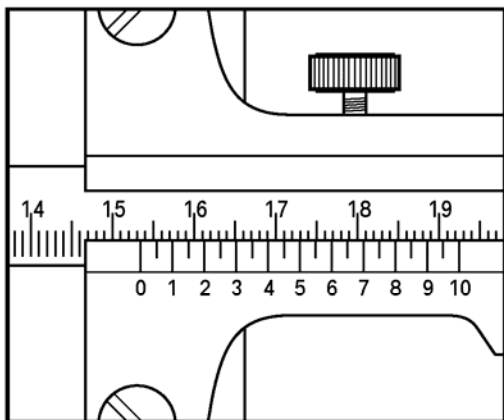
Vernier Reading 1:

Vernier 2



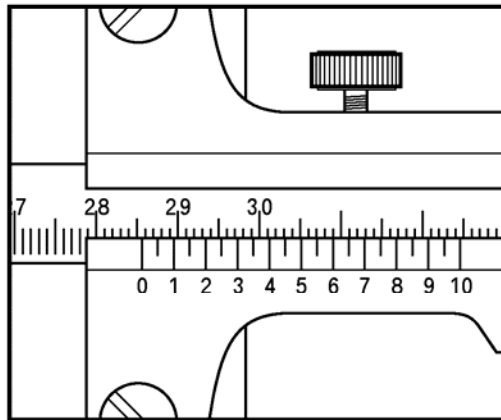
Vernier Reading 2:

Vernier 3



Vernier Reading 3:

Vernier 4



Vernier Reading 4:

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Fig. 4: Identifying Vernier Scale Reading
Courtesy of BMW OF NORTH AMERICA, INC.

Micrometer Measurements

Another valuable measuring tool is the micrometer, which can be used for measurements such as bearing journal diameter, cylinder head thickness, valve shim thickness and brake rotor thickness etc. Micrometers also come in configurations for inside measurements as well.

The micrometer scale comes in both fractional and metric varieties. We will cover only the metric micrometer scale in this course.

First you must familiarize yourself with the construction of the micrometer in order to understand how measurements are made.

Metric Micrometer Construction

The micrometer is constructed of a few basic parts. The actual item to be measured is placed between the anvil and the spindle. The micrometer can be adjusted to the approximate size using the thimble. The thimble should only be used for the coarse adjustment. In order to make the actual measurement, the micrometer should only be turned using the ratchet (a.k.a. the friction stop). Do not attempt to make a measurement using the thimble. This will give an inaccurate measurement and ultimately damage the micrometer.

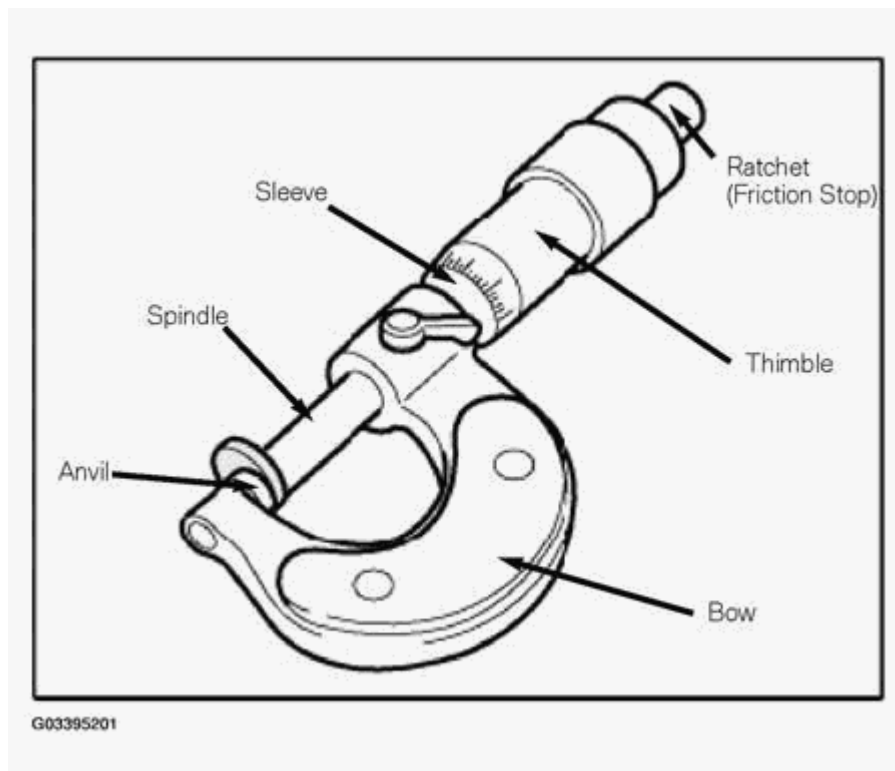


Fig. 5: Identifying Micrometer
Courtesy of BMW OF NORTH AMERICA, INC.

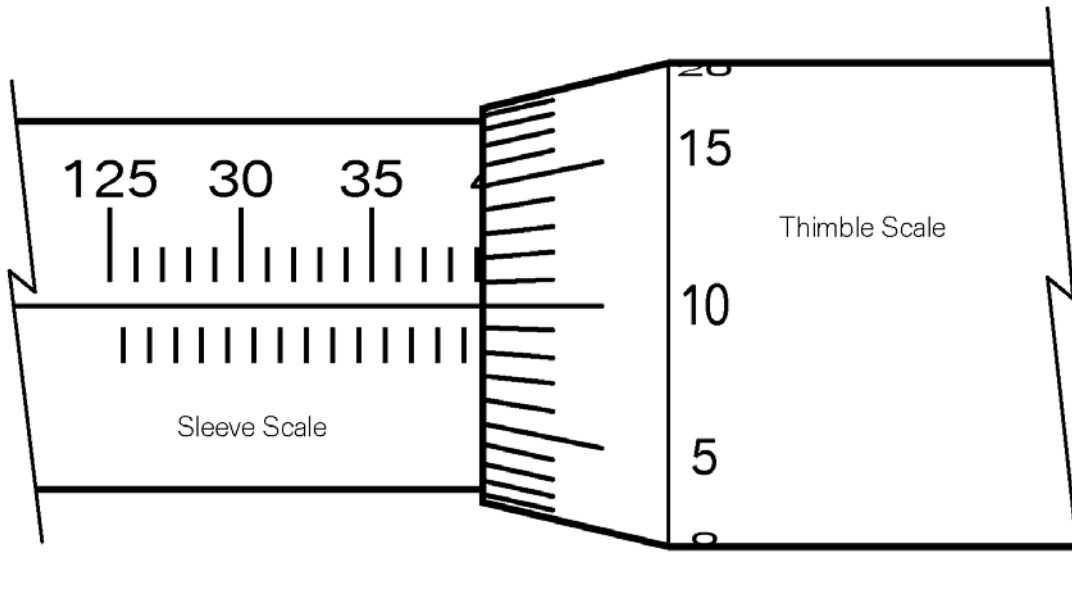
Micrometers are available in various sizes for outside as well as inside measurements. The more common variation is the outside micrometer. They are usually available in 25 millimeter increments such as 0-25 mm, 25-50 mm, 50-75 mm etc..

The metric micrometer can measure in increments of one hundredth of a millimeter (.01mm). One hundredth of a millimeter is equal to 0.0003937 inch which is less than one thousandth of an inch.

The measurement area of the micrometer consists of the sleeve scale and the thimble scale. The sleeve scale is used to read whole and half millimeters. The thimble scale (which rotates) reads in hundredths (.01) of a

millimeter from zero to fifty. Two complete revolutions of the thimble equals one millimeter.

On the sleeve scale, each scale mark above the center line indicates whole millimeters. Below the center line, half of a millimeter (or .5mm) increments are indicated.



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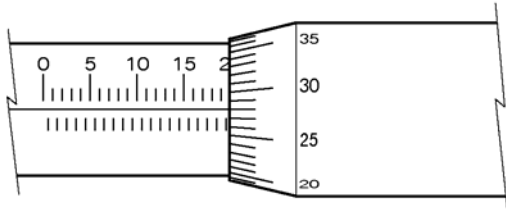
Fig. 6: Identifying Micrometer Reading
Courtesy of BMW OF NORTH AMERICA, INC.

Using the example shown above, the micrometer is a 125-150mm micrometer. To read this micrometer, first take the basic reading from the sleeve scale. The thimble is past the 139 mm mark. Therefore the reading is a least 139 mm. Next, look at the thimble scale and note the reading on the centerline. The "10" on the thimble scale is lined up with the centerline. This indicates a reading of .10 mm. If you add the two readings; $139 + .10 = 139.10$ mm.

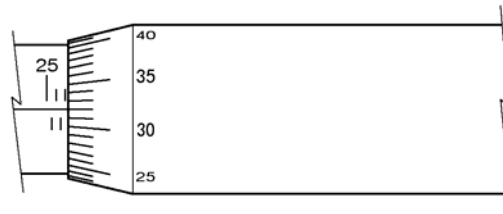


Classroom Exercises - Micrometer Measurements

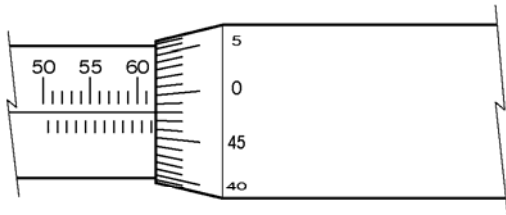
Fill in the correct micrometer readings in the spaces provided below.



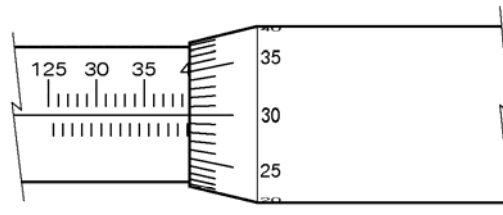
Micrometer Reading 1:



Micrometer Reading 2:



Micrometer Reading 3:



Micrometer Reading 4:

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Fig. 7: Identifying Correct Micrometer Reading
Courtesy of BMW OF NORTH AMERICA, INC.

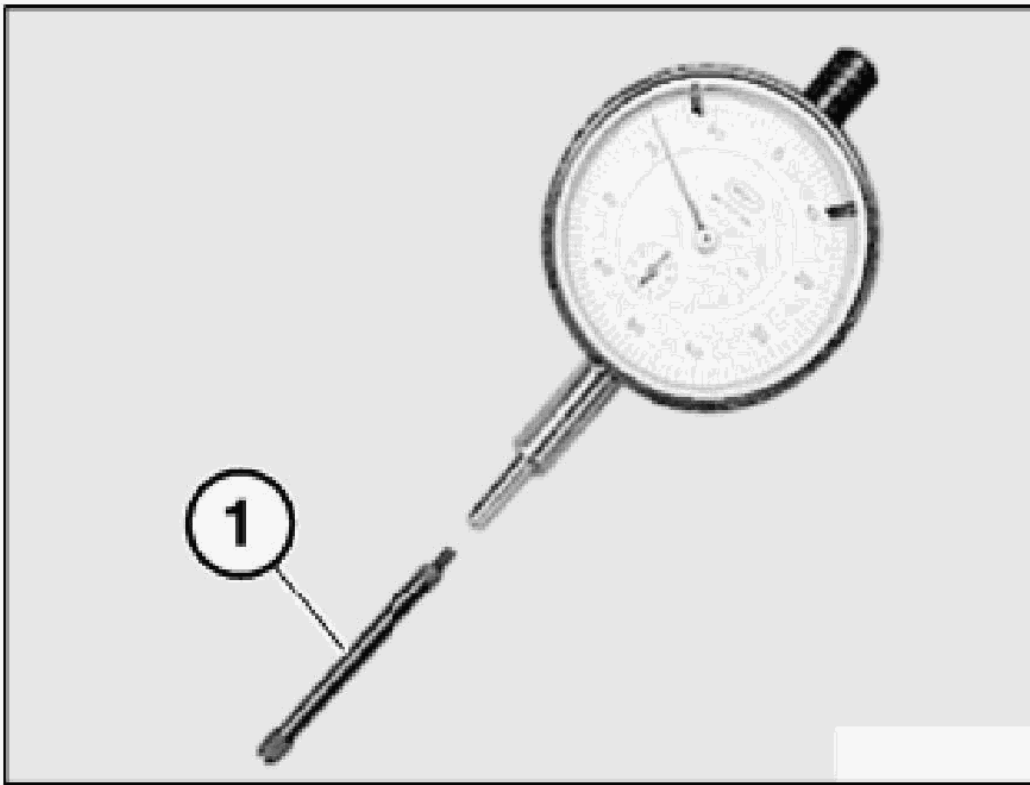
Dial Indicator Measurements

The dial indicator is used to measure the travel or movement of a specific item. It can also be used to measure axial and radial runout. In engine measurement applications, the dial indicator can be used to measure valve guide wear, axial movement of the crankshaft (thrust), and runout of flywheels and harmonic balancers.

First, it is important to familiarize yourself with Dial Indicator construction. The face of the dial indicator consists of a moveable bezel which is also attached to the large measuring scale. This allows the tool to be brought to the "zero point" when needed.

The main measuring device is the contact point. The contact point (1) is placed against the object to be measured. Usually, the contact point is rounded or has a ball bearing. This allows for a more accurate measurement.

The measuring face of the dial indicator consists of 2 scales. The smaller scale is for the "coarse" measurement which is in graduations of 1 millimeter. One revolution of the small scale is 10 millimeters.



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Fig. 8: Identifying Dial Indicator

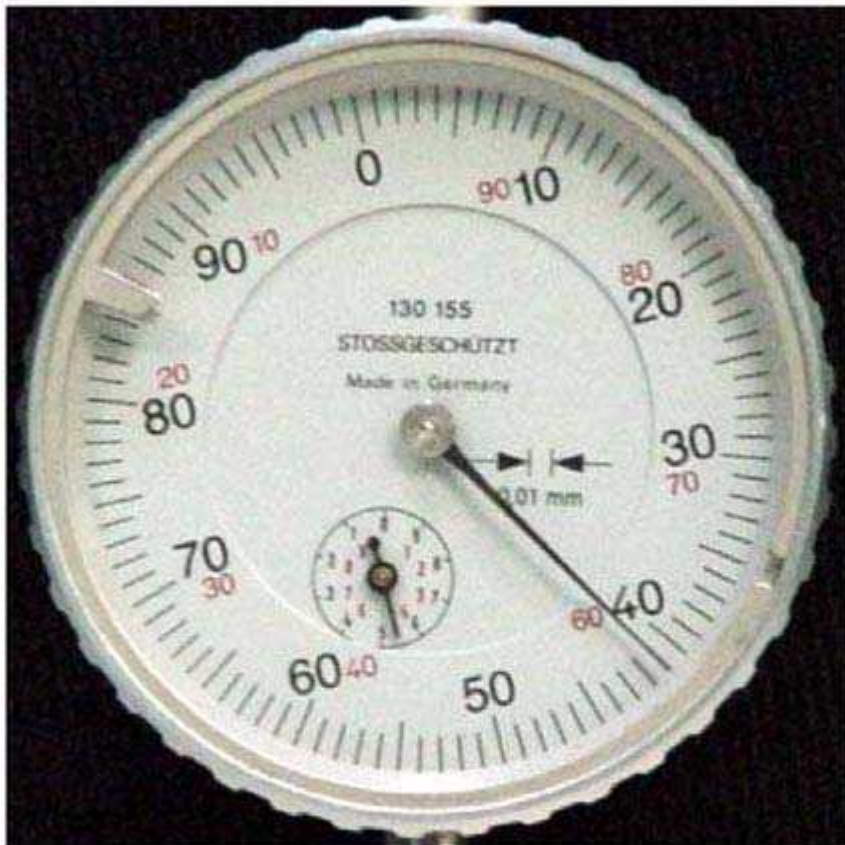
Courtesy of BMW OF NORTH AMERICA, INC.

The large scale is in graduations of .01 millimeter and the scale goes from zero to one hundred. Therefore, one revolution of the large scale is one millimeter.

The dial indicator also needs to be held in place when taking a measurement. This requires a stand or base. Depending upon the application, these stands can be a clamp type, magnetic or a threaded base.

When taking a measurement, place the contact point on the object to be measured. The dial indicator must be pre-loaded slightly to prevent the measurement from bottoming out.

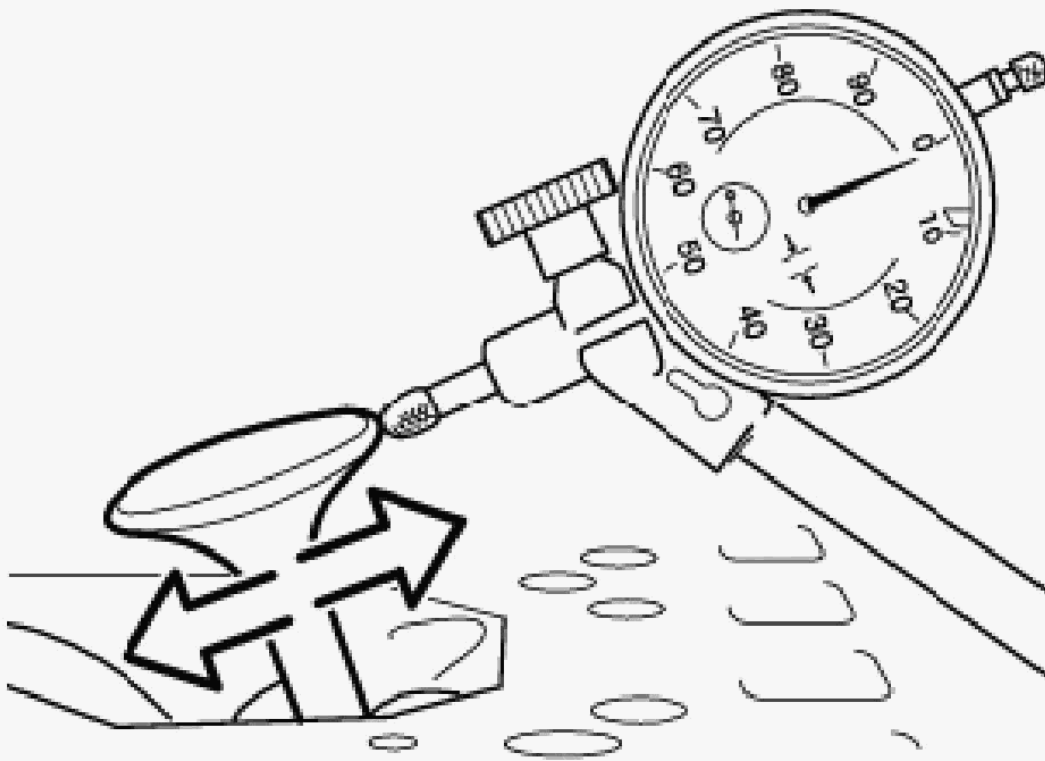
When reading the scale, be sure to "zero" the dial indicator first. If the readings to be taken are less than 1 millimeter, you do not need to use the small scale. If the readings are larger than 1 millimeter, be sure to factor the small scale into your measurement.



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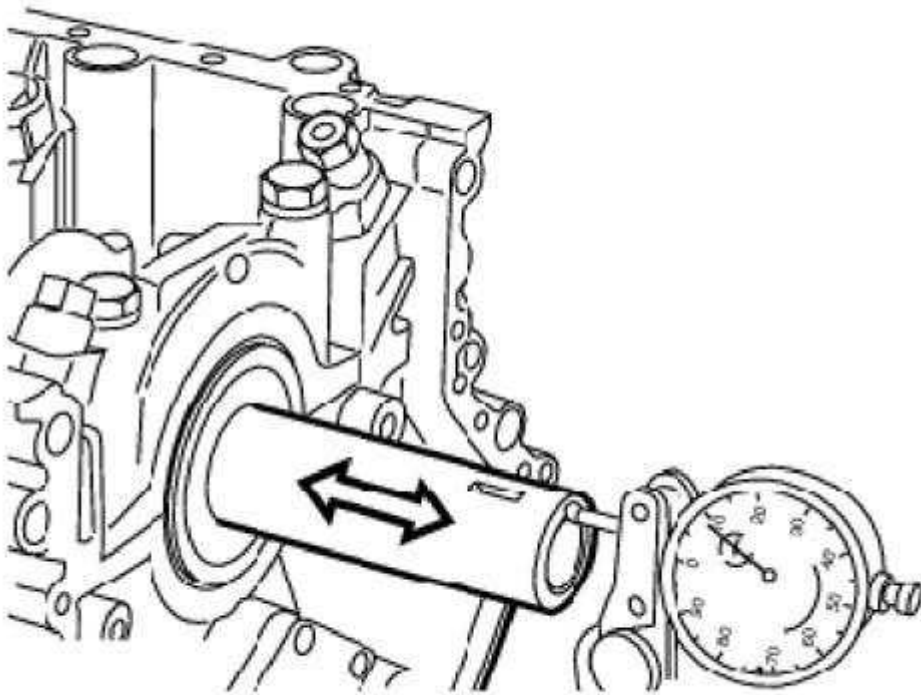
Fig. 9: Identifying Dial Indicator Reading
Courtesy of BMW OF NORTH AMERICA, INC.

Examples Of Dial Indicator Measurements



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Fig. 10: Measuring Valve Guide Wear - Tilt Angle "K" Using Dial Indicator
Courtesy of BMW OF NORTH AMERICA, INC.



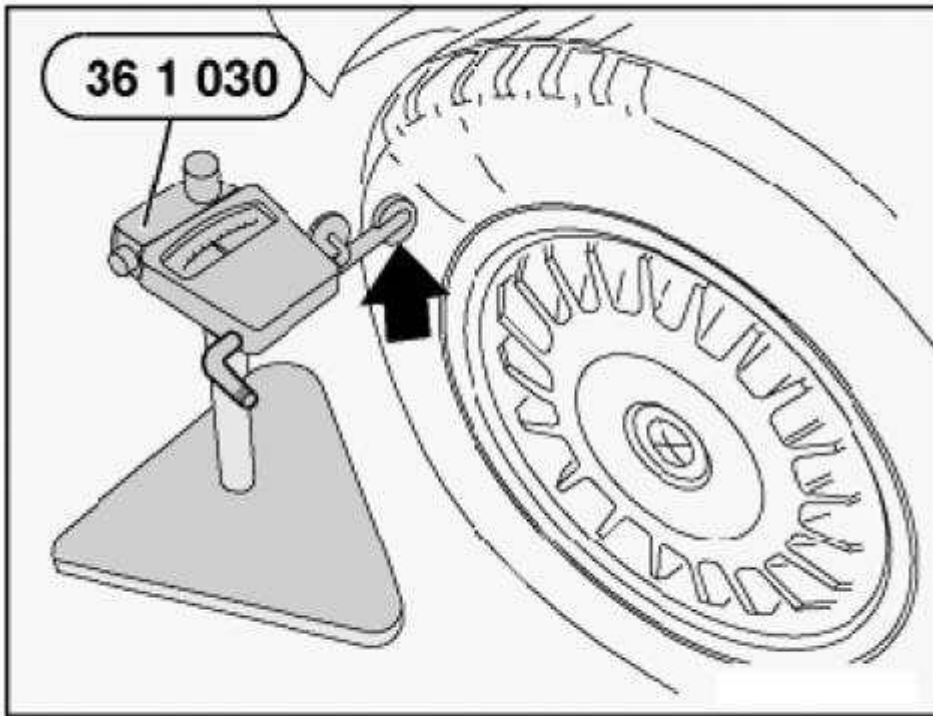
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Fig. 11: Measuring Crankshaft Endplay - Axial Using Dial Indicator
Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 12: Measuring S62 Engine - Basic Throttle Setting Using Dial Indicator
Courtesy of BMW OF NORTH AMERICA, INC.



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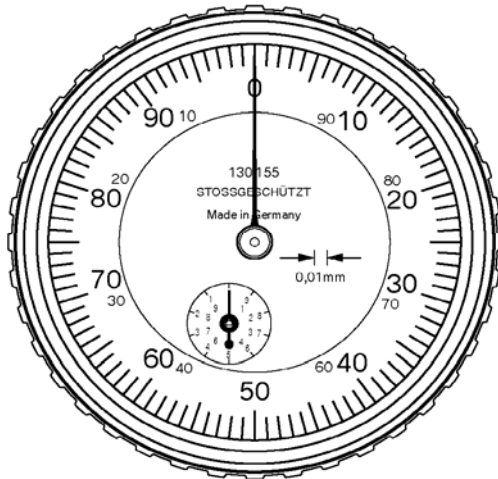
Fig. 13: Measuring Wheel Runout - Axial Using Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.



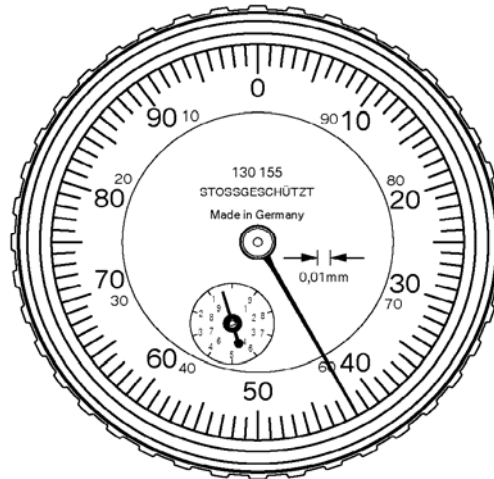
Classroom Exercise - Dial Indicator Measurements

Compare the dial indicator readings, and determine the total travel. Record your results below in the spaces provided.

Dial indicator A

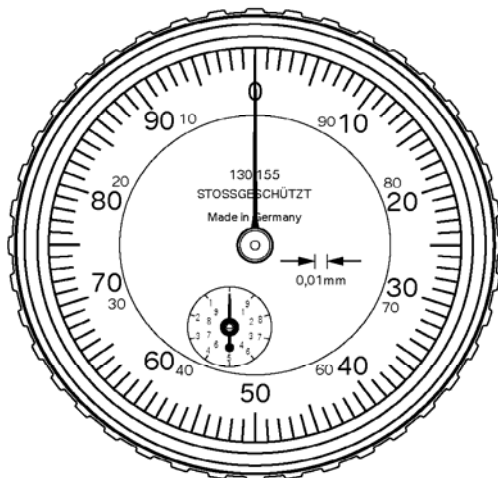


Dial indicator B

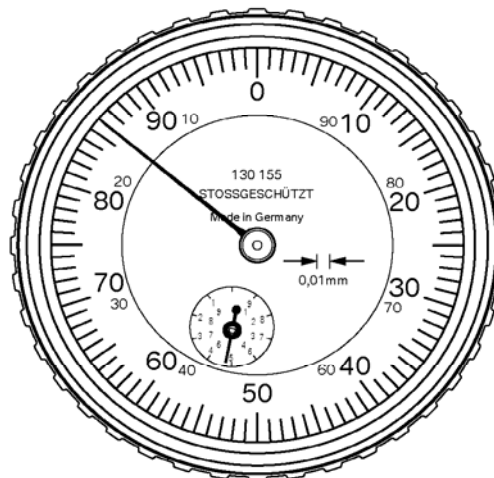


What is the difference (total travel) between dial indicator A and dial indicator B?

Dial indicator C



Dial indicator D



What is the difference (total travel) between dial indicator C and dial indicator D?

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Fig. 14: Identifying Correct Dial Indicator Reading
Courtesy of BMW OF NORTH AMERICA, INC.

ADDITIONAL ENGINE MEASUREMENTS

During engine repair procedures it is sometimes necessary to assess engine wear to make determinations on

parts replacement. Also, some engine measurements are needed to verify a previous diagnosis.

For example, a cylinder leakdown test could indicate a cylinder sealing concern. Once the engine is disassembled, it would be necessary to verify this condition by checking the piston and piston ring condition. If OK, the next step would be to determine the condition of the cylinder bore. At this point, the cylinders should be checked for taper (conicity) and for out-of-round. The correct measurements could mean the difference between just replacing the rings and/or pistons or replacing the engine block. This is why it is necessary to make accurate measurements when needed.

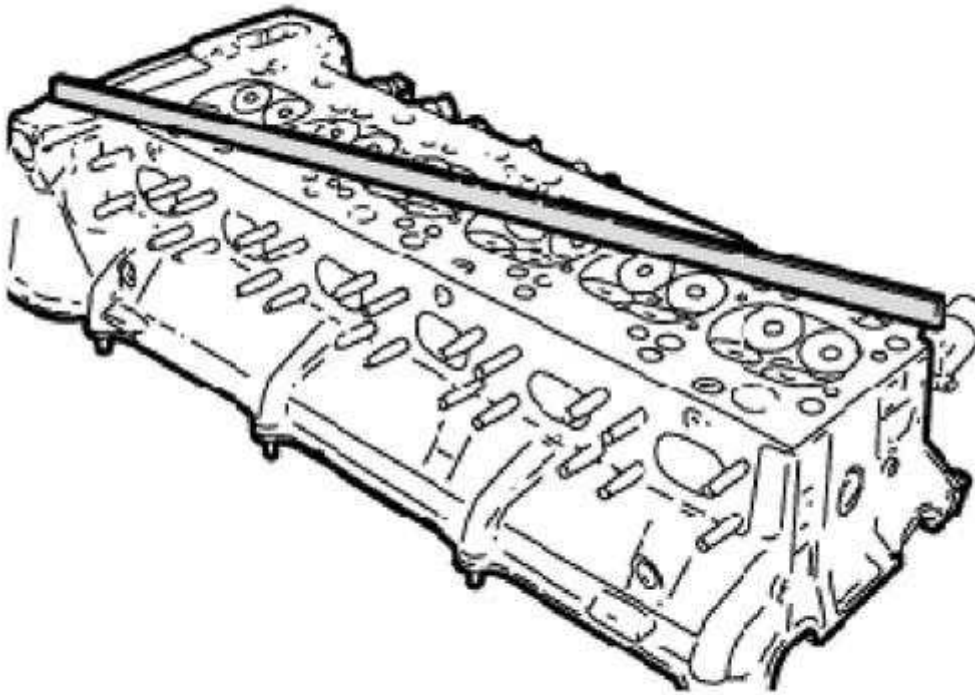
Some of the other routine engine measurements include:

- Cylinder head warpage
- Cylinder head thickness (on some applications)
- Piston rings - end gap and axial clearance
- Cylinder bore - including out-of-round and taper

Cylinder Head Measurement

If a repair requires removal of the cylinder head, a few basic measurements can be performed to save time and unnecessary machine shop costs. If an engine has been overheated or has an internal or external fluid leakage (coolant/oil), it is a good idea to check the cylinder head for warpage.

This can be done by using a commercially available machinists straight edge and a feeler gauge. by sliding the feeler gauge under the straight edge in various locations, it can determine if there are any low spots or warpage. Usually, the specification is about .05 mm.



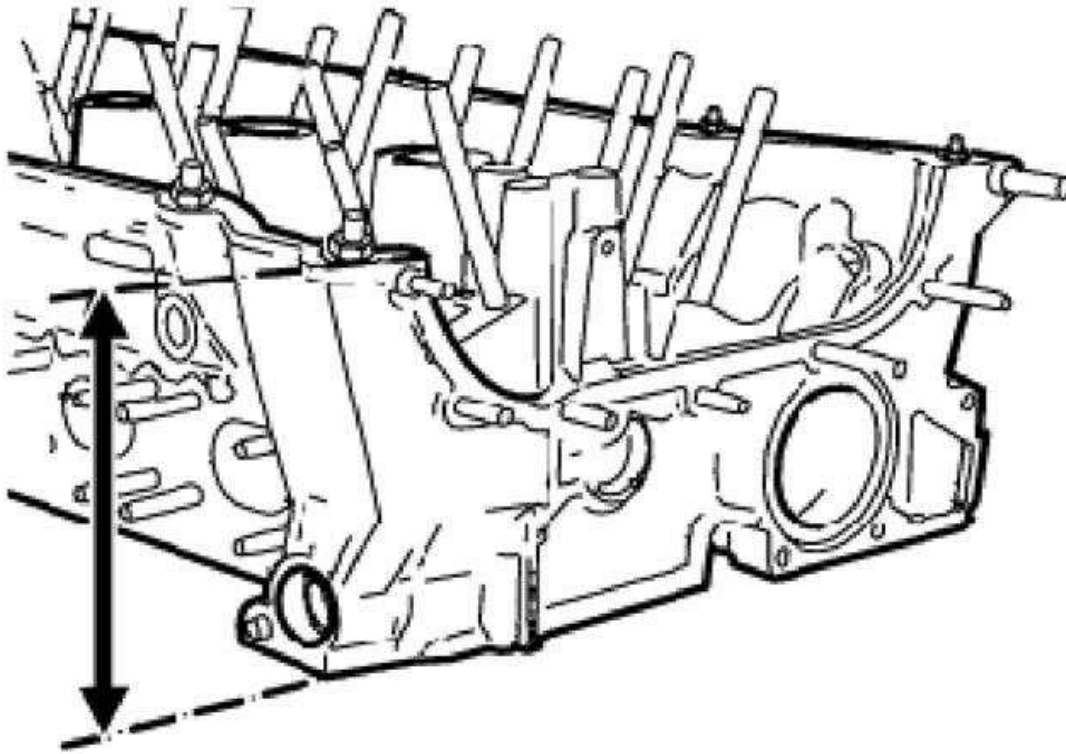
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Fig. 15: Identifying Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

Also, check to see if the cylinder head has a specification for machining limit. If so, it may be possible to have the cylinder head re-surfaced. Depending on the amount of material removed during the machining process, it may be necessary to install a thicker head gasket. There are some "service" head gaskets available through the parts department.

The cylinder head can be checked for minimum thickness. This is done using a micrometer or a vernier caliper. This is not possible on all engines, the example shown is a 6-cylinder (M52TU/M54).

If the minimum thickness is not met, the head will need to be replaced.



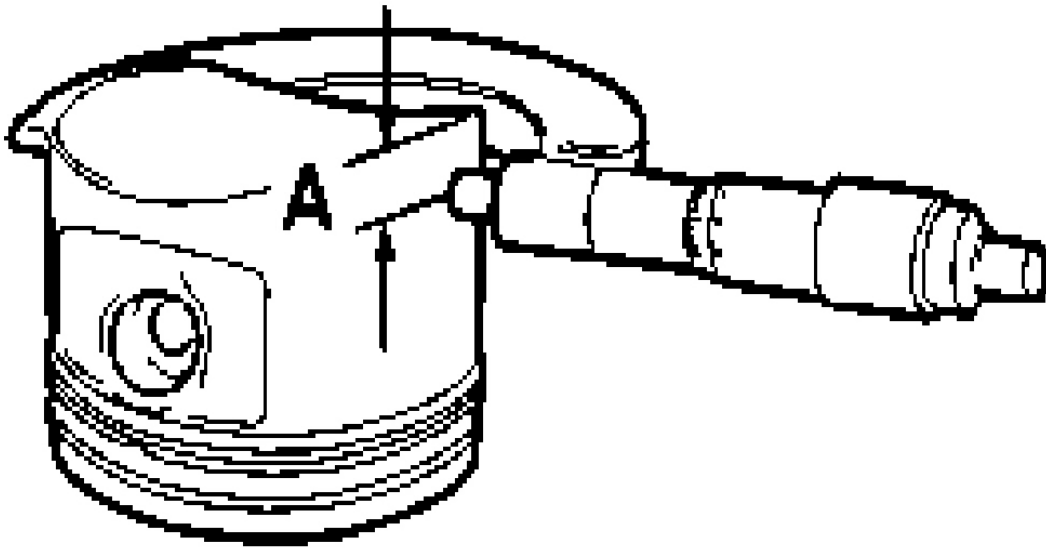
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Fig. 16: Measuring Thickness Of Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

Piston Measurements

When replacing pistons and/or piston rings, there are some basic measurements that need to be made. When fitting a piston to a cylinder bore, the piston diameter should be checked to ensure a proper fit.

The piston diameter is measured using a micrometer. The measurement is taken at a specified point (A) which is 90 degrees from the piston pin axis. Each engine has a specific location to measure piston diameter. For example, the illustration below shows measuring Point A. The specification for this engine (N62) is 18 mm. So the piston diameter is measured 18 mm from the bottom of the piston skirt.



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Fig. 17: Measuring Piston Diameter Using Micrometer
Courtesy of BMW OF NORTH AMERICA, INC.

The piston diameter, when subtracted from the cylinder bore equals the cylinder wall to piston clearance. If the clearance measurement obtained is not correct, re-check your readings.

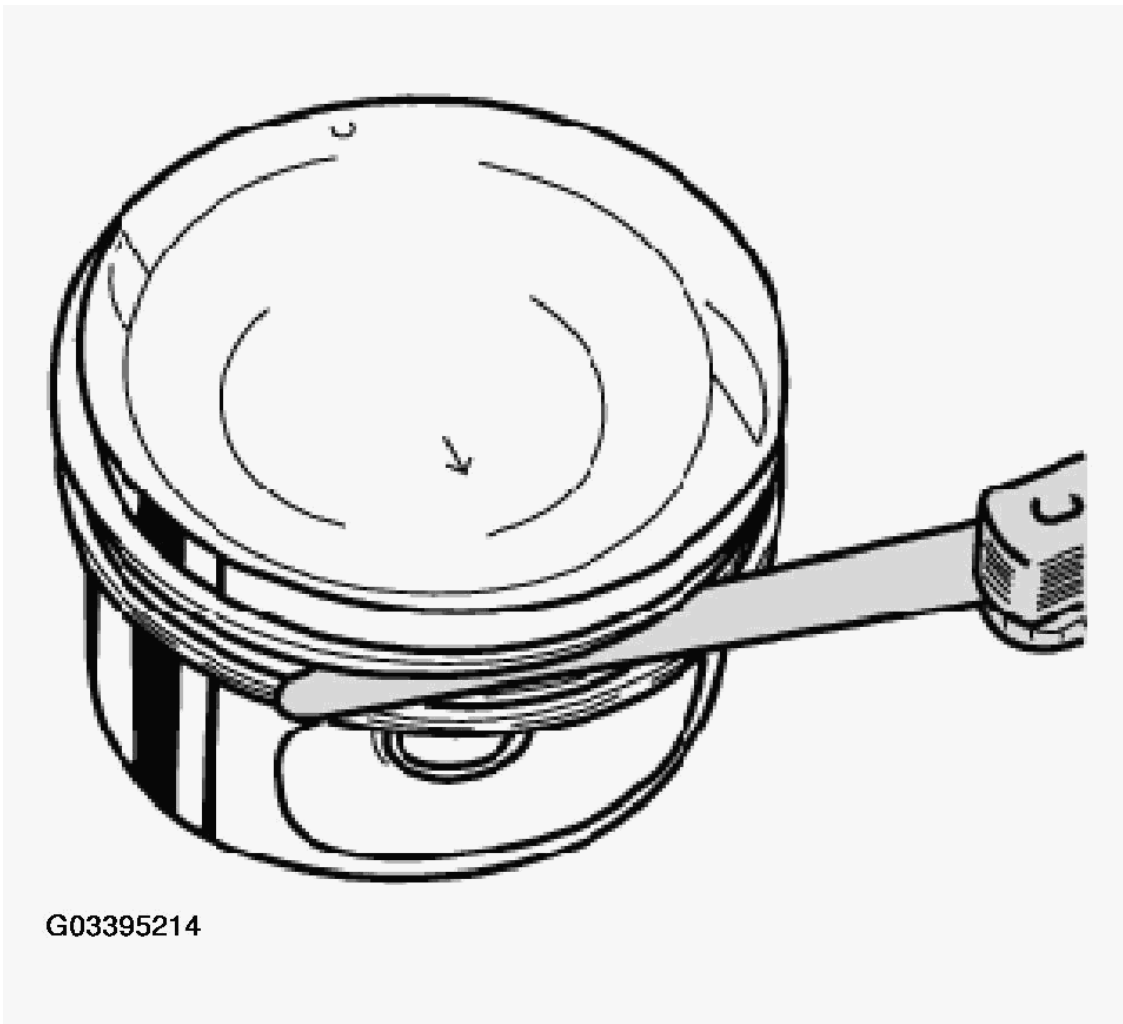
Piston Ring Measurements

There are some important specifications to check when installing piston rings. One of the measurements is axial clearance. Axial clearance is the distance between the piston ring and ring land. This prevents the rings from binding in the ring land at operating temperature. Axial clearance is measured using a feeler gauge.

Also the piston ring end gap has to be checked. This measurement is checked using a feeler gauge.

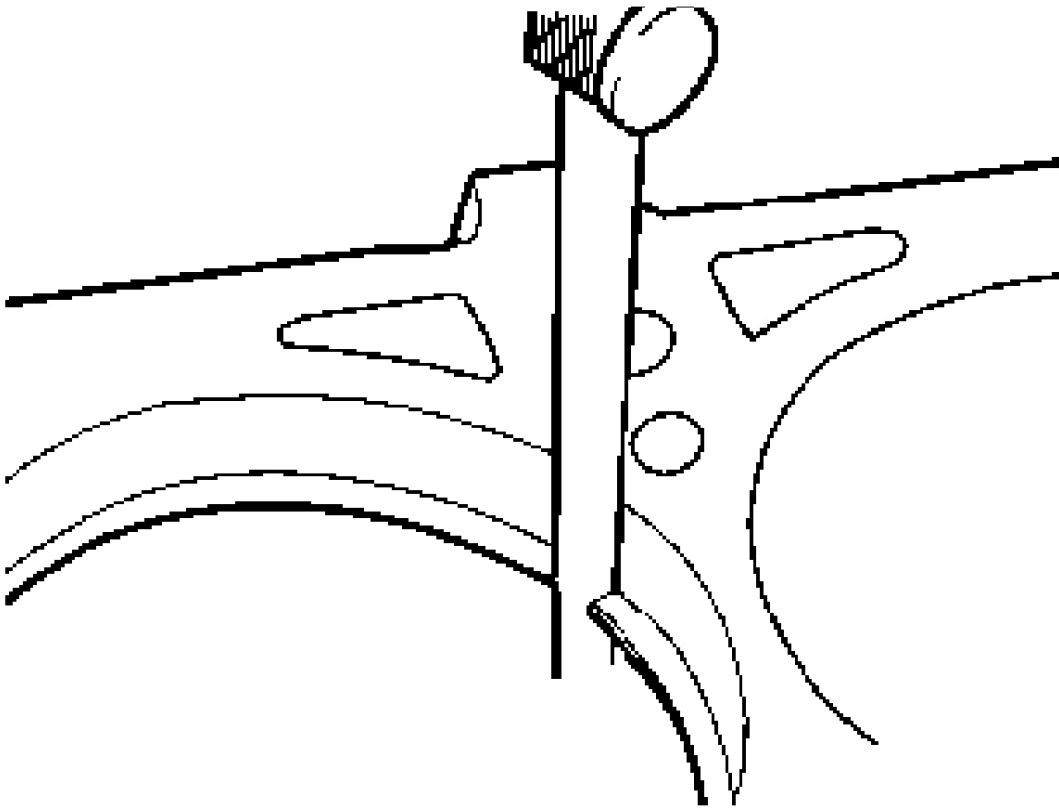
This clearance is critical in order to prevent the end gaps from contacting each other when the engine is at operating temp.

When installing the piston rings, always stagger the end gaps as per the repair instructions.



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Fig. 18: Measuring Piston Ring Gap Using Feeler Gauge
Courtesy of BMW OF NORTH AMERICA, INC.



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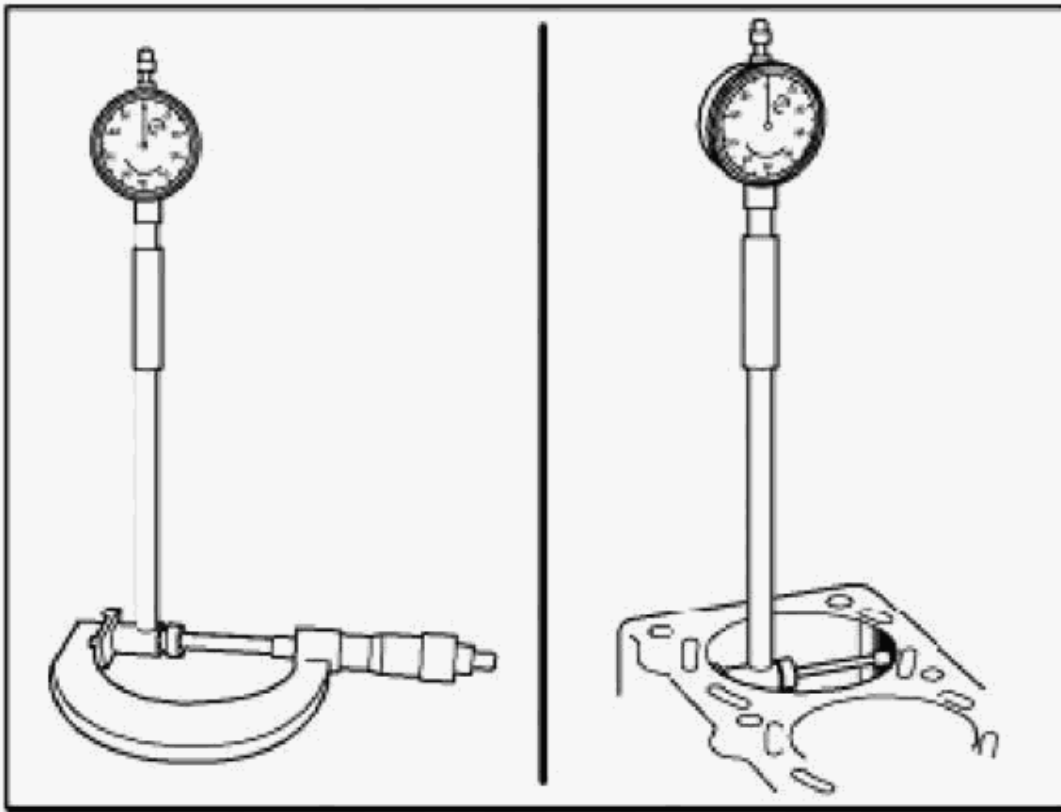
Fig. 19: Measuring Piston Ring End Gap Using Feeler Gauge
Courtesy of BMW OF NORTH AMERICA, INC.

Cylinder Bore

In order for the cylinder bore to be considered acceptable, it must not be excessively tapered or out-of-round. Once the cylinder has been checked for obvious damage and the surface finish is OK, the integrity of the bores must be verified. If cylinder wear is suspected, it must be checked using the proper cylinder bore gauge.

Each cylinder must be checked at three position in the bore - top, middle and bottom. Also there must be two opposing dimensions that should be checked. The difference between the top and bottom measurements will indicate the taper of the bore. The opposing dimensions will indicate the out-of-round specification.

If these measurements are out of specification, the cylinder bore must be re-finished or overbored. New pistons and rings must be fitted as well.



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Fig. 20: Checking Cylinder Bore Using Cylinder Bore Gauge
Courtesy of BMW OF NORTH AMERICA, INC.

METRIC SYSTEM

The unit of length, and the basis for all other metric units of measurement is the meter. The meter (1 meter), as a point of reference, is slightly longer than a yard (39.37 inches).

The divisions of a meter are hundredths and thousandths. One hundredth of a meter is called a centimeter, and is equal to .3937 inch or about half the diameter of a nickel.

One thousandth of a meter is called a millimeter. The small marks between the centimeter increments are each one millimeter, or one tenth of a centimeter. And as a point of reference, a standard paper clip is about one millimeter thick.

Metric System Denominations

Throughout the metric system, common to all units of measurement, are prefixes which designate multiples or fractions of the unit.

For automotive applications, the most common prefixes are centi; designating one-hundredth; milli; for one thousandth and kilo- for one thousand.

There are letters uniformly used throughout the system to label the divisions or multiples of each unit of measurement. The letter "m" represents milli, "c" is for centi and "k" is for kilo. These are then combined with the letter representing the unit of measurement.

For example, mm is millimeter, cm is centimeter and km is kilometer. The same applies to liter which is the unit of volume and gram which is the unit of weight.

One kilogram is equal to one thousand grams which is equal to 2.2 pounds. All metric measurements are directly related. For example, one thousand cubic centimeters, or 10cm x 10cm x 10cm of water weighs one kilogram. The volume of those one thousand cc's is one liter.

Metric Reference Chart

METRIC REFERENCE CHART

Weight			
1 kilogram	= 1 kg	= 1000 grams	= 1000 g
1 hectogram	= 1 hg	= 100 grams	= 100 g
1 dekagram	= 1 dag	= 10 grams	= 10 g
1 gram	= 1g		
1 decigram	= 1dg	= .1 gram	= 0.1 g
1 centigram	= 1 cg	= 0.01 gram	= 0.01 g
1 milligram	= 1 mg	= 0.001 gram	= 0.001 g
Length			
1 kilometer	= 1 km	= 1000 meters	= 1000 m
1 hectometer	= 1 hm	= 100 meters	= 100 m
1 dekameter	= 1 dam	= 10 meters	= 10 m
1 meter	= 1m		
1 decimeter	= 1dm	= .1 meter	= .1 m
1 centimeter	= 1 cm	= 0.01 meter	= 0.01 m
1 millimeter	= 1 mm	= 0.001 meter	= 0.001 m
Volume			
1 kiloliter	= 1 kl	= 1000 liters	= 1000 l
1 hectoliter	= 1 hl	= 100 liters	= 100 l
1 dekaliter	= 1 dal	= 10 liters	= 10 l
1 liter	= 1l		
1 deciliter	= 1dl	= .1 liter	= .1 l
1 centiliter	= 1 cl	= 0.01 liter	= 0.01 l
1 milliliter	= 1 ml	= 0.001 liter	= 0.001 l

Metric System Conversion Charts

METRIC SYSTEM CONVERSION CHARTS

Linear Measure to Metric	Linear Measure (Metric) to English
1 inch = 2.54 cm	1 mm = 0.03937 inch
12 inches = 1 foot = 30.48 cm	1 cm = 0.39 inch
3 feet = 1 yard = 0.91 m	1 m = 39.37 inch
5.5 yards = 1 rod = 5.03 m	1 km = 0.62 miles
5280 feet = 1 mile = 1.61 km	-
Square Measure to Metric	Square Measure (Metric) to English
1 in ² = 6.45 cm ²	1 mm ² = 0.002 in ²
144 in ² = 1 ft ² = 0.09 m ²	1 cm ² = 0.16 in ²
9 ft ² = 1 yd ² = 0.84 m ²	1 m ² = 1549 in ²
640 acres = 1mi ² = 2.59 km ²	1 km ² = 0.39 mi ² = 247.10 acres
Cubic Measure to Metric	Cubic Measure (Metric) to English
1 in ³ = 16.39 cm ³	1 mm ³ = 0.000061 in ³
1728 in ³ = 1 yd ³ = 0.76 m ³	1 cm ³ = 0.061 in ³
27ft ³ = 1 yd ³ = 0.76 m ³	1 m ³ = 35.32 ft ³
	1 km ³ = 0.24 mi ³
Liquid Measure to Metric	Liquid Measure (Metric) to English
1.81 in ³ = 1 fluid oz. = 30 ml	1 ml = 0.03 fluid oz = 0.061 in ³
1 pint = 0.47	1 1000 cm ³ = 1 l = 61.02 in ³ = 1.06 qt
57.75 in ³ = 1 quart = 0.95 l	1 ft ³ water = 62.5 lb
231 in ³ = 1 gal = 3.79 l = 0.0038 m ³	
1 ft ³ = 7.48 gal = 28.35 l	
Weights to Metric	Weight (Metric) to English
1 Oz = 28.35 g	1 g = 0.035 oz
1 lb = 453.59 g	1 kg = 2.20 lb
1 lb = 0.45 kg	1 metric ton = 1000 kg = 1.102 tons = 2205 lb
1 ton = .91 metric ton	
Temperature to Metric	Temperature to Fahrenheit
F = 9/5C + 32	C = 5/9 (F-32)

Pressure Conversion Chart

PRESSURE CONVERSION CHART

Bar	kPa	psi	in.Hg.
6.0	600	87.0	
5.9	590	85.5	
5.8	580	84.0	
5.7	570	82.5	

5.6	560	81.0	
5.5	550	79.0	
5.4	540	78.5	
5.3	530	77.0	
5.2	520	75.5	
5.1	510	73.5	
5.0	500	72.5	
4.9	490	71.0	
4.8	480	69.5	
4.7	470	68.0	
4.6	460	66.5	
4.5	450	65.5	
4.4	440	64.0	
4.3	430	62.5	
4.2	420	61.0	
4.1	410	59.5	
4.0	400	58.0	
3.9	390	56.5	
3.8	380	55.0	
3.7	370	53.5	
3.6	360	52.0	
3.5	350	51.0	
3.4	340	49.5	
3.3	330	48.0	
3.2	320	46.5	
3.1	310	45.0	
3.0	300	43.5	
2.9	290	42.0	
2.8	280	40.5	
2.7	270	39.0	
2.6	260	37.5	
2.5	250	36.5	
2.4	240	35.0	
2.3	230	33.5	
2.2	220	32.0	
2.1	210	30.5	
2.0	200	29.0	
1.9	190	27.5	
1.8	180	26.0	
1.7	170	24.5	
1.6	160	23.0	
1.5			

	150	22.0	
1.4	140	20.5	
1.3	130	19.0	
1.2	120	17.5	35.90
1.1	110	16.0	32.91
1.0	100	14.5	29.92
0.9	90	13.0	26.93
0.8	80	11.5	23.94
0.7	70	10.0	20.94
0.6	60	9.0	17.95
0.5	50	7.5	14.96
0.4	40	6.0	11.97
0.3	30	4.5	8.98
0.2	20	3.0	5.98
0.1	10	1.5	2.99
0.0	0	0.0	0.0

GENERAL INFORMATION

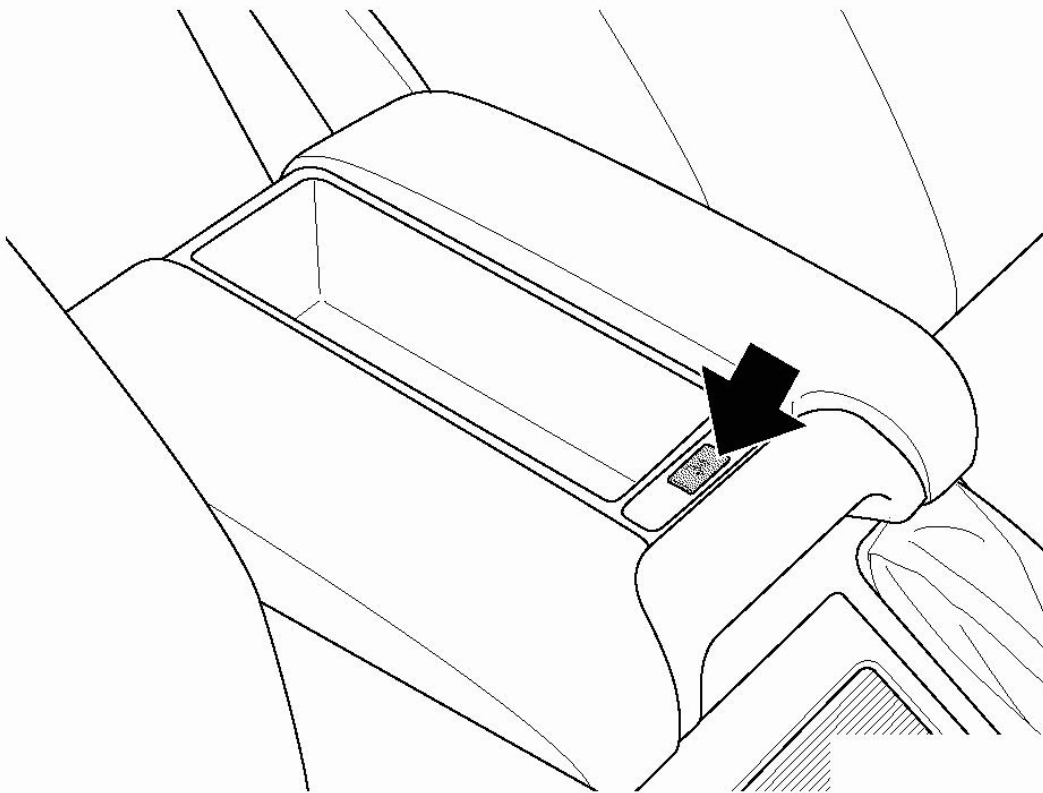
BMW Universal Bluetooth - Overview - All Models

BMW UNIVERSAL BLUETOOTH™

INTRODUCTION

The BMW Universal Bluetooth™ HandsFree System (ULF) utilizes Bluetooth™ wireless technology to enable a wireless connection to be established between a Bluetooth™ enabled mobile phone and the ULF Control Module installed in the vehicle. The combination of these components results in a new generation of in-vehicle phone system.

The ULF Control Module forms an interface that allows a mobile phone with the embedded Bluetooth™ wireless technology feature to be wirelessly integrated into the vehicle. For the first time BMW is introducing a new generation hands-free telephone system kit that provides the customer with the option of using various Bluetooth™ enabled mobile phones (a list of recommended phones is available from your BMW Center).



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Fig. 1: Identifying Oddment Tray Button

Courtesy of BMW OF NORTH AMERICA, INC.

WHAT IS BLUETOOTH™

The name Bluetooth™ is derived from the Danish King Harald Bluetooth who lived in the 10th century. He was well known for his ability to unify his kingdom and today lends his name to a wireless technology standard that can connect/unify various electronic devices that are Bluetooth™ enabled and located within a short range (approx. 10 m or 32.8 ft) of each other.

Bluetooth™ wireless technology is a short-range radio frequency technology standard that allows several devices to communicate with each other simultaneously. The standard indicates that up to seven simultaneous connections can be established and maintained at one time, as long as the connected devices are within a range of 10 m (32.8 ft).

NOTE: The ULF system will allow four phones to be paired to the system at a time and only allow one phone to be connected at a time.

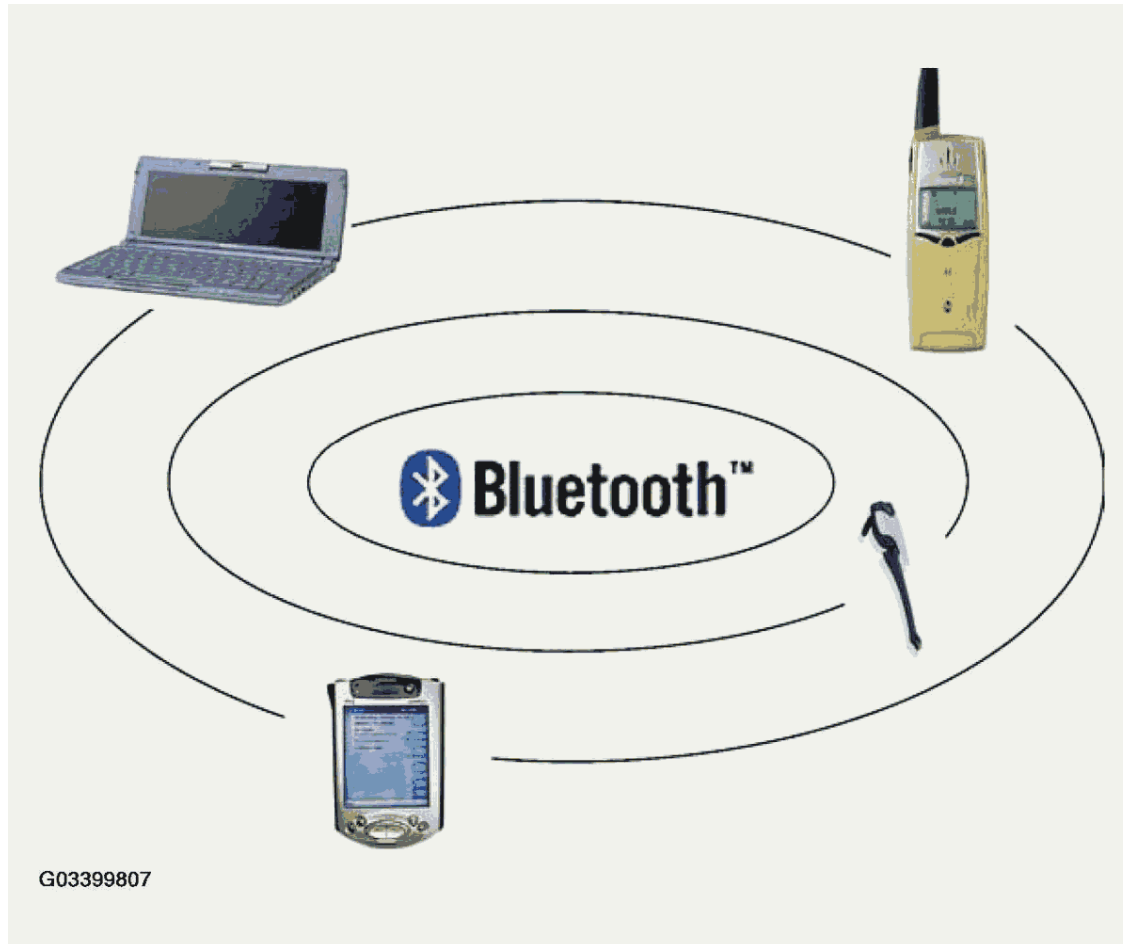


Fig. 2: Bluetooth Network Area Description
Courtesy of BMW OF NORTH AMERICA, INC.

The system uses the license-free, global Industrial Scientific Medical band (ISM) at 2.45 GHz. This frequency range from 2.402 GHz to 2.480 GHz is subdivided into 79 channels with a 1 MHz bandwidth.

Signals transmitted through the airways can be scrambled and unscrambled to enhance communication security. With Bluetooth™ technology, communication frequencies are changed 1600 times per second to reduce the risk of interference or interception of the transmitted signal. The relatively small operating range of approx. 10 m (32.8 ft) also enhances the security of this technology, since tampering with the transmitted data is only possible when inside the 10 m (32.8 ft) wireless "network".

To further enhance the security of this short-range wireless network the ULF system requires a pairing procedure to be carried out for each device that will be introduced into the network. As part of this procedure a required passkey must be entered once (during the initial pairing procedure) to establish a secure connection between the phone and the ULF Control Module.

Data and Voice

Bluetooth™ was developed for the transmission of both voice as well as data. A bandwidth of approx. 1 MB/s is available for this purpose.

Bluetooth™ Enabled Phones

Ideally all phones that are Bluetooth™ enabled should work with the ULF system, however not all phones utilize the same profiles and therefore may not be recognized by the ULF System. A list of recommended Bluetooth™ enabled phones is available from your BMW Center.

ADVANTAGES OF THE ULF SYSTEM

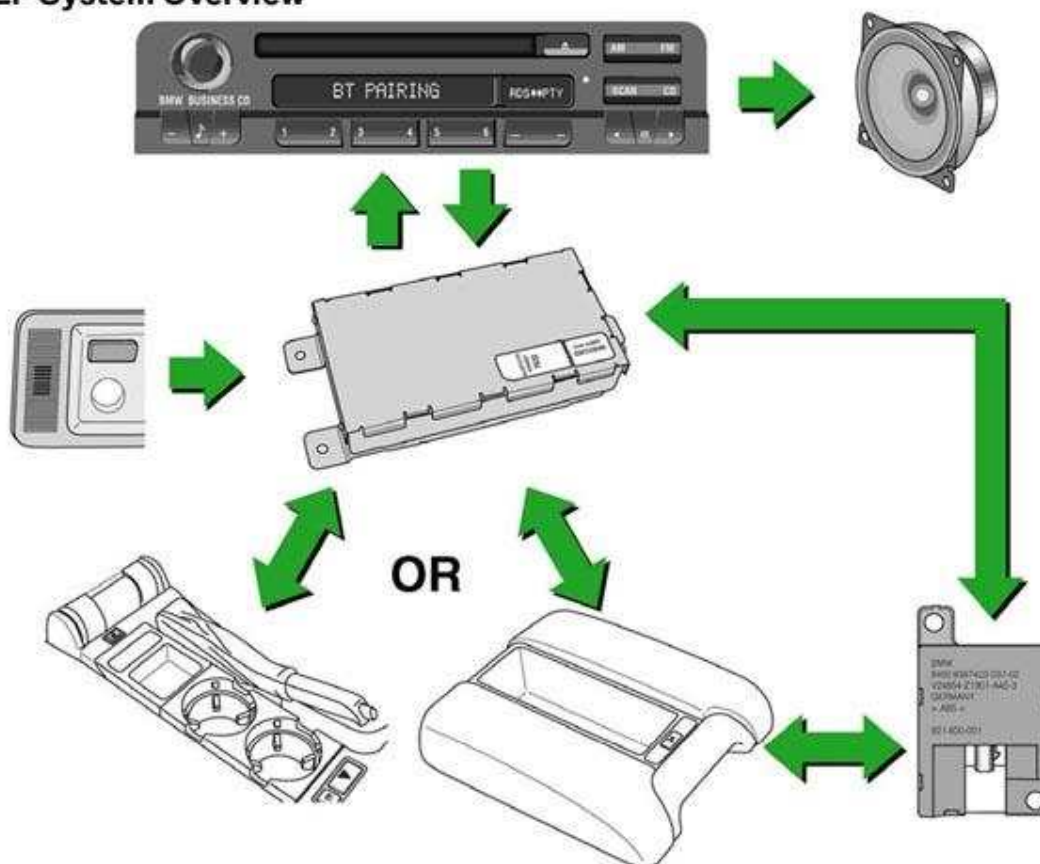
- Once a phone is paired to the system it will be able to automatically connect to the Bluetooth™ wireless network of the vehicle, the next time it is introduced into the vehicle and the vehicle ignition is on.
- Up to four different Bluetooth™ phones can be paired to the system at one time, although only one phone can be wirelessly connected at any time.
- The phone does not need to be inserted into a phone specific cradle in order to be integrated into the vehicle.
- The phone can remain in a briefcase, purse, glove box, etc.; as long as it is turned on and located within the interior of the vehicle.
- The MFL buttons on the steering wheel can be utilized to place or receive a call, to scroll the phone book and select a number or activate voice recognition in order to dial a number via voice command.
- A voice recognition system is integrated into the ULF control module and can be activated by depressing the send/receive™ button.
- The communications protocol of Bluetooth™ wireless technology is standardized irrespective of the manufacturer, this therefore allows various mobile telephones that utilize Bluetooth™ wireless technology and a recognized profile to be connected to the ULF System.

System Overview

A ULF system consists of a control module, microphone, Bluetooth™ antenna, a standalone pairing

(send/receive) button, or eject box with a coin tray insert.

ULF System Overview



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Fig. 3: ULF Control Module System Components
Courtesy of BMW OF NORTH AMERICA, INC.

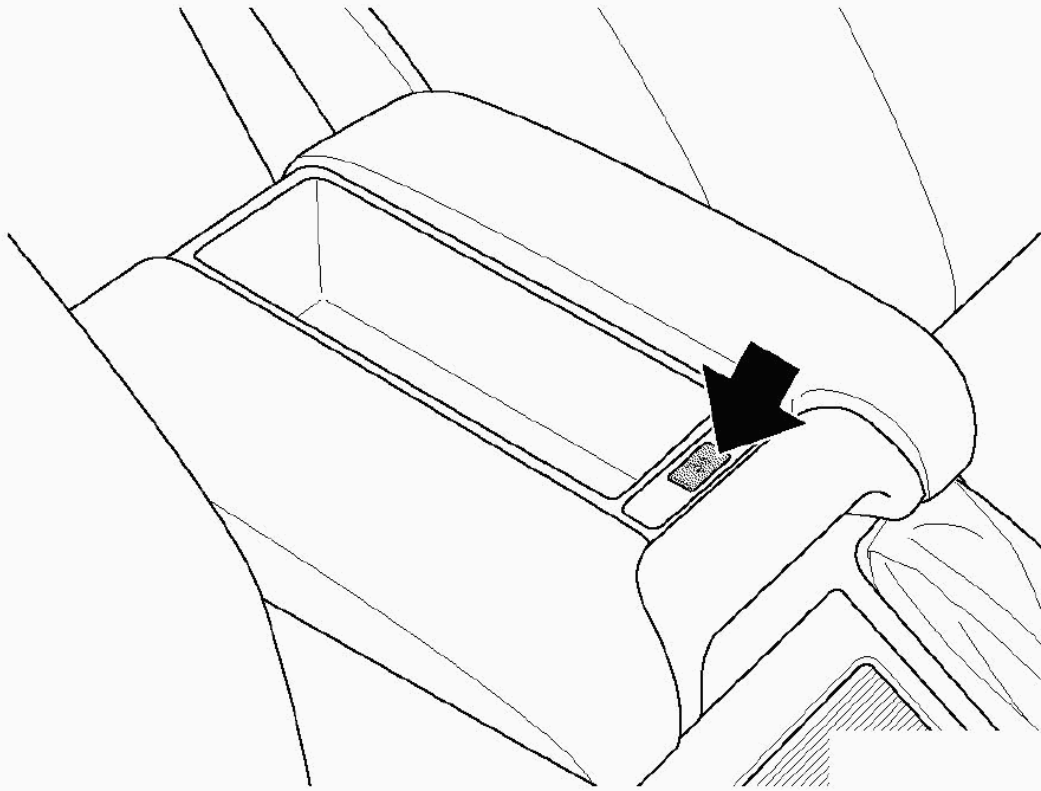
ULF Control Module

The ULF module forms the interface between the Bluetooth™ mobile phone and the electronic system in the vehicle. The mobile phone with the embedded Bluetooth™ wireless technology is the transceiver, this requires that the phone be activated, paired and present within the vehicle network in order to place or receive a call in the vehicle.

Oddment Tray

The oddment tray, which is connected to the ULF control module via the vehicles wiring harness, serves the purpose of:

Housing the send/receive™ or pairing button, which must be depressed to activate the pairing procedure between the phone and the control module.



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Fig. 4: Identifying Oddment Tray Button
Courtesy of BMW OF NORTH AMERICA, INC.

Pairing Button

A stand-alone send/receive™ or pairing button is supplied for the 3 Series in order to retain the cup holders. The button provides the same function as the send/receive™ button on the steering wheel, plus is the button that must be depressed to activate the pairing procedure between the phone and the control module.

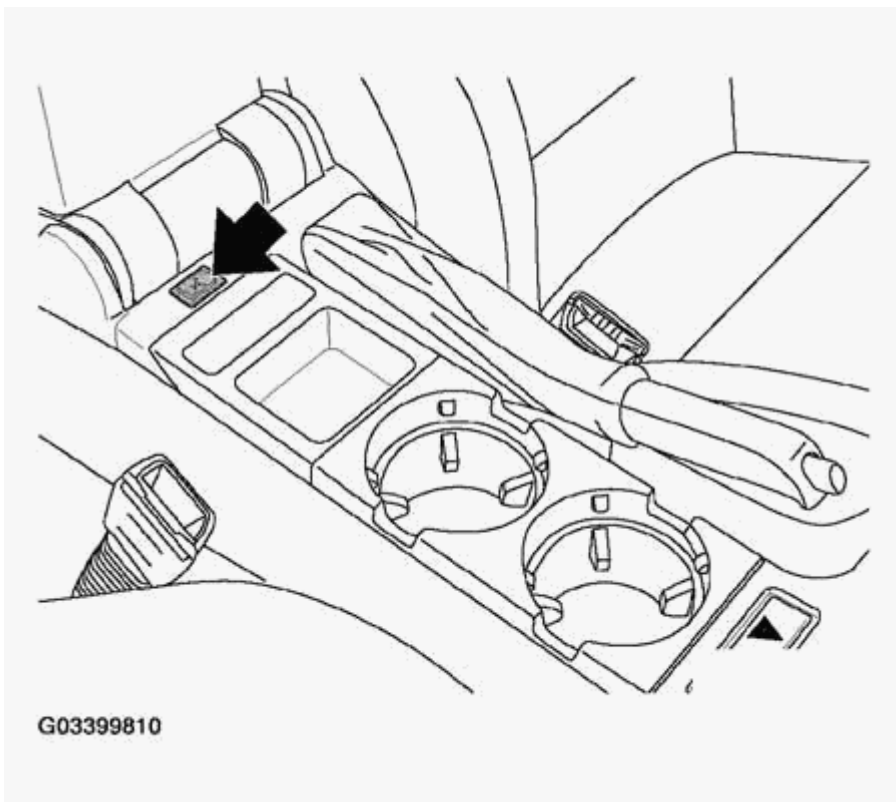


Fig. 5: Identifying Pairing Button

Courtesy of BMW OF NORTH AMERICA, INC.

Bluetooth™ Antenna

The Bluetooth™ antenna operates on a frequency of 2.45 GHz and is installed in the interior compartment of the vehicle. This antenna provides the wireless interface between the Bluetooth™ enabled phone and the ULF Control Module.

SYSTEM OPERATION

Initial Operation

Prior to using the system for the first time, the Bluetooth™ mobile phone that is to be used must be paired with the ULF control module. This pairing procedure is necessary in order to assign the digital code of the mobile phone to the ULF control module installed in the vehicle. The pairing procedure is only required when a new phone is introduced to the ULF system for the very first time or the list of paired devices is cleared from the memory of the ULF module, it does not need to be performed every time the phone is used with the system.

After pairing, the mobile phone is recognized automatically by the ULF control module within 45 seconds after it is introduced into the vehicle and the ignition is turned on.

NOTE: Depending on the mobile phone manufacturer, particular care must be taken prior to initial operation to ensure that no headset is coupled with the mobile phone. Various devices may interpret the ULF control module as a headset and

request deactivation of the headset. Please refer to the operating instructions of the mobile phone for detailed information.

Pairing Procedure

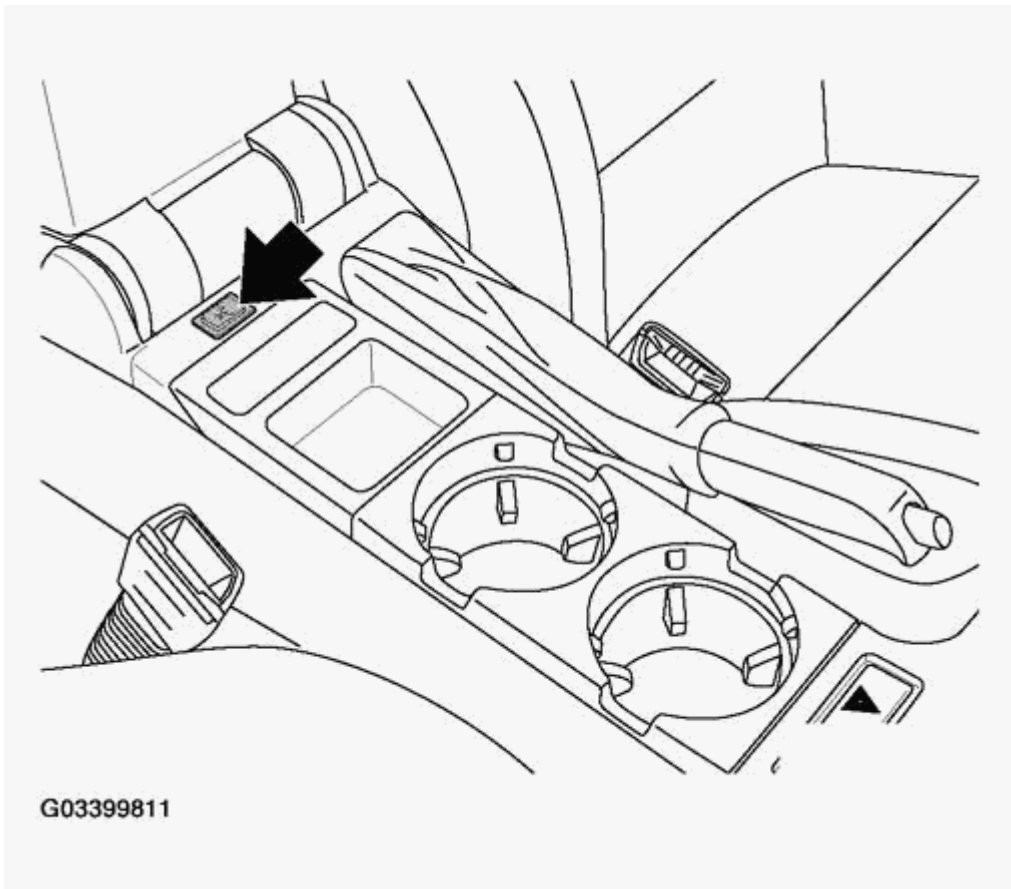
The pairing procedure that must be initiated through the phone will differ corresponding to the different menu configurations of the various Bluetooth™ mobile phones on the market. The user's manual of the phone manufacturer should always be referenced for specific steps on how to activate the Bluetooth™ feature and to pair/link devices.

The following steps are generalized steps that should help in activating the Bluetooth™ function of most phones:

In Vehicle:

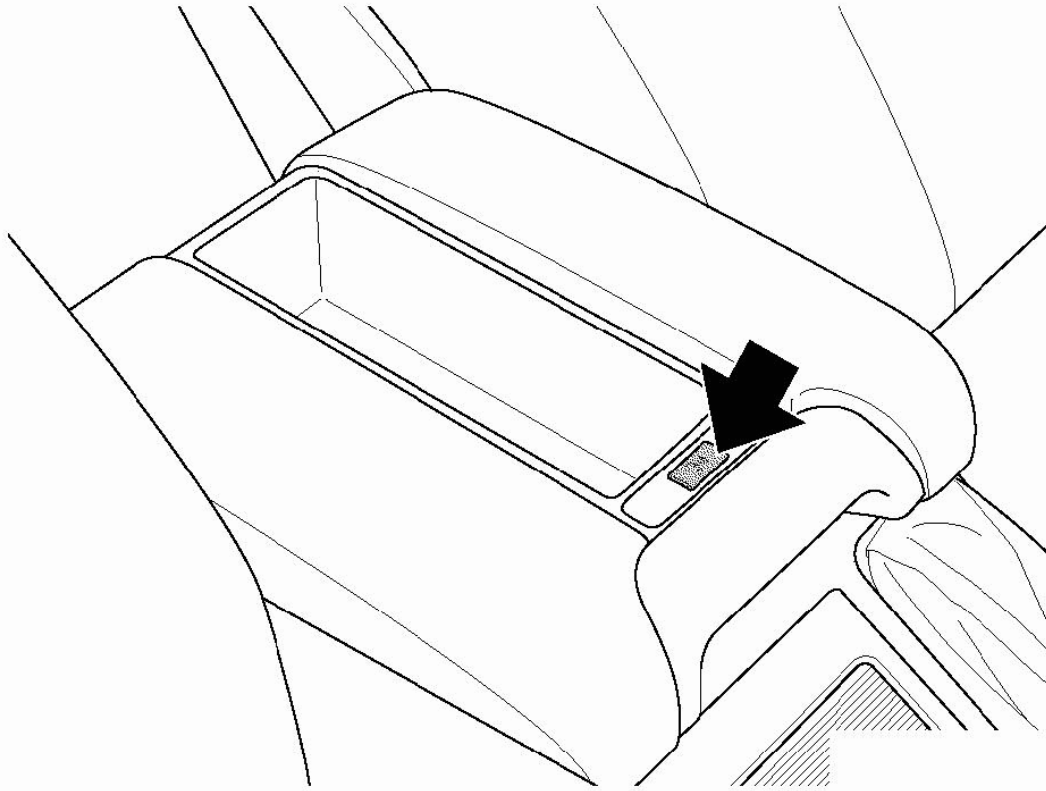
1. Depress the send /receive (pairing) button located in the center console, for at least 1 second prior to switching on the ignition and continue to hold the button down for approximately 2-3 seconds after the ignition is turned on.
2. Release the button.

NOTE: The send/receive (pairing) button in 5 Series and X5 SAV is located on the oddment tray assembly in the center console.



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Fig. 6: Identifying Send /Receive (Pairing) Button Location (1 Of 2)
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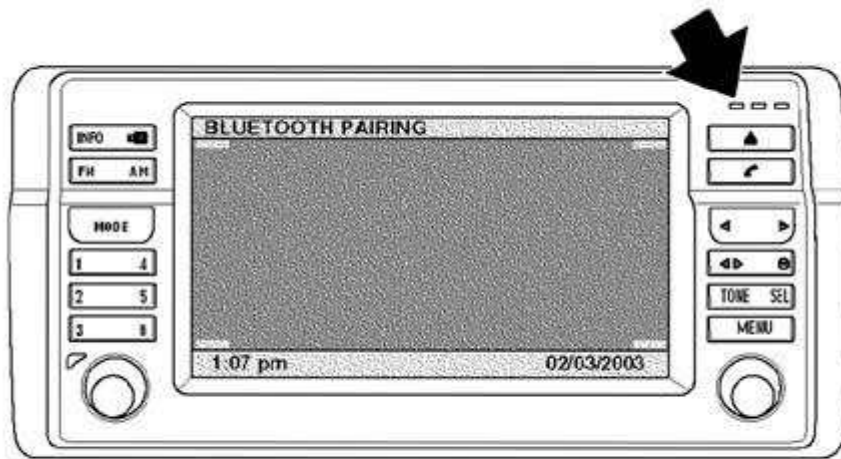
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Fig. 7: Identifying Send /Receive (Pairing) Button Location (2 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

3. Shortly after releasing the button on the Radio or Display Screen, the following message should be displayed:
 - a. Display Screen:

"Bluetooth Pairing" displayed.

Green, Yellow and Red LEDs on the right side of the unit are flashing which indicates that the ULF is waiting for a signal from the Bluetooth™ device to be paired.



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Fig. 8: Identifying Releasing Button On Radio

Courtesy of BMW OF NORTH AMERICA, INC.

b. Radio Display (5 Series and X5 SAV):

"Bluetooth Pairing" Display Which Indicates That The Ulf Is Searching For Available Bluetooth™ Devices. Green, Yellow And Red Leds On The Right Side Of The Unit Are Flashing Which Indicates That The Ulf Is Waiting For A Signal From The Bluetooth™ Device To Be Paired.

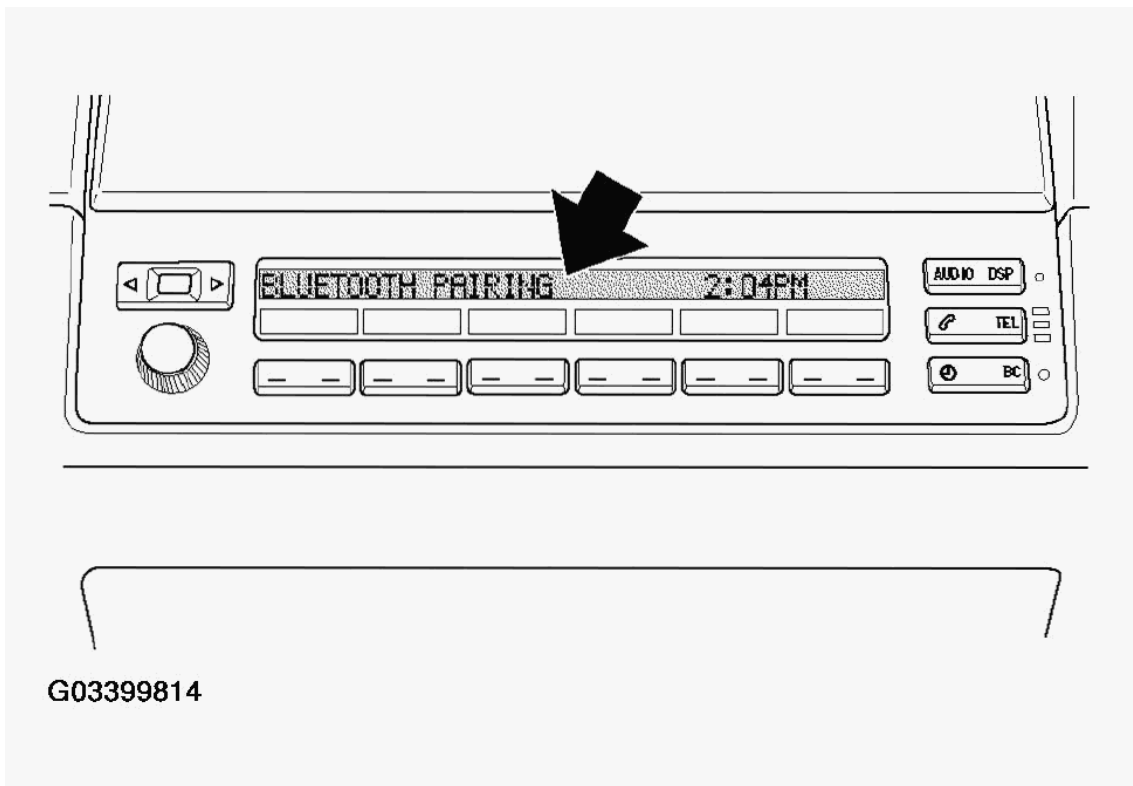


Fig. 9: Bluetooth Pairing Display
Courtesy of BMW OF NORTH AMERICA, INC.

c. Radio Display (3 Series with CD or Cassette):

"BT Pairing" display which indicates that the ULF is searching for available Bluetooth™ devices.

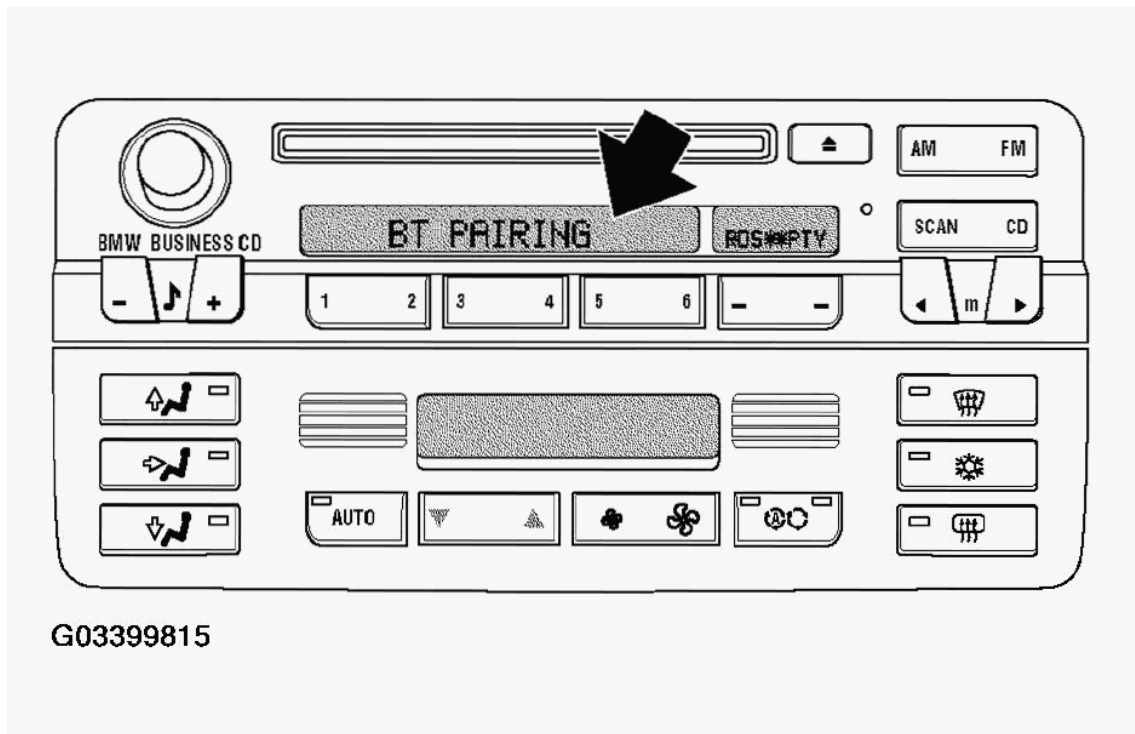


Fig. 10: BT Pairing Display

Courtesy of BMW OF NORTH AMERICA, INC.

4. Activate the search function of the phone as indicated below.

ON PHONE:

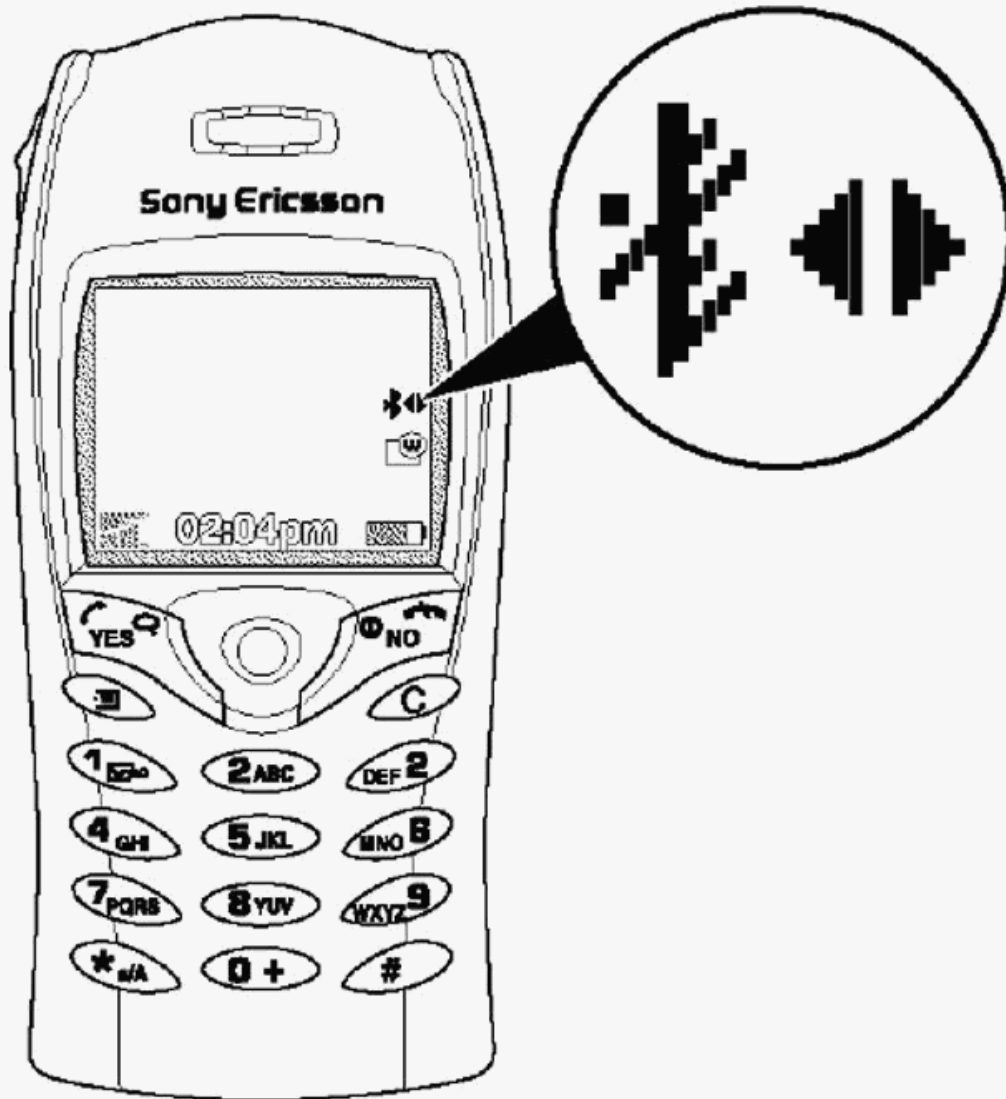
1. Locate the connection/settings menu and select Bluetooth™.
2. Select the response that will activate the Bluetooth™ feature of the phone.
3. Next select a menu option that will allow you to "Discover" or "Search" for active Bluetooth™ devices.
4. If the phone identifies/finds a device (named "BMW" followed by 5 digits) select it and follow the indicated steps to complete the pairing process.
5. Once the phone is successfully paired to the device cycle the vehicle ignition switch off and back on and the devices should wirelessly connect within 30 seconds. When the connection is established the phone will display a connection symbol.

The following steps are an example of the pairing procedure that must be initiated to pair the Sony Ericsson T68i phone to the ULF Control Module.

1. Press the menu button.
2. Select "Connect".
3. Select option 3: "Bluetooth".
4. Select option 4: "Options".
5. Select option 1: "Operation mode" and set to "On" or "Automatic".
6. Go back one step by pressing the red phone button several times.

7. Select option 3: "Discover".
8. Mobile phone display shows 'Searching'
9. Select "BMW" in upcoming list.
10. Select option 1: "Add to paired".
11. Enter the password (= ULF passkey) located on ULF Control Module that is in the rear of the vehicle or on the Passkey Reference Card.
 - Mobile phone display shows 'BMW Pairing'
 - Mobile phone display shows 'Pairing Successful'
 - Display screen shows 'Pairing succeeded' for 3 seconds
12. Enter device name or accept the name that is automatically displayed.
13. Mobile phone display shows "Added to paired devices".
14. Exit menu by pressing the red phone/NO button.
15. Once the phone is successfully paired to the device cycle the ignition switch off and back on.
16. The devices should wirelessly connect within 30 seconds. The connection is established when the phone displays the symbols indicated, on the right side of the screen.

NOTE: Shortly after turning on the ignition and the Bluetooth™ connection is identified, the phone may display a message asking if the connection should be established/accepted. The connection authorization request will always occur unless the setting on the phone is modified to allow automatic connection every time, please refer to the user's manual of the phone to determine how to change this setting.



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Fig. 11: Locating Connection/Settings Menu On Phone
Courtesy of BMW OF NORTH AMERICA, INC.

System Functions

The mobile phone must always be activated, paired and present within the Bluetooth™ network in order to place or receive a call through the vehicle.

Indicator Lamps

The indicator lamps show the following:

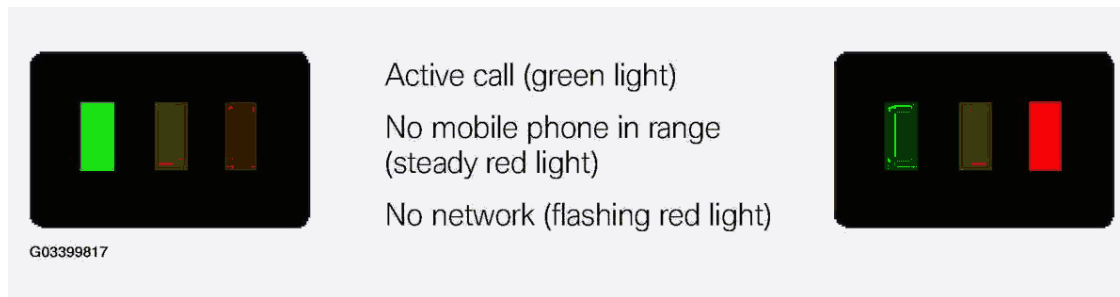


Fig. 12: Identifying Indicator Lamps

Courtesy of BMW OF NORTH AMERICA, INC.

Active call (green light).

No mobile phone in range (steady red light).

No network (flashing red light).

Adopting Telephone Book

Depending on the type of Bluetooth™ mobile phone, the telephone book is either transferred automatically (ex. Nokia 6310, Sony Ericsson T68i) or manually (depending on software version of phone) by the user to the ULF control module. The address book is stored temporarily for the purpose of accessing/displaying stored phonebook information using the steering wheel controls or telephone menu selections available on the display screen or some radio displays.

If a manual transfer of the address book must be made, the ULF must be in setup mode for manual transfer. The corresponding data can then be transferred. If phonebook data is modified while the phone is wirelessly connected to the vehicle the changes will not be displayed in the vehicle if the phonebook is scrolled via the steering wheel or display screen, changes will only be transferred the next time the ignition is cycled.

Placing a Call

A call can be placed in several different ways:

1. Using the keypad or address book of the mobile phone and depressing the send button on the phone.

NOTE: Some phones may ask if the call is to remain within the phone. Refer to the users manual of the phone for specific instructions on disabling this feature.

2. Depressing the R/T button on the steering wheel, then scrolling (using the TM or TM buttons) through the address book of the phone that is linked to the ULF, until the desired number is displayed on the radio or display screen and then depressing the send/receive TM button on the steering wheel or center console to

place the call.

3. Depressing the TM button on the steering wheel until an audible "beep" is heard through the vehicle speakers, at this point a call can be placed by using the following voice commands:
 - "Dial number" or "Dial phone":
 - After the system asks for a number say the number.

Example: "123 456 7890"; the system will repeat the number requested once you stop speaking momentarily, the number may also be displayed depending on the vehicle and equipment/accessories installed.

- "Dial":

NOTE: Once the dial command is given the number will be displayed on the display screen or radio; plus it will always be displayed on the mobile phone after a call is placed.

4. Briefly depressing the TM button on the steering wheel will redial the last number dialed.

For more information on using voice commands refer to the " Owner's Manual for Voice Input System. The Convenient Alternative to Manual Control" (P/N 84 11 027 942)

Receiving/Accepting a Call

The call ringer in the BluetoothTM mobile phone is audible when an incoming call signal is received. At the same time, the signal is sent via the BluetoothTM interface in the mobile phone to the BluetoothTM antenna in the vehicle. The ULF receives the incoming ring/call signal via the BluetoothTM antenna and mutes the radio. The incoming ring/tone signal is then also transmitted to the vehicle speakers.

The following options are available for accepting a call:

3 Series without Display Screen:

- Press send/receive TM button on MFL (Steering Wheel).
- Press send/receive TM button in the center console.
- Press send/receive key on mobile phone.

5 Series and X5 SAV without Display Screen:

- Press send/receive TM button on MFL (Steering Wheel).
- Press send/receive key on radio.
- Press send/receive TM button on the oddment tray (Center Console).
- Press send/receive key on mobile phone.

Vehicles with Display Screen:

- Press send/receive™ button on MFL (Steering Wheel).
- Press send/receive™ button on the oddment tray (Center Console).
- Select the green phone symbol on the Display Screen.
- Press send/receive key on mobile phone.

Conducting a Call

If the call is accepted by pressing the send/receive key™ on the Radio (5 series and X5 SAV), Display Screen, steering wheel or center console, it will be conducted via the hands free microphone and vehicle speakers.

If a call is accepted by pressing the send/receive key on the mobile phone, the reaction will depend on the type of handset. In the majority of cases, however, the question appears:

"Do you wish to use the mobile phone?"

Please refer to the operating instructions of the mobile phone for a detailed description of the operating procedure of the phone.

The hands-free function is activated after pressing the send/receive key. The incoming call is encoded (scrambled) via the Bluetooth™ interface in the mobile phone and sent to the Bluetooth™ antenna in the vehicle. The call is received by the ULF control module and output via the radio to the audio speakers.

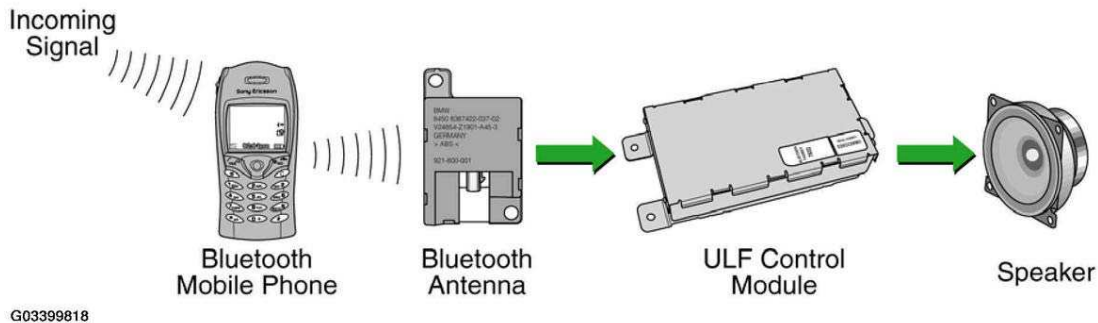


Fig. 13: Identifying Call Components (1 Of 2)
 Courtesy of BMW OF NORTH AMERICA, INC.

Since the ULF system provides a digital full-duplex hands-free operation, it is possible to simultaneously speak and listen to calls. An echo cancellation function prevents feedback when speaking into the microphone. The microphone audio signal is sent via a hardwire connection to the ULF control module. In the ULF module the received audio signal is scrambled via the Bluetooth™ module and transferred via the Bluetooth™ antenna to the mobile phone. The mobile phone then transmits the call via the phone antenna.

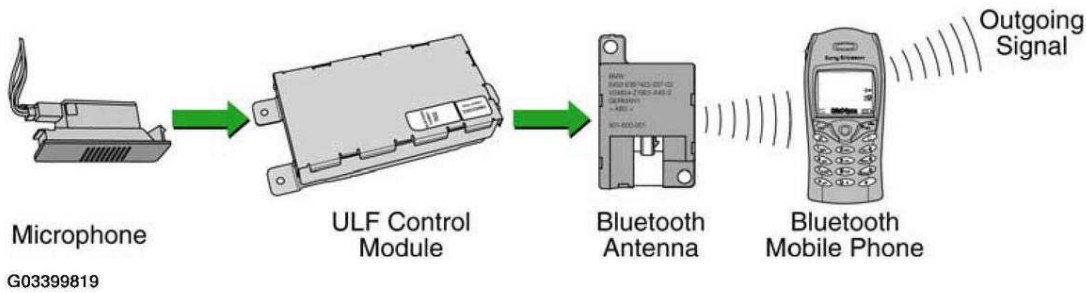


Fig. 14: Identifying Call Components (2 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

Ending a Call

The following options are available for ending a call:

3 Series without Display Screen:

- Press send/receive TM button on MFL (Steering Wheel).
- Press send/receive TM button in the center console.
- Press send/receive key on mobile phone.

5 Series and X5 SAV without Display Screen:

- Press send/receive TM button on MFL (Steering Wheel).
- Press send/receive key on radio.
- Press send/receive TM button on the oddment tray (Center Console).
- Press send/receive key on mobile phone.

Vehicles with Display Screen:

- Press send/receive TM button on MFL (Steering Wheel).
- Press send/receive TM button on the oddment tray (Center Console).
- Select the green phone symbol on the Display Screen.
- Press send/receive key on mobile phone.

Transfer Active Call From Phone to ULF

If a call is received or placed via the handset, it can be transferred into the vehicle once the phone is within the active BluetoothTM network of the vehicle.

Call transfer procedure:

1. Ignition must be on.

2. Bluetooth™ connection must be established.
3. Briefly depress the send/receive™ button located in the center console.

NOTE: Some phones may automatically display a statement asking the user if the active call should be transferred to the ULF system shortly after the Bluetooth™ connection is established. If the request is acknowledged the call is automatically transferred into the vehicle/ULF system without having to depress the send/receive button.

Transfer Active Call from ULF to Phone

If you are currently in an active call and you need to leave the vehicle the call can be transferred into the handset in several ways.

1. Ignition is turned off and you walk away from the vehicle. Once outside the 10 m (32.8 ft) range a message may be displayed on the phone asking if the current call should be maintained or ended, by maintaining the call it will be transferred to the handset.
2. Depending on the model of phone being used the call can be transferred to the handset by manually disconnecting from the Bluetooth™ network via the connections menu or selecting a transfer function in the settings menu of the phone (refer to the user's manual of the phone for more information).

Linking Several Bluetooth™ Mobile Phones

Up to four Bluetooth™ mobile phones can be paired one after the other to the ULF control module. The pairing operation corresponds to the procedure described above.

The handset paired last has the highest priority. The telephone paired first will drop out of the list if a fifth Bluetooth™ mobile phone is paired.

NOTE: For incoming and outgoing calls, only the user connected first to the system can speak via the hands-free facility.

If two users enter the network or connection range simultaneously, only the user with the highest priority (the user last paired during the initial pairing procedure) will be able to use the hands-free function for incoming & outgoing calls. If the highest priority phone is turned off the phone with the next highest priority will be connected.

Deleting Devices

The paired Bluetooth™ mobile phones can only be deleted as a single group from the ULF control module.

The pairing procedure must first be activated, and then the send/receive™ button on the installed eject-box or the pairing button located at the rear of the center console must again be depressed for an additional 10 seconds after the "Bluetooth Pairing" message is displayed on the radio in order to clear the list of paired devices from the control module and the message "paired devices deleted" is displayed.

TECHNICAL INFORMATION

Not only does the Universal Bluetooth™ Hands-Free System offer a means to wirelessly integrate a mobile phone into the vehicle, it also can be diagnosed using the DISplus or GT1.

The control module should always be coded to the specific vehicle that it is installed into to ensure optimum system performance. Coding of the module can be done using the DISplus or GT1 with CD33 or higher installed.

The ULF control module contains several controllers that provide the following functions:

1. Bluetooth™ Control Circuit:

The Bluetooth™ control circuit is physically connected to the Bluetooth™ antenna. It establishes the connection between the Bluetooth™ mobile phone and the vehicle, de-scrambles the incoming call/signal from the phone, scrambles the outgoing signal from the microphone for transmission to the phone, plus controls all communication to paired Bluetooth™ devices.

2. Hands-free Control Circuit:

The hands-free control circuit in the ULF controls the input/output of audio frequency signals in hands-free mode. The hands-free mode is designed for full-duplex transmission. This means the user can listen and speak simultaneously. Voice transmission takes place via a microphone located in the interior of the vehicle.

Pressing and holding the send/receive™ button until an audible beep is heard will activate the integrated voice recognition system and place the system into a hands-free mode.

3. Audio Output Control:

The incoming signal from the Bluetooth™ phone is processed, sent through the radio and to the speakers.

4. Audio Input Control:

The outgoing audio received from the vehicle microphone is processed and transmitted to the Bluetooth™ phone.

5. I/K-Bus Interface:

The interface in the ULF control module for the I/K-bus controls the procedure for transmitting and receiving data telegrams via the I/K-bus in connection with other components on the bus.

6. Power Module:

The power module in the ULF control module regulates the voltage supply and monitors system shutdown in the event of an under voltage situation in the vehicle.

SYSTEM OVERVIEW

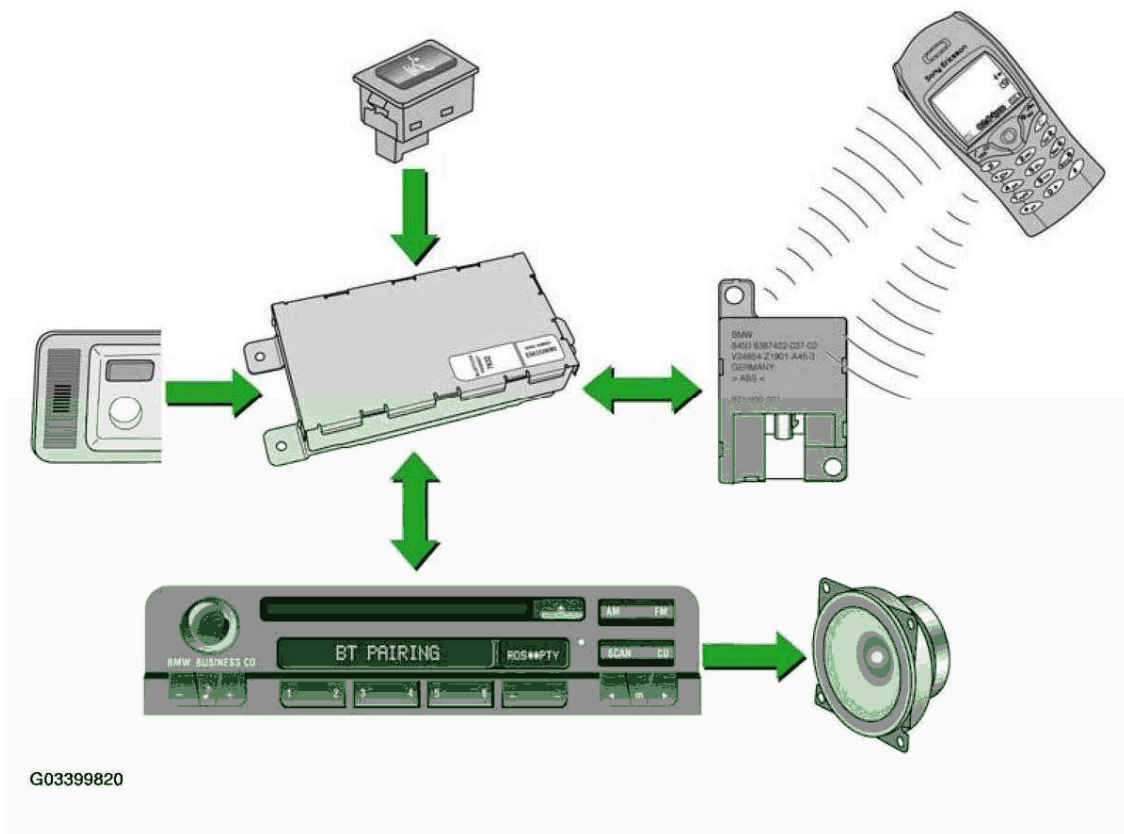


Fig. 15: Identifying Power Module System Components
Courtesy of BMW OF NORTH AMERICA, INC.

Voice Recognition

The voice recognition for this system is integrated into the ULF Control Module and utilizes the same voice commands as those used with the TEMIC Voice Recognition Module used with the CPT8000 phone system. The "Owner's Manual for the Voice Input System" P/N 84 11 0 027 942 should be referenced for more detailed information regarding voice command features.

Coding ULF Control Module to Vehicle

After installing the ULF Kit, the vehicle should be re-coded with DISPlus/GT1 SW 33 or higher, using the "Retrofit" path to ensure that the system works properly with the systems currently installed in the vehicle. The recoding is done automatically when using the following "retrofit" procedure:

Example for coding E46 with ULF installed:

- Connect DIS or GT1 to vehicle (with SW 33 or higher installed).
- Turn on ignition.
- Select "Coding ZCS".

- Series: "E46 Series".
- Path: "2 Retrofit".
- System: "ULF Universal charging and Handsfree facility".
- Follow the on screen requests to activate the coding procedure.

Function Test

Upon completion of the recoding, verify that the BMW Universal Bluetooth™ HandsFree System is working correctly by going through the following action steps. After completing each step ensure that the desired result is obtained:

FUNCTION TEST

Action	Response
Pair phone to vehicle (refer to section for pairing instructions).	Phone and or Radio/MID/Board Computer should display statement indicating Pairing succeeded.
Turn on radio and initiate a call using voice recognition commands by depressing/holding the Voice recognition button on steering wheel until an audible beep is heard.	Radio should mute and an audible beep is heard through vehicle speakers.
Say "Dial number".	System states "Please speak the number".
Say phone number to be dialed ex"1234567890".	System states "1234567890".
If number is correct say "Dial"	Call is placed and number being dialed is displayed on phone as well as on Radio/MID/Board Computer.

TROUBLESHOOTING

TROUBLESHOOTING

Situation	Correction
No audio output through vehicle speakers.	Check SES module jumper plug.
Radio does not mute after placing a call.	Check connections at rear of radio for Tel On and Tel Mute signal. Verify that connectors and pins are properly seated.
Audio quality in vehicle may not sound very good.	Recode ULF Control Module.™ NOTE: Audio quality in vehicle or at person being contacted, is dependent on the quality and signal strength of the wireless service provider in the area traveled.
Customer complains that the person being contacted hears a "Buzzing" noise, at times during their conversation or on voice mail message that he/she has left.	Intermittently a "Buzzing" noise is noticeable to the person being called from the vehicle. The "Buzzing" noise is a result of the GSM signal being feedback through the microphone, this usually occurs if the GSM phone is located too close to the microphone.

	The customer should change the location of where the phone is placed/stored.
Driver is told that the person being contacted complains that there is an echo/reverberation in the audio; person can hear his/her voice back through the phone.	Audio volume in vehicle during a call may be a bit too loud, causing the other person to hear his/her voice coming back through the phone.
A second call is received while in a call, and call cannot be accepted using MFL controls.	Use handset to expect second call and place previous called on hold. Call waiting is functional only via the handset.
The radio audio does not come back immediately if the "other" person hangs up first.	It takes approximately 15 seconds for the ULF system to recognize that the call was terminated from outside the vehicle. If the call is terminated from outside the vehicle first, the driver can depress the button on the steering wheel to terminate the call from the vehicle and un-mute the radio quicker.
Customer is not able to pair phone to system, not able to locate ULF passkey/password reference card.	The "Bluetooth™ Passkey" is identified on the label of the ULF Control Module located in the rear of the vehicle.™ The "Bluetooth™ Passkey" for the installed control module can be obtained by connecting the DISPlus or GT1 and accessing the diagnostics for the ULF system:- select "Diagnostic requests" - select "Bluetooth code".
Intermittently a popping noise is audible through the vehicles speaker and there is no Bluetooth™ wireless communication established between the ULF module and the phone.	Vehicle and /or ULF Control Module are not correctly coded.™ Recode module and vehicle (refer to <u>CODING ULF CONTROL MODULE TO VEHICLE</u>).
E46 Only: After installation of ULF system the speedometer and odometer do not work.	Remove pin 7 & 8 from the 54-pin connector going to the ULF Control Module. .

CONNECTOR PIN ASSIGNMENTS

The 54-pin connector of the ULF Control Module utilizes the following pins on X01185

PINS DESCRIPTION

PIN	Description
1	Microphone +
11	Cradle On/Enable
15	I-Bus
17	KL 30
19	Microphone -
21	Microphone Shield
22	Hook
27	Programming
28	Programming
32	Cradle Key +

33	Telephone On
34	Telephone On (pin 33)
35	KL R (Ignition)
36	KL 31 (Ground)
43	Programming
44	Programming
45	Programming
51	Telephone Mute
52	KL 58g (illumination)

The following pins on X4545 are utilized when the eject box is connected

PINS DESCRIPTION

PIN	Description
1	Cradle Key +
2	KL 31
3	58G
5	KL 30
13	Cradle On/Enable

NOTE: The pairing button used on the E46 only utilizes pin 1, 2 & 3 of X4545

ULF Wiring Schematic for the E53 with Boardmonitor

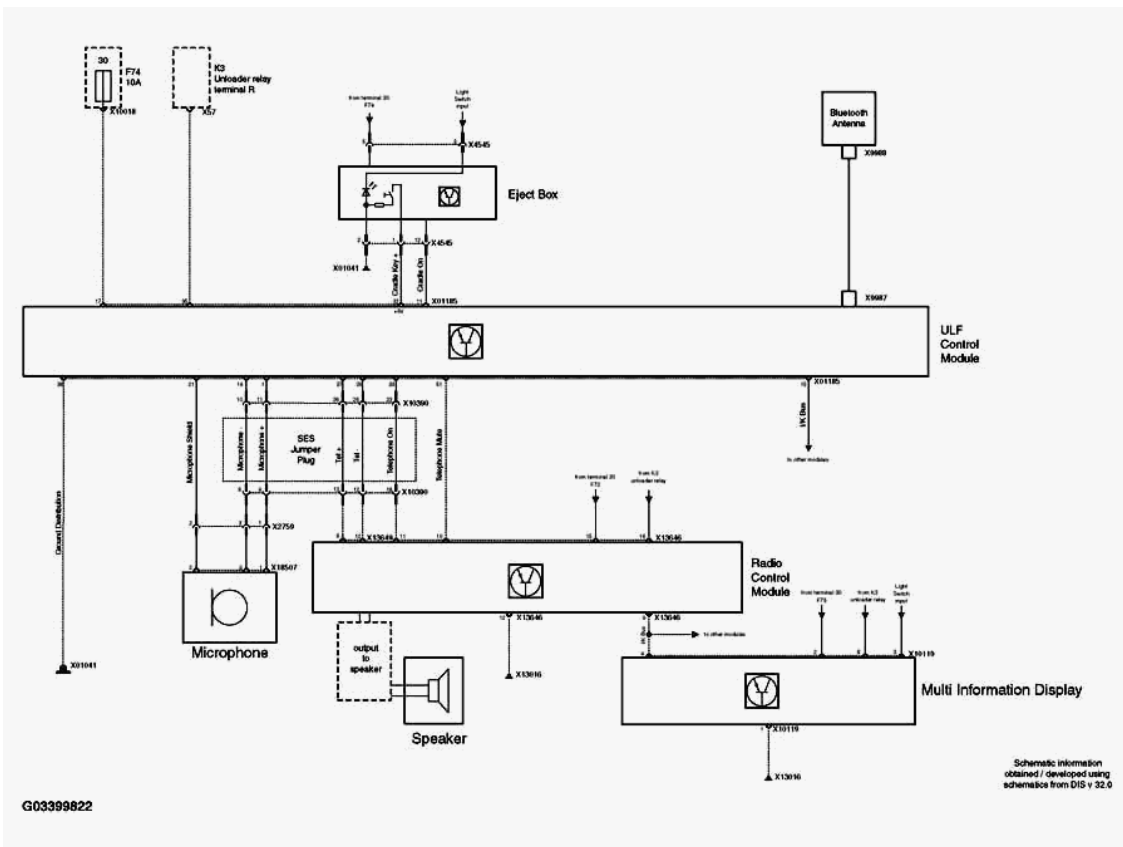


Fig. 17: ULF Wiring Schematic For E53 With MULTI Information Display
 Courtesy of BMW OF NORTH AMERICA, INC.

ULF Wiring Schematic for the E39 with Boardmonitor

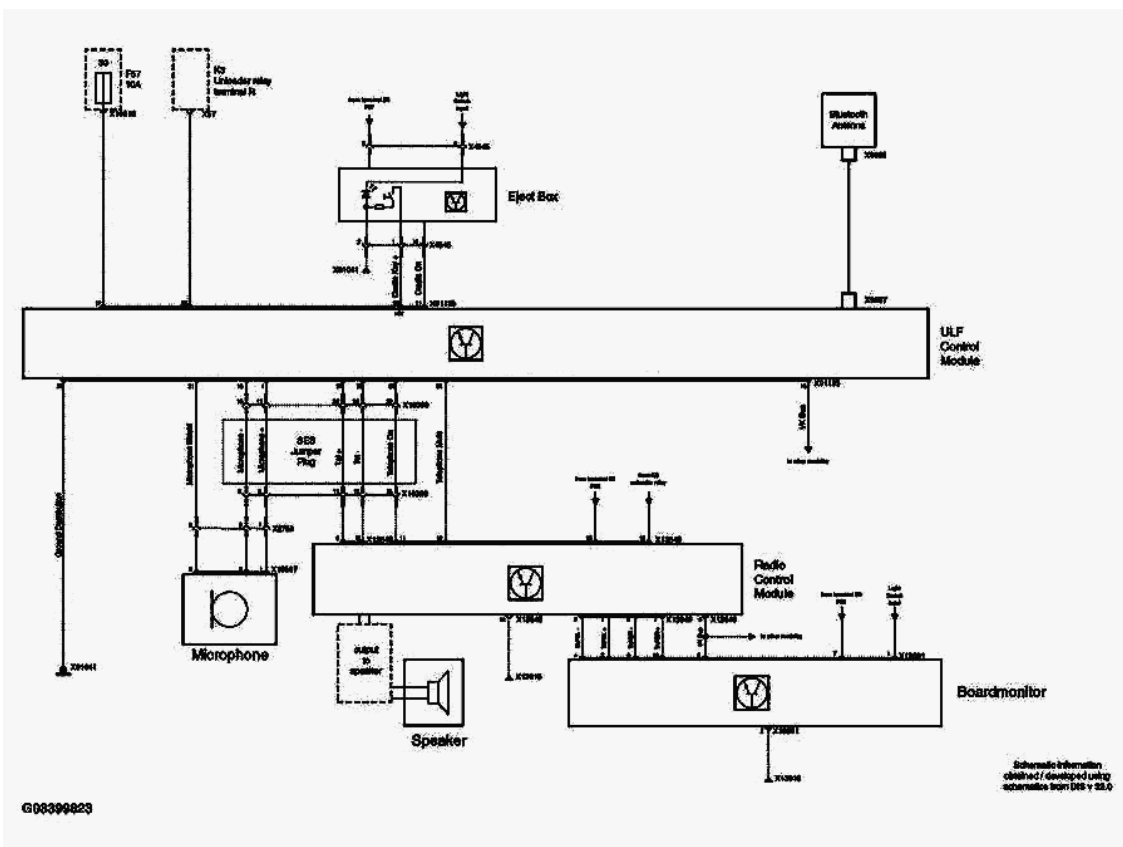


Fig. 18: ULF Wiring Schematic For E39 With Boardmonitor
 Courtesy of BMW OF NORTH AMERICA, INC.

ULF Wiring Schematic for the E39 with Multi Information Display

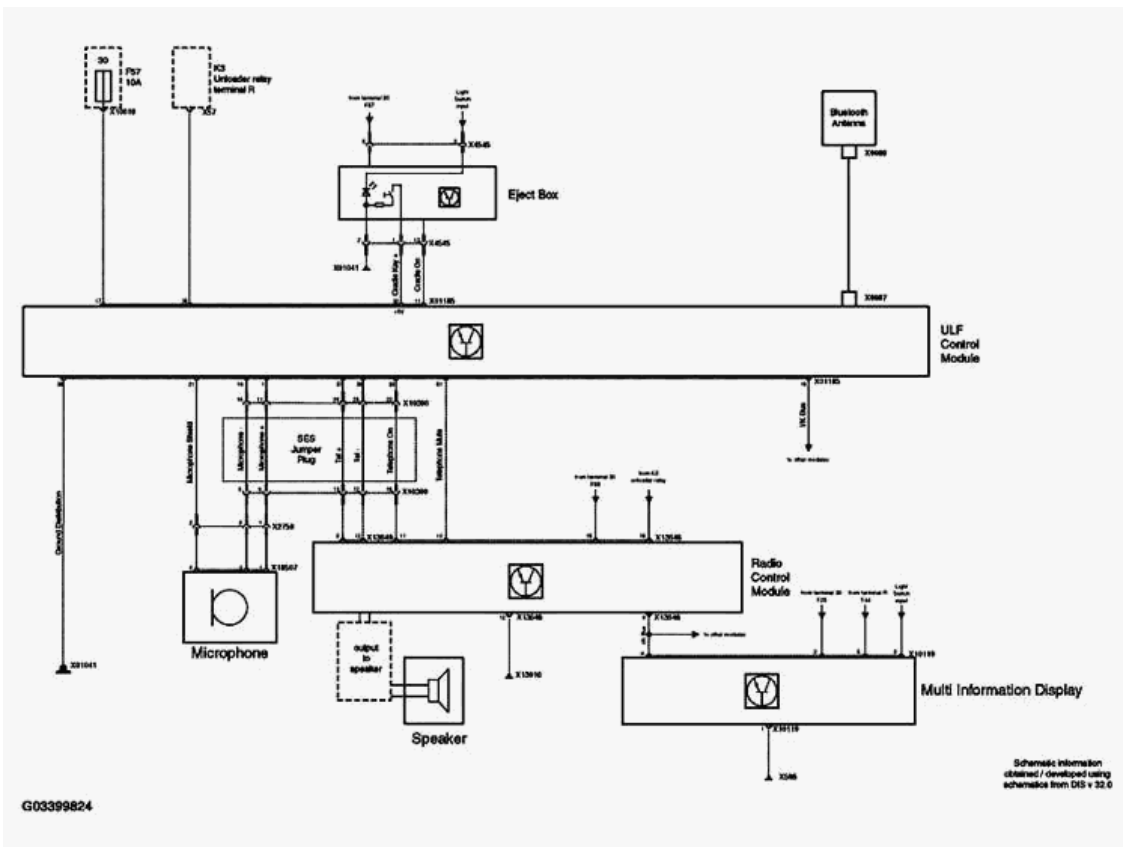


Fig. 19: ULF Wiring Schematic For E39 With Multi Information Display
 Courtesy of BMW OF NORTH AMERICA, INC.

ULF Wiring Schematic for the E46 with Boardmonitor

GENERAL INFORMATION

Breakout Boxes & Connectors - Overview

BREAKOUT BOXES AND CONNECTORS

Model: All

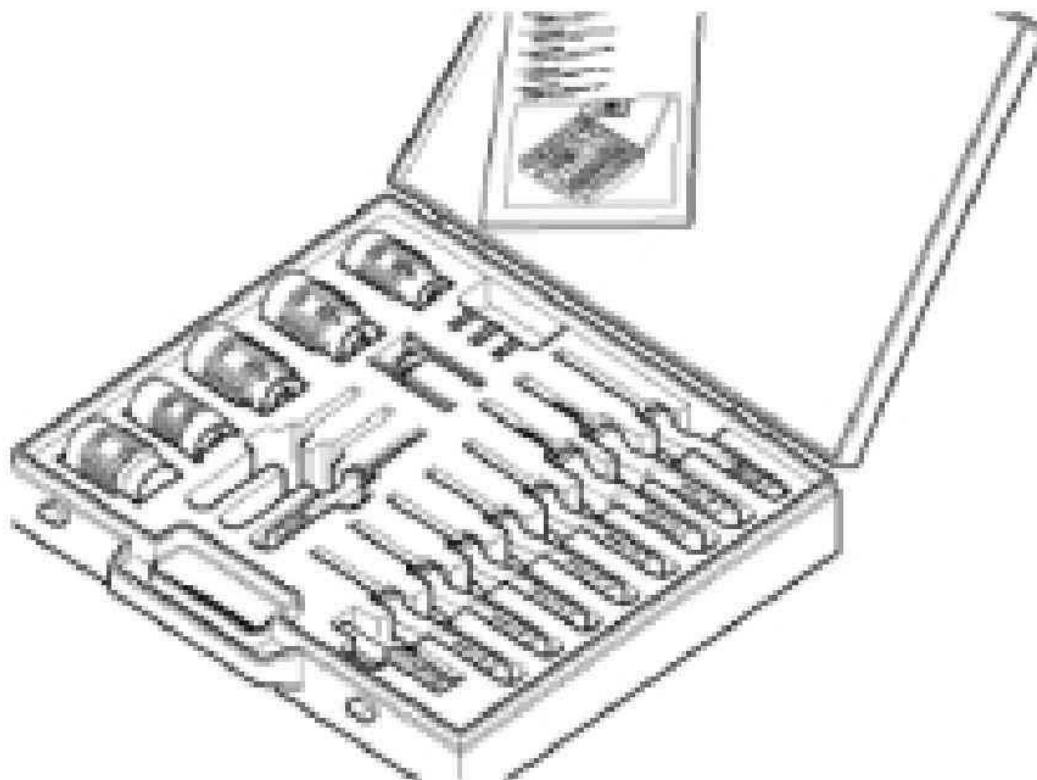
Production Date: All

CONNECTOR CONTACT KIT

Connector Contact Removal Kit

The connector contact removal kit provides tools for the disassembly of connectors. Proper use of these tools enable the technician to access wiring connectors for repairs equal to factory quality.

Always refer to the latest appropriate articles for up to date information regarding new tools.



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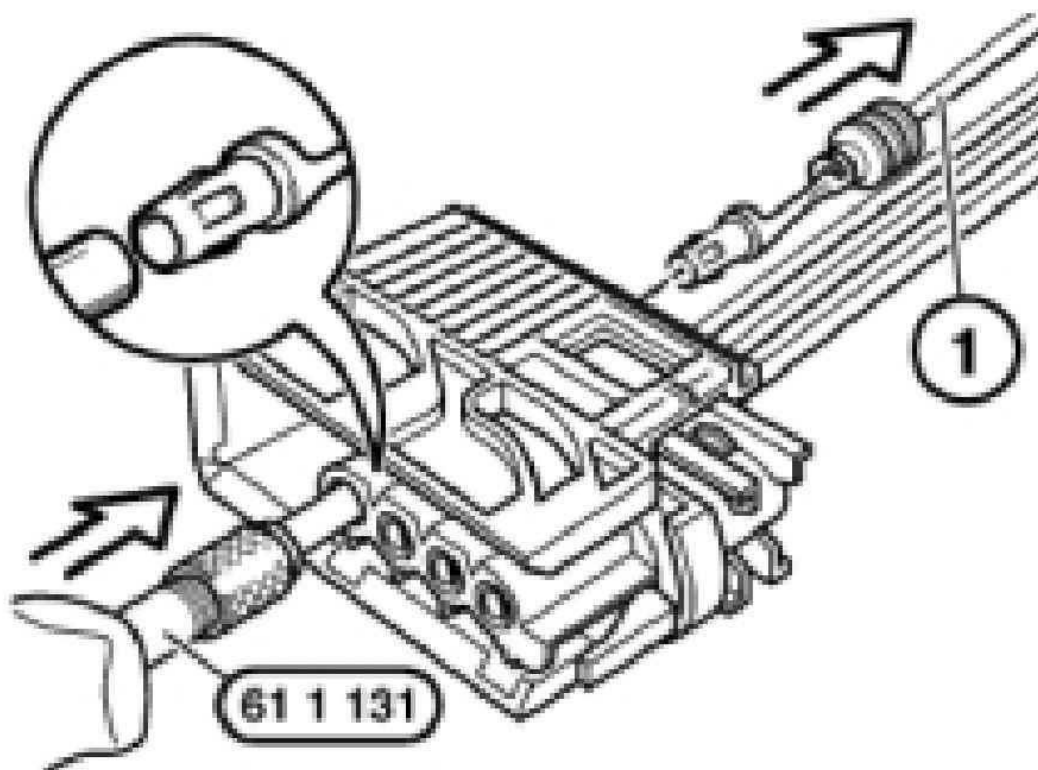
Fig. 1: Identifying Connector Contact Removal Kit
Courtesy of BMW OF NORTH AMERICA, INC.

Current P/N 88 88 6 611 150.

The Connector Contact Removal Kit is used for:

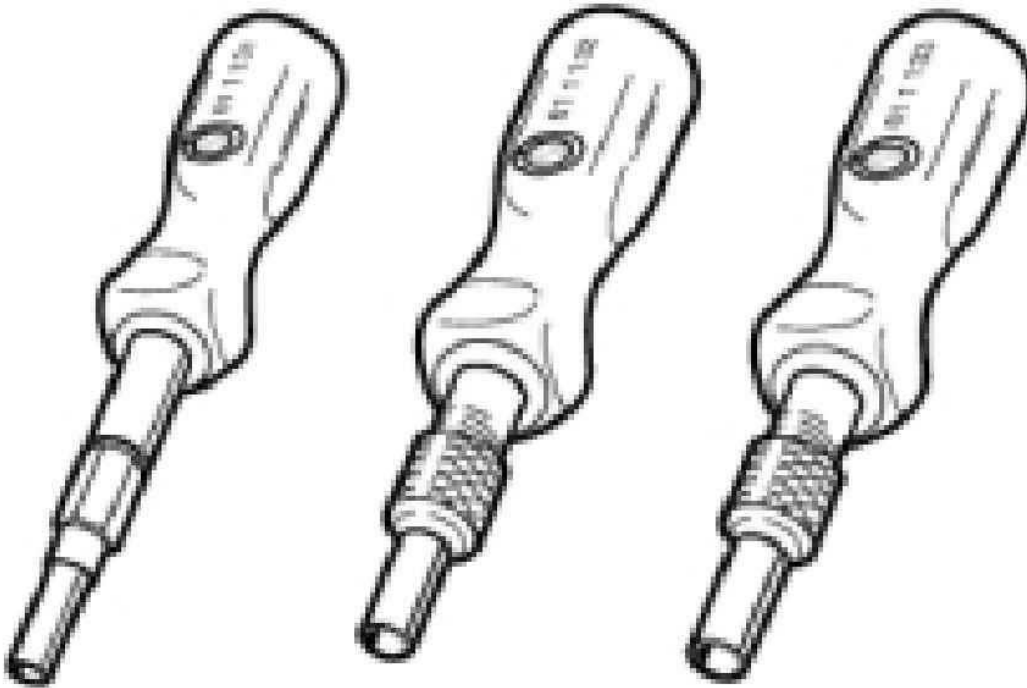
- Releasing round plug housings.
- Releasing relay carriers.
- Pressing out contacts.
- Pulling out indicator lamps.

Socket and Spring Contacts



G03388934

Fig. 2: Identifying Spring Contacts
Courtesy of BMW OF NORTH AMERICA, INC.

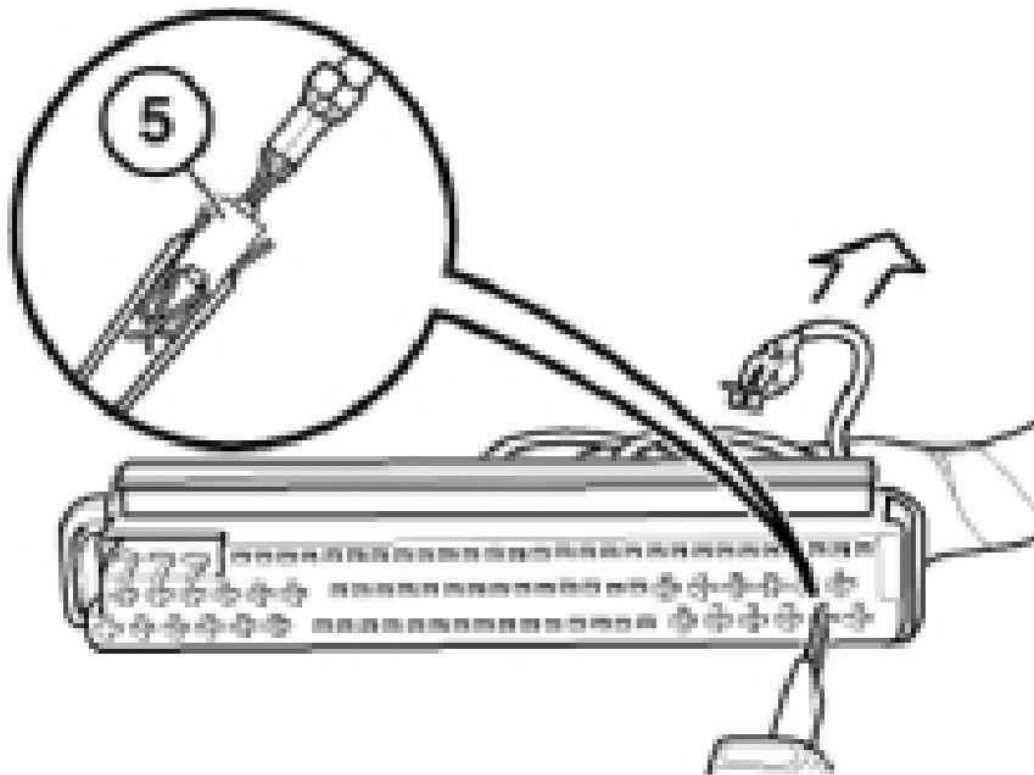


G03388935

Fig. 3: View Of Socket Types

Courtesy of BMW OF NORTH AMERICA, INC.

Socket and Spring contacts compress the springs while the connector is pushed from the housing.



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Fig. 4: Identifying Different Sockets
Courtesy of BMW OF NORTH AMERICA, INC.



G03388937

Fig. 5: View Of Socket And Spring Contacts

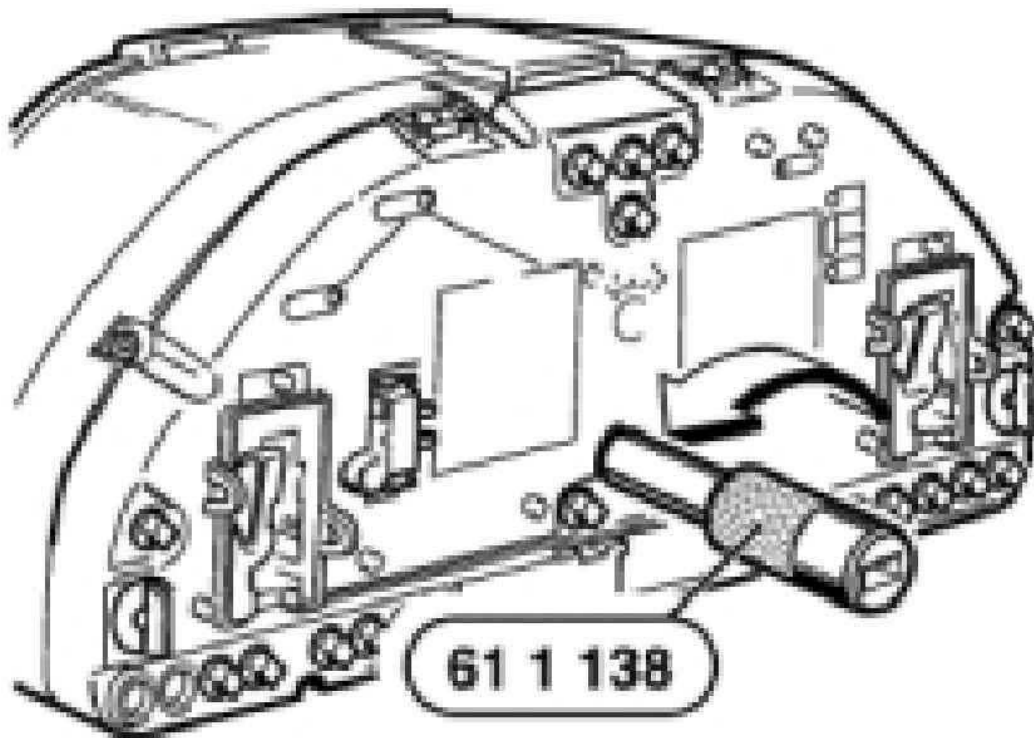
Courtesy of BMW OF NORTH AMERICA, INC.

Flat spring contacts depress the spring allowing the connector to be pushed or gently pulled from the connector housing.

Instrument Cluster Illumination Bulb Holder Removal Socket

The backlighting illumination bulbs are removed from the cluster by placing square head of the socket on the bulb holder and turning 90° counter clockwise.

The bulb removal socket is used on all instrument clusters.

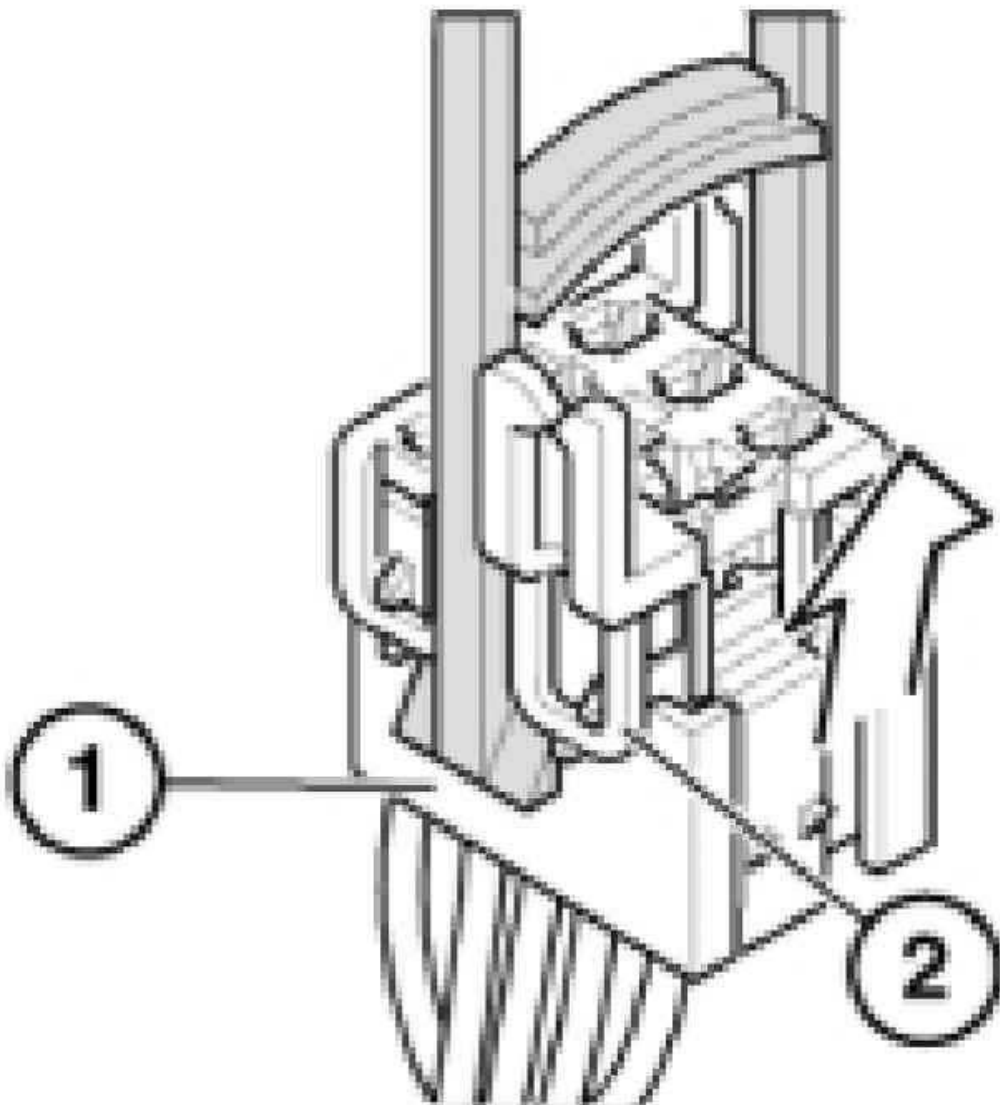


G03388938

Fig. 6: Identifying Instrument Cluster Illumination Bulb Holder Removal Socket
Courtesy of BMW OF NORTH AMERICA, INC.

Relay Holder Disengaging Tool

This tool allows the relay holder (2) to disengage the relay connector (1).



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Fig. 7: Identifying Relay Holder Disengaging Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Circular Connector Lock Disengager

These tools unlock the circular connector housings allowing the individual connectors to be removed.

The various sizes are reflected in the part numbers:

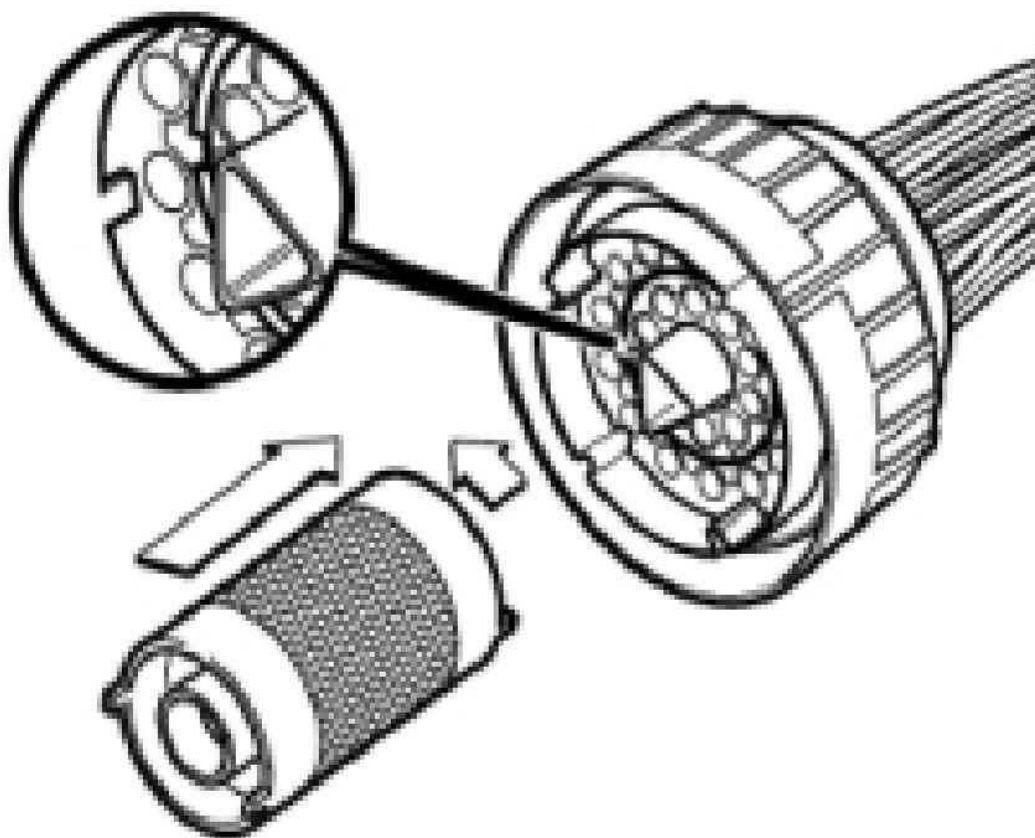
4 pin = 61 1 141.

7 pin = 61 1 142.

10 pin = 61 1 145.

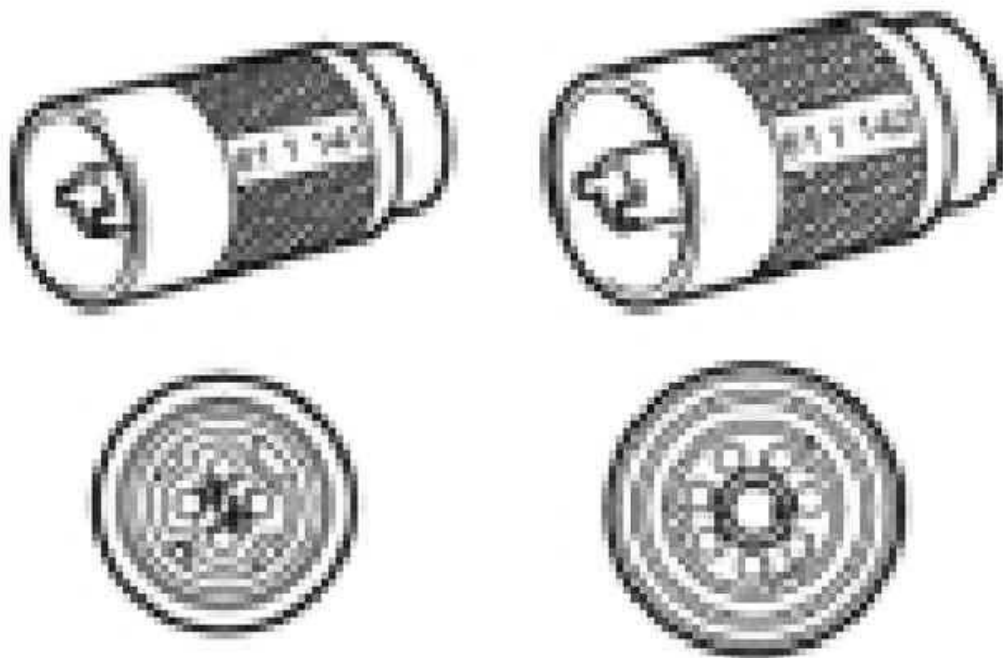
12 pin = 61 1 143.

25 Pin = 61 1 144.



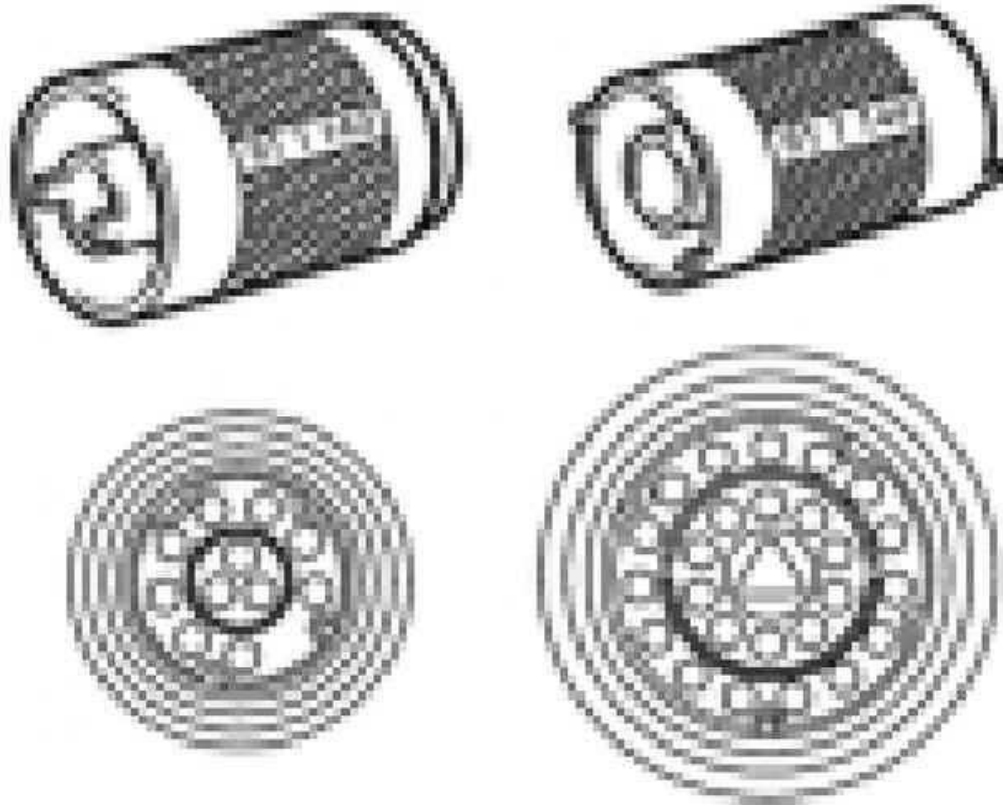
G03388940

Fig. 8: Identifying Circular Connector Lock Disengager (1 Of 4)
Courtesy of BMW OF NORTH AMERICA, INC.



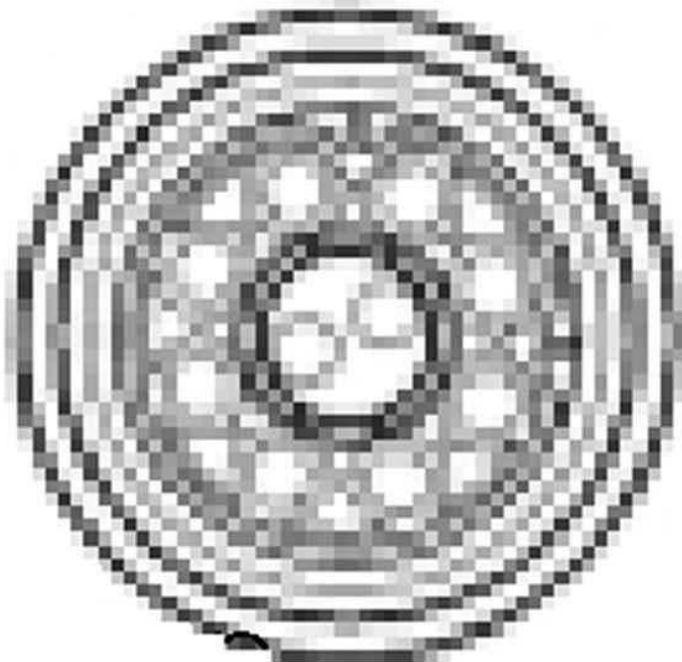
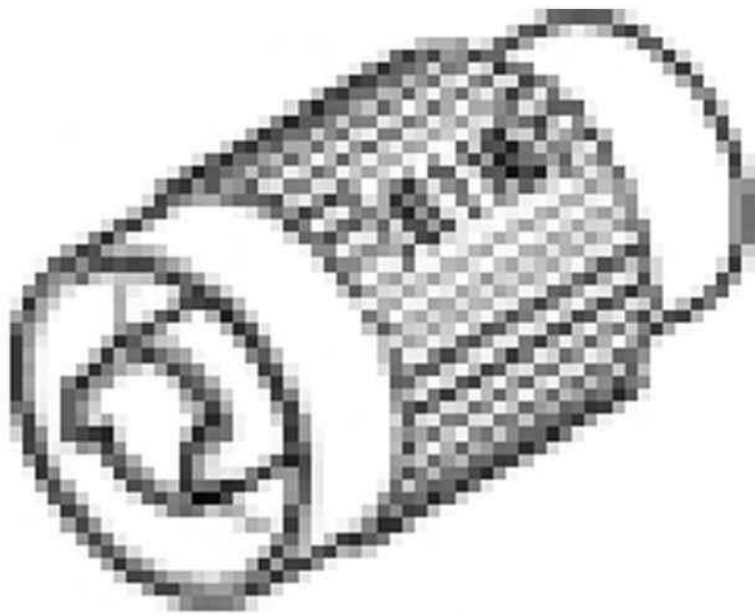
G03388941

Fig. 9: Identifying Circular Connector Lock Disengager (2 Of 4)
Courtesy of BMW OF NORTH AMERICA, INC.



G03388942

Fig. 10: Identifying Circular Connector Lock Disengager (3 Of 4)
Courtesy of BMW OF NORTH AMERICA, INC.



G03388943

Fig. 11: Identifying Circular Connector Lock Disengager (4 Of 4)
Courtesy of BMW OF NORTH AMERICA, INC.

BMW PLUG SYSTEM ABBREVIATIONS

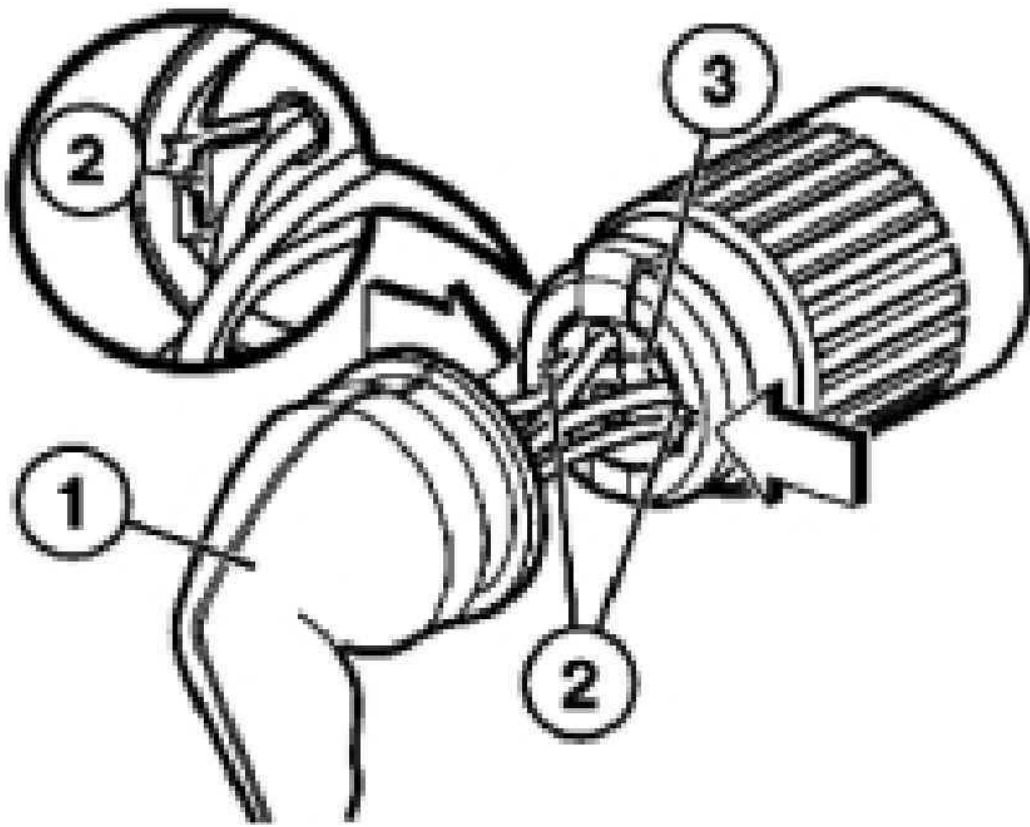
BMW PLUG SYSTEM ABBREVIATIONS

D 1.5/2.5	Round contacts of 1.5mm or 2.5mm diameter
MDK 3 Plus	Miniature double flat spring contact
JPT ELA	Junior Power Timer flat spring contacts with strand sealing
DFK ELA	Double flat spring contacts with strand sealing
Elo	Electronic contacts with and without strand sealing Manufacturer: Siemens
Elo	Power Electronic contacts for heavy loads with and without strand sealing Manufacturer: Siemens
MQS	Micro Quadlock System electronic contacts with and without strand sealing Manufacturer: AMP
MPQ	Micro Power Quadlock electronic contacts for heavy loads with and without strand sealing Manufacturer: AMP

PLUG SYSTEM D1.5/D2.5

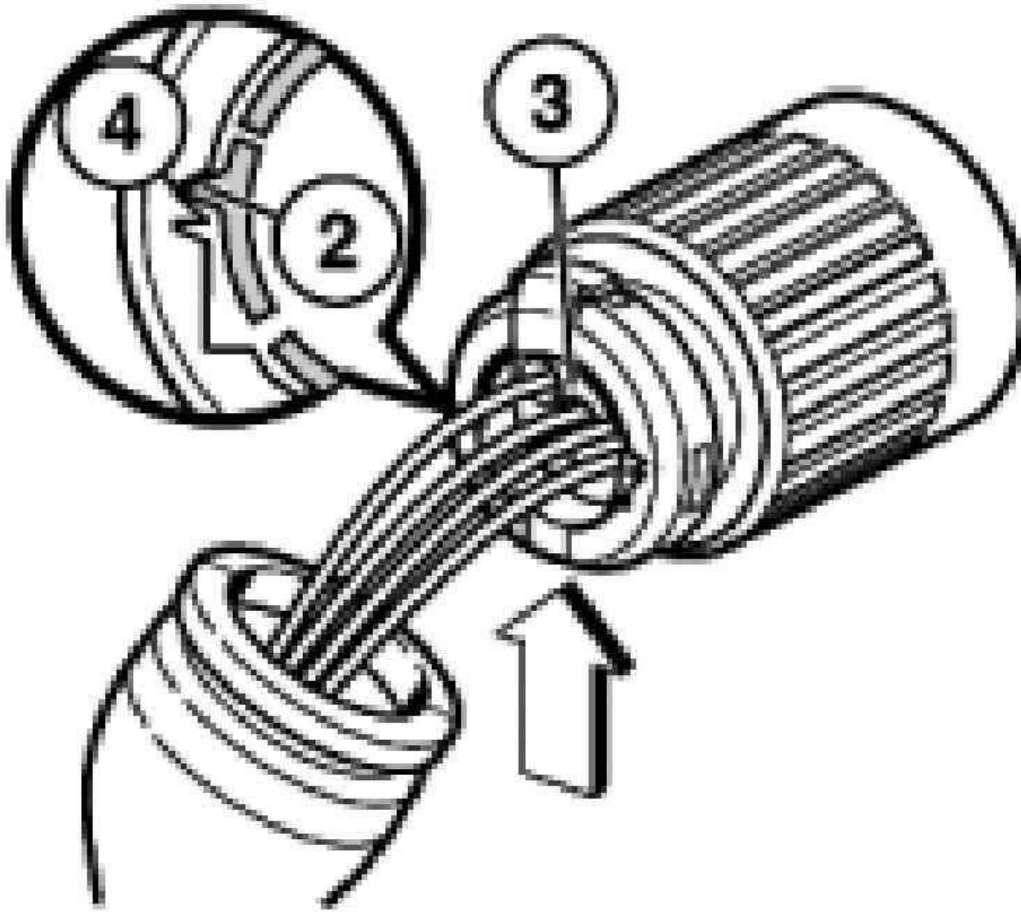
Circular Plug 7--8 Pin System D2.5

- Pull off the rubber boot (1).
- Push the retaining lugs (2) of the inner connector section 3 inward carefully to disengage the lock notch.
- Push the inner connector section (3) in the direction of the arrow in the illustration until the retaining lugs (2) are in the recessed notch (4) and use the appropriate sized spring contact tool and remove the connector from the housing.



G03388944

Fig. 12: Identifying Inner Connector Retaining Lugs
Courtesy of BMW OF NORTH AMERICA, INC.

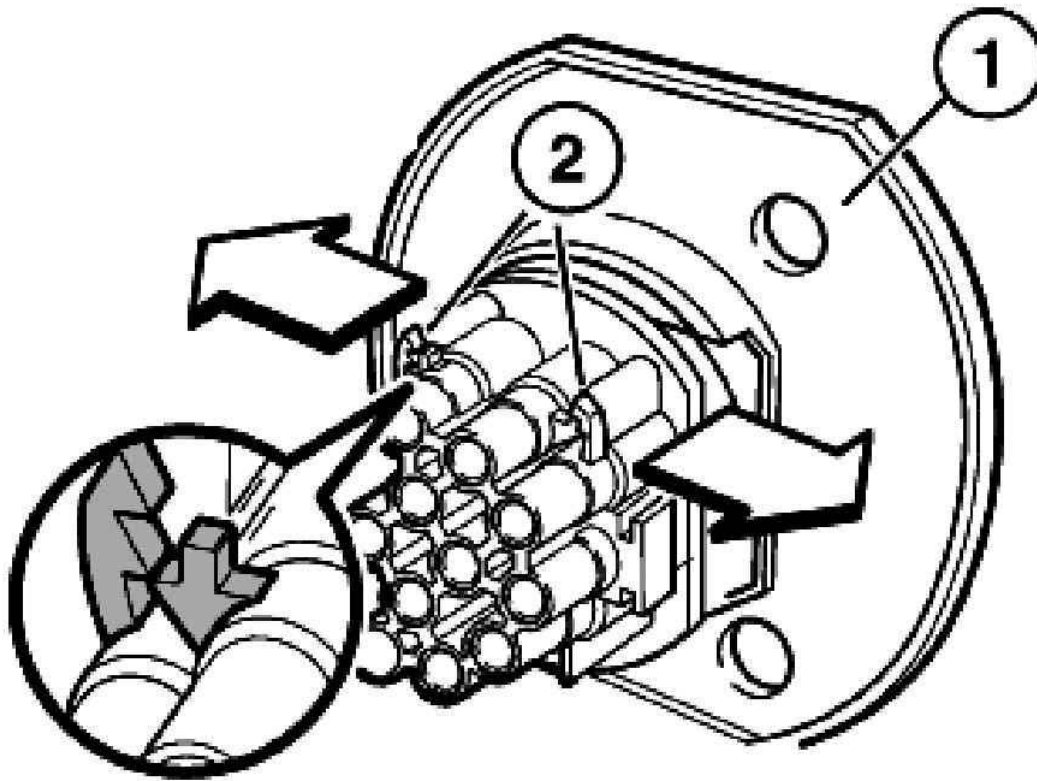


G03388945

Fig. 13: Locating Recessed Notch In Inner Connector
Courtesy of BMW OF NORTH AMERICA, INC.

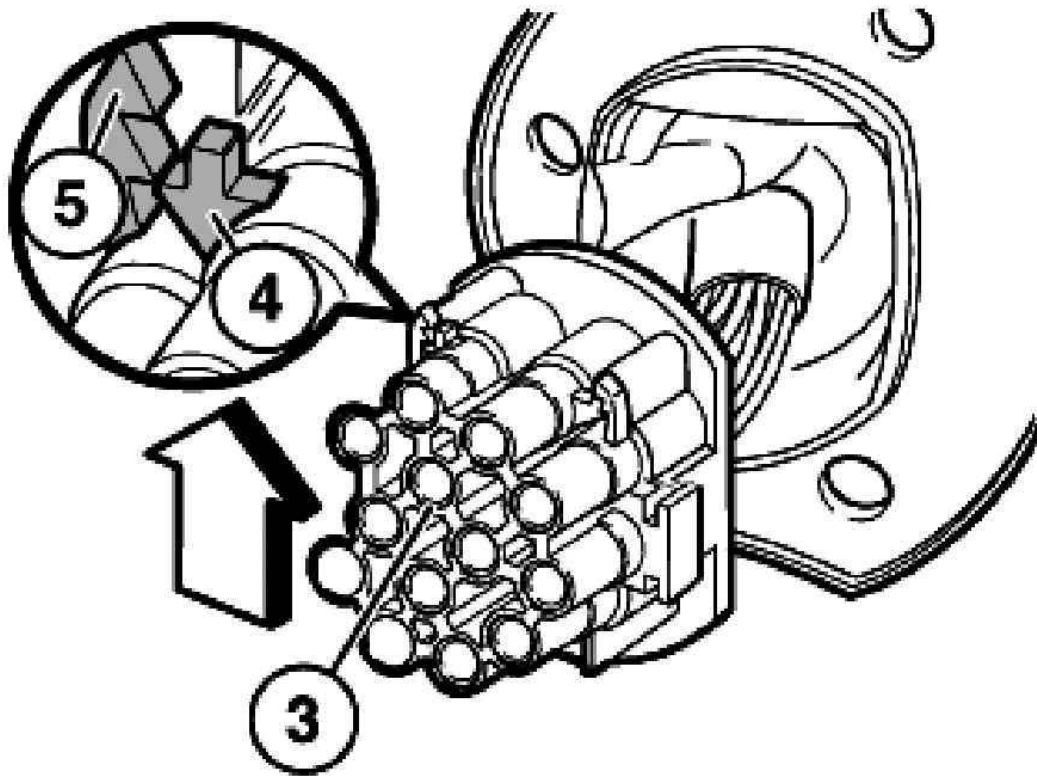
Circular plug 13 Pin System D2.5

- Carefully pull off the rubber grommet (1).
- Pull the lock retainers (2) outward (direction of arrows) to allow the lock notch to disengage.
- Pull the inner section (3) upward as shown in the illustration until the lock notches (4) are in the released position of the lock retainers (5) and use the appropriate size spring contact and remove the connector from the housing.



G03388946

Fig. 14: Locating Circular Plug Lock Retainers
Courtesy of BMW OF NORTH AMERICA, INC.

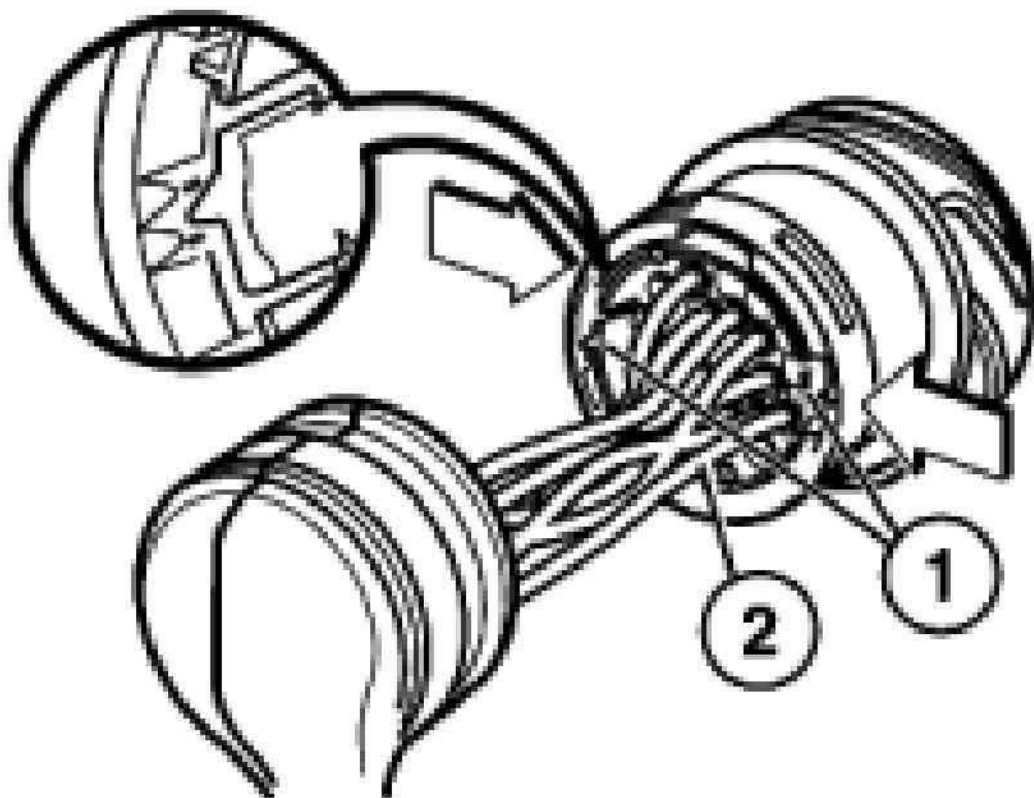


G03388947

Fig. 15: View Of Lock Notch In Circular Plug
Courtesy of BMW OF NORTH AMERICA, INC.

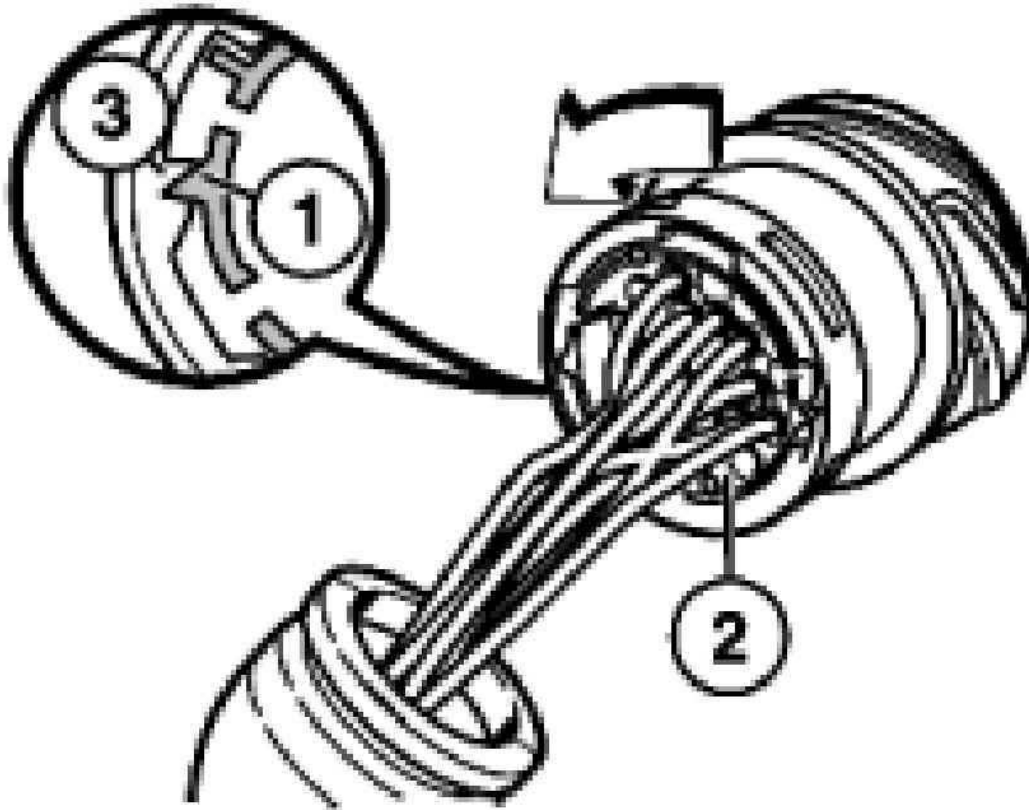
Circular Plug 20 Pin System D2.5

- With the boot pulled back, press the lock tabs (1) of the inner connector section (2) inward.
- Simultaneously, rotate the inner connection section (2) counter clockwise to allow the lock tabs (1) to engage in the unlocked position and use the appropriate sized spring contact and remove connector from the housing.



G03388948

Fig. 16: Identifying Circular Plug Lock Tabs
Courtesy of BMW OF NORTH AMERICA, INC.

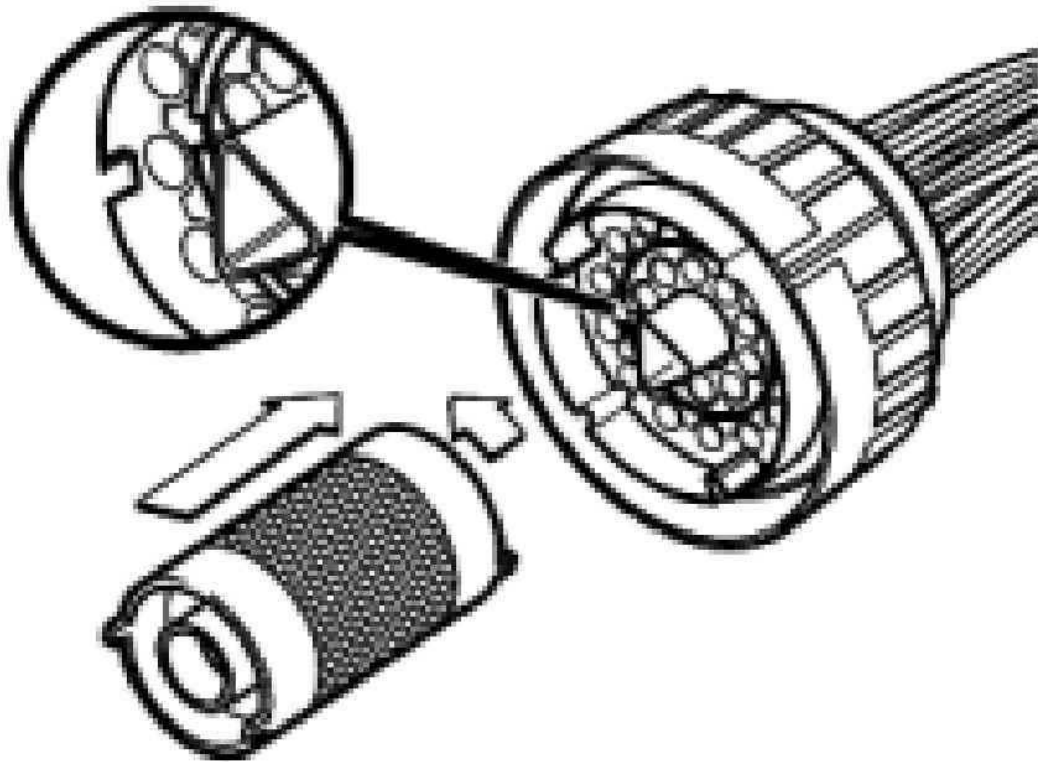


G03388949

Fig. 17: View Of Inner Connection Of Circular
Courtesy of BMW OF NORTH AMERICA, INC.

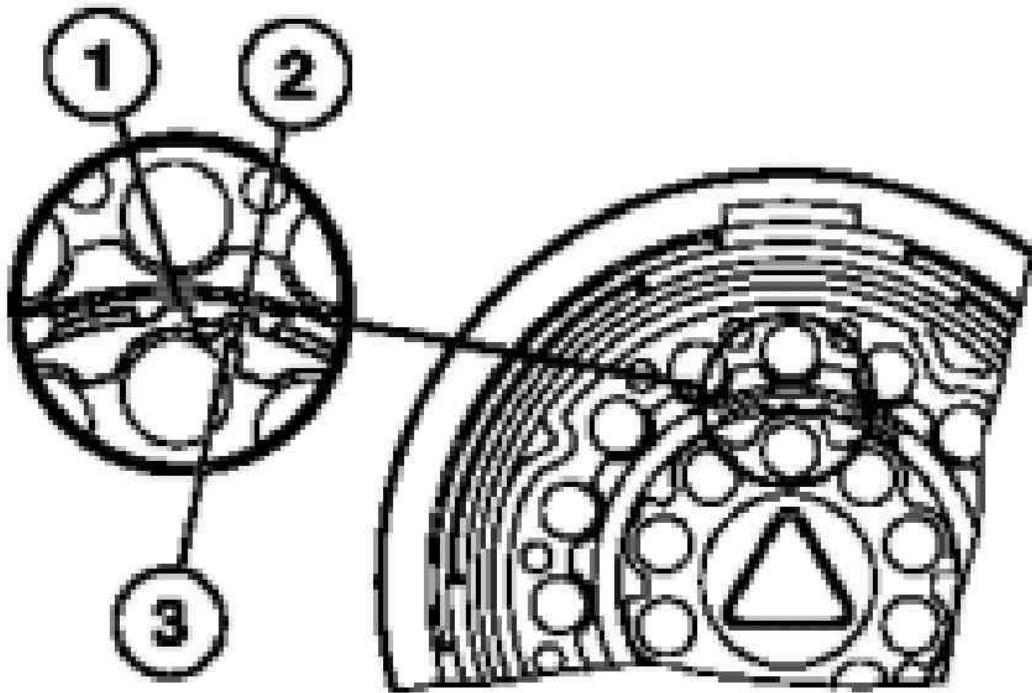
Circular Plug 4-7-10-12-25 Pin System D1.5/D2.5

- Insert the appropriate unlocking tool (determined by the number of pins) into the connector.
- The connector is unlocked when the lock tab (3) is in the unlocked position (1). The connector is locked when the lock tab (3) is in the locked position (2).
- Use the appropriate sized spring contact and remove connector from the housing.



G03388950

Fig. 18: View Of Circular Plug And Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

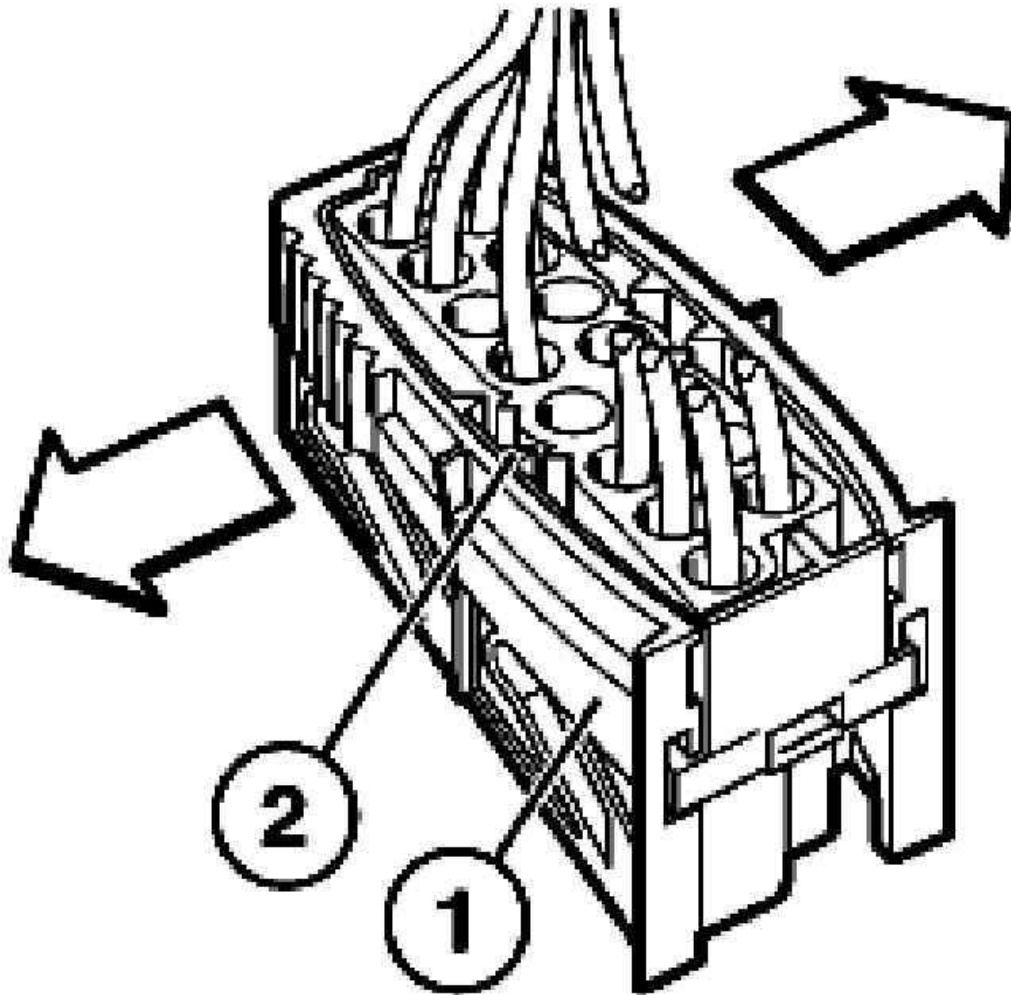


G03388951

Fig. 19: Identifying Lock Tab Of Circular Plug
Courtesy of BMW OF NORTH AMERICA, INC.

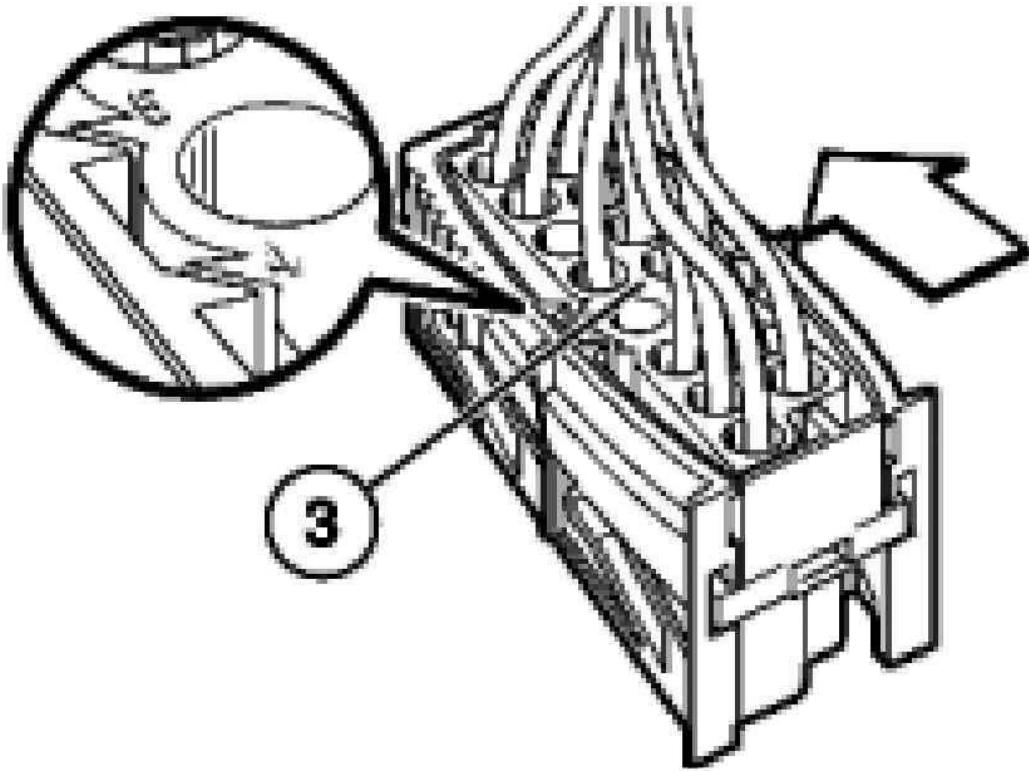
In-line Plug 15 Pin System D2.5

- Pull the outer connector section (1) slightly outward in the area of lock tabs (2).
- Simultaneously, slide the inner connector section (3) in the direction of the arrow to the unlocked position.
- Use the appropriate sized spring contact and remove connector from housing.



G03388952

Fig. 20: Identifying In-Line Plug Lock Tabs
Courtesy of BMW OF NORTH AMERICA, INC.

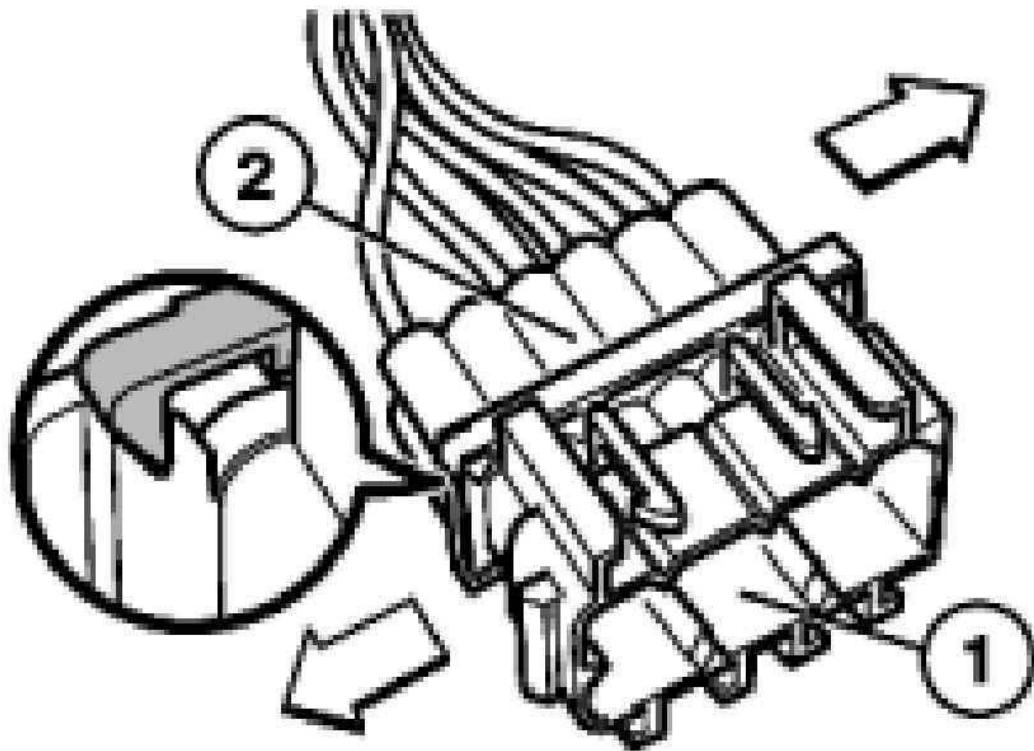


G03388953

Fig. 21: Locating In-Line Plug Inner Connector Section
Courtesy of BMW OF NORTH AMERICA, INC.

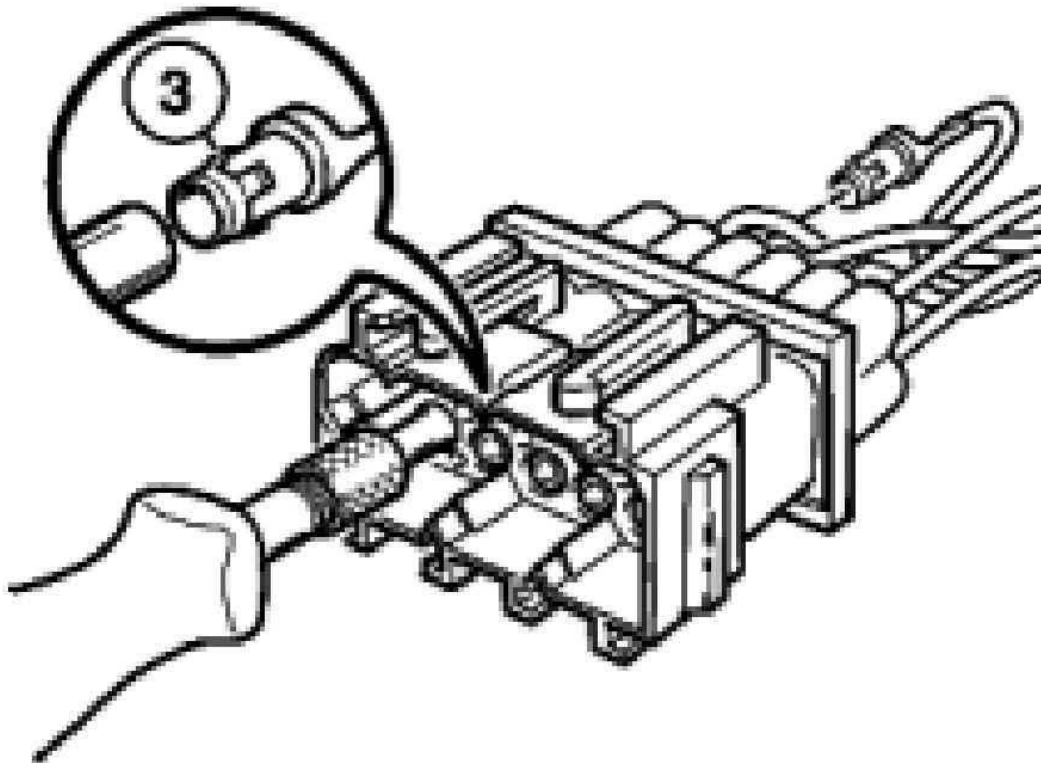
In-line Plug 8-, 12 Pin System D2.5

- Slide the upper section (1) and the lower section (2) of the connector in opposite directions to unlock the connector.
- Using special tool **61 1 132** press the spring latch down and pull the connector (3) from the housing.



G03388954

Fig. 22: Separating In-Line Plug Lower And Upper Sections
Courtesy of BMW OF NORTH AMERICA, INC.



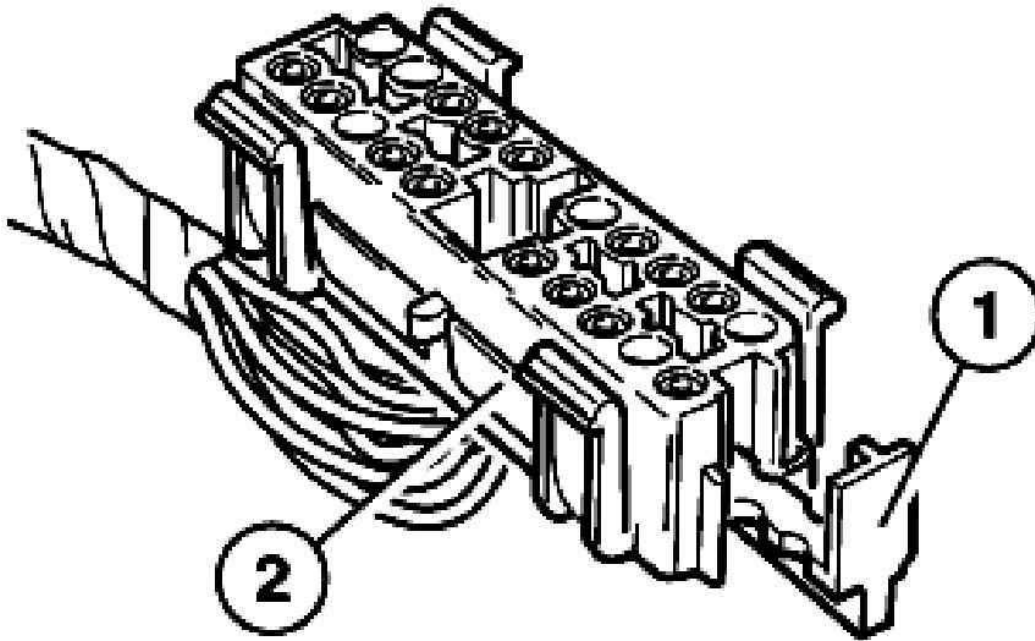
G03388955

Fig. 23: View Of In-Line Plug Connector

Courtesy of BMW OF NORTH AMERICA, INC.

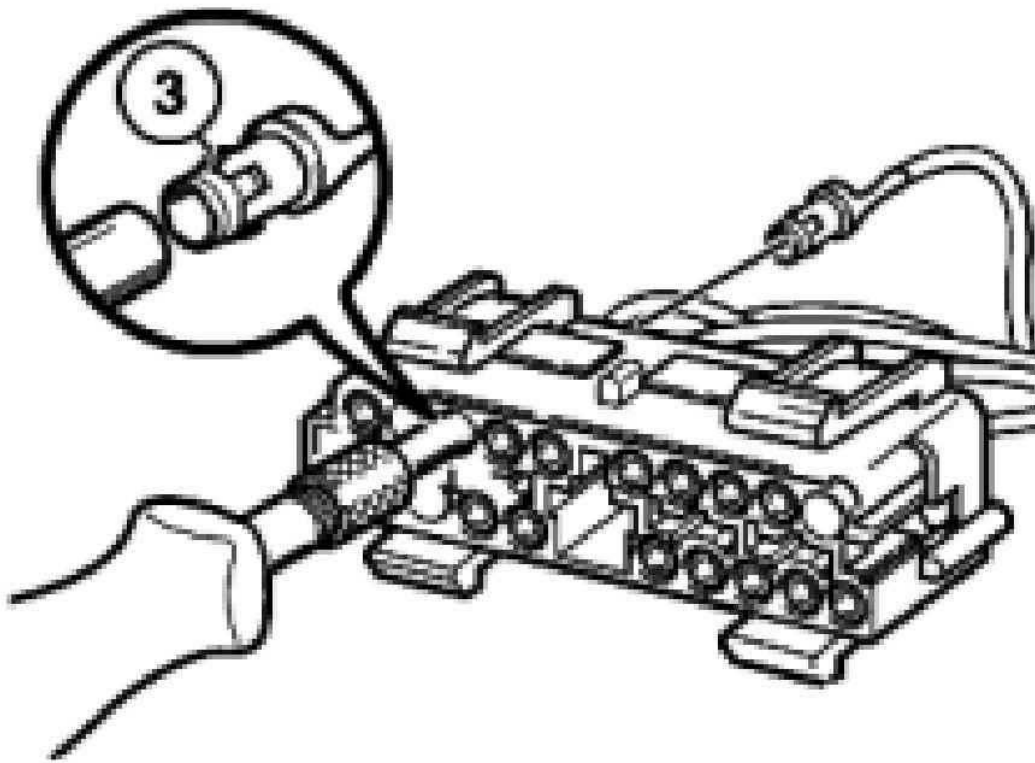
In-line Plug 20 Pin System D2.5

- Pull locking slide (1) completely out of connector (2).
- Using special tool **61 1 132** press the spring latch down and pull the connector from the housing.



G03388956

Fig. 24: Removing Locking Slide From Connector
Courtesy of BMW OF NORTH AMERICA, INC.

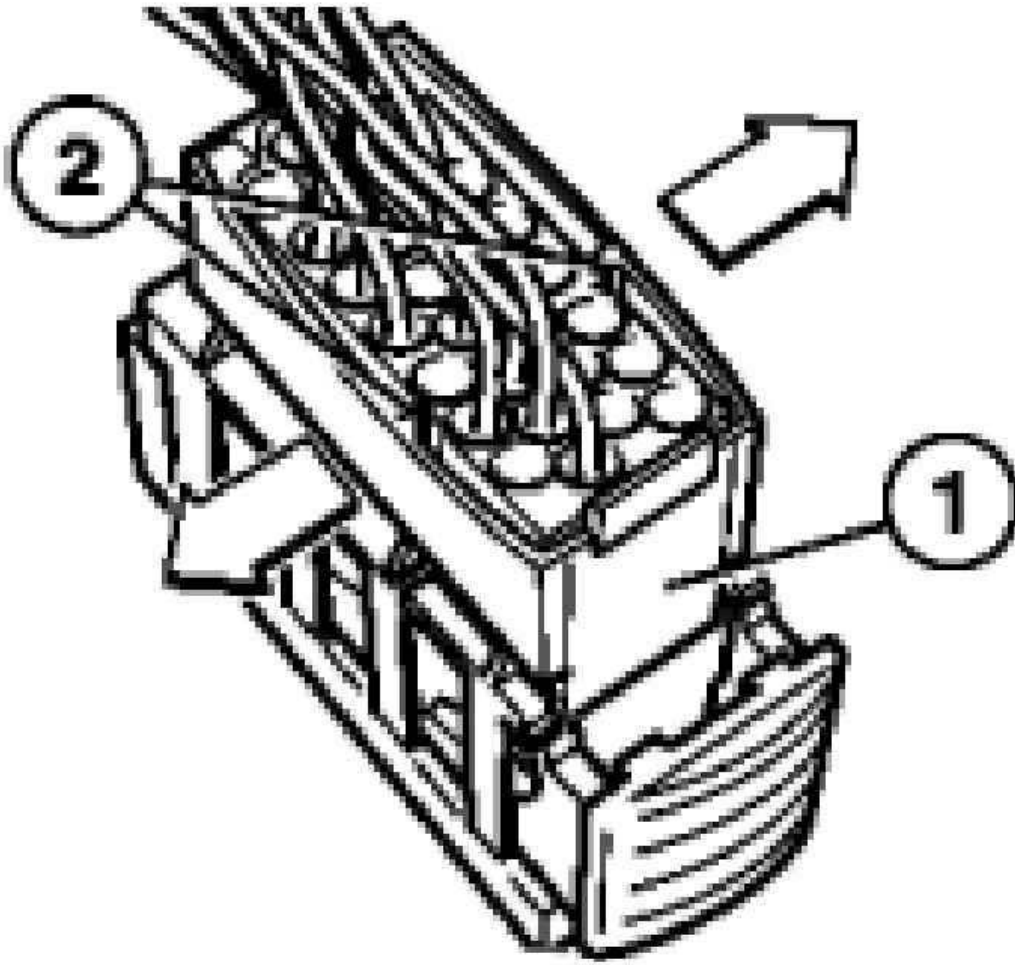


G03388957

Fig. 25: View Of In-Line Plug Connector
Courtesy of BMW OF NORTH AMERICA, INC.

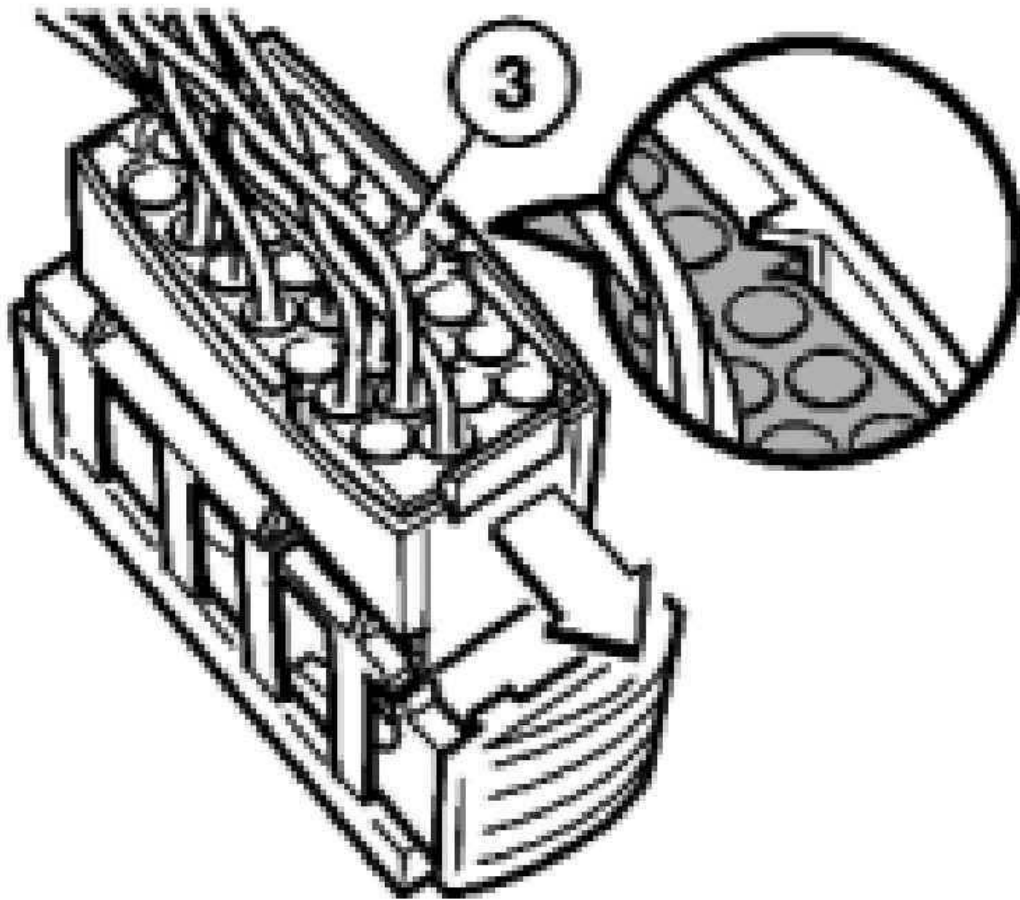
In-line Plug 30 Pin System D2.5

- Pull the outer section (1) slightly outward in the area of lock tabs (2).
- Simultaneously, slide the inner connector section (3) in the direction of the arrow to the unlocked position.
- Use the appropriate sized spring contact and remove connector from housing.



G03388958

Fig. 26: Identifying In-Line Plug Outer Section
Courtesy of BMW OF NORTH AMERICA, INC.



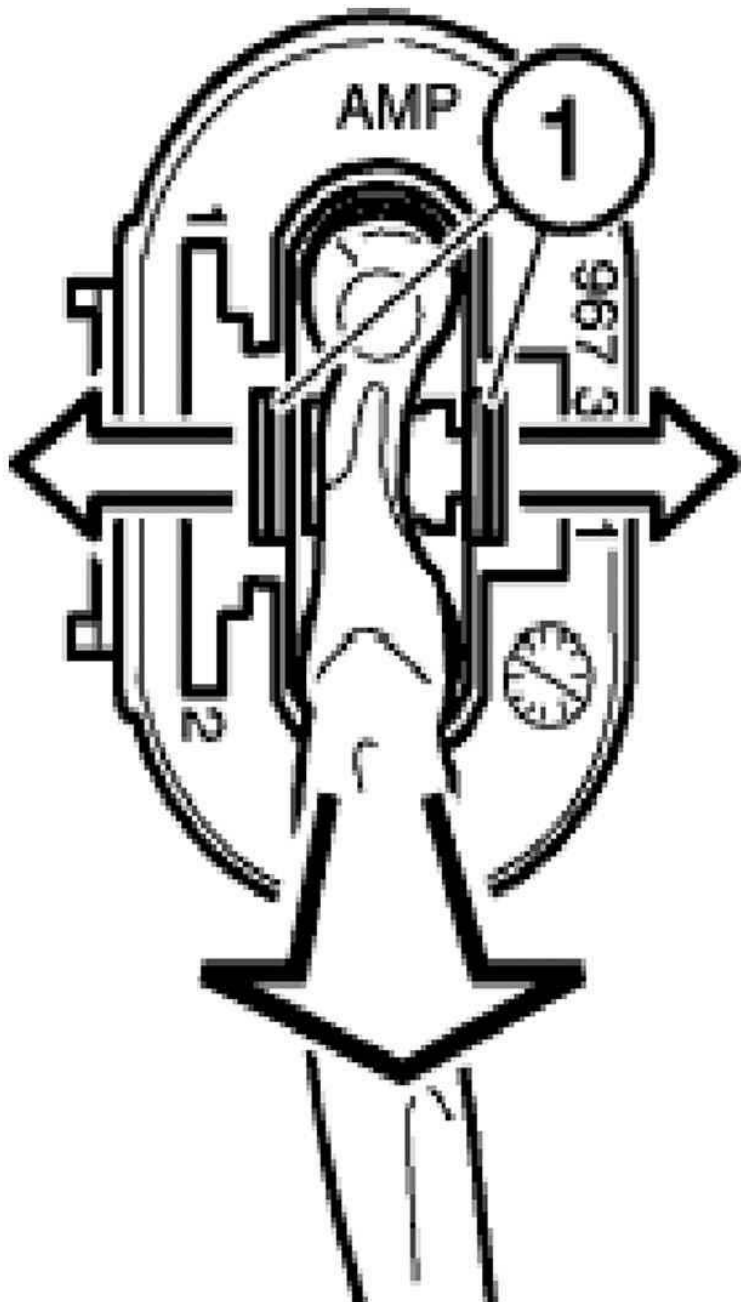
G03388959

Fig. 27: View Of Inner Section Of In-Line Plug
Courtesy of BMW OF NORTH AMERICA, INC.

PLUG SYSTEM JPT/MDK/DFK

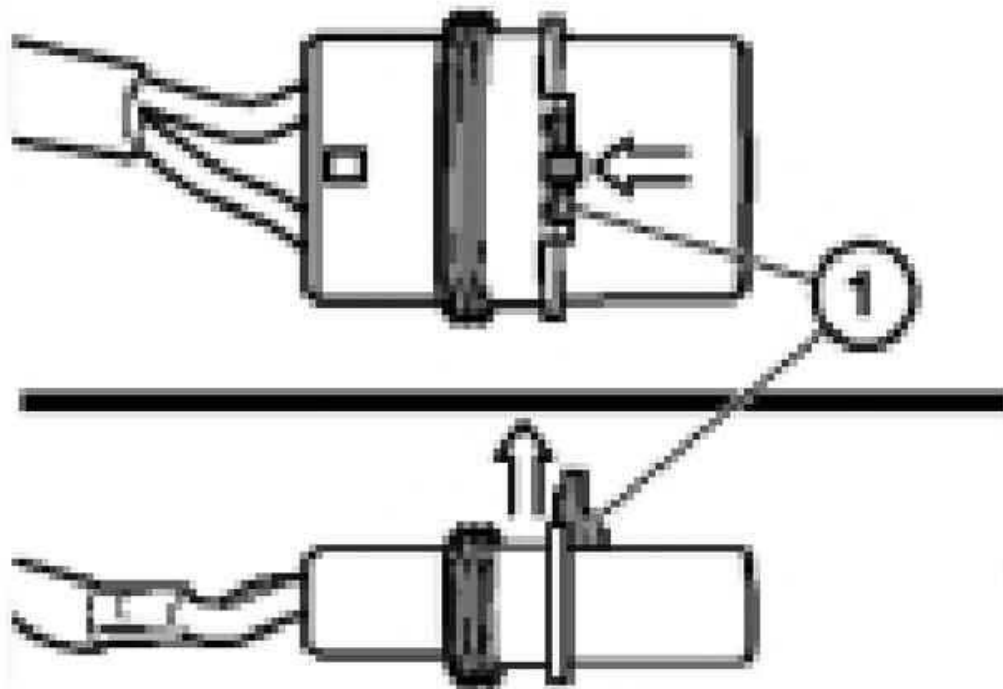
In-line plug 2 Pin System JPT ELA

- Press lock (1) in direction of arrow and slide plug forward.
- Press lock (1) downward and slide out to one side.
- Unlock contact with special tool **61 1 136** and pull out cable (2) and contact towards rear.



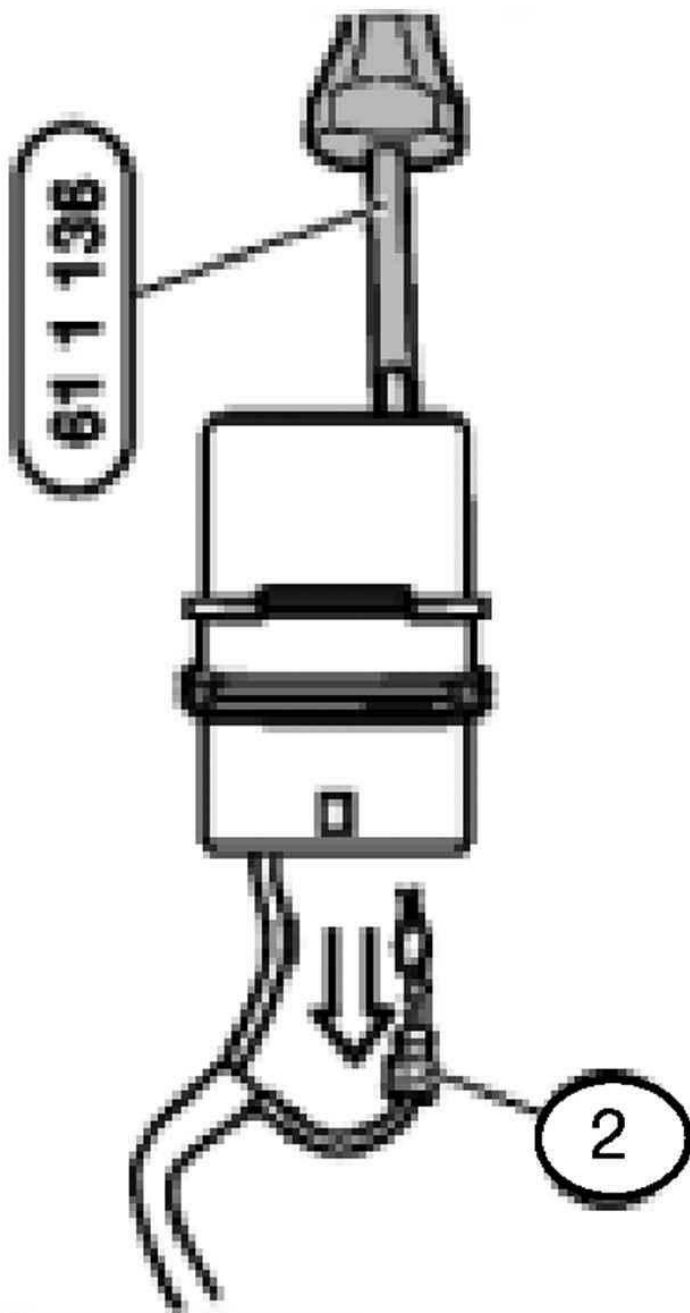
G03388960

Fig. 28: Locating Lock For In-Line Plug
Courtesy of BMW OF NORTH AMERICA, INC.



G03388961

Fig. 29: View Of In-Line Plug Lock
Courtesy of BMW OF NORTH AMERICA, INC.

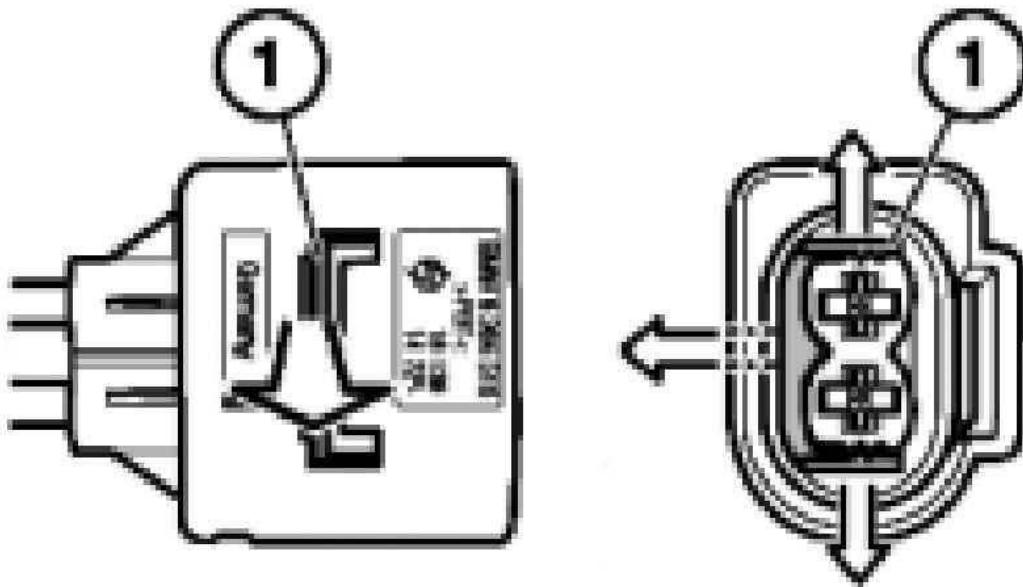


G03388962

Fig. 30: Removing In-Line Plug Contact Using Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

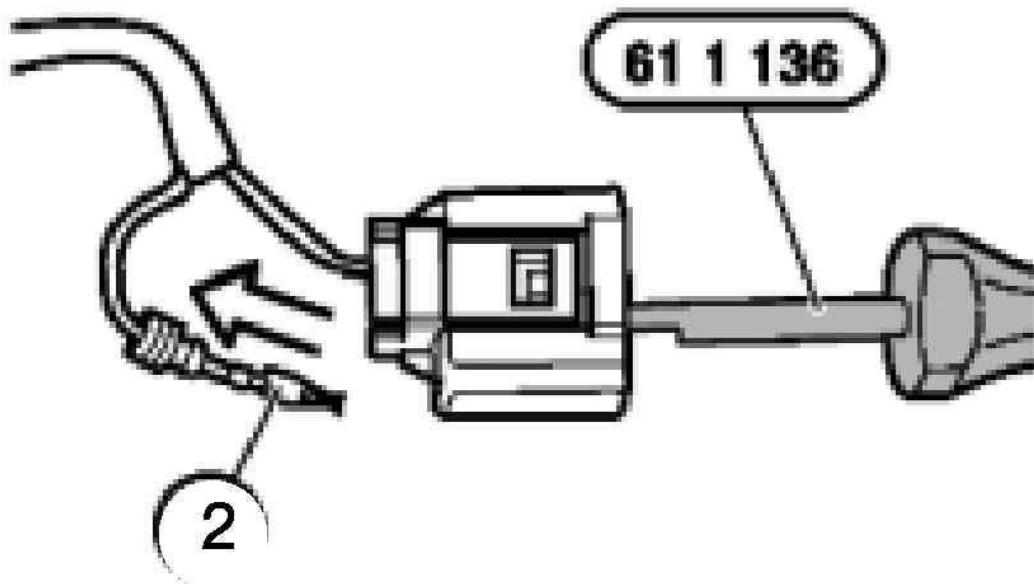
In-line plug 2 Pin System MDK 3 plus 2.8

- Unlock lock (1) on outside at arrester hook and slide out lock (1) side.
- Unlock contact with special tool **61 1 136** and pull out cable (2) and contact towards rear.



G03388963

Fig. 31: View Of Lock On In-Line Plug Arrester Hook
Courtesy of BMW OF NORTH AMERICA, INC.



G03388964

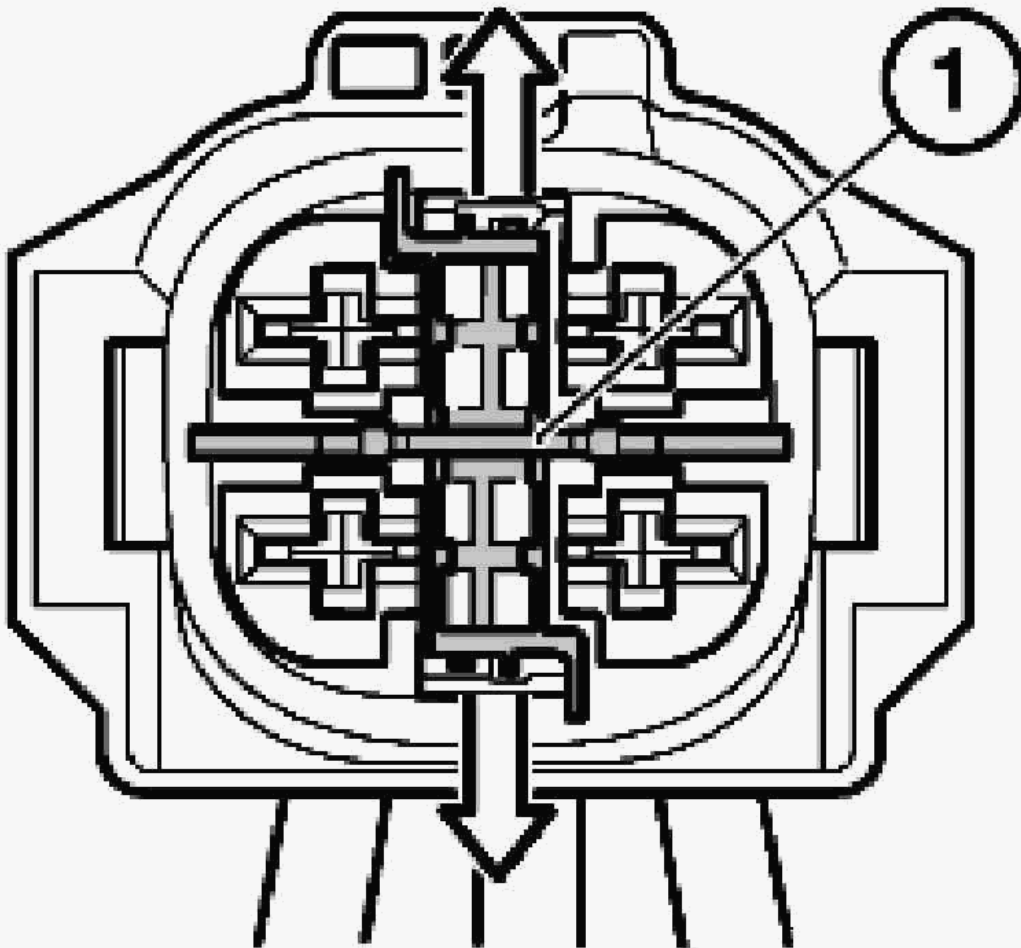
Fig. 32: Identifying In-Line Plug And Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

In-line plug 4 Pin System DFK ELA

- Press arrester hook in direction of arrow and remove lock (1).
- Unlock contact with special tool **61 1 136** and pull cable and contact out towards rear.

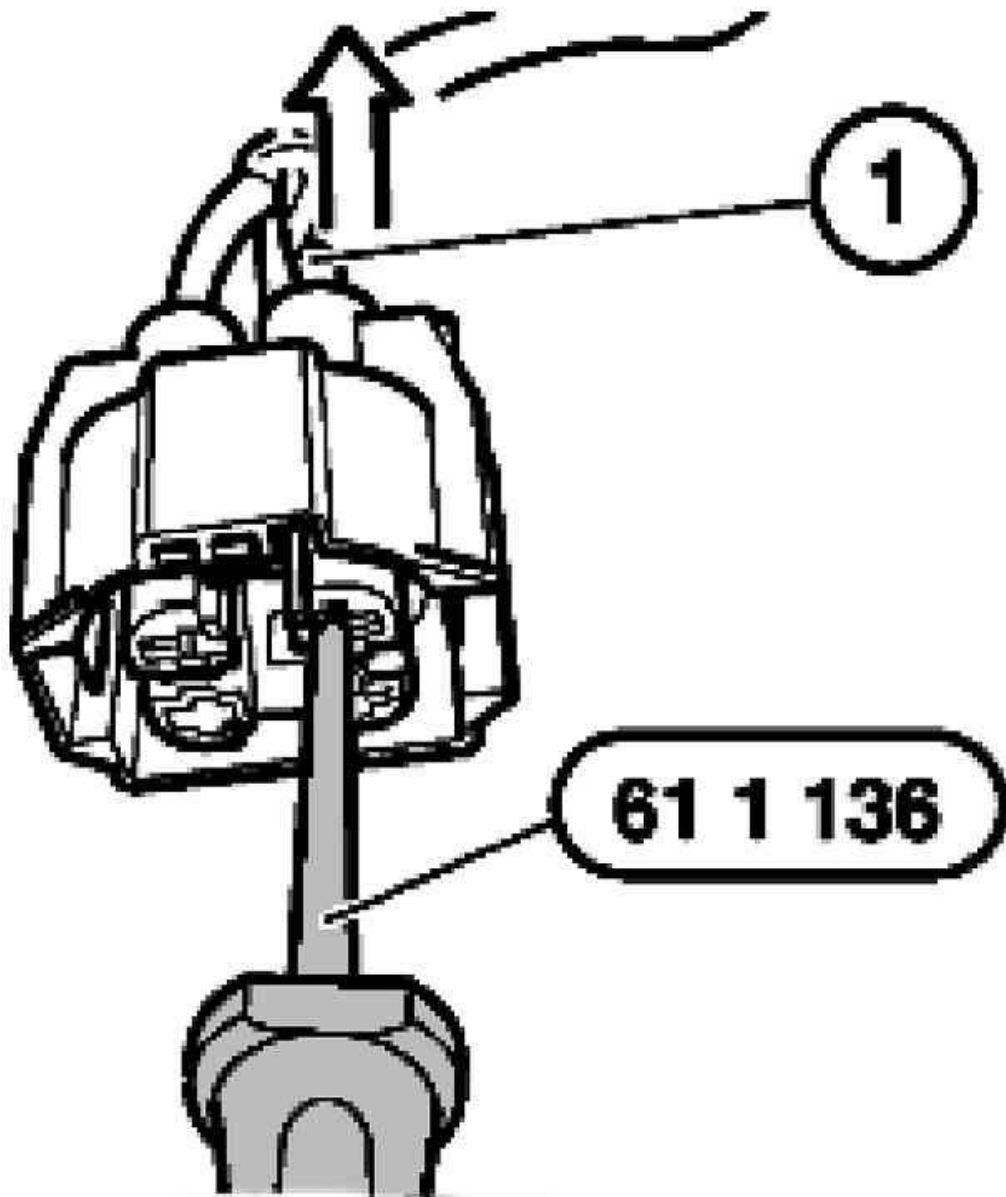
Installation Instructions:

- If necessary, slide lock must also be unlocked with screw driver.



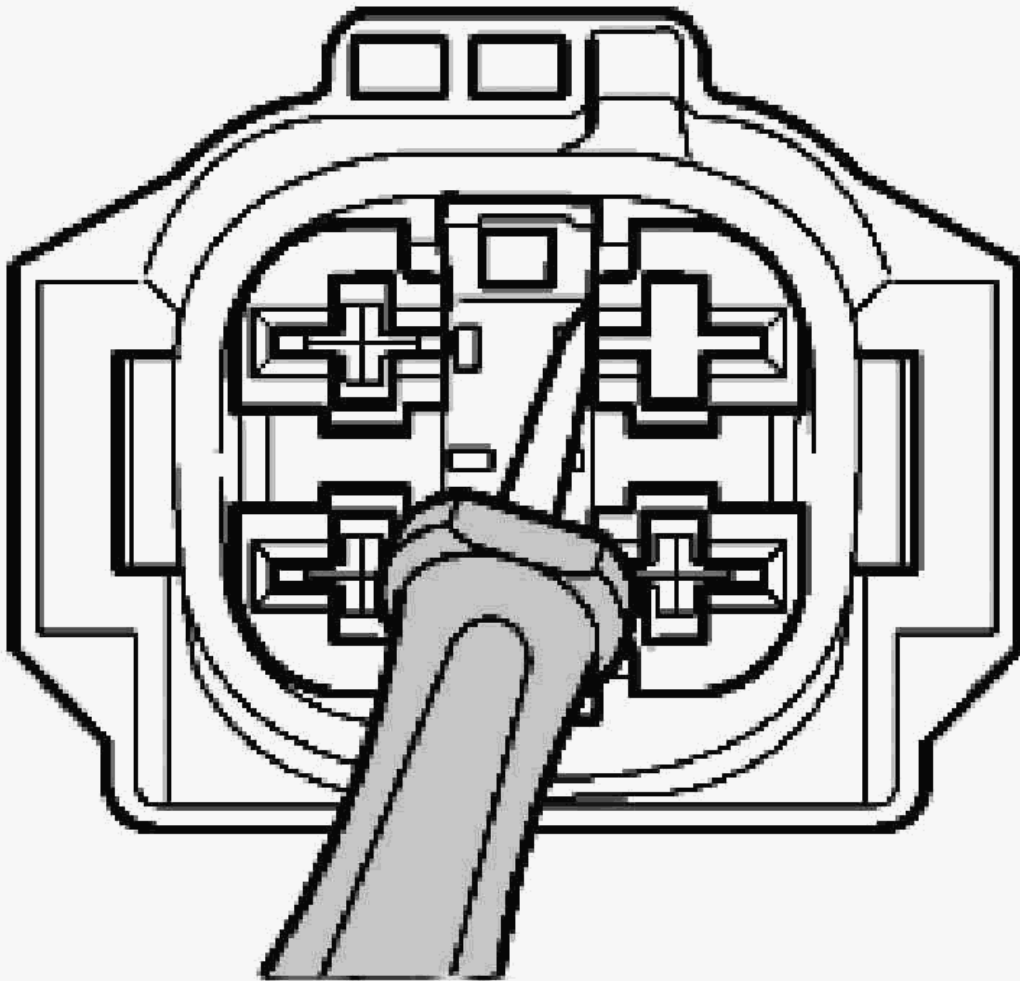
G03388965

Fig. 33: Locating Lock In Plug
Courtesy of BMW OF NORTH AMERICA, INC.



G03388966

Fig. 34: Unlocking With Special Tool (61 1 136)
Courtesy of BMW OF NORTH AMERICA, INC.



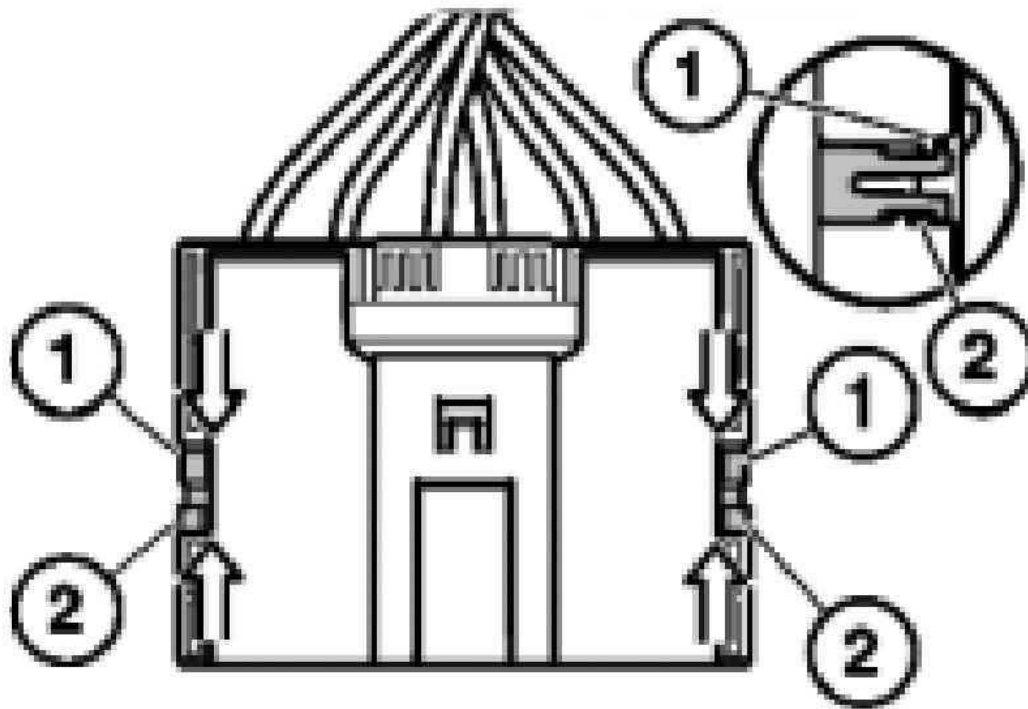
G03388967

Fig. 35: View Of Slide Lock In Plug
Courtesy of BMW OF NORTH AMERICA, INC.

PLUG SYSTEM ELO/ELO POWER

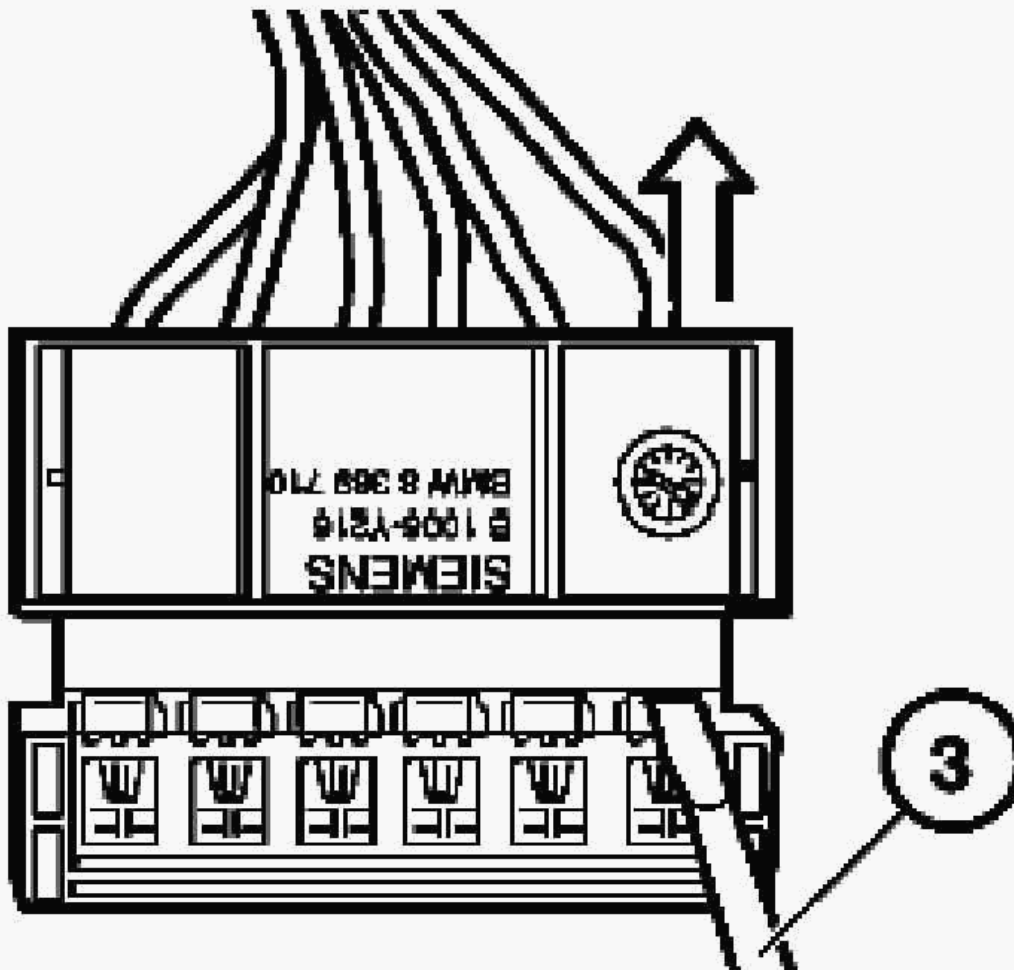
In-line Plug 3-,6 Pin System Elo-Power 2.8

- Press unlocking hook (1) in direction of arrow and disengage. Then unlock locking hook (2) and remove lock.
- Press down arrestor hook (3) with screwdriver and pull out cable with contact towards rear.



G03388968

Fig. 36: Identifying Hook On In-Line Plug
Courtesy of BMW OF NORTH AMERICA, INC.

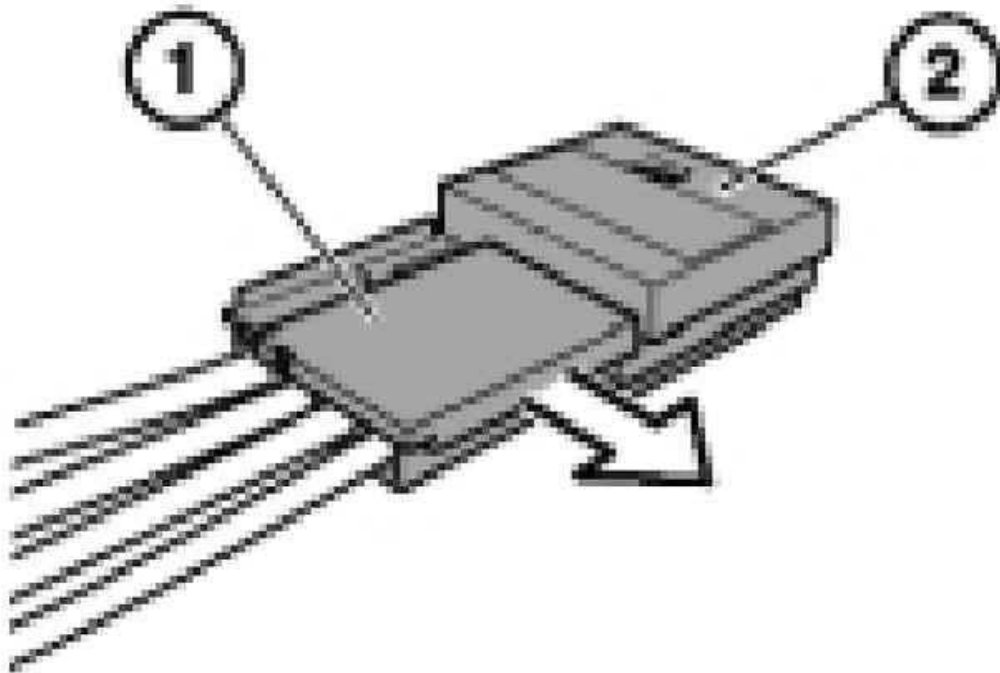


G03388969

Fig. 37: View Of In-Line Plug Arrester Hook
Courtesy of BMW OF NORTH AMERICA, INC.

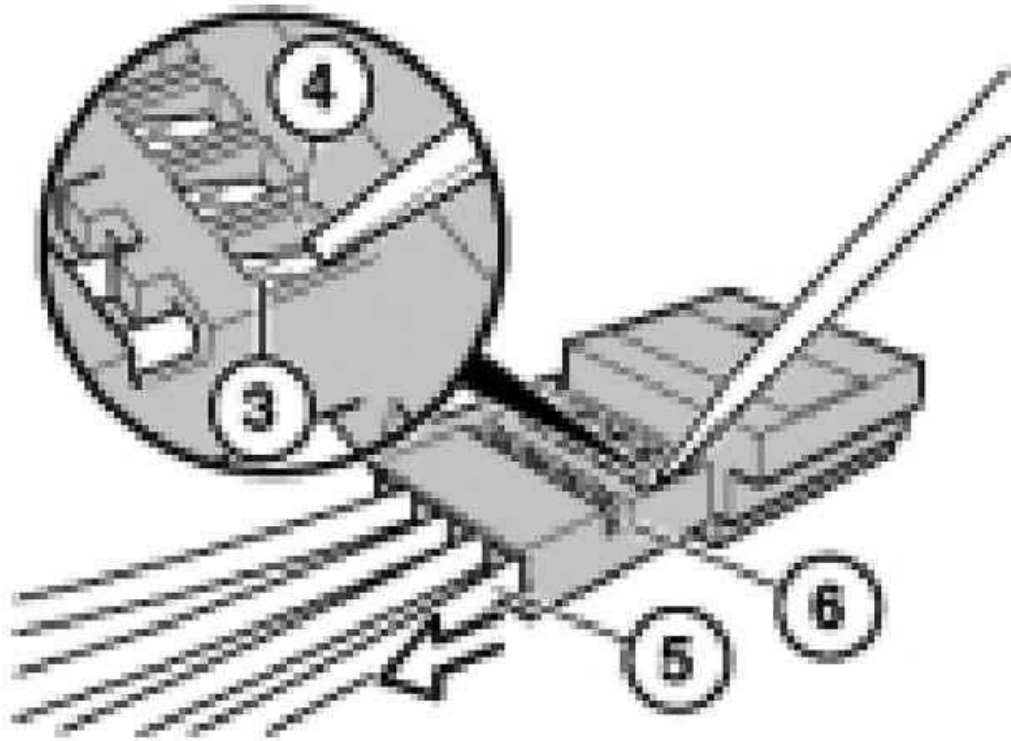
In-line plug 4-,10 Pin System Elo

- Slide connector lock (1) off of main connector body.
- Push the lock tab of the connector being removed down (3) with pin or small screwdriver in the primary lock slot (4) and pull the wire out (5) to the secondary lock position (6).
- Push the lock tab down again in the secondary lock position and remove wire completely.



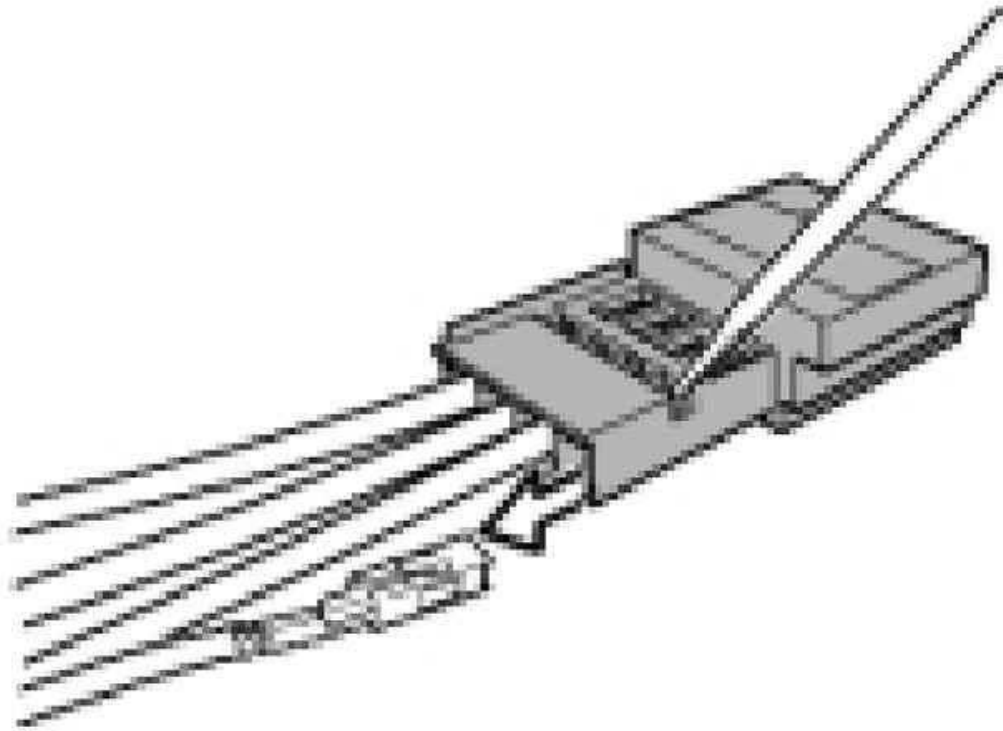
G03388970

Fig. 38: Locating Connector Lock For In-Line Plug
Courtesy of BMW OF NORTH AMERICA, INC.



G03388971

Fig. 39: Identifying In-Line Plug Lock Tab
Courtesy of BMW OF NORTH AMERICA, INC.

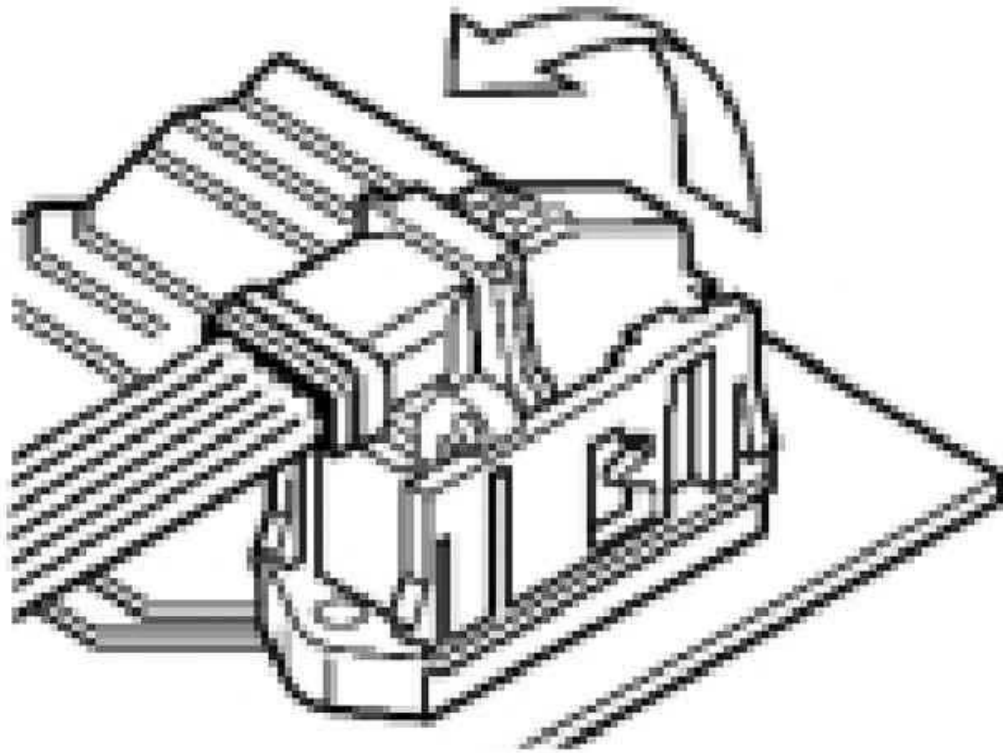


G03388972

Fig. 40: View Of In-Line Plug 4-, 10 Pin System Elo
Courtesy of BMW OF NORTH AMERICA, INC.

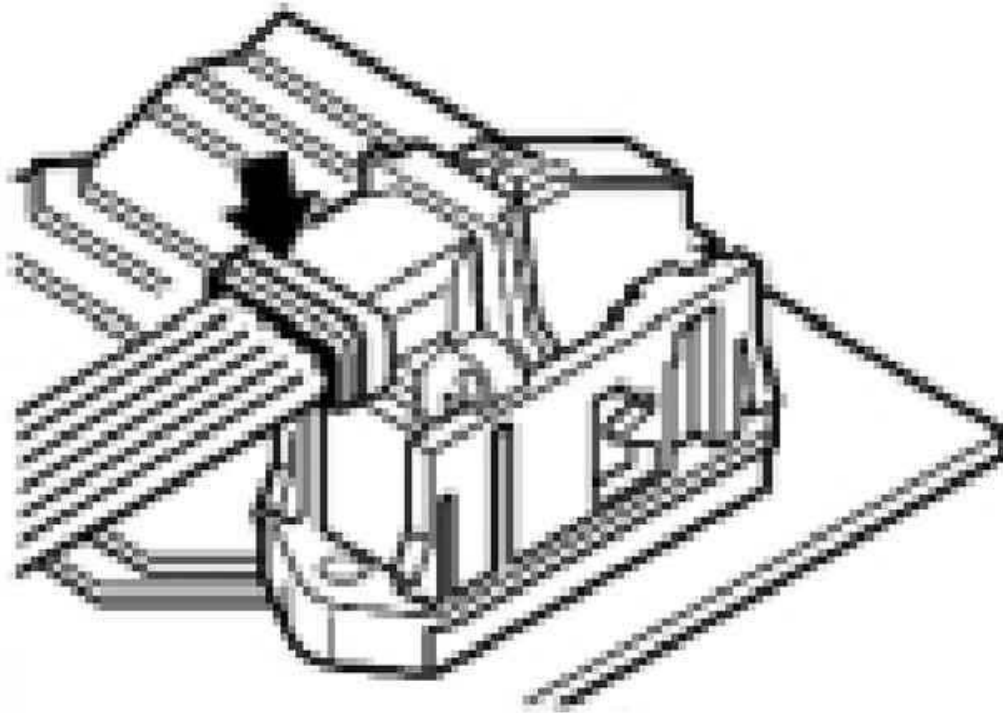
In-line Plug 6-,50 Pin System Elo

- Unlock lock (**Fig. 41**).
- Unfasten cable clip (**Fig. 42**).
- Slide connector lock (1) off of main connector body (2) (**Fig. 43**).
- Push the connector plate (3) out of connector shell using a small screwdriver through hole on end of connector body (**Fig. 44**).
- Push the lock tab of the connector being removed down (6) with pin or small screw driver in the primary lock slot (7) and pull the wire out to the secondary lock position (8) (**Fig. 45**).
- Push the lock tab down again in the secondary lock position and remove wire completely (**Fig. 46**).



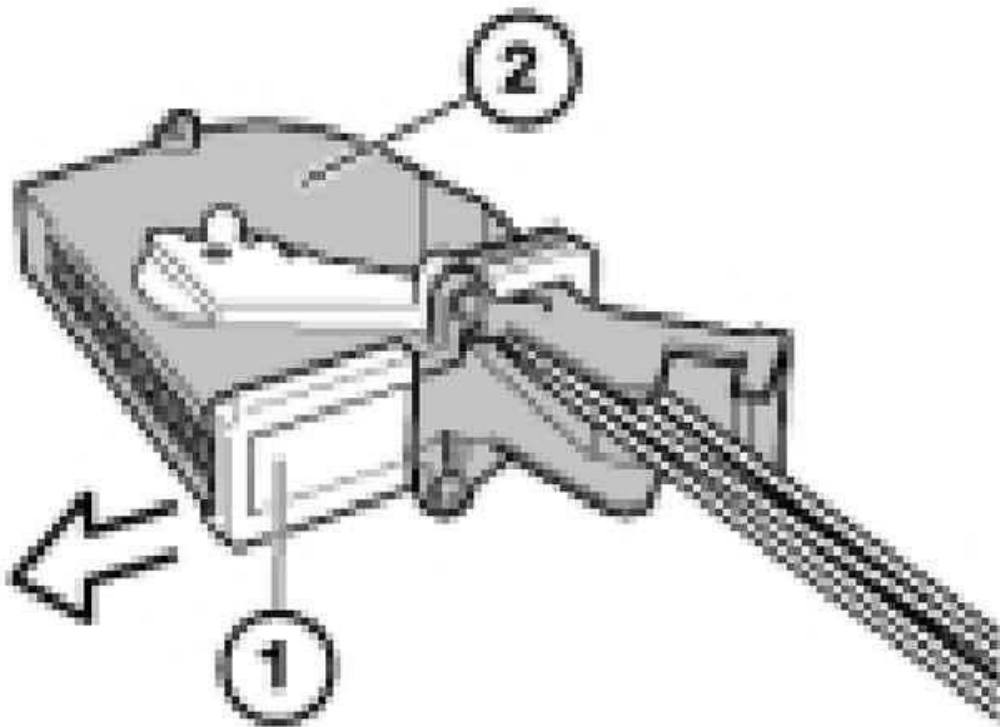
G03388973

Fig. 41: Identifying Lock On In-Line Plug
Courtesy of BMW OF NORTH AMERICA, INC.



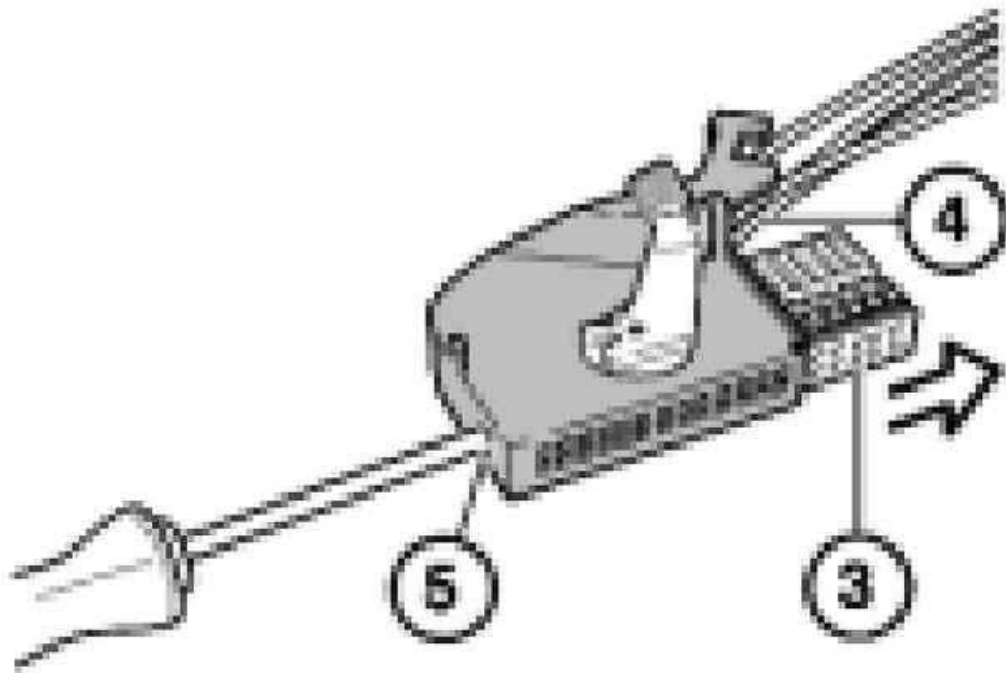
G03388974

Fig. 42: View Of Clip On In-Line Plug
Courtesy of BMW OF NORTH AMERICA, INC.



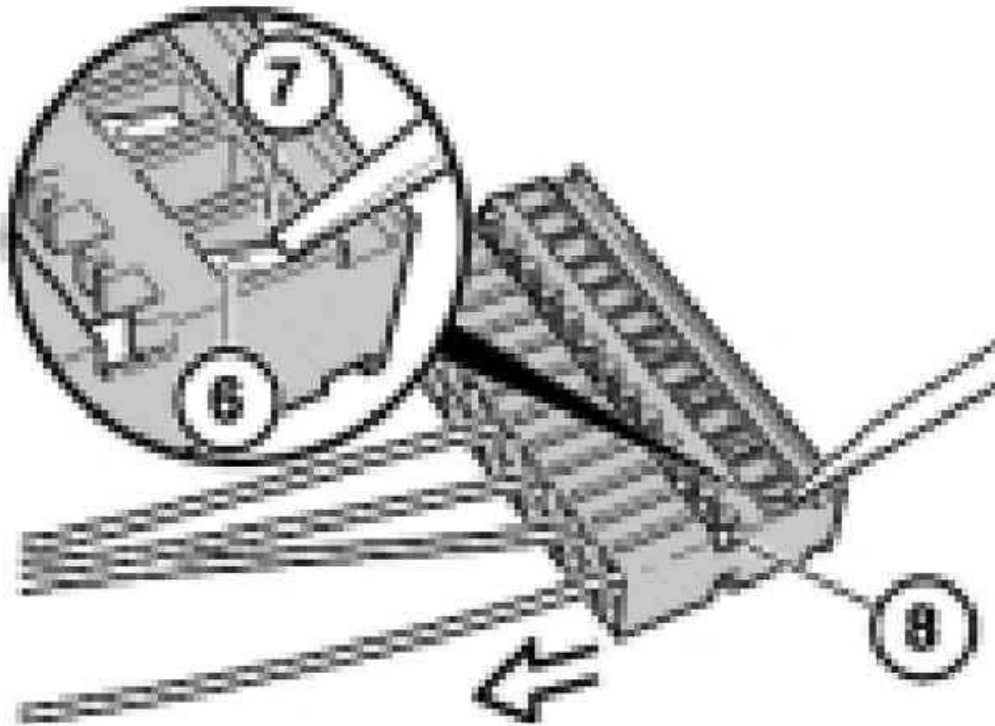
G03388975

Fig. 43: Removing Connector Lock From In-Line
Courtesy of BMW OF NORTH AMERICA, INC.



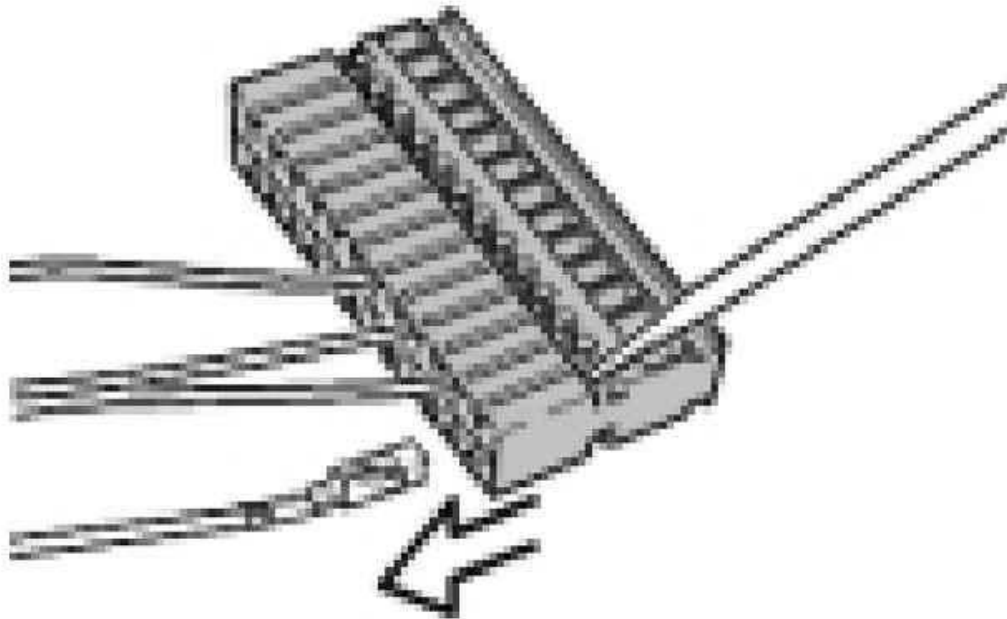
G03388976

Fig. 44: Removing Connector Plate From In-Line Plug
Courtesy of BMW OF NORTH AMERICA, INC.



G03388977

Fig. 45: Removing Wire From Secondary Lock Position
Courtesy of BMW OF NORTH AMERICA, INC.



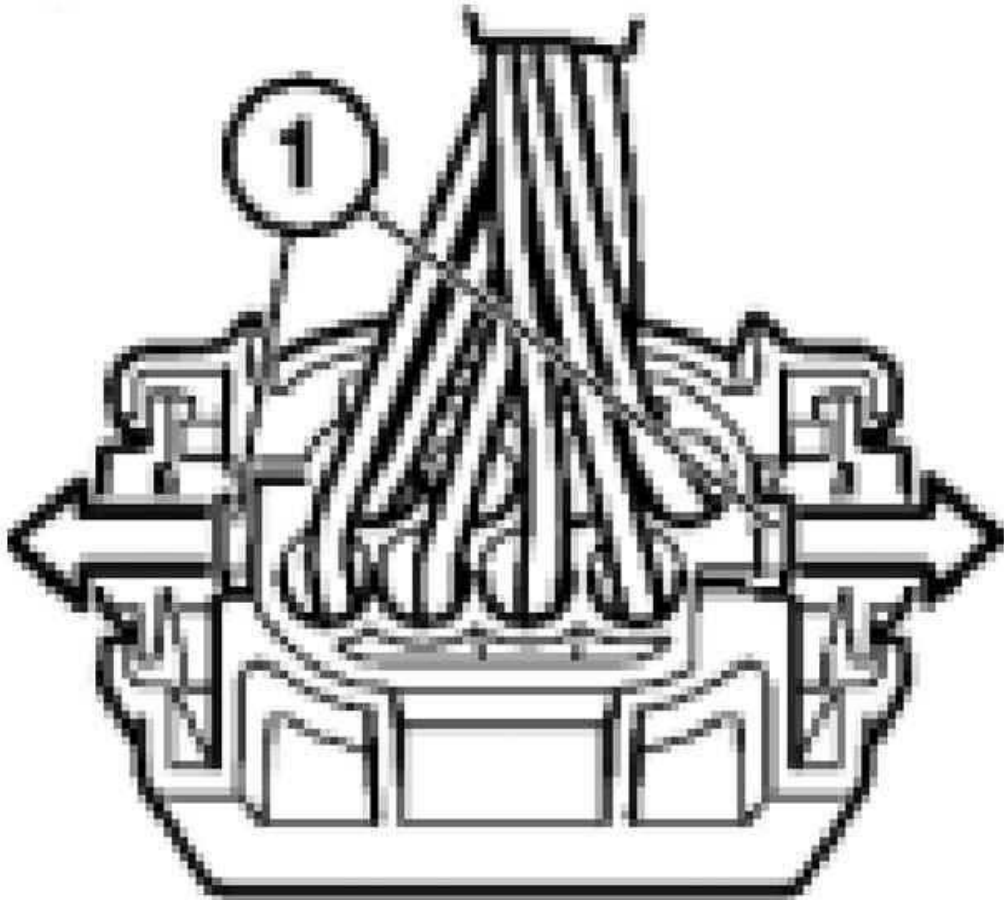
G03388978

Fig. 46: Removing Wire Using Screwdriver
Courtesy of BMW OF NORTH AMERICA, INC.

PLUG SYSTEM MQS/MPQ

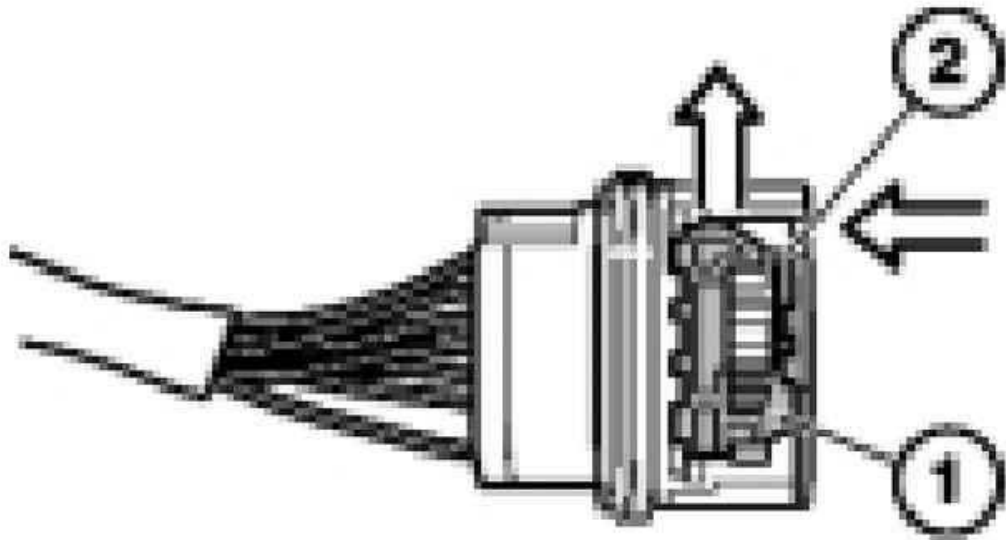
In-line Plug 6-,8 Pin System MQS

- Press lock (1) in direction of arrow and slide plug forward.
- Press locking hook (2) downward and slide lock (1) out.
- Press down arrester hook (3) with screwdriver and pull out cable with contact towards rear.



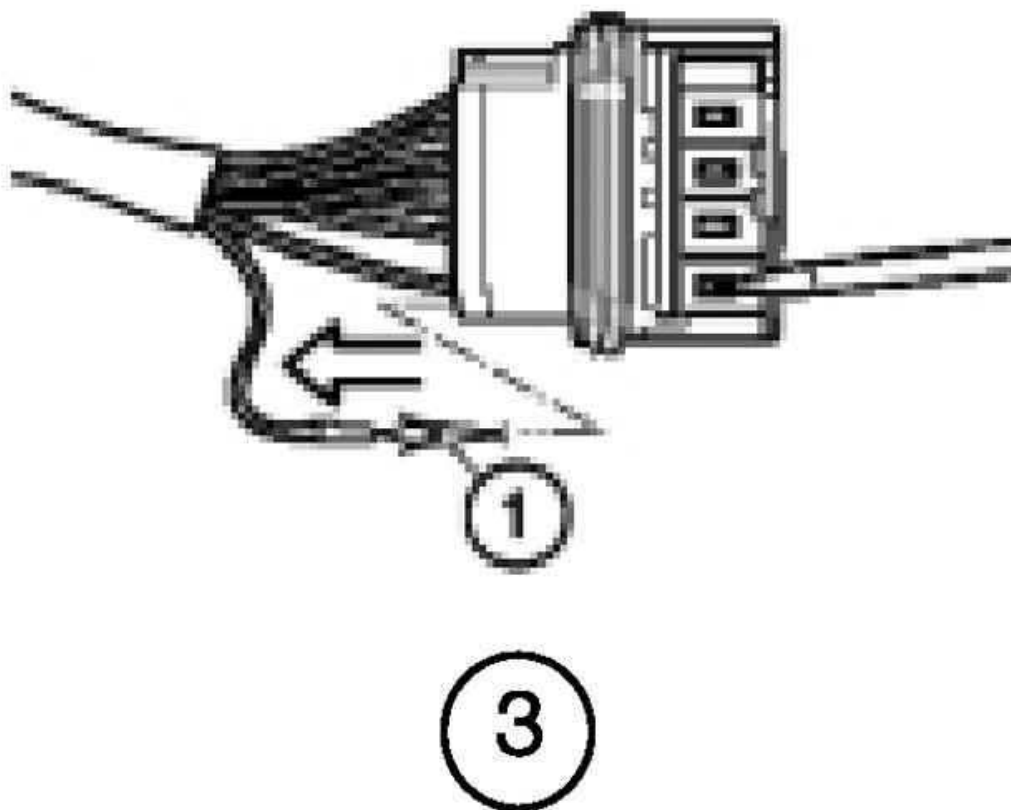
G03388979

Fig. 47: View Of In-Line Plug Lock
Courtesy of BMW OF NORTH AMERICA, INC.



G03388980

Fig. 48: Identifying In-Line Plug Locking Hook
Courtesy of BMW OF NORTH AMERICA, INC.



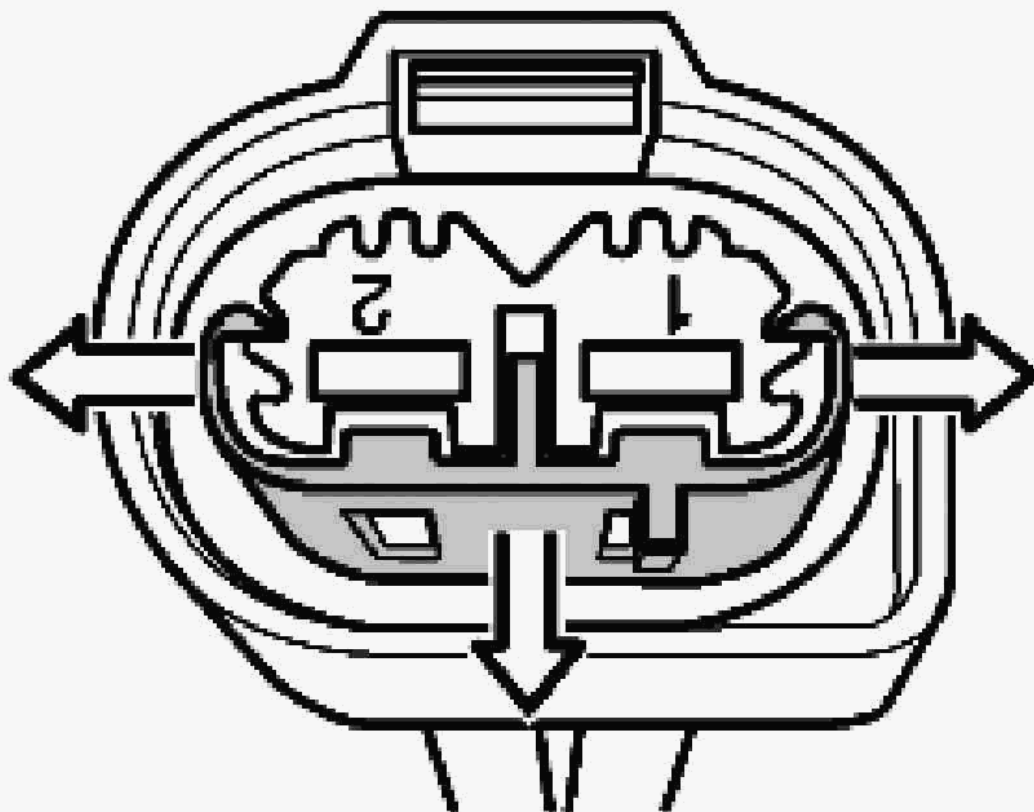
G03388981

Fig. 49: Removing Cable From In-Line Plug

Courtesy of BMW OF NORTH AMERICA, INC.

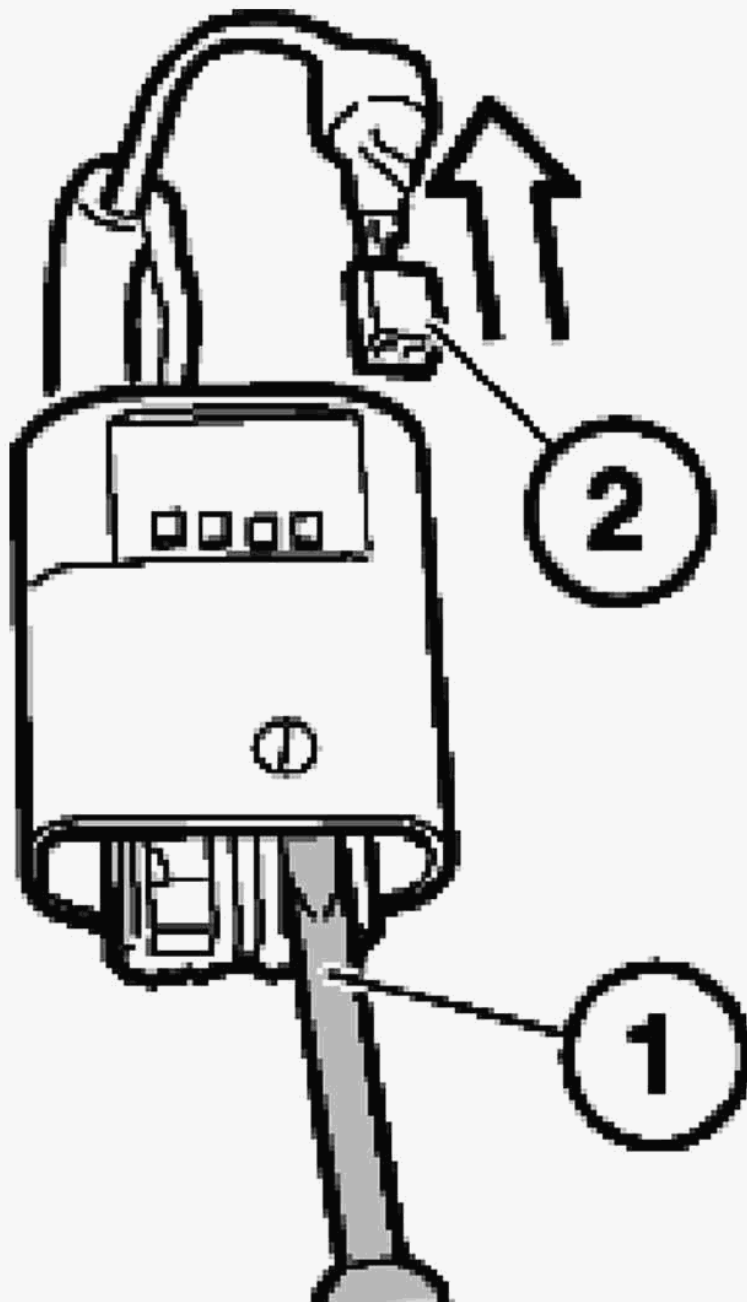
In-line Plug 2 Pin System MPQ 2.8

- Press catch on outside in direction of arrow and remove towards top.
- Press down arrestor hook (1) with screwdriver and pull out cable and contact (2) towards rear.



G03388982

Fig. 50: Identifying Catch On In-Line Plug
Courtesy of BMW OF NORTH AMERICA, INC.

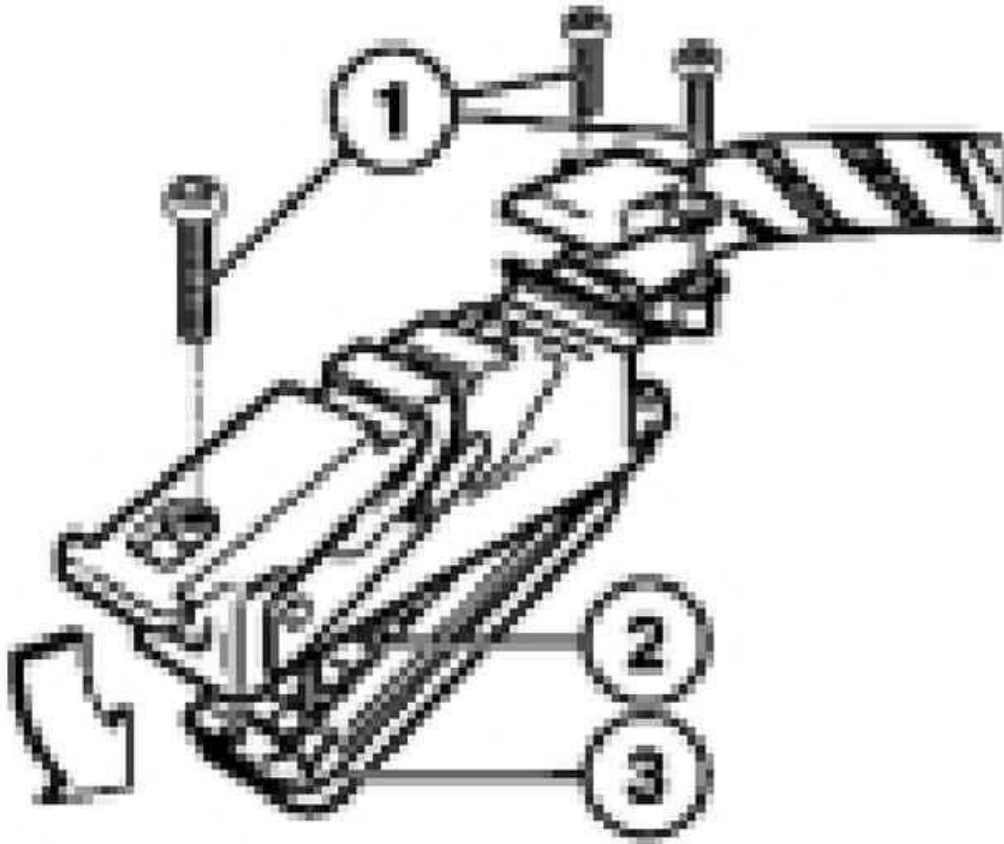


G03388983

Fig. 51: Removing Cable And Contact From In-Line Plug
Courtesy of BMW OF NORTH AMERICA, INC.

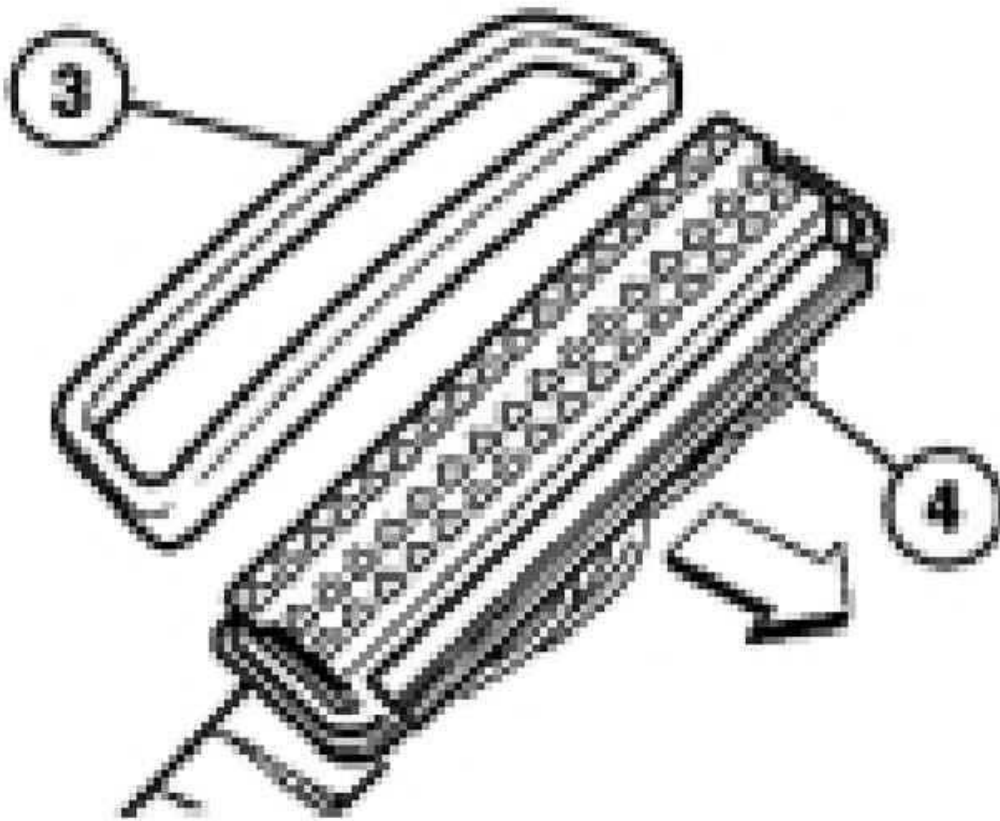
Control Unit Plug 25-, 35-, 55-,83-,88 Pin

- Remove phillips head screws (1) from connector. Gently pivot the connector plate (2) with seal (3) out of the connector shell.
- Remove seal (3) and pull connector plate lock (4) out of locked position.
- Using the appropriate sized spring contact and remove connector (5) from housing.



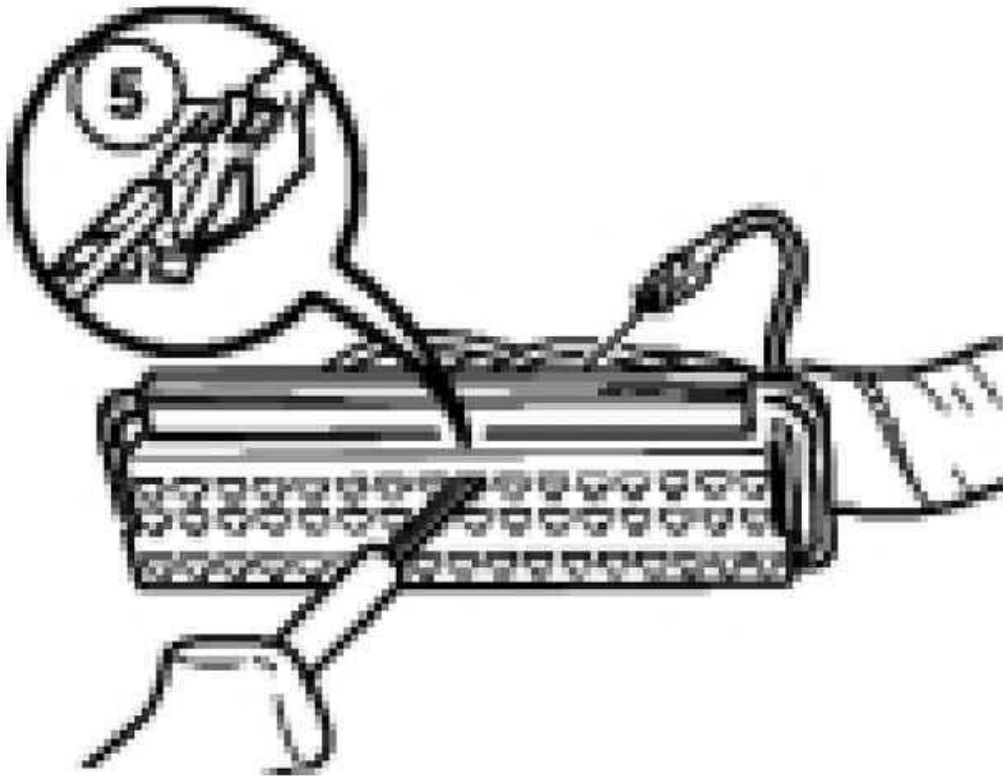
G03388984

Fig. 52: Identifying Control Unit Plug Retaining Screws
Courtesy of BMW OF NORTH AMERICA, INC.



G03388985

Fig. 53: View Of Control Unit Plug Seal
Courtesy of BMW OF NORTH AMERICA, INC.



G03388986

Fig. 54: Removing Connector From Control Unit Plug
Courtesy of BMW OF NORTH AMERICA, INC.

In-line Plug 24 Pin Hybrid System MQS/MPQ

Manufactured by AMP : The following contact types without strand sealing can be fitted in the plug housings:

MQS (Micro Quadlock System).

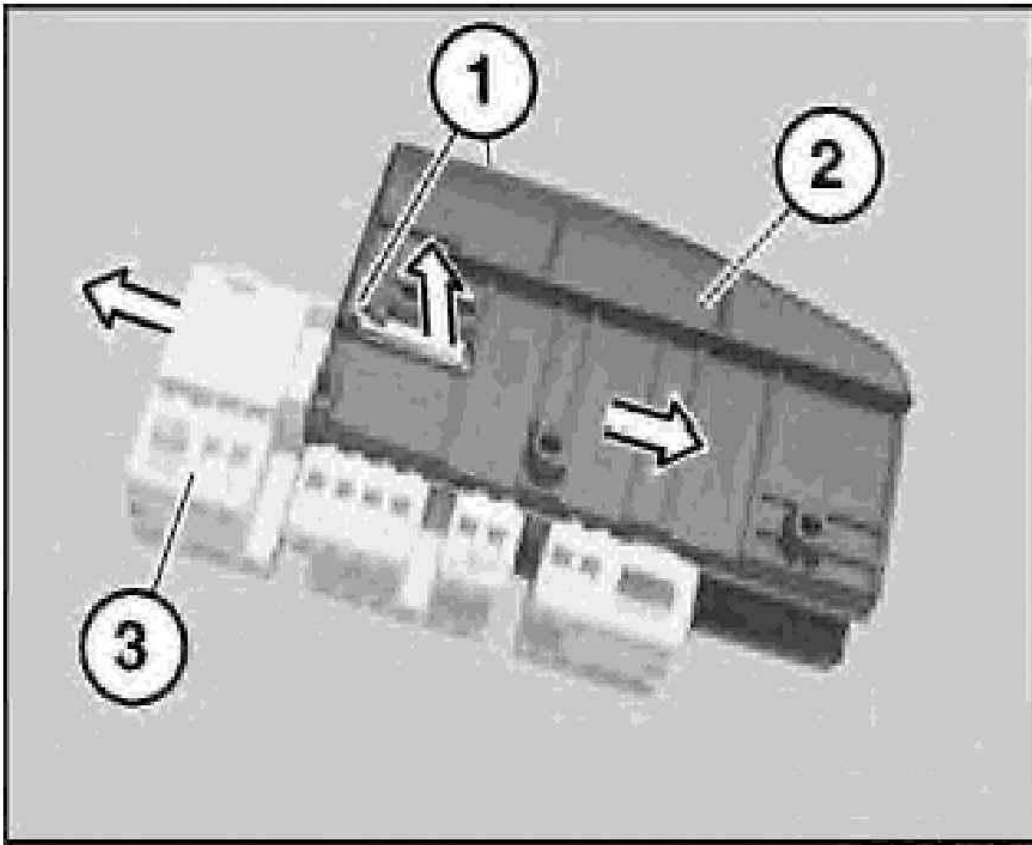
MPQ, width 2.8 mm (Micro Power Quadlock).

MPQ, width 5.2 mm (Micro Power Quadlock).

Socket Housing

- Press locks (1) on cap (2) upwards on both sides.
- Detach cap from contact carrier (3).

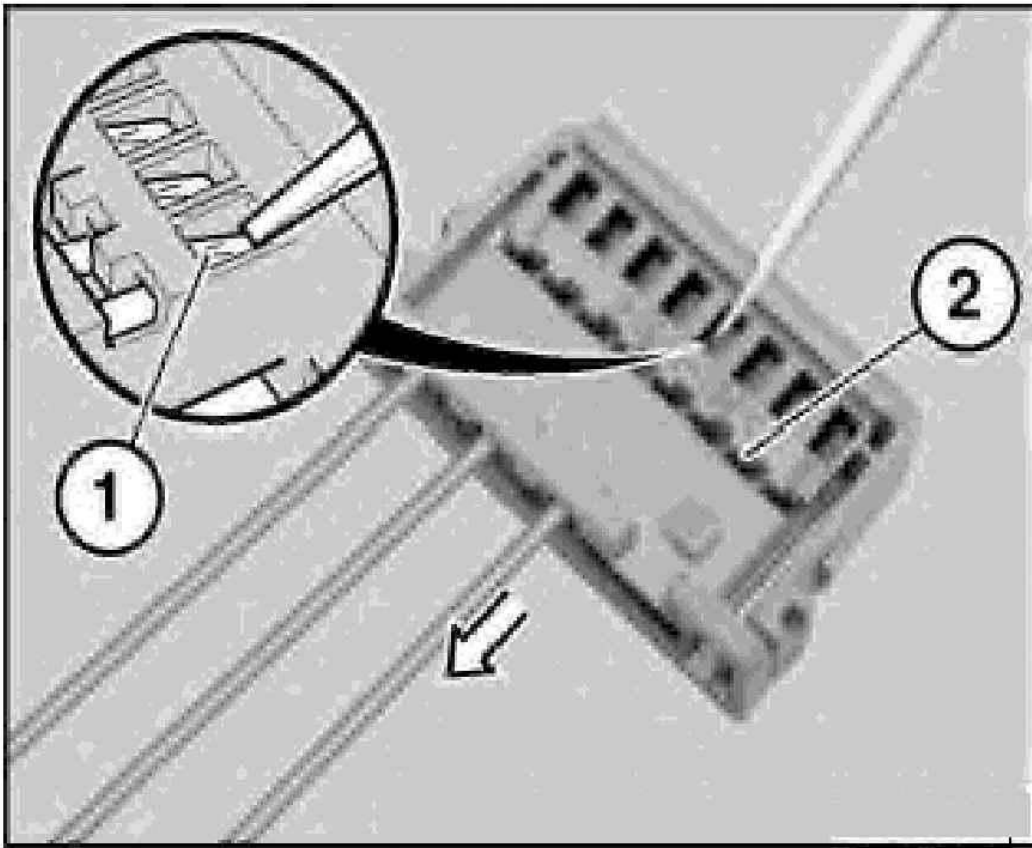
NOTE: Detaching the cap releases the secondary lock of the socket contacts.



G03388987

Fig. 55: Removing Cap From Contact Carrier
Courtesy of BMW OF NORTH AMERICA, INC.

- Hold down retaining hook (1) of socket contact carrier with a small screwdriver.
- Pull wire with socket contact in direction of arrow as far as secondary lock (2). (**Fig. 56**)
- Hold down retaining hook in secondary lock (1) again and pull cable with socket contact (2) completely out of contact carrier (3). (**Fig. 57**)



G03388988

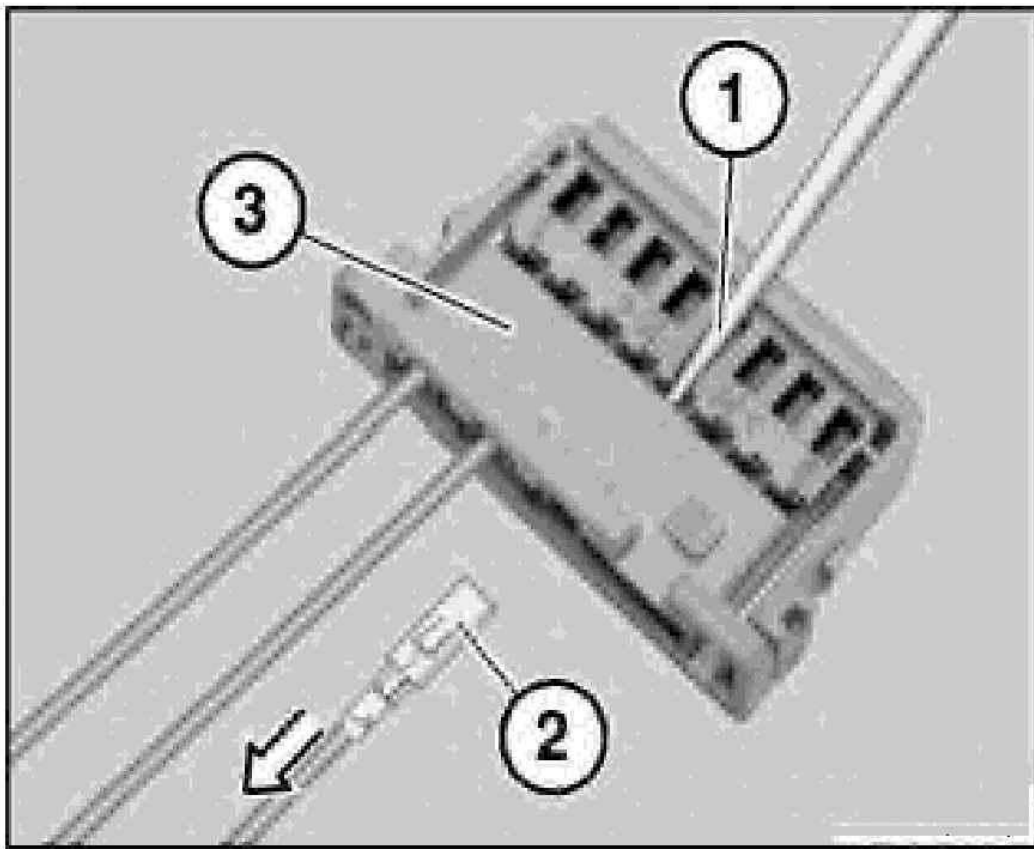
Fig. 56: View Of Retaining Hook In Secondary Lock
Courtesy of BMW OF NORTH AMERICA, INC.

Pin Housing

- Press locks (1) on cap (2) upwards on both sides.
- Detach cap from housing carrier (3)(Fig. 58).

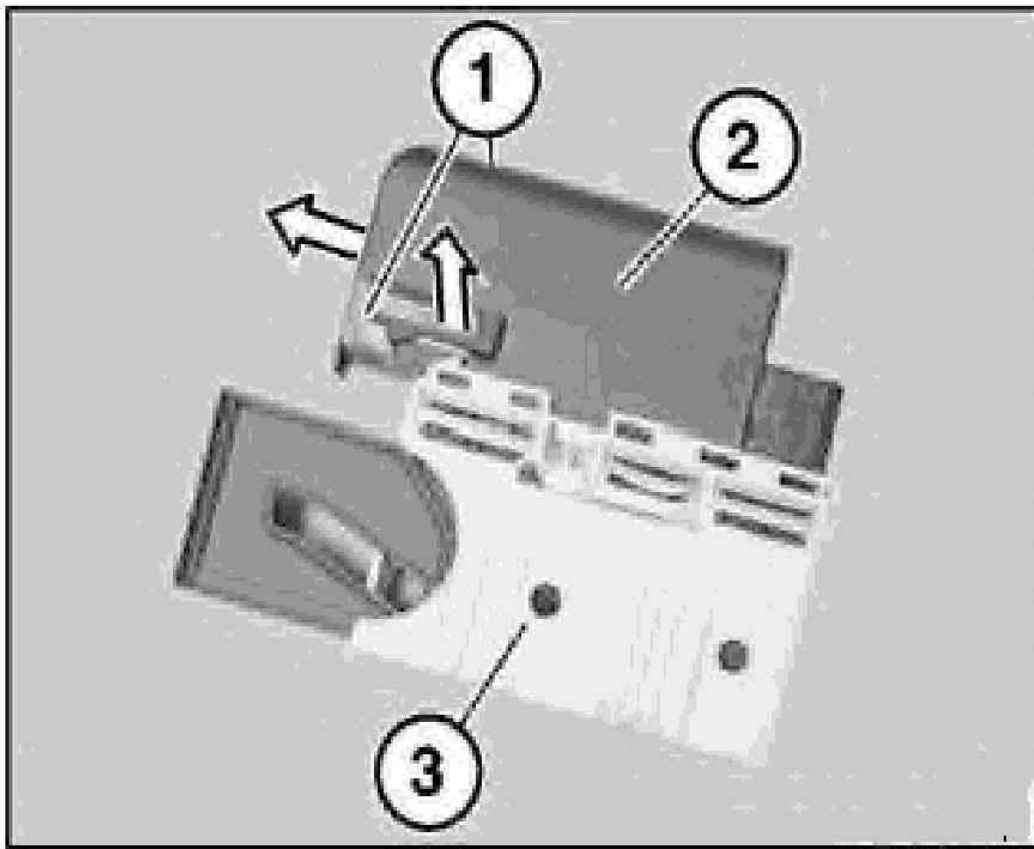
NOTE: **Detaching the cap releases the secondary locks of the pin contacts in the contact carriers.**

- Pull contact carrier (1) out of housing carrier (2) (Fig. 59).
- The pin contacts are pulled of a contact carrier as described under "Socket Housing".



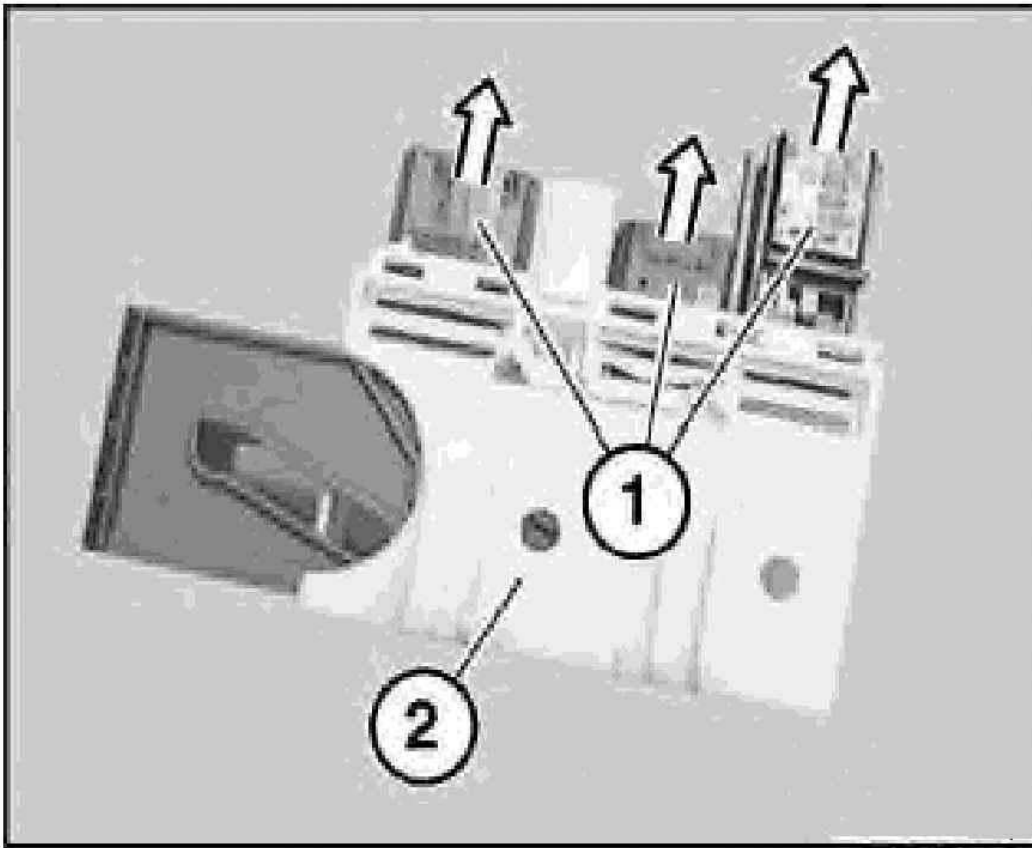
G03388989

Fig. 57: Identifying Pin Housing Locks
Courtesy of BMW OF NORTH AMERICA, INC.



G03388990

Fig. 58: Removing Cap From Pin Housing
Courtesy of BMW OF NORTH AMERICA, INC.



G03388991

Fig. 59: Removing Contact Carrier From Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Socket Housing 42-,43 Pin Hybrid Systems MQS/MPQ

Manufactured by AMP: The following contact types without strand sealing can be fitted in the socket housings:

MQS (Micro Quadlock System).

MPQ, width 2.8 mm (Micro Power Quadlock).

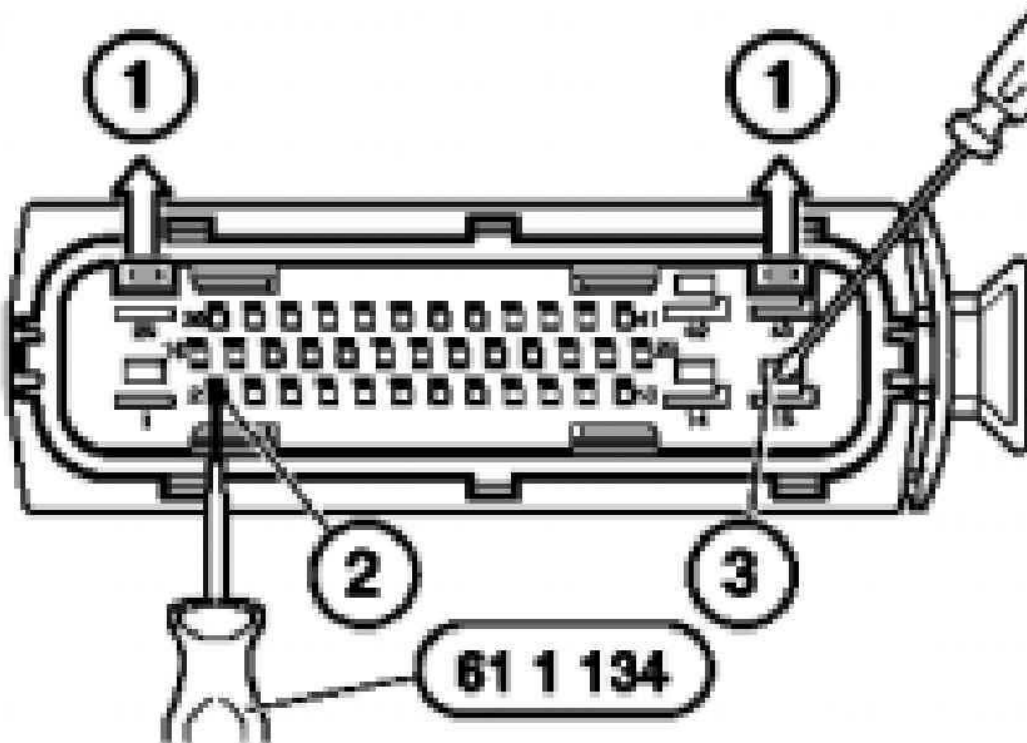
MPQ, width 5.2 mm (Micro Power Quadlock).

- Open secondary locks (1) on socket housing.
- Press back retaining hook of MQS contacts (2) with special tool 61 1 134 and pull out cable with contact.
- Press back retaining hook of MPQ contacts (3) with screwdriver or similar tool and pull out cable with

contact.

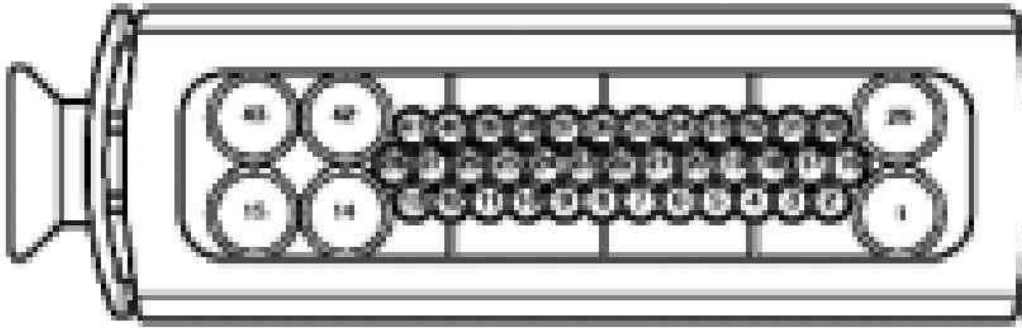
Installation:

- Bend open retaining hook of contacts gently before inserting into plug housing.
- To install contacts, observe cavity numbers on reverse side of socket housing.



G03388992

Fig. 60: Identifying MOS Contact Retaining Hook
Courtesy of BMW OF NORTH AMERICA, INC.



G03388993

Fig. 61: Identifying Cavity Numbers On Socket Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Socket Housing 2x27-, 2x27 Pin Hybrid System MQS/MPQ, Elo/Elo Power

Manufactured by Amp: The following contact types without strand sealing can be fitted in the socket housings:

MQS (Micro Quadlock System).

MQS, width 2.8 mm (Micro Power Quadlock).

MPQ, width 5.2 mm (Micro Power Quadlock).

Manufactured by Siemens: The following contact types without strand sealing can be fitted in the socket housings:

Elo (electronic contact).

Elo-Power 2.8 mm wide (electronic contact for heavy loads).

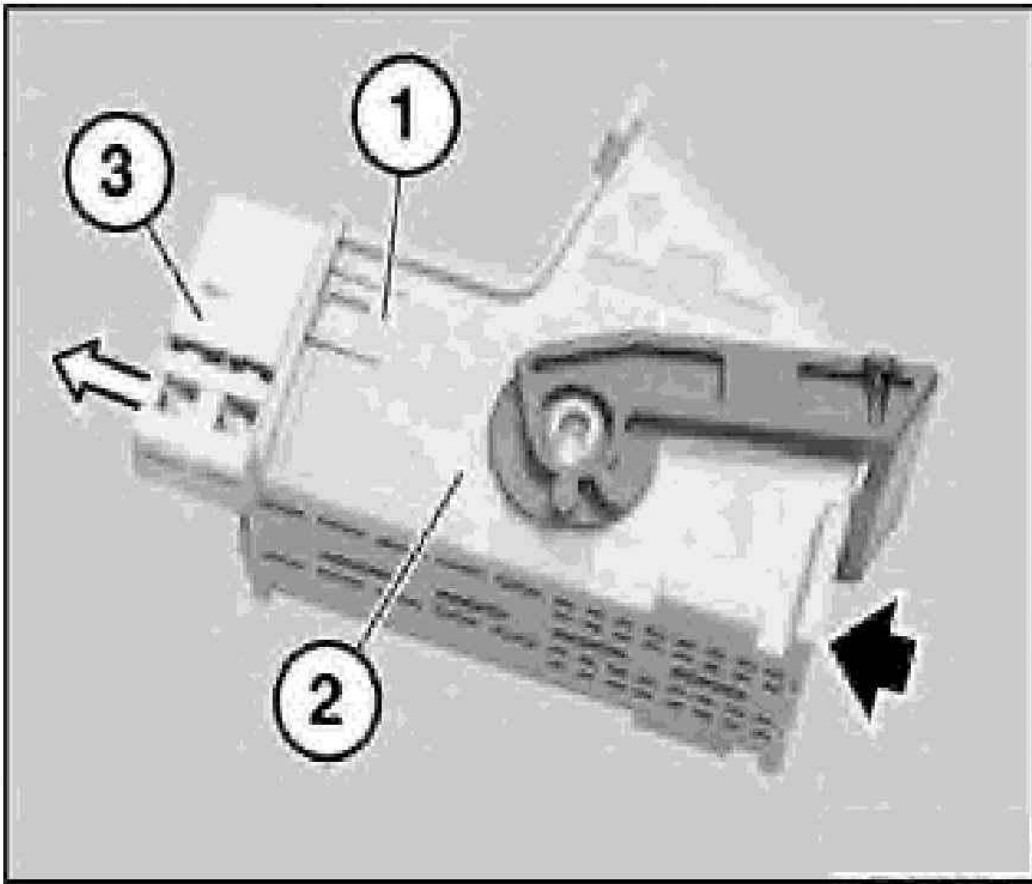
Elo-Power 5.2 mm wide (electronic contact for heavy loads).

- Raise lock (1) on housing (2).
- Push contact carrier (3) from rear out of housing.

NOTE: The second carrier is pushed out in the same way.

Pushing out the contact carrier releases the secondary locks of the secondary contacts.

Procedure for removing contacts are same as for other Elo/Elo-Power Systems, refer to the appropriate article.



G03388994

Fig. 62: Removing Contact Carrier From Rear Housing
Courtesy of BMW OF NORTH AMERICA, INC.

In-line Plug 30 Pin Hybrid System MQS/MPQ

Manufactured by AMP: The following contact types without strand sealing can be fitted in the plug housings:

MQS (Micro Quadlock System).

MPQ, width 2.8 mm (Micro Power Quadlock).

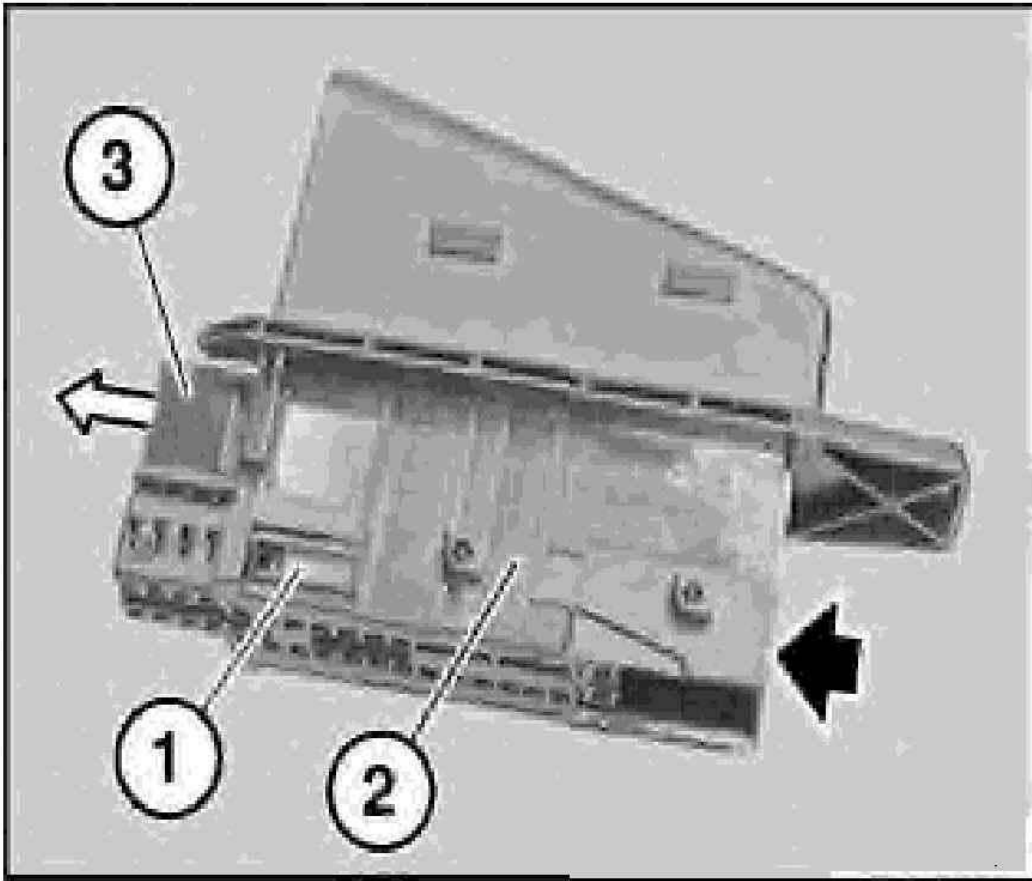
MPQ, width 5.2 mm (Micro Power Quadlock).

Socket Housing

- Raise lock (1) on housing (2).

- Push contact carrier (3) from rear out of housing (2).

NOTE: Pushing out the contact carrier releases the secondary locks of the socket contacts. Procedure for removing contacts are same as for other Elo/Elo-Power Systems, refer to the appropriate article.



G03388995

Fig. 63: Removing Contact Carrier From Rear Out Of Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Pin Housing

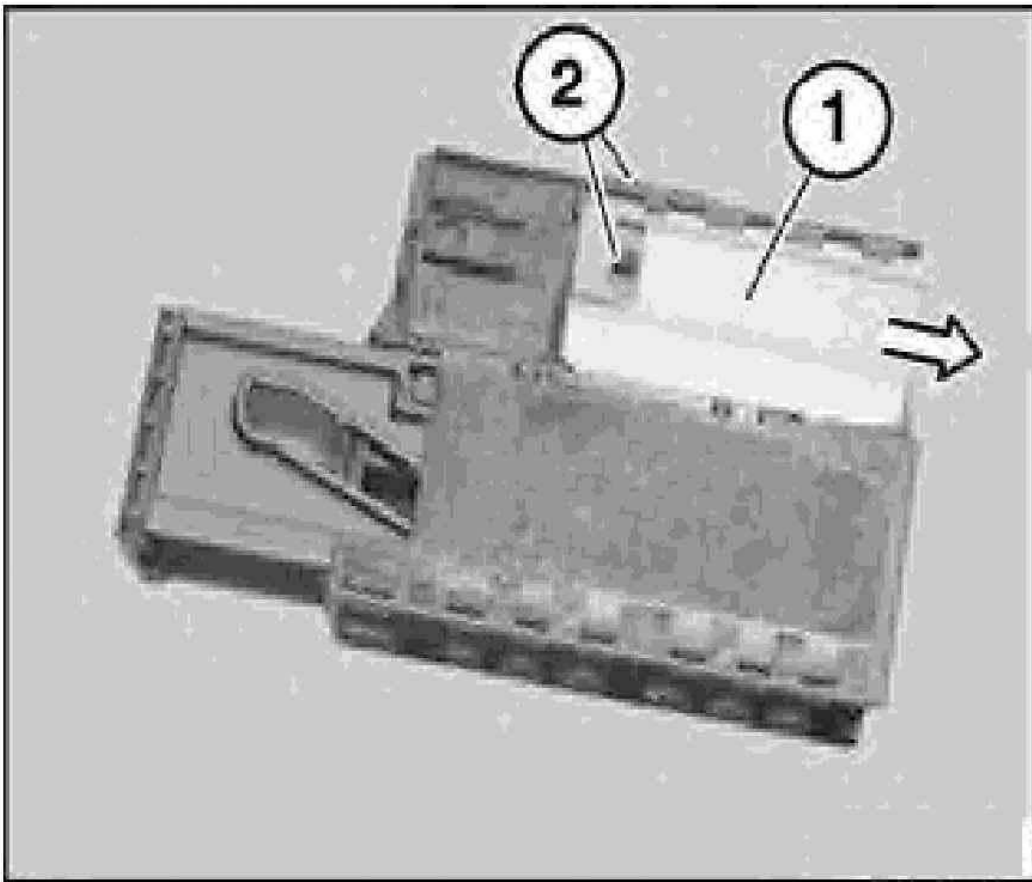
- Contact 1-13 and 19-27.
- Raise locking slide (1) on both sides (2) of housing and detach.

NOTE: Detaching the locking slide releases the secondary locks of the pin

contacts.

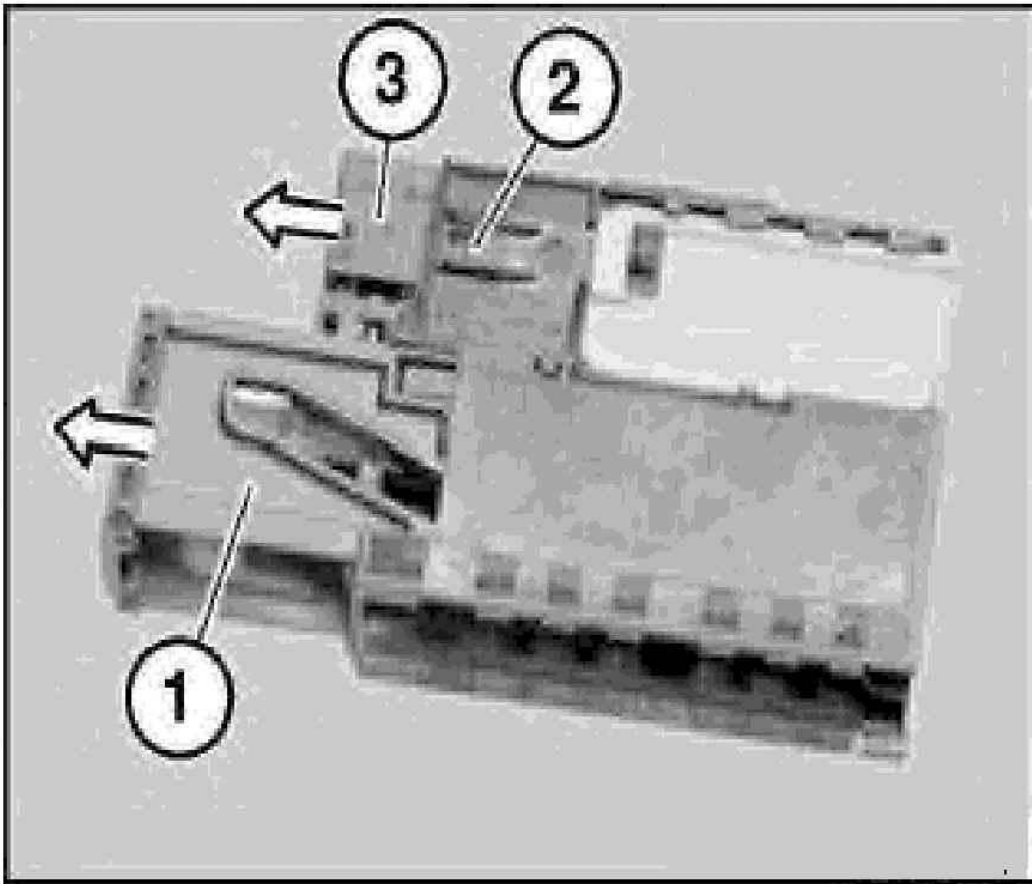
- Contacts 14-18 and 28-30.
- Pull slide (1) outward completely.
- Raise lock (2) on housing.
- Pull contact carrier out of housing.

NOTE: Pulling out the contact carrier releases the secondary locks of the pin contacts.



G03388996

Fig. 64: Identifying Pin Housing Slide
Courtesy of BMW OF NORTH AMERICA, INC.



G03388997

Fig. 65: Removing Pin Housing Contact Carrier
Courtesy of BMW OF NORTH AMERICA, INC.

Socket Housing 5-, 8 Pin System MQS/MPQ

Manufactured by AMP: The following contact types without strand sealing can be fitted in the socket housings:

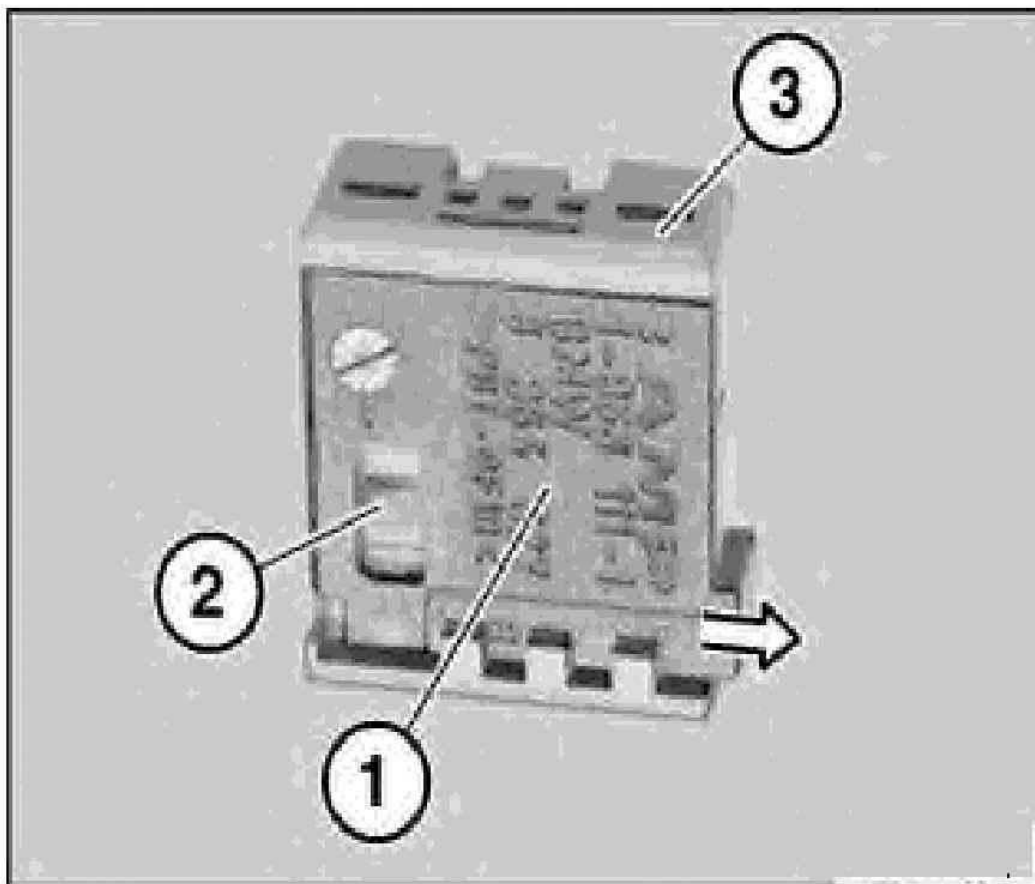
MQS (Micro Quadlock System).

MPQ, width 2.8 mm (Micro Power Quadlock).

MPQ, width 5.2 mm (Micro Power Quadlock).

Socket housing 5 pin (Hybrid System MQS/MPQ)

- Raise fastener (1) (slide) by way of retaining lug (2) and detach from contact carrier (3).



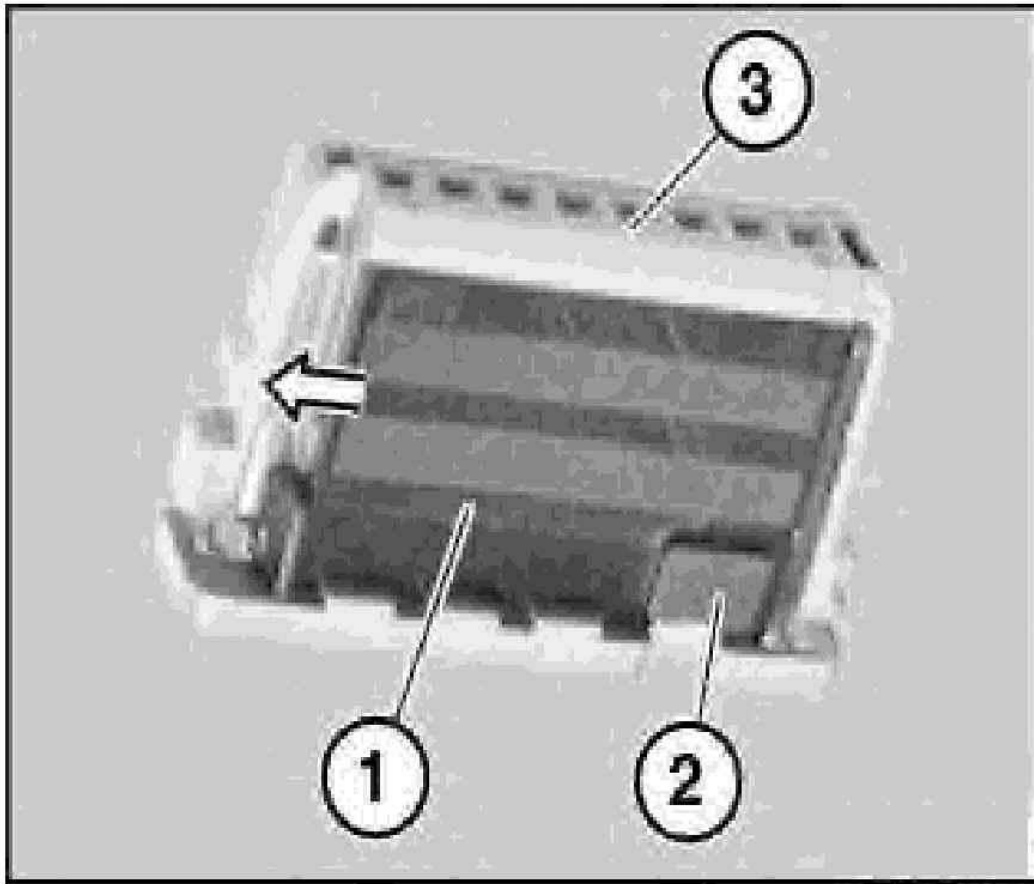
G03388998

Fig. 66: Identifying Socket Housing Fastener
Courtesy of BMW OF NORTH AMERICA, INC.

Socket Housing 8 Pin (MQS)

- Raise fastener (1) (slide) by way of retaining lug (2) and detach from contact carrier (3).

Procedure for removing contacts are same as for other Elo/Elo-Power Systems, refer to the appropriate article.



G03388999

Fig. 67: Identifying Socket Housing 8 Pin (MQS)
Courtesy of BMW OF NORTH AMERICA, INC.

Socket Housing (Radio Plug) Hybrid system MQS/MPS

Manufactured by AMP: The following contact types without strand sealing can be fitted in the plug housings:

MQS (Micro Quadlock System).

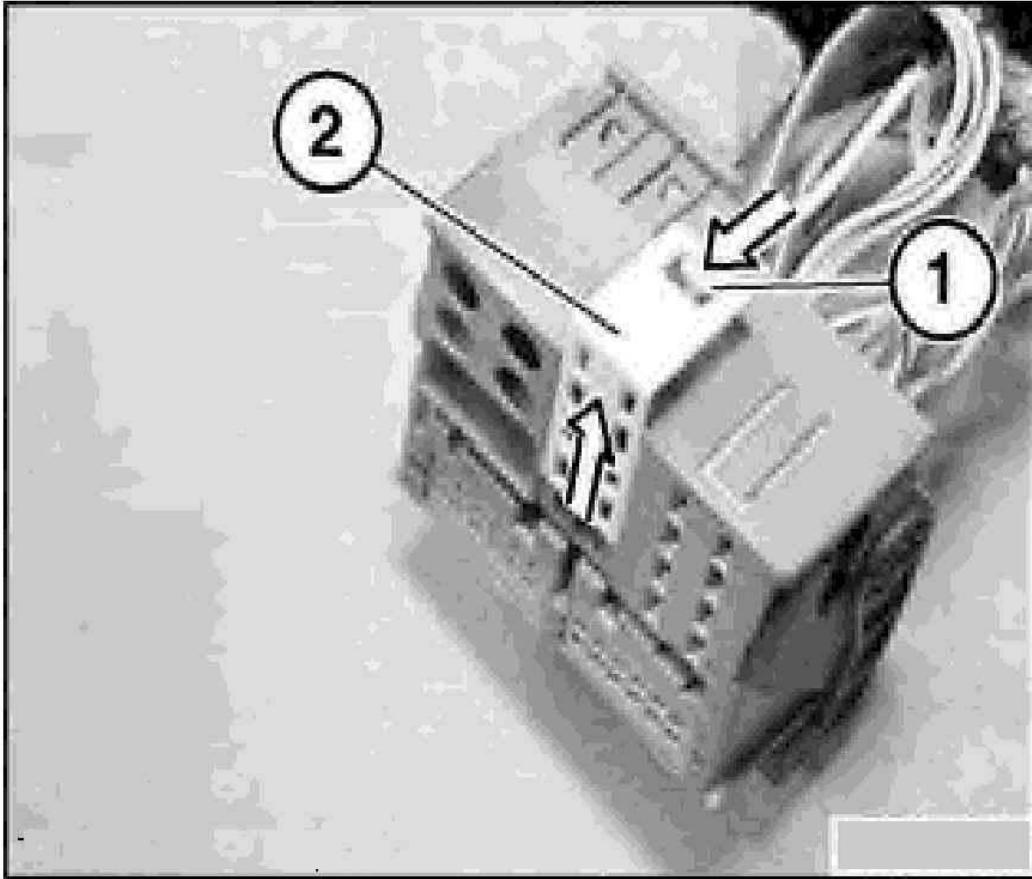
MPQ, width 2.8 mm (Micro Power Quadlock).

MPQ, width 5.2 mm (Micro Power Quadlock).

Removing MPQ contacts from radio plug:

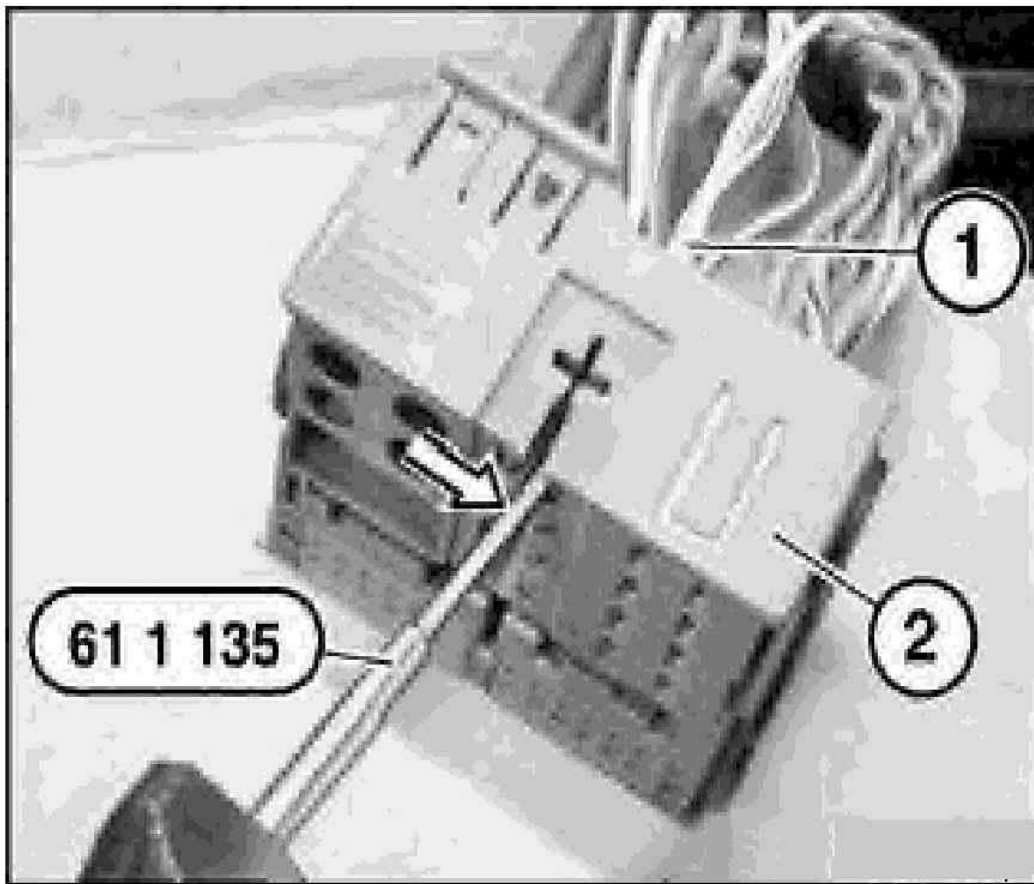
- Press lock (1) in direction of arrow, detach secondary lock (2) from radio plug.

- Feed special tool 61 1 135 past side of contact.
- Press special tool 61 1 135 in direction of arrow.
- Pull wire (1) with socket contact out of radio plug (2).



G03389000

Fig. 68: Locating Radio Plug Lock
Courtesy of BMW OF NORTH AMERICA, INC.



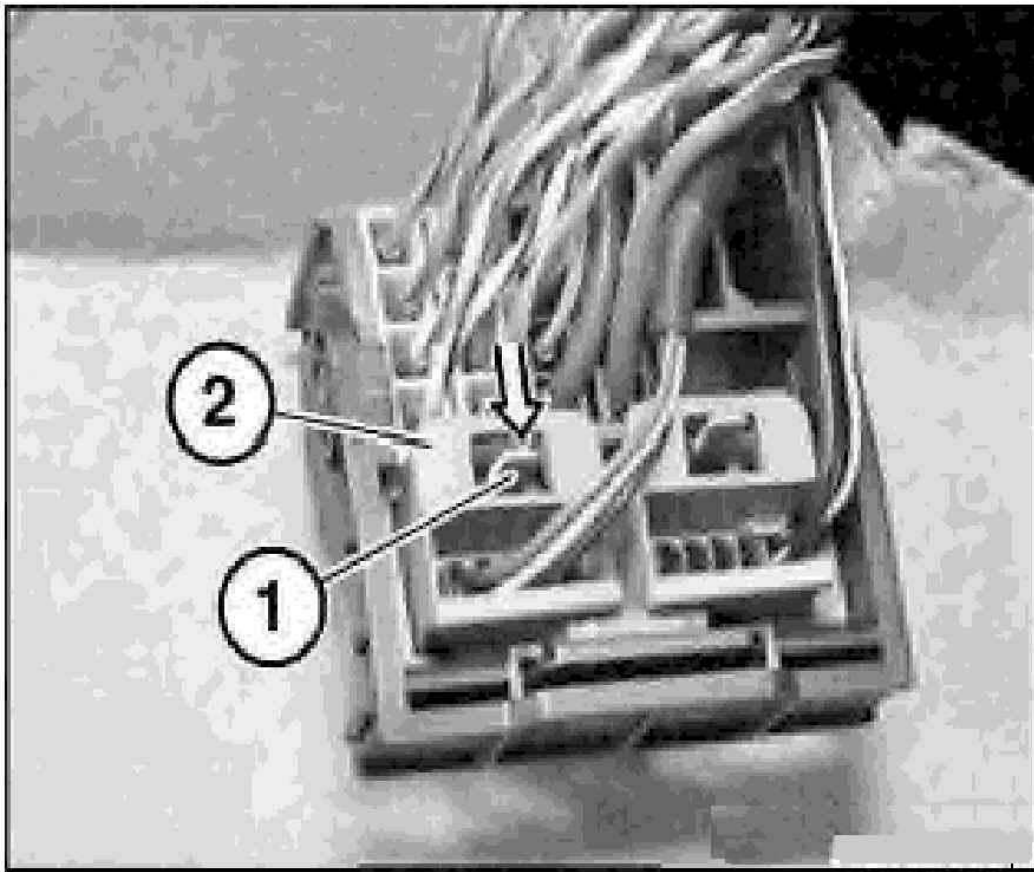
G03389001

Fig. 69: Identifying Special Tool In Radio Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Removing MQS contacts from carrier

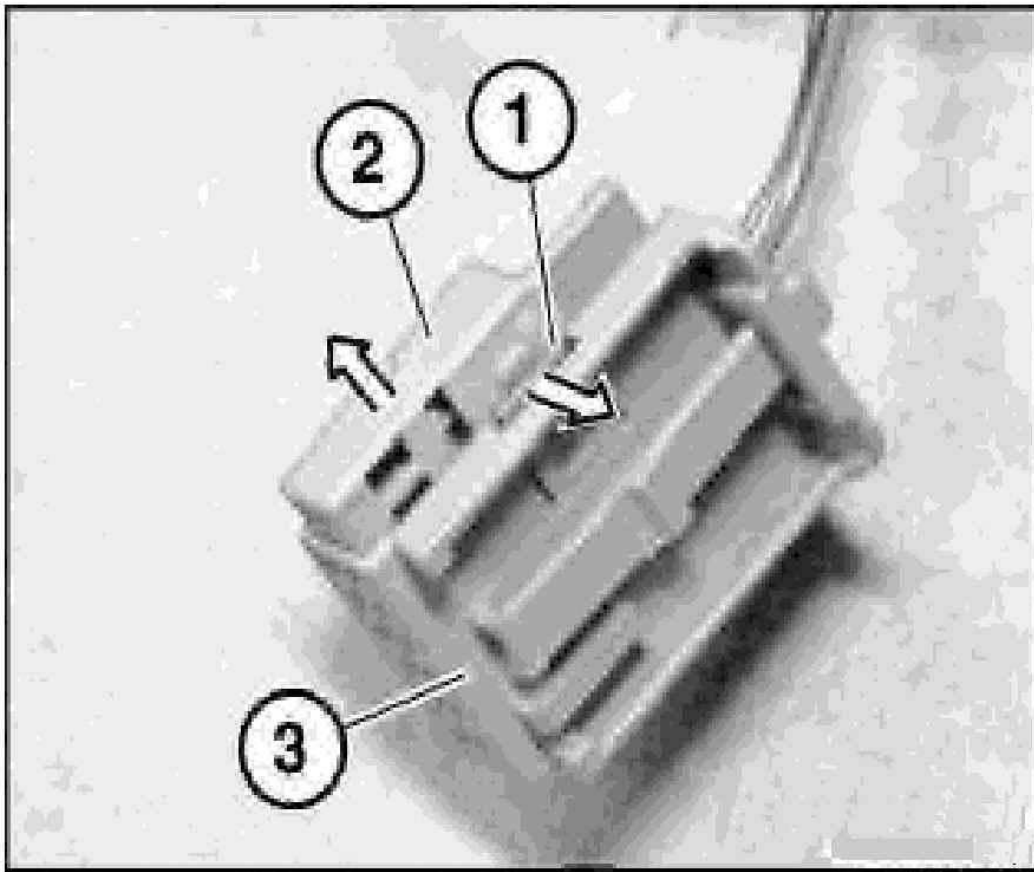
- Press lock (1) in direction of arrow and pull housing (2) out of radio plug (**Fig. 70**).
- Press lock (1) in direction of arrow. Pull contact carrier (2) out of housing (**Fig. 71**).

NOTE: When the contact carrier is pulled out, the secondary locks of the socket contacts are raised. Procedure for removing contacts are same as for other Elo/Elo-Power Systems, refer to the appropriate article.



G03389002

Fig. 70: Removing Housing From Radio Plug
Courtesy of BMW OF NORTH AMERICA, INC.

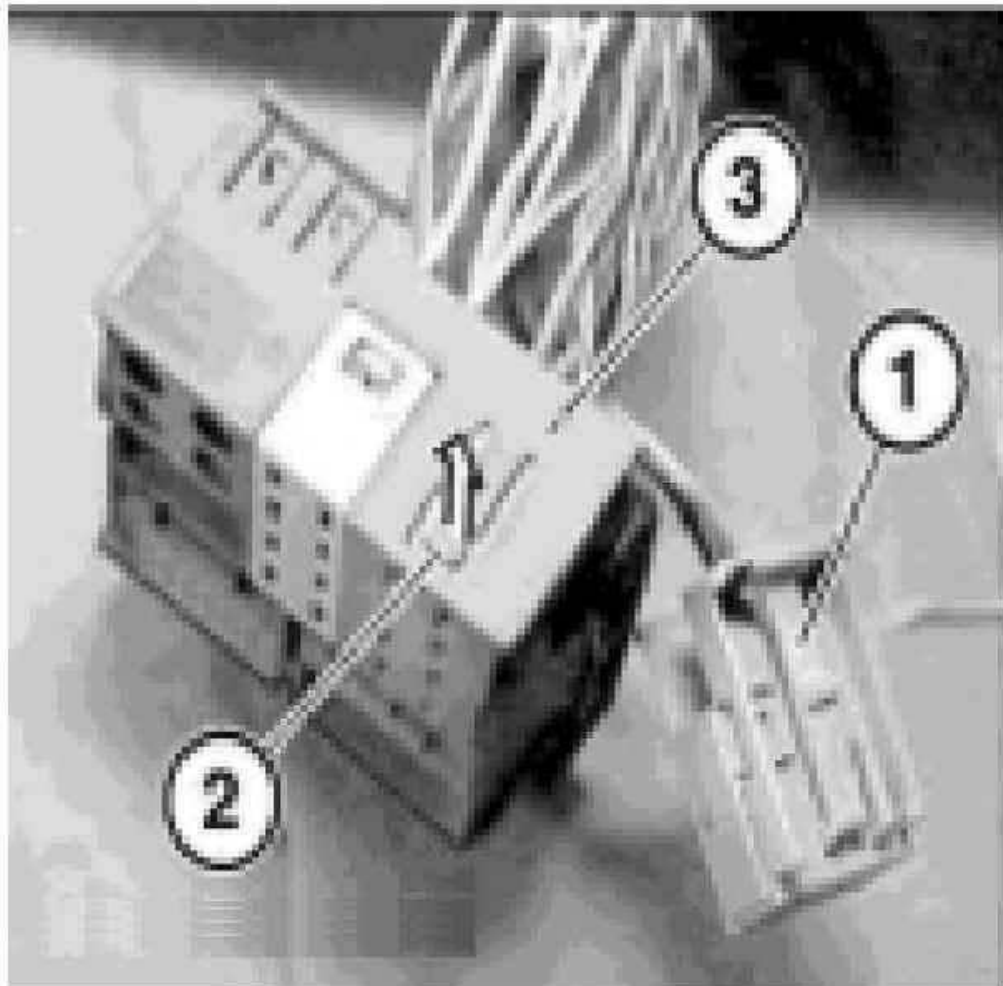


G03389003

Fig. 71: Removing Contact Carrier Out Of Housing
Courtesy of BMW OF NORTH AMERICA, INC.

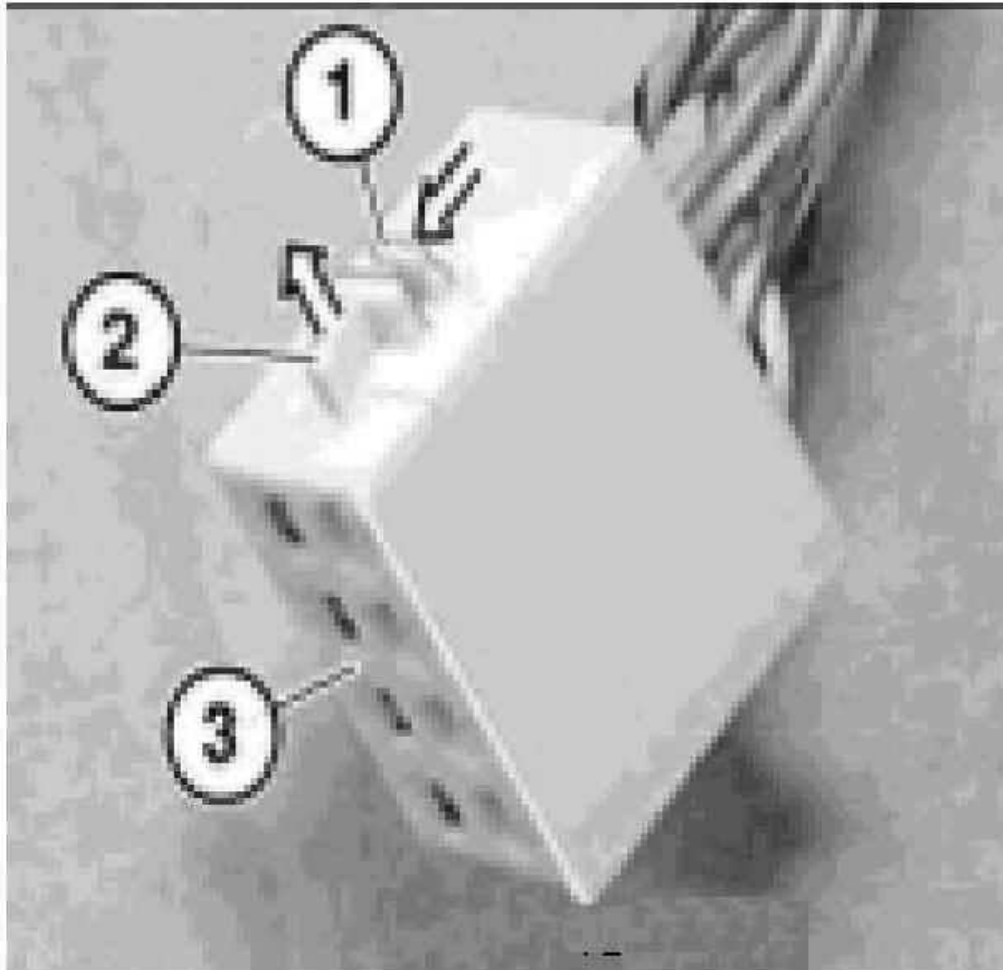
Removing MPQ contacts from contact carrier

- Remove contact carrier (1) with MQS contacts from radio plug. Raise lock (2) on radio plug. Pull contact carrier (3) out of radio plug (**Fig. 72**).
- Press lock (1) in direction of arrow. Pull secondary lock (2) in direction of arrow completely out of contact carrier (3) (**Fig. 73**).
- Press special tool 61 1 135 on inside of contact into contact carrier (2). Pull wire with socket contact (1) out of contact carrier (2) (**Fig. 74**).



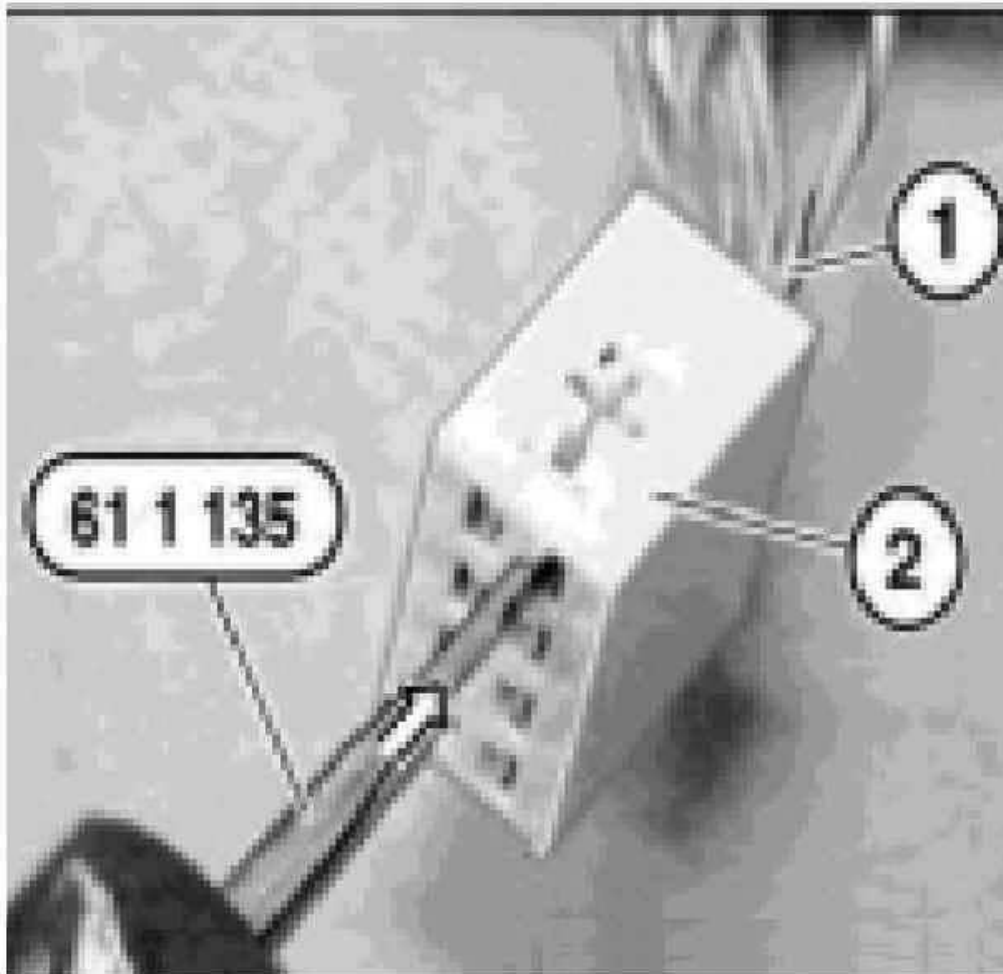
G03389004

Fig. 72: Removing MPQ Contacts From Contact Carrier
Courtesy of BMW OF NORTH AMERICA, INC.



G03389005

Fig. 73: Removing Secondary Lock From Contact Carrier
Courtesy of BMW OF NORTH AMERICA, INC.



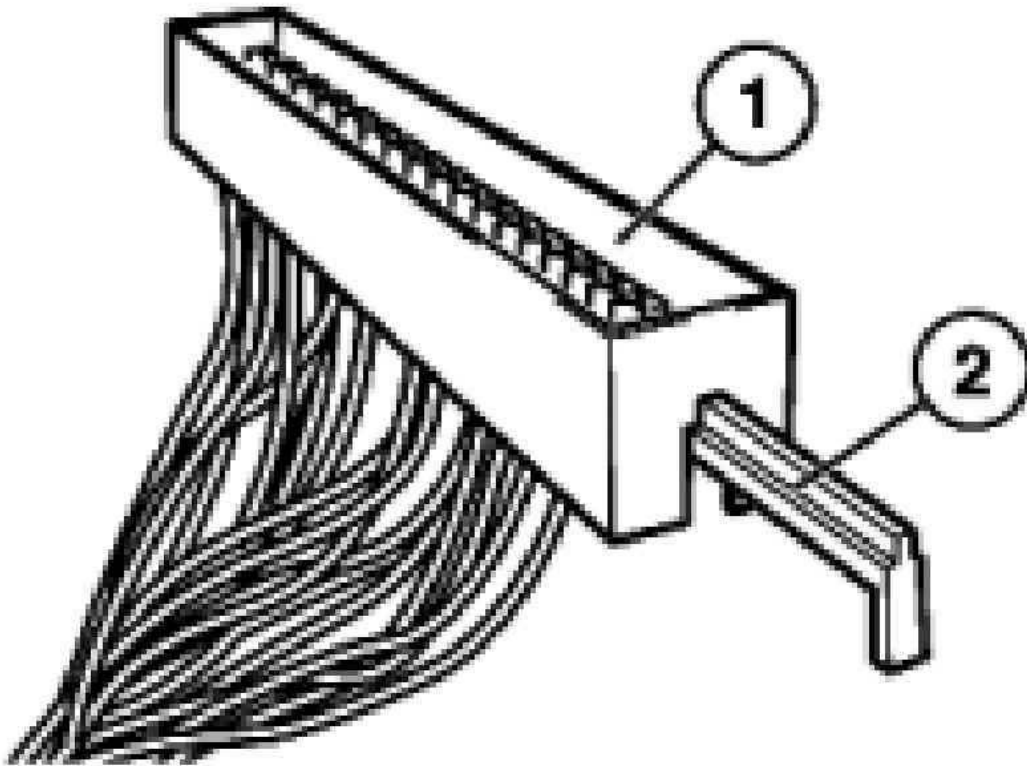
G03389006

Fig. 74: Removing Socket Contact From Contact Carrier
Courtesy of BMW OF NORTH AMERICA, INC.

MISCELLANEOUS CONNECTORS

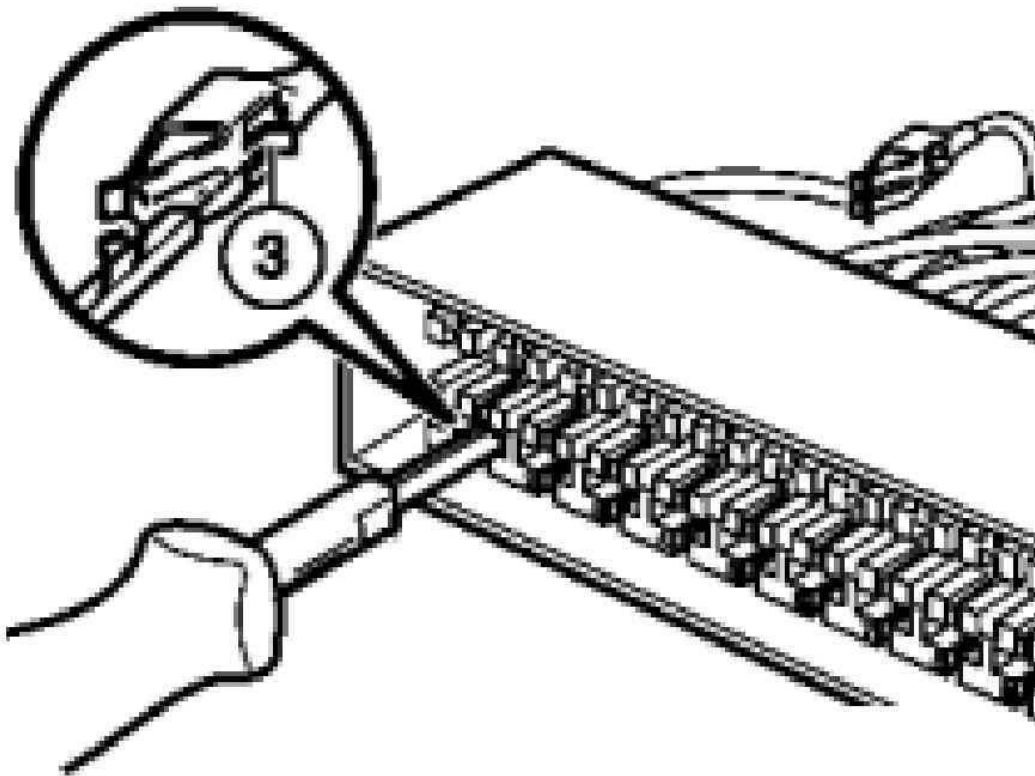
Fuse Strip

- Pull appropriate fuse from fuse strip (1). **Note: Mark fuse rating and position for reinstallation.**
- Pull locking slide (2) out of fuse strip until stop is felt.
- Using special tool **61 1 136** or **61 1 137** press the spring latch down (3) and pull the connector from the housing.



G03389007

Fig. 75: Removing Locking Slide From Fuse Strip
Courtesy of BMW OF NORTH AMERICA, INC.

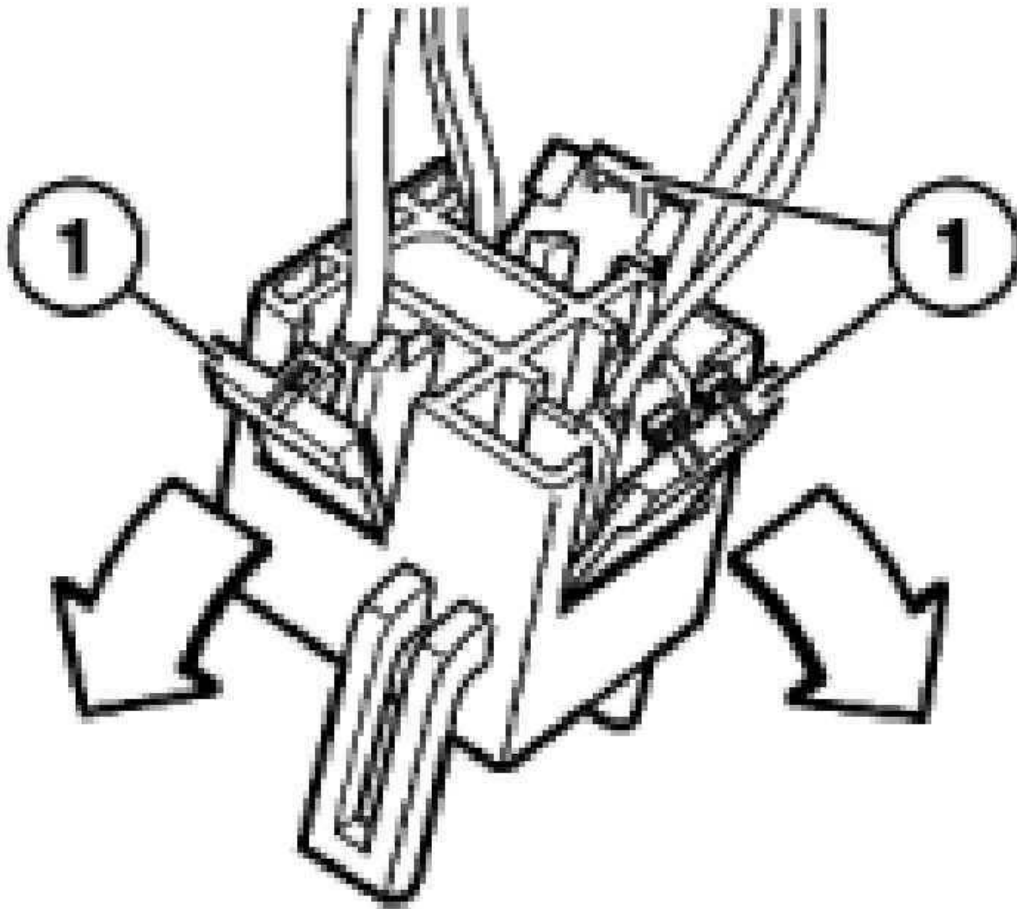


G03389008

Fig. 76: Removing Connector From Housing Using Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

ECM Main Relay Connector

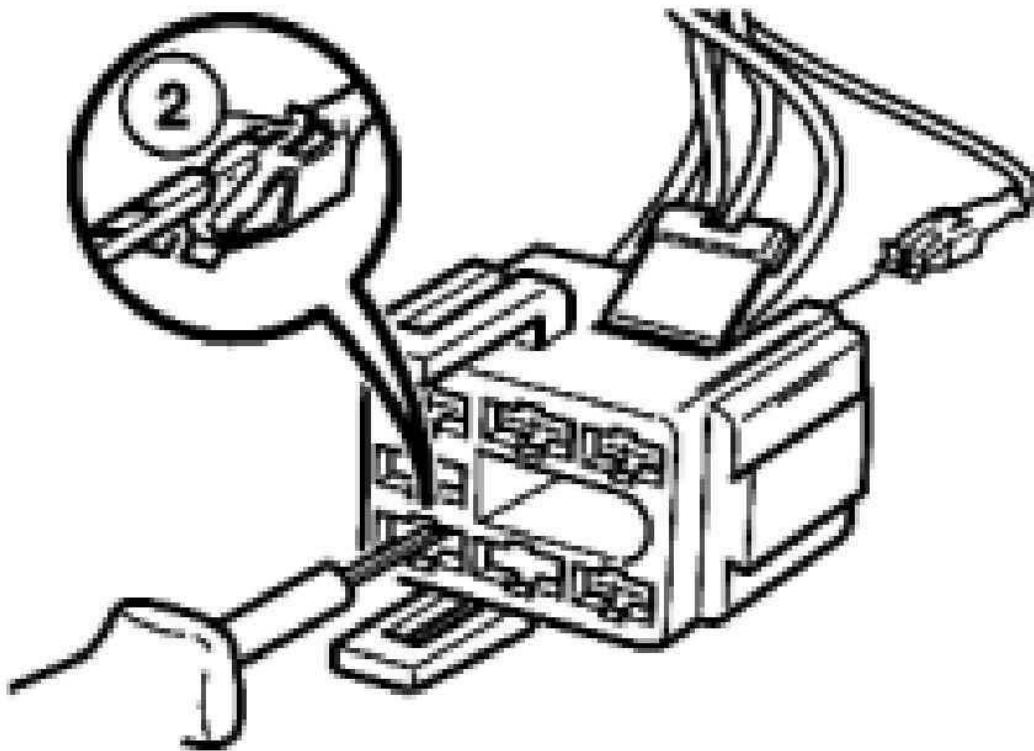
- Unlock wire flap (1) of connector being removed.
- Using special tool **61 1 136** or **61 1 137** press the spring latch down (2) and pull the connector from the housing.



G03389009

Fig. 77: Removing Wire Flap Of Connector

Courtesy of BMW OF NORTH AMERICA, INC.



G03389010

Fig. 78: Locating Spring Latch

Courtesy of BMW OF NORTH AMERICA, INC.

SOLDERLESS TERMINALS AND CONNECTORS

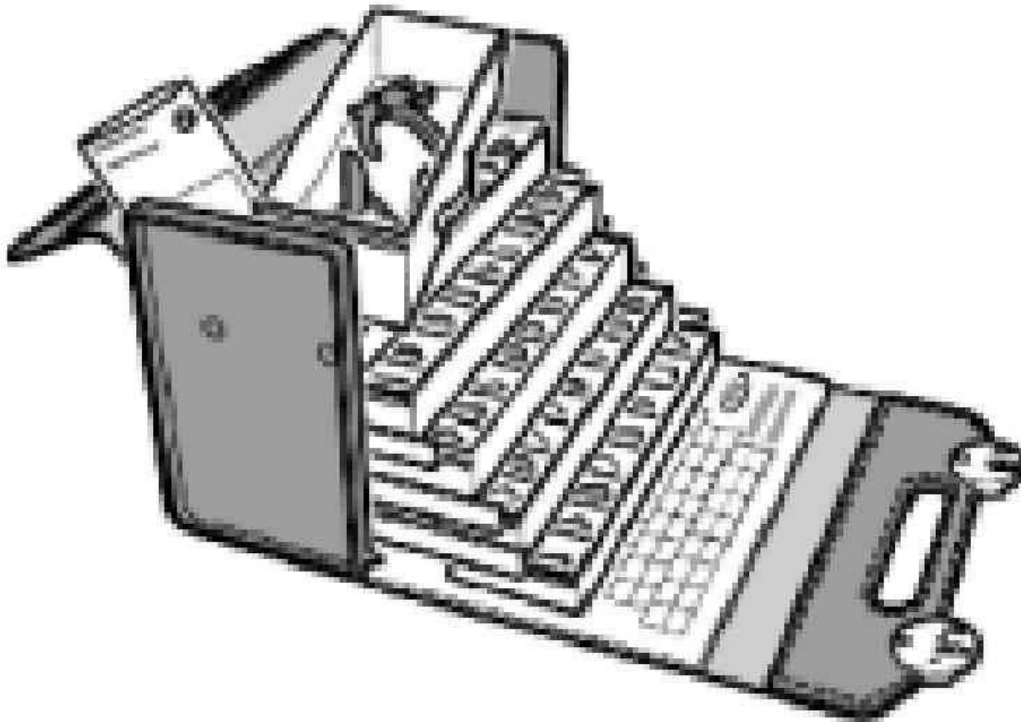
Mechanical strength of solderless terminal design and electrical conductivity must be maintained at all times. To ensure these characteristics are maintained in the vehicles electrical system several BMW repair kits are available.

The repair kits listed contain all the approved connectors, pins, and tools required for proper repair of BMW's electrical, electronics components.

- **Electrical Repair Kit IV**

P/N 90 88 6 619 020

The Electrical Repair Kit IV (Ref. SI. 04 18 92) is used in conjunction with the detailed repair procedures.



G03389011

Fig. 79: Identifying Electrical Repair Kit IV
Courtesy of BMW OF NORTH AMERICA, INC.

- Disassembling, replacing a plug connection on the various types of connectors.
- Cutting cable to length.
- Crimping stop parts (Contacts).
- Butt connectors for repairing a plug connection.

Operating instructions for special tools and the handling of individual parts in the repair kit are available under PN 61 9 029.

Three previous kits issued by BMW are:

- **Electrical Repair Kit I** (Black Case)

P/N 81 24 9 408 080

- **Electrical Repair Kit II** (Blue Case)

P/N 81 24 9 408 300

- **Electrical Repair Kit III** (Red Case)

P/N 82 11 9 408 400

Electrical repair kits I, II and III are primarily needed for repairing wiring harness and connectors of older vehicles (E30 and earlier).

Operating instructions for special tools in these kits are available under **PN 61 8 084**.



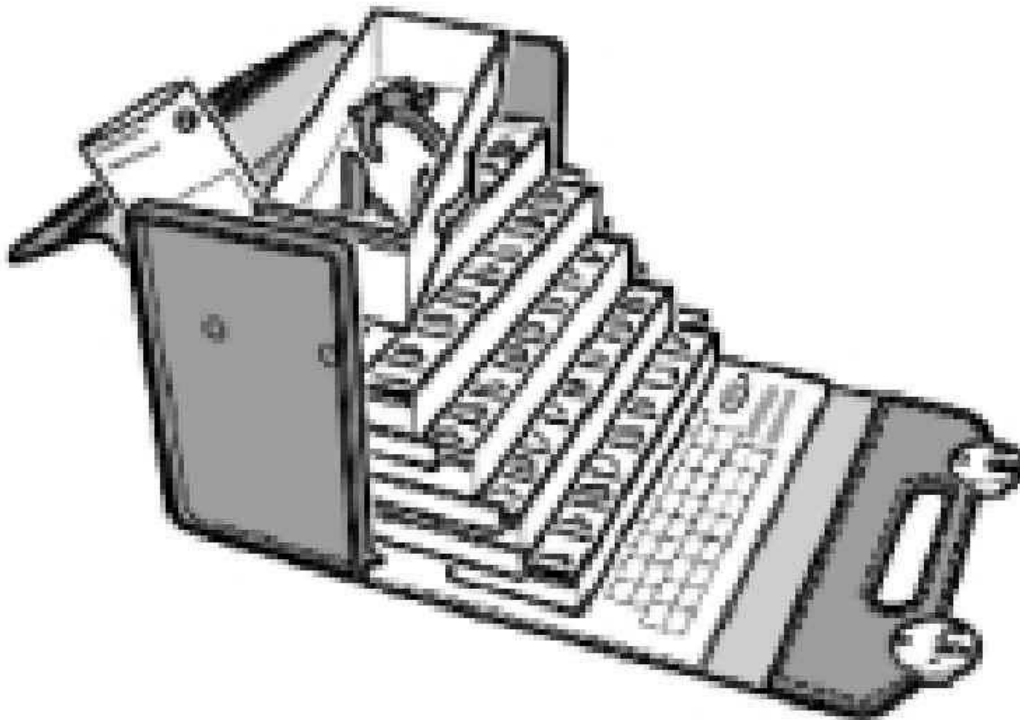
G03389012

Fig. 80: Identifying Electrical Repair Kits
Courtesy of BMW OF NORTH AMERICA, INC.

ELECTRICAL REPAIR KIT IV

The Electrical Repair Kits (I, II, III and IV) have gone through various upgrades.

Electrical Repair Kit IV (PN 90 88 619 020) has been developed to handle repairs of the specialized state of the art wiring and harnesses of the newest BMW products.



G03389013

Fig. 81: Identifying Electrical Repair Kit IV
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: The special tools contained in the Electrical Repair Kits I, II, III are not state of the art and are not suitable for specialized wiring harness repairs. Use exclusively Electrical Repair Kit IV for those repairs.

Electrical Repair Kit IV (61 9 020)

Contains the following:

61 9 041 Crimping Tool.

61 9 042 Matrix.

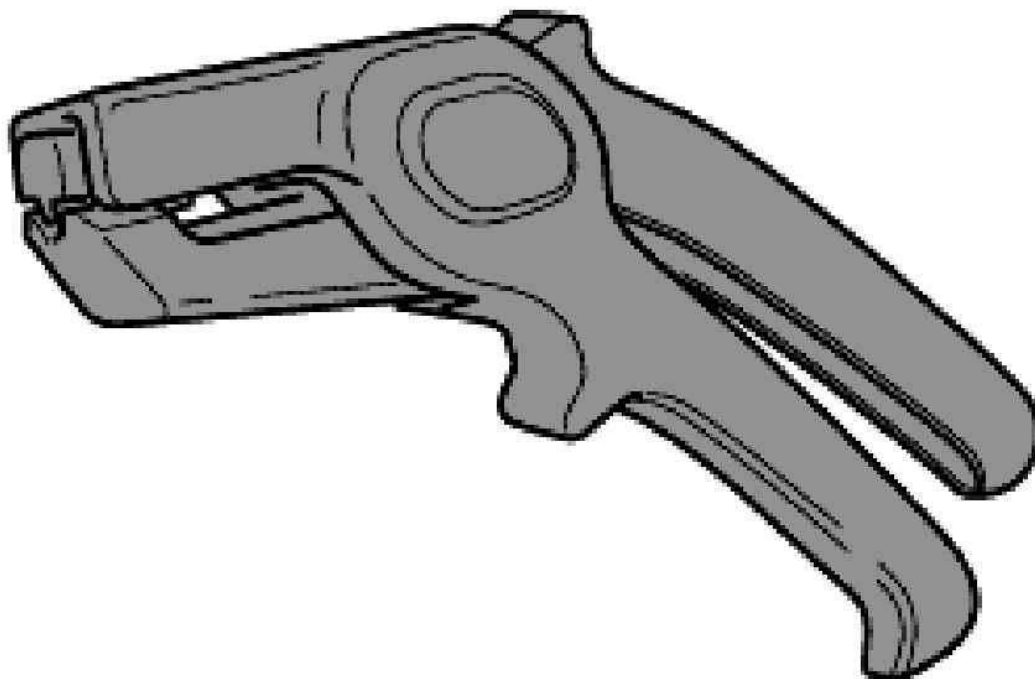
61 9 043 Cable Stripper.

61 9 044 Matrix.

Assorted Individual Parts.

Cable Stripper

Special Tool **61 9 043** Cable stripper with wire cutter for cutting and stripping insulation from cables.



G03389014

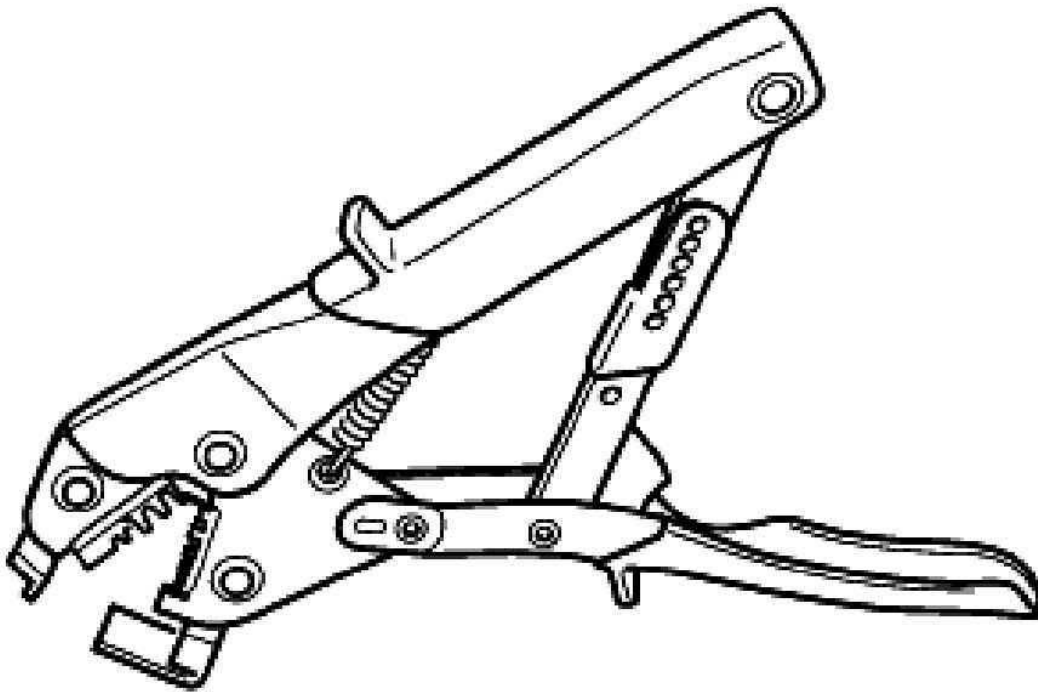
Fig. 82: Identifying Cable Stripper

Courtesy of BMW OF NORTH AMERICA, INC.

Crimping Tool

Special Tool **61 9 041** Crimping Tool with special tool **61 9 044** (matrix) for crimping cable guide and strain relief device on antenna elbow plug.

Supplementary kits for Electrical Repair Kit IV are released periodically.



G03389015

Fig. 83: Identifying Crimping Tool

Courtesy of BMW OF NORTH AMERICA, INC.

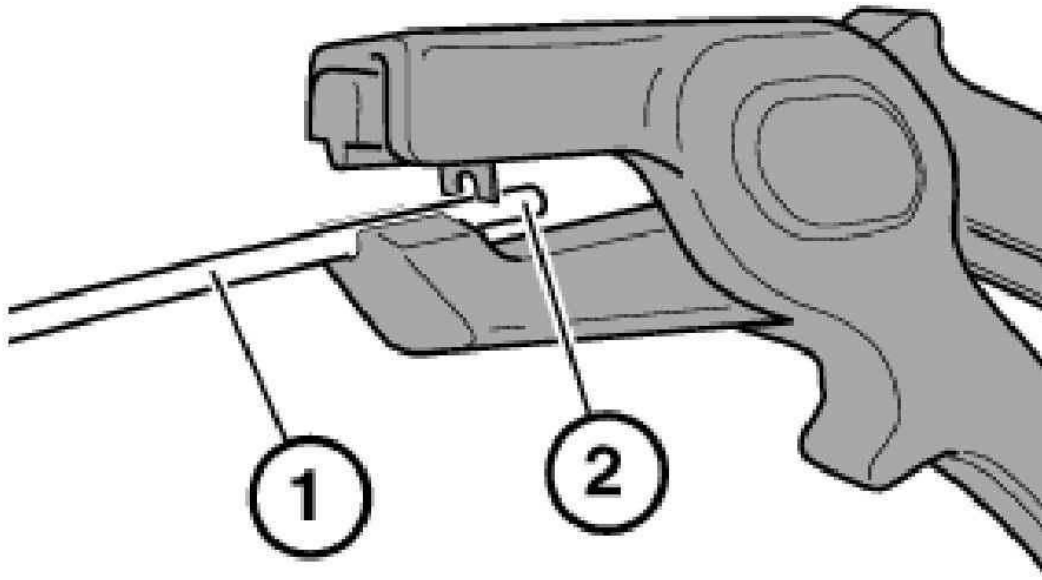
CABLE STRIPPING

Proper wire stripping and connector replacement is essential to ensure the integrity of the electrical connection. Always follow specific instructions in the Electrical Repair Kit IV instruction manual.

The length of wire to be stripped is determined by the wire gauge.

WIRE CROSS-SECTION SIZE SPECIFICATIONS

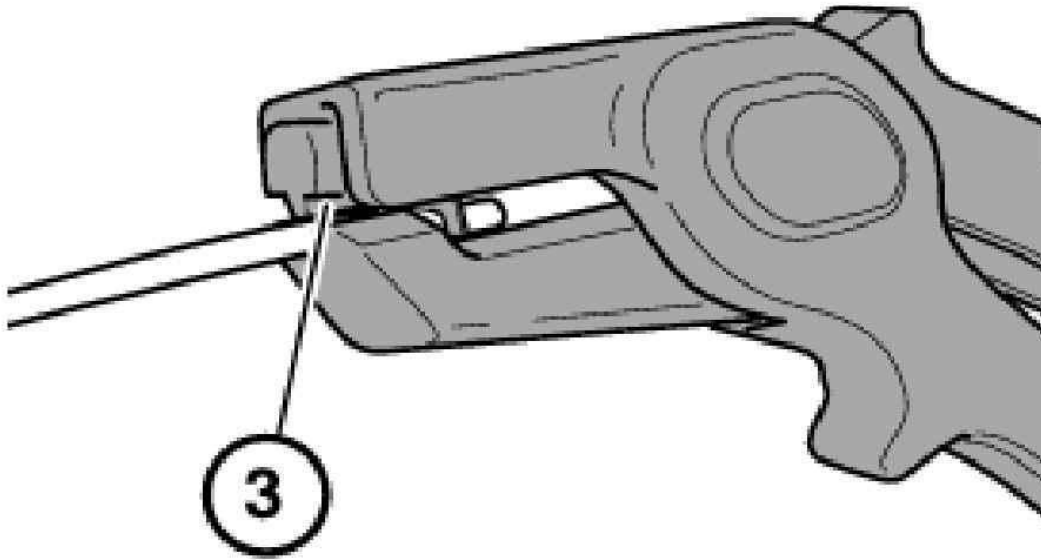
Wire cross-section size	stripped length:
mm ²	mm
0.35... 0.50	4.0
0.75... 1.00	4.5
1.00... 2.50	5.0



G03389016

Fig. 84: Inserting Wire Into Cable Stripping Tool
Courtesy of BMW OF NORTH AMERICA, INC.

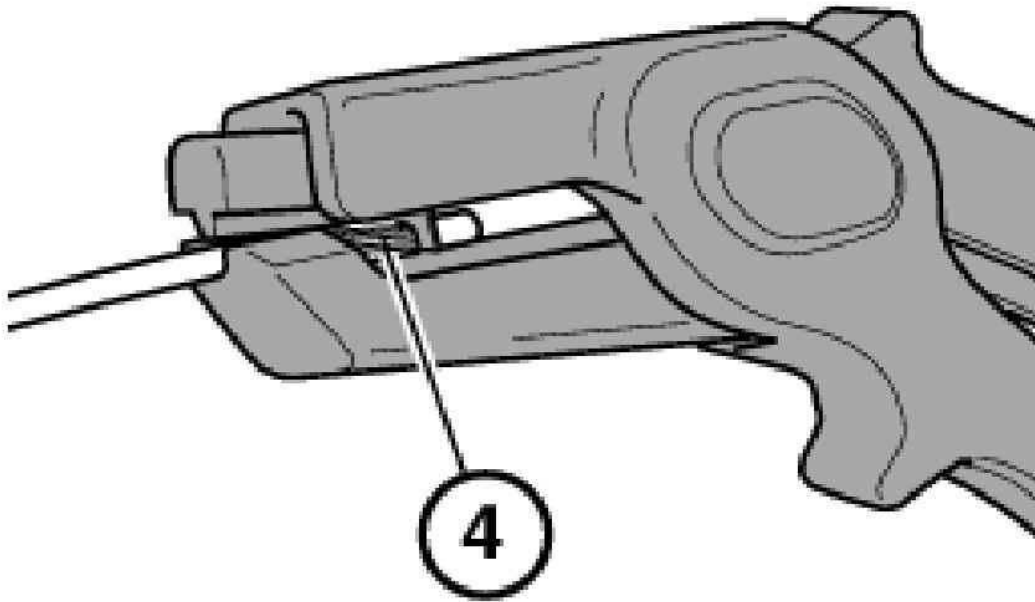
Proper use of the wire stripping tool will provide consistently positive results. Insert the wire (1) into the stripper. Stop the wire when the required strip length is past the cutter (2). Squeeze the handle of the tool.



G03389017

Fig. 85: View Of Wire In Stripper
Courtesy of BMW OF NORTH AMERICA, INC.

When the top jaw of the tool touches the wire (3) the mechanism shifts the clamping action to a pulling action which strips the wire of the insulation (4).



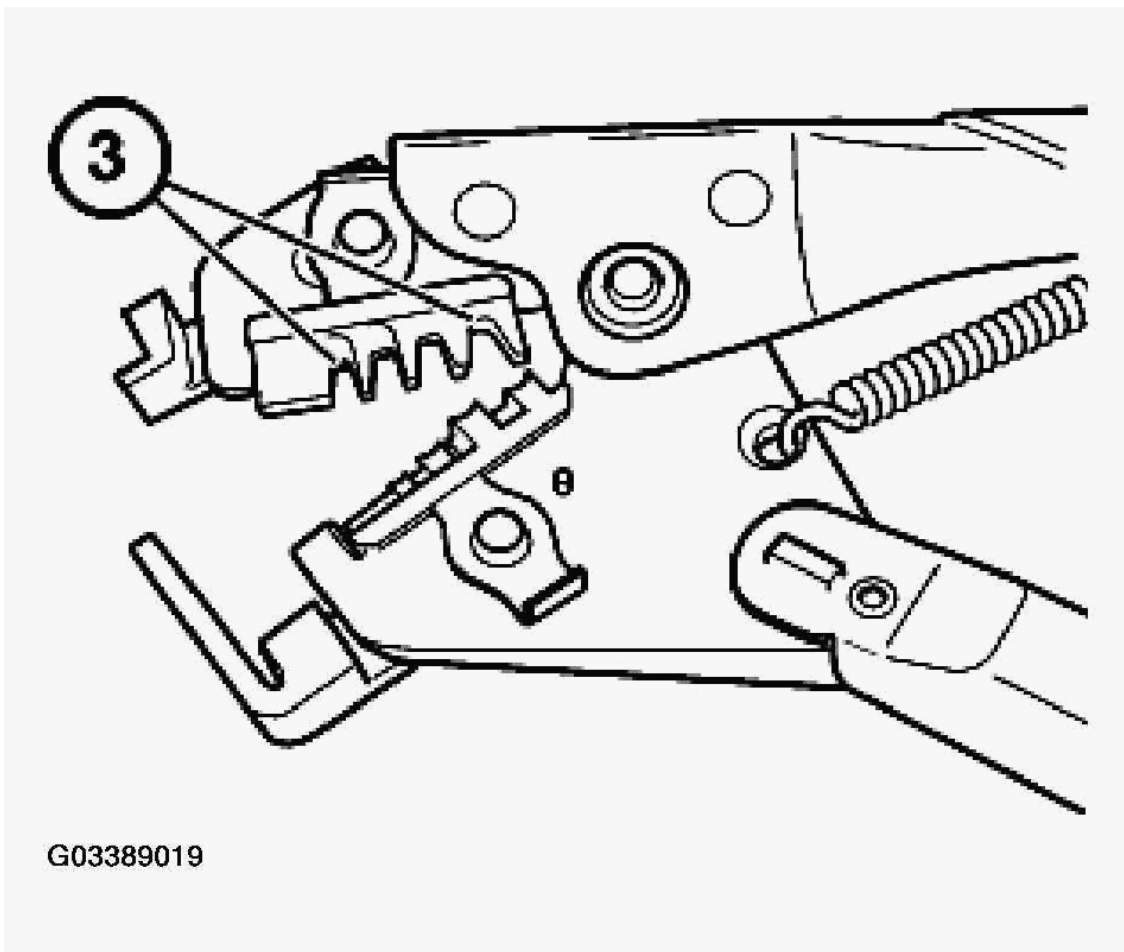
G03389018

Fig. 86: Removing Insulation Using Stripper
Courtesy of BMW OF NORTH AMERICA, INC.

CRIMPING

Use the wire crimper from the BMW Electrical Repair Kit. This crimper is designed for the specific connectors found in BMW automobiles. Proper use of the tools will provide consistent good quality connector crimps.

The crimper is designed to apply just the right amount of pressure based on the wire gauge and connector size.



G03389019

Fig. 87: Identifying Removable Crimper Jaws
Courtesy of BMW OF NORTH AMERICA, INC.

The tool has removable crimper jaws (3). This feature allows for an unlimited number of connector types for future compatibility. The article refers to the different sized crimping slots as "Nests". The gauge of the wire being crimped determines which "Nest" is used.

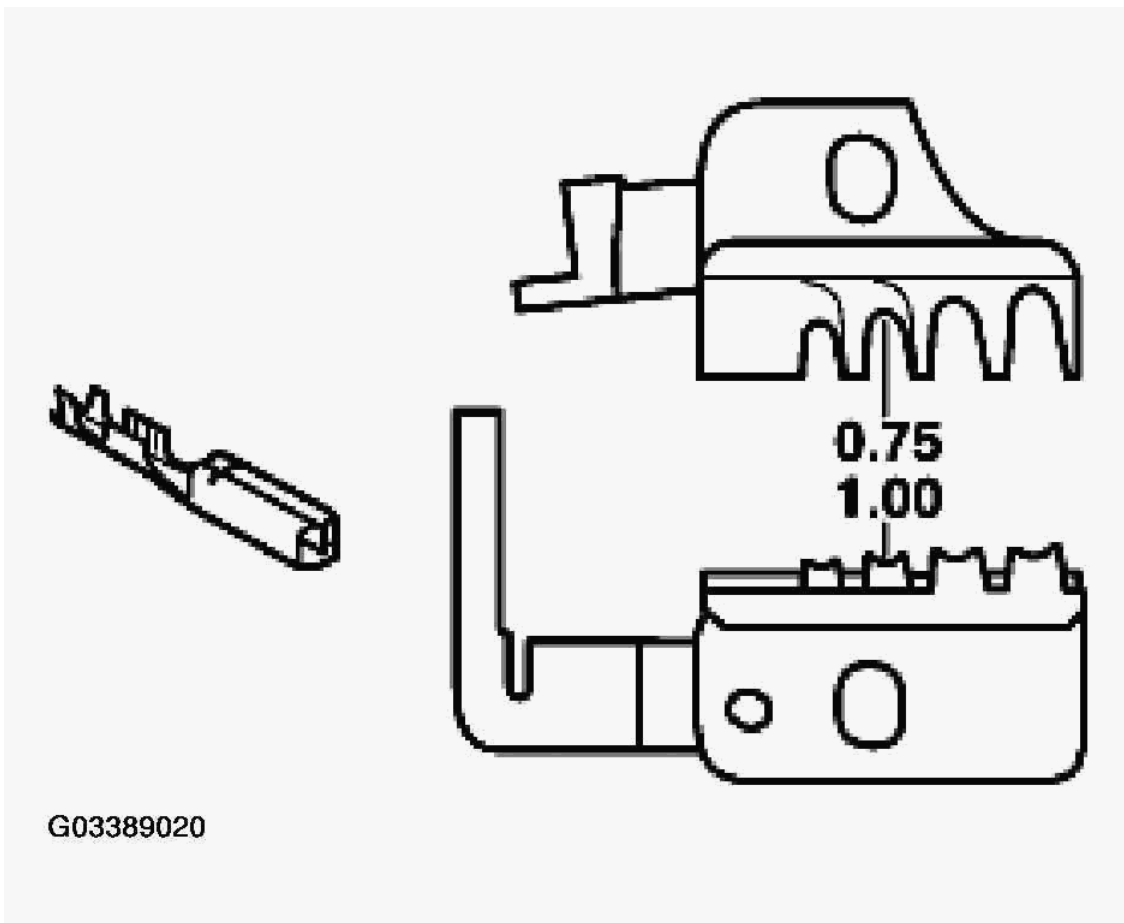


Fig. 88: Identifying Crimper Jaw Dimensions
 Courtesy of BMW OF NORTH AMERICA, INC.

WIRE CROSS-SECTION SIZE SPECIFICATIONS

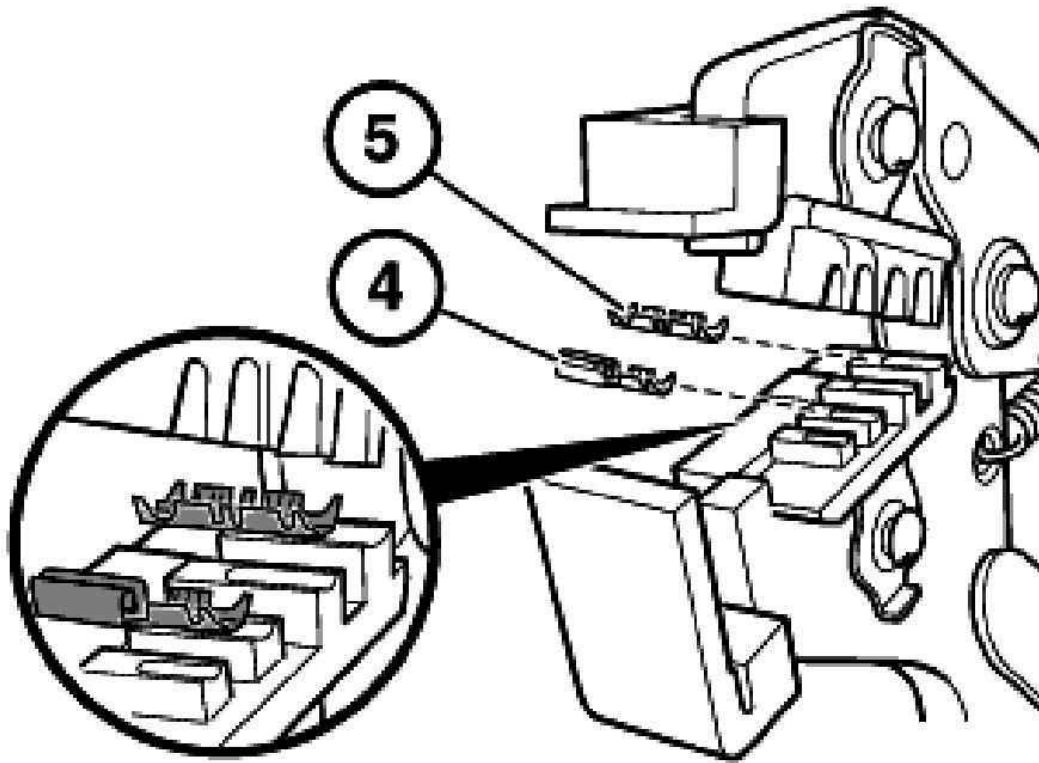
Nest	Wire Cross-section size
1	0.035....0.50mm ²
2	0.75.....1.0mm ²
3	1.5mm ²
4	2.5mm ²

Example:

A. 75 - 1.0mm gauge wire requires nest 2 for proper crimping.

Throughout the Electrical Repair Kit instruction manual are illustrations of various connectors being crimped. The highlighted box of the 16 box grid in these illustrations refers to the storage compartment in the electrical kit drawers in which that specific connector can be found.

Insert the "crimping end" of the connector into the appropriate "nest". Illustration provides example of comb replacement connector (4) and inline splice connector (5).



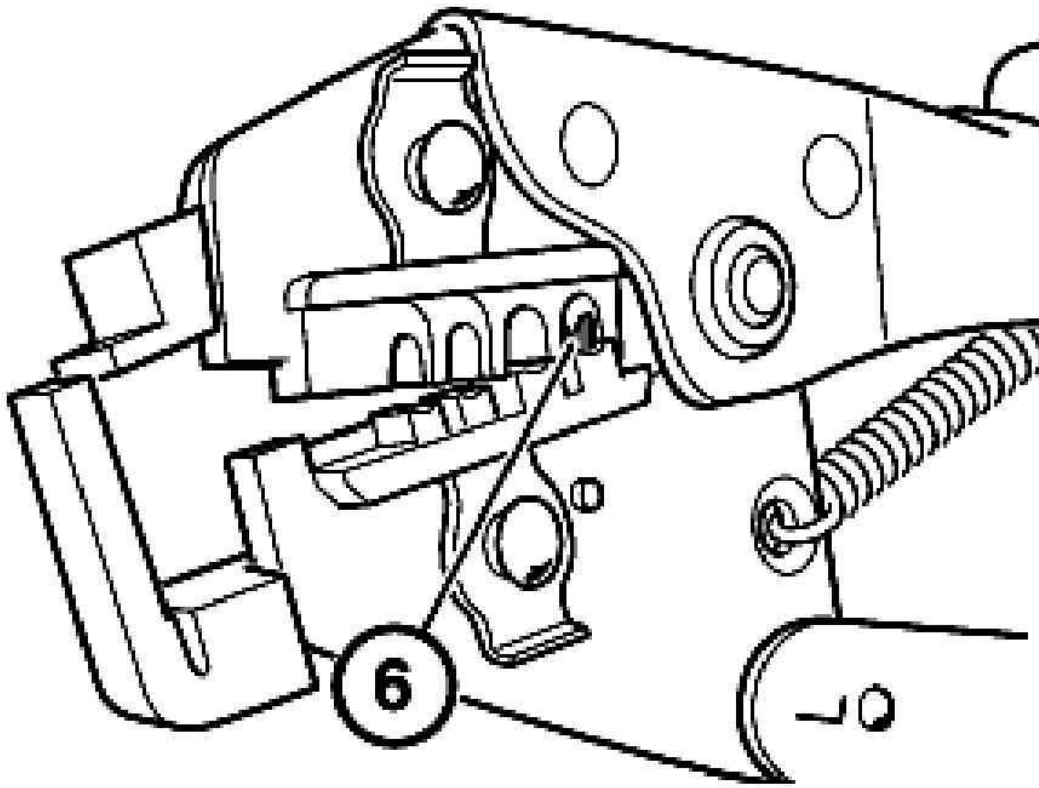
G03389021

Fig. 89: Identifying Comb Replacement Connector
Courtesy of BMW OF NORTH AMERICA, INC.

Squeeze the tool handle slightly to set the tool in the first ratchet latch position. This will hold the connector in the tool without closing the crimp (6).

Insert the stripped wire into the receiving end of the crimper tool making sure the wire is inserted far enough to ensure that only the wire insulation will be inside the insulation support barrel (7).

Properly crimped connectors exhibit the following characteristics:

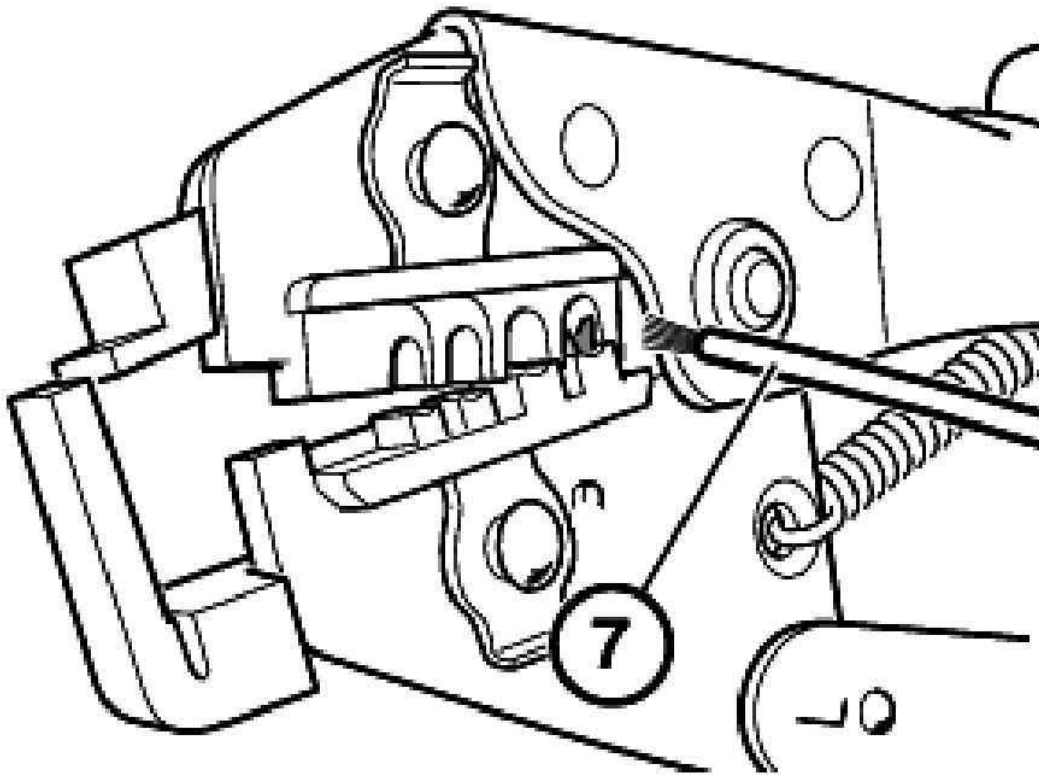


G03389022

Fig. 90: View Of Connector In Tool

Courtesy of BMW OF NORTH AMERICA, INC.

- The insulation support barrel will be crimped consistently and snug against the insulation. The insulation will not be crushed (8).
- A bellmouth crimp will be visible at the wire end of the of the wire barrel (9).
- Wire strands will be visible at the contact end of the wire barrel (10).
- Insulation end will be visible in this area (11) (**Fig. 92**).

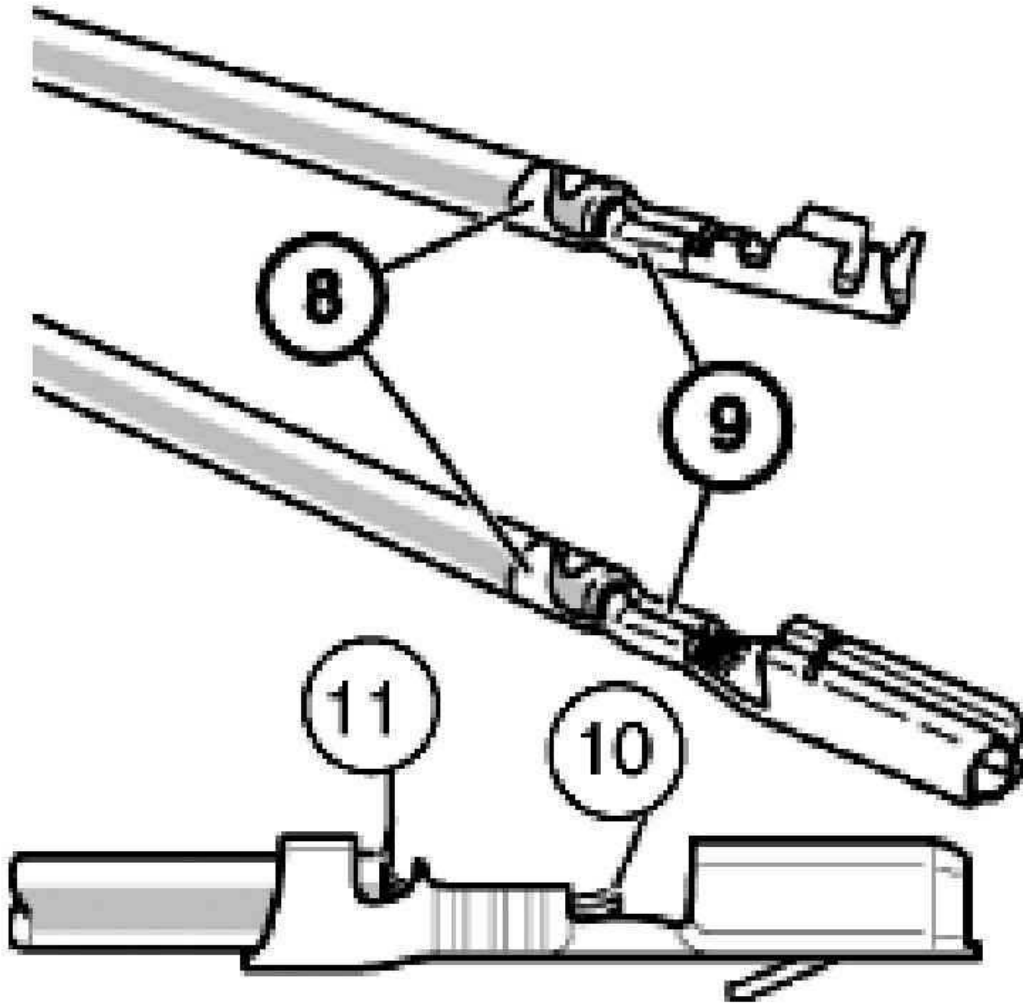


G03389023

Fig. 91: View Of Wire Insulation In Support Barrel
Courtesy of BMW OF NORTH AMERICA, INC.

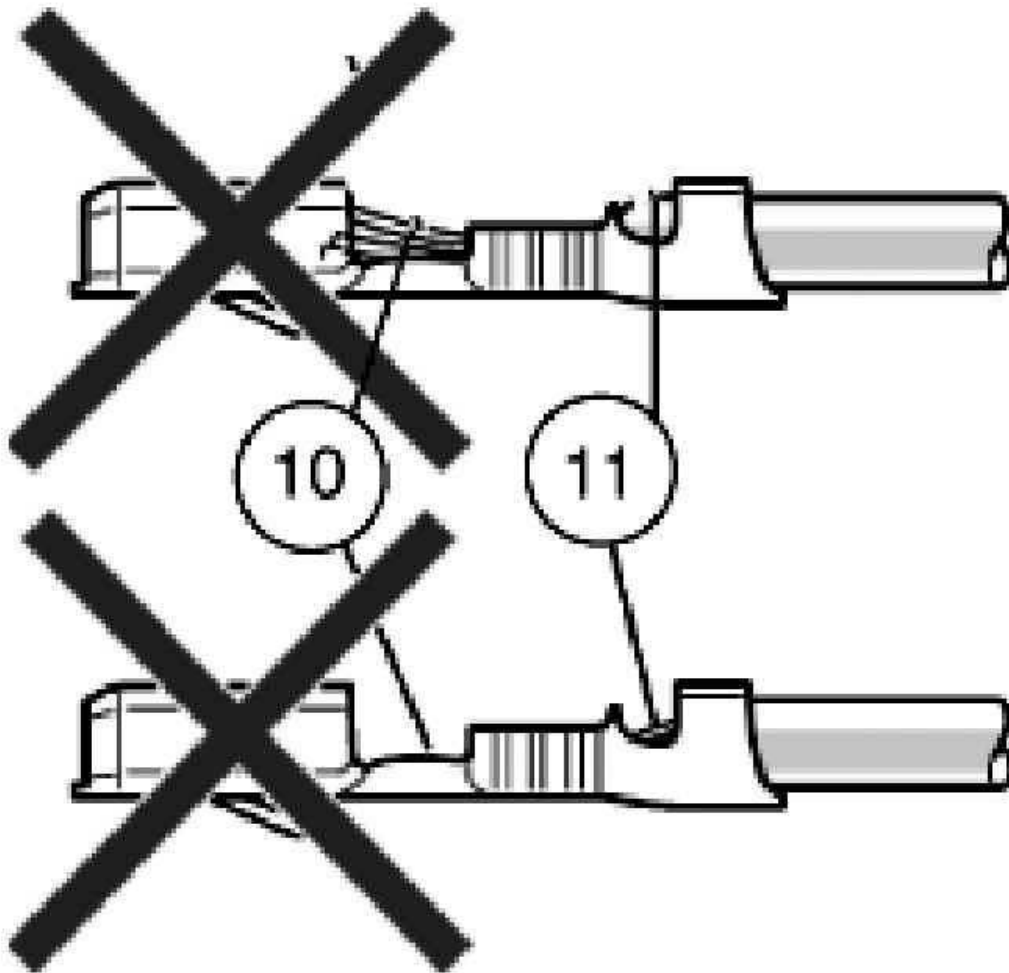
The following are examples of unacceptable crimps: **(Fig. 93)**

- Excessive or no wire strands at the contact end of the wire barrel (10).
- Excessive or no insulation end in the acceptable area (11).



G03389024

Fig. 92: Identifying Properly Crimped Connector
Courtesy of BMW OF NORTH AMERICA, INC.



G03389025

Fig. 93: Identifying Unacceptable Crimps
Courtesy of BMW OF NORTH AMERICA, INC.

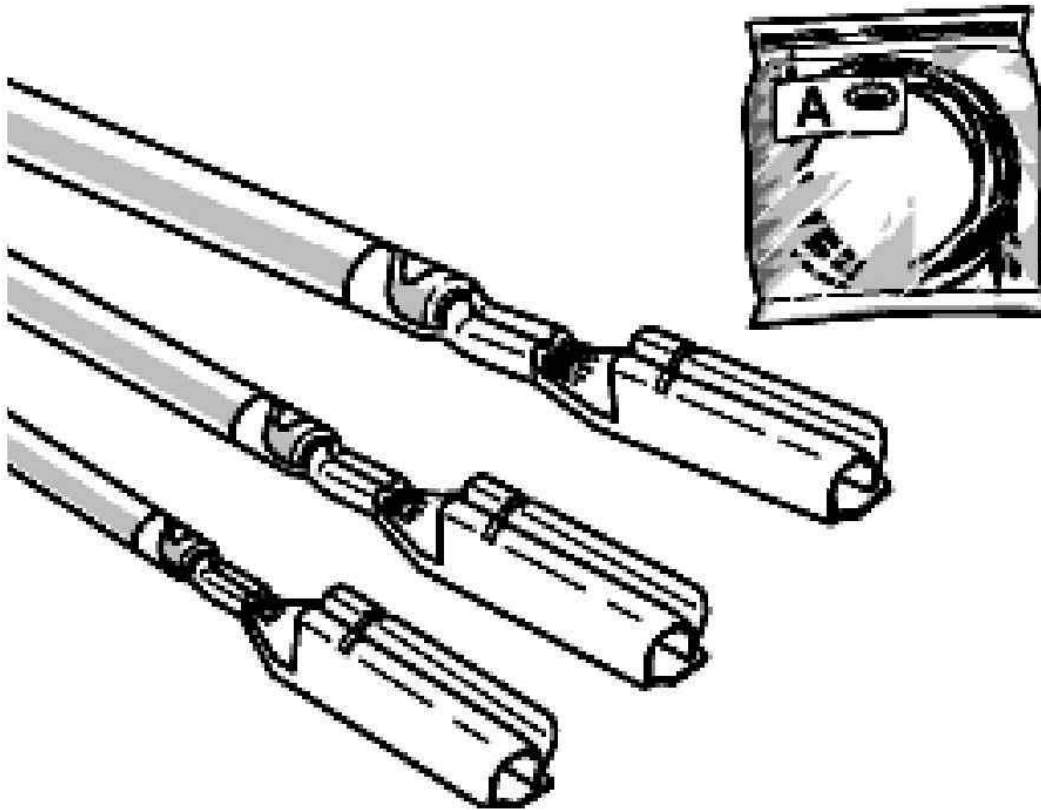
PREPACKAGED WIRING REPAIR SETS

Included with the Electrical Repair Kit IV are a variety of wiring repair sets. These sets contain various pre-crimped wiring connectors on assorted gauge wire lengths for simple splice connection repair into a wiring harness.

The repair kits also contain:

1. Various gauge lengths of wire with precrimped connectors.

2. In-line splice connectors.
3. Heat shrink tubing.

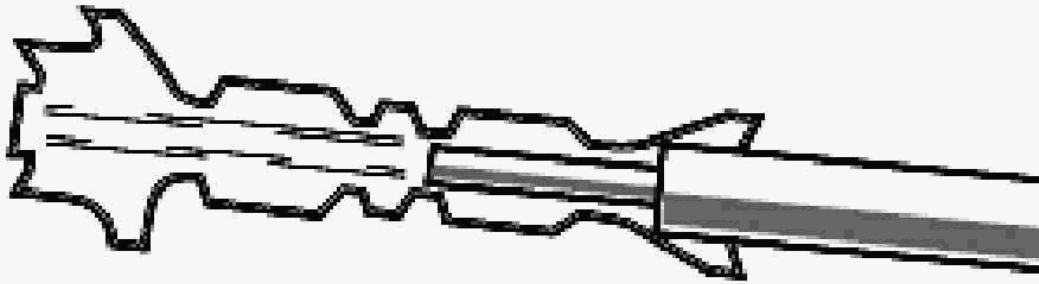


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Fig. 94: Identifying Prepackaged Wiring Repair Sets
Courtesy of BMW OF NORTH AMERICA, INC.

When used correctly the in-line splice connectors provide a BMW factory approved wire crimp. Use the correct size nest in the crimper tool and connect one side of the in-line crimp with the wire.

Slide a piece of heat shrink tubing on the wire and crimp the other side of the in-line connector.



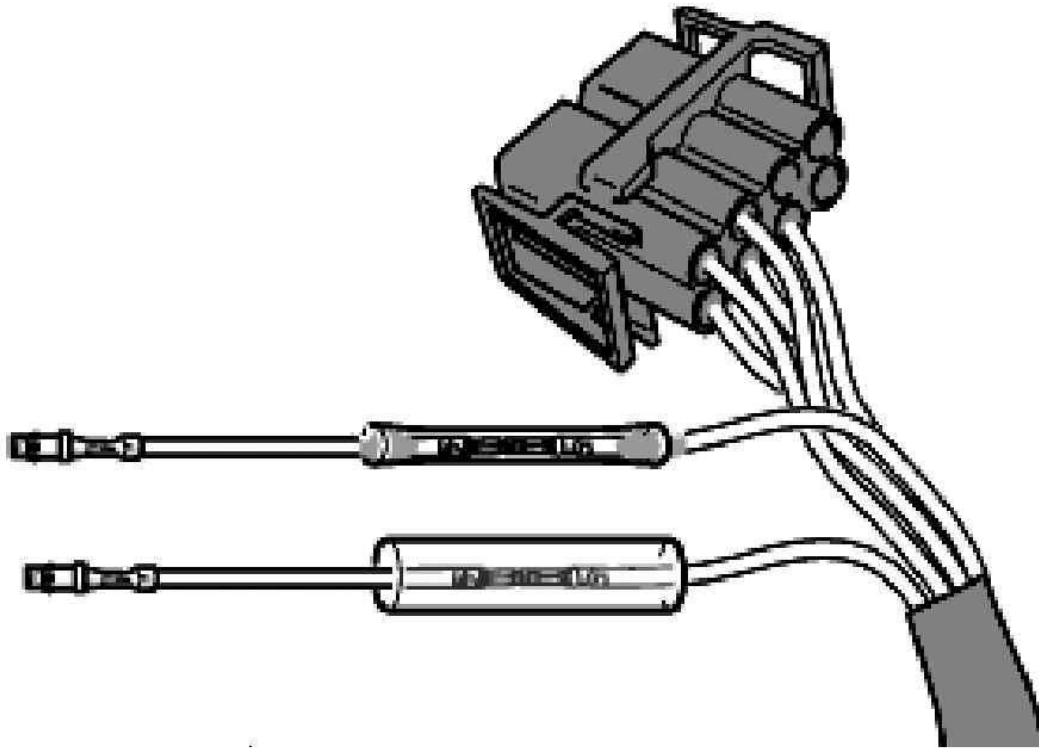
G03389027

Fig. 95: Using Correct Size Crimper Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Use a heat gun to shrink the tube around the splice connector to provide a moisture resistant seal.

Part numbers for the wire sets or any component of all four electrical repair kits can be reordered from:

- The P/N reference card inside each repair kit.
- Special tools microfiche.
- The Electrical Repair Kit 1-4 component catalog (**SD 92-036**).



G03389028

Fig. 96: Identifying Electrical Connectors
Courtesy of BMW OF NORTH AMERICA, INC.

As new connectors are developed for new vehicles, the repair kits will be added to appropriate articles.

Soldering Connections

In the event that a wiring connection must be soldered in a vehicle's electrical system, there are certain procedures which must be followed. Improper soldering will result in poor electrical connections or damage to electrical components.

SAFETY: Adhere to the following basic guidelines when preparing to solder.

- **Safety glasses must be worn.**
- **Disconnect vehicle battery.**
- **Cover vehicle trim surfaces.**
- **Exercise your common sense.**
- **Provide adequate ventilation, it's the best safety precaution!**

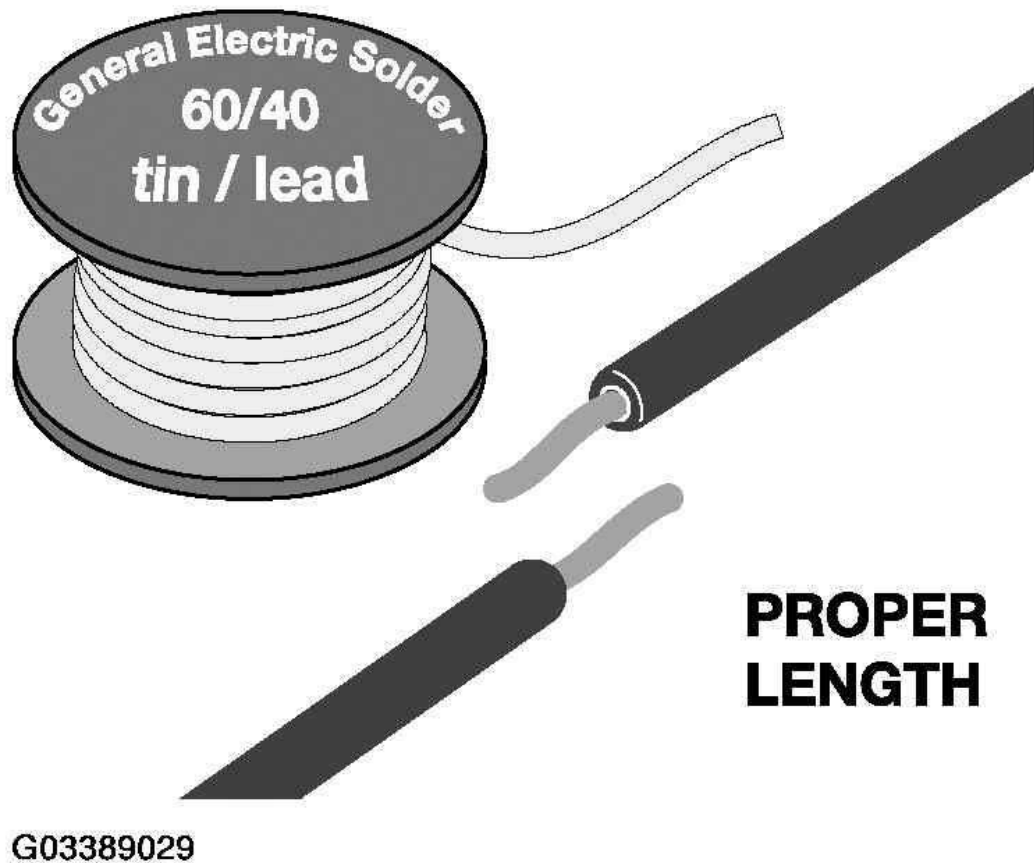


Fig. 97: Identifying Correct Amount Of Wire For Soldering
Courtesy of BMW OF NORTH AMERICA, INC.

Soldering Preparation and Procedure

- The wire insulation must be stripped to expose an adequate amount of bare wire (not too little-not too much.)
- The wires and or connectors must be **clean** and free of grease, dirt, wax, etc.
- A thin coating of **rosin core flux** must be applied to the soldering connection.
- Have enough **60/40 (tin/lead)** general electrical **solder** on hand prior to starting.
- If heat transfer to a heat sensitive component is possible use "**heat sinks**".
- Use a soldering gun tip that is the right size for the job. Do not use an overly large tip which could melt wire insulation and block your view of what is being soldered.
- The soldering tip must be "**tinned**". This means to keep a thin layer of solder on the tip at all times during soldering. This will transfer the heat quickly and allow the solder to flow easily into the joint being soldered.

- Preheat the wires or connector. Introduce the solder into the joint not the soldering tip.
- When the solder starts to flow allow it to infiltrate the joint only for a moment. Almost simultaneously, pull the tip off of the joint to prevent overheating.
- A properly soldered joint will be smooth, shinny, and even surfaced.

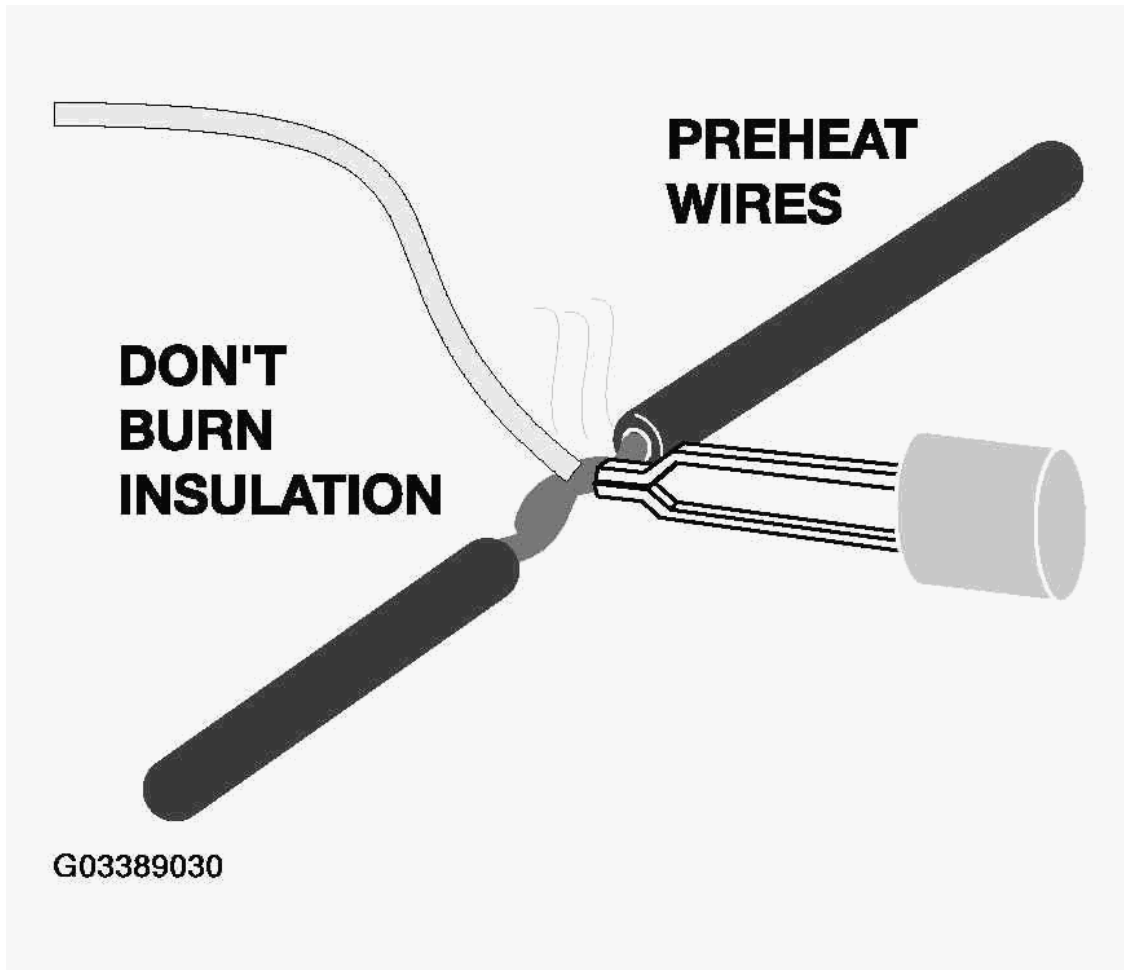


Fig. 98: Identifying Soldering Procedure
 Courtesy of BMW OF NORTH AMERICA, INC.

BREAKOUT BOXES AND "V" CABLES

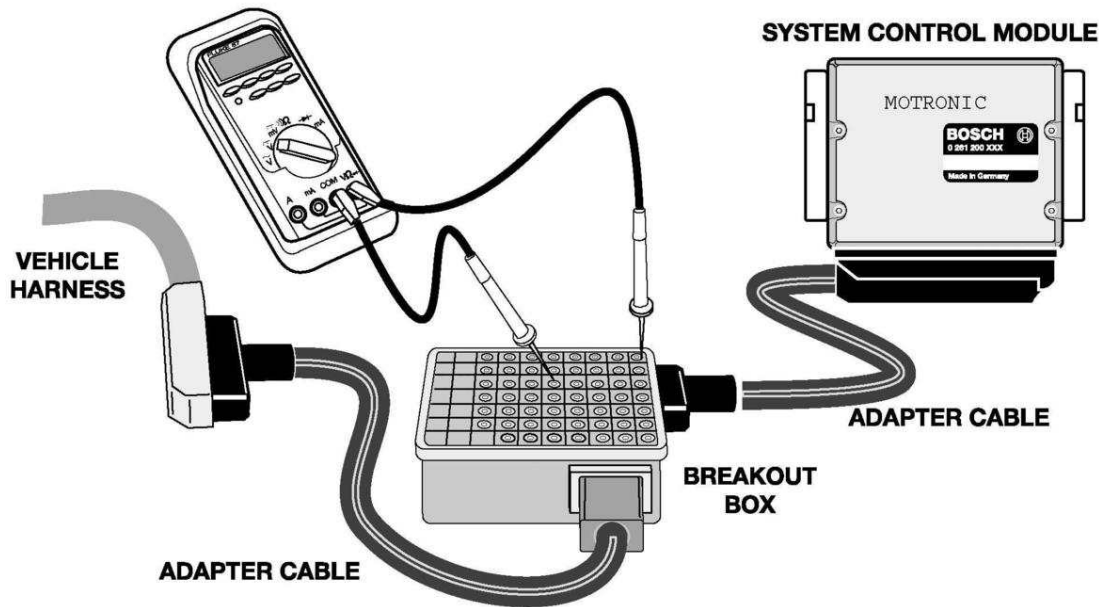
Breakout Boxes are used to:

- Provide a convenient "tap" into an electrical circuit.
- Minimize the possibility of damage to control unit connections and wire harnesses during diagnosis of electrical/electronic systems.
- Ensure solid meter connections for proper diagnosis, this in turn will help the technician to be more organized and efficient.
- Provide easier access to circuits for testing with equipment such as, multimeter, DISplus tester or other diagnostic tools.

CAUTION: Breakout box cable connections are universal in order to fit the varying coded connectors found in the vehicles. Always confirm that you are connecting the correct control module into the system harness that is on the other side of the breakout box. System damage will occur if it is not the correct system.

Example: DME and EGS/AGS control modules both utilize an 88 or 134 pin control module. These control modules reside in the same E-Box on most vehicles. The control modules are coded to prevent unintentional cross connecting at the vehicle harness. But, this connector coding is not present on the 88 or 134 pin breakout box(s). **Result:** A DME control module could be connected to a transmission control system. **Damage will result!**

Several different types of breakout boxes are available depending on the particular system being diagnosed.



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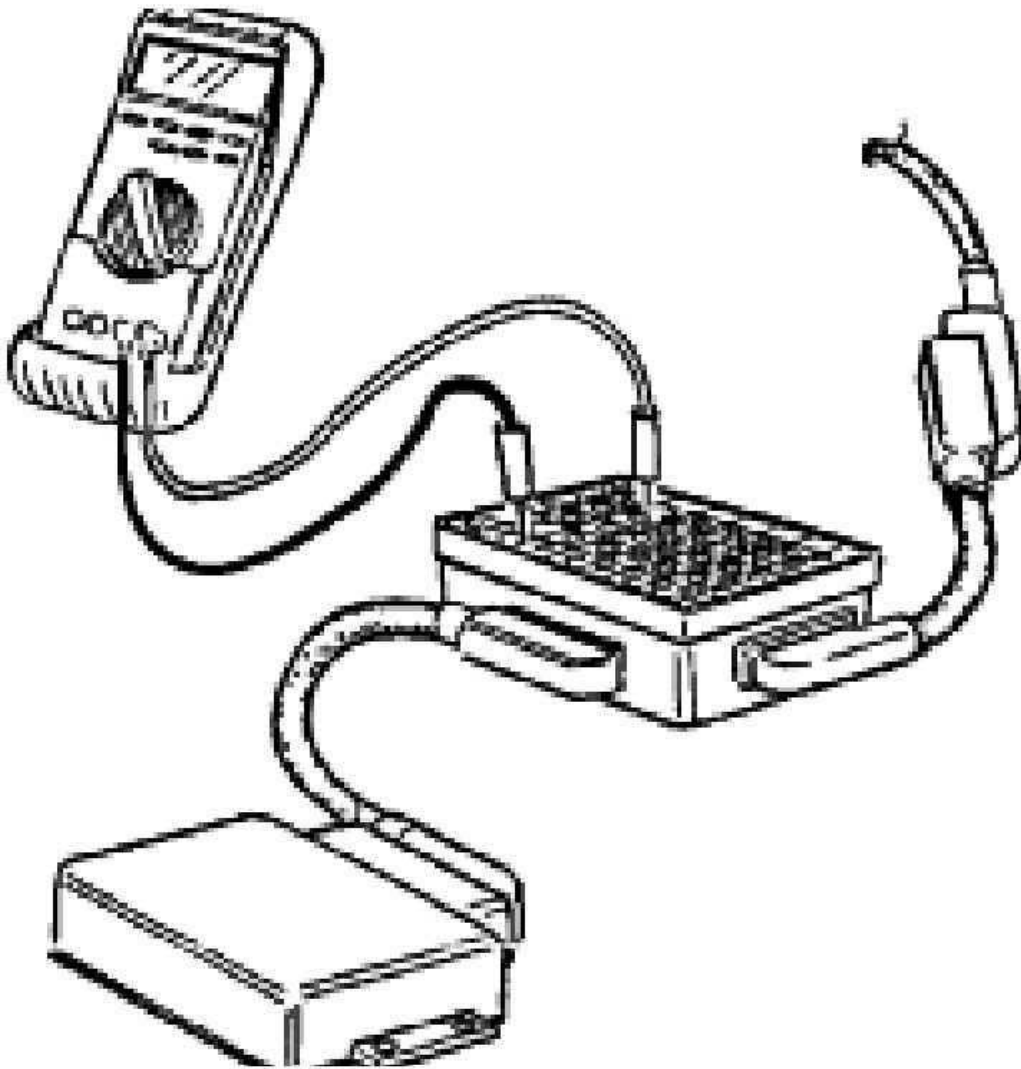
Fig. 99: View Of Breakout Box
Courtesy of BMW OF NORTH AMERICA, INC.

55 pin Breakout Box P/N 81 12 9 425 091

Used with control modules that have single multipin plugs from 25 to 55 pins.

- L-jetronic.
- ABS.
- Motronic.
- EGS.

Adapter cables are required.

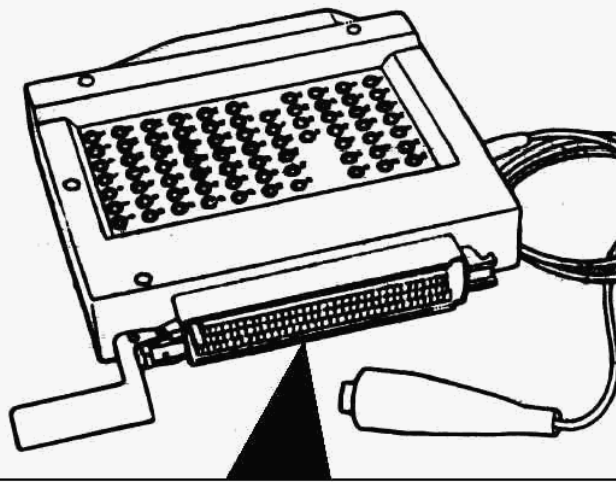


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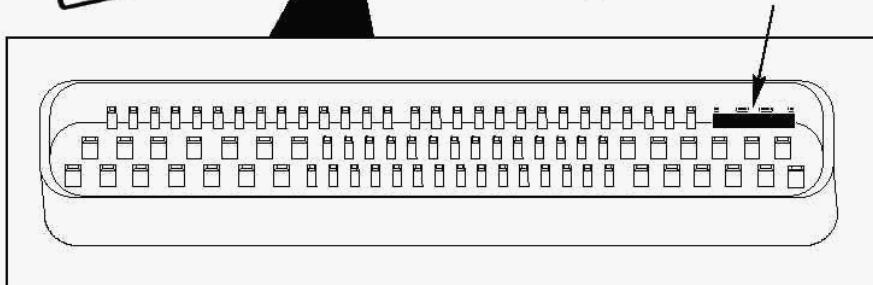
Fig. 100: Identifying 55 Pin Breakout Box P/N 81 12 9 425 091
Courtesy of BMW OF NORTH AMERICA, INC.

83 Pin Breakout Box (Red Face) P/N 90 88 6 614 420

When used with ABS/ASC 5 system, no adapter cables are required. There is an adapter harness for use with the Teves Mark IV G ABS system of the E36.



A PLASTIC KEY
IN THE CONNECTOR
OF THE BREAK OUT
BOX PREVENTS
CONTACTS IN THE
WIRING HARNESS
CONNECTOR FROM
TOUCHING. THIS KEEPS
THE ABS AND IF EQUIPPED
THE ASC INDICATORS
FROM BEING "ON" WHEN
DIAGNOSING



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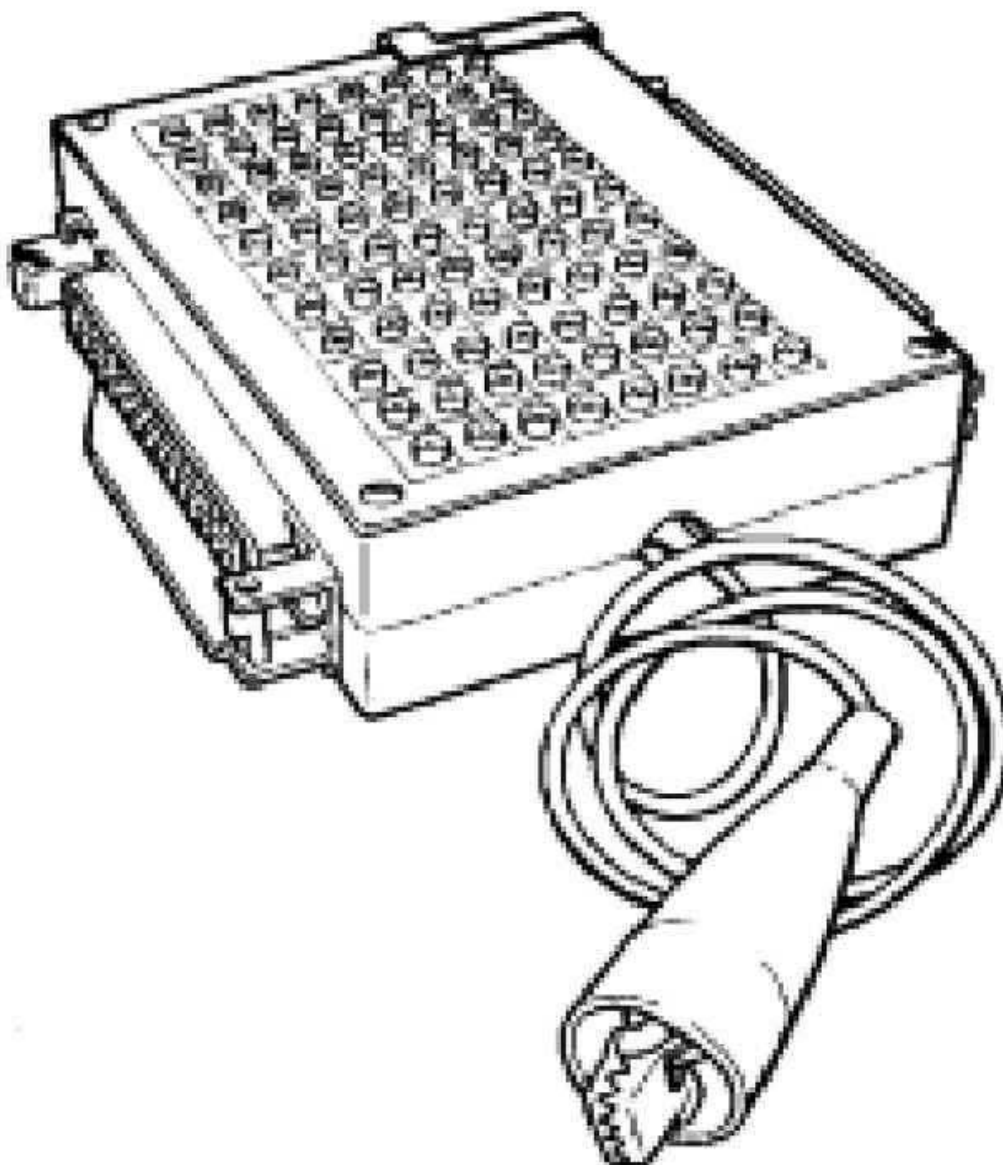
Fig. 101: View Of 83 Pin Breakout Box (Red Face) P/N 90 88 6 614 420
Courtesy of BMW OF NORTH AMERICA, INC.

88 Pin Breakout Box (Green Face) P/N 88 88 6 614 410

Used with control units that have up to 88 pins;

- DME.
- EGS/AGS.
- ZAE/MRS.
- LCM.

No adapter cables are required when connected to a DME or EGS/AGS control module. There are adapter harnesses for ZAE/MRS and LCM systems.



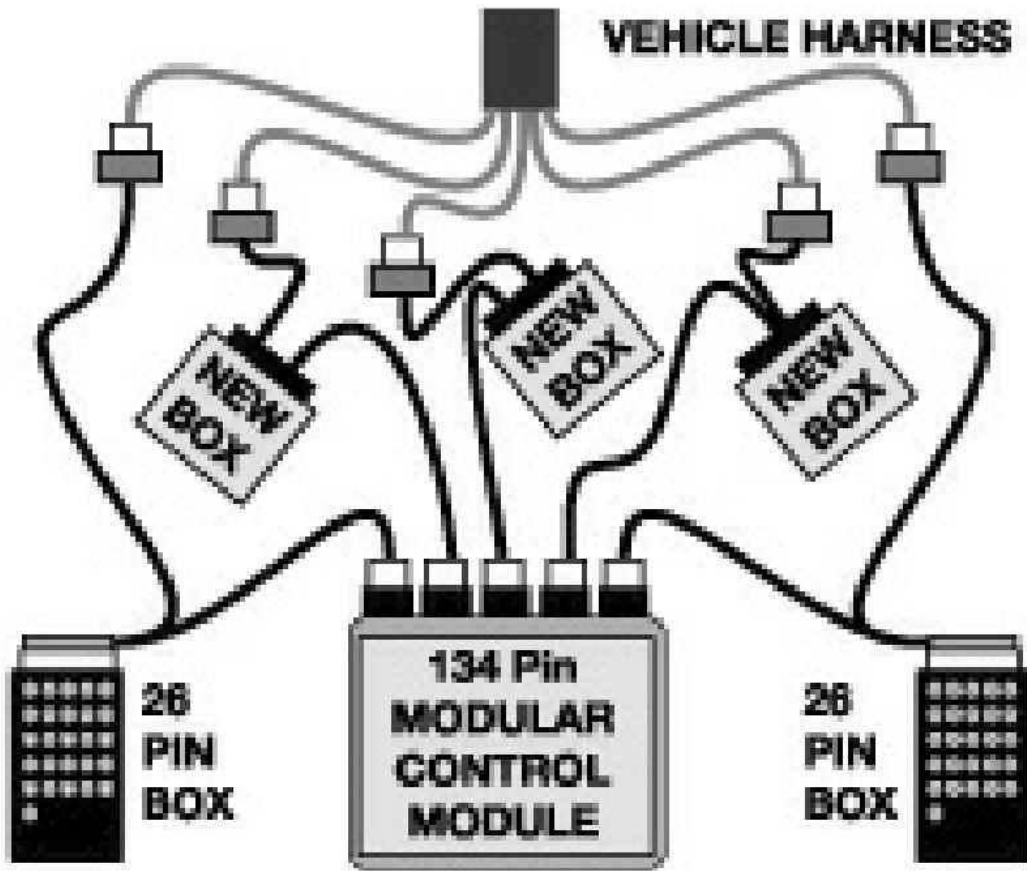
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Fig. 102: Identifying 88 Pin Breakout Box (Green Face) P/N 88 88 6 614 410
Courtesy of BMW OF NORTH AMERICA, INC.

134 Pin SKE Control Module Breakout Box Set P/N 90 88 6 121 300

The 134 pin modular connector DME and AGS control modules use a combination of breakout boxes for troubleshooting. The part number above provides three breakout boxes and five adapter harnesses. The two

outside edge connectors use the familiar 26 pin breakout boxes. The three inside connectors use the boxes from the ordered set.

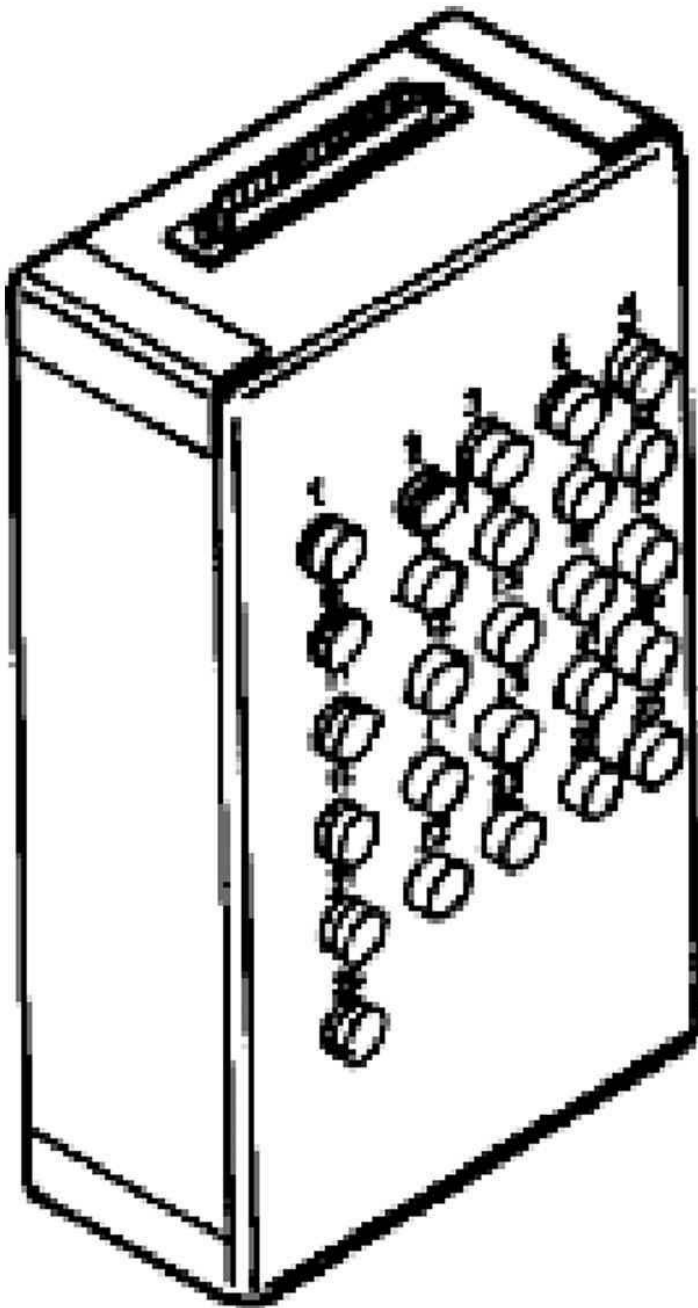


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Fig. 103: View Of 134 Pin SKE Control Module Breakout Box Set P/N 90 88 6 121 300
Courtesy of BMW OF NORTH AMERICA, INC.

26 Pin Breakout Box P/n 88 88 6 611 459

Used with system or peripheral control module that have up to 26 pins. This breakout box is used in conjunction with adapter cables called "V" Cables. There are many different types of "V" cables for the various connectors found on the vehicles.

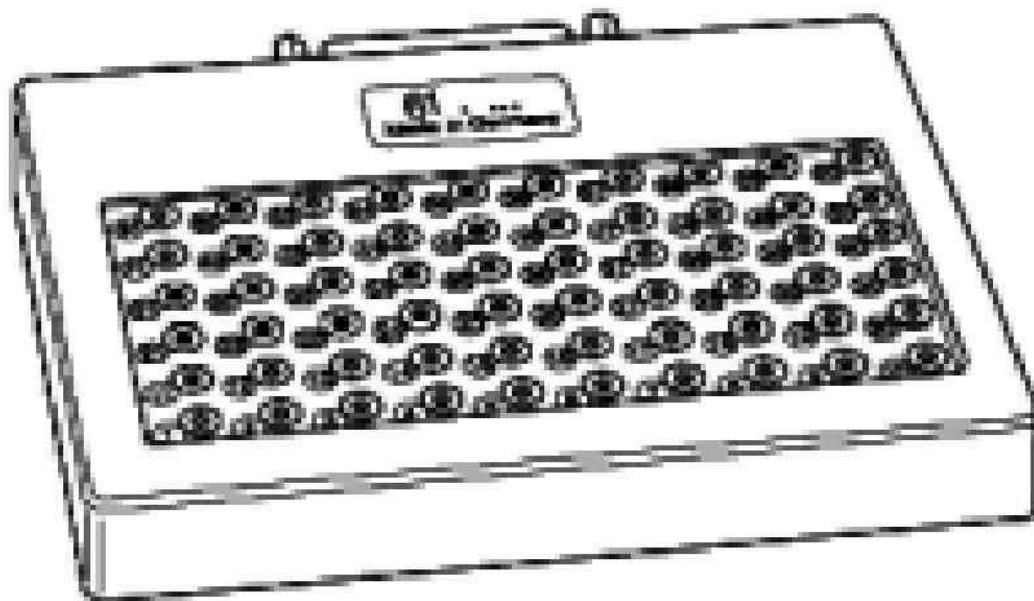


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Fig. 104: Identifying 26 Pin Breakout Box P/N 88 88 6 611 459
Courtesy of BMW OF NORTH AMERICA, INC.

60 Pin Breakout Box P/N 90 88 6 614 390

Used for connecting all adapter leads with 27 pin to 60 pin plug connections.



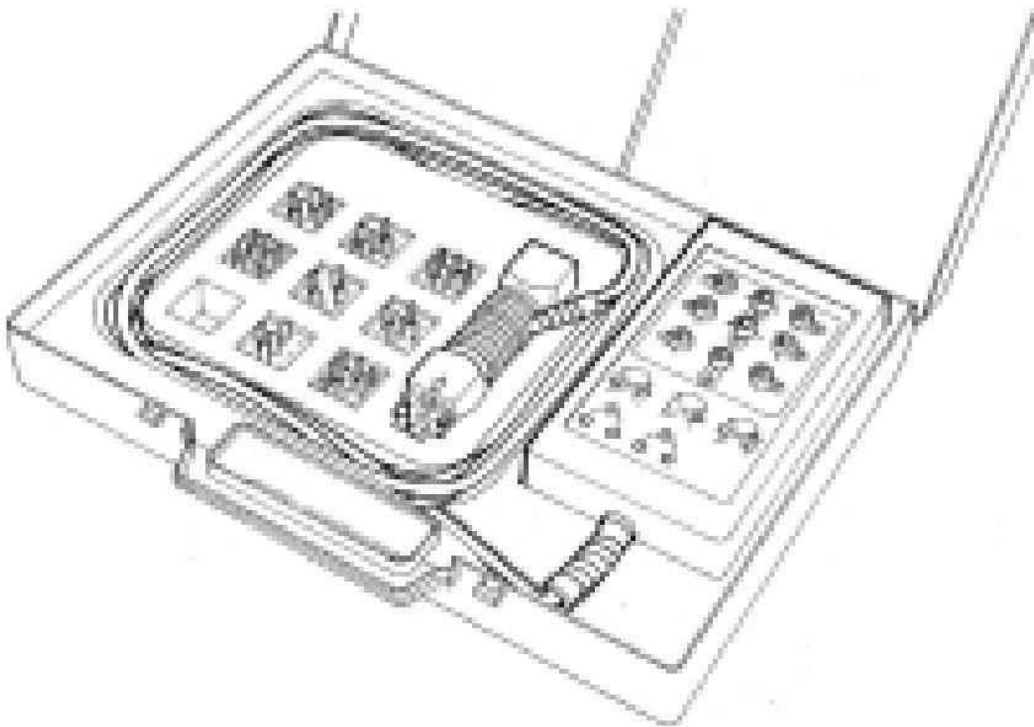
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Fig. 105: View Of 60 Pin Breakout Box P/N 90 88 6 614 390
Courtesy of BMW OF NORTH AMERICA, INC.

TESTER AND ADAPTER SET FOR RELAYS

The Relay Adapter provides a platform to test a relay while allowing the relay to remain active in a circuit.

The adapters included enable different pin configurations of relays to be tested using a single tester.



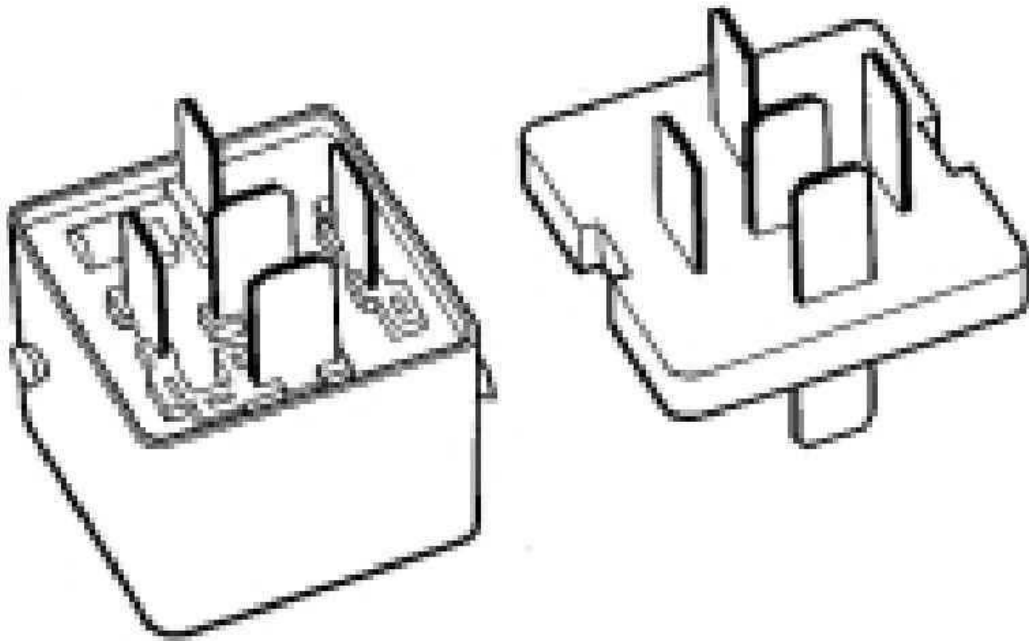
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Fig. 106: Identifying Tester And Adapter Set For Relays
Courtesy of BMW OF NORTH AMERICA, INC.

Remove relay and compare plug in adapter with plug pattern on relay. Choose correct adapter (**Fig. 107**).

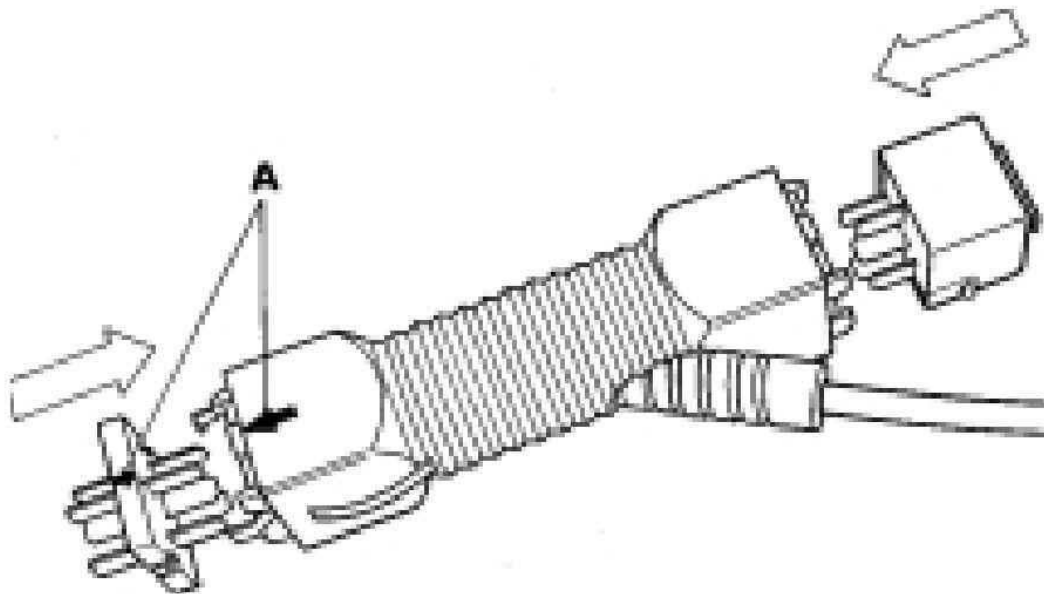
Fit adapter to Measuring bridge, noting the marker arrows (A). Fit the relay to the measuring bridge (**Fig. 108**).

Plug the assemble measuring bridge into the socket of the relay to be checked. Test using a multimeter. See the circuit diagram, testing instructions in the appropriate article for subsequent procedure (**Fig. 109**).



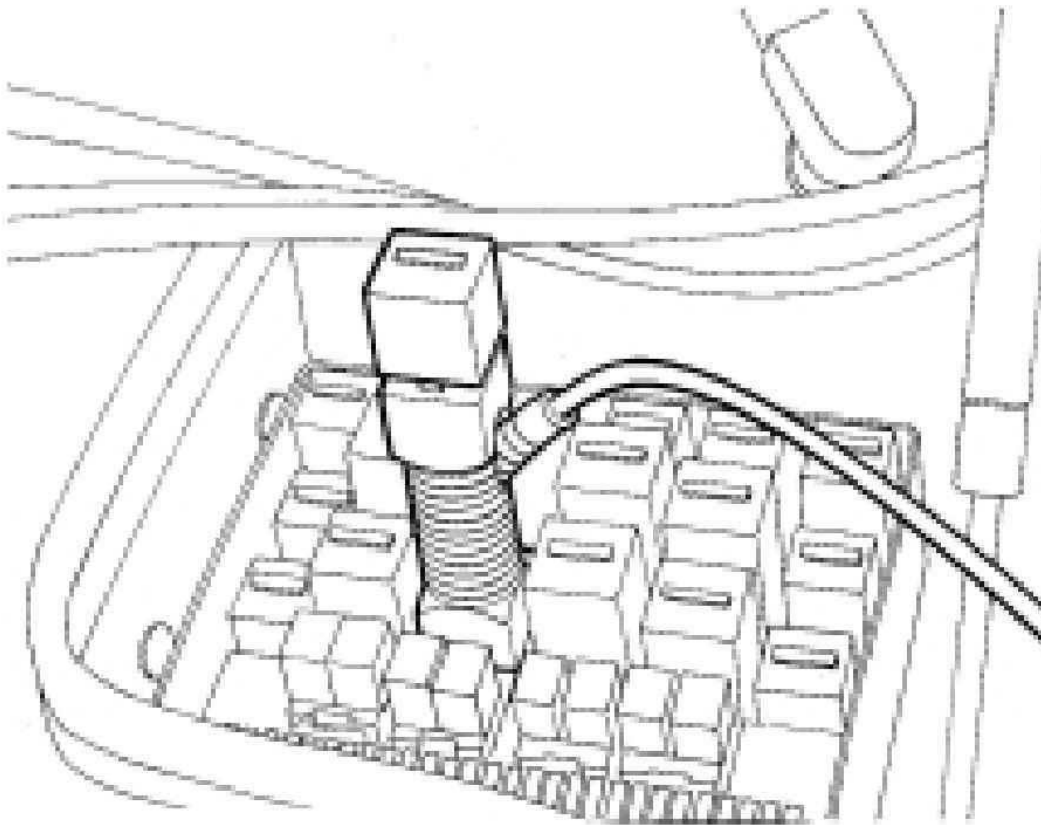
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Fig. 107: Identifying Relay And Compare Plug
Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 108: Fitting Adapter To Measuring Bridge
Courtesy of BMW OF NORTH AMERICA, INC.



G03389041

Fig. 109: View Of Measuring Bridge In Socket
Courtesy of BMW OF NORTH AMERICA, INC.

"V" Cables

"V" cables are available in different versions depending on the system being diagnosed. Always refer to the most recent information for the required special tools.

"V" cables are only used with the 26 pin breakout box to access input and output signals of peripheral modules and systems.

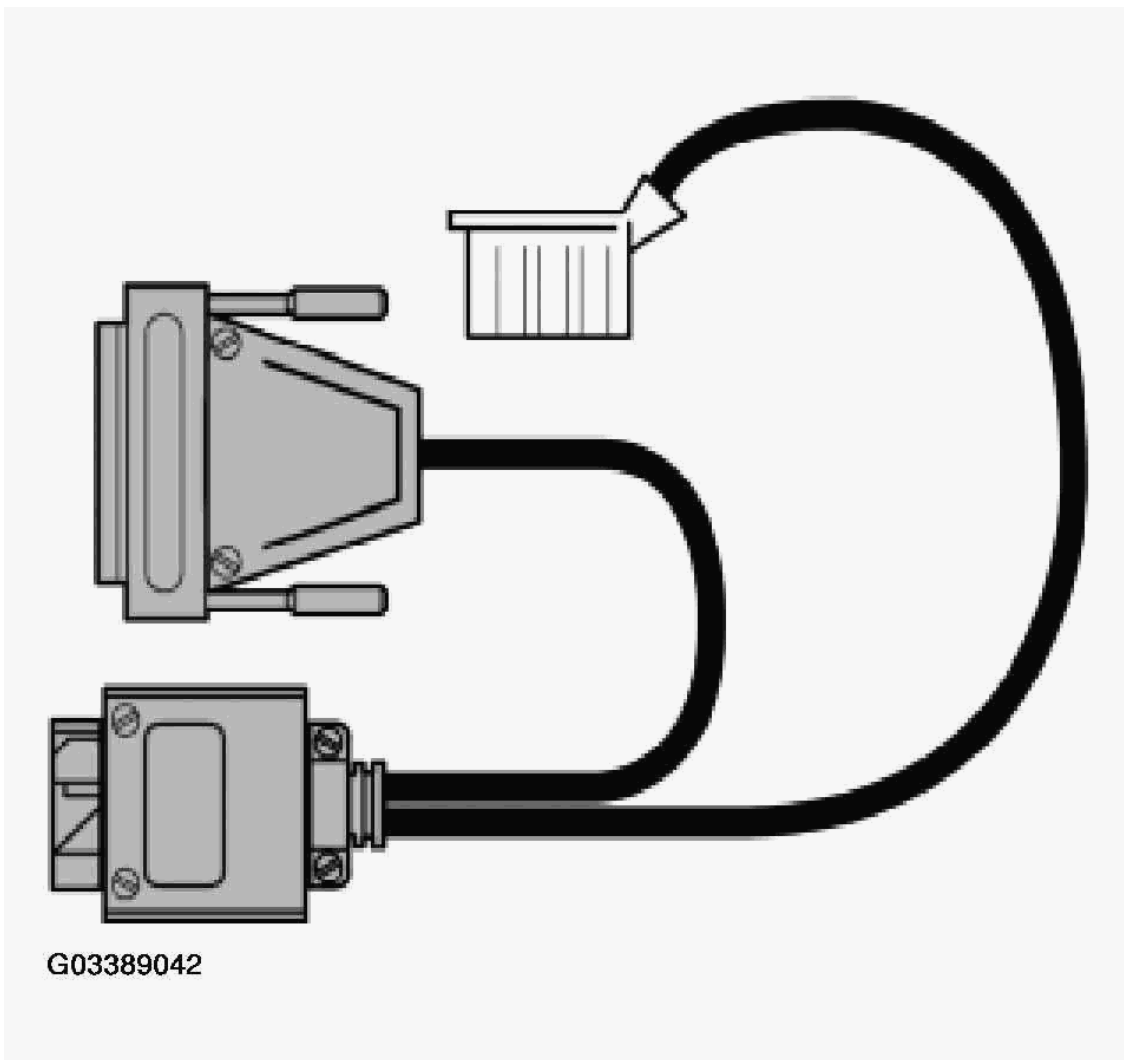


Fig. 110: Identifying "V" Cables

Courtesy of BMW OF NORTH AMERICA, INC.

- The appropriate cable is distinguished by the color of the connector end.
- The color will match the particular modules connector color. Unless the color matches, the cable will not fit the connector on the module being tested.
- Each colored "V" cable has a series of alignment tabs that will only fit it's particular module or system.

"V" cables with ELO connectors are also being used with the 26 pin breakout box. These cables are unique in that they have a locking arm on the component side of the cable. They are light green in color, and the number of pins will vary depending on the system being tested.

"V" harness adapters were introduced with the E38. These also have light green ELO connectors on the component side, but they do not require a breakout box.

There is a black plug on one side with same number of pins as the component being tested.

The plug has numbers stamped on it's side that corresponds with the pins on that particular component.

You access the signals by plugging the test equipment directly into those pin numbers.

As new systems and components are being introduced, new breakout boxes and cables will also be introduced.

2007 ACCESSORIES & EQUIPMENT

Car Care Products - Operating Fluids

1.0 BMW CAR CARE PRODUCTS AND ALTERNATE SUPPLIERS

BMW CAR CARE PRODUCTS AND ALTERNATE SUPPLIERS REFERENCE

Item	BMW P/N	Description/Application	3M	Wurth	Loctite	CRC
Glass Cleaner	82 14 9 400	For effortless and	8968	890925	82544	
	349 ⁽¹⁾	intensive cleaning of				
	82 14 9 406	windows and mirrors.	8968	890925	82544	Siloo 68A
	684 ⁽¹⁾	This glass cleaner				
Window De-Icer	82 14 9 406	removes tenacious dirt,	3585		82544	Siloo 68A
	685 ⁽¹⁾	silicone and oil residues				
	82 14 9 407	and dead insects.				
Window De-Icer	426 ⁽¹⁾	For use on iced-over windows. Contains no methanol and is nontoxic.				Siloo 22A IceOff
Car Shampoo	83 12 0 004	For washing cars. Cleans and protects paint finish.				
Paint Cleaner	826					
	82 14 9 400	For removing dirt	6049			
Paint Cleaner	132 ⁽¹⁾	imbedded in the paint finish. Leaves a new glossy look. Especially suited for older cars.				
	82 14 9 400	For use on metallic as well as lacquer paint. Cleans and seals paint from detergent and weather. Produces an excellent shine and long-term protection. Best for older finishes.	6055	8909671		
Car Polish-Cream	131 ⁽¹⁾					
Car Polish-Liquid	83 12 9 407	Same as above except in liquid.	6005			
Car Wax	779 ⁽¹⁾					
	83 12 9 408	For the care of newer metallic and lacquer finishes. Cleans and seals paint from detergent and weather. Non-abrasive.				
Leather Care (Karneol)	527					
	81 22 9 400	Cleans leather upholstery of mild stains or dirt; provides conditioners.				
Plastic Cleaner	901					
	82 14 9 407	For cleaning soiled plastic interior surfaces.	6046	89024		
Plastic Cleaner	415 ⁽¹⁾					

Cockpit Spray	83 12 9 407 769	For cleaning door liners, head liner, and upholstery. Prevents materials from becoming brittle and has antistatic effect.				
Tar Remover	82 14 9 407 018 ⁽¹⁾	For removing tar, asphalt, and oil stains.	3607	89026	3607	89026
Insect Remover	81 22 9 407 444 ⁽¹⁾	Removes insects rapidly and effortlessly from glass, paint, chrome and plastics.	3607	89026	3607	89026
Chrome Polish	82 14 9 400 890 ⁽¹⁾	A perfect cleaner which provides a genuine gloss and forms an invisible silicone film to protect the chrome work against bad weather, corrosion, dirt etc.	6049	3607	89026	3607
Engine Cleaner	81 22 9 407 760 ⁽¹⁾	For removing grease and built-up dirt from engines and engine parts. Washes off with water. Will not harm paint, rubber, or plastics.	8899	890923	80043	14045
Rubber Care-Spray	82 14 9 400 195 ⁽¹⁾	For use on gaskets, tires, weather stripping. Rubber care cleans, helps maintain elasticity, and renews color.	5959	890110	82333	
Rubber Care - Tube	82 14 9 407 015	Same as spray except in tube form.				
Car Care Kit	82 14 1 467 126	Kit contains: <ul style="list-style-type: none"> ○ BMW Wheel Cleaner Spray (P/N 82 14 1 467 045) ○ BMW Car Shampoo (P/N 82 14 9 400 129) ○ Sponge ○ Long-handled brush ○ Synthetic chamois ○ Bucket with BMW 				

logo

Car Wash Liquid	82 14 1 467 131	Meguiar's Hi-Tech Wash maintains optimum gloss on a continuing basis, by blending in conditioners and gloss enhancers while foaming away dirt and grime.
Final Inspection	82 14 1 467 132	Meguiar's Spray Applicator to give a "show car shine". Removes light dirt without scratching, leaves high-gloss look. Ideal for maintaining perfect finish on display cars. Not for heavily soiled finishes.
Vinyl/Rubber Cleaner	82 14 1 467 133	Meguiar's Cleaner/Conditioner thoroughly cleans, penetrates and rejuvenates the surface, and provides exceptionally durable protection against drying out and cracking.
Cleaner Wax	82 14 1 467 134	Meguiar's Cleaner/Wax cleans, polishes and protects paint in one application. Removes light oxidation, adds depth of color and provides durable protection.
Wheel Cleaner	82 14 1 467 045	Clean wheels and protect finish.
Soft Top Cleaner	83 12 9 407 806	Clean soft top.

(1) *These items are no longer available through BMW NA Parts Department.

GENERAL INFORMATION

Charging Systems - Overview

CHARGING SYSTEMS

Model: All

Production Date: All

PURPOSE OF THE CHARGING SYSTEM

The purpose of the charging system is to convert the mechanical energy of the engine into electrical energy that is used to recharge the battery and power the electrical accessories. When the engine is first started, the battery (s) supplies all the current required by the starting and ignition systems.

As the battery drain continues and engine speed increases the charging system is able to produce more voltage than the battery can deliver. When this occurs, the electrons from the charging device are able to flow in a reverse direction through the battery's positive terminal. The charging device now supplies the electrical system's load requirements and recharges the battery.

The charging system consists of:

- Battery.
- Generator.
- Drive Belt.
- Rectifier Assembly.
- Voltage Regulator.
- Charge Indicator.
- Ignition Switch.
- Cables and Wiring Harness

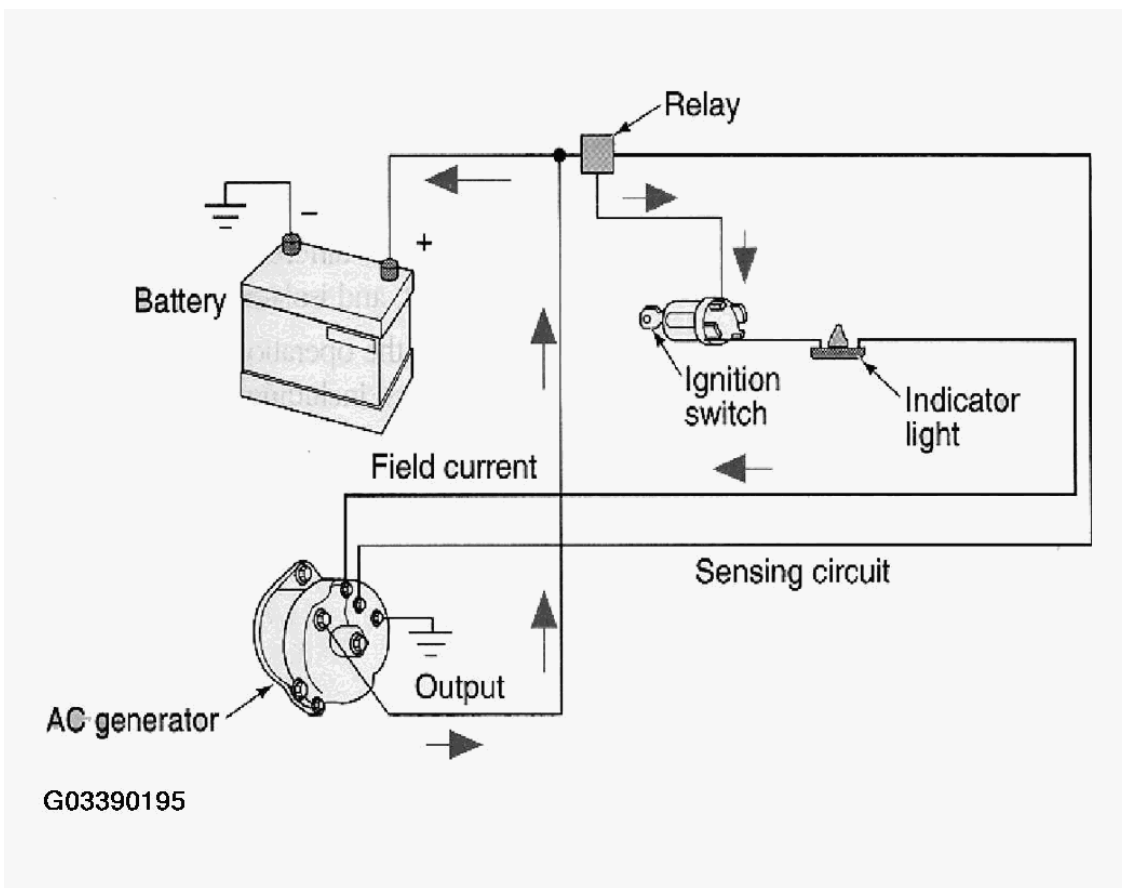


Fig. 1: Identifying Battery Charging System
 Courtesy of BMW OF NORTH AMERICA, INC.

SYSTEM COMPONENTS

Battery

The Battery is the primary EMF source in the automobile. The automotive battery is an electromechanical device that provides the potential difference (voltage). The battery does not store electrical energy. It stores chemical energy that is converted to electrical energy as it discharges.

Generator

The Generator produces free electrons necessary to charge the battery. The electron flow is produced through inductance, a magnetized rotor spinning inside a stator. The generator produces AC voltage which is converted to DC voltage or rectified.

Generator styles:

- Brush Type.
- Brushless Type.

NOTE: In an attempt to standardize terminology in the industry, the term alternator is being replaced with generator. Often an alternator is referred to as an AC generator.

Air or liquid (coolant) is used for generator cooling.

BRUSH TYPE GENERATORS

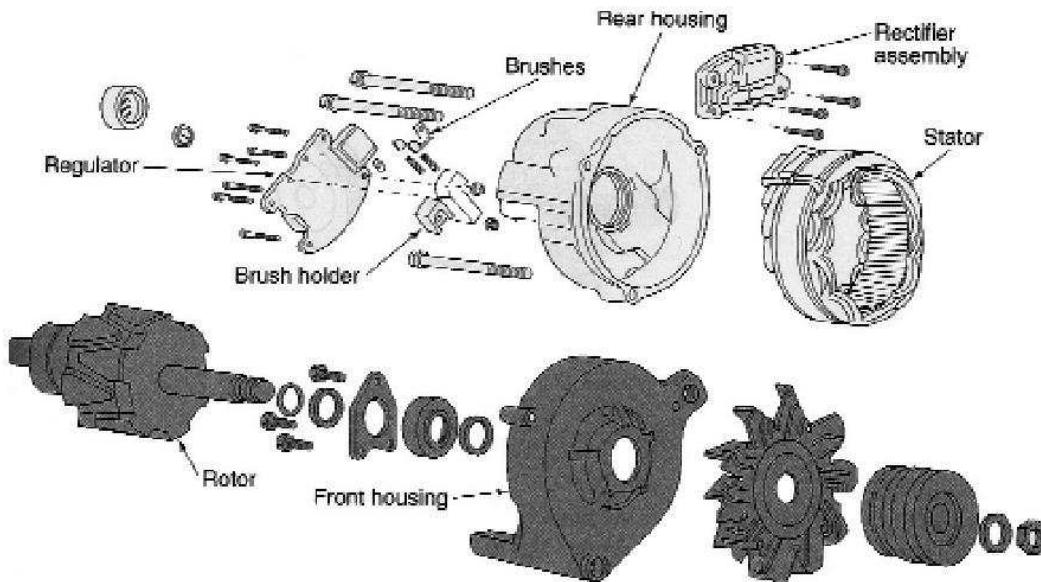
Brush Type generators consist of the following main components:

- Generator Housing.
- Stator Assembly.
- Rotor Assembly.

Generator Housing

The Housing is made of two pieces of die-cast aluminum. Aluminum is used because it is nonmagnetic, light weight and provides good heat dissipation.

Bearings for support of the rotor assembly are mounted in the front and rear housings.



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Fig. 2: Exploded View Of Generator Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Stator Assembly

The Stator is fixed to the housing of the generator and does not turn. It contains three main sets of windings wrapped in slots around a laminated, circular iron frame. Each of the three windings has the same number of coils as the rotor has pairs of north and south poles. The coils of each winding are evenly spaced around the core.

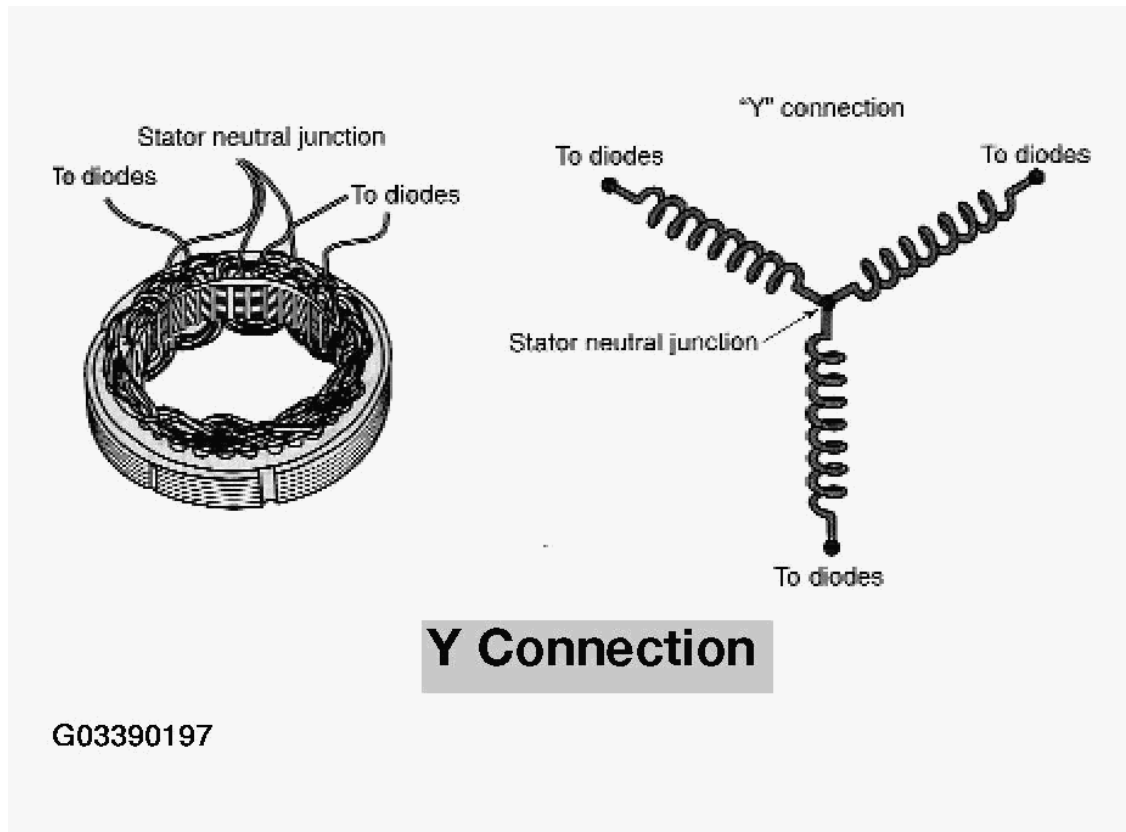


Fig. 3: View Of Stator Assembly (Y Connection)
Courtesy of BMW OF NORTH AMERICA, INC.

The three sets of windings alternate and overlap as they pass through the core in order to produce the required phase angles.

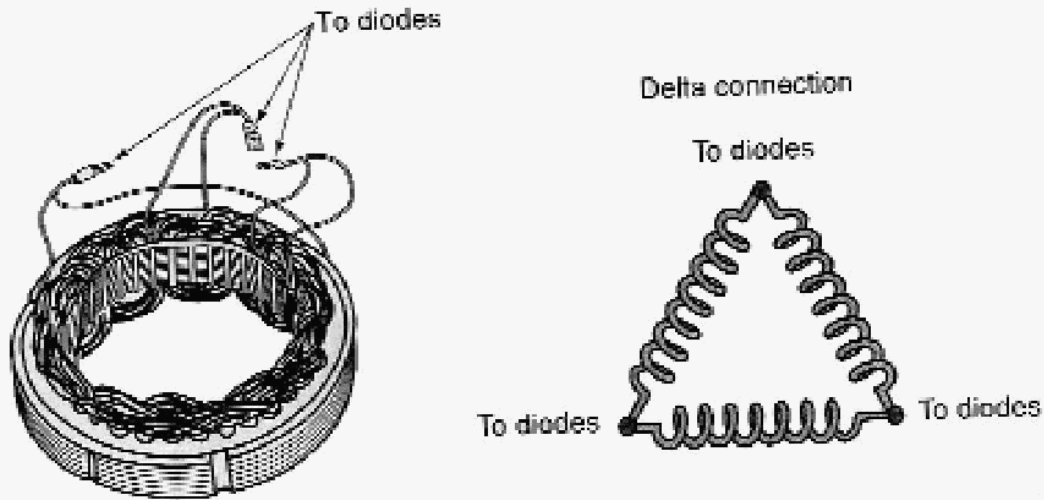
Each group of windings occupy one third of the stator, or 120 degrees of the circle.

The voltage produced by each loop of the stator is at a different phase angle, as a result the output of the stator is divided into three phases.

Two common methods of connecting the windings are:

- Y Connection.
- Delta Connection.

The parallel path of the Delta connection makes more current available.



Delta Connection

G03390198

Fig. 4: Identifying Stator Assembly (Delta Connection)
Courtesy of BMW OF NORTH AMERICA, INC.

Rotor Assembly

The Rotor Assembly consists of the rotor shaft, a winding around an iron core, two pole pieces and slip rings.

The rotor shaft is pressed into the core, then six-fingered malleable iron pole pieces are assembled on the shaft against each end of the winding core.

The pole pieces are placed so that the fingers mesh but do not touch. When direct current is passed through the field coil winding, the fingers become alternately North and South poles.

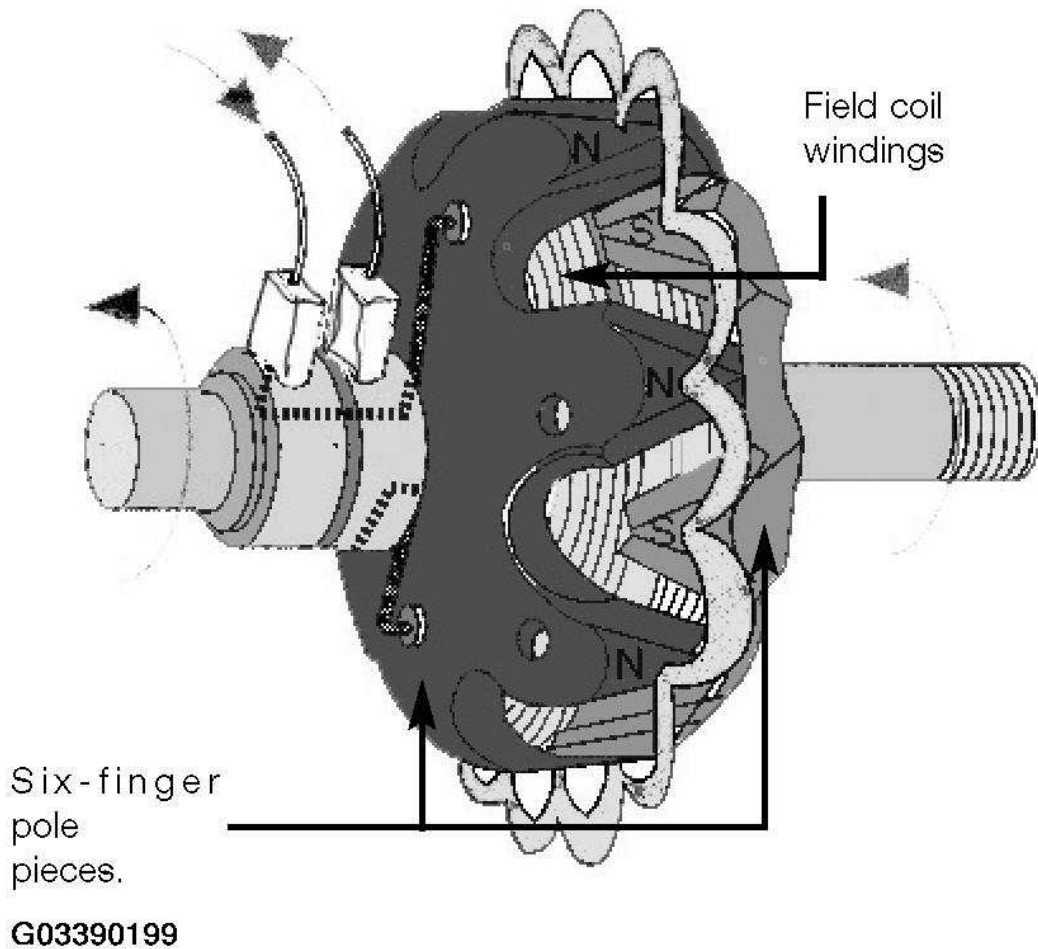
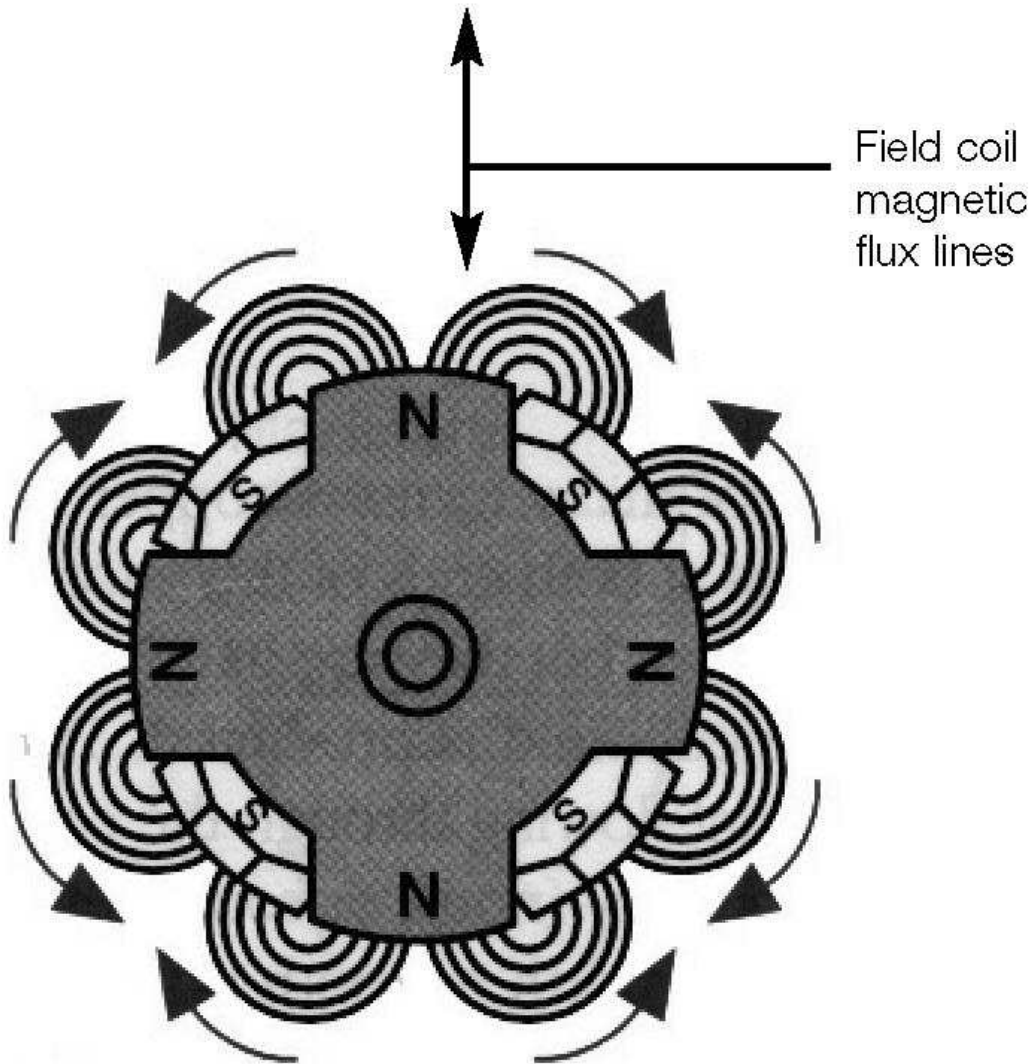


Fig. 5: View Of Rotor Assembly
Courtesy of BMW OF NORTH AMERICA, INC.

As a result of this arrangement of poles, the magnetic flux lines will move in opposite directions between adjacent poles.

(Flux lines always move from North to South.)

This arrangement provides for several alternating magnetic fields to intersect the stator as the rotor is turning.



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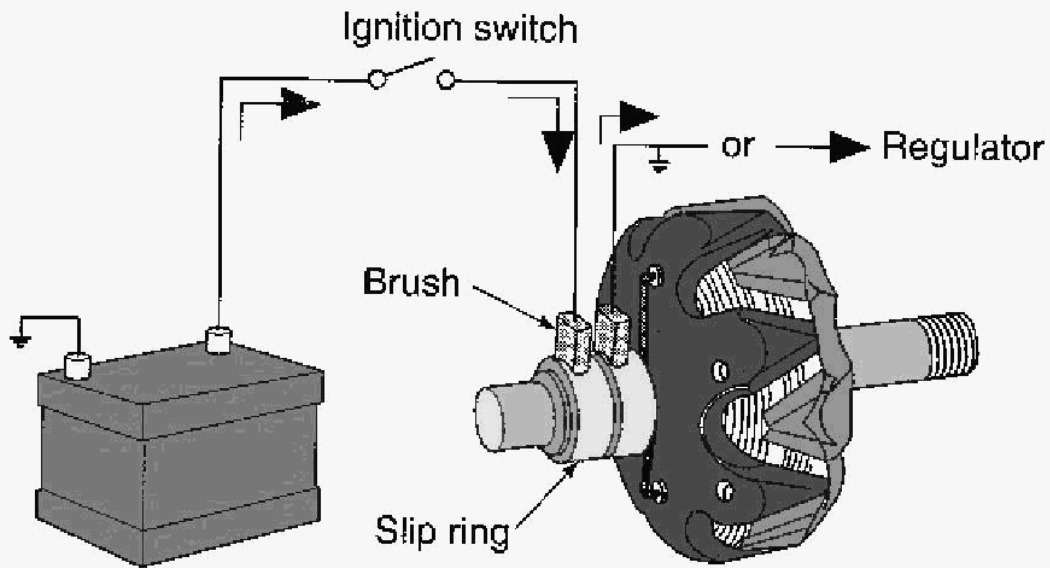
Fig. 6: Identifying Rotor Assembly

Courtesy of BMW OF NORTH AMERICA, INC.

A slip ring pressed on to the rotor shaft is connected to the two ends of the field winding.

Two brushes are held by springs against the slip rings. One brush is connected through a switch to the battery B+, the other to the voltage regulator.

The brushes conduct only the field current (2 to 5 amps).



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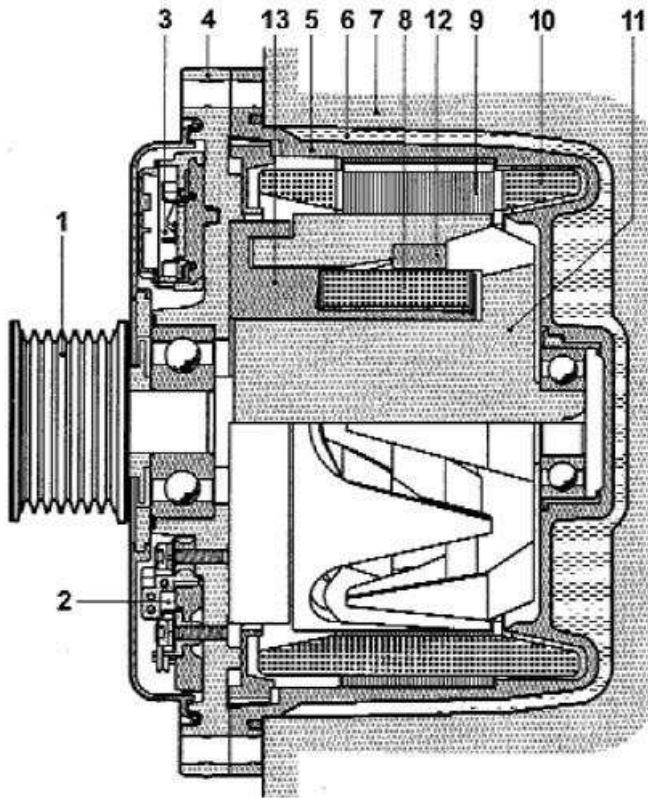
Fig. 7: Locating Brushes On Rotor Assembly

Courtesy of BMW OF NORTH AMERICA, INC.

BRUSHLESS TYPE GENERATORS

Brushless Type generators are liquid cooled (coolant) and consist of the following main components:

- Generator Housing.
- Stator Assembly.
- Rotor Assembly.



1. Pulley
2. Rectifier
3. Voltage Regulator
4. Drive End Shield
5. Generator Housing
6. Coolant
7. Coolant Housing
8. Field Winding
9. Stator Housing
10. Stator Winding
11. Rotor
12. Non Magnetic Intermediate Ring
13. Rotor Pole

G03390202

Fig. 8: Cross Sectional View Of Brushless Type Generator
 Courtesy of BMW OF NORTH AMERICA, INC.

Generator Housing Water Cooled

The Water Cooled Generator is housed in an encapsulated metal shell enclosure. The enclosure is installed an aluminum shell.

The space between the inner surface of the shell and the outer surface of the generator creates a water jacket that engine coolant flows through.

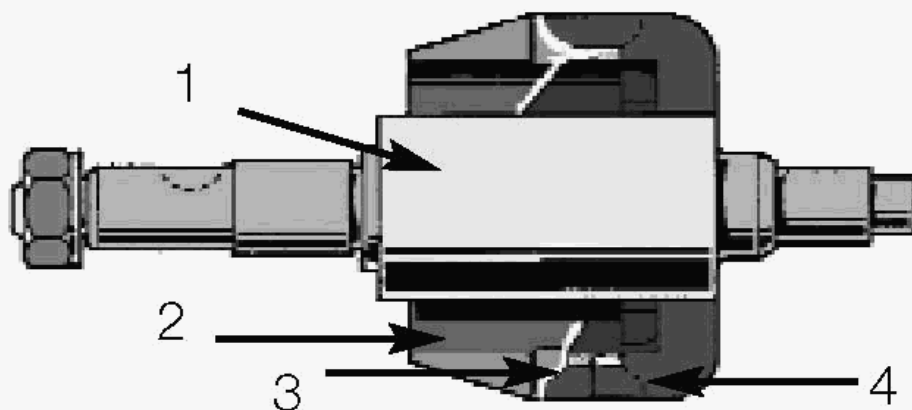
Coolant flows from the engine into the shell through internal ports and exits via hose connections.

Liquid cooling minimizes noise generation through elimination of generator cooling fan.

Stator Assembly

Although different in appearance the Stator Assembly in a brushless generator performs the same functions as the brush type.

Rotor Assembly



1. Rotor Shaft With Pole Core
2. Left Pole-Finger Crown
3. Non-,Magnetic Retaining Ring
4. Right Pole-Finger Crown

G03390203

Fig. 9: Identifying Rotor Assembly

Courtesy of BMW OF NORTH AMERICA, INC.

The brushless generator Rotor does not contain the field coil. The pole-finger crowns rotate around a fixed field coil and are magnetized by the flux field of the field coil.

The two crowns form claw-pole half sections and are retained by a non-magnetic ring positioned below the pole fingers.

Rectifier Assembly

The Rectifier Assembly consists of six diodes, a pair of diodes for each stator winding. Each pair contain one positive biased diode and one negative biased diode. By using a pair of diodes that are reversed biased to each other, rectification of both sides of the AC sine wave is achieved. The negative biased diodes allow for conducting current from the negative side of the AC sine wave and putting this current into the circuit as positive current. The use of positive and negative biased diodes provide for full wave rectification because both halves of the sine wave are used.

Drive Belt

It is the function of the Drive Belt to transfer rotating energy from the engine to the generator. The drive belt rotates the rotor, spinning the magnetic field. A loose belt can inhibit charging system efficiency and a belt that too tight causes early bearing failure.

VOLTAGE REGULATOR

Voltage Regulators prevent excessively high voltage output of the generator. Excessive voltage would cause damage to the battery (through overcharging), light bulbs, motors, and particularly sensitive electronic components.

The regulator prevents these problems by limiting the current output of the generator.

Two types of regulators that are used:

- Standard Regulator.
- Multifunction Controller.

Standard Regulator

Electronic Voltage Regulators are mounted internally in the back of the generator assembly. Generator output is controlled by varying the amount of time the field coil is energized. The duty cycle of the field coil ground side is varied based on the demand placed on the electrical system.

The electronic voltage regulator compares field current supply voltage (from the stator windings through the diode trio) against a set voltage level (using a zener diode).

As the field current supply voltage surpasses the zener diode's breakdown voltage, the field current to the rotor is switched off. When the field current voltage to the rotor is off, the generator is not producing voltage. A rapid switching of the field current allows a fixed voltage output to be maintained. Additional diodes in the regulator,

prevent current flow when the ignition is off preventing battery drain.

Multifunction Controller

In addition to voltage regulation, the Multi-function Control electronic regulator provides the following features:

- Load response during start-up.
- Load response during driving.
- Fault display (under voltage, drive belt breakage, field coil interruption).

NOTE: Multi-function Control electronic regulators are available with and without start load response. The only difference is the time limitation of the rated current during the start procedure.

The start-up load response system provides for the alternator exciter current (field coil) to be started by a transistor two seconds after the battery indicator goes out. This means that engine start-up is unaffected by generator induced drag.

The load response during driving ensures that when large current consumers are switched on the generator output increases linearly allowing the DME/EML system to stabilize the engine speed and/or modify injection time if necessary.

Charge Indicator

The purpose of the Charge Indicator is to advise the driver that the vehicle's electrical system is not operating at peak efficiency and service should be performed.

The charge indicator operates differently depending on which type of regulator the vehicle is equipped with.

Standard Regulator

The charge indicator operates on the basis of opposing voltages. If there is no output through the diode trio, then the lamp circuit is completed to ground through the rotor field. Diode output applies voltage to the previously grounded side of the bulb, turning the bulb off (No current flow with equal voltage on both sides of the bulb).

Multifunction Controller

The charge indicator is activated by an electronic switch integrated in the controller. This internal switch receives its voltage supply from KL15 of the 2 pin generator connector. The controller measures internally the difference in voltage between KL30 and KL15 and switches the indicator circuit low in case of a fault.

Ignition Switch

The Ignition Switch provides initial power for the field circuit of the alternator, reducing the time required for the field to develop the magnetic field. Depending on which type of regulator is employed the ignition switch supplies power to the charge indicator to check bulb integrity.

Cables and Wiring Harness

The Cables and Wiring Harness are used to deliver the voltage produced by the generator to the battery for storage, and to vehicle systems to supplement battery voltage.

CHARGING SYSTEM PRINCIPLE OF OPERATION

Charging Systems (Brush or Brushless) use the principle of electromagnetic induction to generate electrical power. Electromagnetic induction occurs in a generator when a magnetic field is rotated within a stationary conductor. The magnetic field can be generated by permanent magnets or as in the case of the automotive generator by powerful electromagnets.

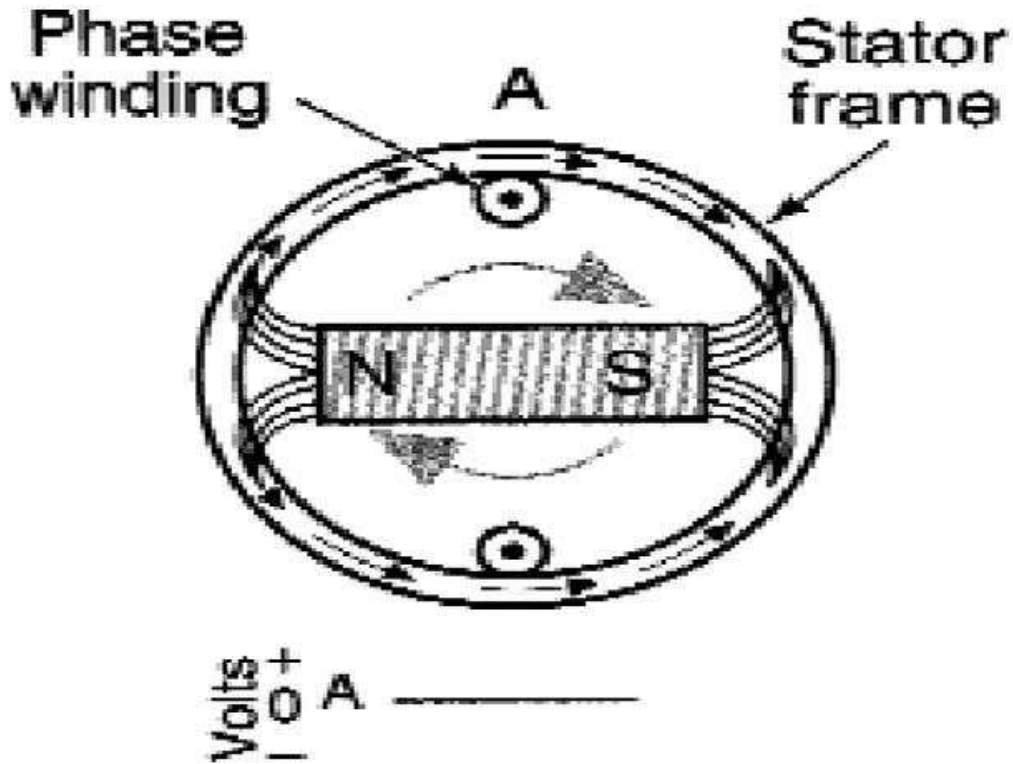
Passing electric current through a wire or winding causes a magnet field to surround the wire or winding. The number of turns in the winding and the magnitude of the current flowing through the winding determine the magnetic field strength.

The strength of the field is further increased by surrounding the coil with pole pieces. The poles will take on the polarity (North or South) of the side of the coil they touch or the ones they are closest to. The combined windings (field coil) and pole pieces are referred to as the rotor. Output of the generator is regulated through control of field coil intensity.

An examination of single phase AC voltage generation, will aid in the understanding of 3 phase AC voltage generation.

SINGLE-PHASE AC VOLTAGE GENERATION

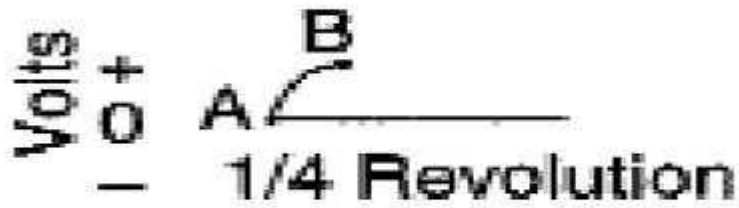
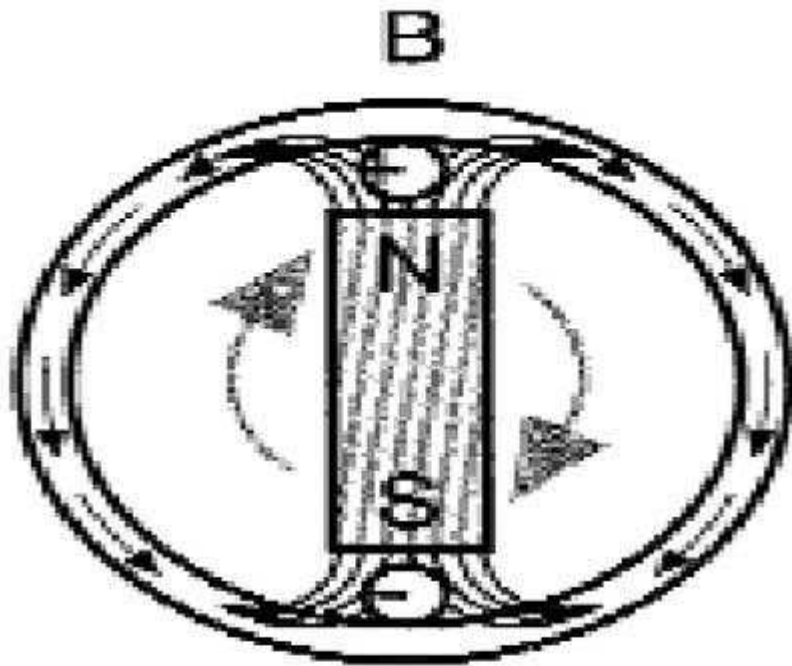
Single Phase AC Voltage Generation requires one stator frame with windings and one magnetic field (North and South pole pieces).



G03390204

Fig. 10: View Of North/South Poles And Stator Frame
 Courtesy of BMW OF NORTH AMERICA, INC.

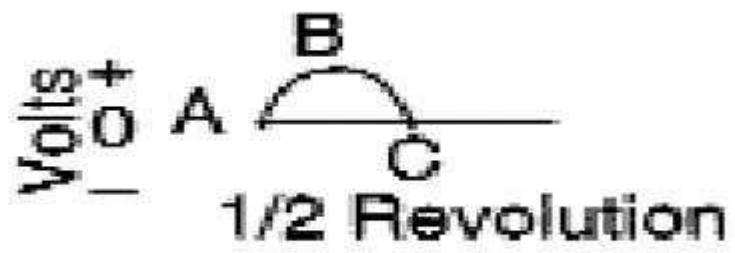
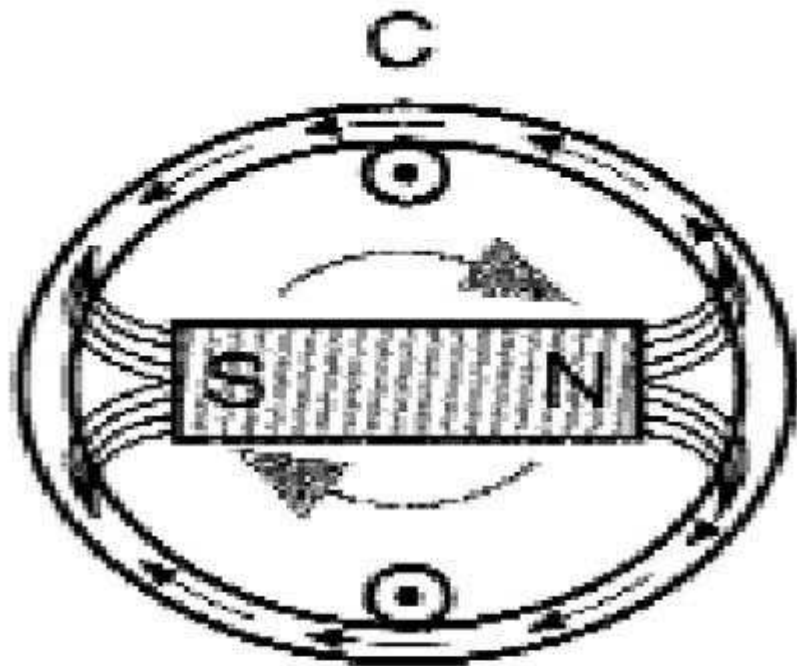
As the North pole of the rotor pole piece approaches the winding of the stator, induced voltage level in the stator begins to rise. The closer the North pole gets to the stator winding the higher the induced voltage. As the North pole reaches 90° to the stator winding the maximum amount of flux lines are acting on the winding, induced voltage is at its highest positive value (1/4 turn).



G00433344

Fig. 11: Identifying Stator Rotation (1/4 Turn)
 Courtesy of BMW OF NORTH AMERICA, INC.

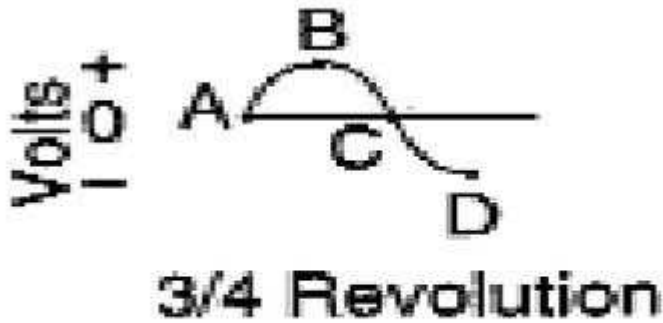
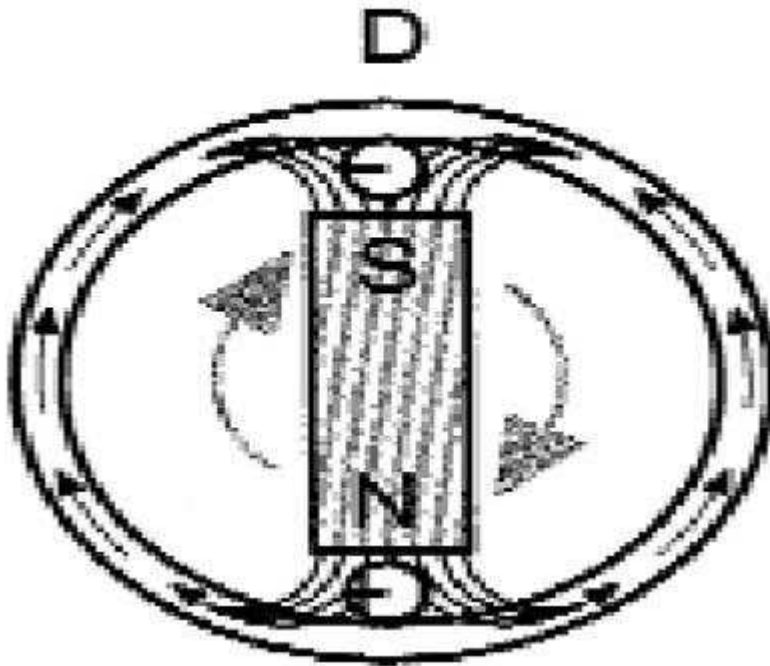
The rotor continues to rotate and the North pole gets further away from the winding. The voltage drops, until 0 voltage is induced through the stator (1/2 turn).



G00433345

Fig. 12: Identifying Stator Rotation (1/2 Turn)
 Courtesy of BMW OF NORTH AMERICA, INC.

With the South pole now approaching the winding voltage begins to increase negatively. When the South pole reaches 90° to the winding, again the maximum amount of flux lines are acting on the winding and induced voltage is at its greatest negative value (3/4 turn).

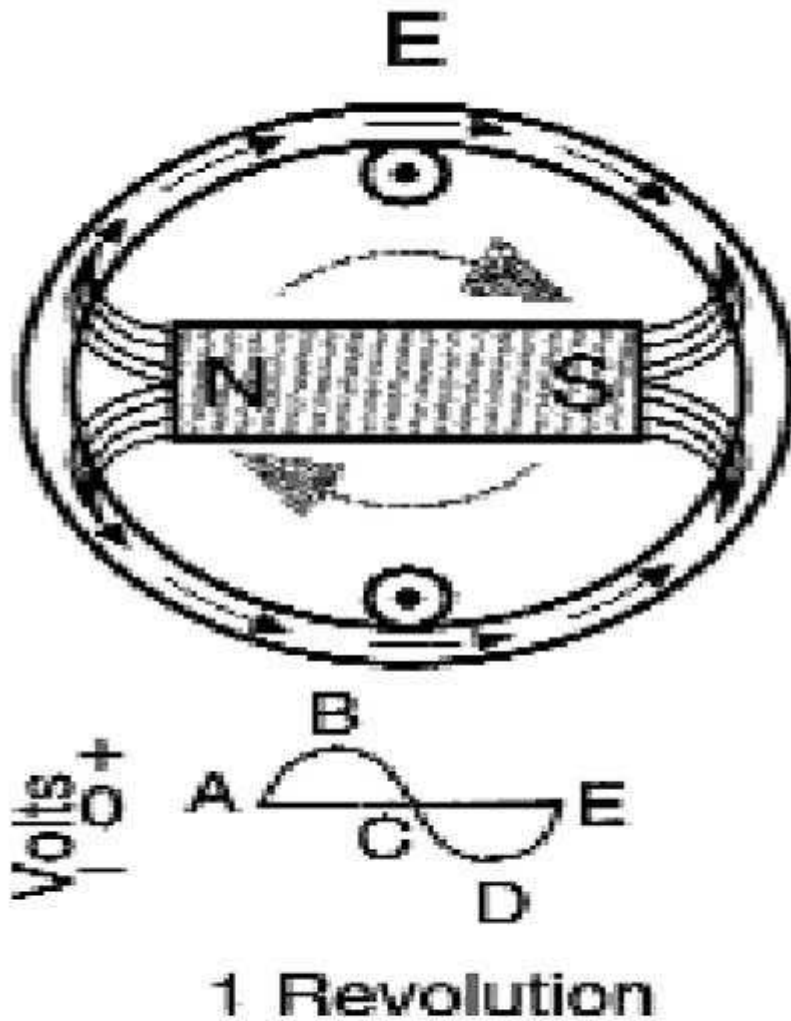


G00433346

Fig. 13: Identifying Stator Rotation (3/4 Turn)
 Courtesy of BMW OF NORTH AMERICA, INC.

The South pole continues to travel farther away from the winding decreasing the negative voltage value until 0 voltage is again reached (1 full turn).

This comprises one cycle or 360° rotation of the magnetic field.



G00433347

Fig. 14: Identifying Stator Rotation (1 Full Turn)
 Courtesy of BMW OF NORTH AMERICA, INC.

Sine wave produced by a single winding of the stator during a single revolution of one pair of pole pieces is called single phase voltage.

THREE-PHASE AC VOLTAGE GENERATION

Most AC generators use either a twelve or a fourteen pole rotor. Each pair of poles (North and South) produce one complete sine wave in each winding per revolution.

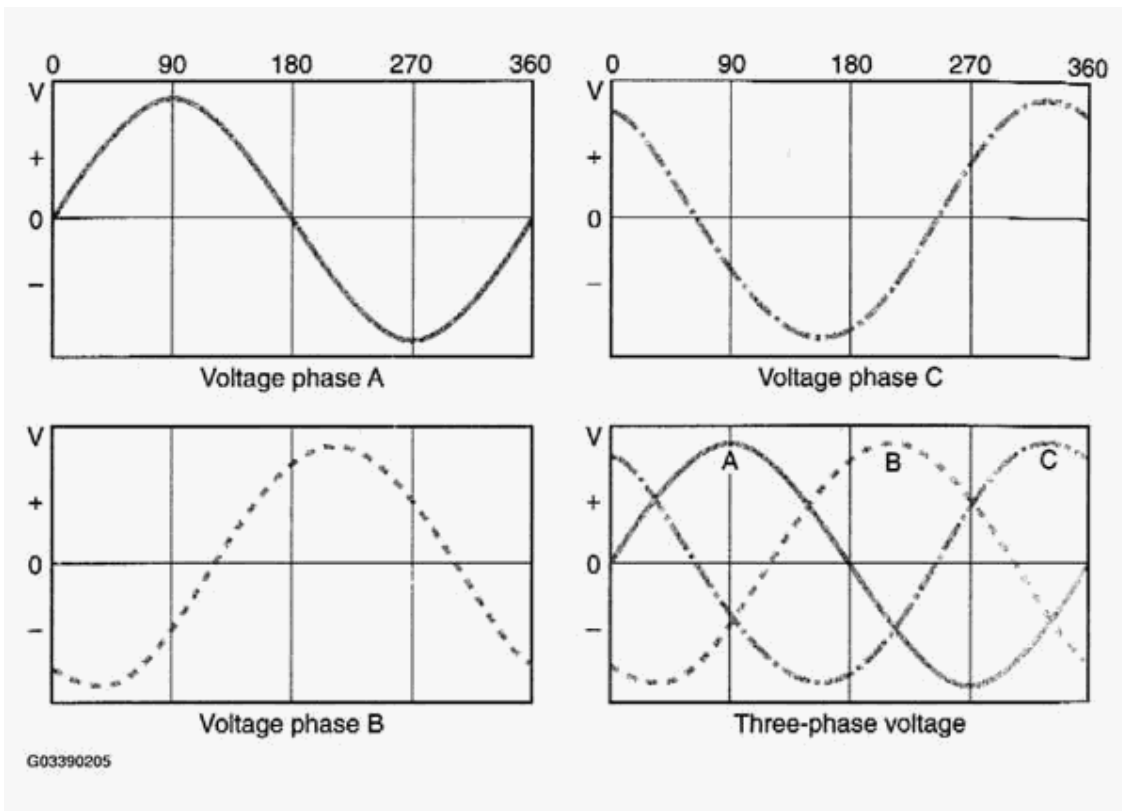


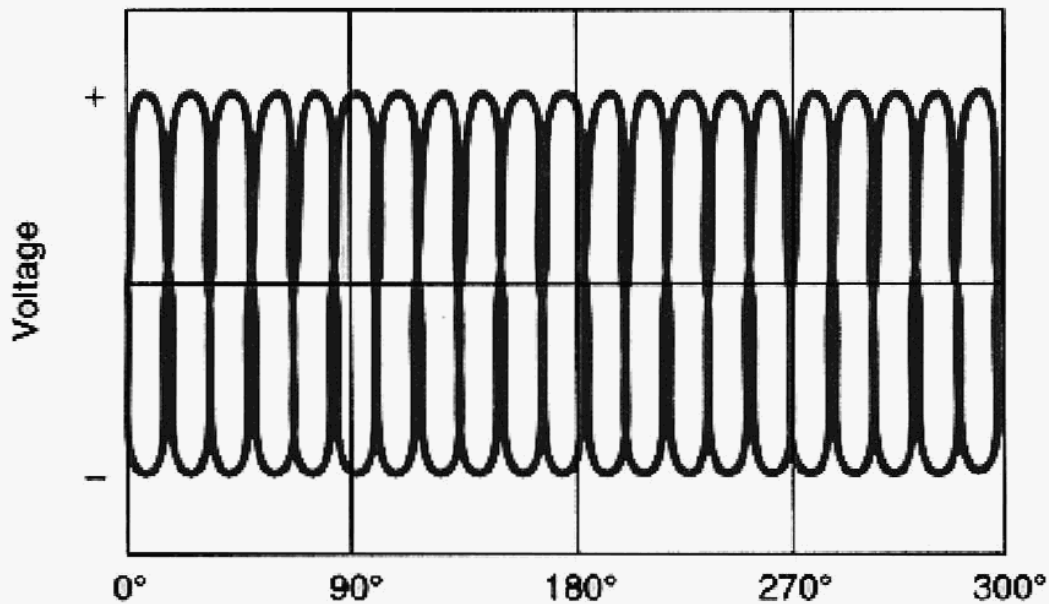
Fig. 15: Three-Phase AC Voltage Graph
 Courtesy of BMW OF NORTH AMERICA, INC.

Voltage of each stator winding is added together to create three-phase voltage.

During one revolution a fourteen pole rotor will produce seven sine waves. (The stator has one winding (coil) for each pair of rotors.)

The rotor generates three overlapping sine wave voltage cycles in the stator (one rotor three sets of windings in the stator).

The total output would be twenty one sine wave cycles per revolution (3 sets of stator windings, each with 7 coils).



G03390206

Fig. 16: Identifying Wave Cycle

Courtesy of BMW OF NORTH AMERICA, INC.

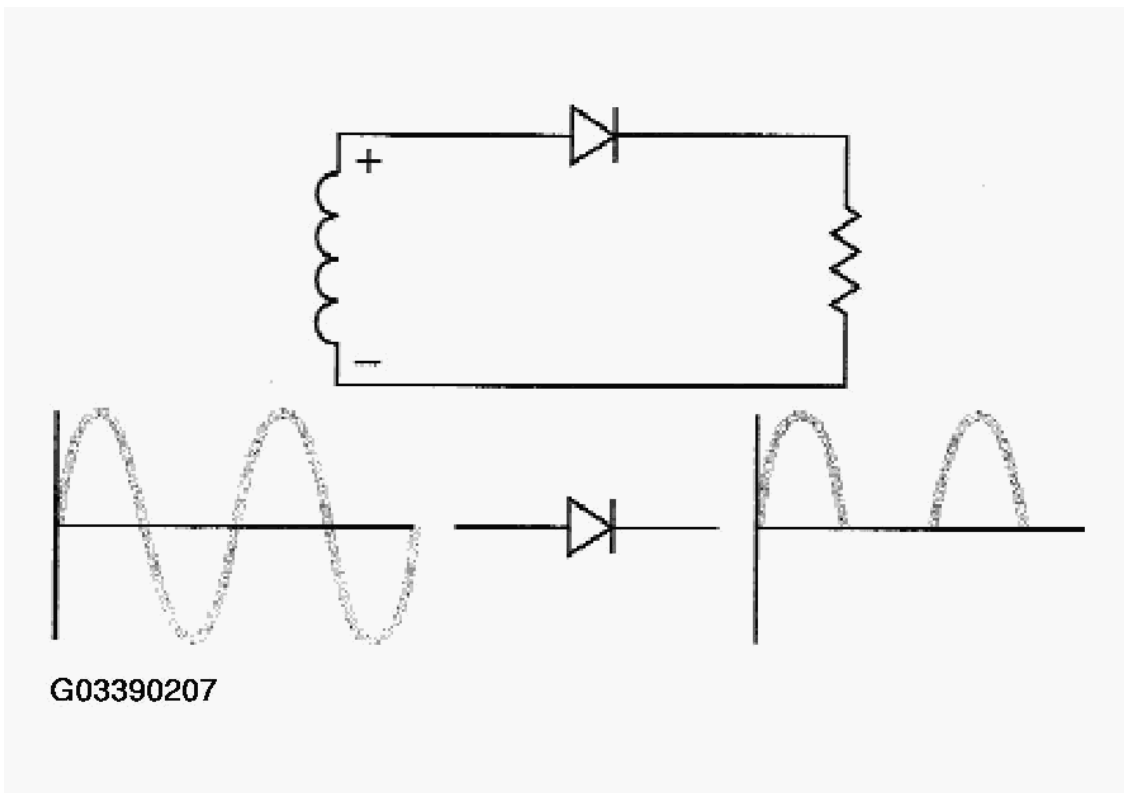
Sine wave cycle of a fourteen pole rotor and three phase stator.

VOLTAGE RECTIFICATION

The battery and the electrical system cannot store or use the 3-phase AC voltage produced by a generator, it must be rectified or converted to DC voltage.

A diode rectifier bridge is used to make the conversion.

The diode is similar to a non-return or one way valve which permits the passage of a fluid or gas in only one direction.



G03390207

Fig. 17: Identifying Voltage Rectification

Courtesy of BMW OF NORTH AMERICA, INC.

In a simple conversion the rectifier diode suppresses the negative half waves and allows only positive half waves to pass.

To make use of the negative value half waves full rectification is applied.

Full rectification of the negative half waves invert them into positive half waves.

The result is a rectified pulsating direct current.

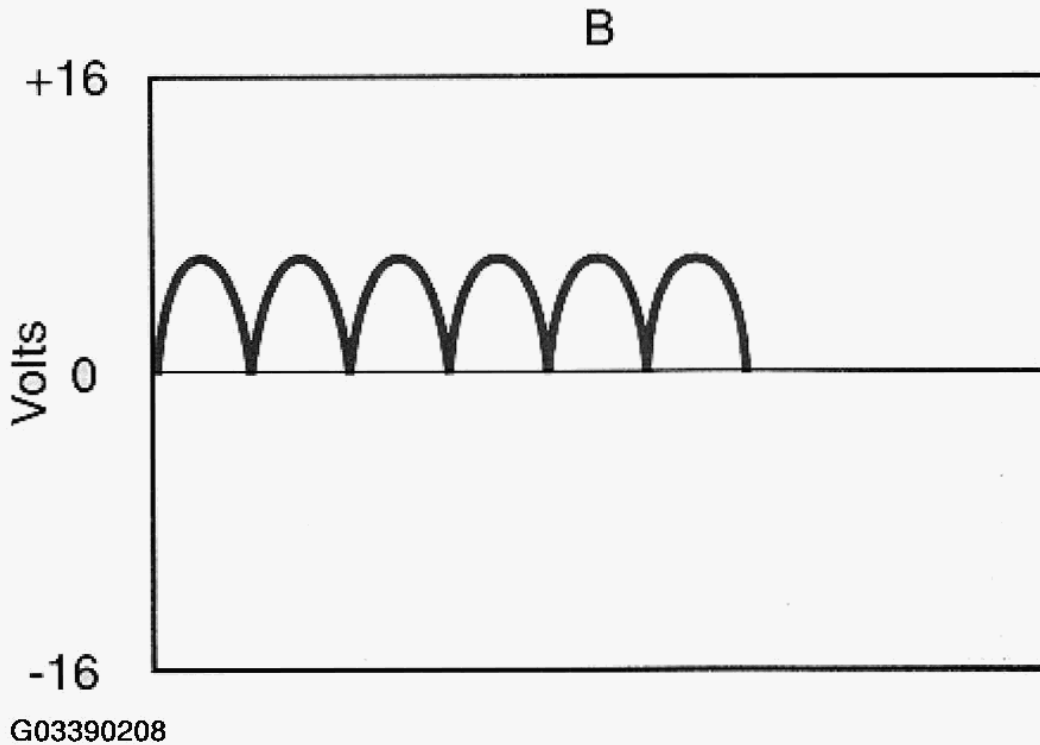


Fig. 18: Identifying Half Waves
 Courtesy of BMW OF NORTH AMERICA, INC.

Rectified Pulsating DC current

THREE-PHASE VOLTAGE REGULATION

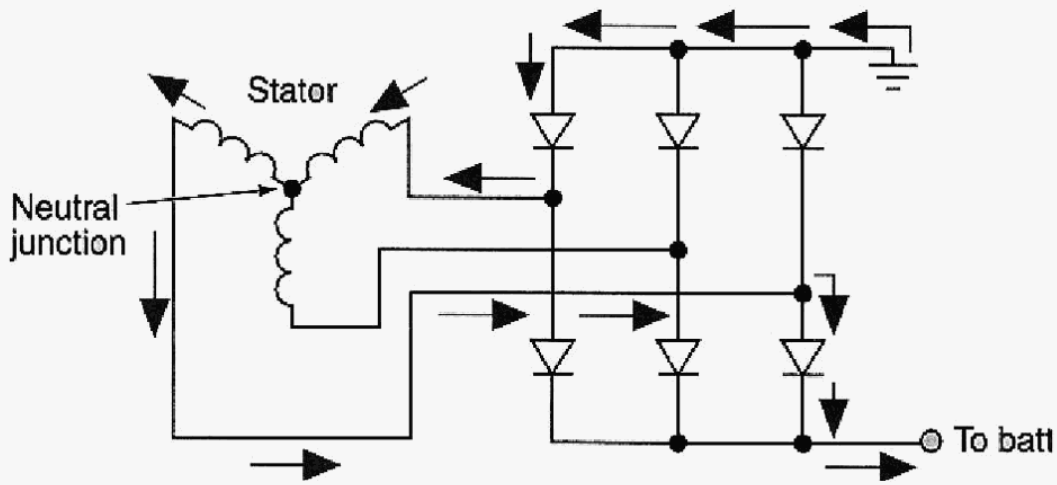
Six diodes are used to achieve three-phase AC voltage rectification. Three diodes are positive biased and three are negative biased.

The positive half-waves pass through the positive biased diodes and the negative halfwaves through the negative biased diodes.

Diode rectification of the negative half-waves invert them into positive half-waves.

With full rectification DC voltage supplied to vehicle by generator is not ideally smooth, but exhibits a slight ripple. This ripple is further smoothed by the battery which is connected in parallel with the generator.

The rectifier diodes in the generator not only convert the current but also prevent battery discharging through the 3 phase windings of the stator. Current flow can only take place from the generator to the battery.

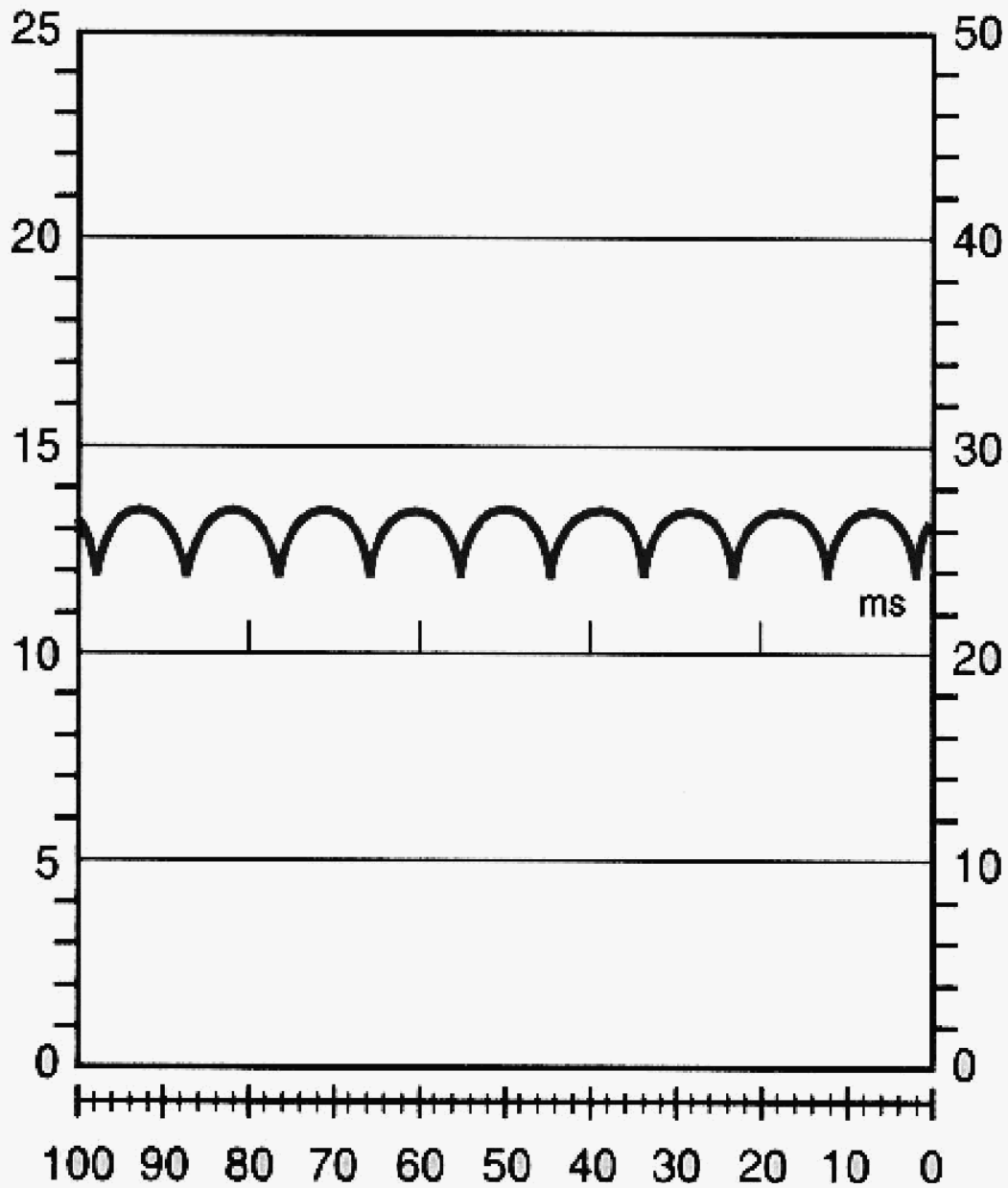


G03390209

Fig. 19: Rectifier Diodes Circuit Diagram

Courtesy of BMW OF NORTH AMERICA, INC.

Current flow through Y wound stator.



G03390210

Fig. 20: Oscilloscope Graph

Courtesy of BMW OF NORTH AMERICA, INC.

Rectified AC output has a ripple as seen on oscilloscope.

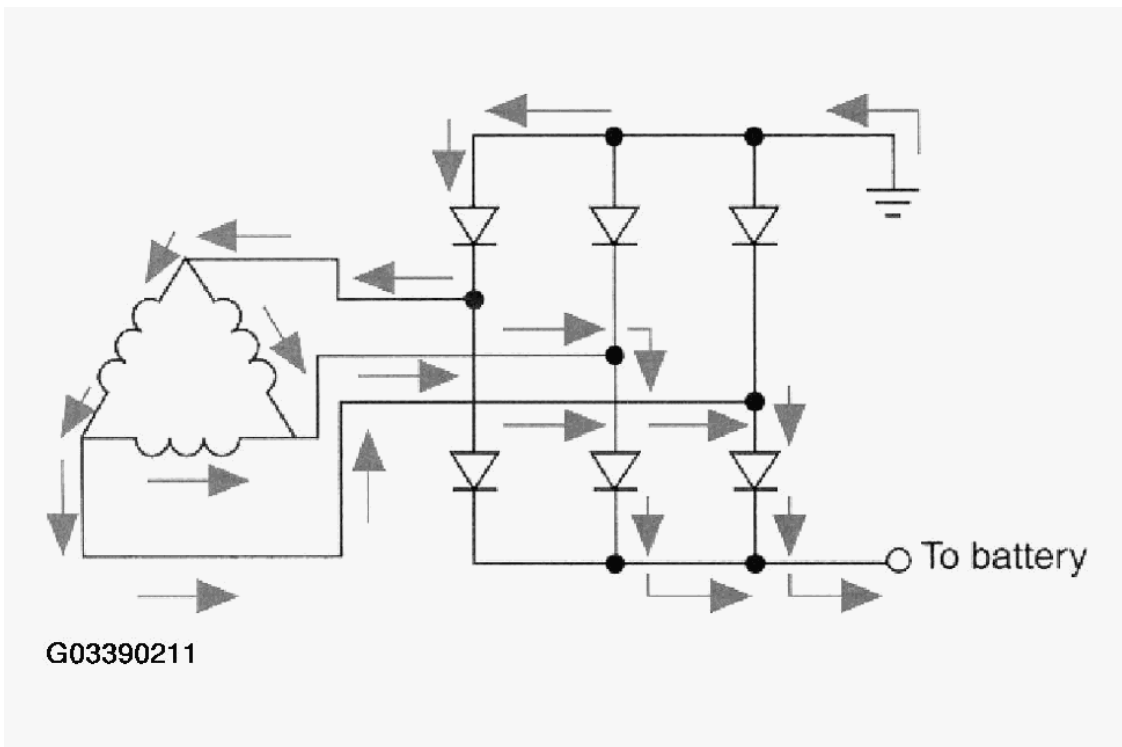


Fig. 21: Identifying Current Flow Through Delta Wound Stator
 Courtesy of BMW OF NORTH AMERICA, INC.

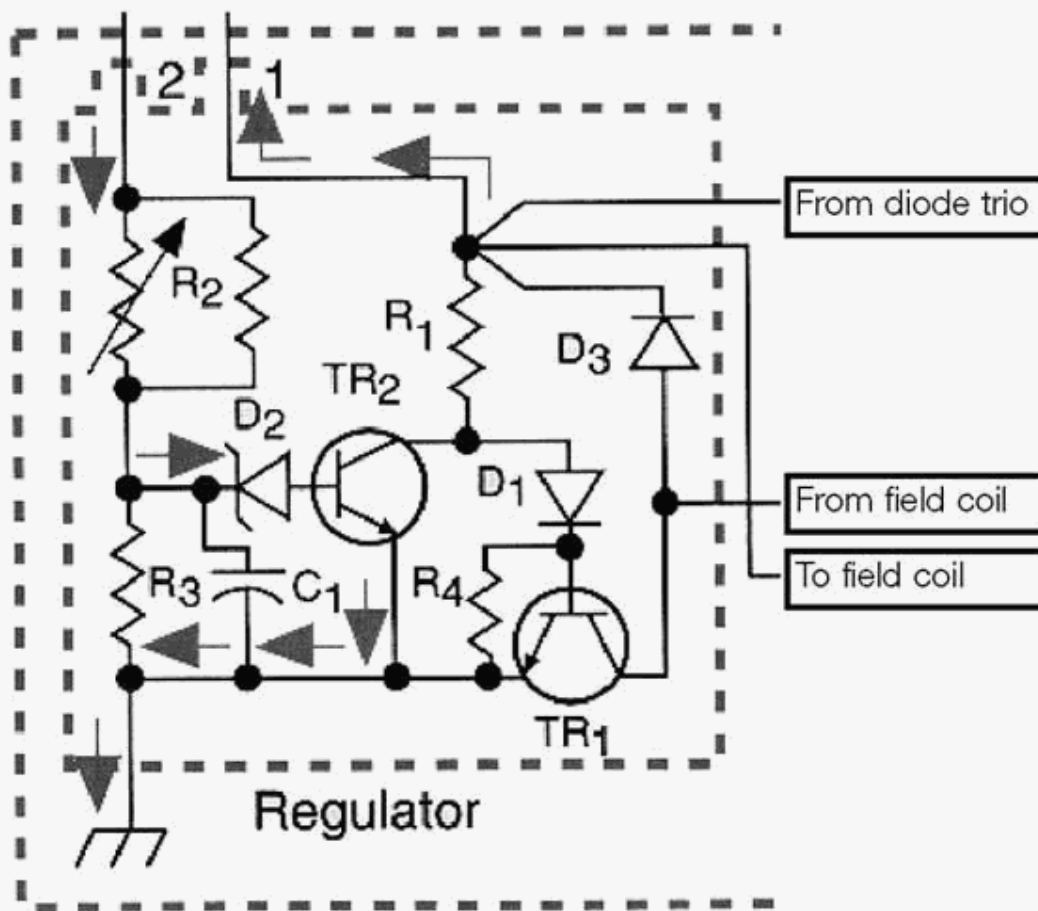
Current flow through Delta wound stator.

Voltage Regulation

Standard Regulator

The Electronic Regulator uses a zener diode that blocks current flow until a specified voltage is obtained.

Sensing current from terminal 2 passes through a thermistor to the zener diode (D2). As the system voltage exceeds the breakdown voltage of the zener diode, current flows through the zener diode turning transistor 2 (TR2) on. With TR2 on transistor 1 (TR1) is shut off.



G03390212

Fig. 22: Regulator Circuit Diagram (1 Of 2)

Courtesy of BMW OF NORTH AMERICA, INC.

Transistor 1 controls field current to the rotor. With TR1 off no current flows to the field coil and the generator has no output.

A voltage drop below the breakdown voltage of the zener diode stops the current flow to TR2 which turns on TR1.

Voltage is again applied to the field allowing the generator to produce voltage.

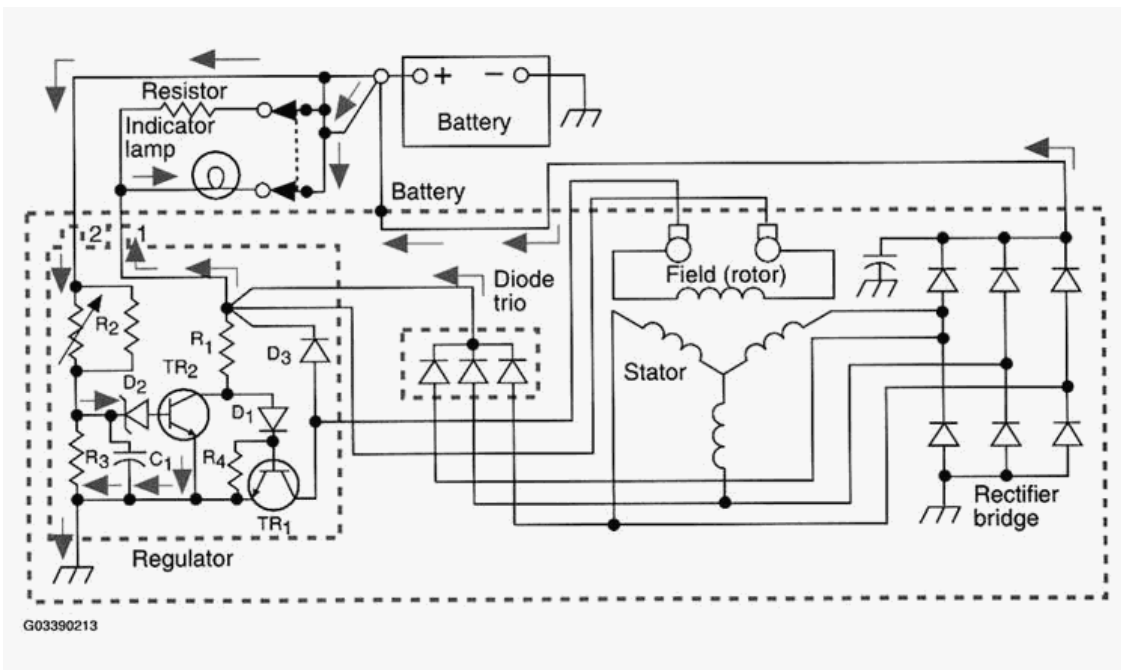


Fig. 23: Regulator Circuit Diagram (2 Of 2)
 Courtesy of BMW OF NORTH AMERICA, INC.

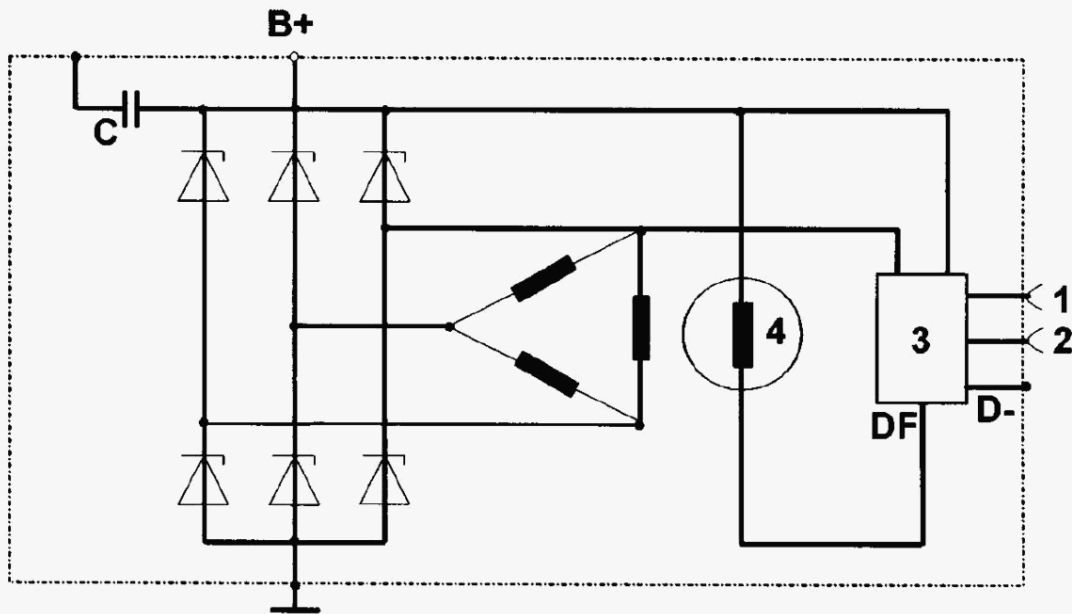
Field coil off, no charging.

Multifunction Controller

The Multifunction Controller regulates voltage in the same manner as the standard voltage regulator. Regulation is through duty cycle control of the field coil.

The differences as compared to the standard regulator are:

- Manner in which malfunction indicator lamp is controlled.
- Connections to wiring harness.



G03390214

Fig. 24: Identifying Multifunction Controller Circuit Diagram
 Courtesy of BMW OF NORTH AMERICA, INC.

Terminal 1:

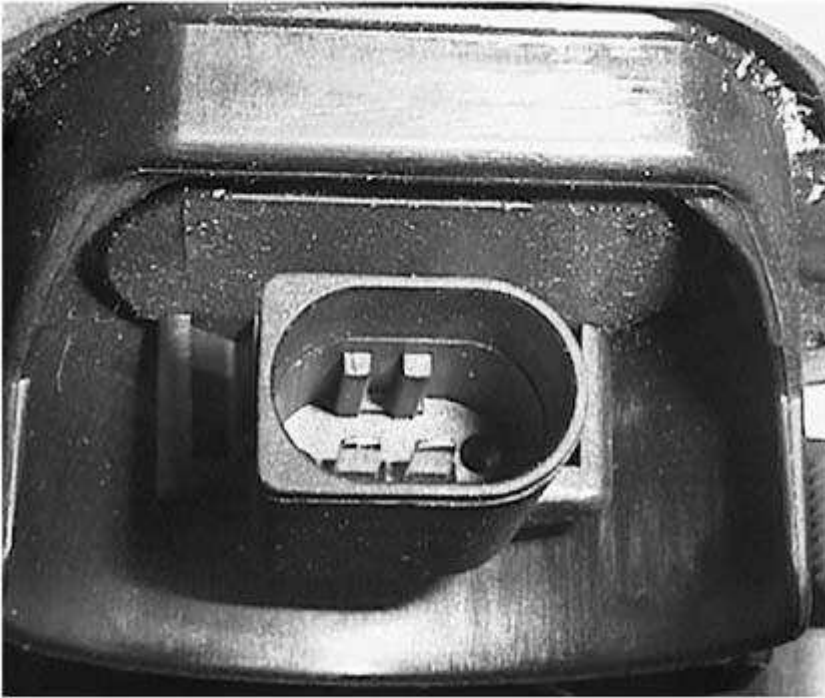
KL 15 from fused source.

Terminal 2:

D+ (KL61) to DME.

B+

Generator output to Battery.



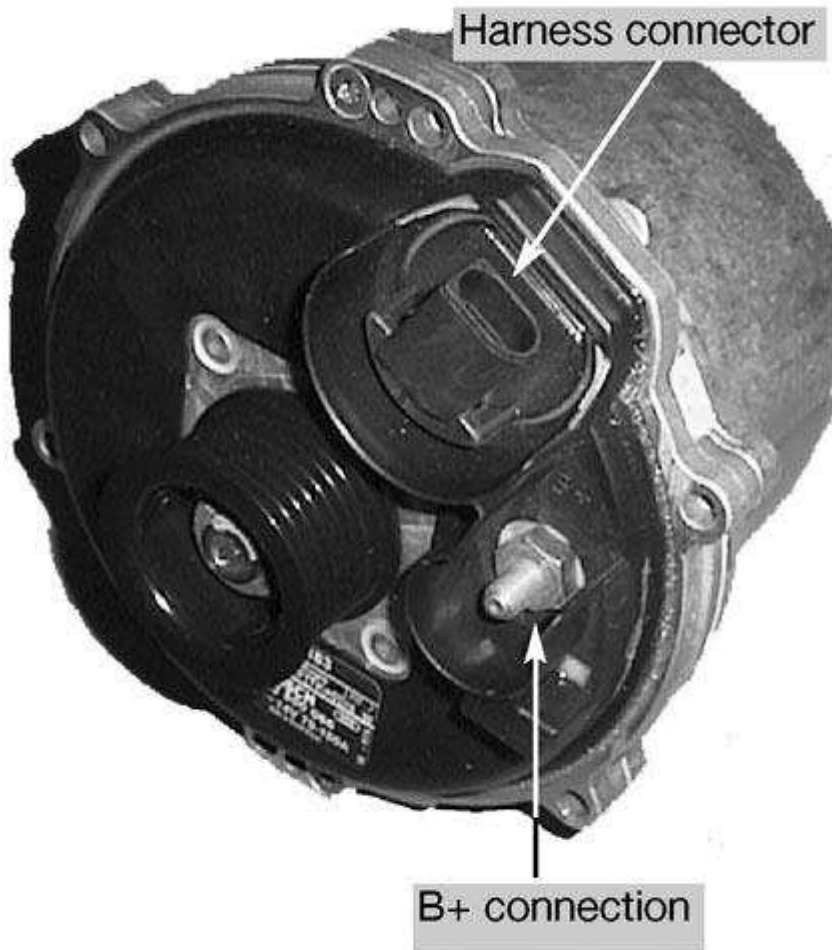
G03390215

Fig. 25: Identifying Two Pin Wiring Harness Connector
Courtesy of BMW OF NORTH AMERICA, INC.

Two Pin wiring harness connector

Harness connector

B+ connection.



G03390216

Fig. 26: Identifying Harness Connector
Courtesy of BMW OF NORTH AMERICA, INC.

CHARGE SYSTEM INDICATOR

Standard Regulator

The Charging System Indicator light operates on the principle of opposing voltage. Battery voltage is supplied to one side of the light bulb, the other side of the bulb is connected to the voltage regulator. With the key turned on, power is sent to the light bulb, through to the regulator. No voltage is being produced by the stator, so there is no voltage from the diode trio. This lack of voltage from the diode trio, allows the voltage from the ignition switch to flow through the regulator to ground. This completes the circuit allowing the charge indicator bulb to burn.

As the generator begins to produce voltage, the output of the diode trio equals battery voltage. This equal voltage is supplied to the light bulb. With equal voltage on each side of the light bulb, no current can flow and

the light is turned off.

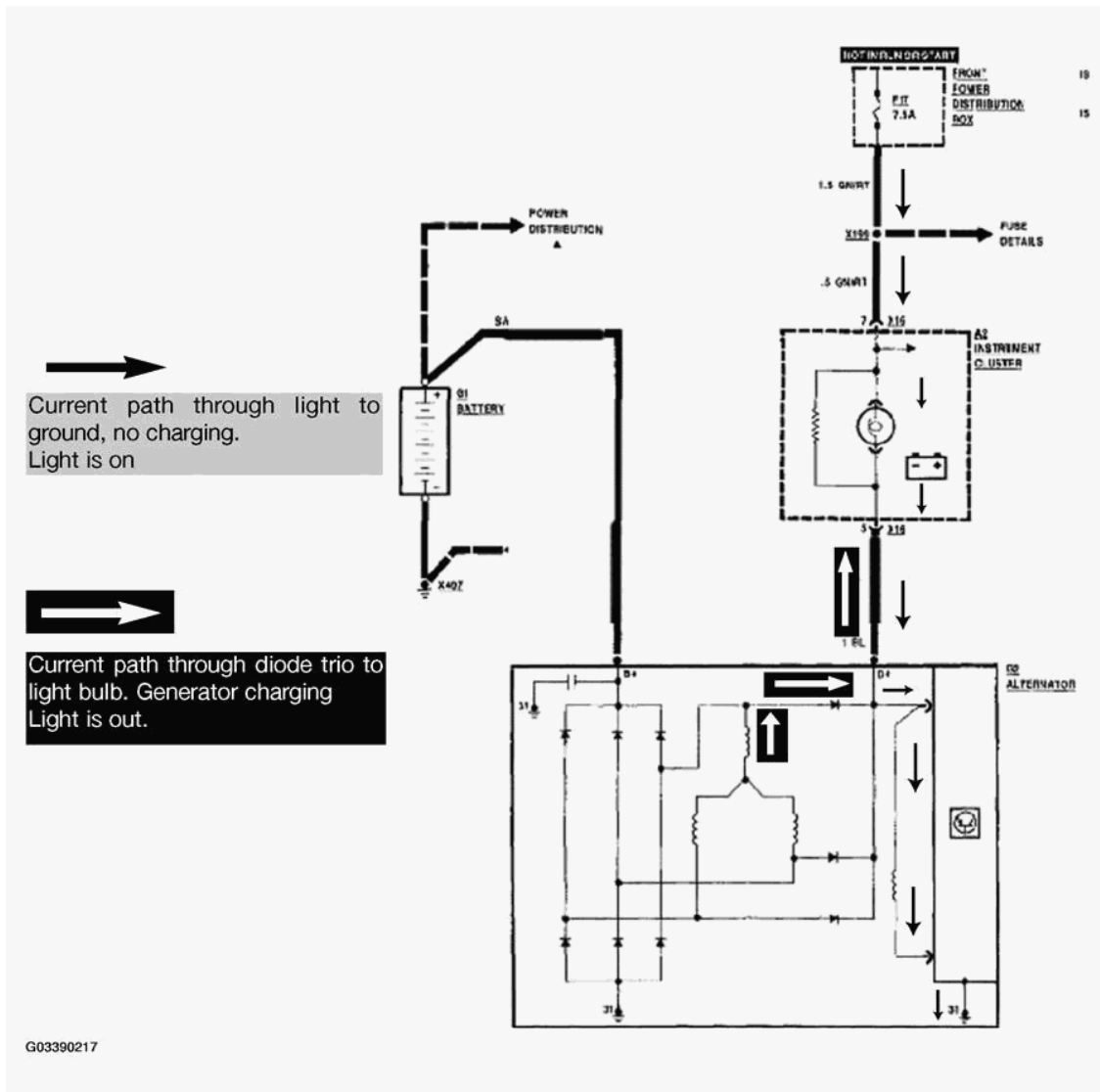


Fig. 27: View Of Charge Indicator System Circuit Diagram
Courtesy of BMW OF NORTH AMERICA, INC.

Multifunction Controller

The charge indicator light is activated by means of an electronic switch integrated into the controller. This switch receives its voltage supply from terminal 15 on the 2 or 3 pin connector on the generator. Terminal D+ is replaced by an isolated electronic terminal 61E in generators with a multifunction controller. The task on this terminal is to activate the battery charge indicator lamp and to indicate to the various loads that the generator is in charge mode.

The indicator lamp is supplied with voltage via terminal 15 from the instrument cluster. The lamp is illuminated when the voltage at terminal 61E is below 1.5v and goes out when the voltage is above 8v.

The indicator is on during the following conditions:

- Key on, engine off.
- Generator not charging.
- Failure of drive belt.
- Interruption of field coil.
- Controller overvoltage.
- Break in charging cable.

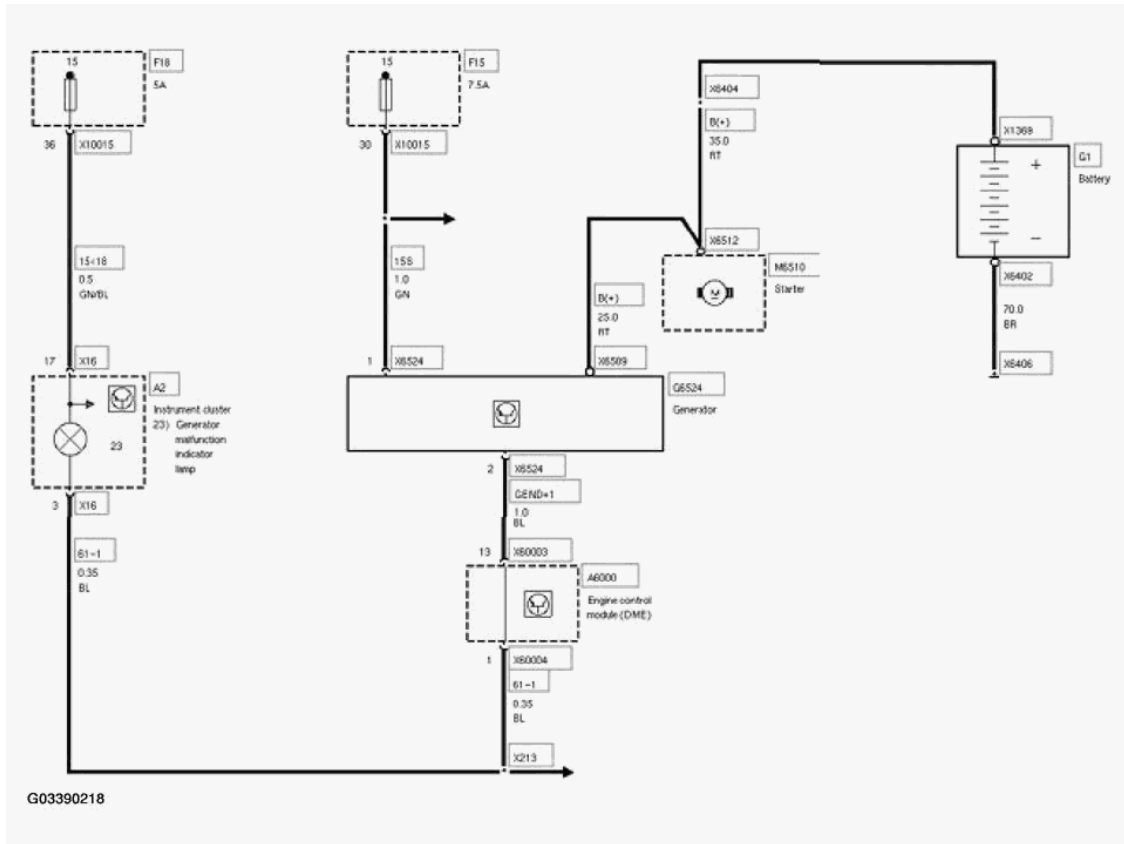


Fig. 28: View Of Multifunction Controller Circuit Diagram
 Courtesy of BMW OF NORTH AMERICA, INC.

GENERATOR DIAGNOSIS

Before beginning any generator diagnosis, ensure that the battery is in good condition and has passed all testing procedures. A weak or defective battery will influence the generator testing.

The generator may be tested using:

- DISplus.
- VAT testing equipment.

Workshop Hint:

Before beginning diagnostic procedures on the charging system do the following:

- Run engine at idle speed for about 5 minutes.
- Switch off all electrical loads.

This is done to ensure the battery is charged to such a level that the generator will not be fully utilized and that loads required during starting (e.g. starter, secondary air pump) will be already switched off.

Testing Generator With DISplus

Two modes of testing are available when using DISplus.

- Testing using Test Plan.
- Testing using Preset Measurement.

Testing Generator Using Test Plan

Testing the charging system using a test plan is the more complete method of testing.

When selecting this mode of testing, other components in the charging system are tested in addition to the generator.

Test plans available:

- Generator (Checks voltage and current output).
- Wiring from generator to battery (Performs voltage drop test).
- Charge indicator lamp (Condition of bulb, wiring and signal to bulb).
- ON delay and Start ON delay (If applicable).
- Ground side circuit wiring (Voltage drop test).

Sub-tests may be available with some of the component testing.

There are many advantages to using the test plan.

1. Complete system testing.
2. Functional description of system on screen.
3. Proper wiring diagrams provided during testing.
4. Test instructions and notes.
5. Instructions for proper test set-up.
6. Display of nominal values.
7. Solutions.

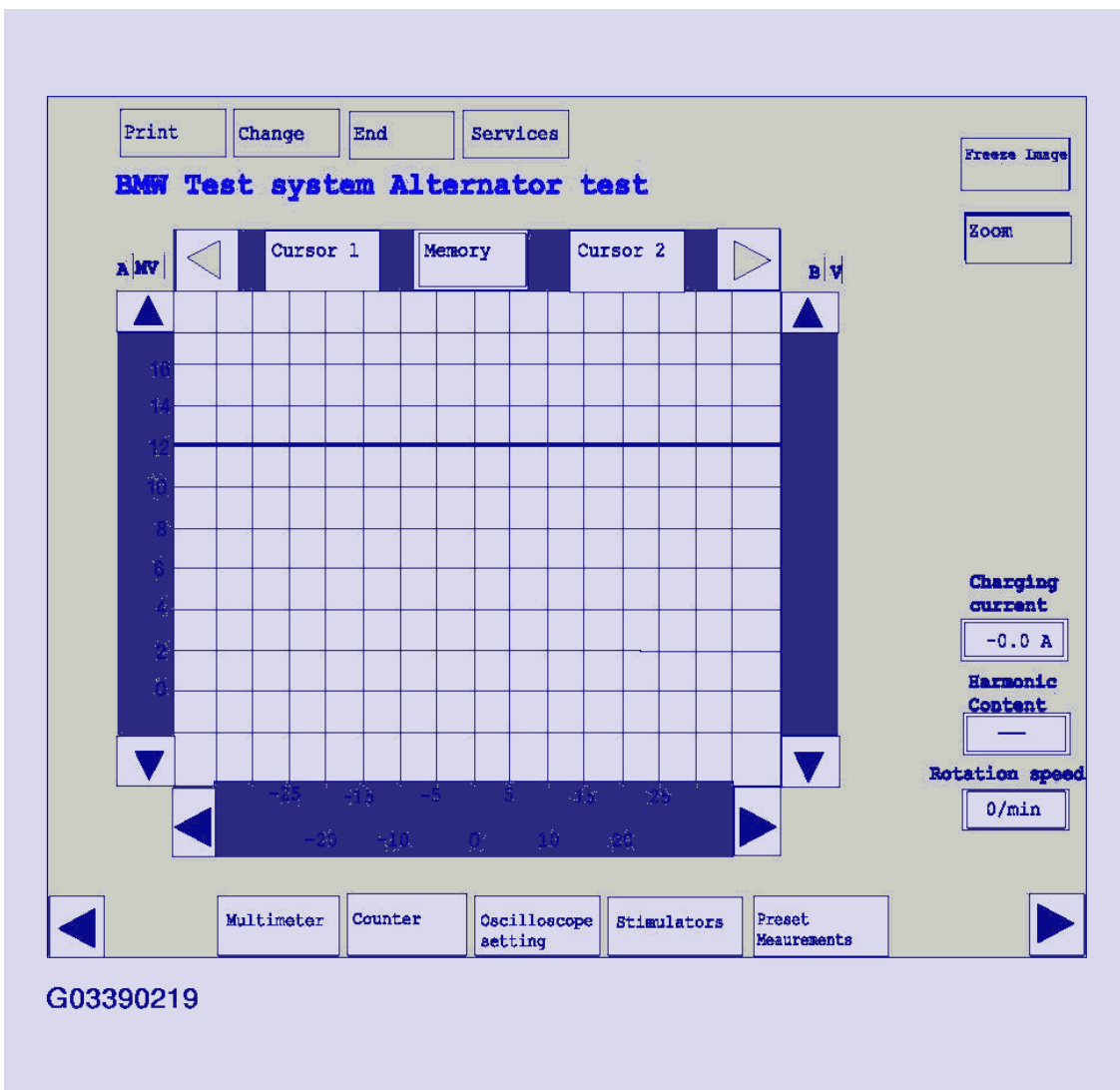


Fig. 29: Identifying DISplus Screen

Courtesy of BMW OF NORTH AMERICA, INC.

Testing Generator Using Measurement System

Enter the measurement system and select **Preset Measurements**.

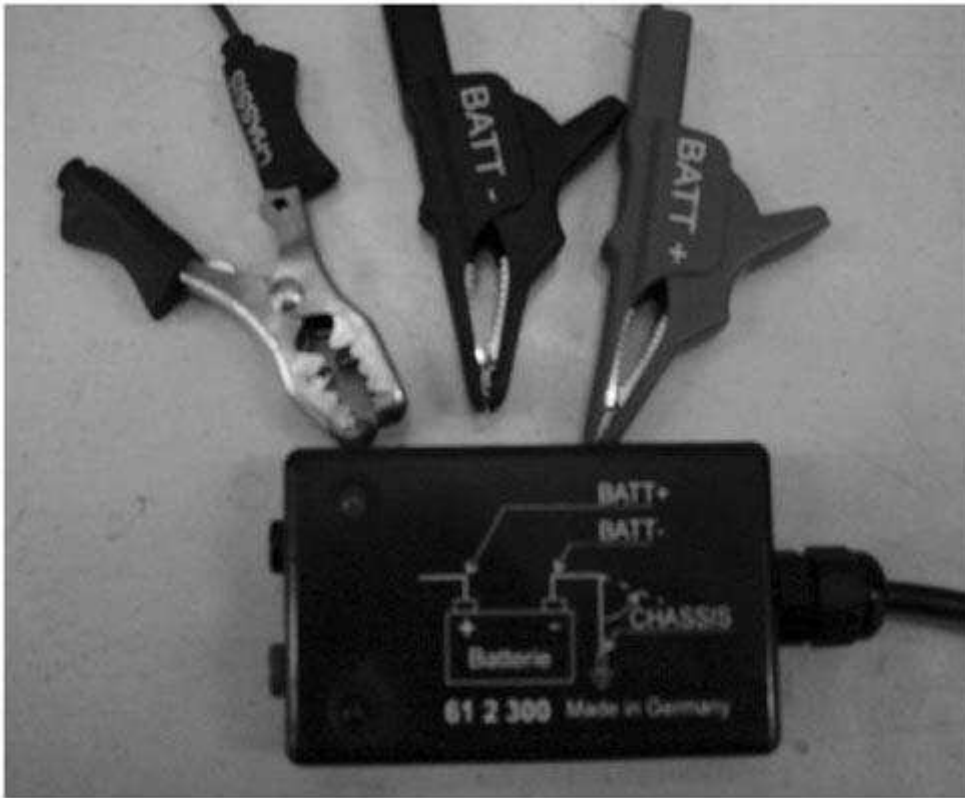
Instruction on the proper hook-ups required are available through the **HELP** button, selecting **Help using Preset Measurement**.

The oscilloscope will display pre-configured for the testing.

Diagnostic information available through oscilloscope.

- Voltage Graph.
- Charging Current.
- Harmonic Content.

- Rotation Speed (Engine RPM).



G03390220

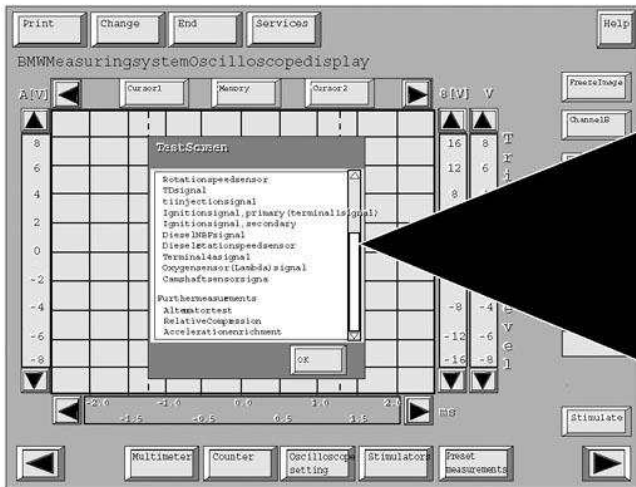
Fig. 30: View Of Special Tool 61 2 300
Courtesy of BMW OF NORTH AMERICA, INC.

Harmonic Content:

This is an expression of AC voltage contained in DC voltage.

The higher the percentage of harmonic content the larger the amount of residual AC voltage in the DC voltage.

High residual AC voltage is caused by weak or failing diodes in the generator. Generators which have harmonic content readings higher than specified (In TIS) should be replaced.



Signal Tests

- * Wire Tests
- * Potentiometer Tests

Signal Measurements

- * Status Diagnostic Socket
- * Status of OBD Socket
- * Engine Speed Sensor Signal
- * TD Signal
- * TI Injection Signal
- * Ignition Signal, Primary (Terminal 1 Signal)
- * Ignition Signal, Secondary
- * Diesel NBF Signal
- * Diesel Engine Speed Sensor Signal
- * Terminal 4a Signal
- * Oxygen Sensor (Lambd-a) Signal
- * Idle Actuator Signals
- * Throttle Valve Potentiometer Signal
- * Camshaft Sensor Signal

Futher Measurements

- * Alternator Test
- * Absolute Compression
- * Relative Compression
- * Smooth Running
- * Xenon Headlight Test Up to 8/99
- * Xenon Headlight Test from 9/98

G03390221

Fig. 31: Functional Description Of System On Screen
Courtesy of BMW OF NORTH AMERICA, INC.

GENERAL INFORMATION

CIP Programming - Overview

CIP PROGRAMMING

CIP PROGRAMMING SCREENS

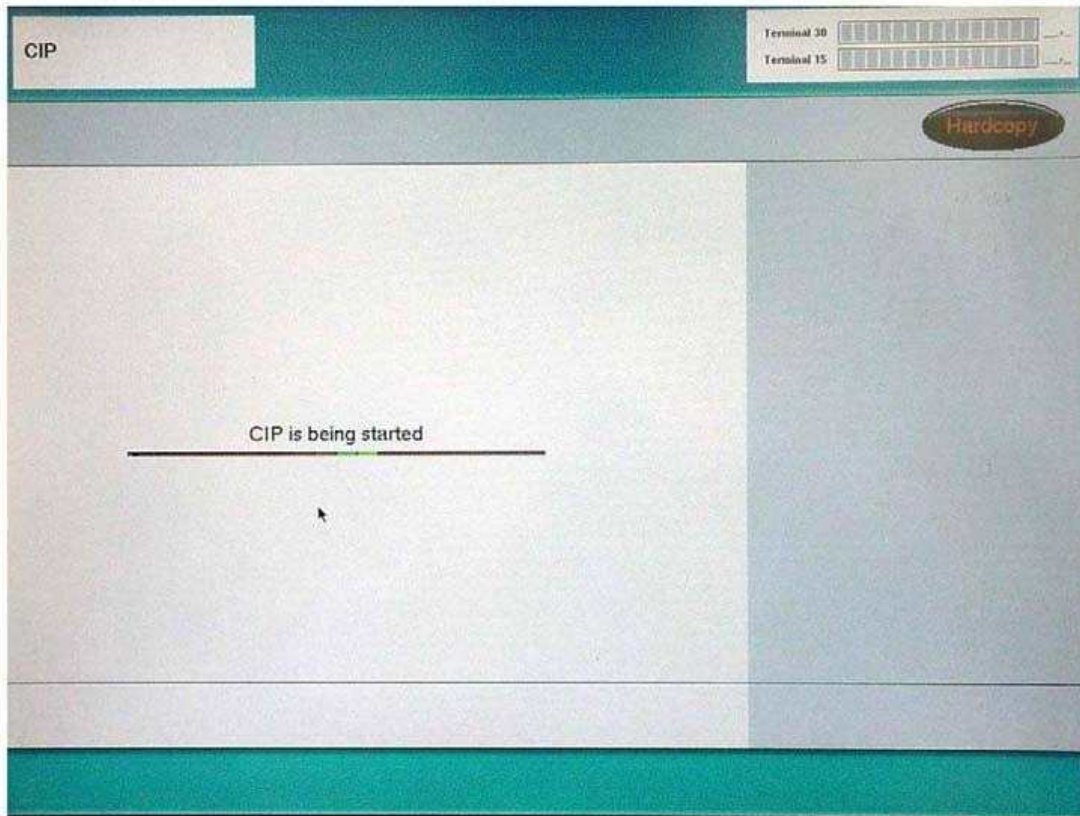
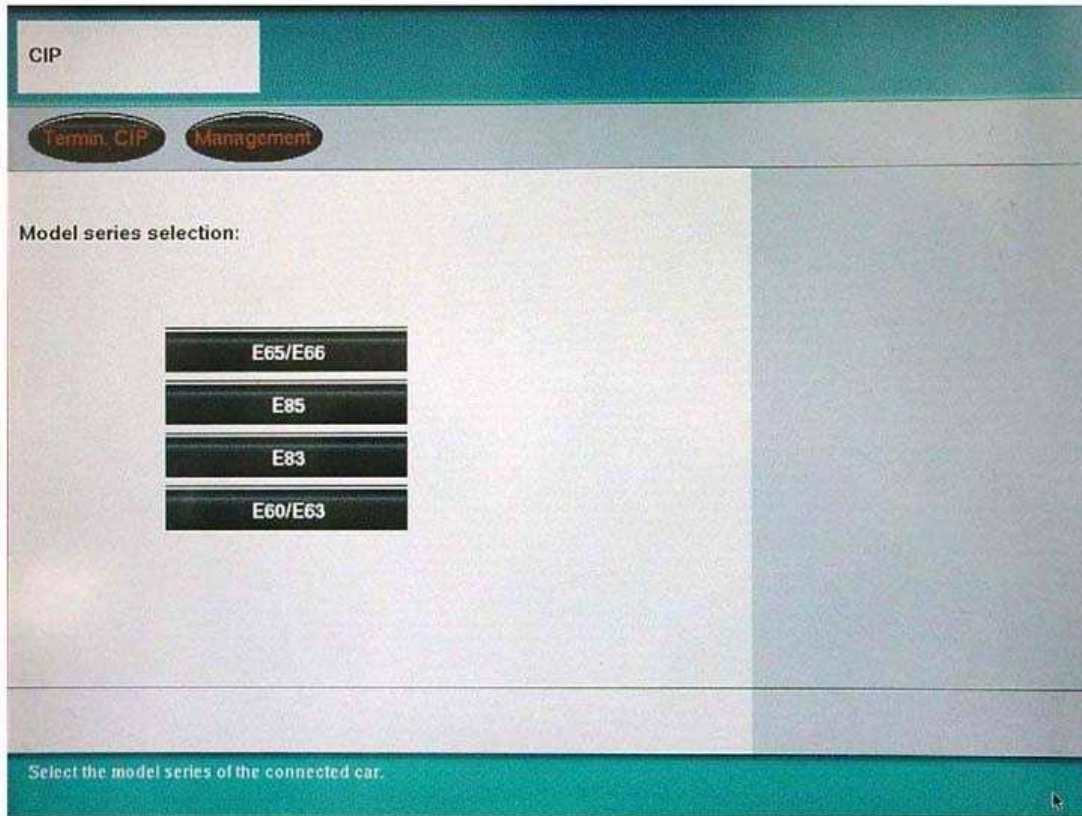


Fig. 1: CIP Programming Screen

Courtesy of BMW OF NORTH AMERICA, INC.

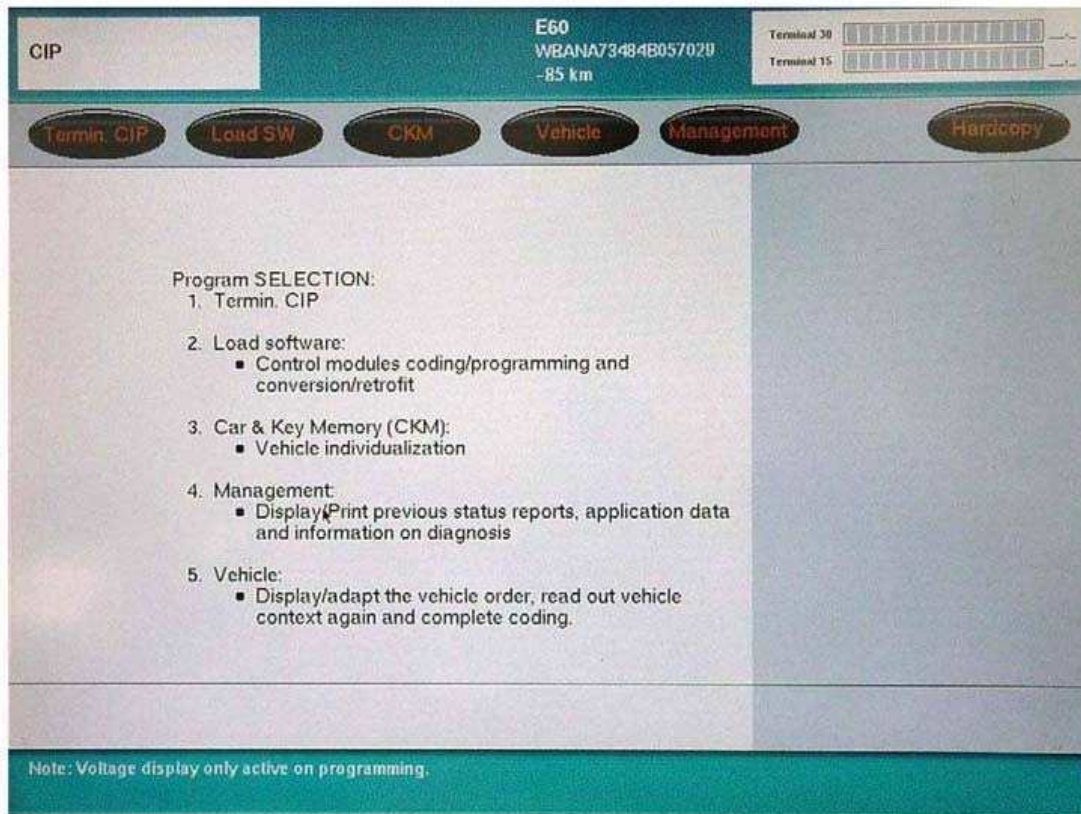
The opening screen when CIP is started.

Choose which vehicle you will be programming.



G03399790

Fig. 2: Vehicle Selecting Programming Screen
Courtesy of BMW OF NORTH AMERICA, INC.



G03399791

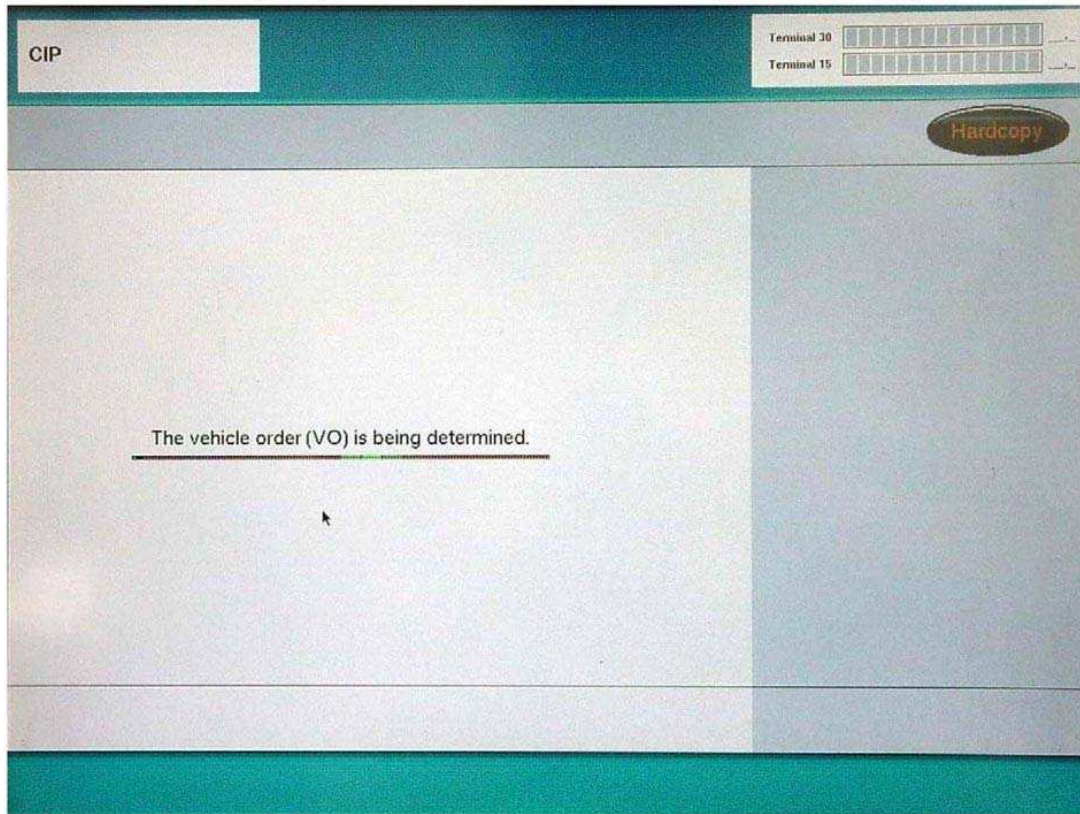
Fig. 3: Programming Screen - Retrofit Select
Courtesy of BMW OF NORTH AMERICA, INC.

Select depending upon programming required.

To retrofit select **Load SW**.

To update a vehicle select **Vehicle**.

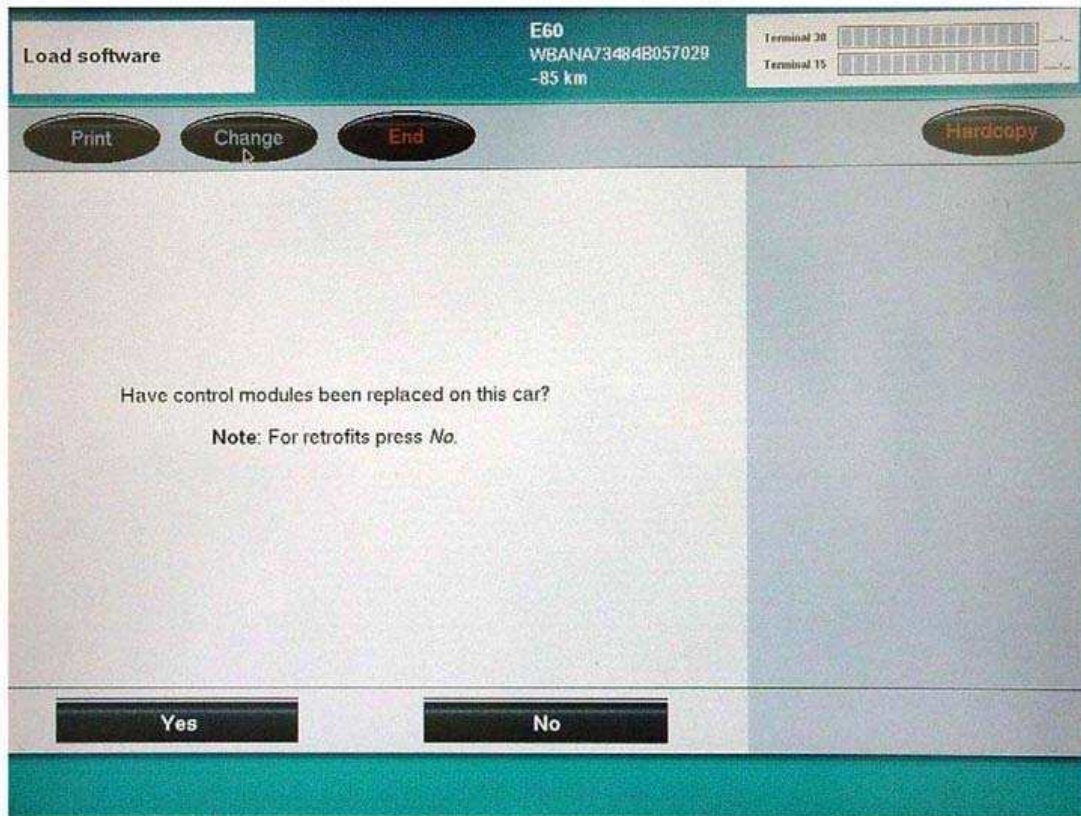
Selecting Vehicle will ensure that complete encoding is performed.



G03399792

Fig. 4: Programming Screen - Load Software
Courtesy of BMW OF NORTH AMERICA, INC.

Regardless of whether you have selected Load SW or Vehicle, the VO will be determined.

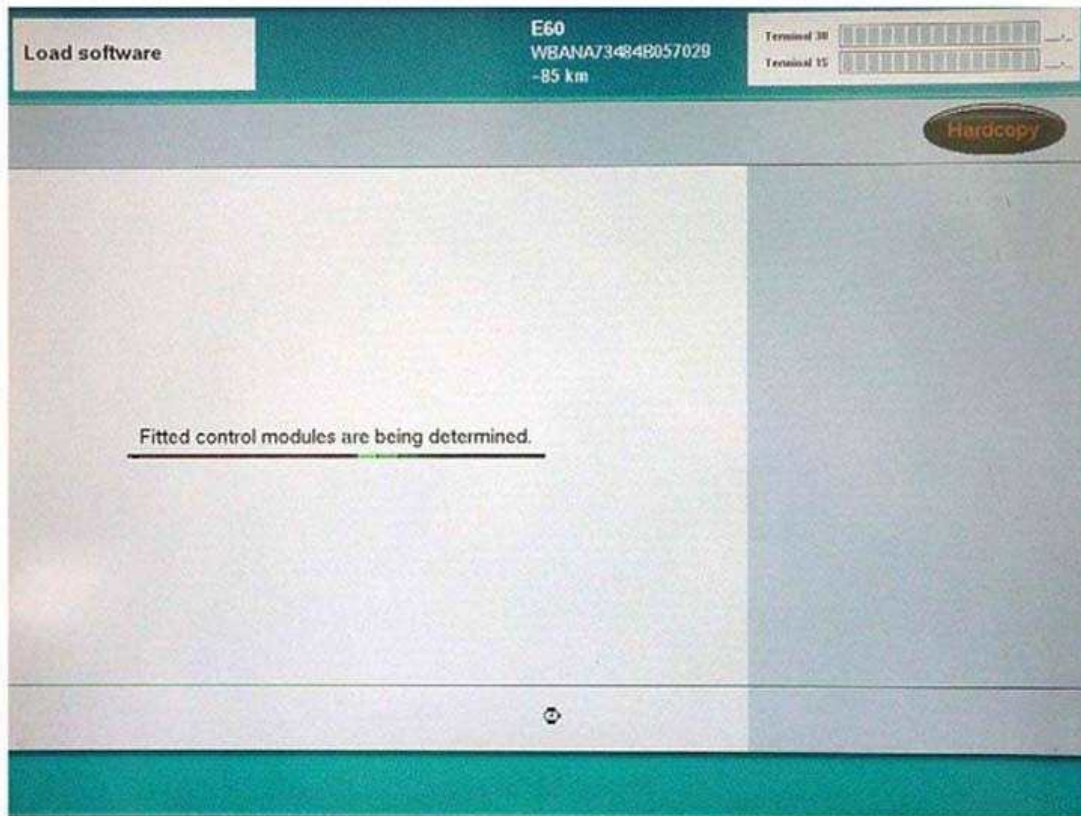


G03399793

Fig. 5: Programming Screen - Determine
Courtesy of BMW OF NORTH AMERICA, INC.

A **YES** selection will lead you to choose which control module(s) have been replaced.

A **NO** selection will lead you to **Retrofits** .

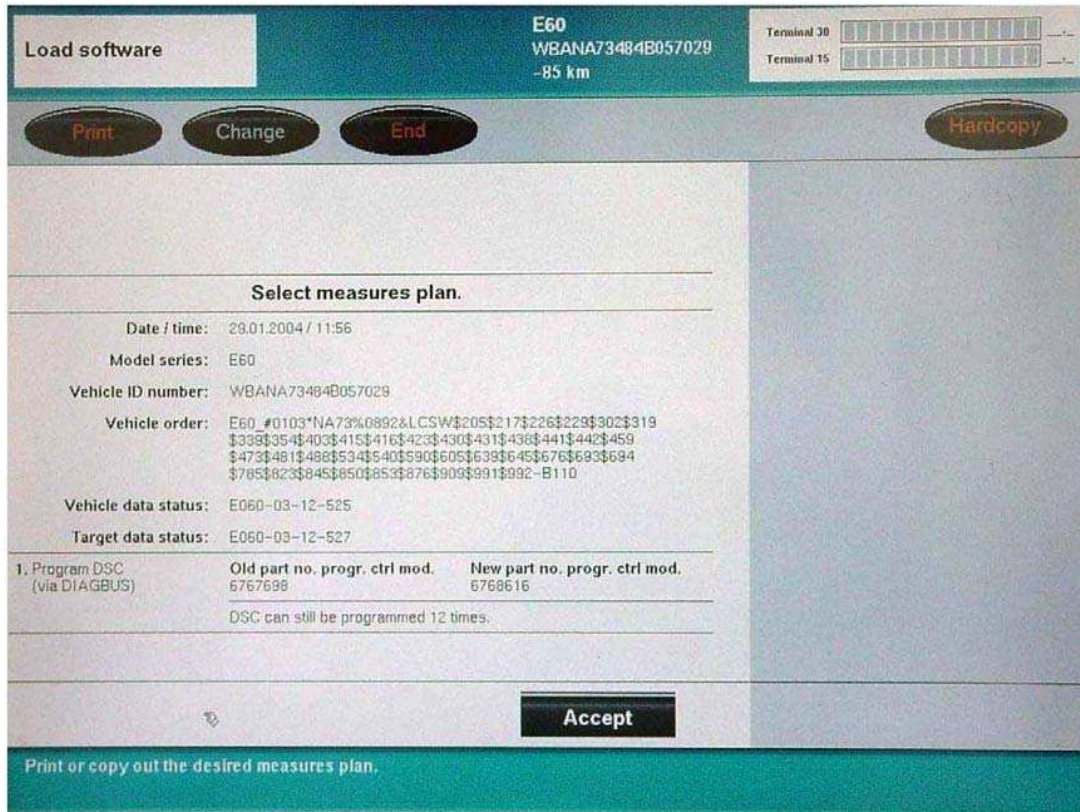


G03399794

Fig. 6: Programming Screen - Measure Plan

Courtesy of BMW OF NORTH AMERICA, INC.

After selecting YES fitted control modules will be determined.



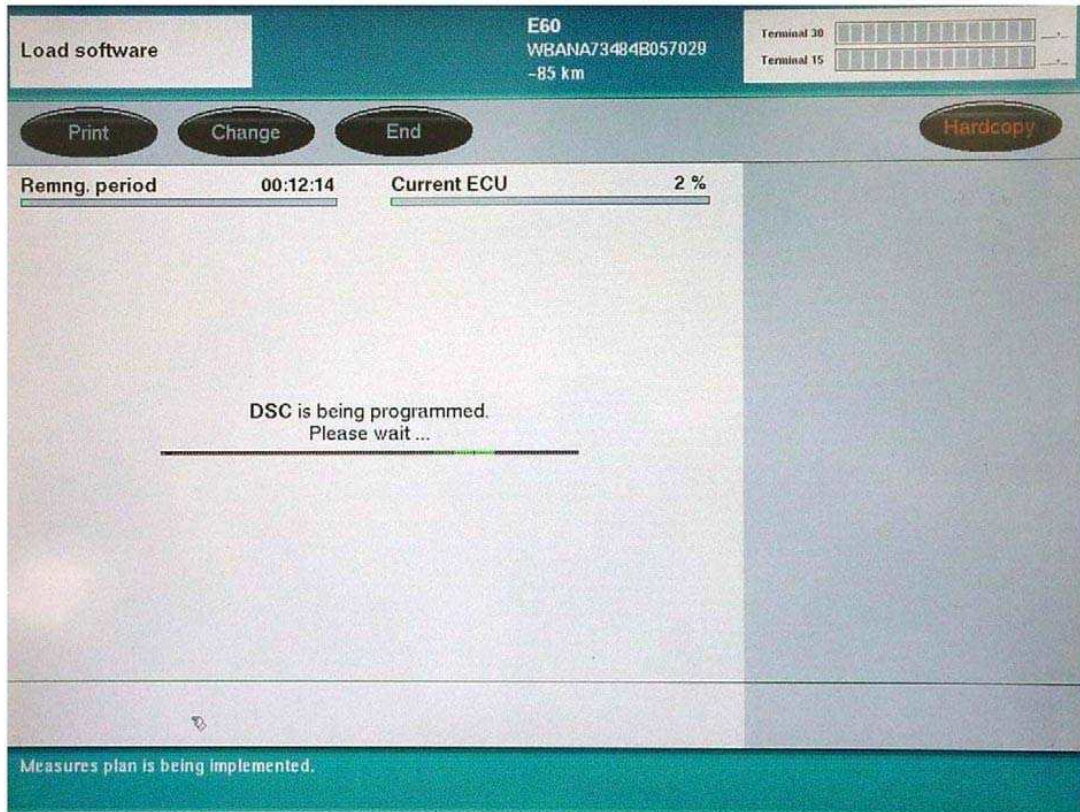
G03399795

Fig. 7: Programming Screen - Control Modules
 Courtesy of BMW OF NORTH AMERICA, INC.

After determining the fitted modules, a measures plan will be made. At this point you will be notified if control modules need to be replaced.

Control module replacement is required if the hardware level in a module can not be upgraded to a high enough software level.

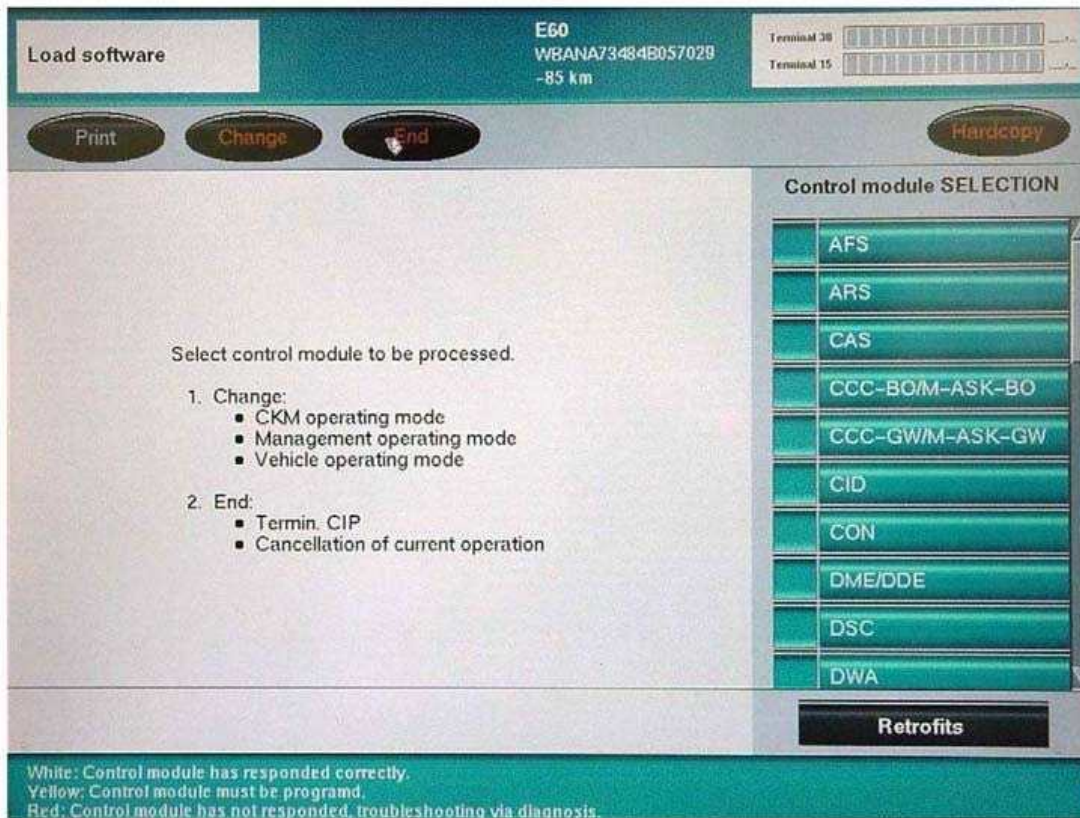
In the case above no modules need replacement, in fact on the DSC needs to be reprogrammed.



G03399796

Fig. 8: Programming Screen - DSC Being
Courtesy of BMW OF NORTH AMERICA, INC.

DSC programming is being carried out.

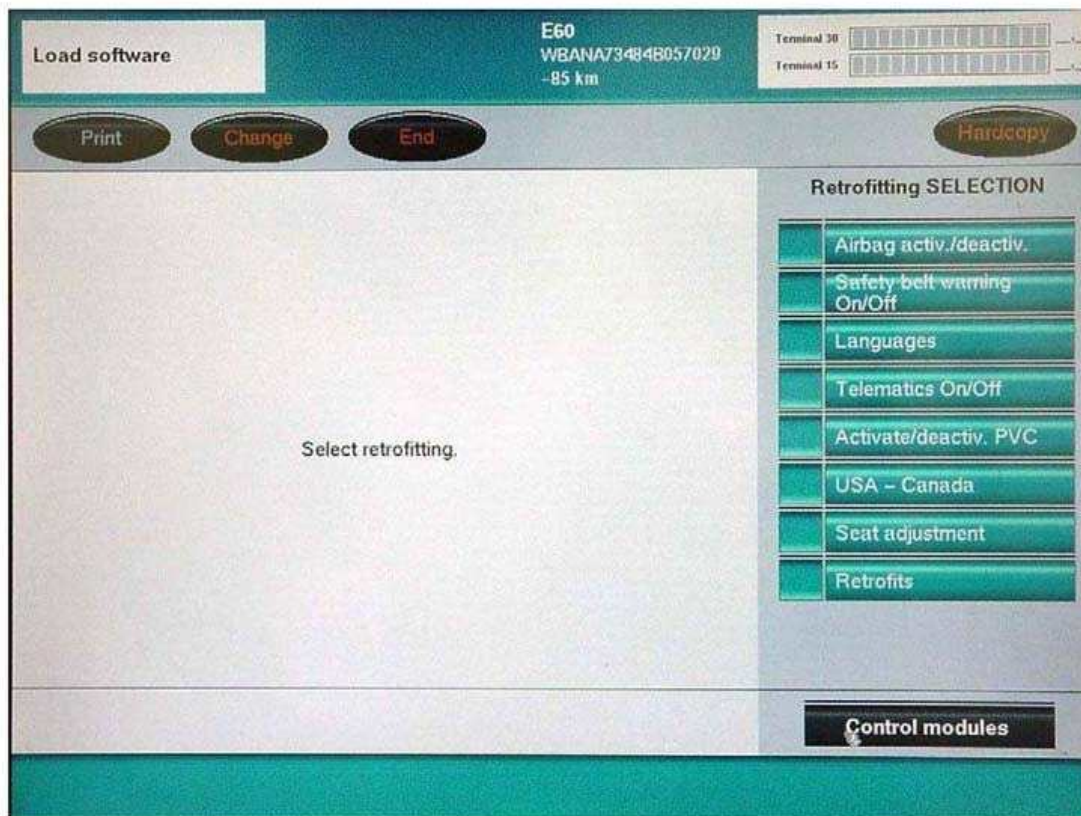


G03399797

Fig. 9: Programming Screen - Retrofit Programming
Courtesy of BMW OF NORTH AMERICA, INC.

If you selected no earlier (Have any control modules been replaced?) you would come to this screen.

Here selections to reprogram individual modules can be made or entry into retrofit programming.

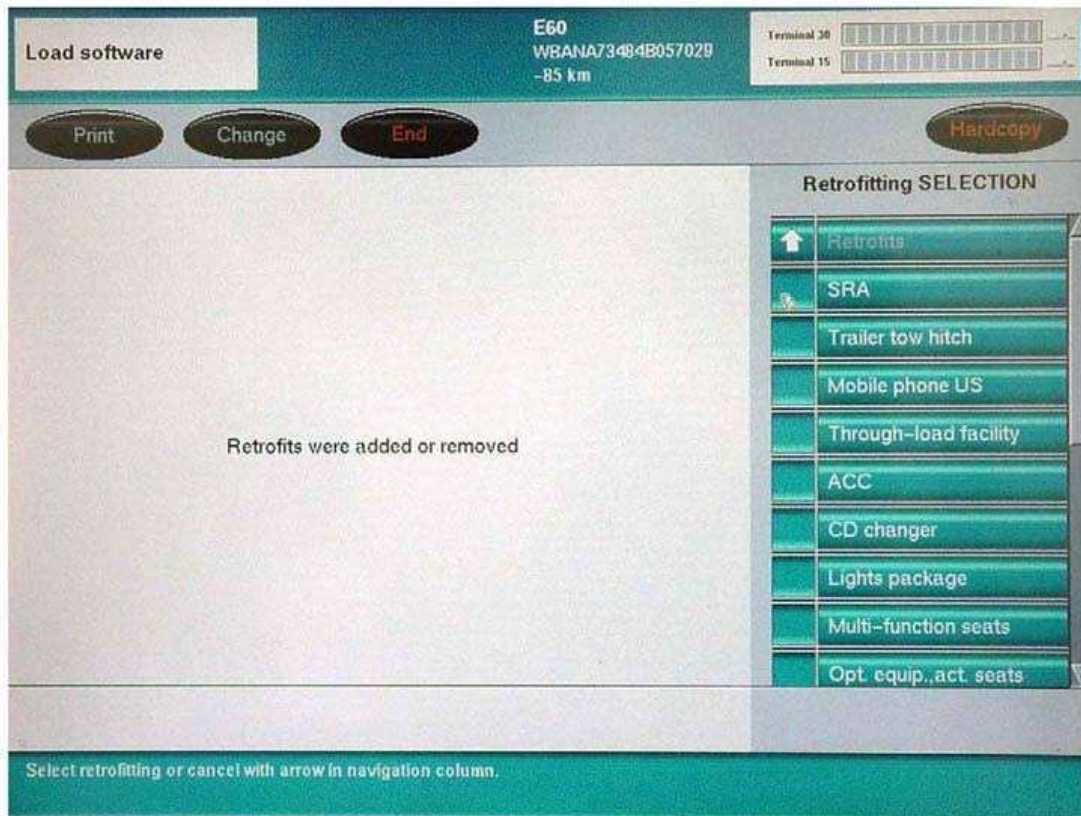


G03399798

Fig. 10: Programming Screen - Selecting Retrofit
Courtesy of BMW OF NORTH AMERICA, INC.

Selecting retrofit on the previous screen brings you here.

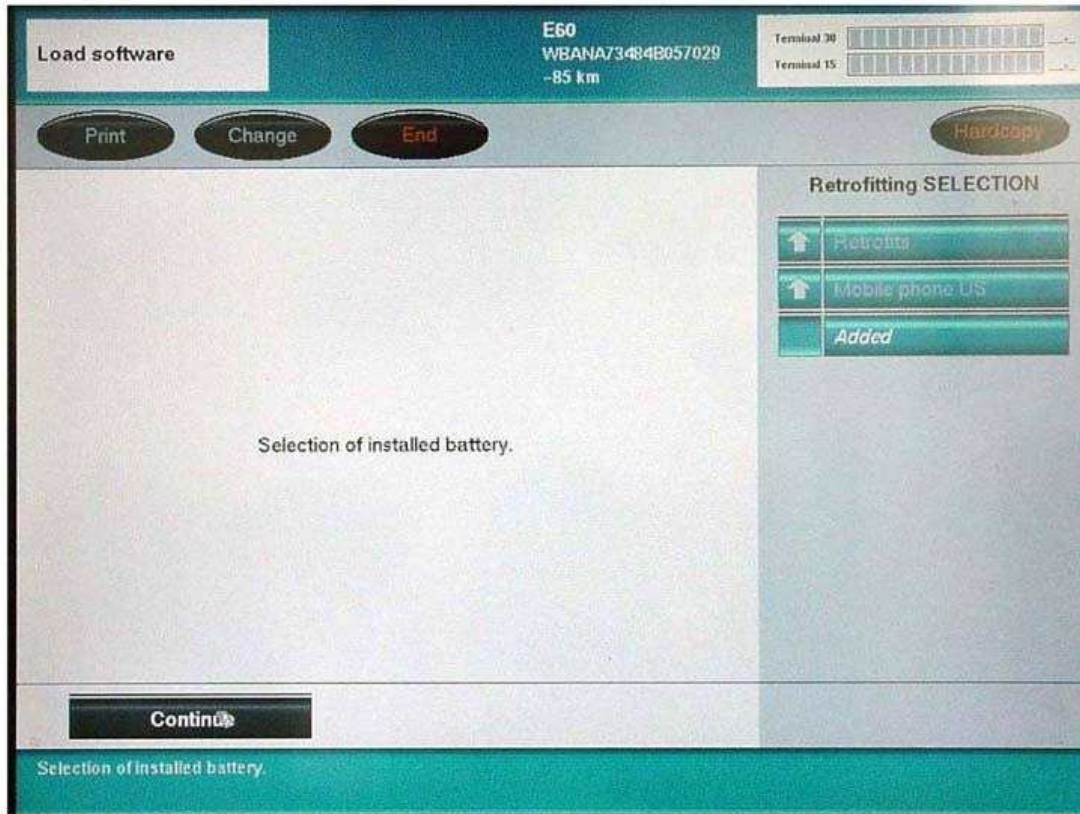
More selections (such as mobile phone USA) are on the next page, accessed by pressing retrofits on bottom of selection list.



G03399799

Fig. 11: Programming Screen - Retrofit
Courtesy of BMW OF NORTH AMERICA, INC.

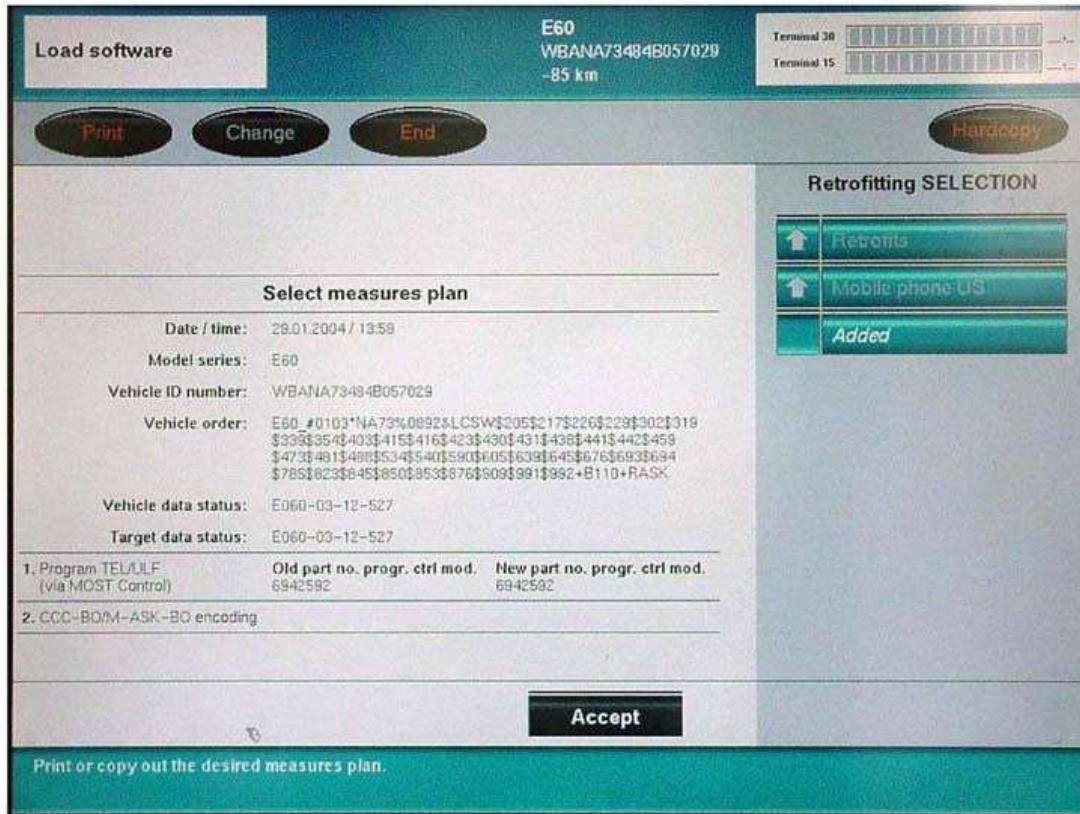
Select the retrofit, in this case the Mobile phone USA.



G03399800

Fig. 12: Programming Screen - Battery
Courtesy of BMW OF NORTH AMERICA, INC.

You will be asked which battery the car has installed.

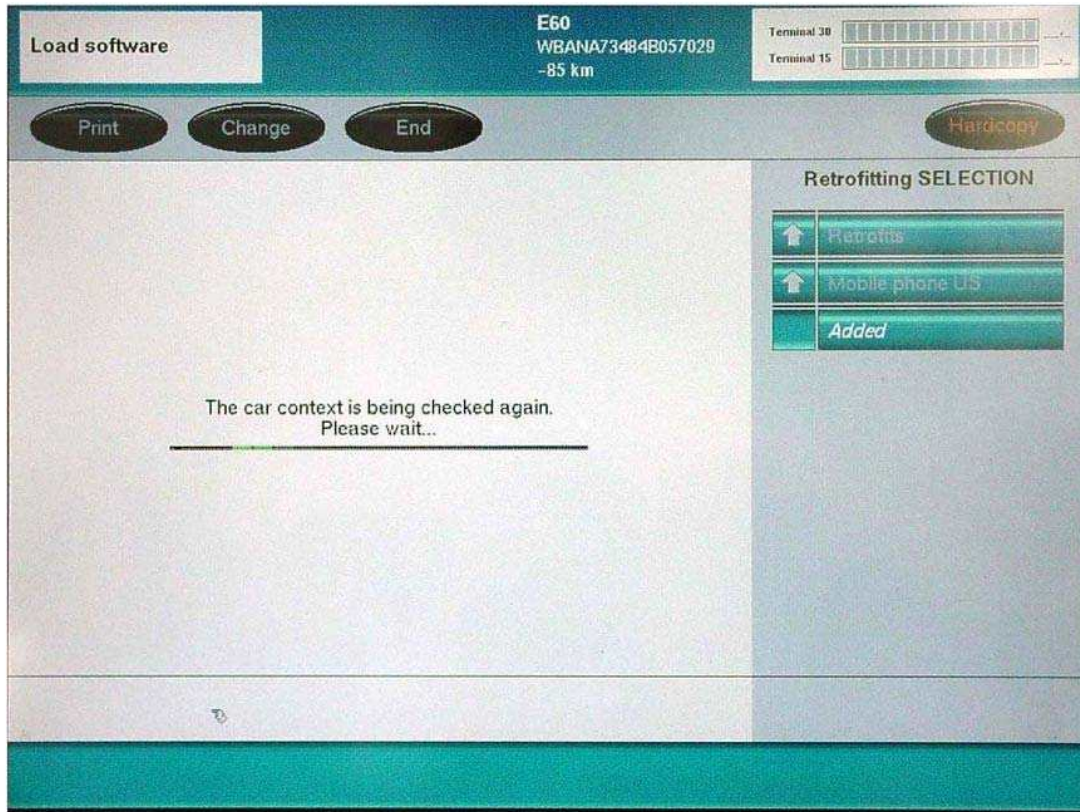


G03399801

Fig. 13: Programming Screen - Measures Plan
 Courtesy of BMW OF NORTH AMERICA, INC.

A measures plan will be determined and displayed to accomplish the retrofit.

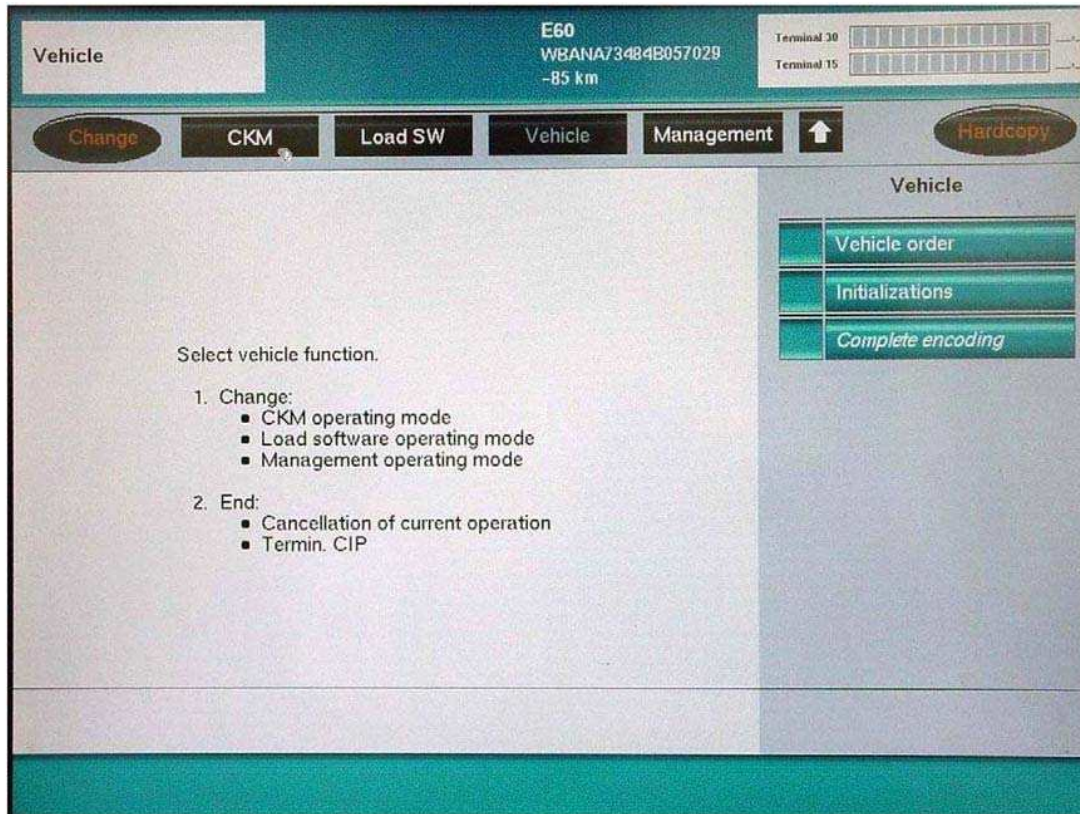
Press Accept.



G03399802

Fig. 14: Programming Screen - Retrofit Being Carried Out
Courtesy of BMW OF NORTH AMERICA, INC.

The retrofit is being carried out.



G03399803

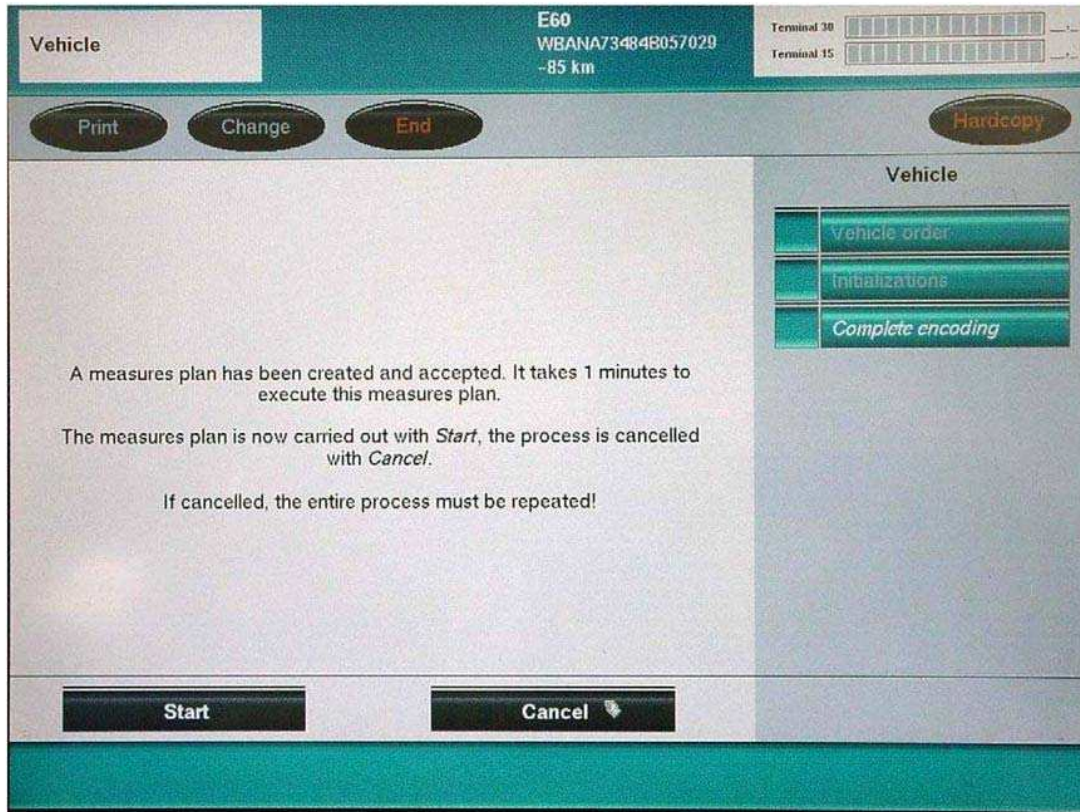
Fig. 15: Programming Screen - Vehicle Function
Courtesy of BMW OF NORTH AMERICA, INC.

By selecting Vehicle initially when entering CIP, you will save time when updating the vehicle.

Updating through Load SW differs from Measures Plan determined through Vehicle.

When updating through Load SW only the module programmed is re-coded. You still need to come to this screen and perform Complete Encoding.

By updating through Vehicle, the entire car is automatically encoded, after the programming is complete.



G03399804

Fig. 16: Programming Screen - Pressing Start
Courtesy of BMW OF NORTH AMERICA, INC.

Press start to begin the programming and encoding procedure.

1986-06 GENERAL INFORMATION

Coding And Programming - Overview - All Models

INTRODUCTION TO CODING & PROGRAMMING

Model: All

Production: All

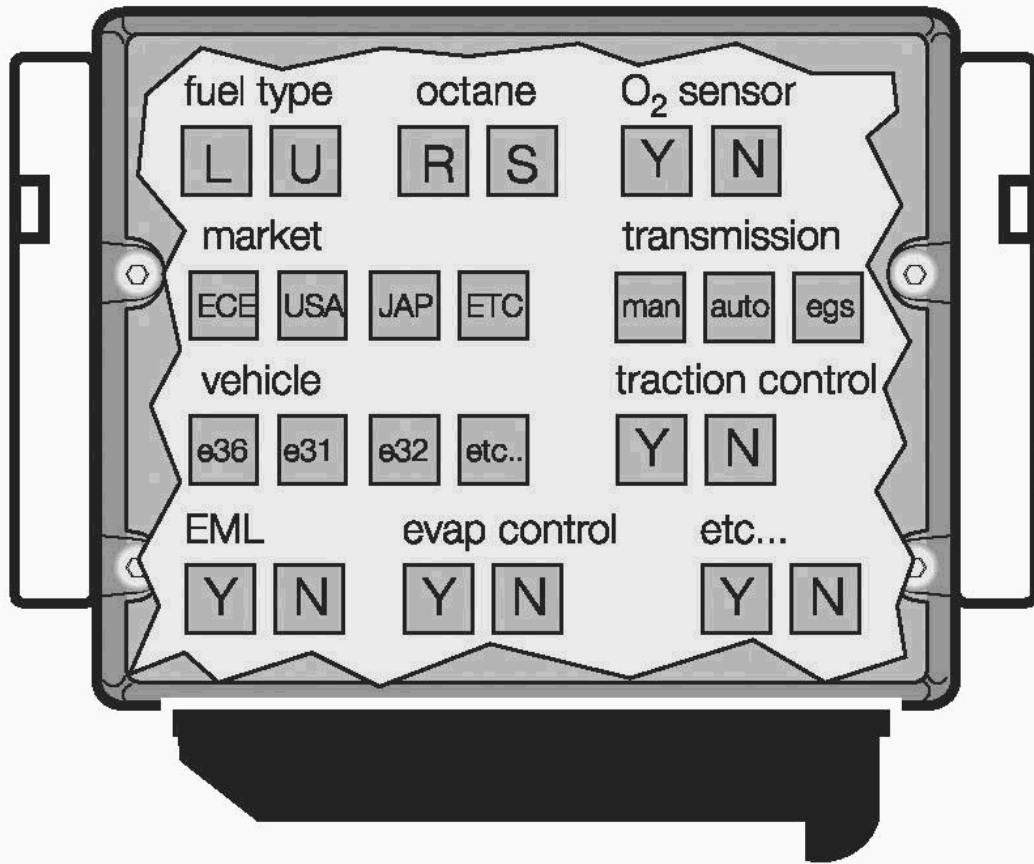
WHAT IS CODING?

It is a process utilized by BMW, which groups system specific operating requirements (Data) together and then assigns a label/code to each of these groups of data. The various groups of data are all pre-loaded into system specific "codable" control modules, along with a basic set of operating instructions (Program).

Types of operating requirements:

- Nominal values of device input signals (0.25V to 2.5V, 5W - 25W, ...)
- Type of device input signal (PWM, square wave, analog ...)
- Operational parameters (device activation/deactivation time, ...)
- Market specific operations (O2 Sensors, Fuel Type, Emission Control, ...)
- Country Specific Regulations (U.S., Canada, Japan, UK, ECE, ...)
- Powertrain Configurations (Manual, Auto, TLEV, ULEV, SULEV, Diesel, ...)

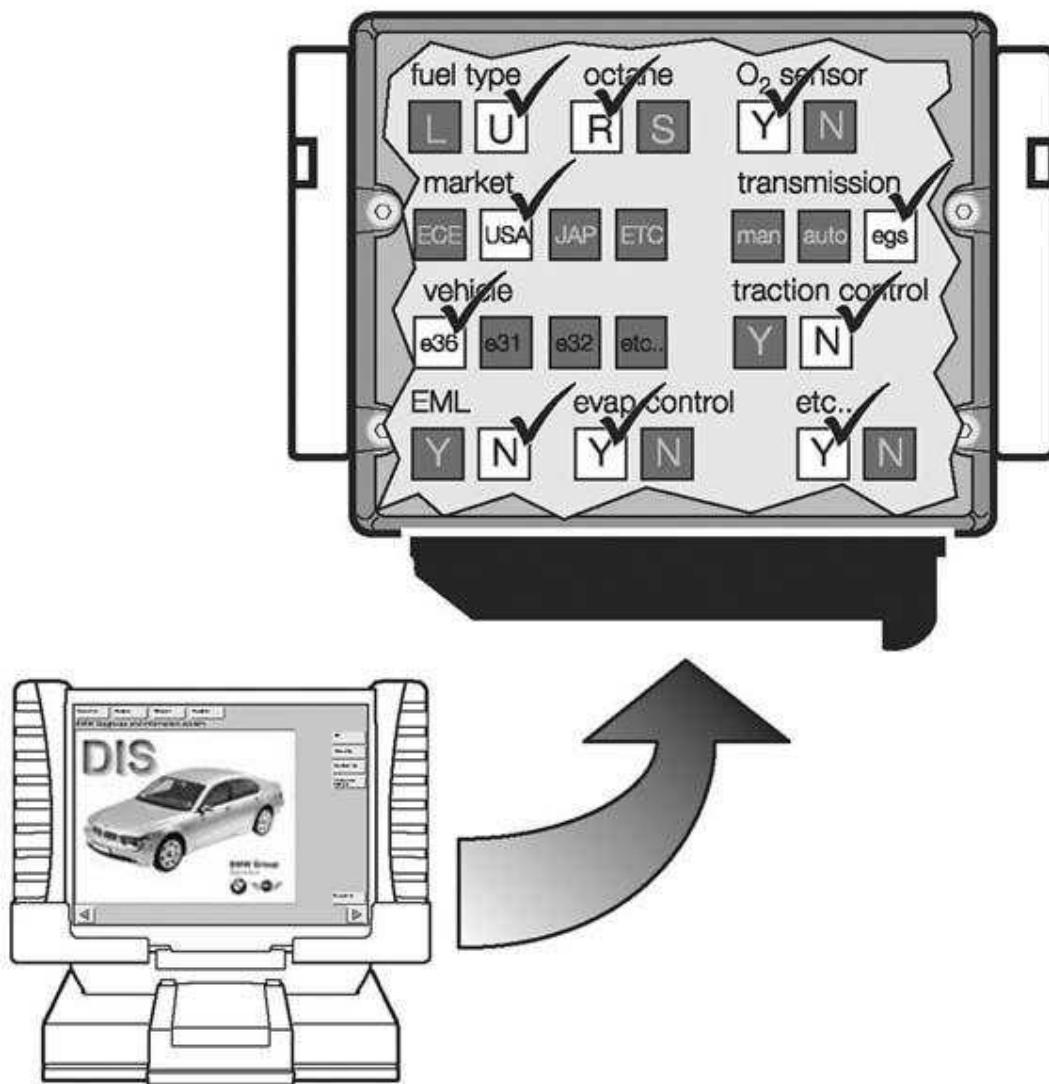
The procedure of assigning one specifically labeled group of data to the operating program of a specific control module/component is referred to as "coding".



G03397851

Fig. 1: Identifying Data Before Coding

Courtesy of BMW OF NORTH AMERICA, INC.



G03397852

Fig. 2: Identifying Data After Coding
 Courtesy of BMW OF NORTH AMERICA, INC.

A "codable" control module has a basic operating program already installed along with several specific variations of operating data. The coding process allows a specific set of operating data to be assigned to the basic operating program of that module/component, with respect to its specific application.

Coding can be performed for some systems/components:

- By installing a specific plug (coding plug) into a device/component
- By entering a 4 digit alpha-numeric code (variant code) via the programming selection on

DISplus/GT1/SSS

- Selecting customer specific system operational settings from a list of available features (VKM)
- Automatically by selecting a specific coding process available via ZCS Coding or CIP using the DISplus/GT1/SSS

NOTE: **Codable control modules/components are system specific, which means that not all control modules are codable.**

WHAT IS PROGRAMMING?

It is a process utilized by BMW to load application/system specific operating instructions



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Fig. 3: Identifying Data Before Programming
Courtesy of BMW OF NORTH AMERICA, INC.

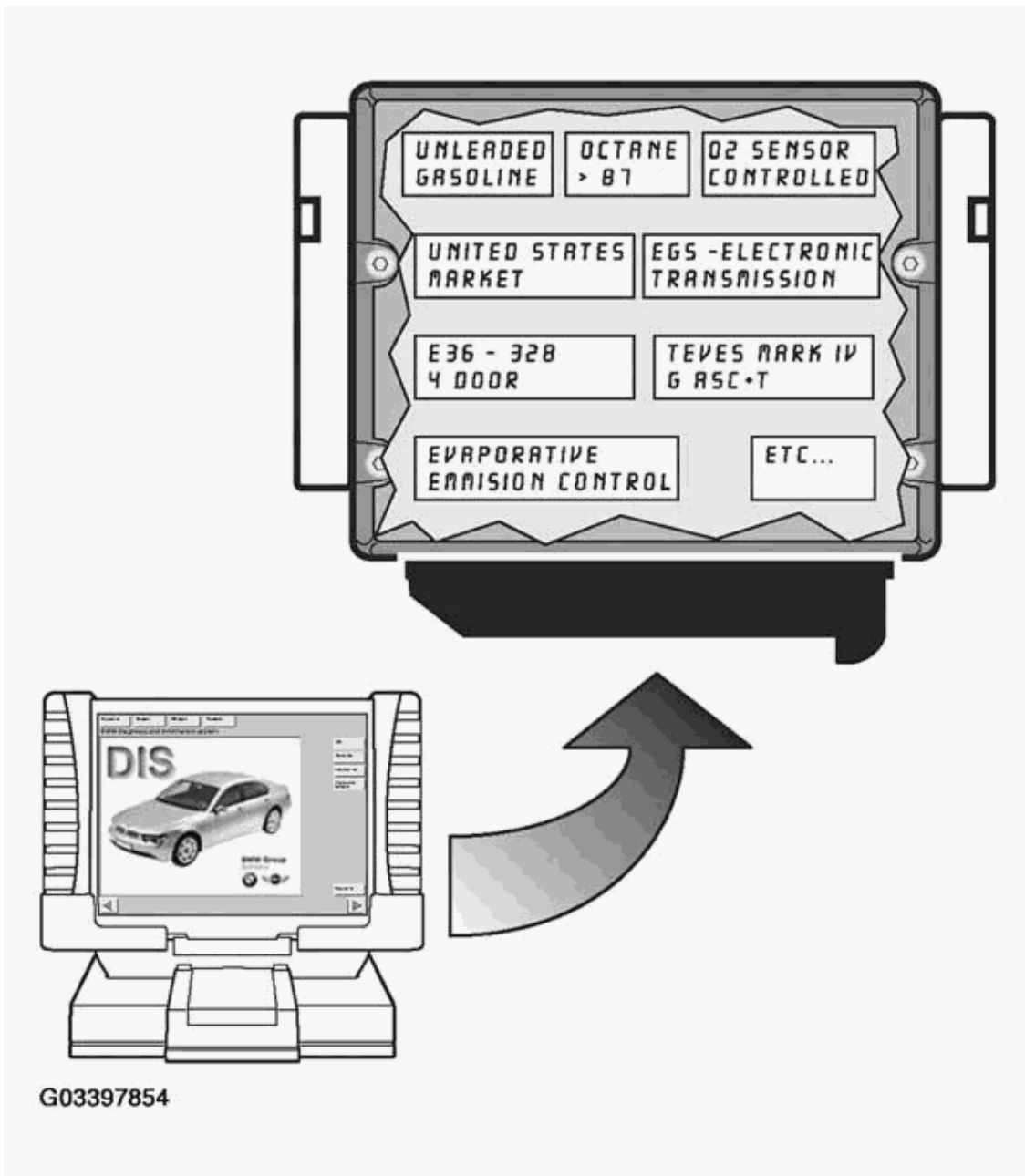


Fig. 4: Identifying Data After Programming
Courtesy of BMW OF NORTH AMERICA, INC.

(Program) into a module/component which already has the systems operating requirements (Data) installed, plus it can be used as a means of updating data and operating instructions previously installed in a control module.

Basic programmable control modules have a pre-defined set of operating data already installed which allows the module to be fairly generic until a specific operational program is installed.

Programming of system control modules is performed using a DISplus/GT1/SSS.

NOTE: Programmable control modules are system specific and not all control modules are programmable using workshop equipment like the DISplus,GT1 or SSS. The ability to program a module is limited to the number of times it has already been programmed and the hardware version of the control module itself.

WHAT IS THE PURPOSE OF CODING AND PROGRAMMING?

As a global manufacturer, BMW must design a large variety of control modules to meet numerous vehicle requirements pertaining to issues such as:

- Country Specific Regulations (U.S., Canada, Japan, UK, ECE, ...)
- Vehicle Equipment Level (Phone, Navigation, HiFi, IHKA, IHKR, ...)
- Vehicle Powertrain Configurations (Manual, Auto, TLEV, ULEV, SULEV, Diesel, ...)
- System Specific Operating Requirements (Nominal values, type of input signal, ...)

By using Coding and/or Programming, the large variety of control modules needed can be reduced to a smaller number of model specific hardware variations.

Codable control modules contain:

- A common operating program
- A large number/variety of specific operating data groups

In order to use this type of control module it must first be CODED to ensure that the operating data specific to that vehicle/model application is used by the operating program of the control module.

Programmable control modules contain:

- The required/specific operational data
- No operating program

In order to use this type of control module it must first be PROGRAMMED to ensure that the operating program specific to the vehicle/model application is used.

Prior to the availability of Coding and Programming in the workshop this task could only be performed at the factory.

Initially the factory installed Control Module(s) with a common operating program or data into vehicles and as these vehicles reached various points in the assembly process the control modules were updated with the required operating data or program specific to the application for that particular vehicle. Since replacement parts always need to be available, parts inventory needed to contain all variations of preprogrammed control modules installed in all varieties of vehicles that were manufactured. This was not a big problem in the early years, when the variety/quantity of models was smaller.

As the number of control modules and the complexity of the various systems installed into vehicles increased, the number of modules that needed to be stored in parts inventory began to increase as well. Eventually this led

to the stocking of hundreds of different control modules that were either pre-programmed or pre-coded for a specific application and model, but only differed slightly in the way they were coded or programmed.

Pre-programmed and pre-coded control modules always needed to be available in the event a control module failed once the vehicle left the factory floor, since this was the only place programming & coding procedures could be performed. In order for repairs to be made quickly, dealers were required to maintain a stock of several varieties of control modules, since technicians could only remove the failed module and installed a new pre-programmed or pre-coded module into the vehicle.

As a result of having to maintain a very large inventory of pre-programmed and pre-coded control modules in parts inventory, it was decided to make coding and eventually programming available in BMW workshops.

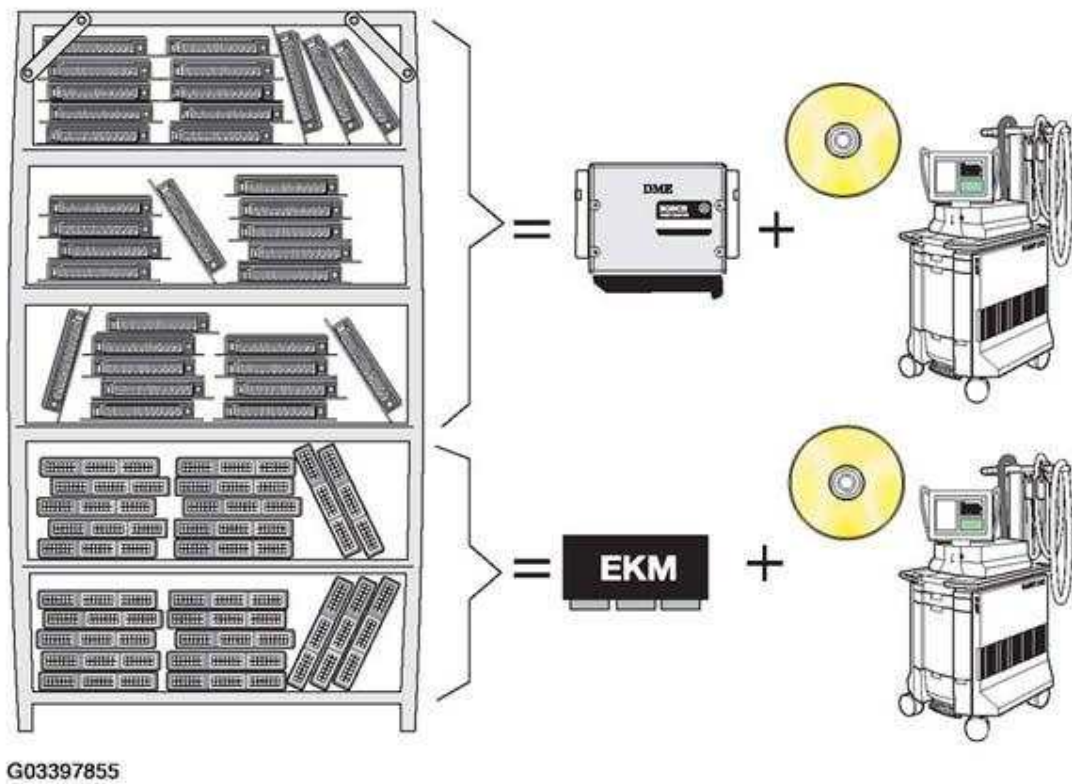


Fig. 5: Identifying BMW Workshop
Courtesy of BMW OF NORTH AMERICA, INC.

The following advantages have occurred since programming and coding can be performed in the workshop:

- Fewer control module hardware versions are needed (only need basic control modules)
- Lower parts and inventory costs
- Able to update software in a control module without having to replace the module (Re-Code/ Re-Program to address service Measures)
- Ability to add special equipment features to existing control modules (DWA, Day Time Running Lights,

...)

- Customization of vehicle operation (Conversions, VKM, A/C, ...)

The means by which coding or programming information is provided to a control module varies and is determined by the vehicle, model year and type of module(s) installed.

BMW currently uses the following methods to perform Coding or Programming:

- Coding Plug
- DME variant Coding
- Coding Code
- Central Coding Key (ZCS) or Vehicle Order (VO)
- EPROM Programming
- Flash Programming
- Vehicle and Key Memory (VKM)

WHERE IS DATA STORED IN A CONTROL MODULE?

The control modules used in our vehicles store data/information on one of the following:

- EPROM (**E**lectrically **P**rogrammable **R**ead **O**nly **M**emory)
- EEPROM (**E**lectrically **E**rasable **P**rogrammable **R**ead **O**nly **M**emory)

In essence these devices are similar to the harddrive of the PC (**P**ersonal **C**omputer) that many of us use daily to store the images and documents/files of information.

EPROM (Electrically Programmable Read Only Memory)

An EPROM is a computer memory chip that can be electrically programmed, however in order to erase data that is stored on the chip it must be removed from the device and exposed to UV lighting for a specific time period. An EPROM has what is commonly called a "window" on the top portion of the chip usually located underneath a protective label, it is this area that must be exposed to UV light of a certain intensity for a specific time period in order to erase the information stored on it.

Early engine control modules (DME 3.X) and transmission control modules were the first devices which allowed technicians to first remove the chip from the module, install a new "blank" EPROM and then program the module.

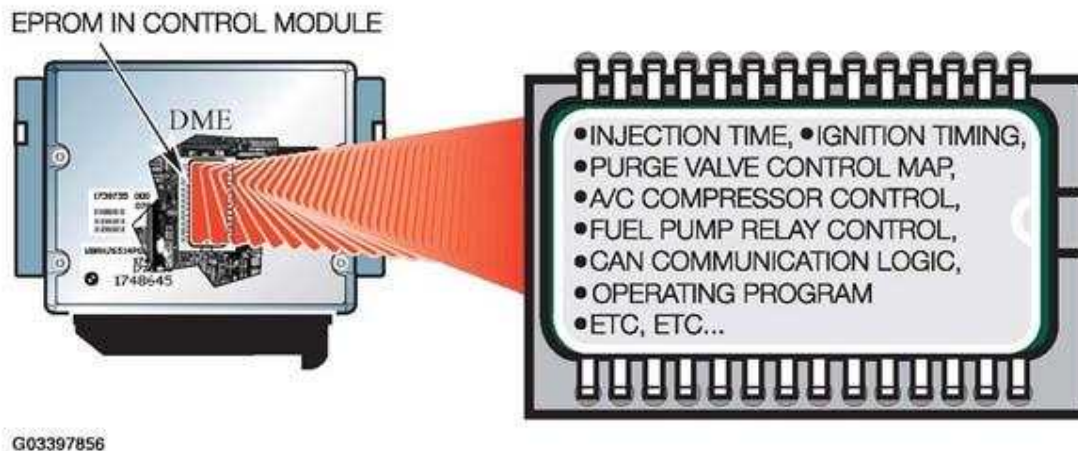


Fig. 6: Identifying EPROM (Electrically Programmable Read Only Memory)
 Courtesy of BMW OF NORTH AMERICA, INC.

EEPROM (Electrically Programmable Read Only Memory)

An EEPROM is a computer memory chip that can be electrically programmed and electrically erased, thereby not requiring the chip to be removed from the module or exposed to light. In general this chip is not easily removable from the device it is installed into.

Since the entire process of programming and erasing is done electronically this device is commonly referred to as "Flash Programmable".

During the programming process the following type of information may be loaded into the control module depending on the specific application or update that needs to be installed:

- Characteristic Maps (Ex. Ignition, Injection, Purge Control, DSC Regulation, ...)
- Control Constants/ Operational Data
- Operational Program
- Control Module Identification Information (Ex. Hardware Number, Program Number, Date of Modification, ...)

What is needed to Code and Program?

In order to code or program a vehicle, specific equipment and special software is required such as a DISplus, GT1 and an SSS which must all be connected to a network and have the most current version of CIP (Coding, Individualization & Programming) installed. CIP is the software program that contains all the latest data and program information to allow control modules to be updated to the latest level to address customer concerns and implement service solutions.

With the release of CIP 15.0 and the implementation of Progman (see **PROGMAN**) the DISplus and GT1 will only be capable of performing vehicle diagnosis and activation/initiation of a Coding, Individualization or Programming task through the SSS. A special program management tool (Progman) will only allow the DISplus

and GT1 to act as remote terminals to the SSS (regarding Coding, Individualization & Programming), which means that the SSS will be the single supplier of Coding, Individualization and Programming information to a vehicle and its respective control modules.

CODING & PROGRAMMING EQUIPMENT

Model: All

Production: All

EQUIPMENT AND SOFTWARE

Coding and Programming of a control module can only be performed within the workshop network using BMW Group Equipment and Software.

As of 2004 the standard diagnostic equipment available for a workshop consists of:

DISplus (Diagnostic Information System)

Used For: Vehicle Diagnosis, Coding, Programming and Individualization

With PROGMAN (CD14) the DISplus will no longer be able to do coding and programming directly, it will only be used as a remote terminal that can initiate Coding & Programming through SSS.

Connection: Direct to LAN/Workshop Network or Direct to OPSS/OPS/Diagnostic Head



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Fig. 7: Identifying DISplus (Diagnostic Information System)
Courtesy of BMW OF NORTH AMERICA, INC.

GT1 (Group Tester 1)

Used For: Vehicle Diagnosis, Coding, Programming and Individualization

With PROGMAN (CD14) the GT1 will no longer be able to do coding and programming directly, it will only be used as a remote terminal that can initiate Coding & Programming through SSS.

Connection: Wireless LAN or Direct to LAN/Workshop Network or Direct to OPPS/OPS/Diagnostic Head



G03397858

Fig. 8: Identifying GT1 (Group Tester 1)

Courtesy of BMW OF NORTH AMERICA, INC.

SSS (Software Service Station)

Used For: Vehicle Coding, Programming and Individualization. NO DIAGNOSTIC CAPABILITY.

With release of PROGMAN (CD 14) the SSS becomes the only tool for performing Coding, Programming and Individualization. All requests from GT1 or DISplus will be performed by the SSS. The SSS can also be used to directly initiate a Coding, Programming or Individualization request.

SSS will be capable for coding/programming multiple vehicles, Max 5 vehicles at a time.

Connection: LAN/Workshop Network or Direct to OPPS/OPS Head



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Fig. 9: Identifying SSS (Software Service Station)
Courtesy of BMW OF NORTH AMERICA, INC.

Diagnostic Head

Interface between vehicle and DISplus, GT1 or SSS

Used For:

- Vehicle Diagnosis, Coding, Programming and Individualization
- Not to be used for programming vehicles with a MOST bus (E60/63/64/65/66...)

Connection:

- Wireless to LAN/Workshop Network via access point
- Wireless connection direct to GT1
- Directly to LAN/Workshop Network using DK LAN cable
- Directly to GT1/DISplus/SSS using DK LAN Cable and adapter

Refer to **EQUIPMENT CONFIGURATIONS**



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Fig. 10: Identifying Diagnostic Head

Courtesy of BMW OF NORTH AMERICA, INC.

OPPS Head - (Optical Testing & Programming System)

Interface between vehicle and DISplus, GT1 or SSS

Used For:

- Vehicle Diagnosis, Coding, Programming and Individualization on Most bus equipped vehicles.

NOTE: **The OPSS is NOT ABLE to perform Diagnosis, Coding, Individualization & Programming on an I-bus equipped vehicle.**

- Optical diagnosis of MOST and Byteflight Bus systems.
- Simultaneously program vehicles equipped MOST Bus system (except E65/66) via MOST Bus access port and OBD Connections.

Connection:

- Directly to LAN/Workshop Network connection using DK LAN cable or
- Directly to GT1/DISplus/SSS using DK LAN Cable and adapter.

Refer to **EQUIPMENT CONFIGURATIONS**

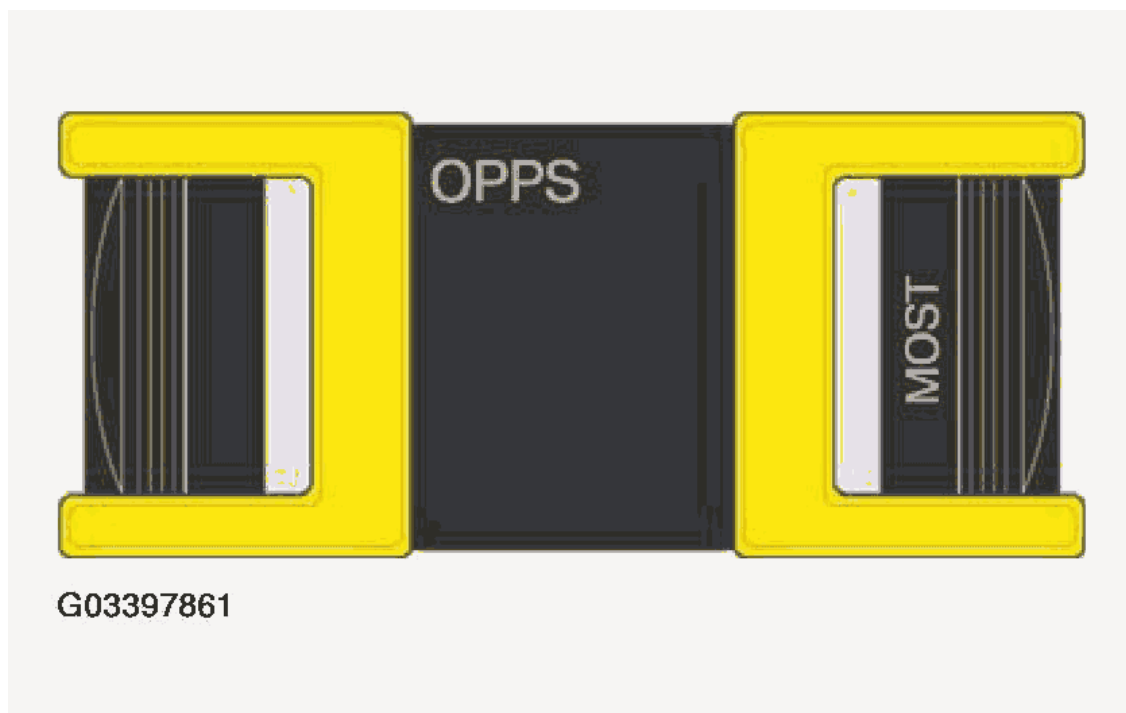


Fig. 11: Identifying OPSS Head - (Optical Testing & Programming System)
Courtesy of BMW OF NORTH AMERICA, INC.

OPS Head - (Optical Programming System)

Interface between vehicle and DISplus, GT1 or SSS

Used For:

- Vehicle Diagnosis, Coding, Programming and Individualization

NOTE: The OPS is not able to perform optical diagnosis of MOST Bus and Byteflight systems nor can it be used to perform Diagnosis, Coding, Individualization & Programming on an I-bus equipped vehicle.

Connection:

- Directly to LAN/Workshop Network or
- Directly to GT1/DISplus/SSS using DK LAN Cable and adapter.

Refer to **EQUIPMENT CONFIGURATIONS**

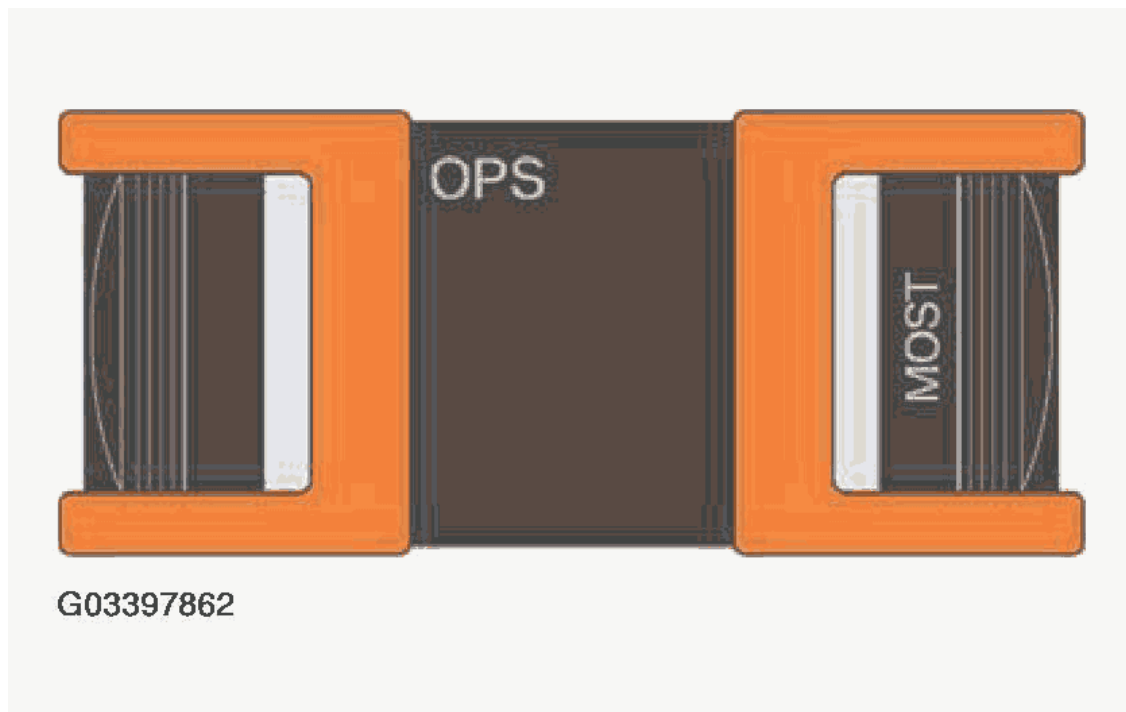


Fig. 12: Identifying OPS Head - (Optical Programming System)
Courtesy of BMW OF NORTH AMERICA, INC.

Deutronic Automatic Battery Charger

Used For:

- Maintaining proper vehicle battery voltage level during Diagnosis, Coding and Programming.
- Follow the initial setup of the charger as indicated in the SIB.

Connection:

- During Coding or Programming Procedure the battery charger must be in the Power Supply (PS) mode.

- Place the charger into the power supply mode by depressing the "MENUE" button 3 times in rapid succession.

Refer to section on **EQUIPMENT CONFIGURATIONS**



G03397863

Fig. 13: Identifying Deutronic Automatic Battery Charger
 Courtesy of BMW OF NORTH AMERICA, INC.

Hardware Operating Conditions

HARDWARE OPERATING CONDITIONS

Device	Operating Temperature	Relative Humidity
GT1	+3°C - +43°C = +37.4°F - +109.4°F	10 - 80% (no condensation)
OPPS/OPS	+3°C - +43°C = +37.4°F - +109.4°F	10 - 90% (no condensation)
SSS	+10°C - +35°C = +50°F - +95°F	10 - 90% (no condensation)
Monitor SSS	+3°C - +35°C = +37.4°F - +95°F	10 - 90% (no condensation)

Coding & Programming Software

Whenever coding and programming are to be performed on a vehicle, the latest version of software for DISplus/GT1 and SSS must be loaded/installed on the equipment being used.

The DIS CD xx contains the diagnostic programs (test modules, schematics, system status values...) prior to CIP 15.0 all coding and programming information for early production vehicles (E31, E32, E34, E36, E38, E39,

E46, E53 and E52) was also available.

NOTE: With the introduction of CIP 15.0 all coding and programming information will be migrated to CIP and incorporated within Progman.

Whenever a new version of either DIS CD xx or CIP xx.x is released this indicates that an update or addition to a specific coding, programming or diagnostic routine has occurred. The change can be reflected by a new/updated programming software for a specific control module, the ability to code a new module or the ability to perform a new retrofit procedure when installing a new system.

NETWORKS

As the level of technology in our vehicles continues to increase so does the level of technology that we use in our diagnostic and programming equipment within the workshop.

In order to meet the ever growing demand for more rapid transfer of information we can no longer have multiple "stand alone" systems, therefore various infrastructures have been created to allow multiple "stand alone" devices/systems to interact with each other to share information.

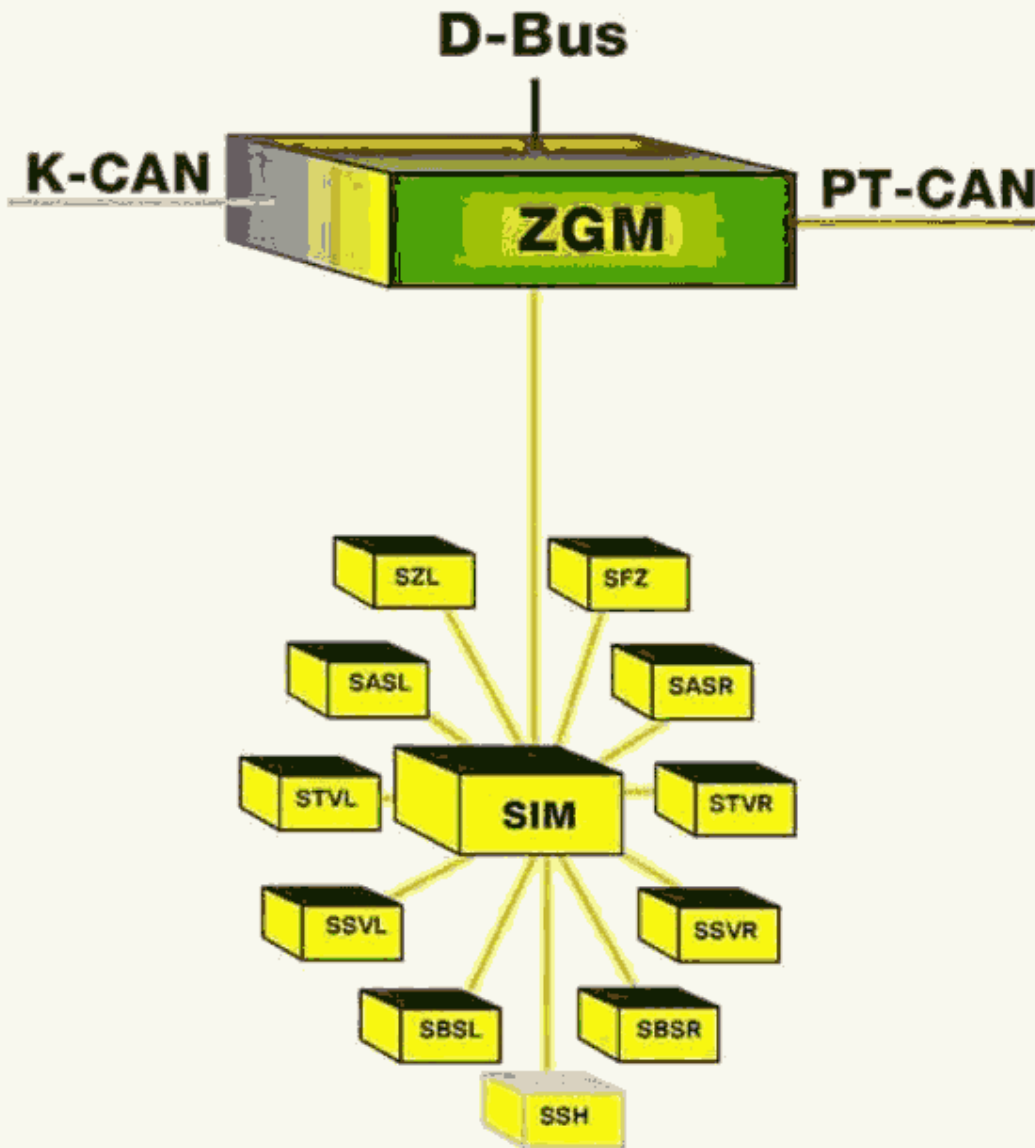
The sharing of information with various control modules in our vehicles has been occurring for quite some time, now we will also be doing this with the diagnostic equipment in the workshop as well.

Vehicle Bus Systems

In order to make the components used in our vehicles more efficient we utilize bus structures (commonly referred to as I-Bus, K-Bus, MOST Bus, Byteflight, PT-CAN, etc.). By using bus structures in vehicles, we can accelerate communication between several different control modules. Many common vehicle systems (such as entertainment, safety, powertrain, etc.) are "stand alone" systems but also require information from other modules/systems in order to be more efficient. In order to obtain the required information the systems must also be able to simultaneously communicate without interfering with each other, which is accomplished by using various bus structures.

Example:

The ISIS (Intelligent Safety Integration System) system on the E65 uses the Byteflight bus structure.



G03397868

Fig. 14: Identifying Vehicle Bus Systems

Courtesy of BMW OF NORTH AMERICA, INC.

Depending on the equipment level of the E65, the ISIS may consist of 11 satellite components (Control Modules/Sensors) that are connected, using fiberoptic cables, to the SIM (Safety Information Module) which monitors the status of the satellite components. Since this is a safety system, components need to be activated within a fraction of a second in order to be effective, there can not be any processing delays. The SIM is connected to the ZGM (Central Gateway Module) which monitors the activity of the SIM and will direct information to the SIM and other devices in the vehicles as necessary.

Workshop LAN Network

A network is nothing more than a group of devices interconnected so that they can communicate with each other. A LAN is a network that is localized to a specific area, such as a workshop or office.

The bus systems (I-Bus, K-Bus, PT-CAN, Byteflight, MOST Bus, ...) that we have been using in our vehicles for quite sometime, are nothing more than networks with different configurations. By looking at the byteflight system mentioned previously, a similarity to a workshop network can be established.

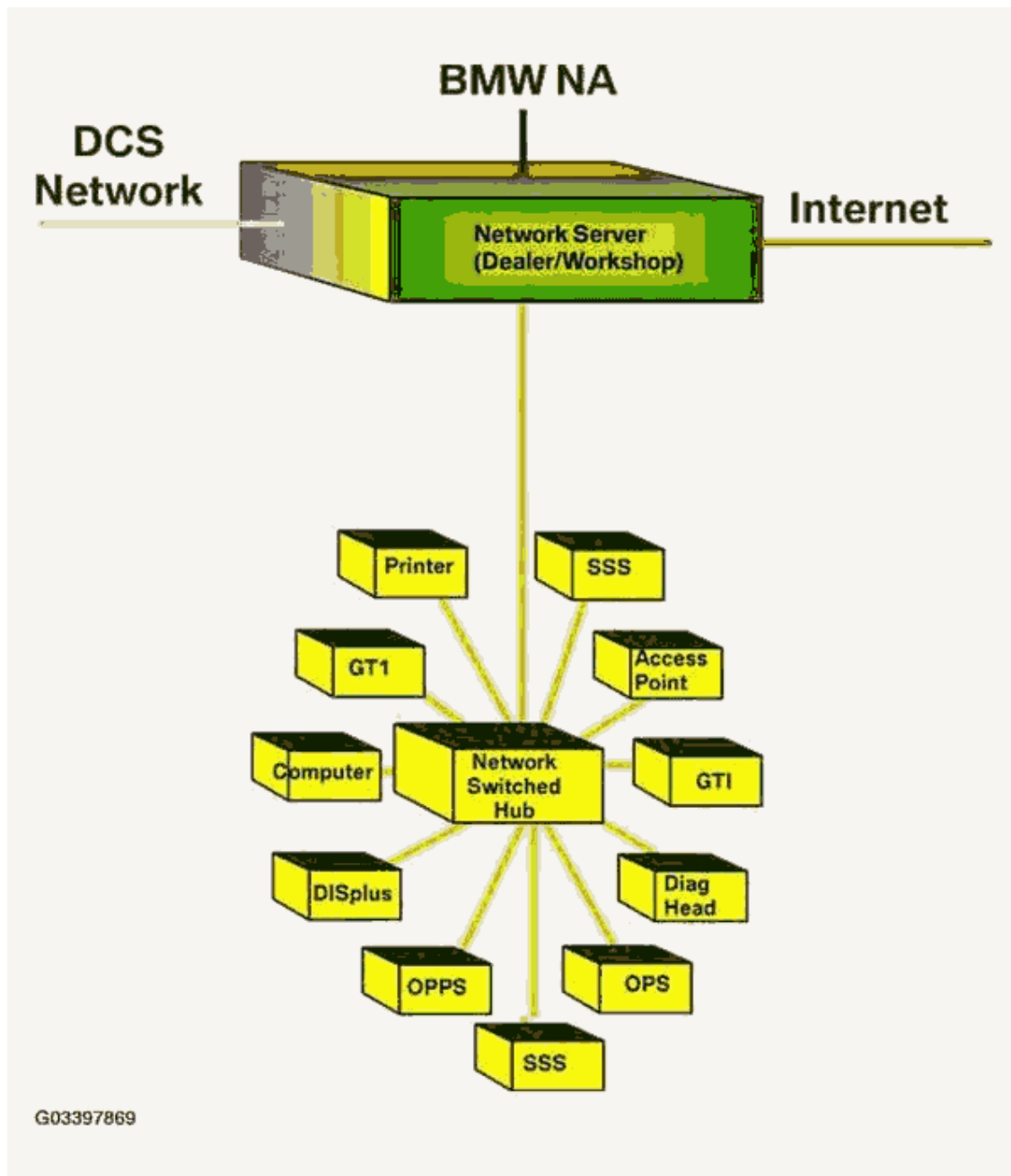


Fig. 15: Identifying Workshop LAN Network
Courtesy of BMW OF NORTH AMERICA, INC.

Workshop Network

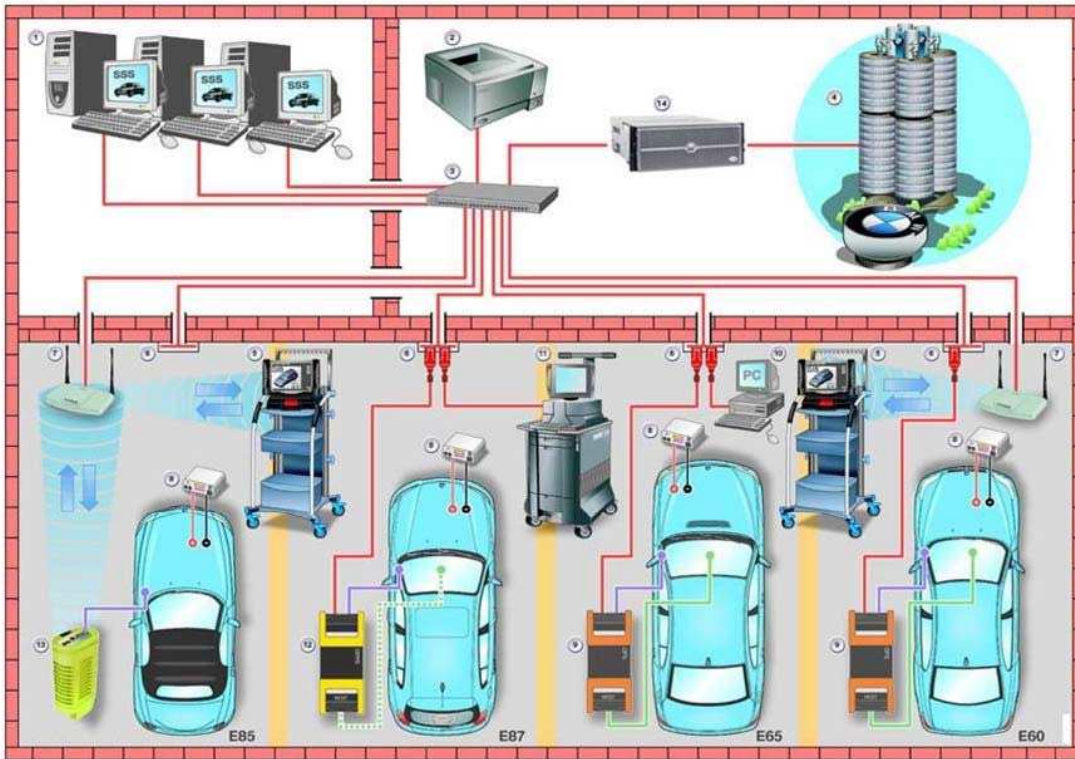
All workshops are currently equipped with a GT1, DISplus, SSS, OPS, OPPS, Diagnostic Head, Access Point, desktop computer(s) and printer(s) which can be considered as satellite components (control modules/sensors). In order for these components to communicate with each other, either directly or indirectly, they must be interconnected via a cable/wire to a common point or switching device. Consider the switching device/hub to be similar to the SIM, which monitors all devices connected to it and allows the devices to communicate with each other. The interconnection of these devices results in the establishment of a network localized to the workshop area thereby establishing a Local Area Network (LAN) in the workshop.

Network Structure

By having the workshop configured to allow the various devices used on a daily basis to be interconnected/networked with each other, as indicated in the illustration, additional components can easily be added and online updates can automatically be installed on all connected devices, as long as they have an approved IP address.

***Example:** The network that exist in the workshop is not much different than the network structure that is used in our vehicles. In order for control modules to communicate with each other they must be correctly identified. The identification process can be considered to occur as part of the coding procedure which is done at the end of the assembly process or at anytime a new component/module/system is added to the vehicle. By not recoding the vehicle after adding or removing a module/system, the communication on a particular bus can be hampered especially if a response from a module that is no longer installed is expected or a new module transmits data that is not expected by anyone else on the bus because it is not correctly identified. The VO for a vehicle can be considered to contain the IP addresses of the modules installed in the vehicle.*

If the devices on the workshop network do not have a rigidly assigned IP address, online updates to specific devices can not occur. The operation/performance of a network can be greatly hampered if multiple devices share an address, since the transmitted data is not able to reach the correct device, it can result in jamming up the operation of the network.



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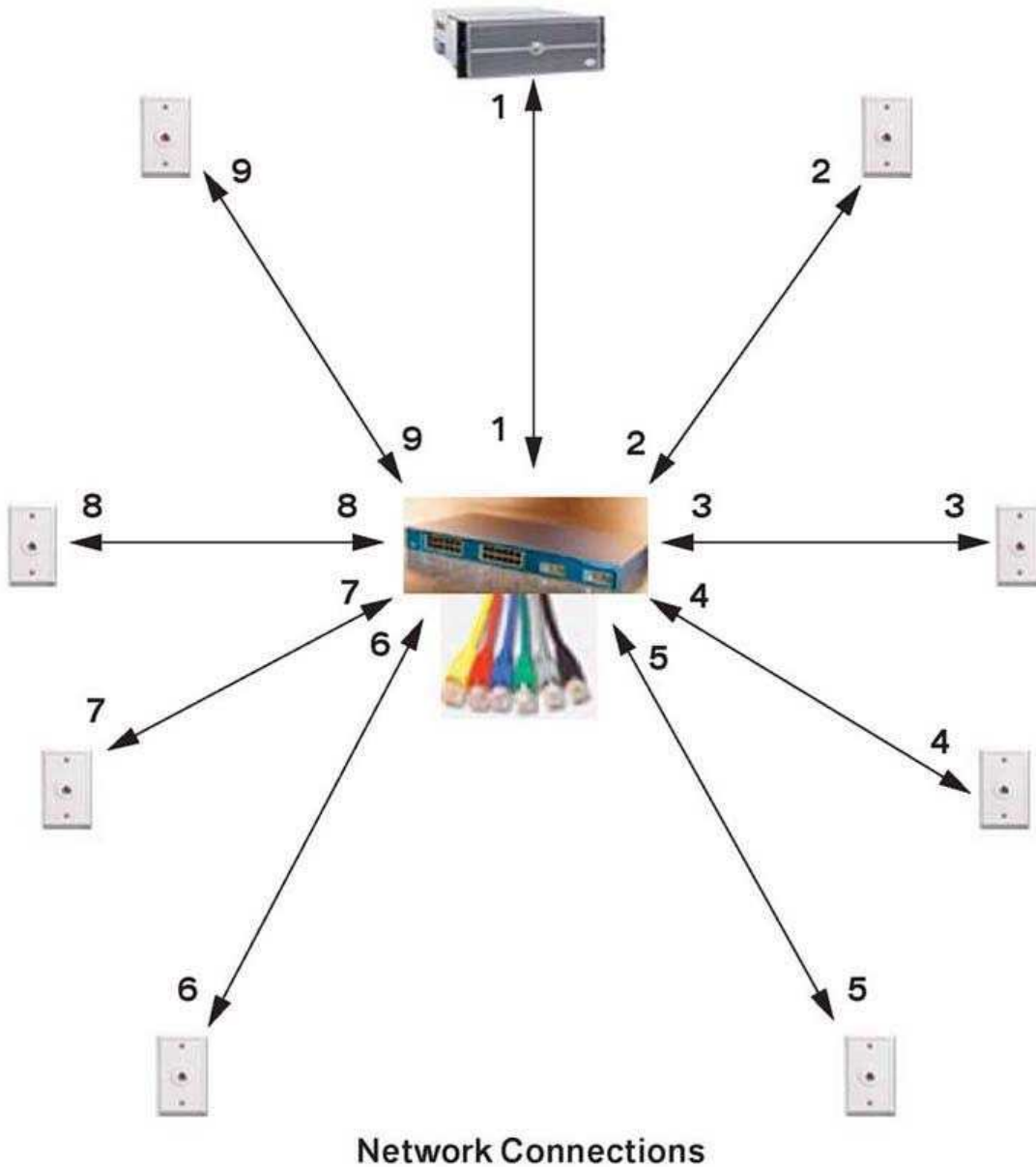
Fig. 16: Identifying Network Structure
 Courtesy of BMW OF NORTH AMERICA, INC.

Network Connections

When establishing a network which will utilize multiple access terminals/jacks it is recommended that the jacks and cables attached to the specific jacks are numbered and that the corresponding end of the cable that connects to the router/switched hub should be numbered as well.

Example: The illustration below shows a basic network structure with no miscellaneous devices connected, other than a Server and Switched Hub. The cables running to/from the Switched Hub are all numbered on both ends to make troubleshooting the network easier in the event of a problem with the cabling, wall jack or Switched Hub connections.

Not having the cable and wall jacks number would be like trying to troubleshoot a problem with an electrical circuit in the vehicle where all the wires are the same color and the components connected have no pin assignments.

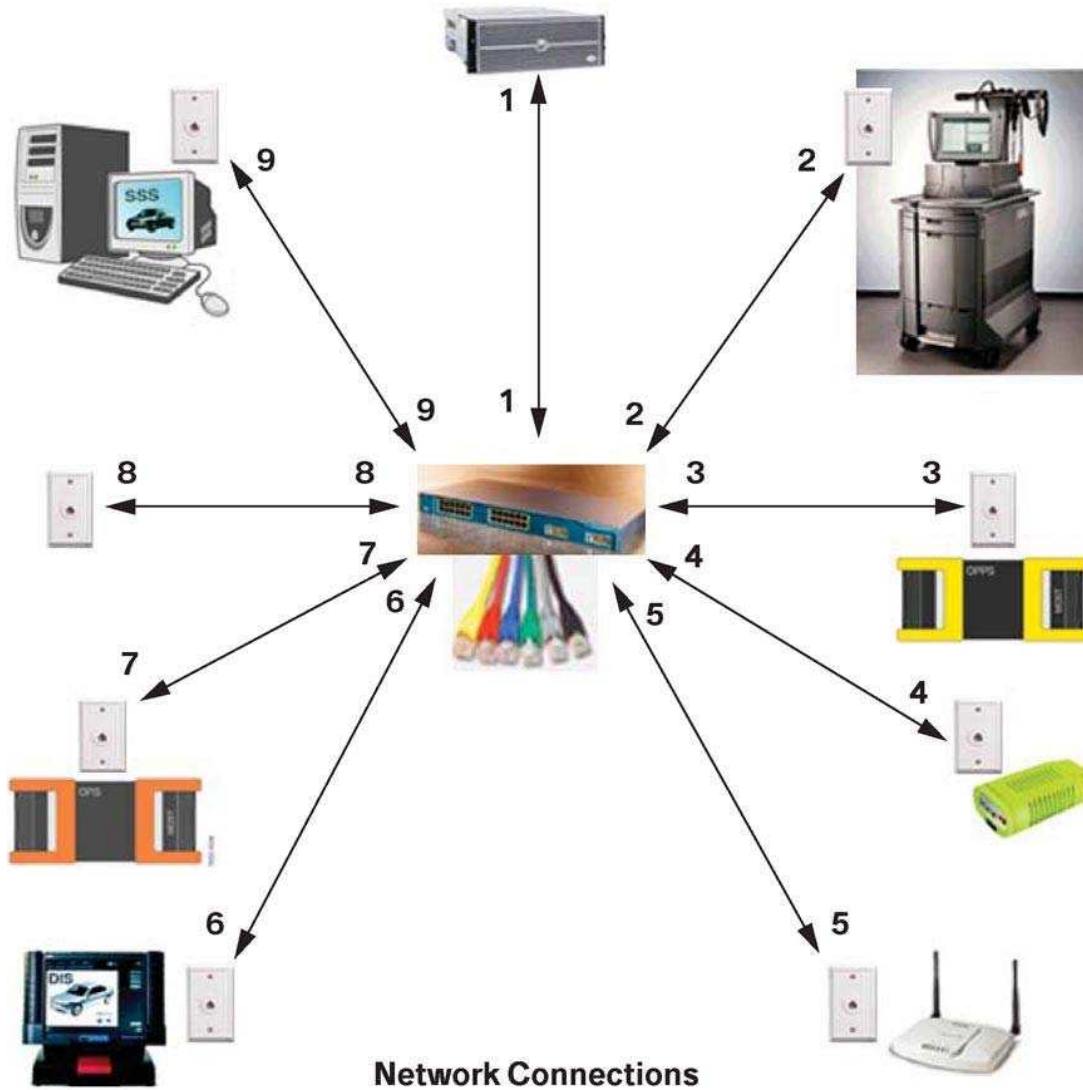


G03397871

Fig. 17: Identifying Network Connections (1 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

Once additional devices are connected it becomes very important that the configuration information (IP Address, Gateway Address, Subnet Mask and Device Name) is entered correctly for each device that is connected to the network. Each device must be assigned a specific/unique IP Address.

It is very important that the IP address not be shared by multiple devices located on the network, as this can result in "Locking-up" the network, which can have a detrimental effect on any control module(s) being programmed or coded.

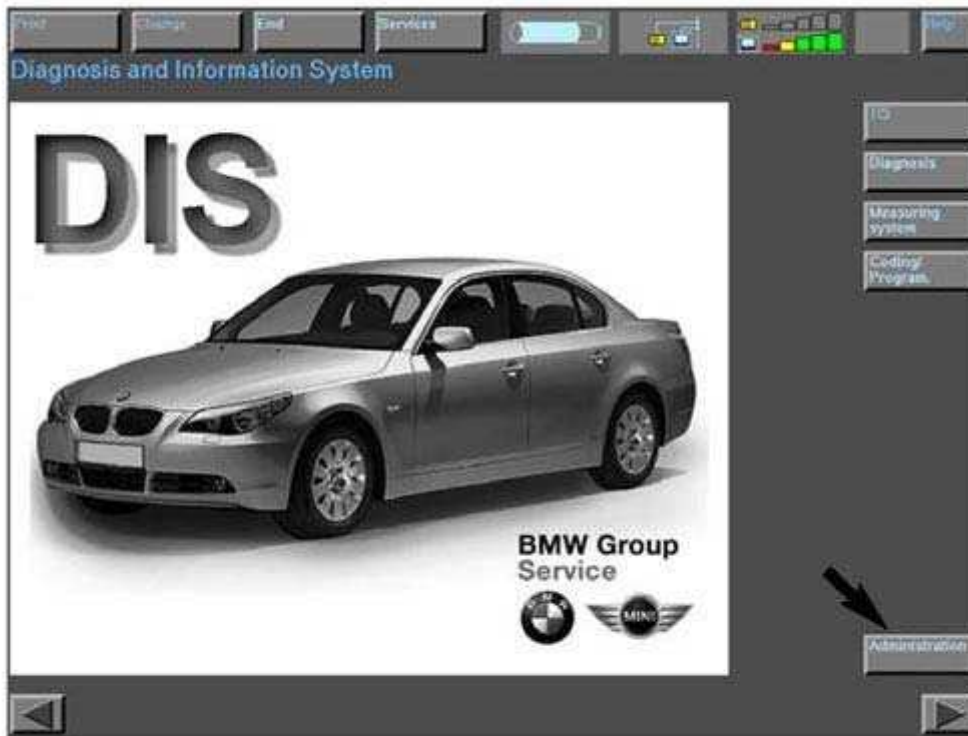


G03397872

Fig. 18: Identifying Network Connections (2 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

Accessing Configuration Information - DISplus/GT1 & Interface(s)

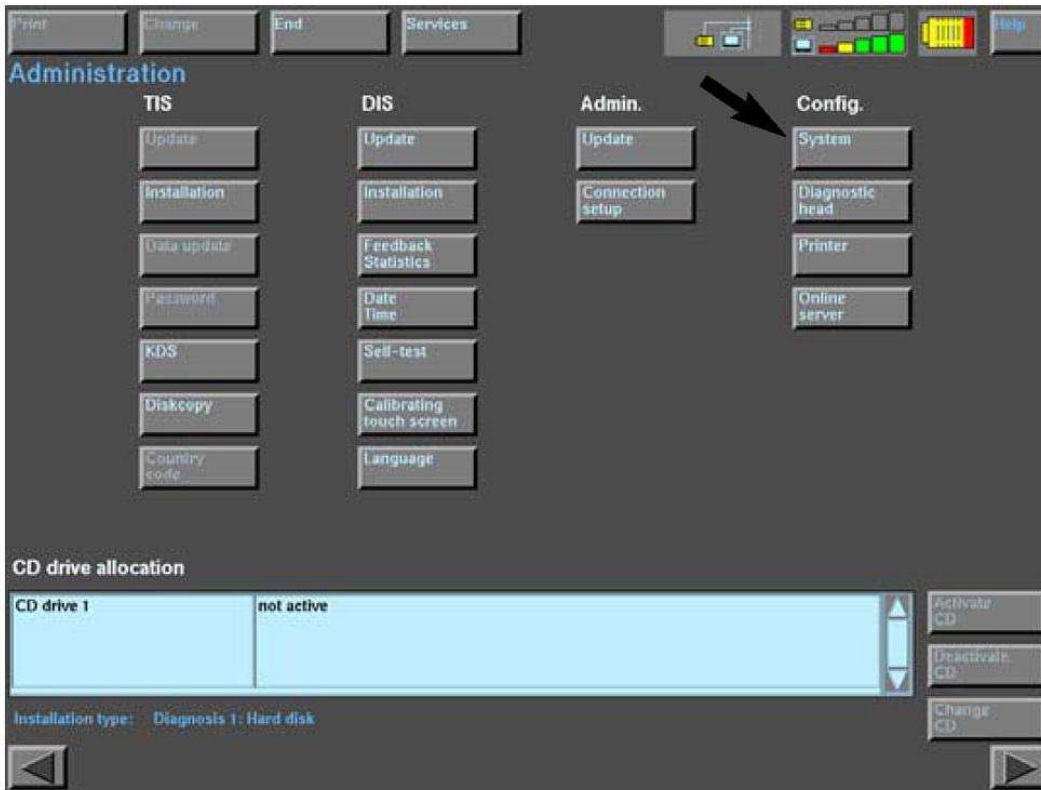
Select "Administration".



G03397873

Fig. 19: Display DISplus/GT1 (Administration)
Courtesy of BMW OF NORTH AMERICA, INC.

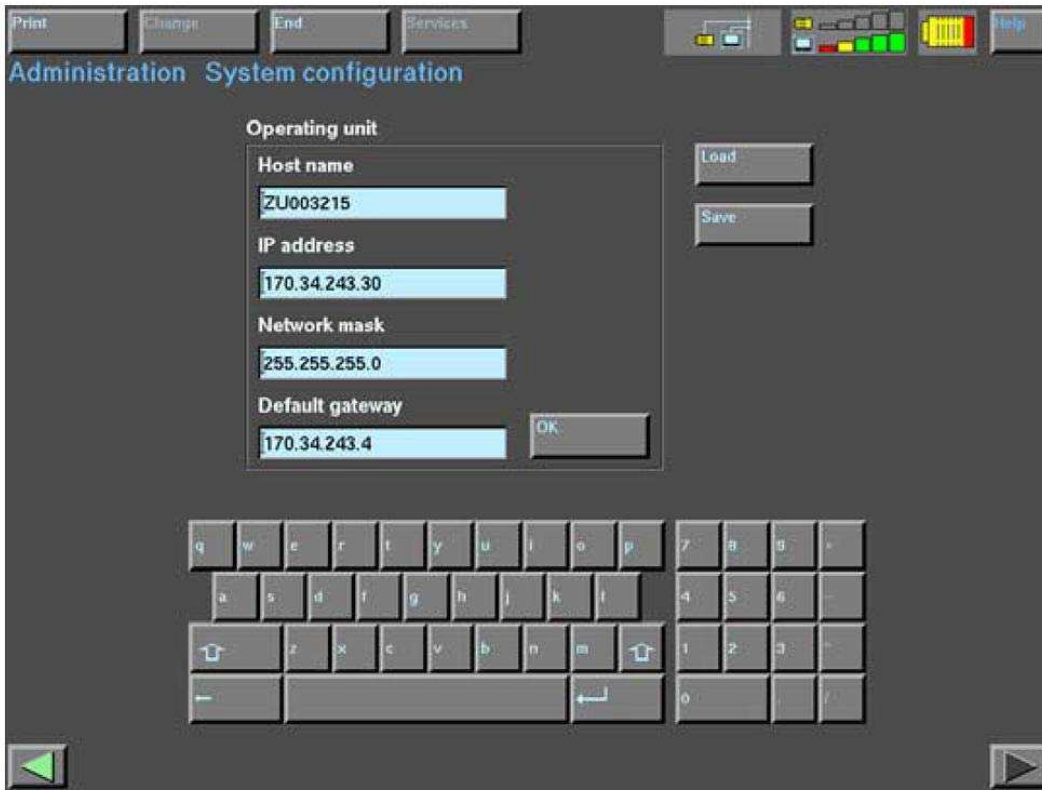
Select "System".



G03397874

Fig. 20: Display DISplus/GT1 (System)
Courtesy of BMW OF NORTH AMERICA, INC.

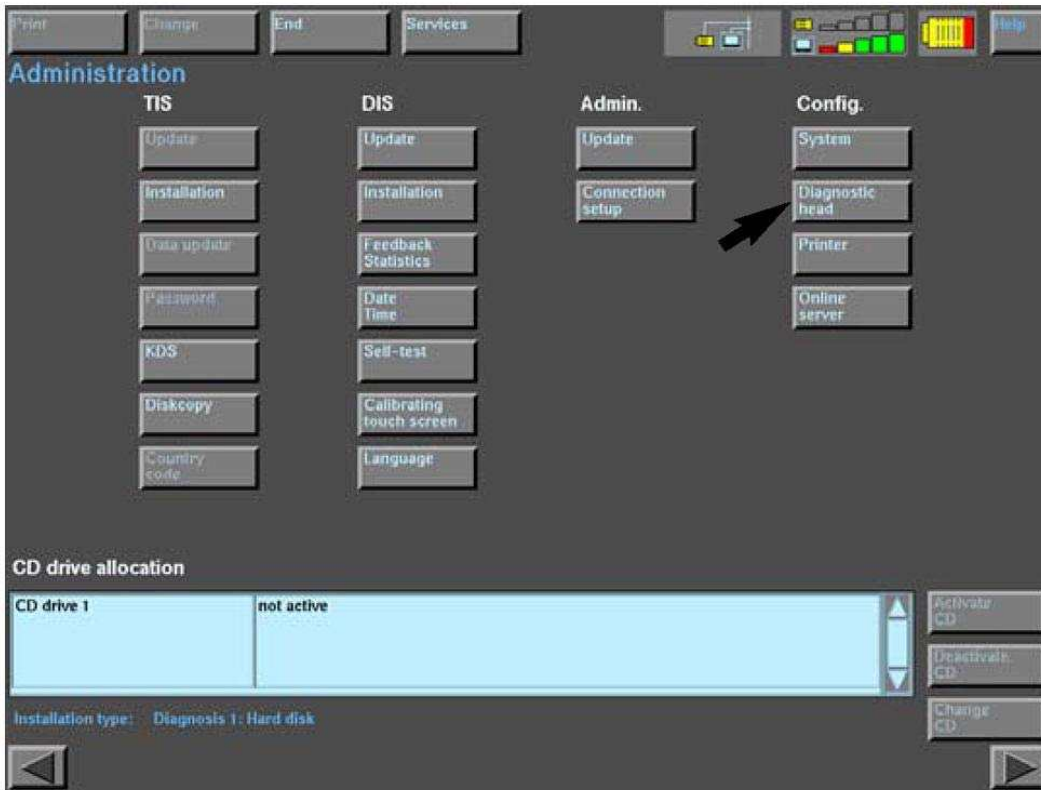
The screen now displays the network configuration information for the device being used DISplus/GT1.



G03397875

Fig. 21: Display DISplus/GT1 (Network Configuration Information)
Courtesy of BMW OF NORTH AMERICA, INC.

Select "**Diagnostic Head**".



G03397876

Fig. 22: Display DISplus/GT1 (Diagnostic Head)
Courtesy of BMW OF NORTH AMERICA, INC.

Select "**Free diagnostic head**".

NOTE: In order for an interface to be displayed it must be connected to a vehicle and the ignition turned on.

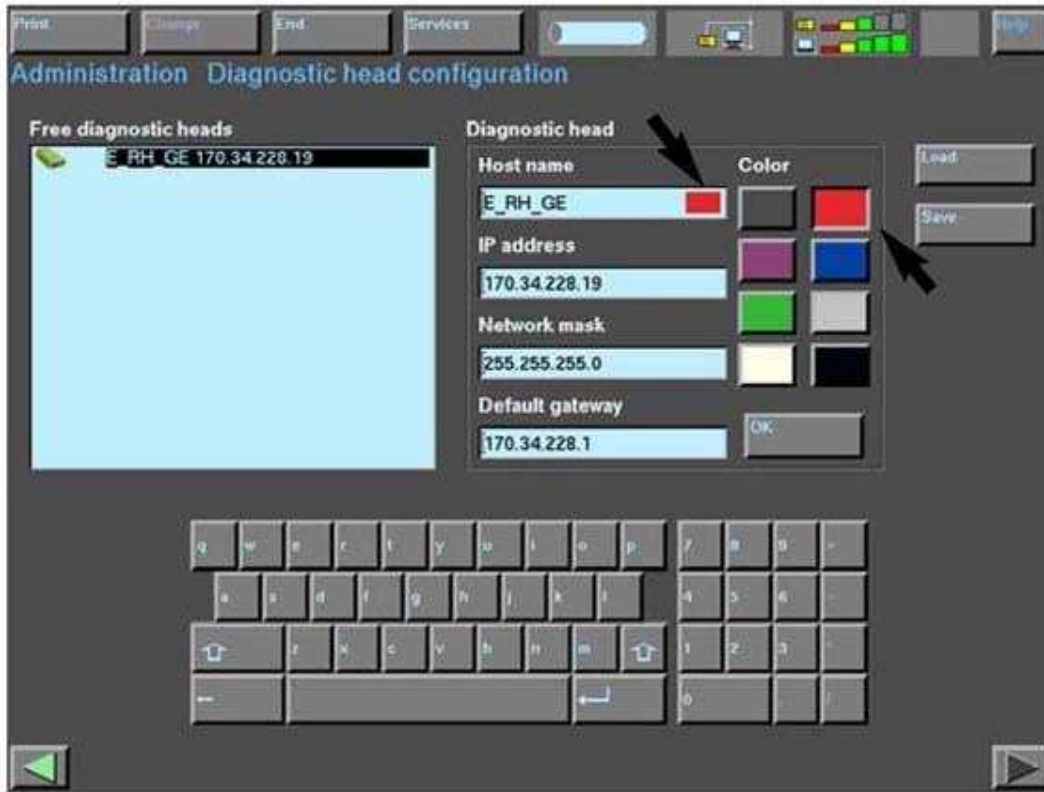


G03397877

Fig. 23: Display DISplus/GT1 (Free Diagnostic Head)
Courtesy of BMW OF NORTH AMERICA, INC.

Network configuration information for the selected interface is displayed.

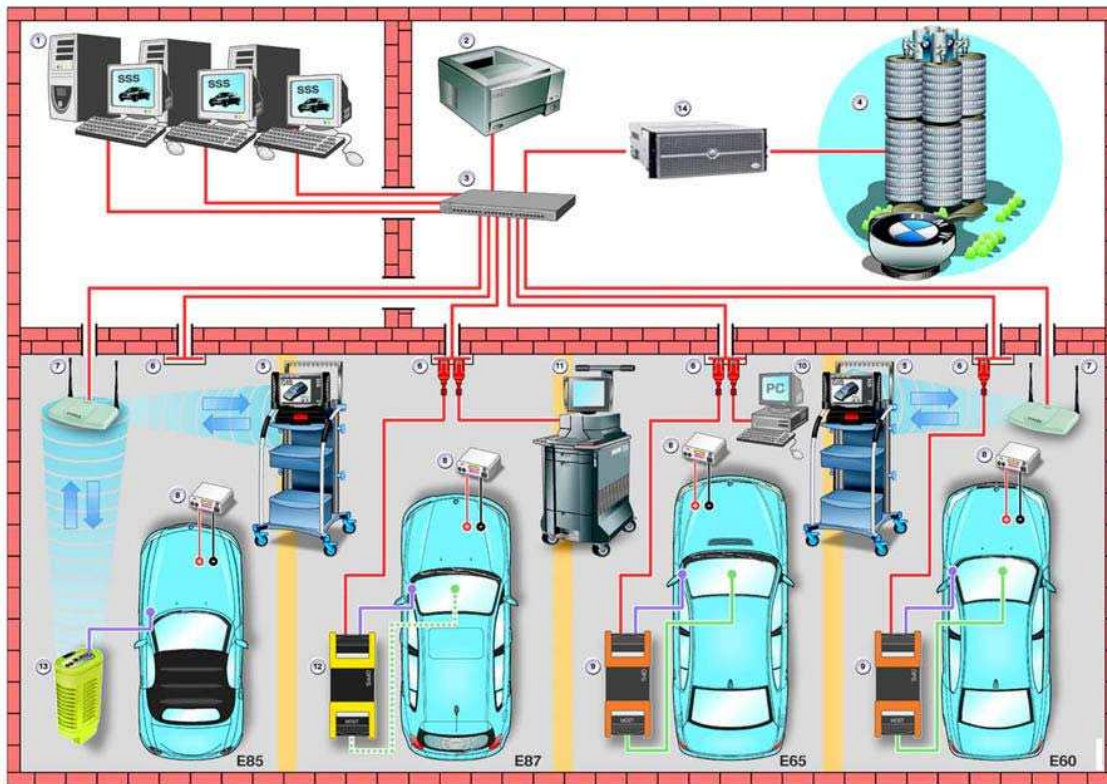
Example: A red color band will be assigned to this interface once "OK" is selected.



G03397878

Fig. 24: Display DISplus/GT1 (Network Configuration Information)
Courtesy of BMW OF NORTH AMERICA, INC.

Workshop Layout



G03397879

Fig. 25: Identifying Workshop Layout Chart
 Courtesy of BMW OF NORTH AMERICA, INC.

Workshop Layout Index

WORKSHOP LAYOUT INDEX

Device #	Device Name/Description
1	Software Service Station (SSS)
2	Network Printer
3	Switched Hub (Cisco Switch WS C2950-24)
4	BMW Network
5	GT1
6	Wall Jack/Ethernet Connection point to workshop Network
7	Access Point
8	Deutronic Automatic Battery Charger
9	OPS
10	Workshop PC
11	DISplus
12	OPS Head
13	Diagnostic Head
14	Network Server

Workshop Network Components

A LAN currently exists in all workshops to allow the diagnostic equipment (DISplus, GT1, SSS, OPSS, OPS & Diagnostic Head) to communicate with each other. In order to successfully diagnose, code and program a vehicle, it is required to have all equipment connected to the workshop network.

Components used to create a network infrastructure in the workshop consist of:

Access Point

Allows direct wireless access to LAN for GT1 and Diagnostic Head

OR

Diagnostic head establishes connection to LAN via wireless communication and thereby can be connected to DISplus or GT1, which are connected to LAN

Access point is connected directly to LAN.

Symbol - Model Spectrum 24/AP 3020-100

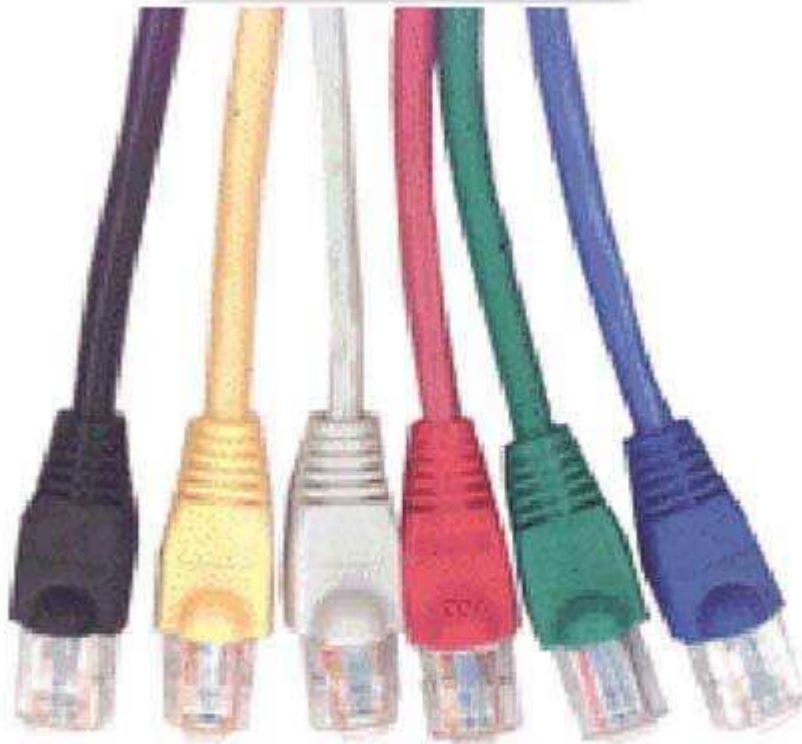
Wall Jack

Connection point for devices such as GT1, DISplus, Access Point, SSS, Diagnostic Head, OPSS/OPS Head, Printer and Network Server to Switched Router via RJ45 cable.



G03397880

Fig. 26: Identifying Wireless
Courtesy of BMW OF NORTH AMERICA, INC.



G03397881

Fig. 27: Identifying CAT 5 Ethernet Cable With RJ-45 Connectors
Courtesy of BMW OF NORTH AMERICA, INC.

CAT 5 Ethernet Cable with RJ-45 Connectors

Used to establish a connection between:

- Wall jack and Switched Router/Hub
- Wall jack and devices such as GT1, DISplus, Access Point, SSS, Diagnostic Head, OPPS/OPS Head and Network Server.

Switched Hub

LAN switched distribution hub for all devices connected to the network. Routes communication telegrams/messages to specific devices from specific devices. Allows multiple devices to communicate with each other without reducing data transfer rate.

Cisco Switch WS-C2950-24

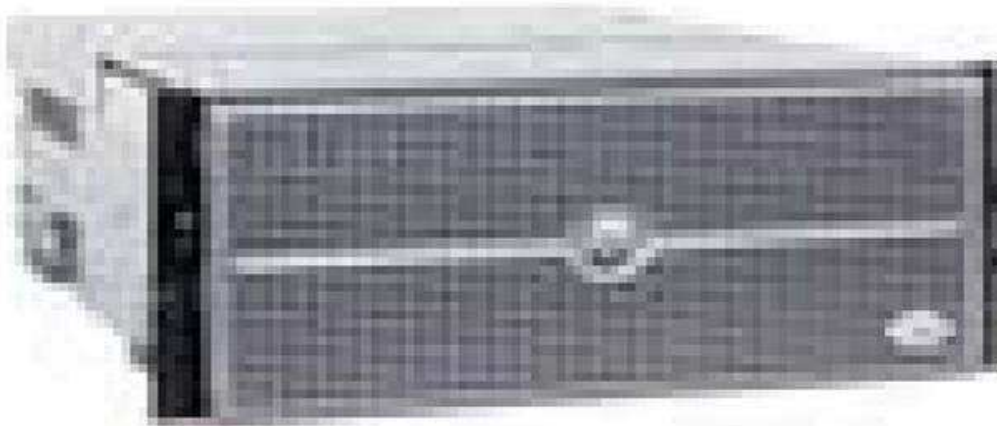
Server

Central computer which controls interface/communication between all devices on the Workshop LAN and communication to external networks and internet. Keystone device for network operation along with switch/router.



G03397882

Fig. 28: Identifying Switched Hub
Courtesy of BMW OF NORTH AMERICA, INC.



G03397883

Fig. 29: Identifying Server

Courtesy of BMW OF NORTH AMERICA, INC.

Common Terminology

Network

A group of computers that are interconnected with each other and able to communicate with each other either by transferring data via a wired or wireless connection.

Local Area Network (LAN)

A network that exists within a specific area.

***Example:** By having all computers, testers and printers in the workshop interconnected results in a Workshop LAN.*

Ethernet

The term Ethernet is a communications protocol used to define a method & speed by which interconnected devices are able to communicate with each other by either a wired (twisted pair) or fiberoptic connection.

Common Ethernet communication protocol terms:

10BaseT - Able to transmit data at a rate of 10Mbps for a maximum distance of 100 meters per segment.

100BaseT - Able to transmit data at a rate of 100Mbps for a maximum distance of 1000 meters per segment.

The speed differences are obtained by modifying the method of encoding the data to be transferred. The maximum distance consist of the distance from switched hub to wall jack plus length of cable used to connect a particular device. The greater the distance the greater the chance of signal loss/disturbance.

Ethernet Cable (CAT 5)

A standard used to define an 8 wire cable (4 twisted pair) that is commonly used to interconnect various computers in the establishment of an ethernet network. Certified to transmit data at a maximum rate of 100Mbps.

RJ-45 Connectors

The plastic connectors at the end of a CAT 5 cable, used to connect the cable to device/computer, wall jack and hub.

Wall Jack

Accepts RJ-45 connectors when connecting devices to the network. Connection point for devices like DISplus, GT1, SSS, OPSS, OPS, Diagnostic Head, workshop computers and printer.

Recommendation is that outlet/jack is numbered and the corresponding end of the ethernet cable connected to the switched hub is numbered as well, to assist in troubleshooting in the event of a problem.

Example: A wall jack outlet is labeled as #1 the other end of the cable at the hub should also be labeled #1.

Switched HUB

Allows multiple devices to send information over the network at the same time without slowing down the communication process. A switched hub essentially isolates the two devices that are communicating, thereby providing each component on the network a separate connection at the maximum data transfer rate of the network.

Example: A switched HUB is similar to the use of cloverleaves on the highway, traffic does not need to stop if a change in direction needs to be made, plus traffic flows smoothly from point to point.

A regular HUB does not provide each component with a separate connection point to the network but rather a shared connection point. By sharing a connection point the data transfer rate of the network is reduced when multiple devices try to communicate.

Example: A regular HUB is similar to the use of a 4 way intersection, the smaller the amount of traffic using the intersection the quicker a car can go through the intersection and reach its desired destination. The greater the traffic the longer it will take for a car to reach its desired destination.

The switched hub installed as part of the workshop wiring project is a Cisco WS-C2950-24.

Network Server

A computer that provides information/data to other computers located on the network. A server allows

computers on its network to access information on another network, such as the internet. The server is the keystone device that allows computers on its specific network to access information on another network.

As an example a server can obtain and distribute software updates to all computers located on its network, instead of having to physically install the updates to each computer individually.

Automatic/Online Updates

The ability to connect the network server to the BMW server and check for new software updates (Diagnostic, Coding & Programming data) then downloads the information to all computers/equipment located on the network automatically at a specific time.

Example: New updates can be installed on SSS, GT1 and DISplus overnight in order to have latest data available the next morning.

The application that performs online updates is referred to as JETstream.

Access Point

The access point is a wireless communication device that is able to establish a wireless connection with a GT1 and/or a diagnostic head and allows them to communicate with other devices on the network.

Manufactured by Symbol - Model Spectrum 24 /AP 3020-100.



Fig. 30: Identifying Access Point
Courtesy of BMW OF NORTH AMERICA, INC.

Interface Name

The specific name assigned to the device (Ex. OPS Blue A)

IP Address

It is a unique four segment number used to identify a specific device located on a specific network. The number

represents the address of the device on the network and is necessary when communicating with other devices located on the network.

Example: 92.168.100.10

Usually the first three segments are used to identify the network and the last segment identifies the device. The IP Subnet Mask information generally defines which segments are needed to identify the network and which identify the device.

In order for a devices on the network to communicate with other devices on the network it must know the addresses of those devices. If a print command is sent from a computer to a printer on the network, the command must be addressed specifically to the desired printer.

Example: An IP address is no different than your home address, in order to receive a letter specifically directed to you, your name and address must be correctly displayed on the letter.

IP addresses are assigned by the network administrator/provider and are rigidly assigned to the device(s) located within the workshop network, by entering it into the device during the initial setup.

IP Subnet Mask

This information is used to define which segment(s) of the four segment IP address specifically identifies the device and which identify the specific network.

Example: 255.255.255.0

Indicates that the first three segments (255.255.255) identify the specific network that the device is located on. The last segment (0) indicates that this is the segment that will identify the specific device.

Gateway

This information identifies the four segment address of the component located on the network responsible for communicating from the current network to another network. If there is no address in this location then a connection to any devices outside of the current network can not be established.

NOTE: The network and device address information must be entered exactly as defined by the network administrator for your facility, otherwise the devices can not be accessed.

REMOTE CODING, INDIVIDUALIZATION & PROGRAMMING TERMINALS



G03397885

Fig. 31: Identifying GT1
Courtesy of BMW OF NORTH AMERICA, INC.



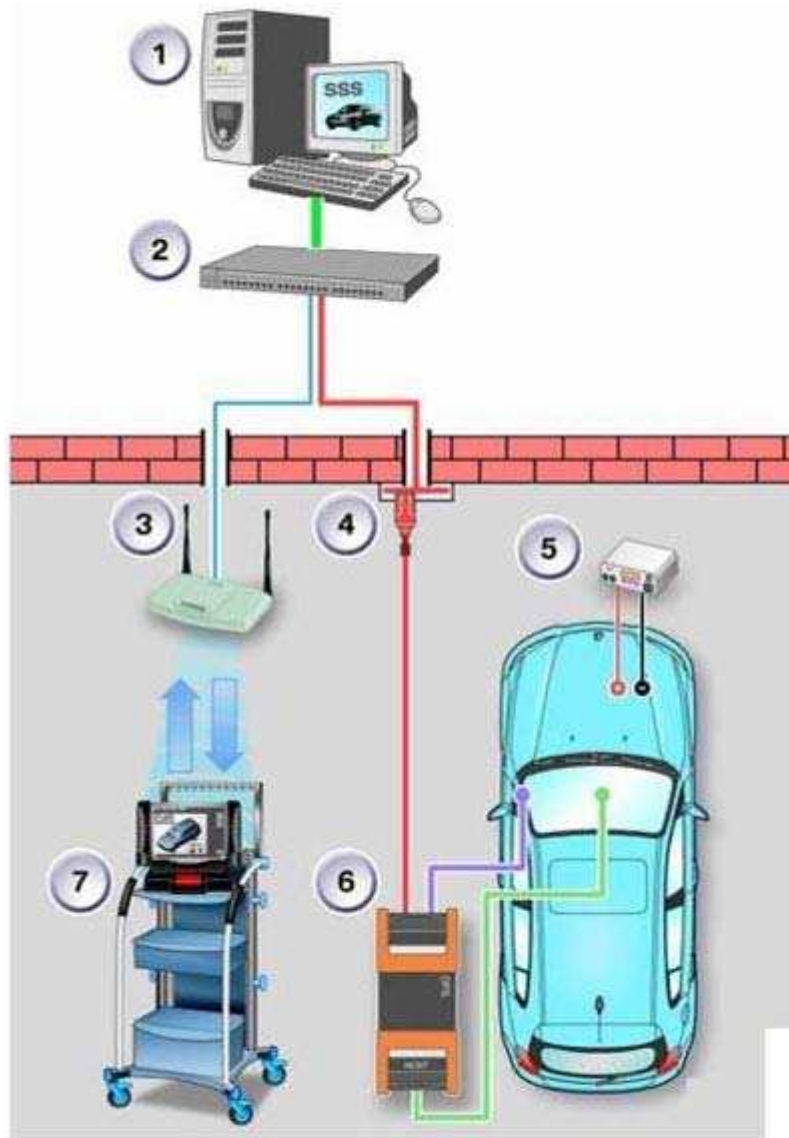
G03397886

Fig. 32: Identifying DISplus
Courtesy of BMW OF NORTH AMERICA, INC.

With the release of CIP 15.0 and the implementation of Progman (see **PROGMAN** section for additional information) the DISplus and GT1 will only be capable of performing vehicle diagnosis and activation/initiation of a Coding, Individualization or Programming task through the SSS. A special program management tool (Progman) will only allow the DISplus and GT1 to act as remote terminals to the SSS (regarding Coding, Individualization & Programming), which means that the SSS will be the single supplier of Coding, Individualization and Programming information to a vehicle and its respective control modules. By having all devices (DISplus, GT1 and SSS) connected to the network, the DISplus and GT1 can be utilized to perform diagnosis on a new vehicle after a request for vehicle programming as an example, has been sent to the SSS for the current vehicle.

Example: GT1(7) is connected to the LAN via access point (3) and to OPPS head (6) which is connected to LAN(4) and vehicle (5):

1. *Diagnosis of complaint is completed and test module result indicates that a control module needs to be updated/reprogrammed.*
2. *Coding and Programming/CIP is accessed on GT1(7) and a request to program specific control module on vehicle (5) connected to OPPS head (6) is made.*
3. *The SSS (1) takes over the programming process and begins to reprogram the control module and recode the vehicle (5).*
4. *At this point the GT1(7) is free to connect to a new OPPS/diagnostic head and begin a diagnostic routine or initiate another programming/coding session on a new vehicle.*



G03397887

Fig. 33: Connecting GT1 To LAN Via Access Point And To OPSS Head
Courtesy of BMW OF NORTH AMERICA, INC.

Software Service Station

The Software Service Station (SSS) was released to all centers for the sole purpose of Coding and Programming vehicles that can only be Coded/Programmed using CIP. The SSS is a dedicated desktop PC, that supplements the DISplus and GT1 diagnostic systems, since the SSS is only capable of performing Coding and Programming it frees up the DISplus and GT1 for diagnostic functions.



G03397888

Fig. 34: Identifying Software Service Station
Courtesy of BMW OF NORTH AMERICA, INC.

With the release of CIP 15.0 and the implementation of Progman, the SSS replaces the DISplus and GT1 (Group Tester One) diagnosis systems as the primary programming system. The DISplus and GT1 will only be able to send a request to Program or Code a vehicle directly through the SSS. The SSS performs the actual programming and coding process. In this configuration the SSS is able to program up to five vehicles at a time and the DISplus and GT1 are free to be used for other tasks, provided that all devices are connected to the workshop network and have been assigned specific IP addresses.

As with the DISplus and GT1, data is supplied to the Software Service Station by means of a CIP DVD-ROM or CD-ROM, additional data can also be provided by online updates via JETStream.

OPPS/OPS/Diagnostic Head

The OPSS (Optical Testing and Programming System), OPS (Optical Programming System) and the diagnostic head can all be used with the Software Service Station to serve as the interface to the vehicle. Optimal programming speed on MOST bus equipped vehicles is obtained by using the OPSS/OPS head connected to the OBD connector and directly to the MOST access port on E60, E63/64 and newer vehicles.

OPSS

The OPSS was first introduced with the E65 and is able to:

- Acts as interface between vehicle and DISplus/GT1/SSS
- Reduce programming time of MOST Bus control modules
- Diagnosis the fiber optic communication system utilized on the byteflight and MOST bus systems.

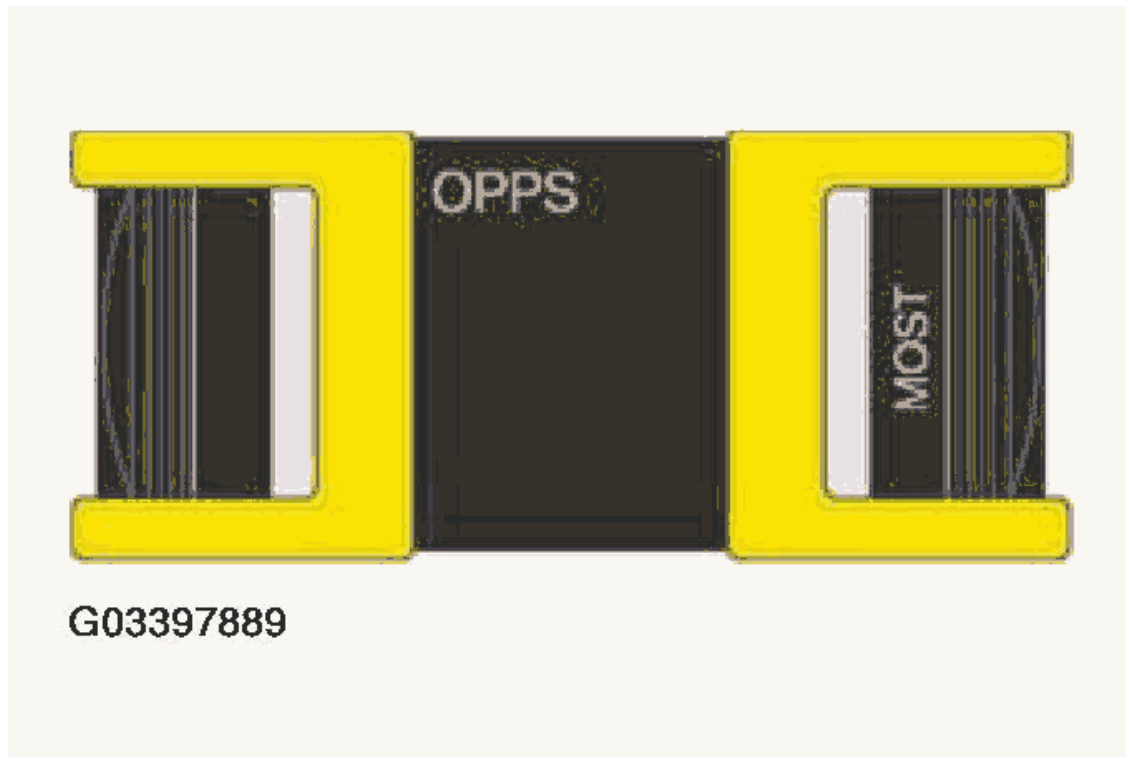


Fig. 35: Identifying OPSS

Courtesy of BMW OF NORTH AMERICA, INC.

- Simultaneously program vehicles equipped with a MOST bus system (except E65/66 up to 3/05 prod.) via MOST Bus access port and OBD connections.
- Perform vehicle diagnosis, coding and programming on all vehicles equipped with a MOST bus.
- Communicates via a wired connection (DK LAN cable) to Network or directly to GT1/DISplus/SSS

The OPSS is NOT ABLE to perform Diagnosis, Coding & Programming on an I-bus equipped vehicle.

OPS

The OPS is able to:

- Acts as interface between vehicle and DISplus/GT1/SSS
- Reduce programming time of MOST Bus control modules
- Simultaneously program vehicles equipped with a MOST bus system (except E65/66) via MOST Bus access port and OBD connections.
- Perform vehicle diagnosis, coding and programming on all vehicles equipped with a MOST bus.
- Communicates via a wired connection (DK LAN cable) to Network or directly to GT1/DISplus/SSS



Fig. 36: Identifying OPS

Courtesy of BMW OF NORTH AMERICA, INC.

The OPS is NOT ABLE to perform Diagnosis on the fiber optic communication system utilized on the byteflight and MOST bus systems nor can it be used to perform Diagnosis, Coding & Programming on an I-bus equipped vehicle.

Diagnostic Head

The diagnostic head is able to:

- Acts as interface between vehicle and DISplus/GT1/SSS
- Perform vehicle diagnosis, coding and programming and Vehicle & Key Memory on most vehicles.

Should not be used for coding and programming vehicles equipped with a MOST bus (E60/63/64/65/66...) as processor is too slow.



G03397891

Fig. 37: Identifying Diagnostic Head
Courtesy of BMW OF NORTH AMERICA, INC.

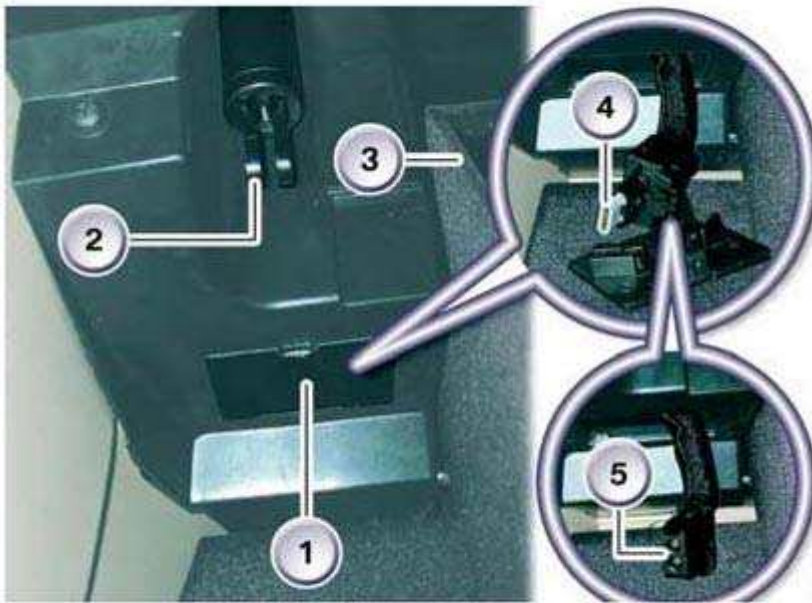
- Communicates via a wired connection (DK LAN cable) to Network or directly to DISplus/GT1/SSS
- Wireless communication to LAN/Workshop Network Connection via Access Point

MOST Direct Access Port

The MOST Direct Access port is installed on vehicles equipped with a MOST bus such as E60/E62/E63.... The port is utilized to allow separate programming of control modules connected to the MOST bus when using the OPSS/OPS head for Programming & Coding. By using this port in conjunction with the OBD socket when programming a vehicle the overall programming/coding time is reduced.

Access to the port differs corresponding to the model.

For E60 the port (5) is located on the left side of the glove box (3) behind the strut (2). To access the connection remove the cover (1) and remove the terminating plug (4) from the cable to allow connection to the port (5).



G03397892

Fig. 38: Identifying MOST Direct Access Port
Courtesy of BMW OF NORTH AMERICA, INC.

Example: Referring to the illustration below - Parallel programming of an E60 using OPSS head in conjunction with short OBD cable (1) P/N 666 111 and MOST bus programming cable (2) P/N 663 121 which connects to the MOST Access Port located in the glovebox. The OPSS is connected to the network via DK LAN cable 3.

NOTE: The OPS can be substituted for the OPSS.



G03397893

Fig. 39: Identifying OBD Cable P/N 666 111 And MOST Bus Programming Cable P/N 663 121
 Courtesy of BMW OF NORTH AMERICA, INC.

Equipment Configurations

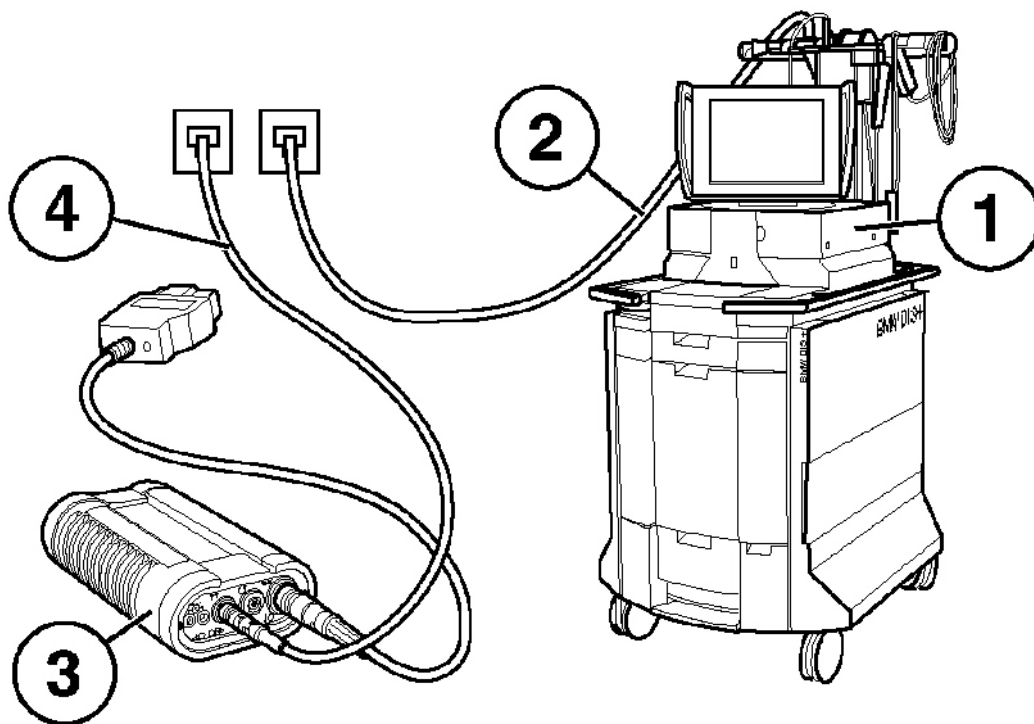
The diagnostic and programming equipment available in the workshop should always be configured to have the DISplus, GT1 and SSS connected directly to the LAN/Workshop network. **To ensure uninterrupted service/data transmission, it is highly recommended that the radio/wireless connection of the diagnostic head is NOT used to perform any type of Programming or Coding function.**

The normal configuration (when coding or programming) of the DISplus & GT1 to the diagnostic/OPPS/OPS head are as follows:

DISplus (1) - Connected to network using SI LAN cable (2)

+ Diagnostic/OPPS/OPS head (3) - Connected to network using DK LAN cable (4)

+ OBD or Diagnostic plug cable - Connecting diagnostic head to vehicle



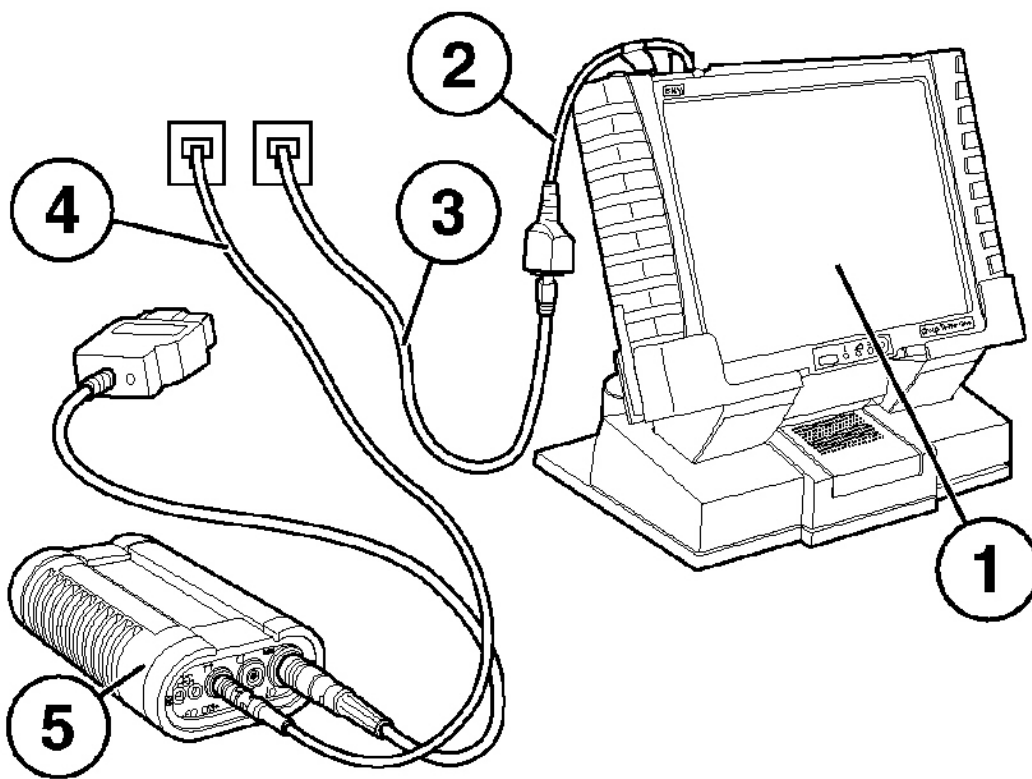
G03397894

Fig. 40: Connecting DISplus To Network Using SI LAN Cable
 Courtesy of BMW OF NORTH AMERICA, INC.

GT1 (1) - Connected to network using SI LAN cable (3) and LAN adapter BT1:1 (2)

+ Diagnostic/Ops head (5) - Connected to network using DK LAN cable (4)

+ OBD or Diagnostic plug cable - Connecting diagnostic head to vehicle.

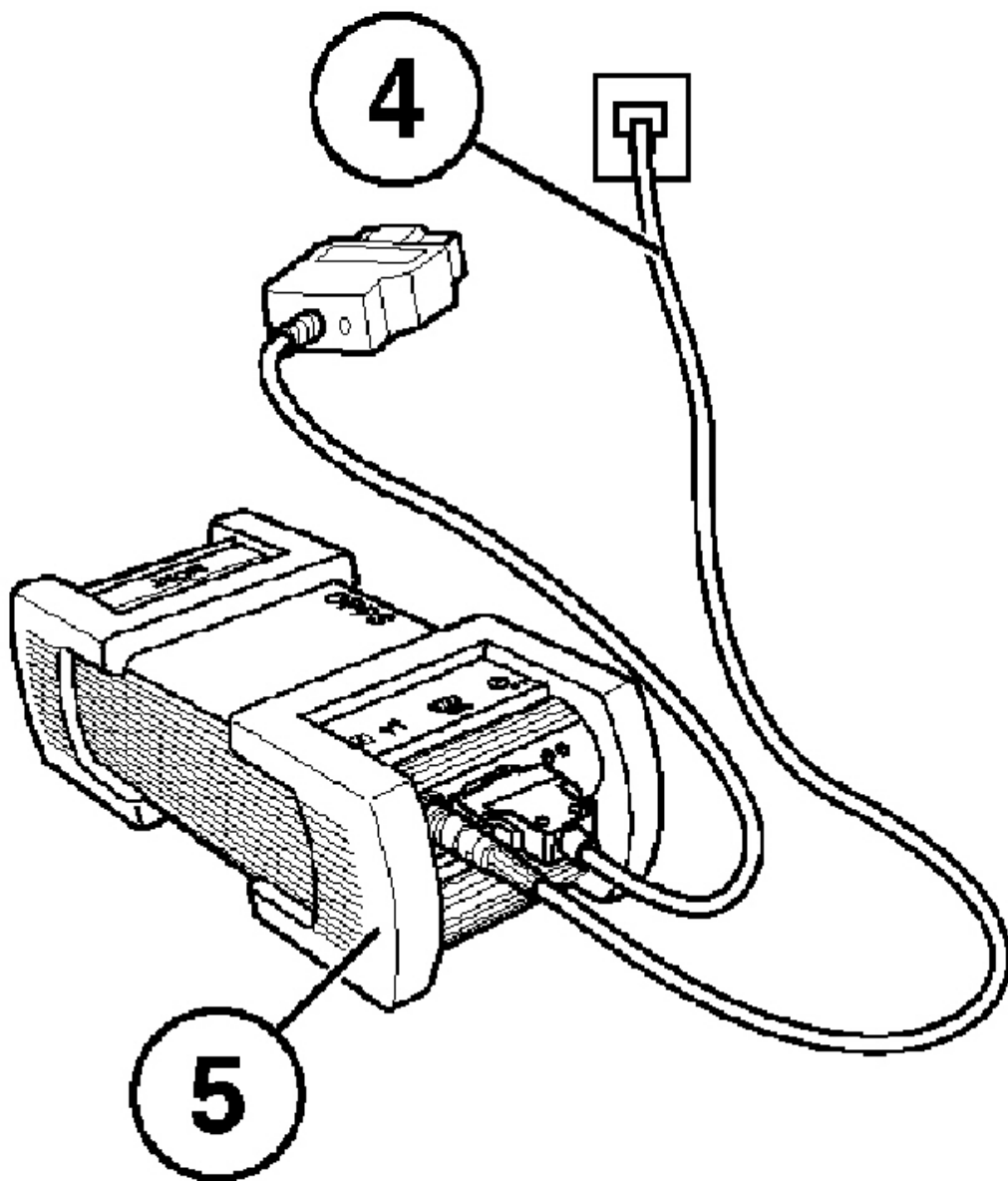


G03397895

Fig. 41: Connecting GT1 To Network Using SI LAN Cable And LAN Adapter BT1:1
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: For optimum programming speed the OPPS/OPS head (5) can be substituted for the diagnostic head:

- + Connect OPPS/OPS head (5) directly to a network drop via a DK LAN cable (4)
- + Connect OPPS/OPS head to the OBD connector using the short OBD cable P/N 663 111



G03397896

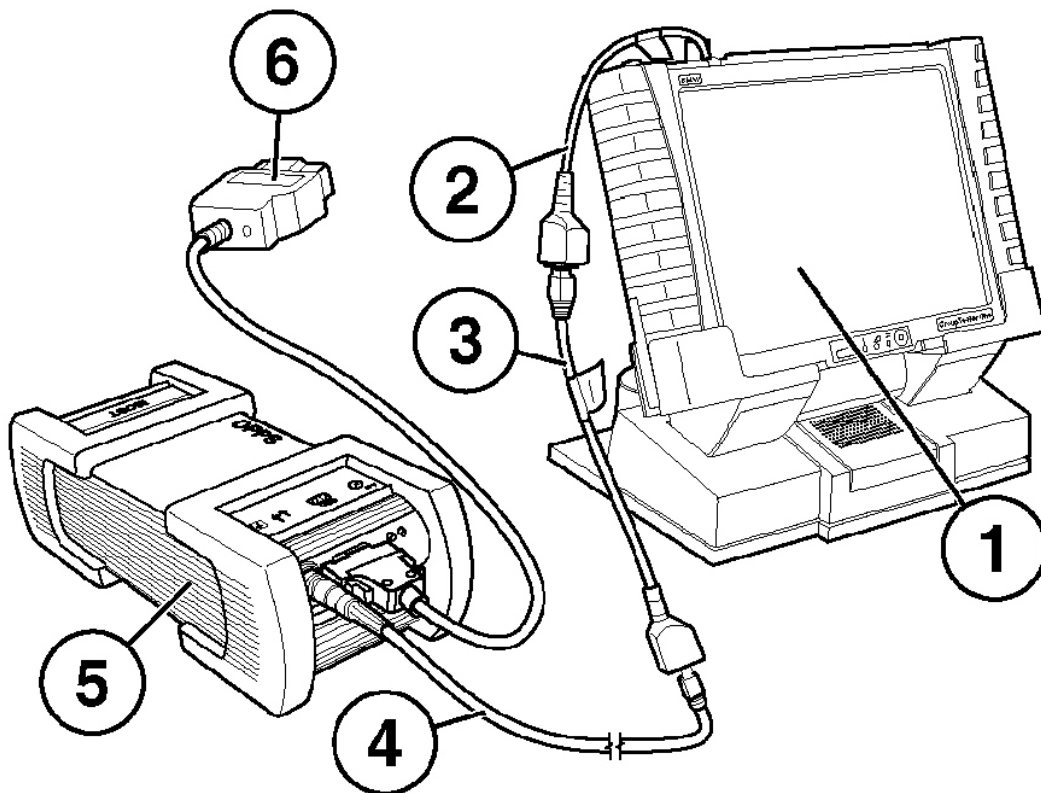
Fig. 42: Connecting OPDS/OPS Head Directly To Network Drop Via DK LAN Cable
Courtesy of BMW OF NORTH AMERICA, INC.

In the event that the workshop network is disabled/down the DISplus and GT1 can still be used to diagnose a vehicle by utilizing the following configurations:

GT1 (1) - Not connected to network

+ Diagnostic/OPPS head (5) - Connected to GT1 using DK LAN cable (4) and LAN adapter BT1:1(2) plus LAN adapter BT X (3)

+ OBD or Diagnostic plug cable (5) Connecting diagnostic head to vehicle



G03397897

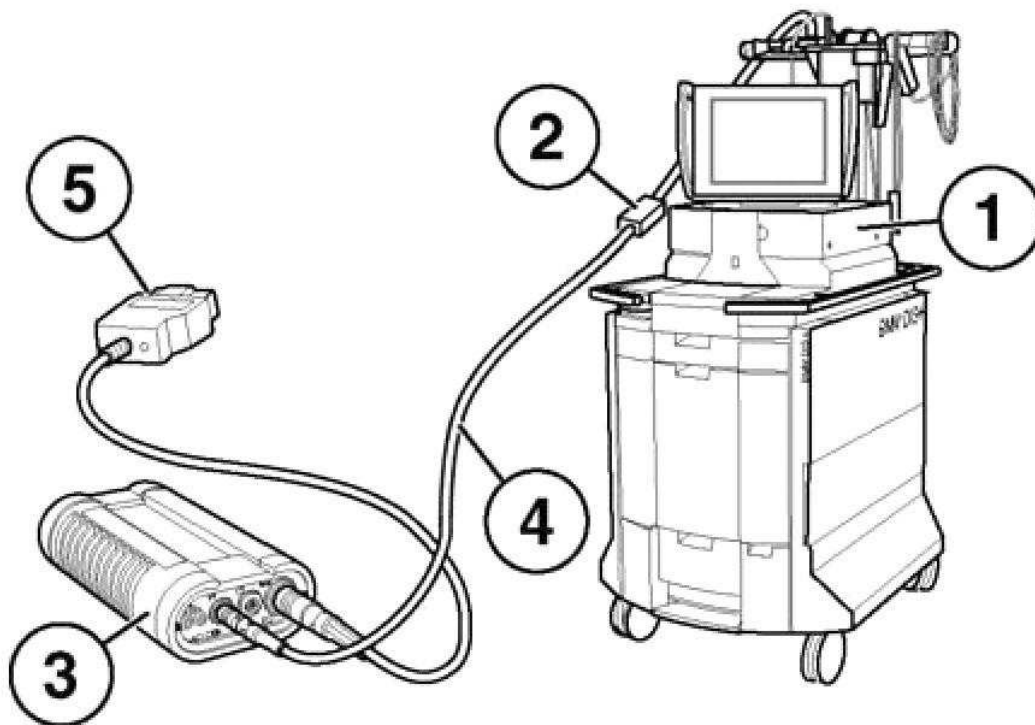
Fig. 43: Connecting Diagnostic/OPPS Head To GT1 Using DK LAN Cable And LAN Adapter BT1:1 Plus LAN Adapter BT X

Courtesy of BMW OF NORTH AMERICA, INC.

DISplus (1) - Not connected to network

+ Diagnostic/OPPS/OPS head (3) - Connected to DISplus using DK LAN cable (4) and PC LAN cable (2)

+ OBD or Diagnostic plug cable - Connecting diagnostic head to vehicle



G03397898

Fig. 44: Connecting Diagnostic/OPPS/OPS Head To DISplus Using DK LAN Cable And PC LAN Cable
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: **OPPS/OPS can not be used to perform diagnosis on an I-bus equipped vehicle (i.e. E32, E36, E38, E46, E53...).**

PROCEDURE FOR CODING & PROGRAMMING

An important prerequisite for ensuring trouble-free programming is the correct preparation of the vehicle.

A diagnostic procedure must first be performed on the vehicle prior to any programming. Programming must not be started before faults in the vehicle electrical system are ruled out.

Correct preparation of the vehicle avoids errors during programming.

The programming procedure may be terminated if a bus signal is generated as the result of activation of electric loads during programming. The programming procedure should be repeated following termination. In exceptional cases it may be necessary to replace the control unit if communication is no longer possible.

Prior to beginning any programming or coding procedure some general guidelines need to be considered in

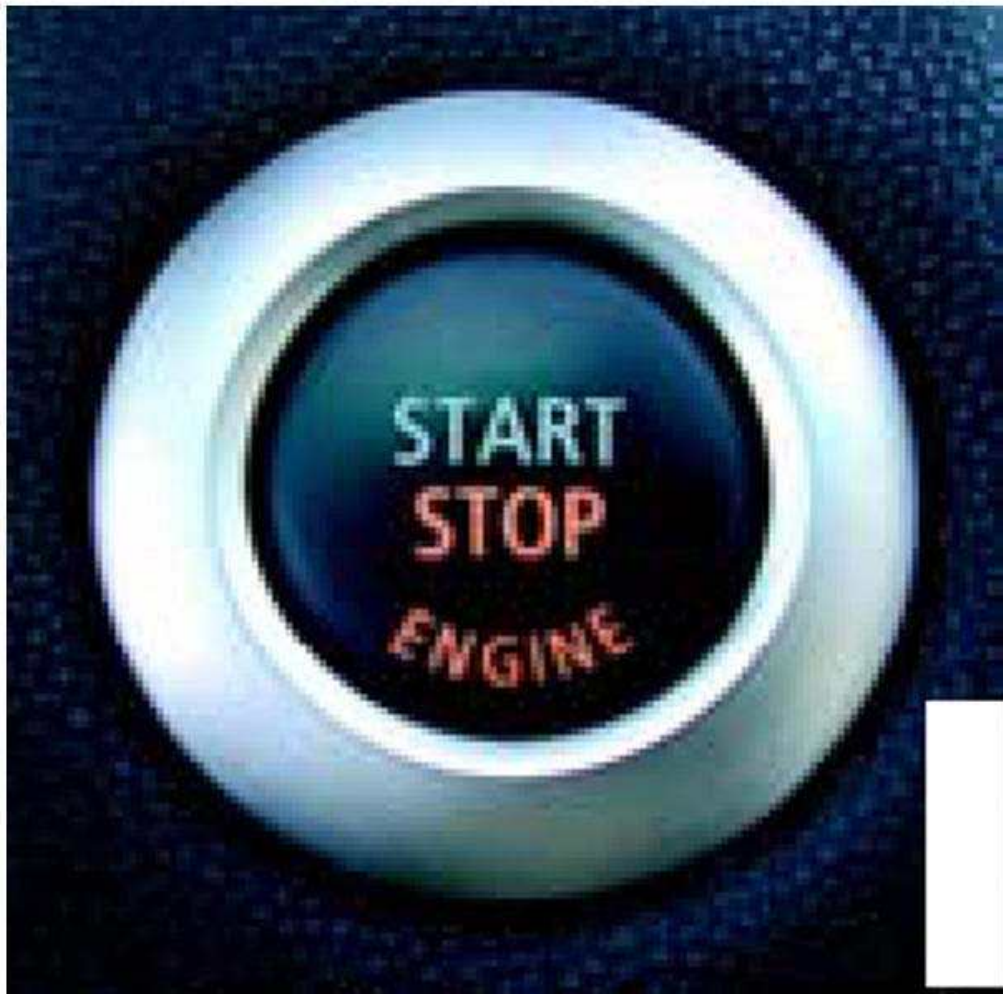
order to ensure that the process goes as smoothly as possible:

Check

Action /Procedure

Engine

Turn off engine, ignition key on - KL15



G03397899

Fig. 45: Identifying Engine Start/Stop Switch

Courtesy of BMW OF NORTH AMERICA, INC.

Manual gearbox/SMG

Transmission in neutral.

Parking brake applied.



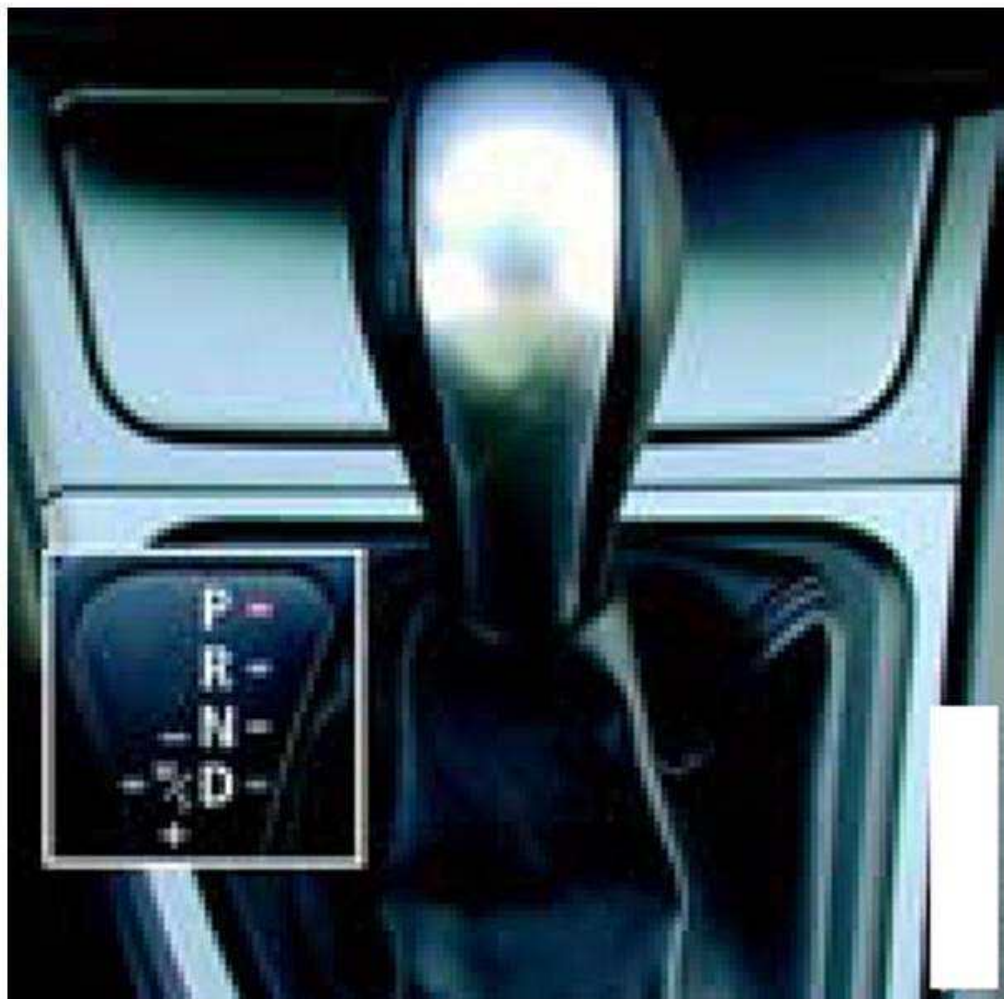
G03397900

Fig. 46: Identifying Manual Gearbox/SMG
Courtesy of BMW OF NORTH AMERICA, INC.

Automatic Transmission

- Transmission in position P.
- System temperature below 80°C.

Attention: Do not apply parking brake on vehicles equipped with the electromechanical parking brake.



G03397901

Fig. 47: Identifying Automatic Transmission Selector Lever
Courtesy of BMW OF NORTH AMERICA, INC.

Loads

- All electric loads, lights and indicator lights switched off.
- Wipe/wash system switched off. Insure that the wipers can move freely. Wipers may be activated during programming.

Do Not Block the Wipers.



G03397902

Fig. 48: Identifying Button

Courtesy of BMW OF NORTH AMERICA, INC.

Check

Action /Procedure

Diagnosis

Perform quick test.

Using the diagnosis system, rectify any problems before programming and clear stored fault codes.



G03397903

Fig. 49: Identifying DISplus
Courtesy of BMW OF NORTH AMERICA, INC.

Battery

The battery should be sufficiently charged at the start of the programming procedure (12.6 V).



G03397904

Fig. 50: Identifying Battery

Courtesy of BMW OF NORTH AMERICA, INC.

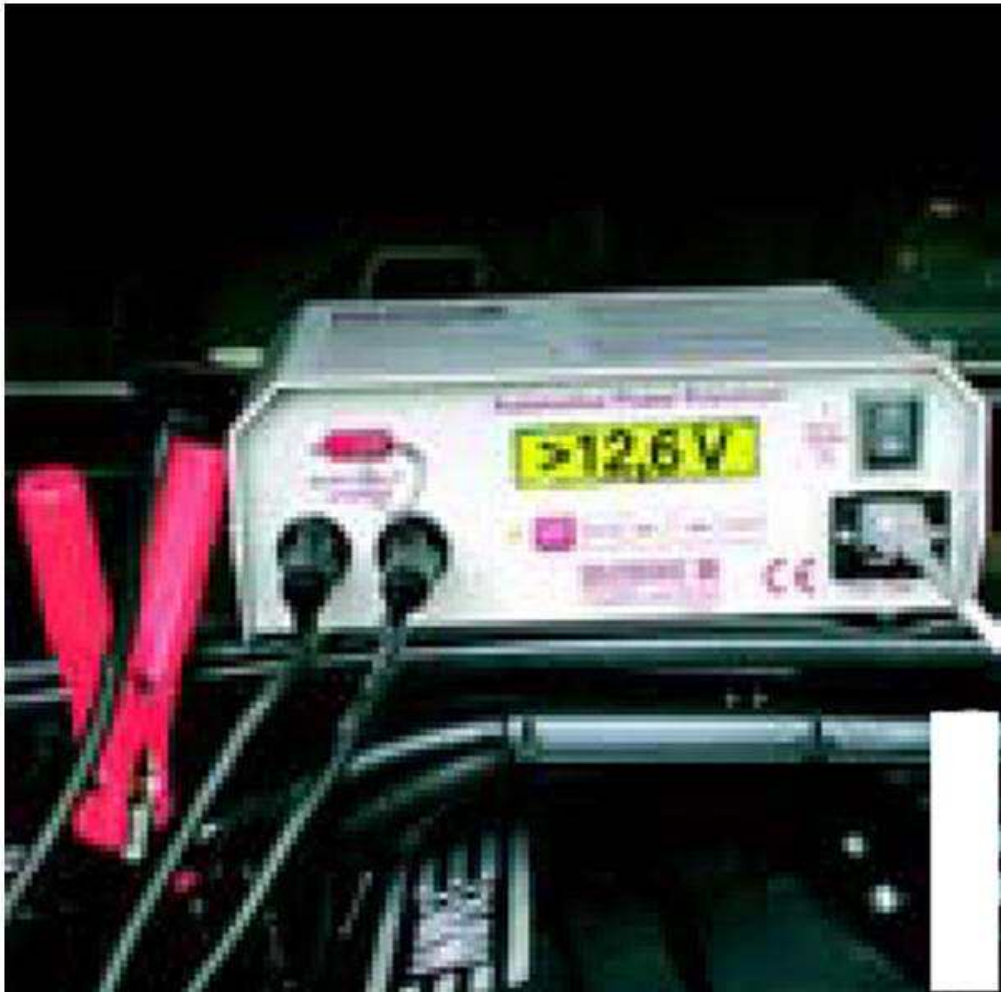
Battery Charger

IMPORTANT: Vehicles must be connected to the Deutronic Automatic Battery Charger prior to beginning the programming or coding procedure, this is the only approved battery charger for MOST bus-equipped vehicles.

During the programming or Coding procedure the battery charger must be in the Power Supply (PS) mode.

Place the charger into the power supply mode by depressing the "MENUE" button 3 times in rapid succession.

Do not connect or disconnect the charger during programming. The system voltage must not drop below 12.6 V during the programming procedure.



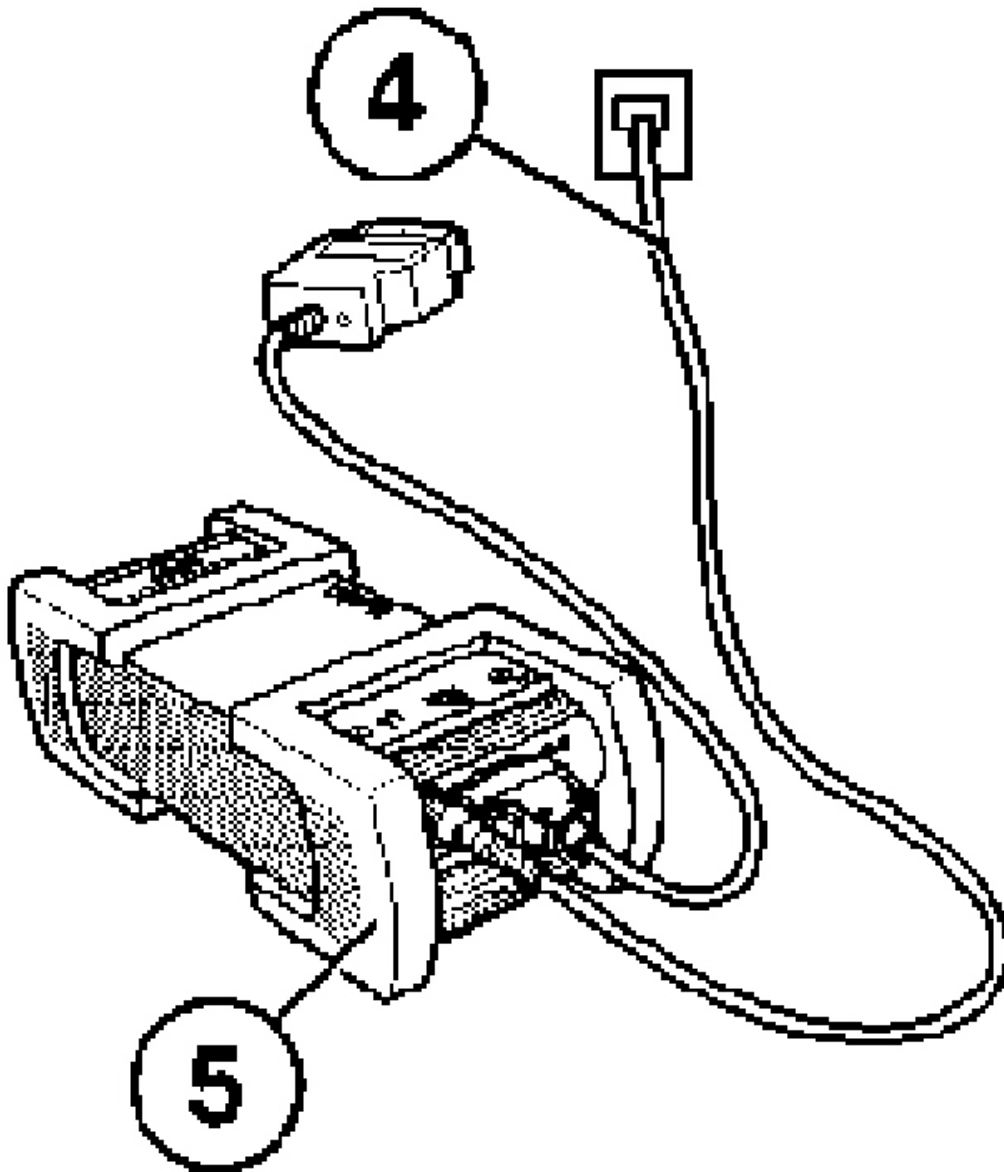
G03397905

Fig. 51: Identifying Battery Charger
Courtesy of BMW OF NORTH AMERICA, INC.

DO NOT USE Radio Connection for Programming or Coding!!

Diagnostic head/OPPS head (5) must be connected directly to a network drop to ensure uninterrupted programming.

The DK LAN cable (4) MUST NOT BE routed through an open window of the vehicle, leave a door open.



G03397906

Fig. 52: Connecting Diagnostic Head/OPPS Head To Network
Courtesy of BMW OF NORTH AMERICA, INC.

Programming

Check CKM values, also observe individual settings on the vehicle if applicable, start programming procedure.

Attention: The data status of the Software Service Station must always be kept updated!



Fig. 53: Identifying Progman

Courtesy of BMW OF NORTH AMERICA, INC.

Make sure that no switches, radio etc. are operated during programming as this could terminate the programming procedure.

DO NOT TOUCH CODING/PROGRAMMING ACTIVE

CODING PLUG

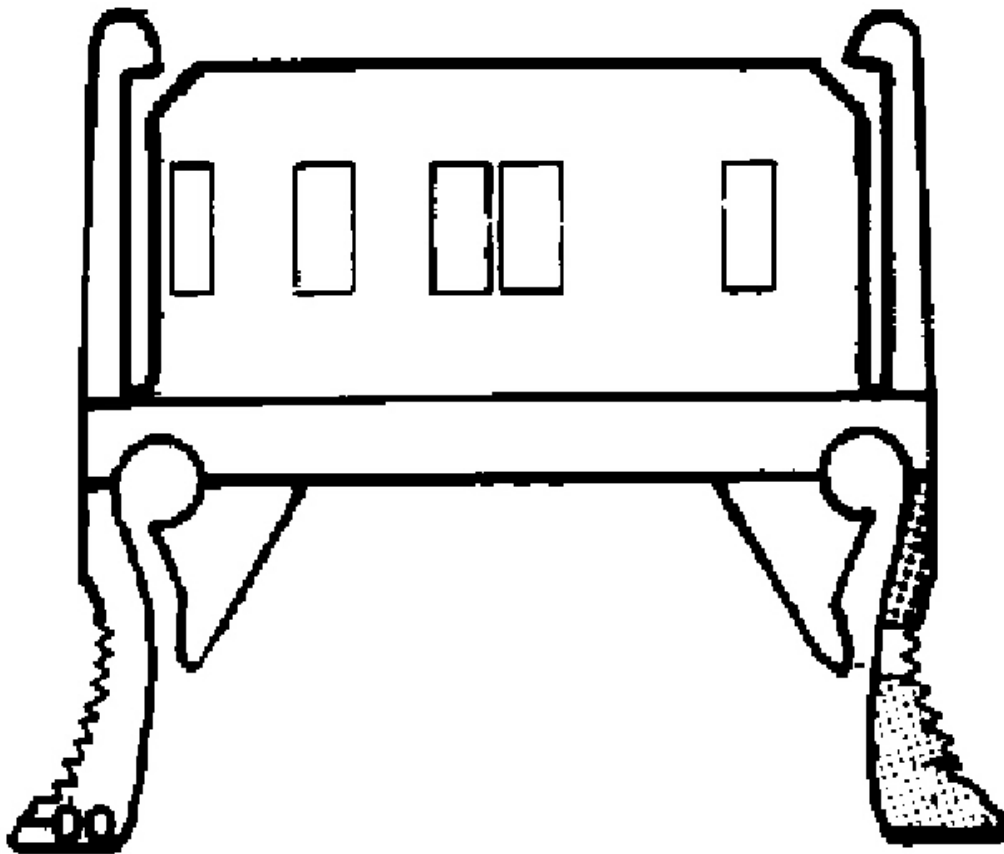
Model: E23, E24, E28, E30, E32, E34, E36

Production: 9/87 - 2002

CODING PLUG

A coding plug is a mechanically keyed or electronically coded device/plug, that can open or bridge circuits in a particular component to allow it to operate differently dependent on the type of plug installed/inserted.

BMW used a mechanical coding plug which simply opened or bridged circuits to assign market specific data to the instrument cluster of the E23, E24, E28 and E30 vehicles. With the introduction of the E32 in 1988 and the E34 in 1989, electronic coding plugs were utilized in the instrument cluster.



G03397908

Fig. 54: Identifying Coding Plug

Courtesy of BMW OF NORTH AMERICA, INC.

The change to an electronic coding plug which allowed market specific data to be assigned to the instrument cluster also contained Non-Volatile Random Access Memory (NV-RAM), which provided an ability to retain vehicle specific data in the plug such as:

- Vehicle Identification Number
- Accumulated Mileage
- Service Indicator Information
- Coding plug number
- Fuel Tank Size data

By using a plug that is able to store data, the instrument cluster can be replaced without losing vehicle mileage, unless the coding plug is damaged.

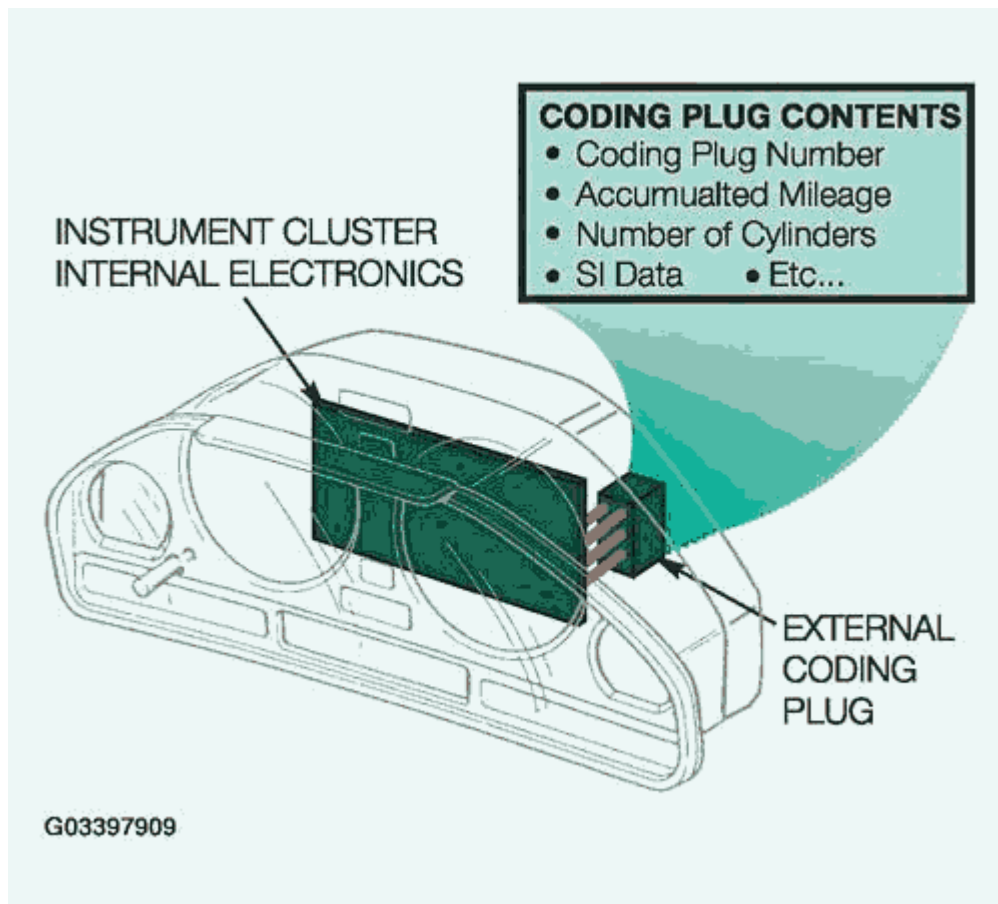


Fig. 55: Identifying External Coding Plug
 Courtesy of BMW OF NORTH AMERICA, INC.

With the introduction of vehicles like the E31 and E38 the instrument cluster no longer utilizes a coding plug since it receives most of its input signals directly from a control module, EKM (E31) or IKE (E38), this allows vehicle data to be directly stored in the control module and the instrument cluster is no longer coded. For these vehicles and newer models, market specific data is stored in the control module (EKM or IKE). By coding these modules by way of ZCS coding (refer to **ZCS CODING PROCEDURE**) market specific data is assigned/released to the control module.

Coding Plug Identification

Each coding plug features a stored 5-digit numerical code that varies between model/equipment, etc.

The code can be read out through the instrument cluster display by pressing the odometer reset button and turning the ignition switch to KL R. The coding plug number will be display in the instrument cluster matrix.



Fig. 56: Identifying Coding Plug Identification Number
Courtesy of BMW OF NORTH AMERICA, INC.

If this is no longer possible, the coding plug must be removed in order to read the code on the label of the coding plug.

Ordering Replacement Coding Plug

The coding plugs are received pre-coded and installing them automatically codes the cluster.

The first digits of the 5-digit code is changed on coding plugs when they are replaced.

ORDERING REPLACEMENT CODING PLUG

	E32	E34
ORIGINAL NUMBER	1 1101	2 0101
REPLACEMENT NUMBER	5 1101	4 0101

NOTE: It is not possible to input the mileage reading, the service interval status and the chassis number into the replacement coding plug.

CODING PLUG OVERVIEW

Since the introduction of the E32 several versions of instrument cluster coding plugs have been introduced, this section will provide an overview of the different versions, plus provide identification and coding information.

Coding Plug Identification - E32/E34

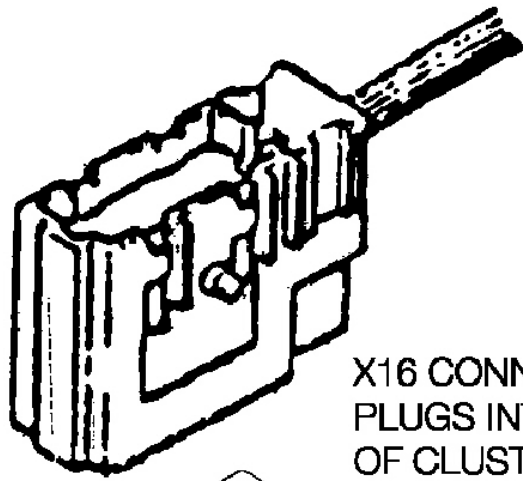
The E32/E34 Instrument cluster coding plugs progressed through three variations of design.

Start of production up to 2/89.

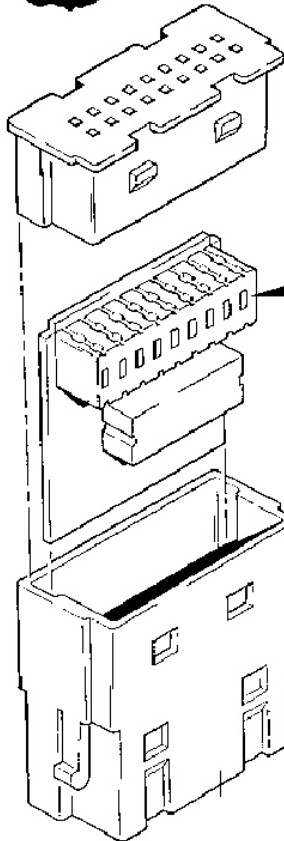
The original E32/E34 instrument cluster coding plug was installed in the wiring harness connector (X16) which plugged into the instrument cluster. This plug contained all of the vehicle specific coding data for the instrument cluster and retained accumulated mileage and service interval information.

In the event that the instrument cluster must be replaced the coding plug is reused with the new cluster. By reusing the old/original plug the mileage in the odometer does not change, since the coding plug is able to retain the information.

- If the coding plug must be replaced, the total mileage and Service Interval information will be lost.



X16 CONNECTOR
PLUGS INTO BACK
OF CLUSTER



CODING PLUG IS
PRESSED OUT OF
CONNECTOR

G03397911

Fig. 57: Removing Coding Plug
Courtesy of BMW OF NORTH AMERICA, INC.

- Replacement coding plugs pre-coded by part number and are available from the parts department.

From 2/89 to 9/91 Production

The E32/E34 instrument cluster and coding plug were redesigned in 2/89. As a result of this redesign the coding plug became an external component and plugged directly into the back of the instrument cluster, no longer part of the X16 connector.

Even though the plug can be removed without disconnecting the harness, all power must be disconnected from the cluster prior to removal, to prevent data loss from the coding plug.

9/90 Revision

In 9/90 the cluster was slightly redesigned again to address changes in the fuel gauge and some minor physical changes. The electronics of the cluster as well as the coding plug were upgraded considerably.

The coding plug and the instrument cluster are not compatible with the earlier redesign. The printed circuit board and the coding plug are colored blue for distinction over the components of the earlier redesigned cluster.

The new blue coding plug is also keyed differently to prevent unintentional exchange with the earlier coding plug.

E32/34 as of 9/91 (1992 Model Year)

After 9/91 production, the instrument cluster coding plug can be coded using the ZCS function within CIP by selecting the specific module via the DISplus/GT1/SSS. The physical characteristics of the coding plug did not change.

A replacement uncoded coding plug (P/N 62 11 8 359 368) must be coded after installation into the instrument cluster, refer to **ZCS CODING PROCEDURE** .

A precoded coding plug (P/N 62 11 8 359 369) is available for this cluster as well. When ordering include with your order the following information:

- ZCS code for the vehicle
- VIN for the vehicle

E36 Instrument Cluster

318i/is, 325i/is and M3

The instrument cluster for these vehicles does not utilize a coding plug. The entire cluster is coded model specific, by using the ZCS coding procedure in CIP by selecting E36.

Recently, a new procedure has been made available that transfers the accumulated mileage and service interval data from a defective instrument cluster into a new replacement cluster for these vehicles.

318ti and Z3 Roadster

These vehicles are equipped with an instrument cluster that is not connected to the diagnostic link and therefore

can not be coded using ZCS. Since the cluster can not be coded, these vehicles require a coding plug for vehicle specific coding.

Like the E32/E34, the coding plug is able to store the accumulated mileage and service interval information. In addition to storing the data on the coding plug the instrument cluster is also able to internally store the data on an EEPROM (Electrically Erasable Programmable Read Only Memory), as redundant back. If the cluster main processor or coding plug need to be replaced, the mileage and SI Indicator data can be transferred to the new component using the clusters test step procedure #9. higher value overwrites the lower.

Test No. 09

DISTANCE READING Test - 09 allows the total stored mileage to be updated if one of the storage components has to be replaced. The test step will be used if the manipulation dot is illuminated in the cluster display. This test step will identify which component has the lower mileage.

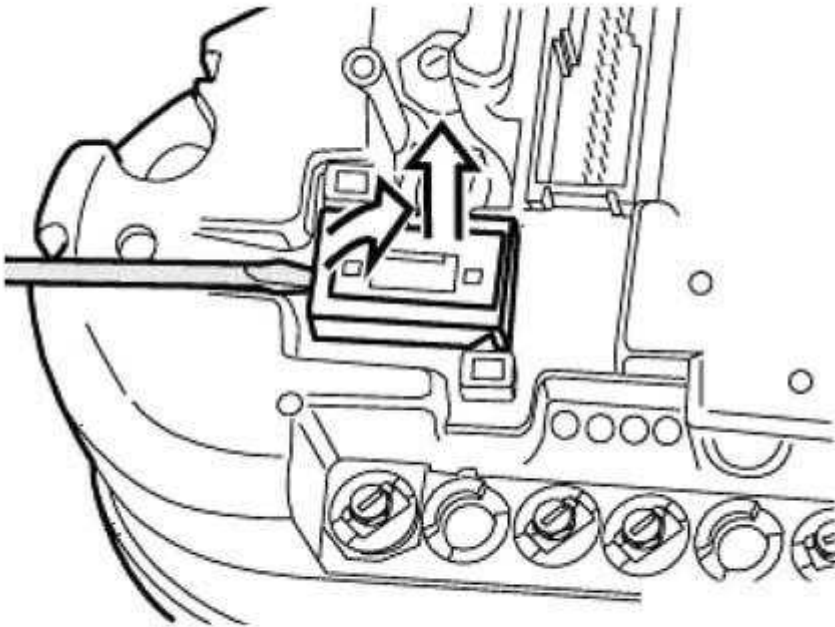
Display Example:

012654 I - Indicates the mileage in the internal EEPROM is lower than the mileage stored in the coding plug.

000325 E - Indicates the mileage in the external coding plug is lower than the total mileage stored in the internal EEPROM.

Pressing the reset button for 4 seconds will over write the lower mileage with the higher mileage and cancel the manipulation dot. The SI data will also be transferred at the same time.

To remove the coding plug from the instrument cluster first remove the snap off cover. Pull the coding plug from the connector in the cluster.



G03397912

Fig. 58: Removing Coding Plug From Instrument Cluster
Courtesy of BMW OF NORTH AMERICA, INC.

FEDERAL ODOMETER DISCLOSURE REQUIREMENT 92-513

The Federal Odometer Disclosure Requirement 92-513 states that, whenever an instrument cluster component is replaced that brings the odometer back to 0 (coding plug), the mileage prior to its replacement along with the date that the replacement occurred must be recorded on the left door frame of the vehicle.

A permanent label to record this information is included with every coding plug (except E36/5 and E36/7) that is ordered from the parts department.

Additional labels can be ordered separately under Part Number 89 89 1 000 500.

ODOMETER NOTICE

ODOMETER HAS BEEN REPAIRED OR
REPLACED AND SET TO ZERO ON:

DATE

PRIOR TO REPAIR OR REPLACEMENT
MILEAGE WAS

MILEAGE

**OWNER OR AGENT
UNLAWFUL TO REMOVE OR ALTER
Federal Law 92-513 Title IV Sec.407**

G03397913

Fig. 59: Identifying Odometer Notice

Courtesy of BMW OF NORTH AMERICA, INC.

ADD MILEAGE OF VEHICLE AND DATE WHEN THE CLUSTER WAS REPLACED IN SERVICE WARRANTY INFORMATION BOOKLET

Speedometer (Odometer Memory) changed:

Mileage 14,671

Date 4/5/95

It is the responsibility of the person making this replacement to record this information on the vehicle and in the Owner's Service Warranty Information Booklet.

G03397914

Fig. 60: Identifying Vehicle Mileage And Cluster Replacement Date
 Courtesy of BMW OF NORTH AMERICA, INC.

Strict compliance with this requirement must be followed through with the following vehicles if mileage is reset to 0:

VARIANT CODING

Model: E24, E28, E30, E32, E34, E36

Production: 3/87 - 12/95

VARIANT CODING

A Variant Code is another means by which market specific application data can be released/assigned to a control module, this process allows one base control module to be utilized for different market applications.

The variant code is a 4 digit hexadecimal (alpha-numeric) code that is entered into a control module as part of the coding process. By entering a valid code into the module a set of operational data (characteristic maps) specific to the code entered is assigned to the operating program of that control module. The operational data and code are semi rigidly assigned, meaning that if a new code is entered, a different set of data is assigned to the program.

Variant coding is only used on engine control modules. Engine control modules which utilize variant coding were first introduced into production vehicles as of 3/87 production with Motronic M1.1 (Engine Control Module ECM/DME).

Variant coding is only used on Engine Control Modules with version M1.X.

ENGINE CONTROL MODULE ECM/DME INFORMATION

DME Version	Series	Cyl.	Engine	Year
M1.1	E28/E30	6	M20/M30	3/87 - 8/92
M1.2	E24/E28	6	S38	87 - 88
M1.3	E34	6	M20/M30	6/87 - 9/90

M1.3	E34	6	M30	6/88 - 12/92
M1.3	E32	6	M30	3/87 - 7/92
M1.7	E30/E36	4	M42	3/90 - 12/93
M1.7.2	E36	4	M42	1/94 - 12/95

Using the DISplus/GT1/SSS with the latest CIP programming software contained within Progman, allows the technician to:

- Code a new, uncoded control module.
- Recode a previously coded control module.

The variant code is entered into the control module either by:

- Adopting the existing code from the defective DME control module (if diagnostic communication is possible).
- Manually entering the variant code via the keypad displayed on the screen of the DISplus/GT1/SSS.

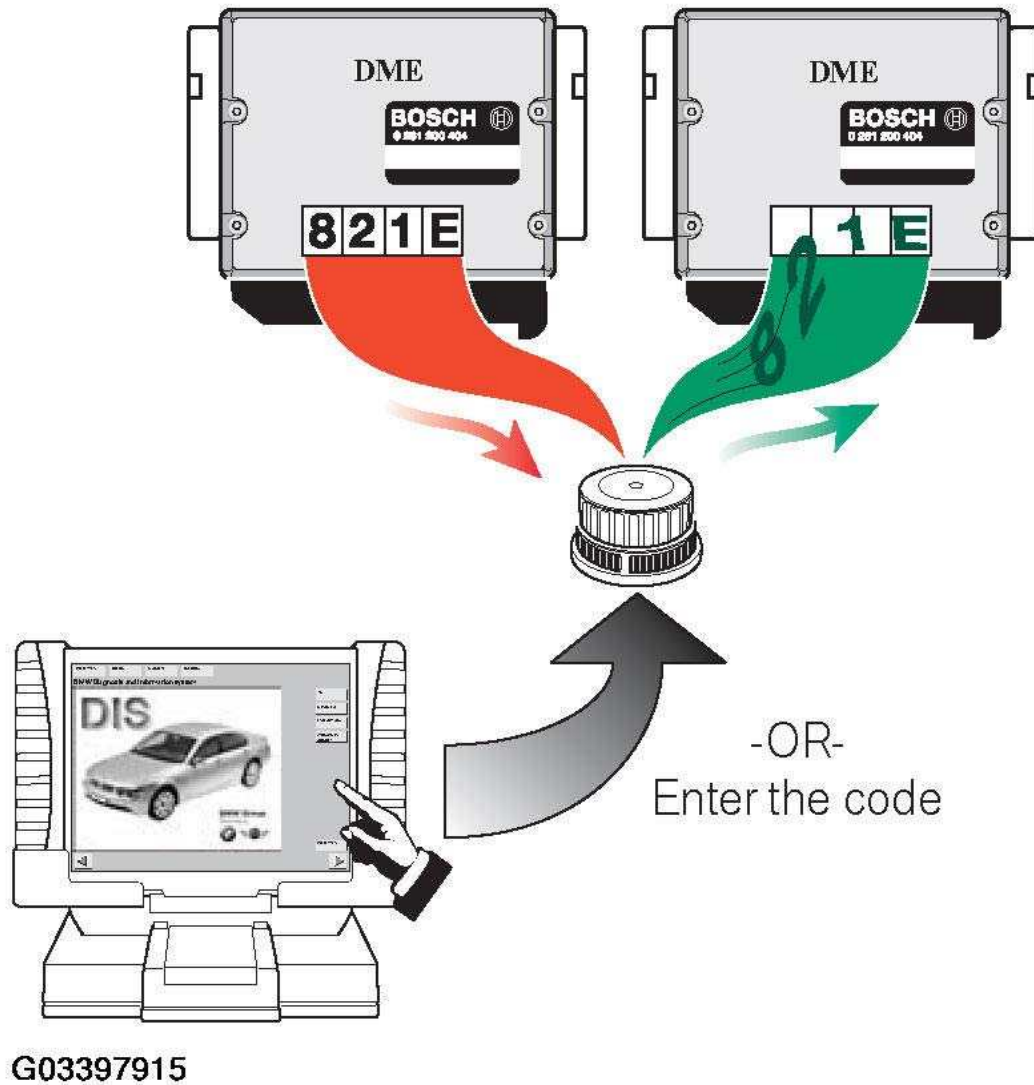


Fig. 61: Entering Variant Code Into Control Module
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: M1.X DME control modules can only be coded up to eight (8) times. The GT1/DISplus will display the remaining number of times the control module can be recoded.

If variant coding of an M1.3 control module for an M20 engine is not possible, the cause may be that Pin 18 (DME Code Link) of the 20 pin diagnostic connector may be backed out of the connector preventing communication between the tester and DME control module.

Variant Code Identification Display

The variant code for a DME M1.X control module can be accessed in three ways:

- Electronically via DISplus or GT1:
 - DME Control Module Identification screen
 - Select "Programming" then "DME variant code", installed variant code is displayed.
- DME control module variant code label
- **SI B13 02 90 (3009)**

The quickest and most accurate way to access the variant code of the installed DME is by viewing the DME Identification page using the DISplus or GT1.

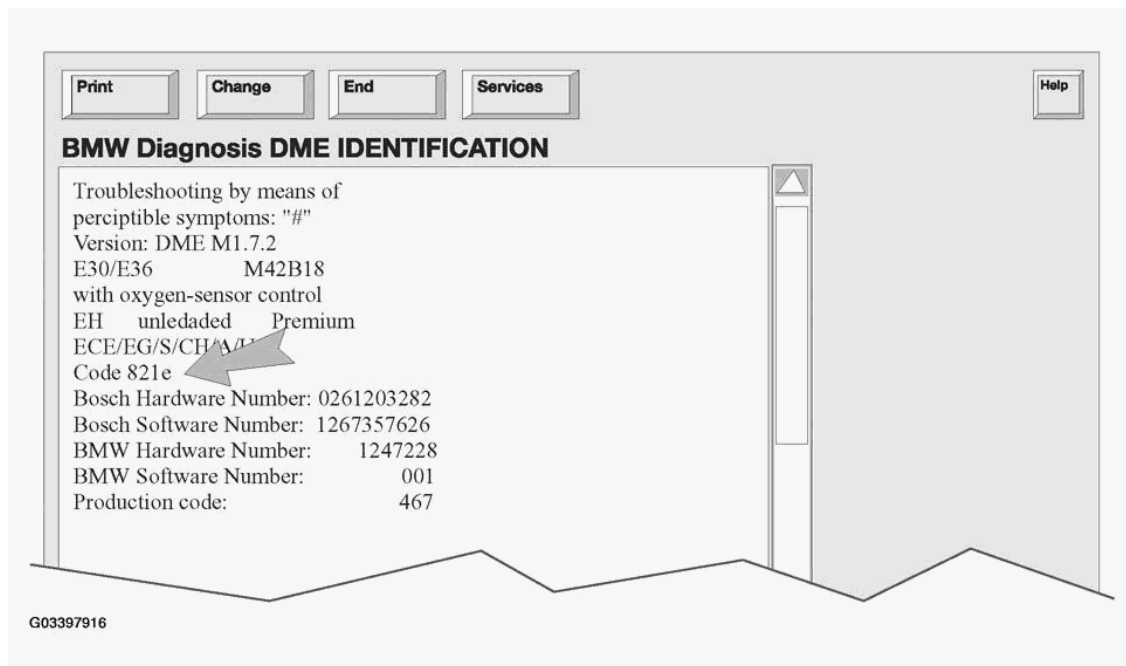


Fig. 62: Identifying DME Identification Page
Courtesy of BMW OF NORTH AMERICA, INC.

If a control module malfunction is suspected cross reference the BMW and Bosch part numbers in the display with the installed variant code. Problems can occur if:

- The correct variant code is installed in the wrong control module.
- An incorrect variant code is installed in the correct control module

Variant Code Structure

The four digit structure of the variant code consists of a 16 bit binary code which converts to a 4 digit hexadecimal code. Each hex character provides information pertaining to specific functions, characteristic maps and vehicle data.

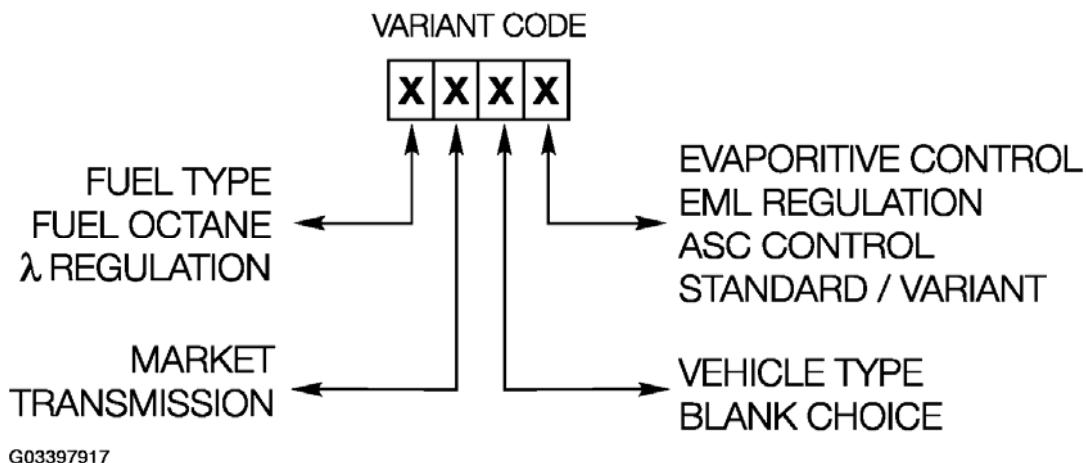


Fig. 63: Identifying Variant Code Structure

Courtesy of BMW OF NORTH AMERICA, INC.

The information from the variant code is used to define the operational data to be assigned to the operating program of the module.

Each hex digit has a binary equivalent that provides four 1's or 0's which results in a total of 16 bits of information (or choices) per hexadecimal digit.

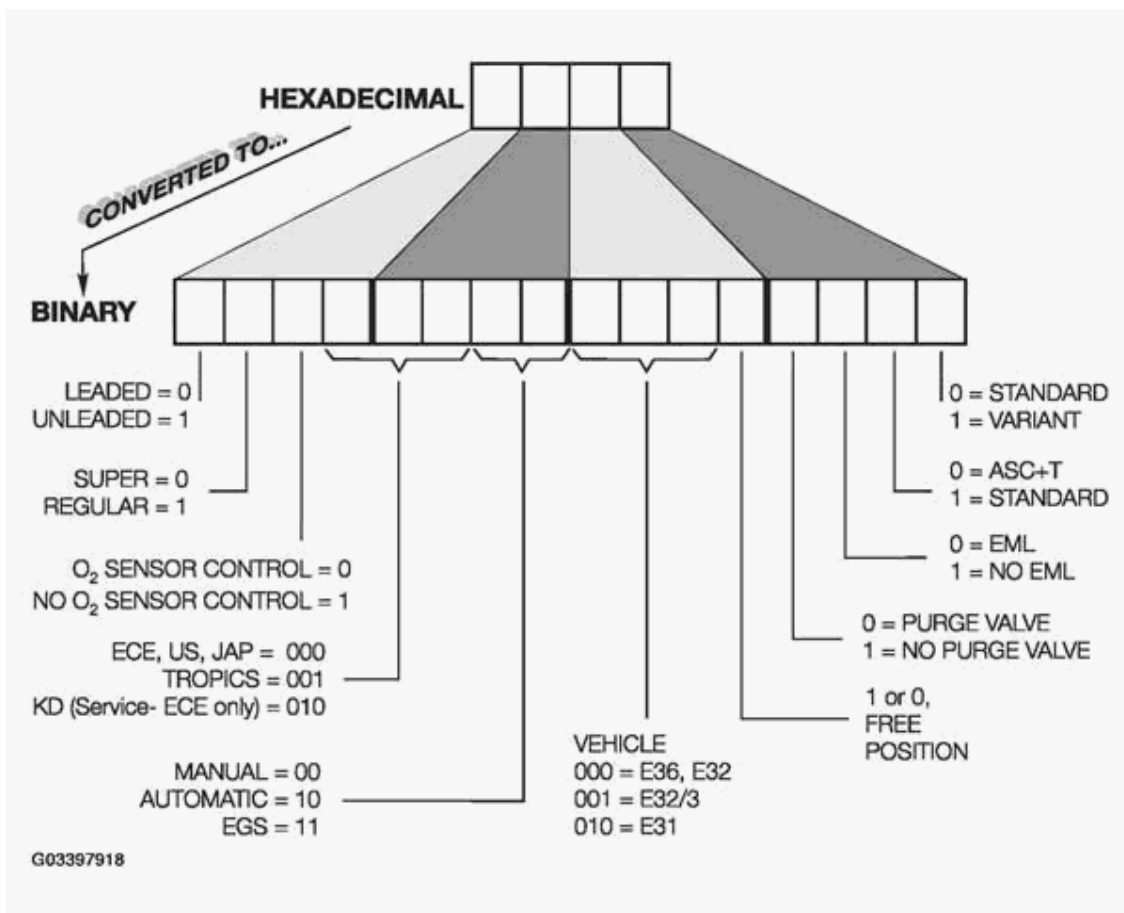


Fig. 64: Identifying Variant Code Information
 Courtesy of BMW OF NORTH AMERICA, INC.

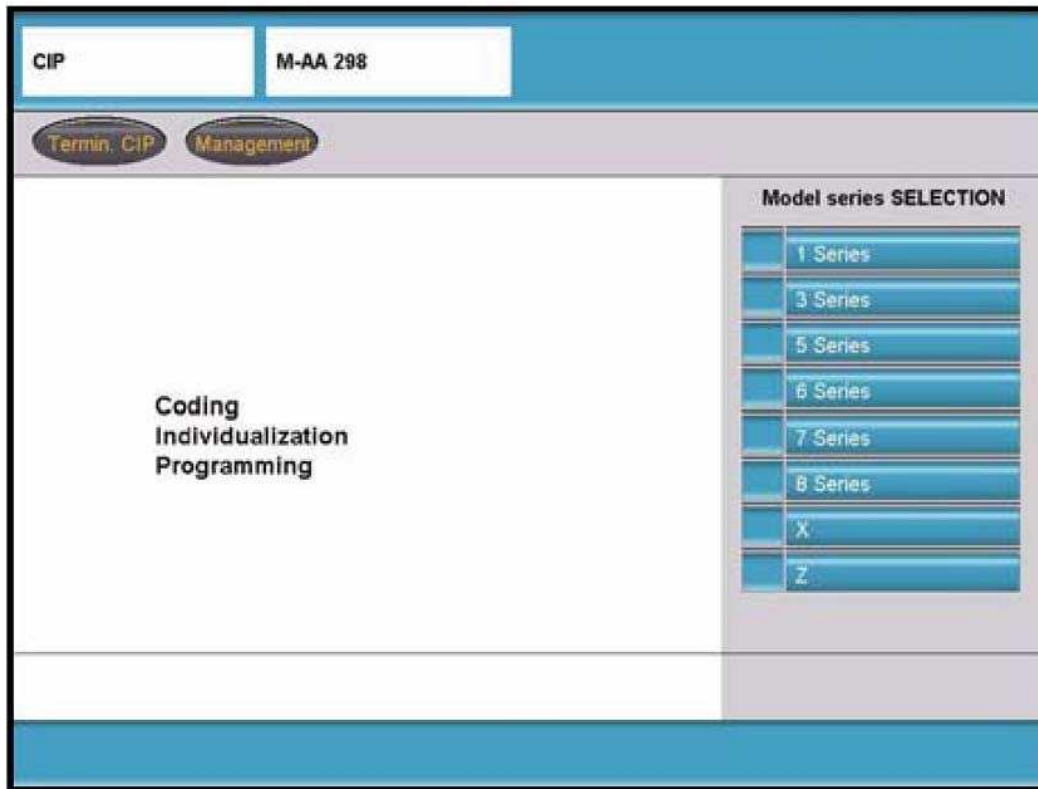
Under no circumstances should the variant code to be changed from the assigned number for the vehicle. Erratic engine operation and possible engine damage may result.

Variant Code Procedure

In the event that an M1.x control module needs to be replaced or recoded the process can be accessed through Progman with CIP 15.0 or higher.

To perform the procedure from CIP the Model series must be selected.

Then select the body (E32, E36 ...)

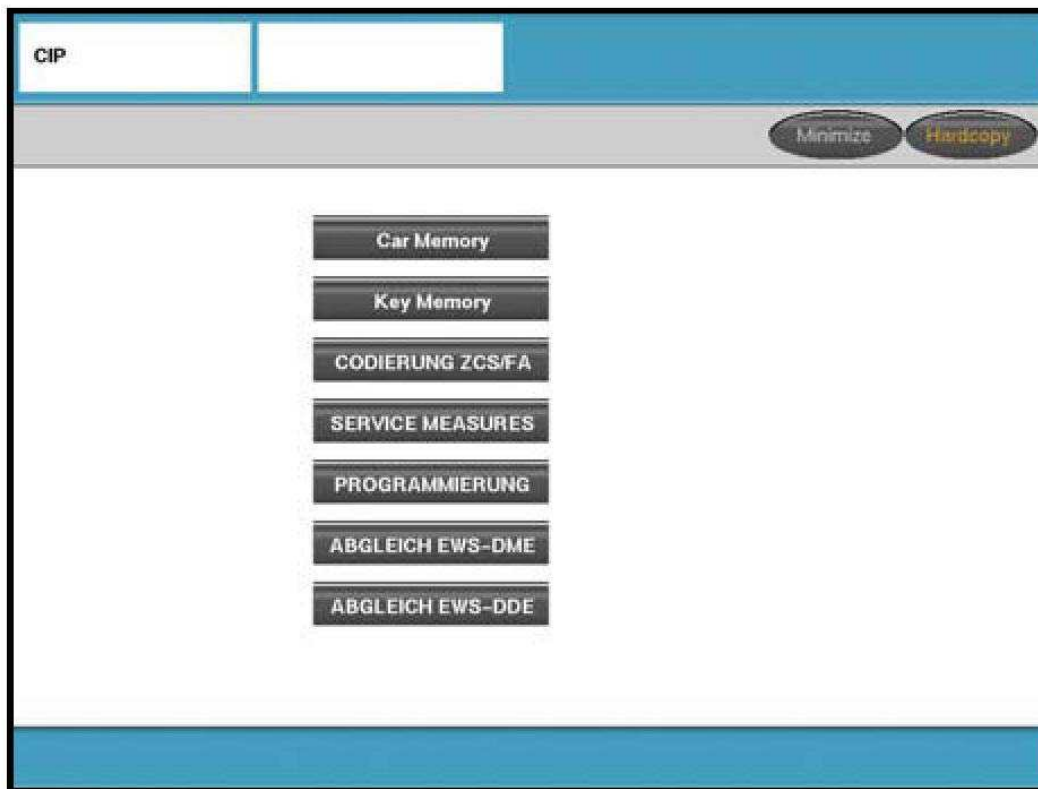


G03397919

Fig. 65: Selecting Model Series Selection Menu
Courtesy of BMW OF NORTH AMERICA, INC.

Select: "**Programmierung**"

Advance screen to the right two times to enter the programming/variant coding selection screen.



G03397920

Fig. 66: Selecting Programmierung
Courtesy of BMW OF NORTH AMERICA, INC.

From the "Selection" screen:

Select: **"DME Variant Code"**

Select: **"Exchange Control Unit"**

Select: The Engine version installed on the connected vehicle to be coded Ex. "M40/42/43"

The following steps are based on the selection of "M40/42/43":

"M40/42/43 4-Cyl. has been selected ? Y/N"

Select: **"Y"**

"Is the vehicle fitted with a DME M1.7.3 (M43 engine from 9/95) ? Y/N"

Select: "N"

Select: **1 "New Coding"**

Select: **1 "Adopt code from old control unit"** and follow the procedure indicated once selection is made.

OR

Select: **2 "Enter code manually"** (See **ENGINE CONTROL MODULE ECM/DME INFORMATION** for Variant Code) and follow the procedure indicated once selection is made.

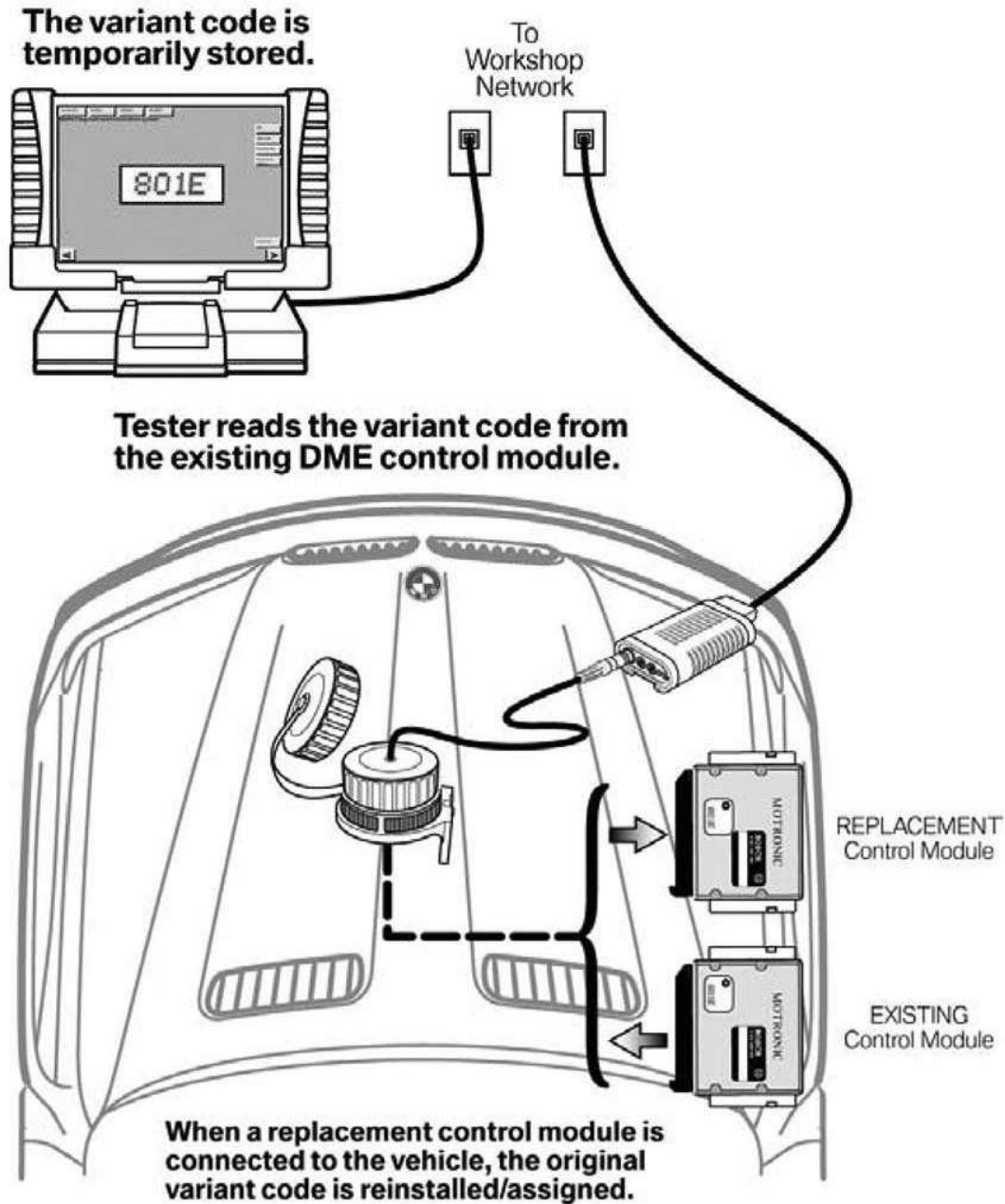
If DME M1.X control module replacement is required, determine which method of variant coding you will need.

- Adopt variant code from existing control module
- Manual input of variant code from control module label

NOTE: For vehicles produced with the M42B19 engine (M1.7.2 Engine Control Module) a replacement EPROM was made available for vehicles produced 1/94-12/95 to address a service issue. Since the control module for this engine requires a variant code in order to assign the correct operating data to the program a variant code must still be assigned to the module upon installing the EPROM.

Adopt a Variant Code

The preferred method of coding a replacement module is by "Adopting" the code from the old module, since this method prevents accidentally entering the wrong code which may occur when trying to manually enter the code. If the control module cannot communicate on the diagnostic link the manual input method will be necessary (refer to **MANUALLY ENTERING A VARIANT CODE**).



G03397921

Fig. 67: Identifying Variant Code Adopting Chart
 Courtesy of BMW OF NORTH AMERICA, INC.

Manually Entering a Variant Code

The process of manually entering a variant code should only be utilized when it is not possible to communicate

with the Engine Control Module (DME) via the DISplus or GT1. The variant code to be entered can be taken from the label of the problem control module and checked against the listing of variant codes provided in *SI B13 02 90 (3009)* prior to entering the code into the new module.

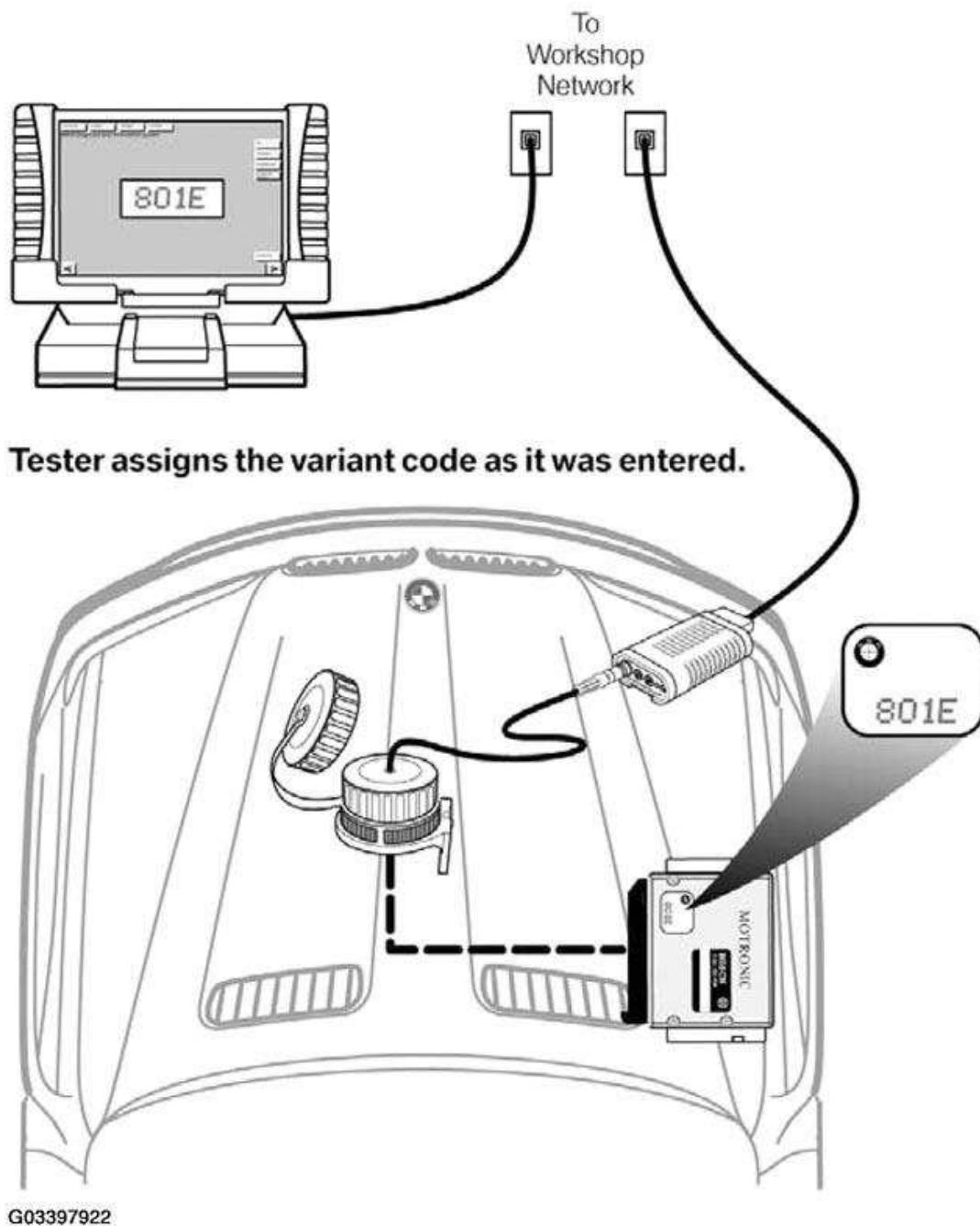


Fig. 68: Entering Variant Code

Courtesy of BMW OF NORTH AMERICA, INC.

CODING CODE

Model: E32 and E34

Production: 10/90 - 9/91

CODING CODE (CODE NUMBER)

E32 and E34 vehicles produced from 9/90 to 10/91 were not ZCS compatible. For this limited range of production a coding code is required in order to properly code the following control modules:

- IHKR 2 & 3
- EDC III
- DWA

All other replacement control modules (except DME) within this production range are precoded at the factory.

The coding code is a single digit. Like variant coding, the code is entered via the DISplus/GT1/SSS. By entering a valid code into the module a set of operational data specific to the code entered is assigned to the operating program of that control module.

Code Number Identification

Along with the VIN, the Code number for the installed control module(s) is printed on a label, located on the underside of the fuse box cover.

Additional labels are available from the parts department under P/N 01 99 9 784 735

WBAHD23D8MBG11081

CODE IHKR II: 0

CODE EDC III: 2



G03397923

Fig. 69: Identifying Code Identification Number
Courtesy of BMW OF NORTH AMERICA, INC.

Coding Code Procedure

With the original module still installed in the vehicle, select the Coding/Programming function which can be accessed through Progman with CIP 15.0 or higher using the DISplus/GT1 or SSS.

1. From Progman establish a connection to the interface connected to the vehicle and access CIP

To perform the procedure from CIP the Model series must be selected (**3 series, 7 series ...**)

Then select the body (**E32, E36 ...**)

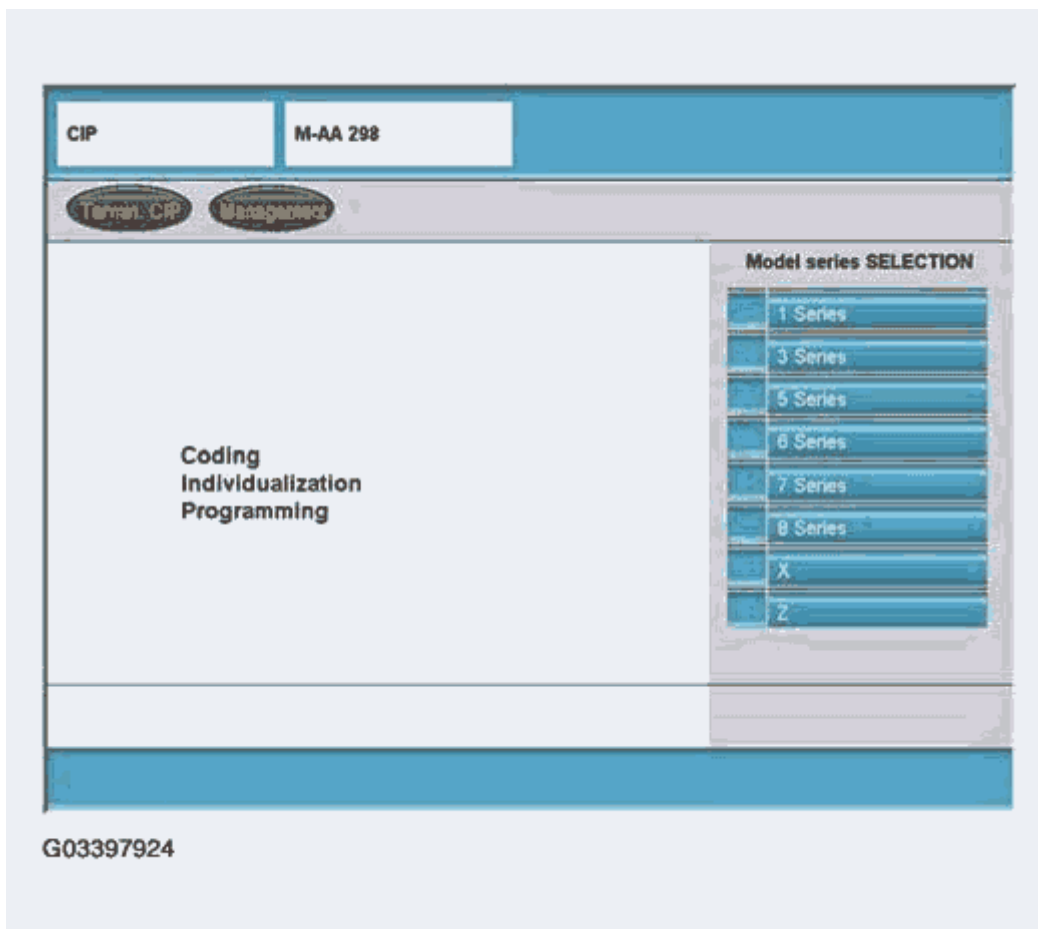


Fig. 70: Selecting Model Series Selection Menu
Courtesy of BMW OF NORTH AMERICA, INC.

2. Select "Codierung ZCS/FA "

(Advance screen to the right two times to enter the selection screen.)

3. Select: Specific model series
4. Select: "**Recoding**" or "**Coding Code**"
5. Select: "**Replacement part**"



Fig. 71: Selecting Codierung ZCS/FA
Courtesy of BMW OF NORTH AMERICA, INC.

6. Select: Specific system/module to be coded
7. Turn off ignition and remove the old module, install new module and turn ignition on.
8. Advance the screen and enter "0" plus the number located on the label of the module
9. Confirm entry
10. 10. If the displayed number is correct confirm and coding will begin A message "Coding Complete" will be displayed when finished coding.

Ordering Pre-Coded Modules

Pre-coded control modules are available from the parts department and requires the following information:

- Part number "Basic Control Module"
- VIN of vehicle for which it is needed
- The "Code Number" indicated on the module

Workshop Exercise

Access the initial start screen in CIP for performing the Coding Code procedure.

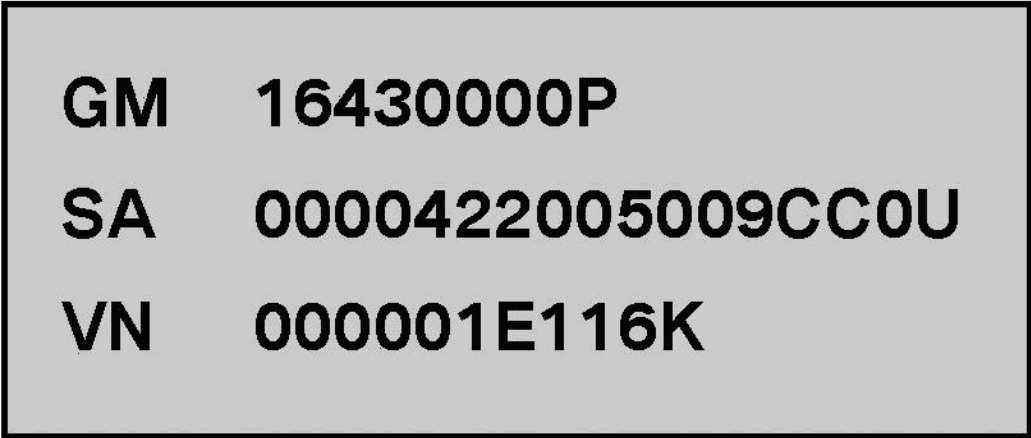
VEHICLE CODING INFORMATION

Model: All

VEHICLE CODING INFORMATION

Introduction

As part of an ongoing process to reduce the need for country, model and option specific control modules, BMW began to utilize a multi digit vehicle coding structure referred to as a Central Coding Key (ZCS) and later changed to a structure referred to as a Vehicle Order (VO/FA).



GM	16430000P
SA	0000422005009CC0U
VN	000001E116K

G03397926

Fig. 72: Identifying Vehicle Coding Information Number
Courtesy of BMW OF NORTH AMERICA, INC.

The Central Coding Key (ZCS) is a unique 37 digit (originally a 48 digit) code that contains specific model, country variation and individual equipment/option information for a vehicle.

During the manufacturing process of a vehicle, the ZCS code is created to identify the specific vehicle being built and to properly code the control modules installed during the assembly process once the vehicle reaches the end of the line. To ensure that the ZCS code can be retrieved once the vehicle leaves the factory it is stored in one or two control modules, depending on the model.

ZCS is often referred to as a "key" since it is able to automatically "unlock" or "activate" specific functions of a

new control module or can be used to recode a used control module to be compatible with the specific vehicle it has been installed into. With the introduction of the E31 the ZCS information was used for the first time as a coding key for replacement vehicle control modules, this ensured that the replacement modules would be coded to the required specification of the vehicle.

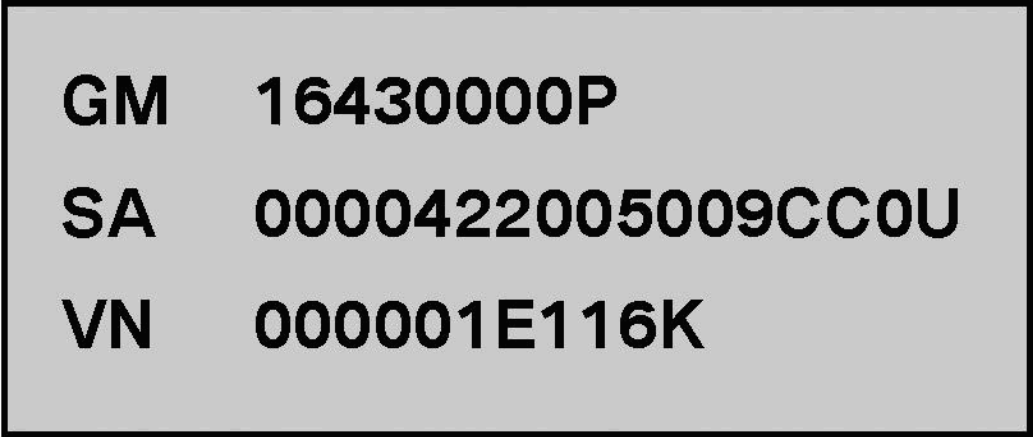
As the number of options & accessories available for installation in a vehicle increased, an alternative to the ZCS code was introduced on 9/01 production E46 vehicles. The ZCS system was replaced with a system known as the Vehicle Order (VO/FA). The VO is a straight forward listing of vehicle specific information including a list of the option codes pertaining to the systems or equipment installed in the vehicle and is used in the same manner as the ZCS to properly code replacement or additional modules.

Regardless of which structure is utilized on a vehicle, codeable modules have no limit as to the number of times that they can be recoded.

ZCS STRUCTURE

The 37 digit structure of the ZCS is subdivided into three segments. The segments represent specific information about the vehicle.

Each segment ends with a checksum "digit". A checksum is utilized by the coding software to detect unacceptable/erroneous manually entered coding information.



GM	16430000P
SA	0000422005009CC0U
VN	000001E116K

G03397927

Fig. 73: Identifying ZCS Structure

Courtesy of BMW OF NORTH AMERICA, INC.

The information/digits of the ZCS code reflects the options installed in the vehicle and should never be changed manually unless it is necessary for special recoding functions such as:

- Canadian market vehicle being moved to the US
- Retrofit installation of an accessory system (ie. CPT9000 phone system or BMW ULF system)

If a modification needs to be made to the ZCS structure and there is no information available in a service bulletin then the BMW Technical Hotline should be contacted for assistance by submitting a PUMA case, requesting a modified ZCS code.

Each portion of the ZCS provides specific information regarding that vehicle:

GM (Grundmerkmale) - Identifies the "Basic Features" of the vehicle and contains 9 digits that are used to describe:

- Vehicle type (E36, E38, E39 ...)
- Specific body style of the vehicle (Sedan, Coupe ...)
- Country specific coding identification (US, UK, ECE ...)
- Unique equipment that affects the basics of the vehicle (with sunroof, without sunroof, wheel size ...)
- Basic language variant (English, Spanish, German ...)

SA (Sonderausstattungs) - Identifies the "Special Equipment" of the vehicle and contains 17 digits that describe what features/functions are installed in the vehicle, such as:

- Power Windows or Manual windows
- Power Door Locks or Manual Door Locks
- Power Sunroof or Manual Sunroof
- Power Convertible Top or Manual Convertible Top
- Phone Pre-wire

The SA segment is configured to provide a total of 64 possible number combinations (option groups) for all series vehicles worldwide. The information is modified whenever a new component/accessory is added to the vehicle via a retrofit coding procedure.

VN (Versionsnummer) - Identifies the "Version Number" of the vehicle and contains 11 digits that are used to describe:

- Series specific coding data that are not reflected in the GM or SA segments. This includes, model year dependent data, software and hardware versions of the control modules installed, coding instructions, etc.

The VN is displayed as 40 possible combinations of digits. A deliberate change in the VN will result in erroneous coding data being used when recoding a module or coding a replacement module which will affect the proper operation of a control module(s) coded with an incorrect VN.

NOTE: In its original form the ZCS was displayed as a 48 digit code containing a fourth segment, the AM (Antriebsmanagement) which identified Powertrain management information specific to the vehicle, however this information was

eliminated and was not needed for coding a control module.

FOUR DIGIT PORTION REPRESENTS VEHICLE BODY AND SPECIFIC BODY EQUIPMENT (COUPE, SEDAN, ROADSTER, SUNROOF, ETC,)

There are 4096 possible combinations of digits per model.

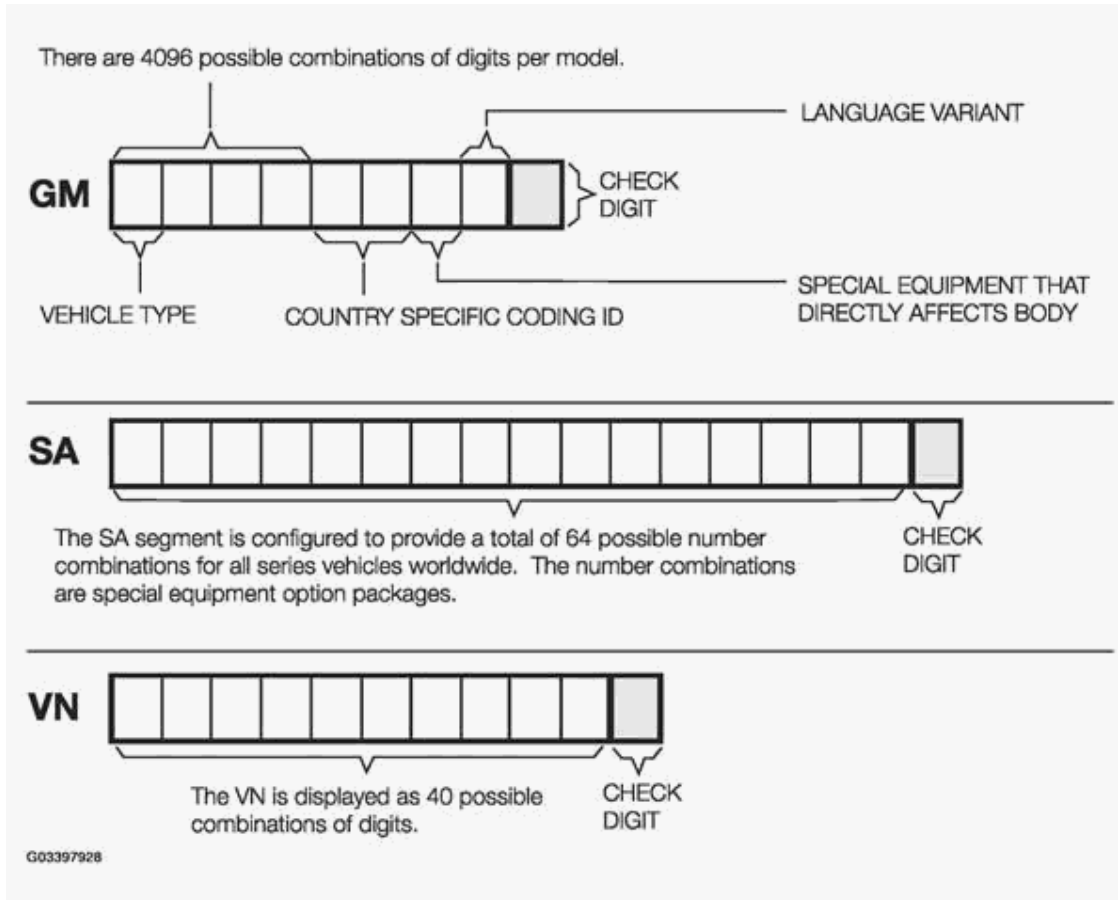


Fig. 74: Identifying ZCS Structure Information Chart
 Courtesy of BMW OF NORTH AMERICA, INC.

ZCS Stored Location In Vehicle

The ZCS is stored in the vehicle to simplify the coding procedures when a module needs to be recoded or a replacement module needs to be coded. Depending on the vehicle, the ZCS information is stored in the following locations:

ZCS STORED LOCATION IN VEHICLE

Vehicle	Model	Module	Vehicle	Model	Module
E31	All	EKM	E39	All	Instrument Cluster/EWS
E32	All	Instrument	E38	All	Instrument

		Cluster			Cluster/EWS
E34	All	Instrument Cluster	E46 ⁽¹⁾	All	Instrument Cluster/LSZ
E36	318i/is 325i/is M3	Instrument Cluster	E52	All	Instrument Cluster/LSZ
E36	318ti Z3	EWS II As of 9/98: Instrument Cluster/EWS	E53	All	Instrument Cluster/LSZ

(1) The E46 switched to a Vehicle Order (VO) data structure in 9/01.

The procedure to code control modules that utilize the ZCS information can be performed via the DISplus/GT1 or SSS using Progman with CIP 15.0 or higher and accessing the "Codierung ZCS/FA" function.

When coding a ZCS codable control module the coding program in CIP automatically searches the stored location, based on the VIN, and codes the selected module according to the information provided in the ZCS code.

On later production vehicles the ZCS information began to be stored in two locations, referred to as redundant data storages, this insures that the information is always available in the event the primary device storing the data fails.

NOTE: On early production vehicles without redundant data storage, if the module being coded or recoded is the module that stores the ZCS information, then the vehicles ZCS information must be obtained from the label located on the vehicle or electronically accessed from the module and printed out then entered manually via the input screen on DISplus/GT1 or SSS.

For vehicles with redundant data storage the coding of the module storing the data is performed automatically using the information stored in the "back up" module.

ZCS Identification/Display

The ZCS information for a specific vehicle can be obtained by:

- Accessing the control module(s) that electronically stores the information, using the DISplus/GT1 or SSS
- Locating the ZCS label affixed in the vehicle

Accessing Stored ZCS Information

From Progman establish a connection to the interface connected to the vehicle and access CIP.

To perform the procedure from CIP the Model series must be selected (**3 series, 7 series ...**).

Then select the body (**E32, E36 ...**).

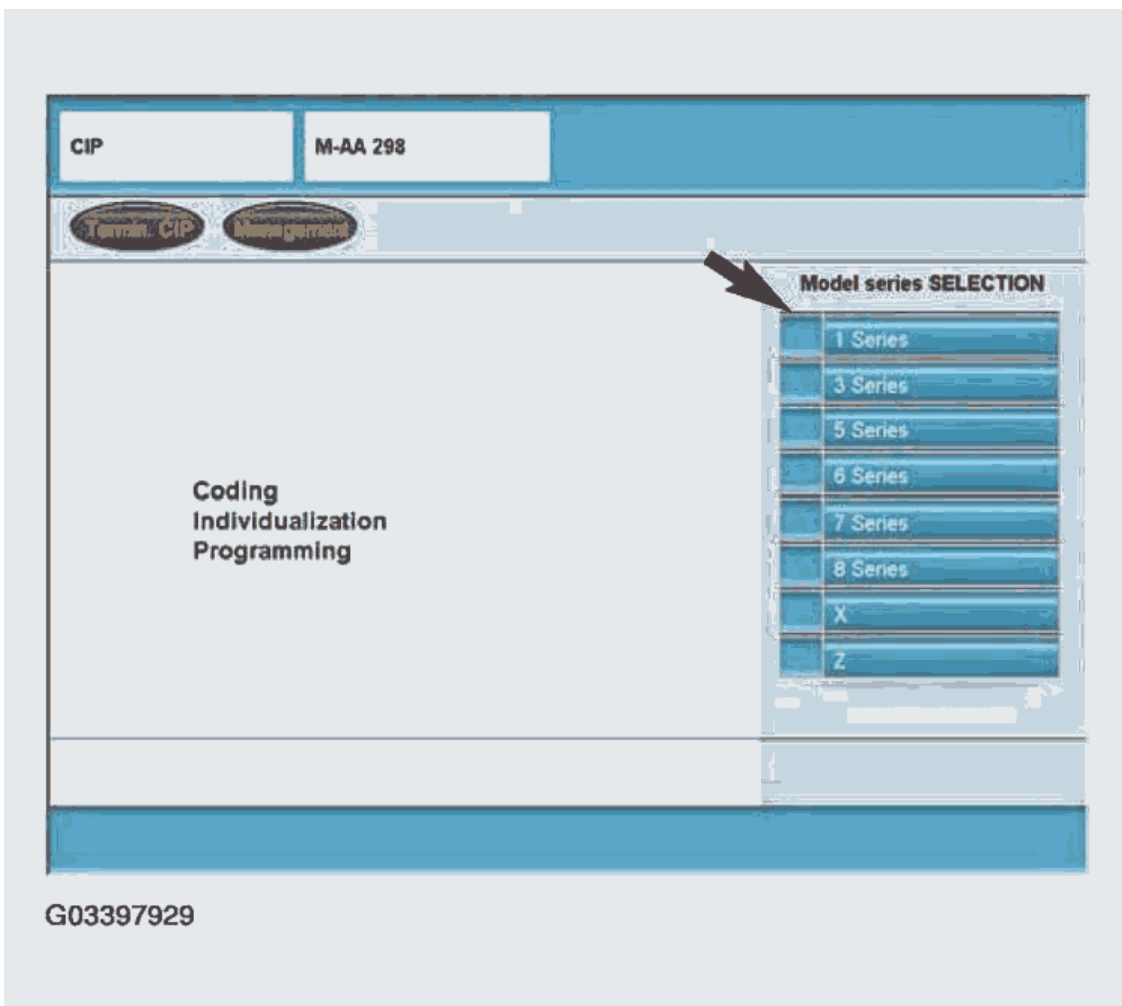


Fig. 75: Selecting Model Series Selection Menu
Courtesy of BMW OF NORTH AMERICA, INC.

Select "**Codierung ZCS/FA**".

Then advance screen to the right two times to enter the vehicle series selection screen.

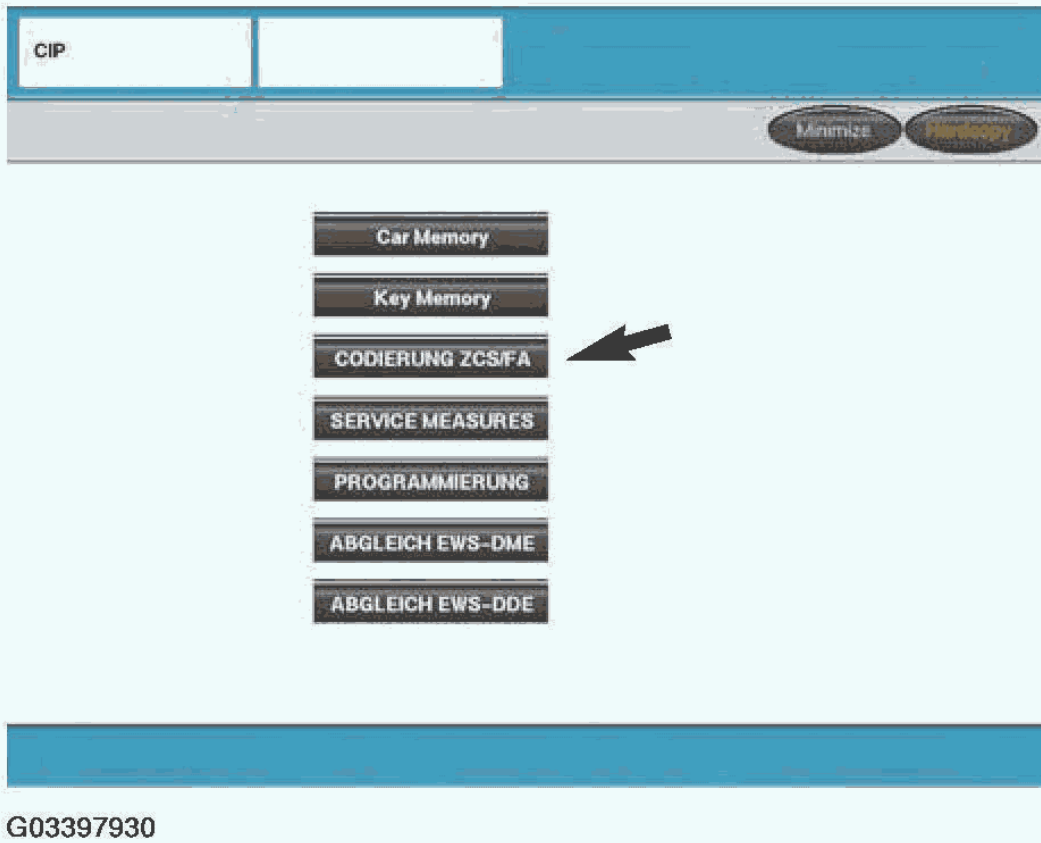


Fig. 76: Selecting Codierung ZCS/FA
Courtesy of BMW OF NORTH AMERICA, INC.

Example:

Select vehicle series (i.e "E36 Series").



G03397931

Fig. 77: Selecting Vehicle Series

Courtesy of BMW OF NORTH AMERICA, INC.

Select "**Display coding code and code for printout**".



G03397932

Fig. 78: Selecting Display Coding Code And Code For Printout
Courtesy of BMW OF NORTH AMERICA, INC.

ZCS Information for vehicle is displayed along with the stored location.



G03397933

Fig. 79: Display ZCS Information For Vehicle Along With Stored Location
Courtesy of BMW OF NORTH AMERICA, INC.

Accessing ZCS Information Label

On earlier production vehicles the ZCS label is affixed to the vehicle in a specific location depending on the model:

- E36 - Under rear seat; center area or next to left sending unit of fuel tank.
- Z3 Roadster - In Trunk; under carpet on floor, forward of tool kit.
- E31/32/34 - In fuse box cover
- E38 - In E-Box cover

DH66019

00333 / 00333 03.04.95

GM 45230000 R

SA 00000C590B124001 U

VN 00000002A9 8



G03397934

Fig. 80: Identifying Accessing ZCS Information Label

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: As of 9/98 production the ZCS label was eliminated from the vehicle. Some older vehicles will have identification labels containing an AM segment, this information is not needed for coding or recoding a control module on that vehicle.

ZCS Codable Control Modules

Control modules located in a vehicle that are ZCS codable are listed/identified by the "Codierung ZCS/FA" function contained in CIP.

A list of the modules specific to the model can be accessed as follows:

From Progman establish a connection to the interface connected to the vehicle and access CIP.

To perform the procedure from CIP the Model series must be selected (**3 series, 7 series ...**).

Then select the body (E32, E36 ...).

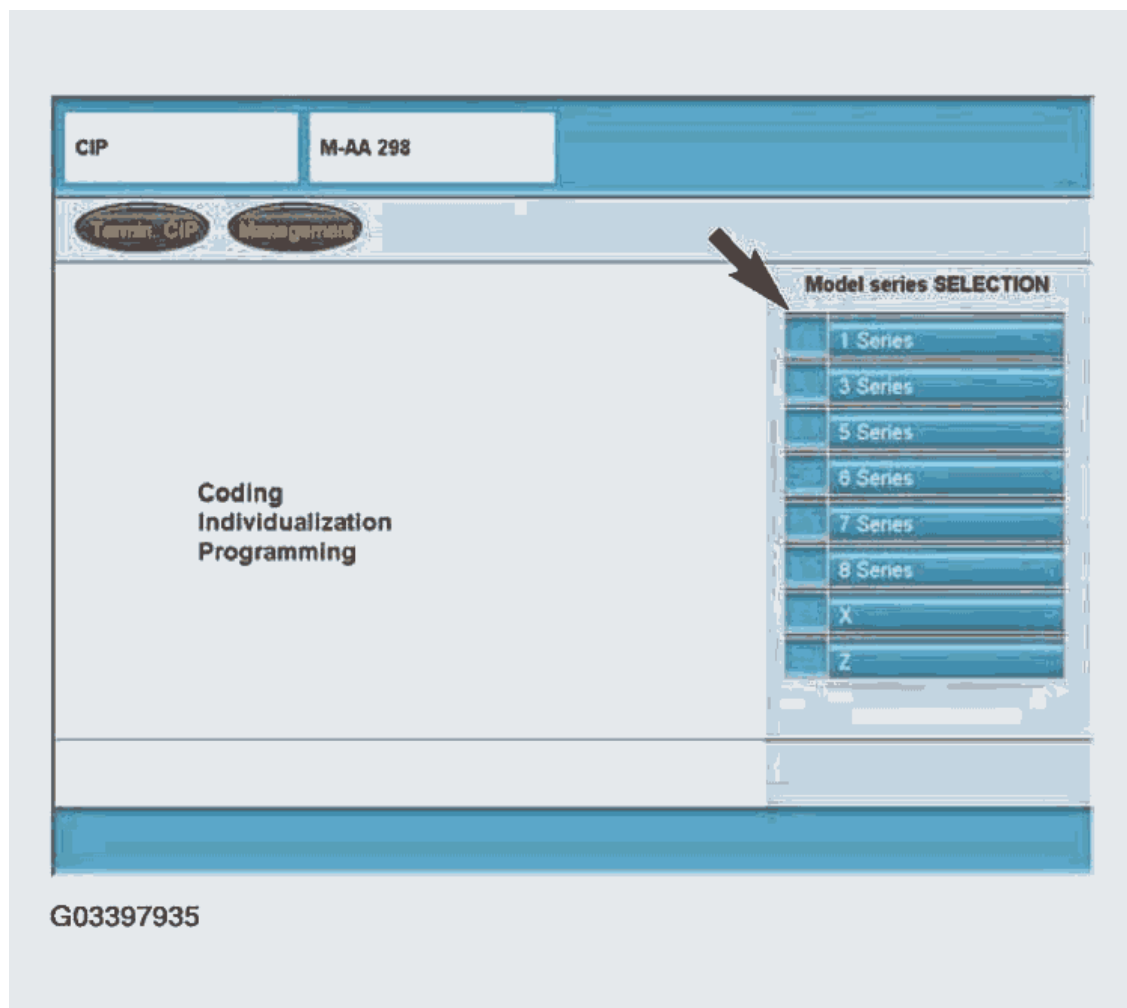


Fig. 81: Selecting Model Series Selection Menu
Courtesy of BMW OF NORTH AMERICA, INC.

Select "CodierungZCS/FA".

Then advance screen to the right two times to enter the vehicle series selection screen.



Fig. 82: Selecting CodierungZCS/FA
Courtesy of BMW OF NORTH AMERICA, INC.

Example:

Select vehicle series (i.e "E36 Series").



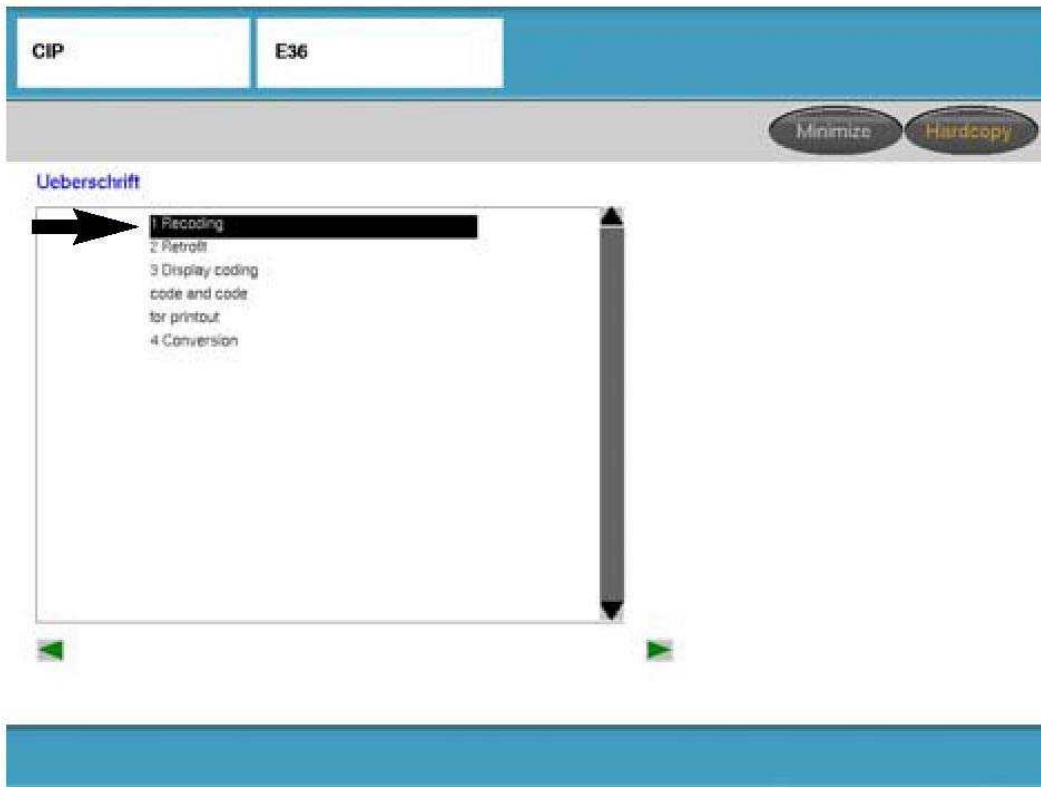
G03397937

Fig. 83: Selecting Vehicle Series

Courtesy of BMW OF NORTH AMERICA, INC.

Select "**Recode**".

Then advance screen to the right.

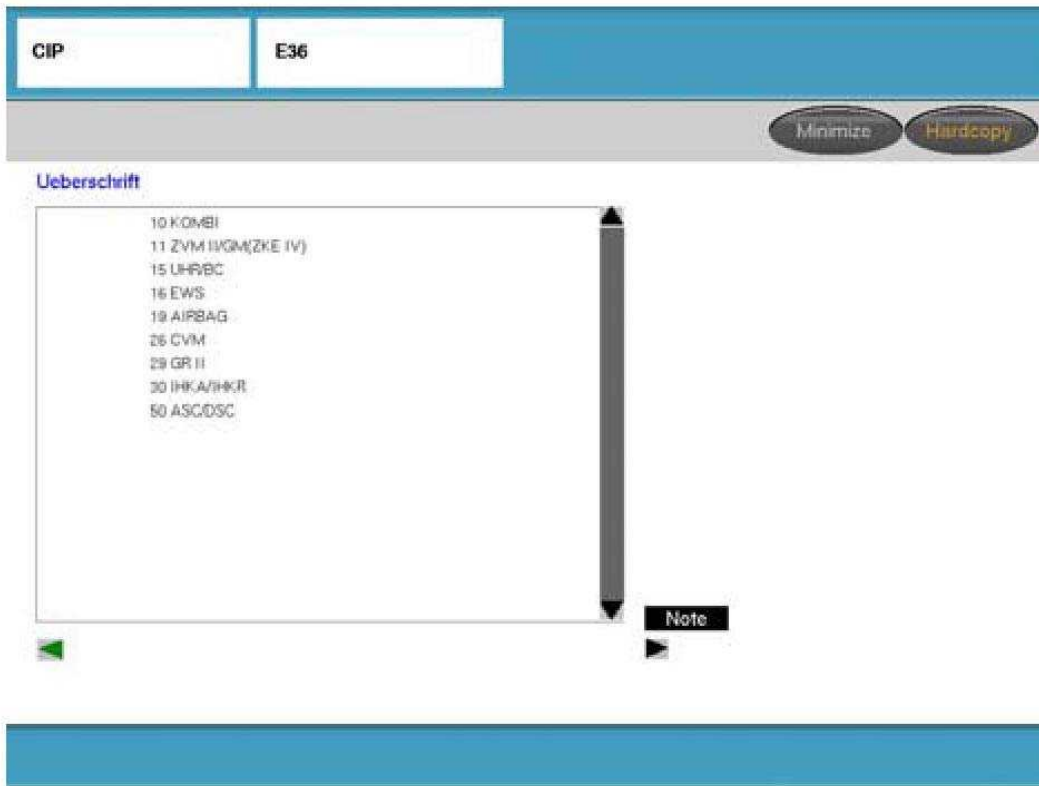


G03397938

Fig. 84: Selecting Recode

Courtesy of BMW OF NORTH AMERICA, INC.

Displays control modules that are ZCS codable.



G03397939

Fig. 85: [Displays Control Modules That ZCS Codable]
 Courtesy of BMW OF NORTH AMERICA, INC.

Workshop Exercise

Access the ZCS coding information on an E36, E39, E46 or E53. and identify where the information is stored.

Determine which modules in an E36, E39, E46 or E53 are codable.

VEHICLE ORDER

In 9/01 the ZCS vehicle data structure on the E46 was replaced with what is referred to as the Vehicle Order (VO) or Fahrzeugauftrag (FA). The vehicle order structure is utilized on all new models introduced/produced as of 9/01, such as E65/66, E60, E63/64, E83, E85 etc. Models such as E36, E39, E52, and E53 produced after 9/01 continued to be manufactured using the ZCS structure until production of the model is complete.

Vehicle Order for E46 as of 9/01 Production:

Vehicle identification number: KW17732	E-Wort:	521,522,534,550,639, 645,650,661,674,692, 818,823,832,845,853, 876,925,926,992,302,
Vehicle order:	HO-Wort: 633L,	Vehicle order and vehicle identification number are stored in KOMBI
Model series: E46		
Type des. code: EV33		
Time criterion: 0904	SA:	
Paint code: 0A08	1CA,205,210,240,249,	
Upholstery code: N6SW	279,354,403,411,431,	
Assbly. no.:	438,441,459,465,473, 488,494,495,502,520,	

G03397940

Fig. 86: Vehicle Order Chart (For E46 As Of 9/01 Production)
Courtesy of BMW OF NORTH AMERICA, INC.

Vehicle Order for New Models as of 9/01 Introduction:

Select measures plan.

Date / time: 10.11.2004 / 13:31

Model series: E60

Vehicle ID number: WBANA53584B848013

Vehicle order: E60_#1203*NA53%0475&LCBA\$1CA\$205\$248\$2RA
\$302\$319\$354\$403\$415\$416\$430\$431\$438\$441
\$442\$459\$465\$473\$488\$494\$502\$534\$540\$563
\$605\$609\$620\$639\$645\$676\$694\$697\$785\$818
\$823\$850\$853\$876\$8SP\$925\$992-B110+K639+O111
+O112

Vehicle data status: E060-04-09-504

Target data status: E060-04-09-504

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Fig. 87: Vehicle Order Chart (For New Models As Of 9/01 Introduction)
Courtesy of BMW OF NORTH AMERICA, INC.

The vehicle order format contains information pertaining to the production of a specific vehicle such as:

Series Type - (E46, E65, E60, etc.)

Time Criterion - Identifies date the options/hardware equipment available for installation into the vehicle was standardized/"locked". This information does not refer to the production date of the vehicle. A problem with coding or programming may occur if a module or option based on a newer or older time criterion date is installed into the vehicle.

Model Code (Basic Type) - Base level from which the vehicle is "created/built".

Paint Code - Identifies the color of the vehicle at time of production.

Upholstery Code - Identifies the type of upholstery installed in the vehicle at time of production.

Assembly Number - Identifies the programmed part number for powertrain (Not used)

E-Wort - Identifies additions/options added to the vehicle that are not part of standard SA codes/options

HO-Wort - Identifies options installed at Center/Dealer using 3 digit option code (Currently not used).

Installed Option/SA Codes - Listing of accessories & equipment options installed in the vehicle.

The information contained in the vehicle order is used to identify the module(s)/system(s) that are/should be installed in the vehicle and also what if any control modules need to be updated if a new system/option is added or removed to/from the vehicle to ensure proper compatibility with the devices installed in the vehicle. The information contained in the vehicle order such as installed options, is modified whenever a new component (module/system) is installed and coded to the vehicle. If the new component is not properly coded to the vehicle the SA listing is not updated and problems can be encountered whenever a measures plan for the vehicle is created, vehicle needs to be recoded or VKM/Individualization functions are to be modified.

A listing of the components that need to be updated is provided whenever a measures plan is generated.

Example: Information contained in the VO of an E60

Select measures plan.

Date / time: 10.11.2004 / 13:31

Model series: E60

Vehicle ID number: WBANA53584B848013

Vehicle order: E60_#1203*NA53%0475&LCBA\$1CA\$205\$248\$2RA
\$302\$319\$354\$403\$415\$416\$430\$431\$438\$441
\$442\$459\$465\$473\$488\$494\$502\$534\$540\$563
\$605\$609\$620\$639\$645\$676\$694\$697\$785\$818
\$823\$850\$853\$876\$8SP\$925\$992-B110+K639+O111
+O112

Vehicle data status: E060-04-09-504

Target data status: E060-04-09-504

G03397942

Fig. 88: Identifying Select Measures Plan

Courtesy of BMW OF NORTH AMERICA, INC.

Series Type: E60

Time Criterion: Identified as 1203 indicates the date (month/year) that the list of available options/hardware available for installation into the vehicle was standardized/"locked". Although the vehicle referenced was produced in 6/04 the time criterion of 1203 is still valid and indicates that no changes were made to the available option packages/hardware available for installation into that specific model since 1203.

Model Code: Identified as NA53 indicates the vehicle and engine type plus provides information pertaining to the country the vehicle was built for (i.e. LH or RH drive). If an automatic transmission is installed it will be considered an NA63, however the model code contained in the VO will always reflect the base level which is a manual transmission vehicle.

Paint Code: Identified as 0475 indicates the color of the vehicle at time of production.

Upholstery Code: Identified as LCBA indicates the type of upholstery installed in the vehicle at time of production.

Installed Option/SA Codes: Listing of accessories & equipment options installed in the vehicle ICA - Selection COP relevant vehicles

205 -Automatic transmission

248 - Steering Wheel Heating

EPROMS & EEPROMS

Model: E31/32/34/36/38/39

Production: All

INTRODUCTION

Early Engine and Transmission Control Modules used EPROMs (Electrically Programmable Read Only Memory device) to store operational programs and operating data specific for the application that they were used for. Since the operating program and associated data is installed at the factory during the vehicle assembly process updates could not be provided for vehicles once they were programmed and left the factory floor. In order to install a new or updated program (DME or TCM) the module needed to be replaced. Eventually it became possible to replace EPROMs and/or update them which dramatically reduced the cost of updating a module and a vehicle.

ENGINE CONTROL MODULE EPROM PROGRAMMING

With the introduction of M3.X & DME/ECM control modules it was no longer necessary to replace the entire control module in order to install updated engine operating programs and/or data.

ENGINE CONTROL MODULE EPROM PROGRAMMING DATA

M3.X	DME/ECM Version	Vehicle Application
	M3.1	E36 - 325i/is (up to 8/92)
		E34 - 525i (up to 8/92)
	M3.3	E31 - 840Ci (9/93 - 12/95)
		E32 - 740i/iL (9/92 - 8/94)
		E34 - 530i/it & 540i (3/93 - 12/95)
		E38 - 740i/iL (9/94 - 12/95)
	M3.3.1	E36 - 325i/is & M3 (as of 9/92)
		E34 - 525i/it (as of 9/92)

M3.x engine control modules allow EPROMs:

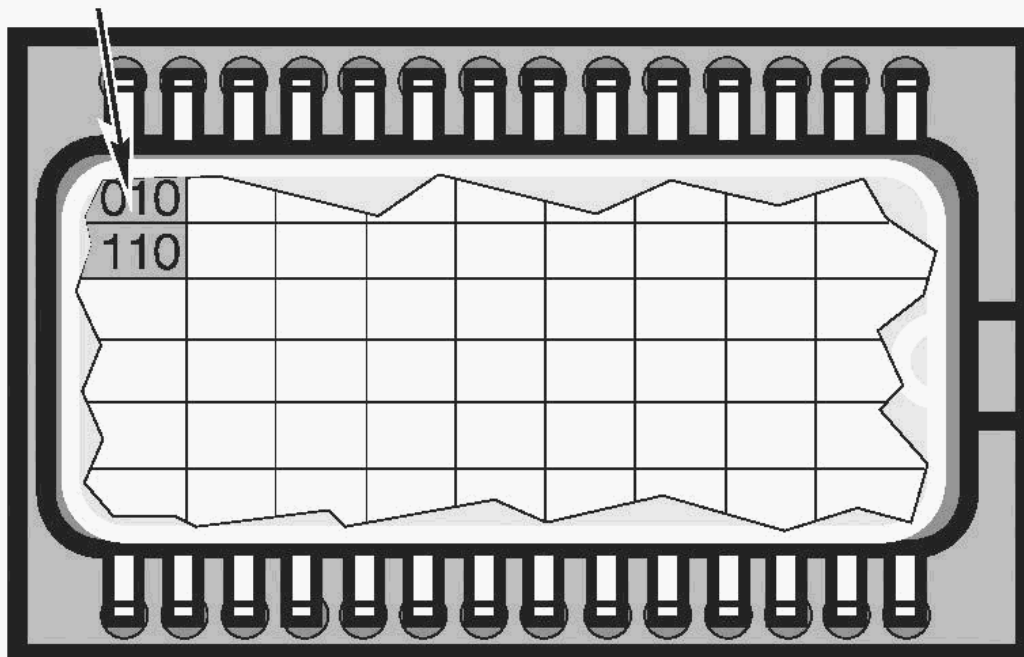
- To be removed & replaced
- Programmed or updated depending on control module version

M3.1 Engine Control Modules

Beginning with M3.1 DME/ECM control modules, BMW introduced the ability to program an EPROM using BMW diagnostic equipment. On the M3.1 control module the originally installed EPROM needs to be removed from the control module and a new partially blank EPROM installed in order to update the existing control module.

For the M3.1 systems the replacement EPROM that is installed does not contain all the data necessary for the engine to operate, it is a "basic" EPROM that only contains some basic data referred to as "resident data" which helps identify the module and allows the diagnostic equipment to determine what program and associated data needs to be installed/loaded.

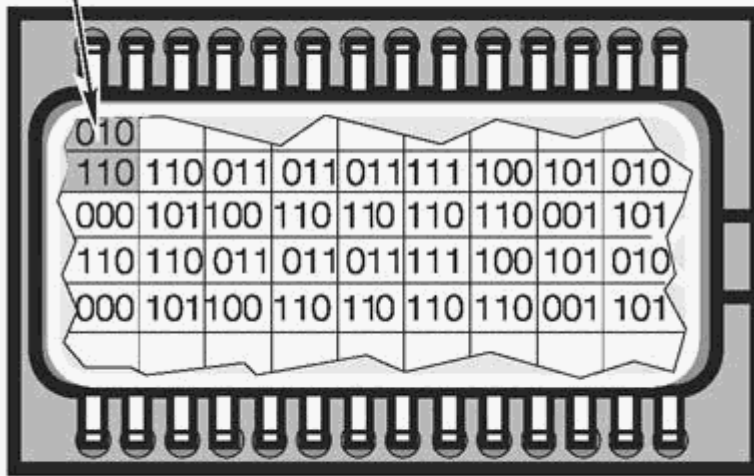
RESIDENT
DATA



G03397943

Fig. 89: Identifying EPROM Replacement Information (Basic State)
Courtesy of BMW OF NORTH AMERICA, INC.

RESIDENT
DATA & ALL REQUIRED PROGRAMS



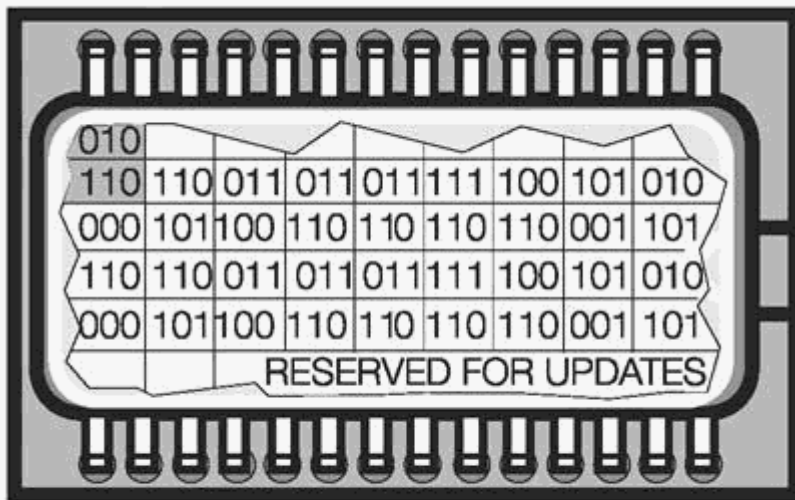
G03397944

Fig. 90: Identifying EPROM Replacement Information (Programmed)
Courtesy of BMW OF NORTH AMERICA, INC.

M3.3 & M3.3.1 Engine Control Modules

As later versions of engine control modules (M3.3 & M3.3.1) were introduced it was not always necessary to replace the EPROM in order to perform an update to the module. The EPROMs installed on the newer systems are larger and allow additional information to be loaded without having to install a new EPROM. In the event that the size of the update exceeds the space available on the installed EPROM or an update was previously performed, then the installed EPROM will need to be replaced.

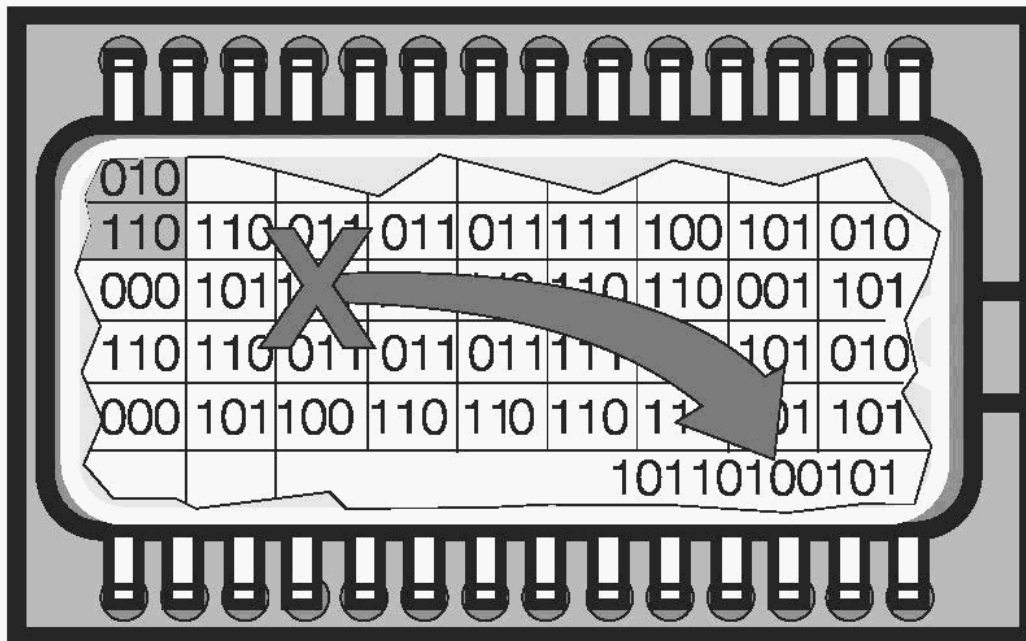
THE UPDATE CANCELS THE OLD FUNCTIONS CHARACTERISTICS AND ADDS THE UPDATED FUNCTION TO THE EPROM



G03397945

Fig. 91: Identifying EPROM Before Update

Courtesy of BMW OF NORTH AMERICA, INC.



G03397946

Fig. 92: Identifying EPROM After Update
Courtesy of BMW OF NORTH AMERICA, INC.

For the M3.3 & M3.3.1 systems the replacement EPROM that is installed does not contain all the data necessary for the engine to operate, it is a "basic" EPROM that only contains some basic data referred to as "resident data" which helps identify the module and allows the diagnostic equipment to determine what program and associated data needs to be installed/loaded.

ENGINE CONTROL MODULES FLASH (EEPROM) PROGRAMMING

At the end of 1995 new variations of DME/ECM control modules were introduced that no longer contained a removable EPROM but instead contained a soldered in EEPROM. An EEPROM is an Electrically Erasable Programmable Read Only Memory device, which means that programs & data stored on the chip can be electrically erased and replaced with new/revised programs or data. In order to erase the data on the chip a short duration low level voltage/charge is applied to a pin on the EEPROM and the stored data is erased, hence the name "Flash". Once the data is erased new data is loaded.

By using a newer technology, these control modules have the ability to be updated a total of 13 times before they need to be replaced.

Theoretically an EEPROM can be erased and reprogrammed more than 13 times, BMW set the number to 13, since a point will be reached where the update being installed may no longer be compatible with the hardware of the installed module which could result in erroneous operation. If the program is not compatible with the hardware version of the module, the program used to determine the correct update for the module will indicate that the module will need to be replaced before the update can be performed.

The reference to Flash programming is a result of the technology used to erase the EEPROM prior to installing a new program and or data.

The control modules listed identify when EEPROMs were first introduced into the DME/ECM:

CONTROL MODULES INFORMATION DATA (DME/ECM)

DME/ECM Version	ENGINE	Vehicle Application
M5.2	M44	E36 - 318i/iA (as of 12/95) E36 - Z3 (as of 1/96)
	M62	E39 - 540i/iA (as 3/96) E38 - 740iLA (as of 12/95) E31 - 840iCA (as of 1/96)
MS41.1	M52	E36 - 328i/iA (as of 10/95) E39 - 528i/iA (as of 2/96)
MS 41.2	S52	E36 - M3 (as of 1/96)

The utilization of EEPROMs within the Engine Management Systems continues to be used today, and has expanded into other control modules as well.

TRANSMISSION EPROMS

Beginning with vehicles produced in the early 1990's the Transmission EPROM can be replaced on some vehicles in order to address customer complaints that would normally be addressed by having to replace the Transmission Control Module (TCM). Service EPROMs are available for the following systems:

TRANSMISSION CONTROL MODULE (TCM) INFORMATION DATA

TCM Version	Engine	Application
EGS 1.27	M70B50	E31 - 850iA (1/90 - 9/91)
EGS 1.29	M70B50	E31 - 850iA (9/91 - 12/91)
EGS 4.16	M42B18	E36 - 318iA/isA/iCA/itA (12/92 - 12/95)
	M50B25	E36 - 325iA/iSA/iCA (10/91 - 9/95)
		E34 - 525iTA/iA (9/90 - 12/95)
EGS 7.30	M60B30	E34 - 530iA (3/93 - 8/93)
AGS 7.32	M60B30	E34 - 530iA (9/93 - 6/95)
EGS 9.20	M60B40	E34 - 540iA (3/93 - 8/93)
		E32 - 740iA/iLA (9/92 - 9/94)
		E31 - 840CiA (9/93 - 9/94)
AGS 9.22	M60B40	E34 - 540iA (9/93 - 5/96)
		E38 - 740iA/iLA (9/94 - 5/95)
		E38 - 750iLA (1/95 - 6/95)

TRANSMISSION CONTROL MODULE FLASH (EEPROM) PROGRAMMING

The introduction of newer generation Transmission Control Modules introduced with the M44, M52 and M62 engines at the end of 1995, brought with it the ability to "flash" program this module as well. By being able to electrically erase and install a new program and or data stored on the EEPROM, it no longer becomes necessary to replace the chip to get an updated transmission program installed.

The technology used on the Transmission Control module is the same as explained in the section "**ENGINE CONTROL MODULES FLASH (EEPROM) PROGRAMMING**".

WHEN IS EPROM REPLACEMENT AND/OR PROGRAMMING NECESSARY?

The program and or data of an engine or transmission control module only needs to be updated or replaced if:

- The control module is replaced with a non programmed/basic module.
- A Service Action, Recall or customer concerns have resulted in the release of a new/updated program or revised operational data.

The programming procedure of the diagnostic equipment will identify if:

- a DME EPROM needs to be replaced or can be updated
- a control module (DME or Transmission) can still be programmed or needs to be replaced if the reprogramming limit of 13 times has been reached

How A Replacement EPROM Or Control Module Is Determined

DME/ECM EPROM

As mentioned previously on the M3.1 Engine Control Modules the EPROM needs to be replaced whenever an update is to be performed. On M3.3 and M3.3.1 Control Modules the EPROM's for these modules generally have enough additional space to add/load one update. However, if the update that needs to be installed is too large, then the installed EPROM needs to be removed and a Basic EPROM reinstalled. The diagnostic equipment (DISplus, GT1 or SSS) contains a program within CIP that will determine the part number of the replacement EPROM or control module that needs to be installed.

For some control module variations there is more than one replacement EPROM available.

Example: An M3.1 DME has three different hardware versions:

Bosch Hardware Number 0 261 200 402

Bosch Hardware Number 0 261 200 403

Bosch Hardware Number 0 261 200 405

This requires three different replacement EPROM's, however one EPROM is not necessarily specific to one hardware version.

TCM

Regarding the replacement EPROM for Transmission Control Modules there are specific Service Bulletins which identify various situations that can be addressed by replacing the EPROM in the control module. The replacement transmission EPROM does not require any type of programming after being installed, as it already contains all the program and operational data.

If an early version Transmission Control Module, for vehicles prior to 1996 model year, is replaced it generally also does not need to have the EPROM replaced as the required program is already installed.

Programming Procedure

Within CIP is a procedure that requires the selection of the model/series whenever a/an:

- EPROM needs to be updated/replaced
- EEPROM needs to be updated
- Control module needs to be replaced

Then select "Programming" - "DME Programming" or "EGS Programming" and follow the steps given in the respective SIB.

Workshop Exercise - SIB Look-up

Detailed information pertaining to updates and replacements is provided in:

SI B12 08 95(4274) - DME EPROM replacement

SI B12 08 94(4117) - M50 DME EPROM Update

SI B12 07 94(4116) - M50 DME Programming Update,

SI B12 09 94(4132) - M60 DME EPROM Update

SI B 12 07 95(4273) - M60 DME EPROM Needs Replacement

SI B12 05 96 - Programming Flash Control Modules (DME)

SI B2404 96 - EPROM Replacement Application Chart

SI B24 05 95 - EGS/AGS EPROM Replacement

Plus additional situation/complaint specific Service Bulletins available on the TIS website.

Determination Process for DME EPROM

In the event a DME EPROM, a control module or the program of a control module needs to be updated or replaced the program contained within CIP will provide the information necessary to perform the specific task. A program within CIP is used to determine the correct replacement part numbers (EPROM, Control Module or software update) to be installed.

For earlier production vehicles there are two ways to perform this process:

- "automatic" determination

or

- "manual" determination.

The automatic determination is the preferred method as it is faster and mistakes made during data entry into the tester are avoided. For newer production vehicles that utilize EEPROMs/Flash programming the determination process is done automatically as part of determining a measures plan (refer to **CIP** section or more information).

Automatic Determination

In order to determine which EPROM needs to be installed there is a special procedure that is executed as part of the "Exchange EPROM" process. The procedure will "automatically" determine the correct replacement EPROM or control module part number, based on the "Basic part number" and "Programmed part number" stored on the installed EPROM, if the EPROM is not damaged.

The procedure is run automatically if "YES" is selected for the answer to the question Is old EPROM still installed.

During the automatic determination process the tester compares the part numbers stored in the EPROM of the

currently installed DME control module with a list of possible replacement part numbers contained in the program of the tester.

The comparison is done to determine if the tester can "recommend" a replacement EPROM or control module part number.

Manual Determination

If the EPROM is damaged then the "Basic part number" and "Programmed part number" indicated on the label of the control module that is located on the cover of the module must be entered "manually" via the touch screen on the tester so that the replacement part numbers can be determined.

This procedure is followed if "NO" is selected for the answer to the question "Is old EPROM still installed?"

During a manual determination you will need to:

- Enter the part number for a basic (programmable) control module.
- Enter the VIN number of the vehicle.
- Enter the part number of a programmed control module

Once the correct numbers are entered, the tester searches a "master list" for the proper replacement part number and will display either that part number or the message "no substitute found."

Regardless of which process is used if the replacement part does not match the part number displayed and "expected" by the program on the tester, programming will not occur. You need to obtain the proper replacement part.

At no time during the determination or programming process should you turn off the ignition, disconnect the control module or tester/interface.

Once the EPROM is programmed by way of the "Automatic" or "Manual" determination process it contains the operating program for the engine and the associated operational data or characteristic maps. In the event a basic replacement control module is installed, the EPROM installed in the control module will be programmed in the same manner.

NOTE: The EPROM in a basic replacement module does not need to be replaced since it only contains the "resident data" and nothing else.

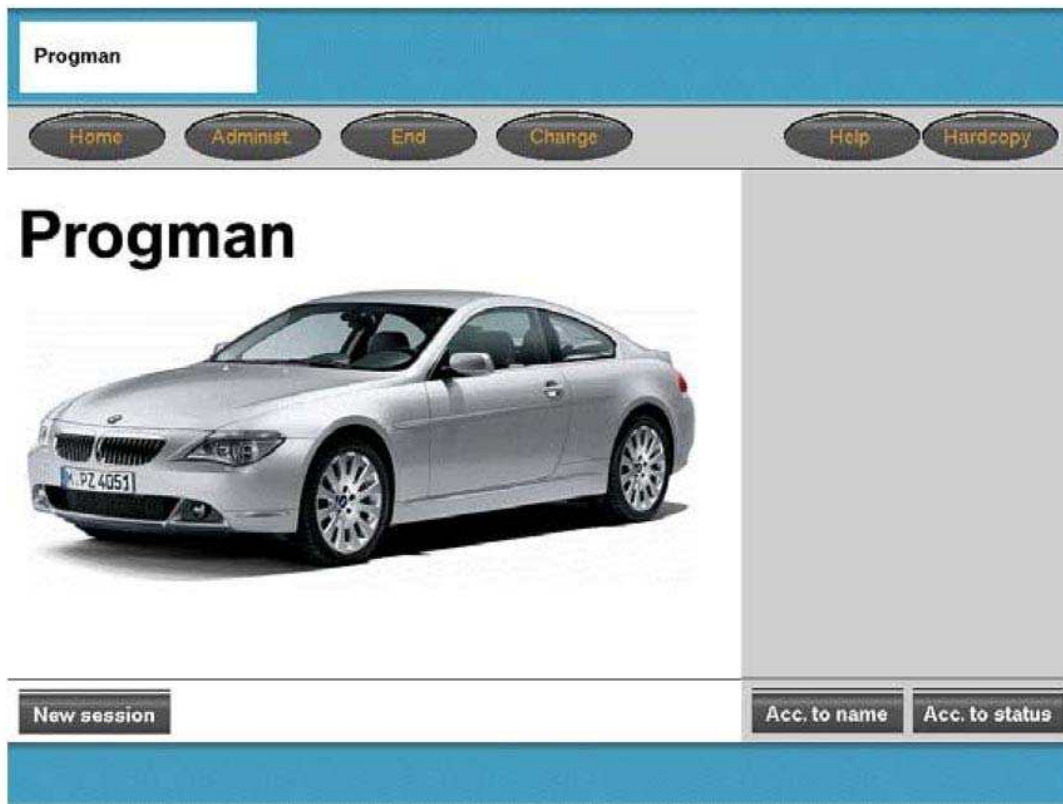
PROGMAN

Model: All

Production: All

PROGMAN INTRODUCTION

With the release of CIP 15.0, BMW released a new software program known as Progman.



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Fig. 93: Identifying New Software Program Known As Progman
Courtesy of BMW OF NORTH AMERICA, INC.

Progman is a software package that operates with Windows XP Embedded to manage:

- Administration & assignment of OPPS/OPS/Diagnostic heads plus network configuration/addressing.
- Installation/loading of new data updates via Jetstream.
- Activation of a Coding, Individualization or Programming request from a GT1 to an SSS via a multiconsole/multisession feature.
- Coding, Individualization or Programming of older vehicles via the SGC/UNIX application.
- Coding, Individualization & Programming functions of CIP.

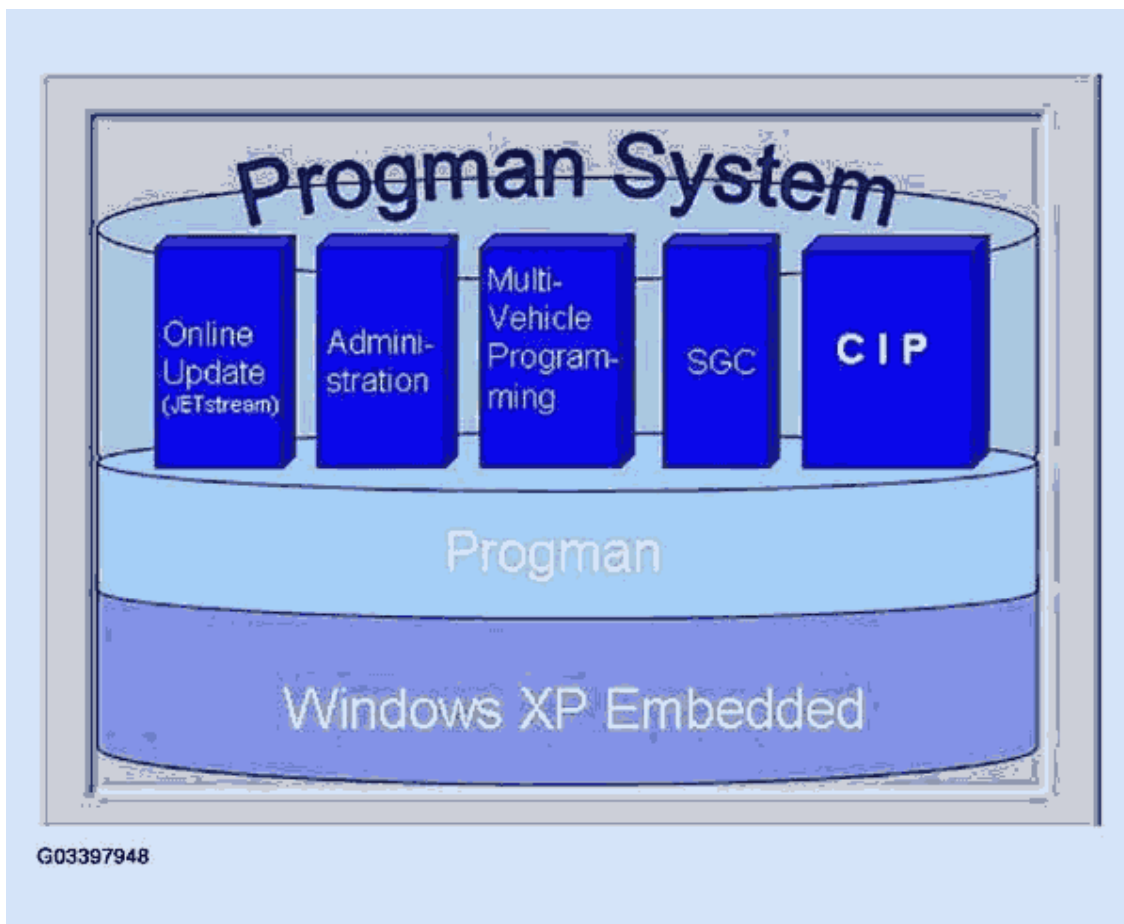
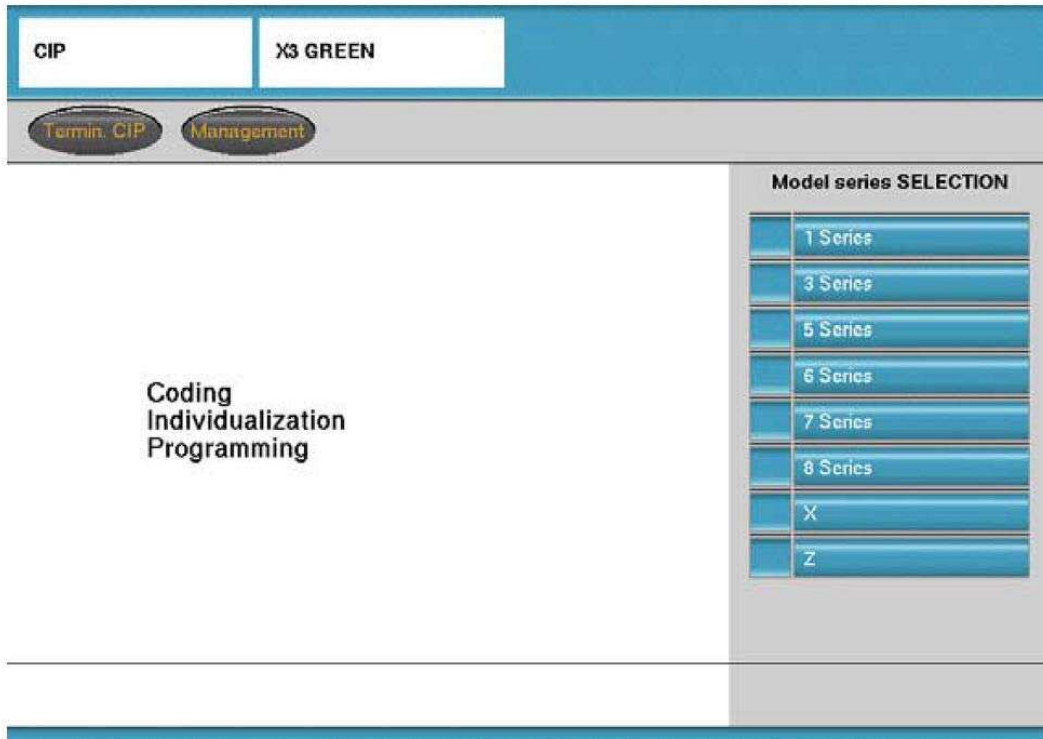


Fig. 94: Identifying Program System With Windows XP Embedded
 Courtesy of BMW OF NORTH AMERICA, INC.

Progman

The new programming management tool utilizes a new operating system (Windows XP Embedded) to manage the programming processes that can be initiated via the SSS.

Progman utilizes Windows XP Embedded which will serve as the basis for all further programs required for programming applications. No changes can be made to the operating system of this Windows variant and it can be used only in connection with the corresponding hardware (Software Service Station).



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Fig. 95: Display Model Series Selection Menu
 Courtesy of BMW OF NORTH AMERICA, INC.

Progman incorporates all Coding, Individualization & Programming functions that were previously part of the DIS CD for E31/32/34/36/38/39/46/52 & E53, which operates under the old SGC/UNIX application, into the CIP application.

Since CIP is incorporated into Progman, it will now contain all Coding, Individualization & Programming functions. CIP will be used to launch the SGC/UNIX application for the older vehicles as well as launch the Windows XP based application for Coding and Programming the newer vehicles.

In the future the E36/38/39/46/52/53 applications will be converted/integrated directly into CIP and be based on Windows XP Embedded. The structure for the E31/32/34 will not be changed and will remain SGC/UNIX based.

Administration

The administration tool provides the same setting options as before however, Progman adds additional features/capabilities:

- Ability to view and select accessible "Interfaces" (Diagnostic Head, OPSS, OPS...)

- Configure interfaces
- Adjust SSS and network specific settings
- View available SSS units and select a specific unit
- Select language specific to each SSS

JETstream

JETstream is the application that provides online data updates for Coding and Programming data. The feature allows the SSS to be up to date on the current/new vehicle data regarding coding and programming information prior to the release of an update DVD. The application can be configured to automatically search for online updates at a specific time (ex. after normal shop hours every night) and install any updates found at a specific time/point in the systems operation cycle.

In order for this feature to work the SSS must:

- Be located on the workshop network
- Be connected to BMW via a network connection
- Have the correct network specific data entered in the "Network" mask
- Have the host/domain name and IP address of the BMW server entered in the "Online Service" mask
- Have the "Automatic Online Update" feature active

Multiconsole/Multisession

Since the SSS is the primary Coding and Programming system, coding and programming tasks can be "transferred" to the SSS from any GT1 located on the workshop network. In order to monitor the tasks assigned to a specific SSS a menu of active jobs is displayed via Progman and can be accessed by any GT1 or SSS on the network.

MULTICONSOLE/MULTISESSION FUNCTION

Multiconsole	The multiconsole function makes it possible to control programming procedures both via the Software Service Station as well as via the BMW diagnosis systems GT1.
Multisession	The multisession function makes it possible to program several vehicles simultaneously.

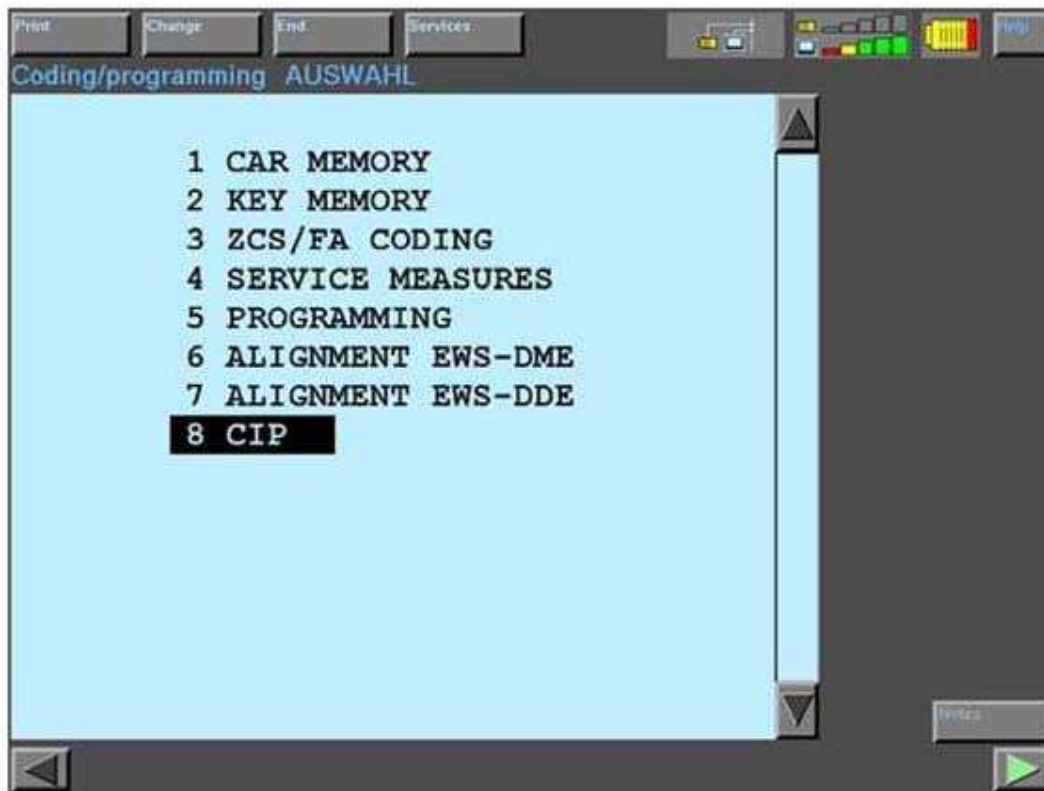
This function allows the GT1 to be remote terminals for the SSS with respect to Coding and Programming and once a task is transferred to an available SSS, the GT1 can be used to diagnose another vehicle and/or transfer another coding/programming task to an SSS.

CIP

The Coding, Individualization and Programming application that has been used previously since the introduction of the E65 continues to operate the same as before. The only major change is that all of the Coding and Programming functions for the older vehicles (E31/32/34/36/38/39/46/52 & E53) that was only available on

the DIS CD for use on DISplus and GT1 has been incorporated into CIP.

Prior to CIP15.0 SGC/Unix functions for Coding, Individualization & Programming were incorporated into DIS CD VXX.X.



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Fig. 96: Display Coding, Individualization And Programming Application (1 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

As of CIP 15.0 SGC/Unix functions for Coding, Individualization & Programming are incorporated into CIP.

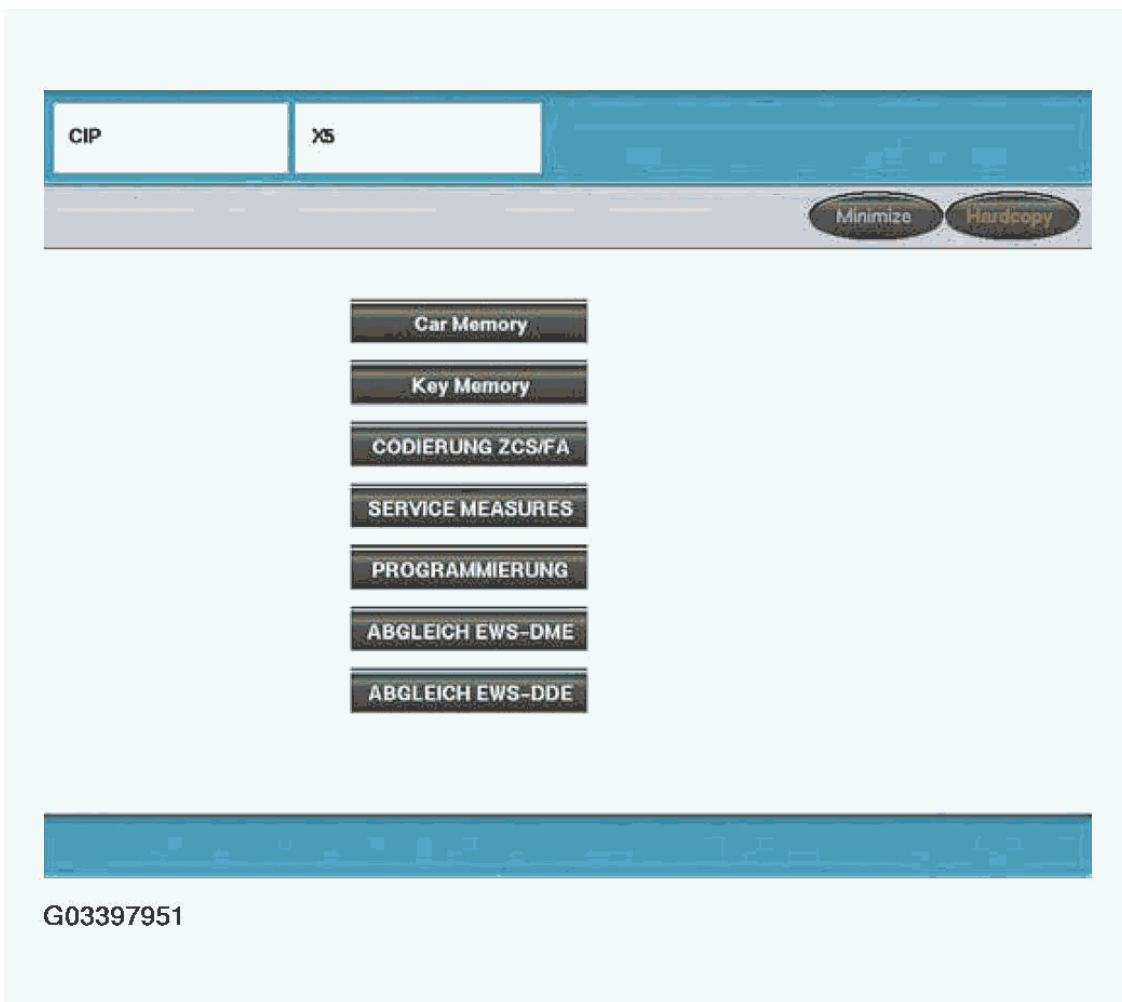


Fig. 97: Display Coding, Individualization And Programming Application (2 Of 2)
 Courtesy of BMW OF NORTH AMERICA, INC.

WHAT WILL PROGMAN DO FOR ME?

Progman allows the GT1 to be released from the task of Programming and Coding vehicles. The GT1 will be capable of performing vehicle diagnosis while the SSS is used to Program and Code a vehicle(s).

Example: Given a workshop with 10 active workstalls (CORA) and equipped with 2-GT1's, 1-DISplus, 1-SSS, 3-Diagnostic Heads, 1 OPSS Head, 2-OPS Heads

Before Progman (CIP 15.0)

CIP INFORMATION BEFORE PROGMAN (CIP 15.0)

Device	# of MOST-bus equipped Vehicles able to be Programmed at one time	# Vehicles able to be Diagnosed while another is being Programmed
GT1	1	0
GT1	1	0

DISplus	0	1
SSS	1	0
TOTAL	3	1

With Progman (CIP15.0)

CIP INFORMATION WITH PROGMAN (CIP 15.0)

Device	# of MOST-bus equipped Vehicles able to be Programmed at one time	# Vehicles able to be Diagnosed while another is being Programmed
GT1	0	1
GT1	0	1
DISplus	0	1
SSS	5	0
TOTAL	5	3

By installing CIP 15.0 on all of the GT1's and SSS's, Progman can be accessed via any GT1 or SSS but is controlled/operated by the Software Service Station (SSS) only. Since the SSS controls/runs Progman, it will be the only device able to code and program vehicles, the GT1 will be viewed as a remote terminal for Progman.

With the introduction of Progman, parallel programming of up to five vehicles can be performed. The vehicles to be programmed do not need to be the same model series nor have the same data status or be connected at the same time.

GETTING STARTED WITH PROGMAN

Progman is launched from the GT1 whenever the Coding/Programming function is selected. On the SSS Progman is always active as this is the only program installed on the system.

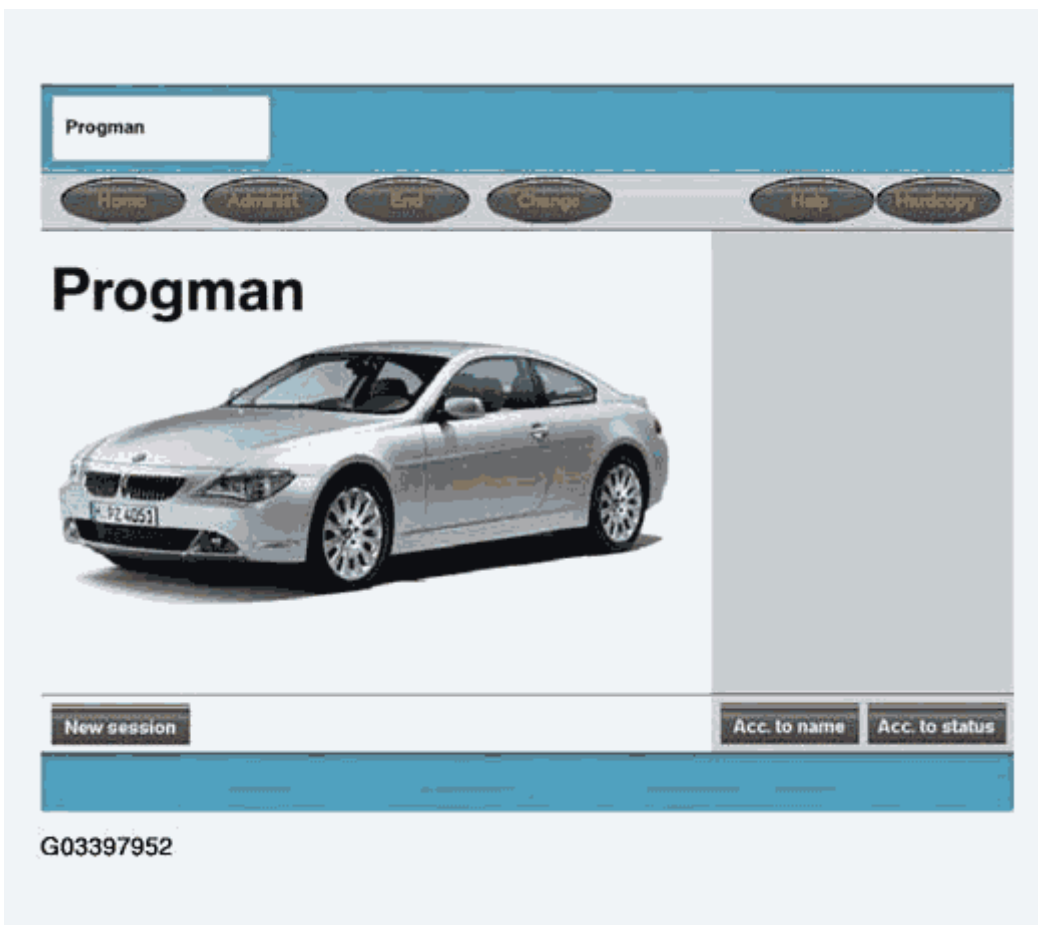


Fig. 98: Display Progman System

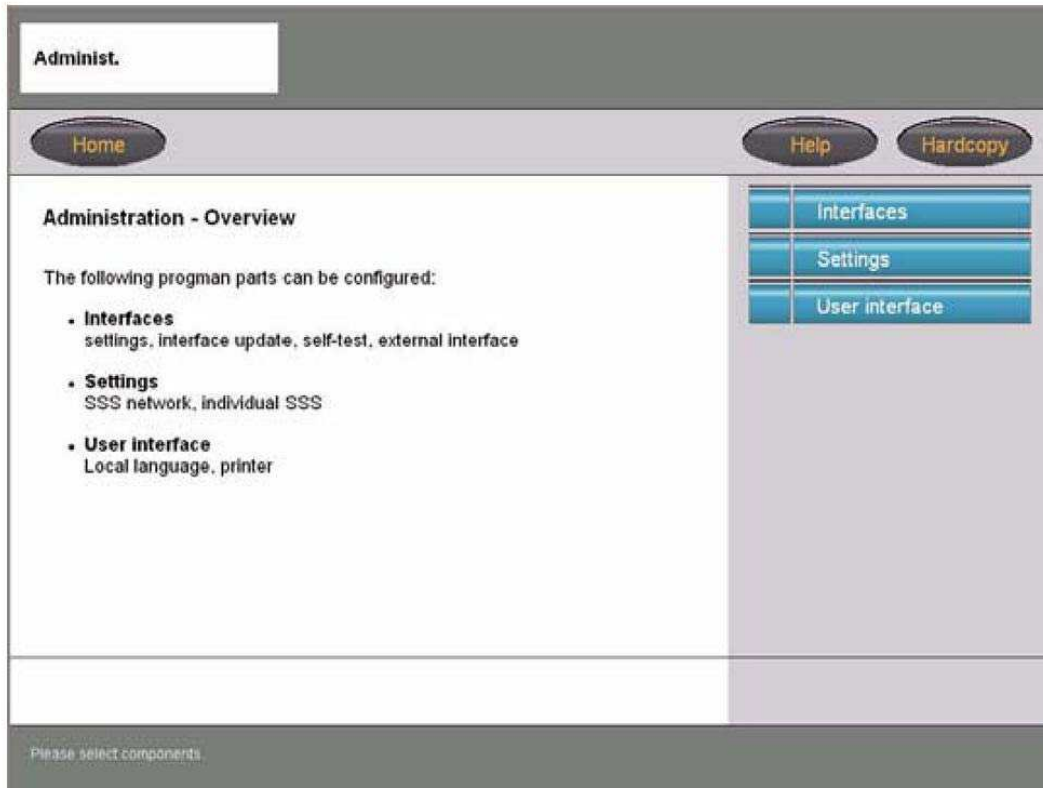
Courtesy of BMW OF NORTH AMERICA, INC.

From the main menu screen in Progman the administration features for system configuration can be accessed or a new session can be started. By selecting "Help" a more detailed document explaining Progman can be accessed.

ADMINISTRATION

In order to insure initial system setup selecting "Administration" will bring up a new screen which explains the menu selections available on the right side.

At this point Interfaces, Settings or User Interface can be selected.



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Fig. 99: Display Administration Overview
Courtesy of BMW OF NORTH AMERICA, INC.

Interfaces

By selecting "Interfaces" an overview of all available and/or connected interfaces is obtained along with information pertaining to the status of the interface, device name, software level and IP address.

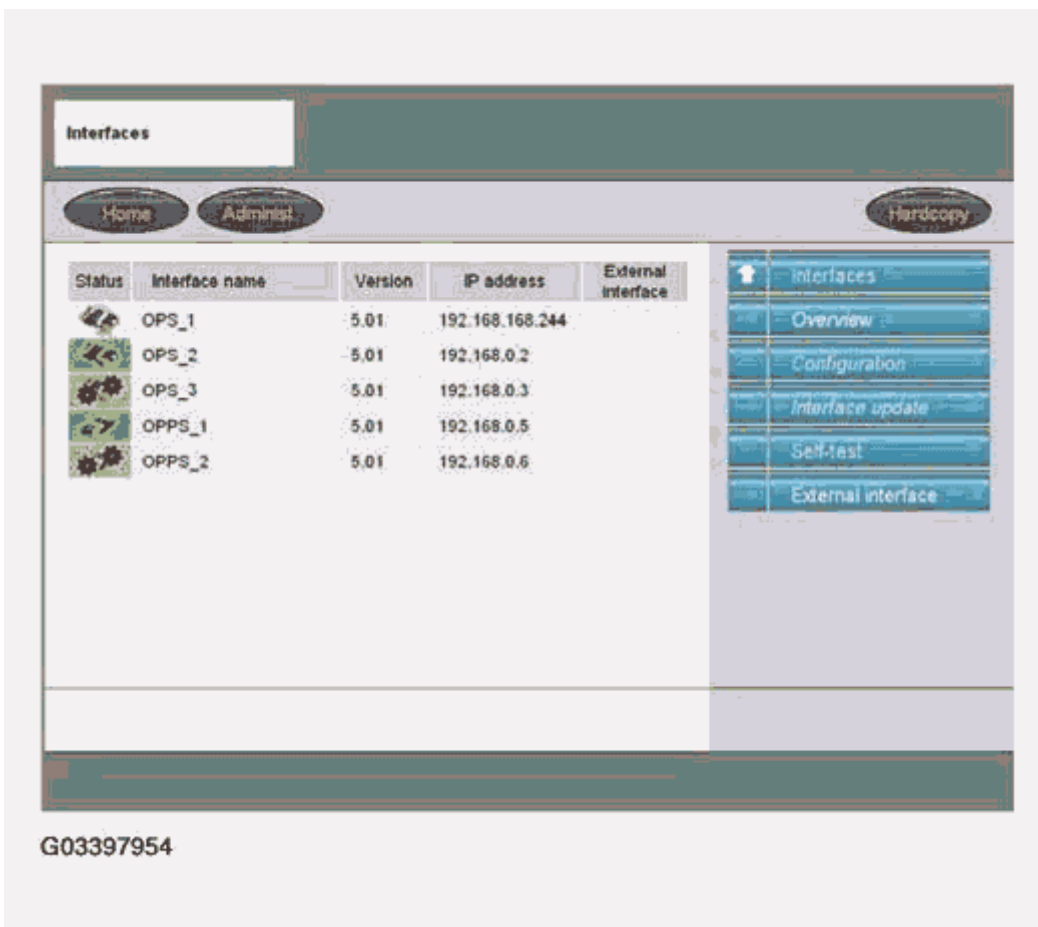


Fig. 100: Display Status Of Interface, Device Name, Software Level And IP Address
 Courtesy of BMW OF NORTH AMERICA, INC.

Explanation of Status Indicators

Symbol Description

	Green background - interface is free and can be selected
	Grey background - interface not detected - It is currently being shut down or started up - It is unconfigured referred to the sub-network in which it is located
	Red background - the interface is occupied and is not available for a session It is possible to query the configuration and the current session.
	Black lettering - interface can be selected
	Grey lettering - interface cannot be selected as it is not available or cannot be reached
	Black question mark- interface is unconfigured referred to the sub-network in which it is located
	Grey question mark - connection to interface is not possible, the device cannot be reached
	Black gear wheels - the interface is currently being used exclusively. Only the configuration data can be queried.
	Diagnostic Head
	OPS
	OPPS
	OPS with grey background and grey question mark: The OPS can not be detected as it is currently being started up or shut down or is not correctly configured/connected for the current network When devices are not connected, they are indicated as a grey question mark on a grey background without the interface symbol.
	OPPS with grey background and black question mark: A black question mark means that the OPPS is not configured for the current network.
	Diagnostic head with red background and black gearwheels: The diagnostic head is currently being used and is not available for a new session at this time. Only the configuration of the diagnostic head can be queried.

G03397955

Fig. 101: Identifying Interfaces Status Indicators Explanation
Courtesy of BMW OF NORTH AMERICA, INC.

Examples of Possible Combinations

Interface Name

An interface name can be freely assigned to each interface so as to simplify definition of the interface in the

workshop. The name used should be helpful in locating/identifying the particular interface if necessary.

Version

The firmware version indicates the software level currently installed on the selected interface (OPPS/OPS/diagnostic head). It is recommended that the version on the interface be the same as that of the SSS it is being used with.

IP Address

The IP address (internet protocol address) is a unique and specifically assigned address for each device in the workshop network. This address consists of a number block which is normally structured as follows.

Example: 192.168.100.10

The IP addresses must be structured so that each device in the network is distinguished from all the others and must be exclusive to that device and not shared among other devices connected to the network.

External Interface

This column indicates whether the current interface is an external interface. External interfaces are located in external subnetworks and can be used in connection with this Software Service Station.

Overview

If an interface is selected and items on the right of the screen in the menu listing are selectable (not grey) then additional information can be accessed for that device.

In this example "Overview", "Interface update", "Configuration" and "Self-test" are available.

If a device is not correctly configured for the network certain selections may not be available for that device.



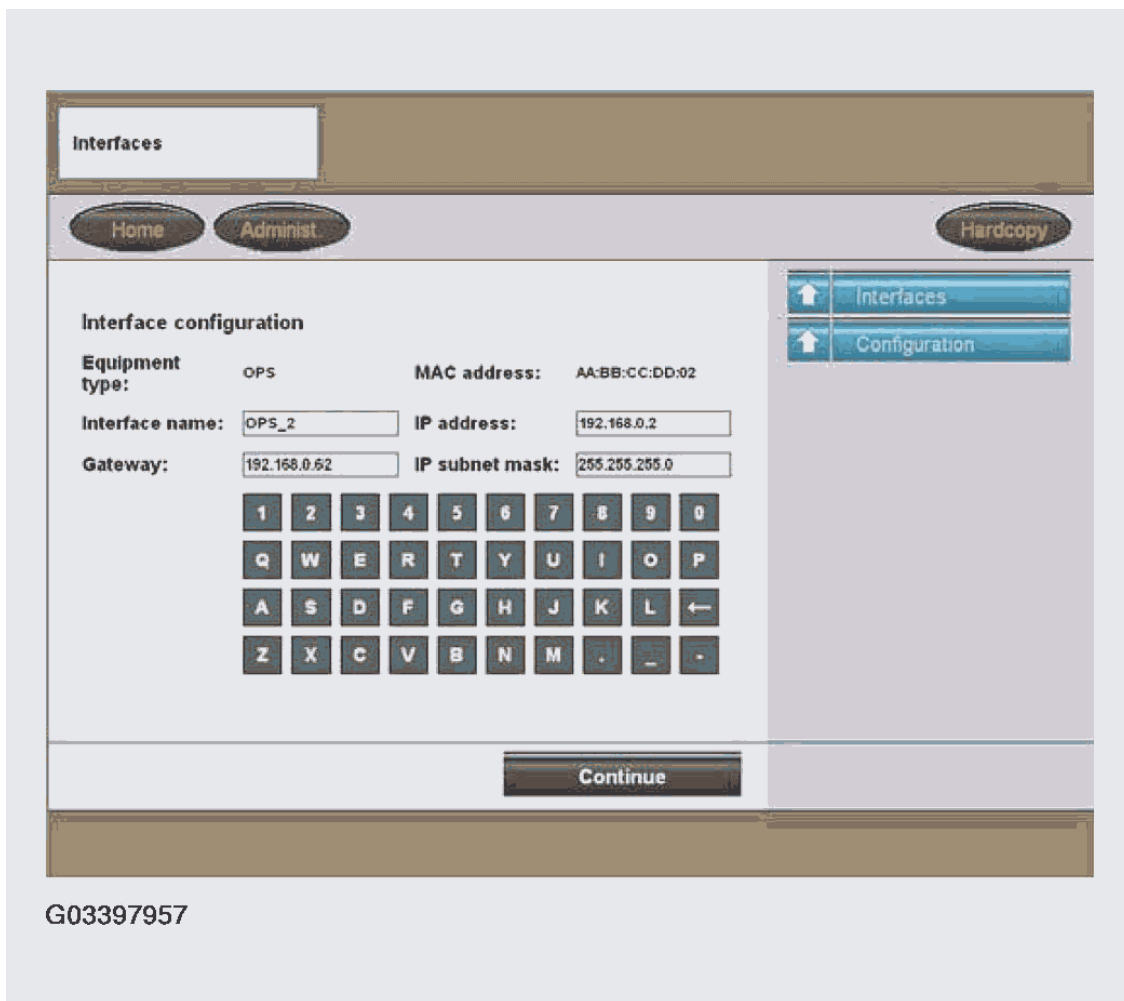
Fig. 102: Display Interfaces Name, Version And IP Address
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The Interface list does not automatically update as devices are utilized or freed up. The only way to update the list is to select "Overview".

Configuration

Configuration provides information for the device selected pertaining to:

- Interface Name
- Gateway
- IP Address
- IP Subnet Mask



G03397957

Fig. 103: Display Interfaces Configuration Information (1 Of 3)
Courtesy of BMW OF NORTH AMERICA, INC.

Interface Name

The specific name assigned to the device (Ex. Blue A). The name used should be helpful in locating/identifying the particular interface if necessary.

IP Address

A specific four segment number assigned exclusively to the device. The number represents the address of the device on the network and is necessary when communicating with other devices located on the network.

Gateway

This information identifies the four segment address of the component located on the network responsible for communicating from the current network to another network. If there is no address in this location then a connection to any devices outside of the current network can not be established.

IP Subnet Mask

This information is used to define which segment of the four segment IP address specifically identifies the device and which identify the specific network.

Example: 255.255.255.0

Indicates that the first three segments (255.255.255) identify the specific network that the device is located on. The last segment (0) indicates that this is the segment that will identify the specific device.

NOTE: The network and device address information must be entered exactly as defined by the network administrator for your facility, otherwise the devices can not be accessed.

After entering the necessary information and continue is selected, Progman will run a check on the values/information entered and will indicate if the information is acceptable.

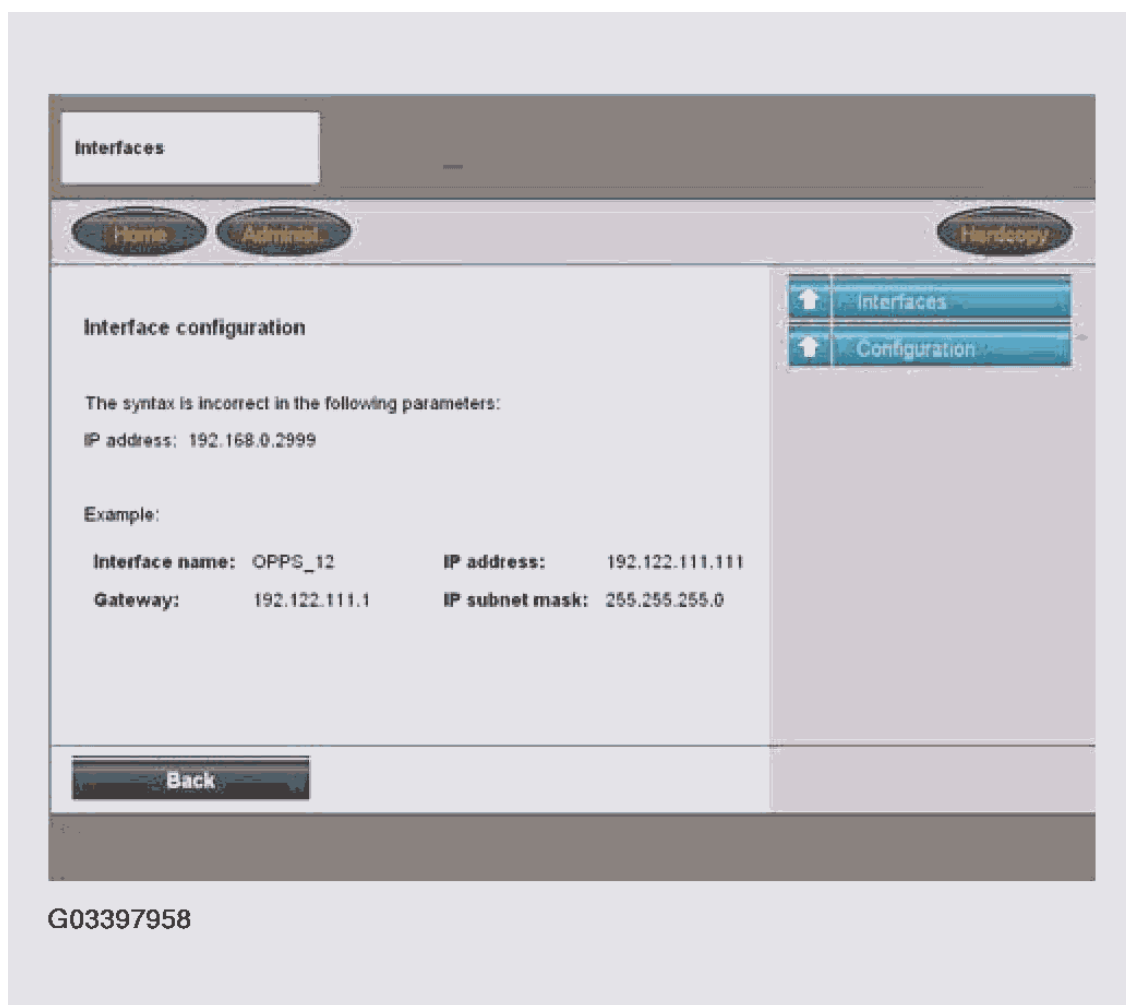


Fig. 104: Display Interfaces Configuration Information (2 Of 3)
Courtesy of BMW OF NORTH AMERICA, INC.

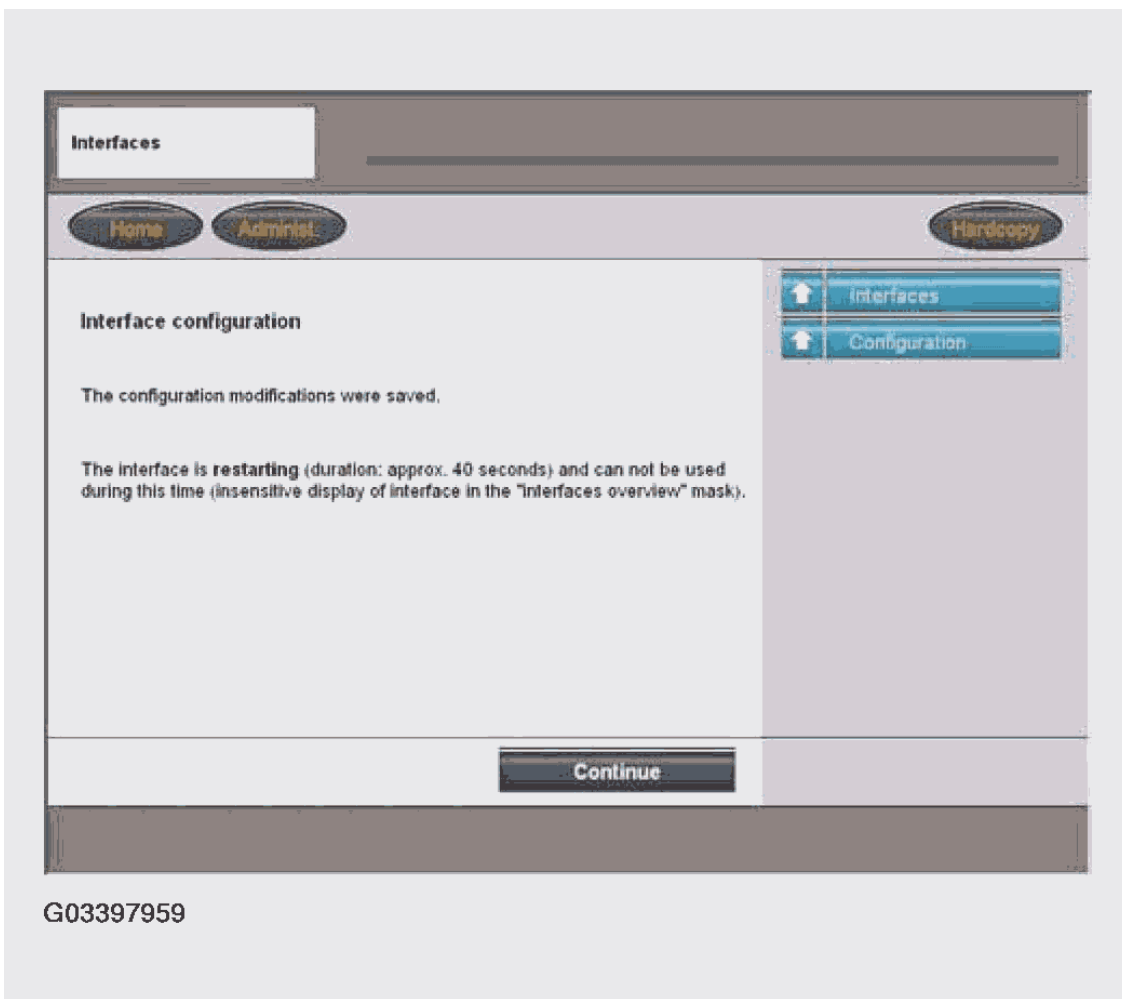


Fig. 105: Display Interfaces Configuration Information (3 Of 3)
Courtesy of BMW OF NORTH AMERICA, INC.

Interface Update

Interface update can only be selected if the selected interface is not being used by another device (interface symbol has a green background).

This function allows the firmware of the interface to be checked against the version of the SSS.

It is recommended that the version of the SSS and the Interface be at the same level to reduce susceptibility to errors and system conflicts.

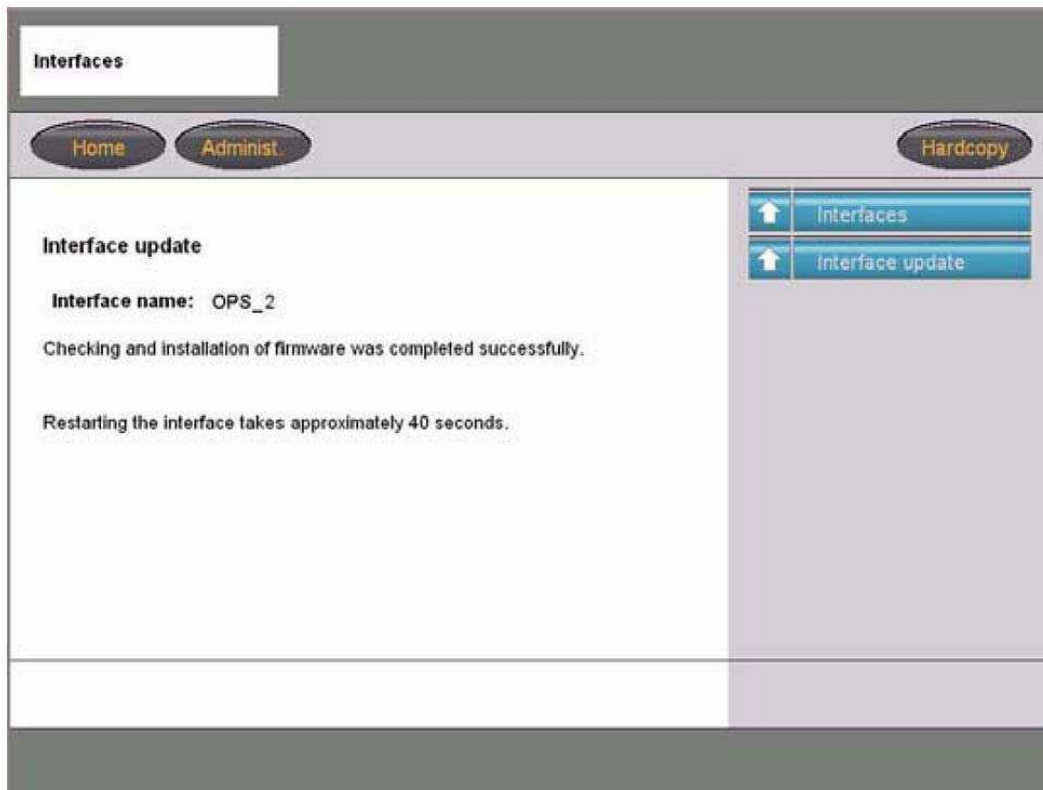


Fig. 106: Display Interface Update Information (1 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

The SSS will check which firmware version is installed in the interface and then searches for the newest available version on the SSS. Depending on the result of the search, Progman will make a recommendation as to what action should be taken.

- If both versions are equal no action is required.
- If the version on the SSS is newer then Progman will suggest updating the version on the interface.
- If the version on the SSS is older, Progman is able to change the version on the interface to the older one.

Once the update is successfully completed a corresponding message is displayed.



G03397961

Fig. 107: Display Interface Update Information (2 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

Updating Interface after Initial Install

After the initial installation of Progman with CIP 15.0, the firmware installed on the interfaces that will be used with Progman must first be updated. If the firmware level of the interface is not at a predefined level then it will not be recognized/identified within the Progman application, thereby not allowing a connection to the interface. This update only needs to be performed when an interface is used for the first time with Progman.

Using the GT1 update the firmware in the interface.

Select the interface



G03397962

Fig. 108: Selecting Interface

Courtesy of BMW OF NORTH AMERICA, INC.

With a connection to the interface established a message should be displayed indicating that the firmware in the head needs to be updated, perform the update by selecting the "Diagnostic head Update" button.

After the update is complete select "Quit connecting".

Access Progman and verify that the interface is recognized



G03397963

Fig. 109: Selecting Quit Connecting Button
 Courtesy of BMW OF NORTH AMERICA, INC.

From Progman the firmware level of the interface should also be checked and updated if necessary. Progman does not automatically inform the user if the firmware of the interface needs to be updated.

Updates to the interface are checked and performed by selecting the specific interface from the list, located under "Administration" - "Interfaces", then selecting "Interface Update" (refer to previous page for additional information).

Self-Test

Self-test can only be selected if the selected interface is not being used by another device (interface symbol has a green background).

Depending on the interface selected a test loop must be attached to the interface.

- For opps use test loop 663124 and 663131
- For OPS use test loop 663124
- For Diagnostic Head, no test loop is needed

External Interface

An external interface is an interface that is not automatically detected by Progman or is not contained in the subnet of the workshop network, such an interface can be added manually to the list of available interfaces or removed using this function. In order to add an interface the I/P address of the interface must be entered.

Interfaces

Home Administ. Hardcopy

External interface (IP address input)

Please enter the IP address:

IP address:

7 8 9
4 5 6
1 2 3
- 0 ←

Continue

↑ Interfaces
↑ External interface
↑ Add

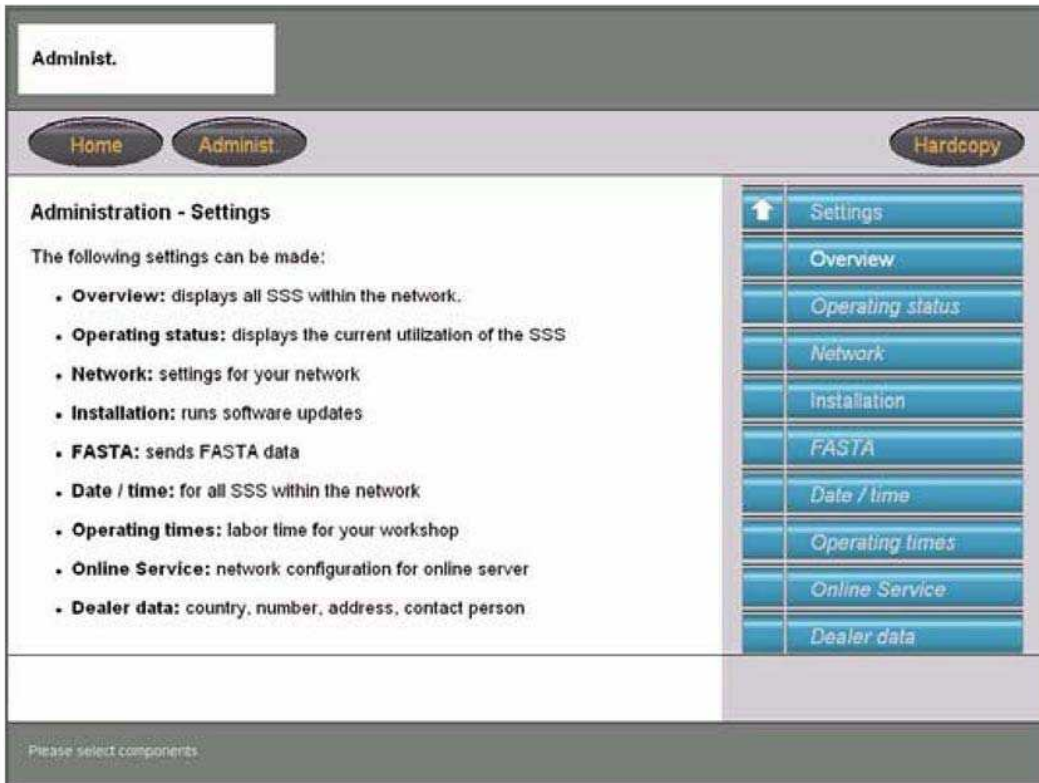
G03397964

Fig. 110: Display Interfaces Menu For Entering IP Address
Courtesy of BMW OF NORTH AMERICA, INC.

Example: The dealer has two separate service facilities each with its own network, an external interface can be connected to a vehicle located within one network and accessed by a GT1 or SSS located in the other network in order to Code/Program the vehicle.

Settings

From the Administration screen the "Settings" tap allows access to information specific to a selected/specific SSS.



G03397965

Fig. 111: Display Administration - Settings Tap
Courtesy of BMW OF NORTH AMERICA, INC.

Overview

The overview tap provides a listing of all SSS's that are located on the network.



Fig. 112: Display SSS Overview Menu (1 Of 2)
 Courtesy of BMW OF NORTH AMERICA, INC.

The Overview screen provides information pertaining to:

- Operating status of a particular SSS

Ready (Green) = Usable

Full use of SSS is possible

Limited (Yellow) = Usable

The number of possible sessions is limited (Ex. a download of a new update is in progress)

Not Ready (Red) = Maintenance

No new sessions are possible (Ex. an update is currently being installed)

- Number of active sessions on each SSS
- The CIP version installed on each SSS

Upon selecting a particular SSS additional menu selections are possible.

The selected SSS is highlighted in a blue frame and all items are possible for the selected SSS are active in the menu.

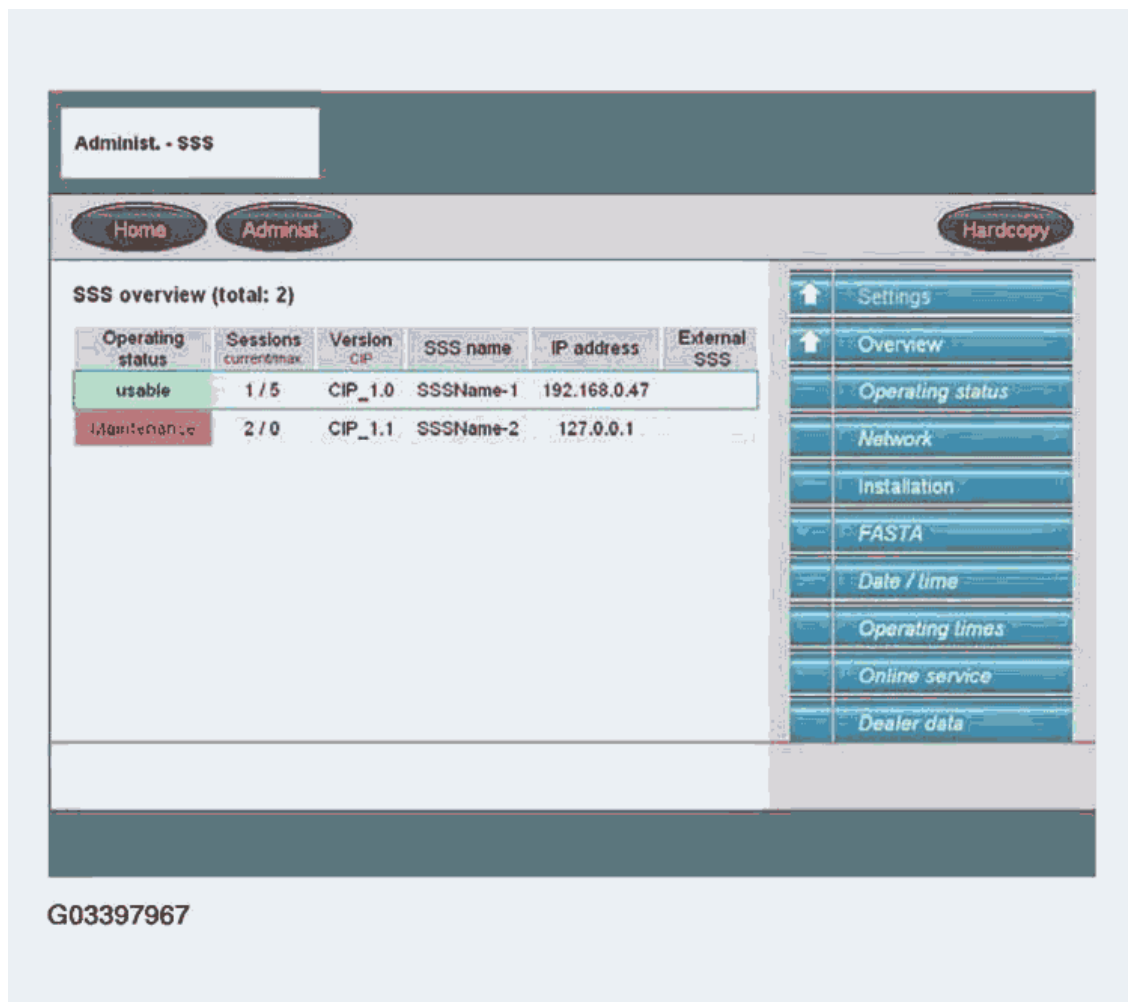


Fig. 113: Display SSS Overview Menu (2 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

Operating Status

This menu item provides a more detailed status information for specific SSS than the Overview table.



G03397968

Fig. 114: Display SSS Operating Status Menu
 Courtesy of BMW OF NORTH AMERICA, INC.

The name of the SSS is displayed with a colored background indicating the status of the selected SSS.

Green = Ready **Yellow** = Limited **Red** = Maintenance

Additional status information is also displayed:

MAC address - Media Access Control address is an unchangeable and unique address for identification of a network device.

Serial Number - Serial number of specific SSS

Operating Status - Provides detailed information about the current operation of the SSS

Sessions - Indicates the number of currently active/started CIP sessions.

Interfaces - Indicates how many interfaces are connected to the specific SSS

Online Service - Indicates whether the online update is activated on the SSS

From this location it is also possible to change the operating status of the SSS, as long as the selected SSS is currently in the "Ready" status, plus **this is also the recommended location from which the SSS should be restarted or shutdown using the buttons at the bottom of the screen.**

Network

The Network function allows network configuration information specific to the SSS to be entered, these settings should have been set during the initial installation of Progan/CIP15.0.

NOTE: Maintain a copy of the system configuration information, in the event information gets disturbed, printout a copy and keep in a binder along with information for DISplus, GT1 and the interfaces.



Fig. 115: Display Network Configuration Menu (1 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

Information that can be entered is similar to the information needed to configure an interface. The following information must be entered to correctly configure the SSS to the network:

- Assign a name specific to the SSS
- Gateway Address
- IP Address specific to SSS
- Information pertaining to the IP subnet mask

Any changes that are made to the configuration are saved by selecting continue and will go into effect once the SSS is restarted.

NOTE: Restart immediately means that Progman checks the current status of any sessions that are still active and once the sessions are complete the system will restart.

Restart later indicates that Progman will wait until the end of the day (specified under "Operating Times") to check and restart the system.

Administ. - SSS

Home Administ. Hardcopy

Network configuration
SSS name: SSSName-1

The configuration will be in effect after a restart.

When would you like to trigger a restart?

immediately (as soon as possible)

later (next maintenance period)

Settings
Overview
Network

Continue

Select the time when your changes will take effect and confirm with "Continue".

G03397970

Fig. 116: Display Network Configuration Menu (2 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

The Installation tap is selected when updates need to be installed either by a way of a new CIP DVD or checking for new online updates (Automatically or Manually). The updates that can be installed pertain to the Progman application as well as updated vehicle data files for utilization by CIP.

The table provides an overview of the software program and version currently installed.

The selection/activation of Automatic online updates via the BMW server is selected from this screen.

"DVD update" can be selected whenever a new CIP DVD needs to be installed.

"Online update" allows a manual check for online updates to be initiated.



G03397971

Fig. 117: Display Installation Menu

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: It is recommended that the Automatic Online Update feature be activated to insure that needed Program and Coding updates are received in a timely

manner. When new updates are made available they are downloaded and installed after the normal operating times of the workshop as specified under "Operating Times".

"Display status" provides information pertaining to the installation of the latest update.

Information pertaining to an erroneous installation of an update is displayed in the messages section.

NOTE: If frequent error messages are displayed contact your service provider for assistance and have available a copy of the error messages that have been received.



G03397972

Fig. 118: Display Installation - Status Menu
Courtesy of BMW OF NORTH AMERICA, INC.

FASTA

The FASTA function assures that vehicle operation and service data from the diagnostic and programming devices are sent to BMW. With Progman if data is available it is transmitted automatically every five minutes

This function shows if any data is available for transfer and when it will be sent.

By selecting "Send data" (manual send) make sure that no sessions are currently running on the SSS as this will lengthen the data transmission process.

It is preferred that the automatic transfer process be utilized.



G03397973

Fig. 119: Display FASTA Function Menu

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: In order for FAST data transmission to be possible the correct BMW server address must be entered in the "Online Service" menu.

Date and Time

In this function the current date and time must be entered. An automatic correction for daylight savings time to standard is made automatically.

Operating Times

The normal operating time of the workshop/service facility is entered in this function. The time is used to establish a maintenance period for the SSS. The end of normal operating time signals Progman to start executing/installing any online updates that may be available.

User Interface

Under this menu language settings specific to the individual SSS and printer configuration information can be set.

Example: If the language of the SSS is set to German then all information displayed on the SSS will be in German, however it does not mean that the GT1 will also display the text in German when accessing Progman and "connecting" to that SSS.

Workshop Exercise - Configuration Check

1. Check/access network configuration information for:
 - SSS
 - DISplus
 - GT1
 - Interfaces (Opps, OPS & Diagnostic Head)
2. Check firmware level of interface's via SSS.

STARTING A PROGRAMMING OR CODING SESSION WITH PROGMAN

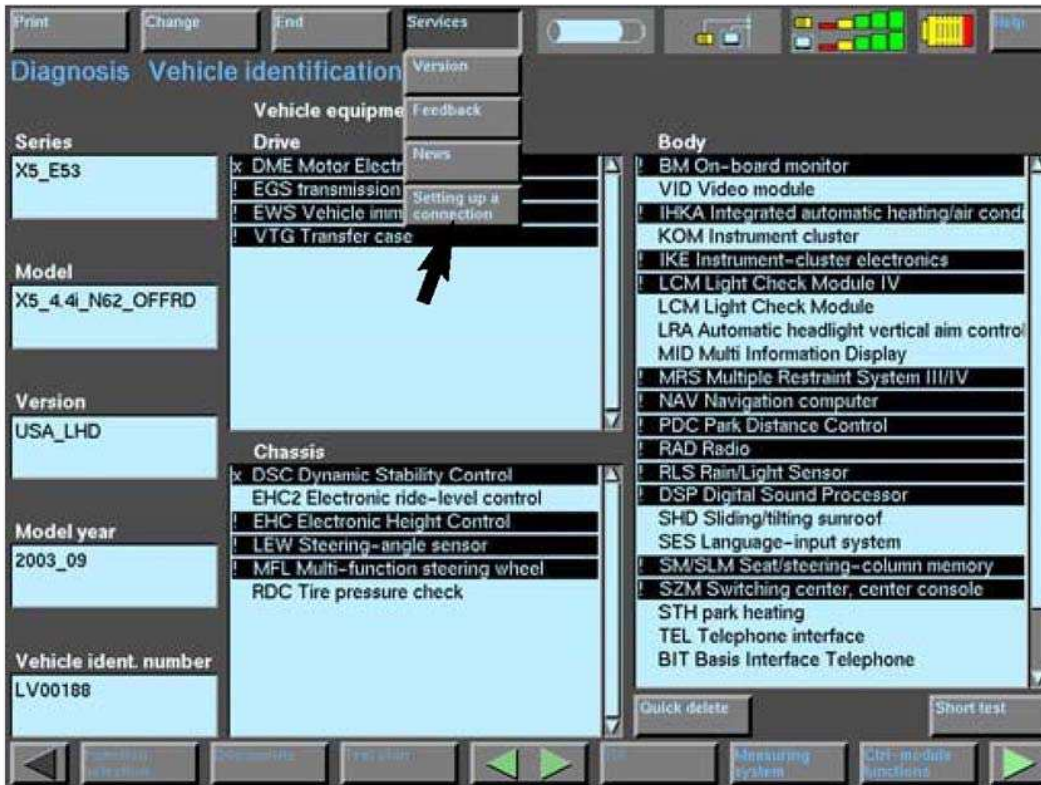
In order to start a session in Progman the Diagnostic, OPSS or OPS head that will be selected can not be connected to the DISplus or GT1.

Disconnecting From Interface To Be Used By Progman

If the vehicle to be programmed was previously being diagnosed using a diagnostic head with the GT1, then the connection with the head must be broken before that head will be recognized by Progman.

Select "Service"

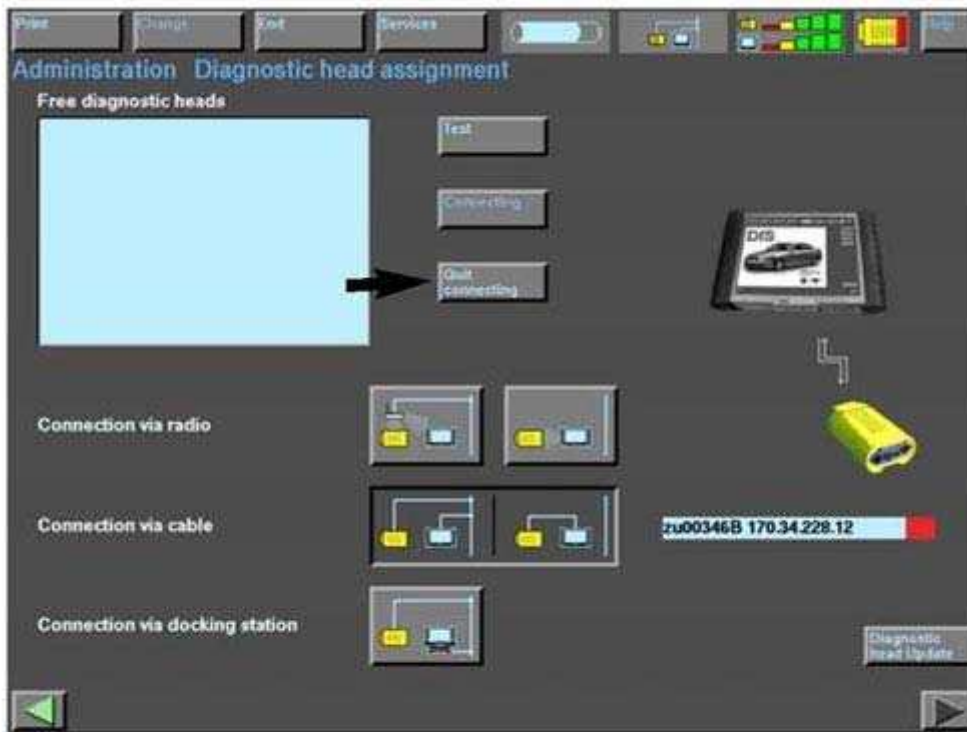
Select "Setting up a connection"



G03397974

Fig. 120: Selecting Service And Setting Up Connection Button
 Courtesy of BMW OF NORTH AMERICA, INC.

Select "Quit connecting"



G03397975

Fig. 121: Selecting Quit Connecting Button
Courtesy of BMW OF NORTH AMERICA, INC.

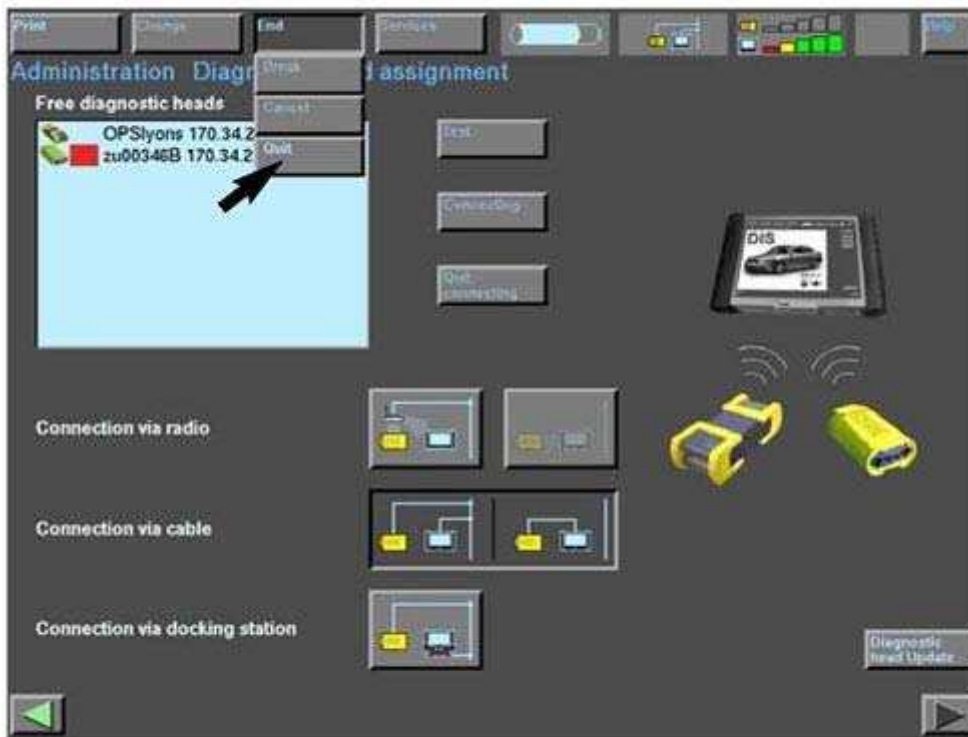
The selected head is free/disconnected



G03397976

Fig. 122: Display Free Diagnostic Head Menu
Courtesy of BMW OF NORTH AMERICA, INC.

Select "End"



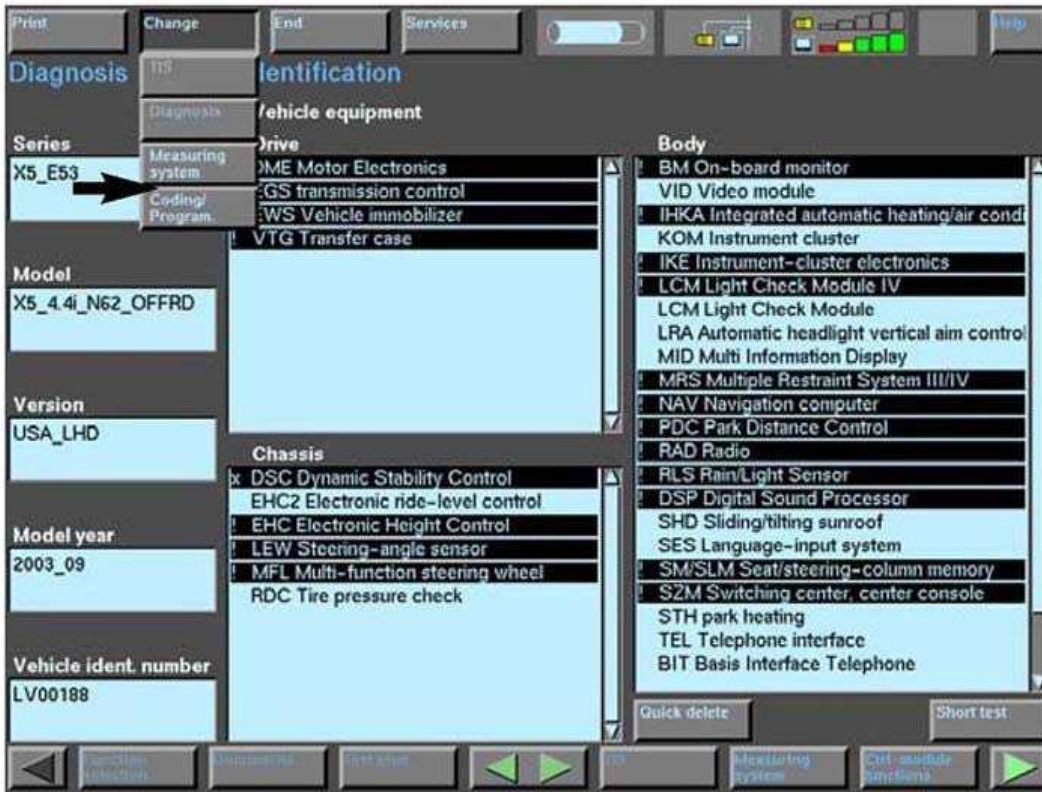
G03397977

Fig. 123: Selecting End Button

Courtesy of BMW OF NORTH AMERICA, INC.

Select "Change"

Select "Coding/Program"



G03397978

Fig. 124: Selecting Change And Coding/Program Button
 Courtesy of BMW OF NORTH AMERICA, INC.

Select available SSS

Select "Continue"

SSS selection

SSS overview (total: 1)

Please select from the following list an SSS to which your terminal is to be connected.

Note: Programming sessions are performed from the selected SSS. Select if possible the SSS that shows the lowest load.

Operating status	Sessions current/max	Version CIF	SSS name	IP address	External SSS
usable	0 / 5	14.0.6	ZU-A-24 Engrnmg	170.34.228.31	



Continue

Available SSS selected

G03397979

Fig. 125: Selecting Continue Button
Courtesy of BMW OF NORTH AMERICA, INC.

Starting A Session With Progman

Select "New Session"

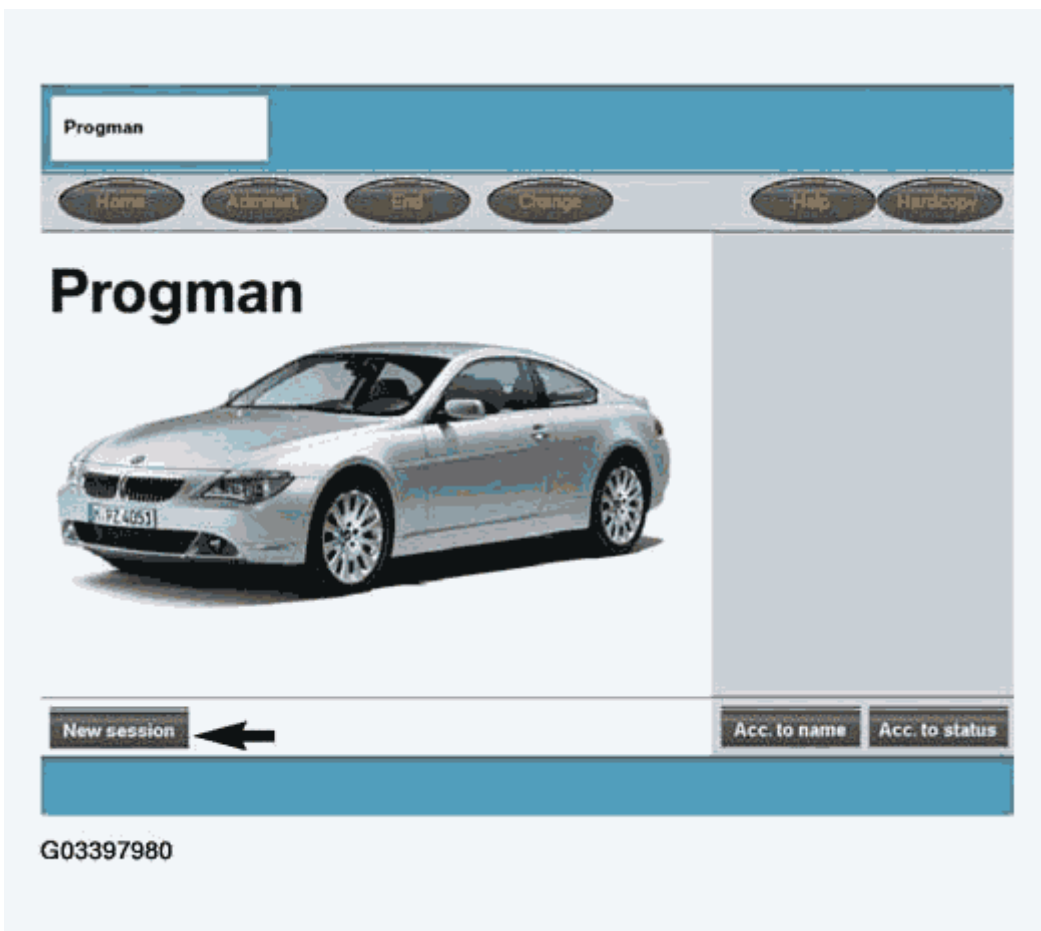


Fig. 126: Selecting New Session Button

Courtesy of BMW OF NORTH AMERICA, INC.

Select the desired interface

Select "Continue"

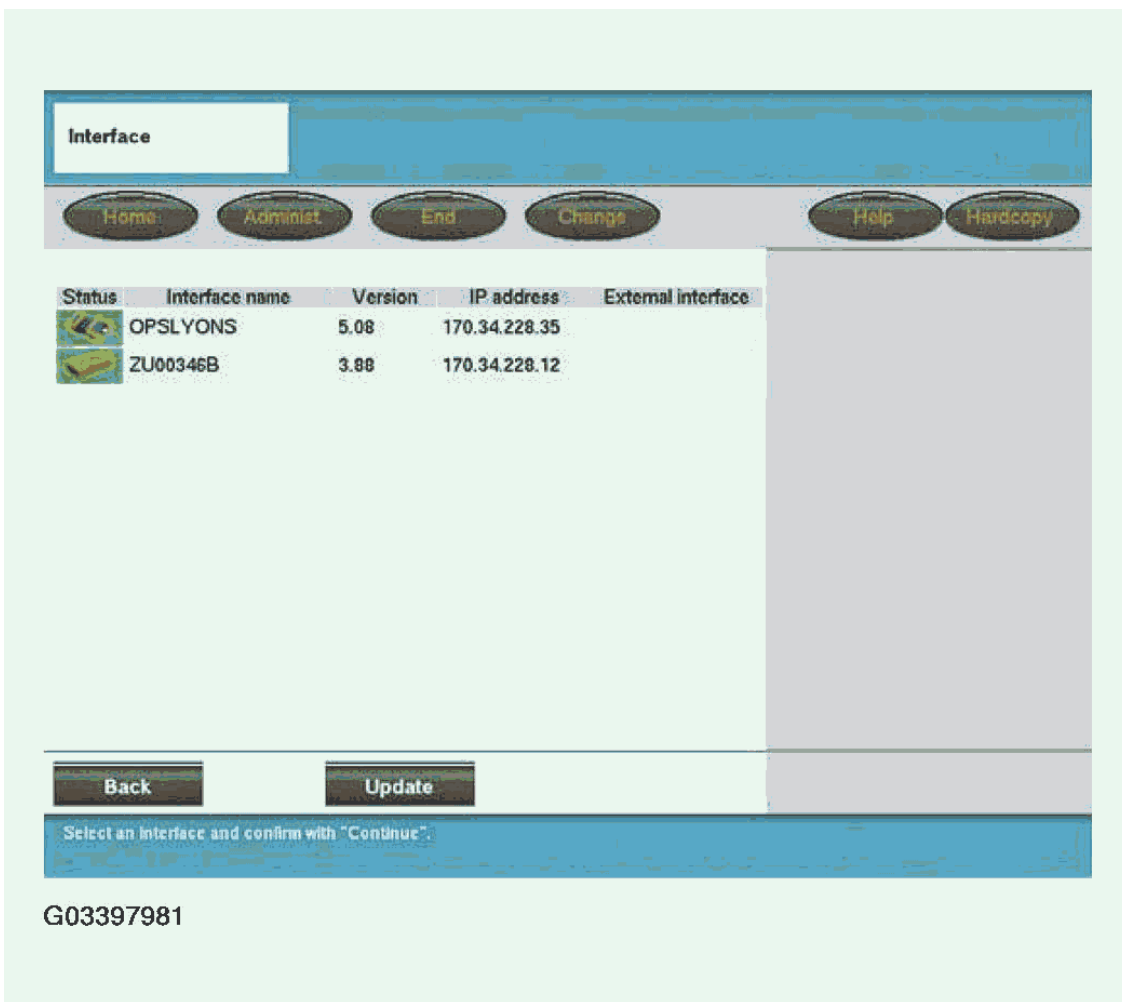


Fig. 127: Display Interfaces Name, Version And IP Address
Courtesy of BMW OF NORTH AMERICA, INC.

Under "Description" enter information that will identify the vehicle to which the interface is connected (Ex. VIN or Model type, Service hat #, Vehicle color, Bay location, etc.)

Select "Continue"

Session	ZU00346B
---------	----------

Home
Administ
End
Change
Help
HardCopy

Description of new session

IP address: 170.34.228.12 Interface name: ZU00346B

Description: ←

1	2	3	4	5	6	7	8	9	0
Q	W	E	R	T	Y	U	I	O	P
A	S	D	F	G	H	J	K	L	←
Z	X	C	V	B	N	M	.	-	-

Back
Continue

Enter the description for the new session and confirm with "Continue".

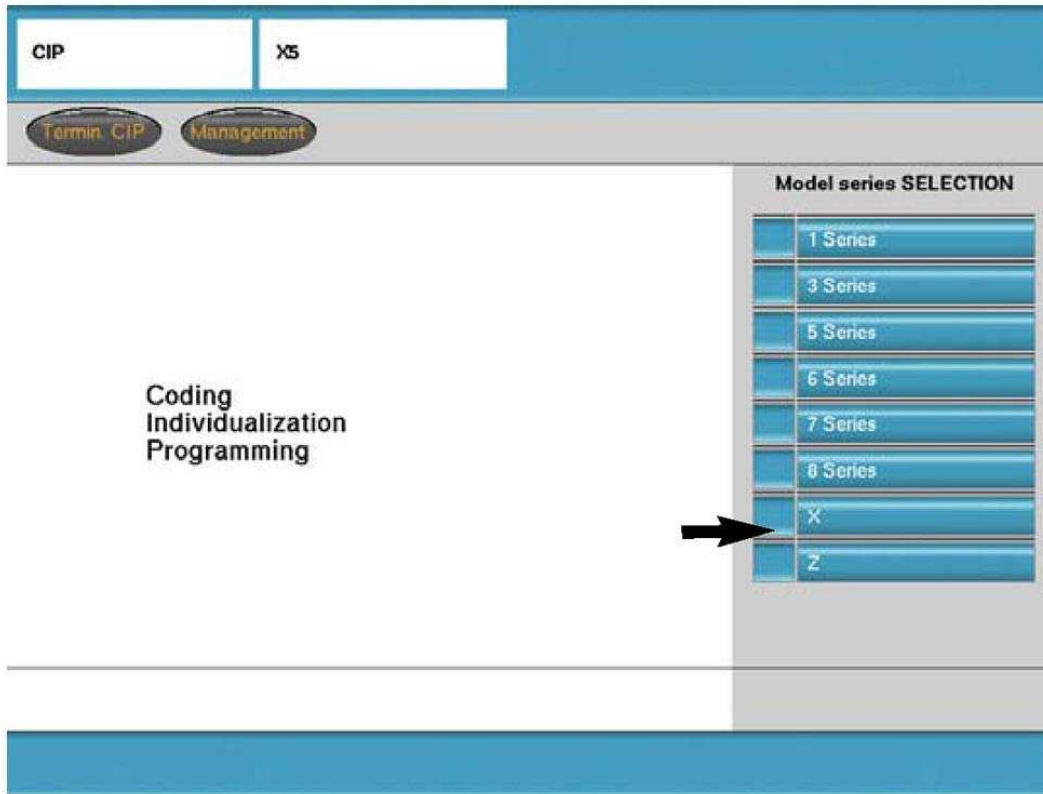
G03397982

Fig. 128: Entering Information In "Description" About Vehicle To Which Interface Connected
 Courtesy of BMW OF NORTH AMERICA, INC.

Access CIP Functions For E31/E32/E34/E36/E38/E39/E46/E52/E53

Select desired model series

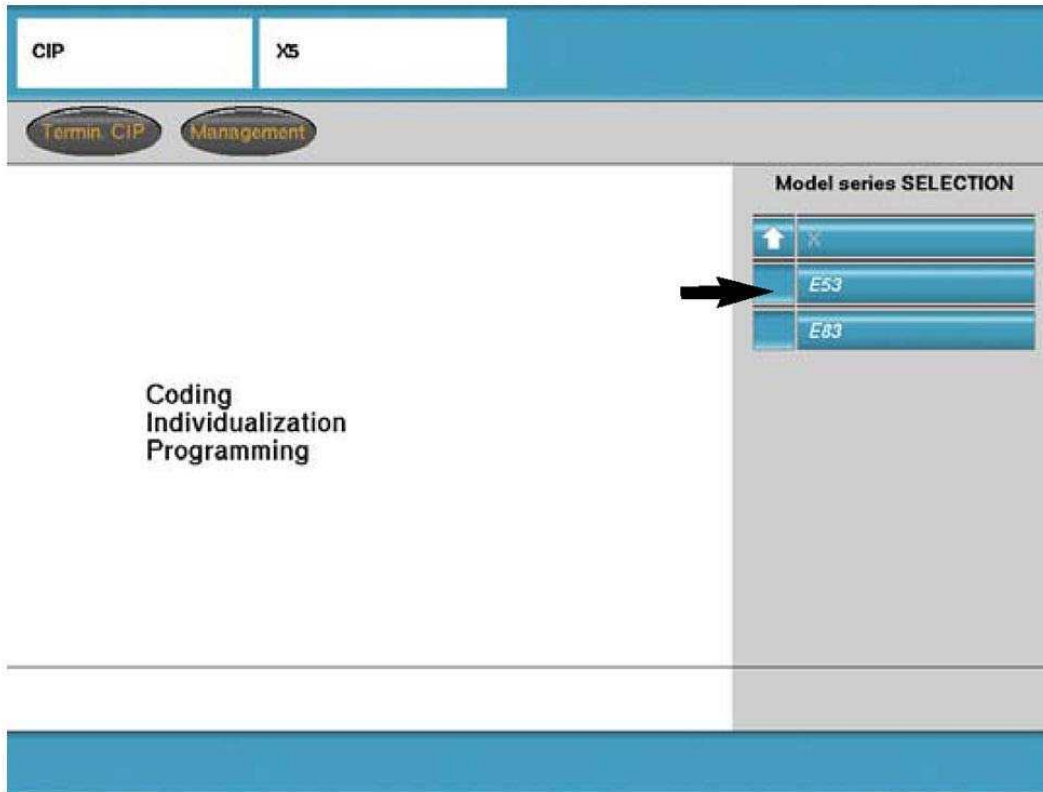
For this example an E53 - X5 is being used, therefore select "X"



G03397983

Fig. 129: Selecting "X" Button
Courtesy of BMW OF NORTH AMERICA, INC.

Select "E53"

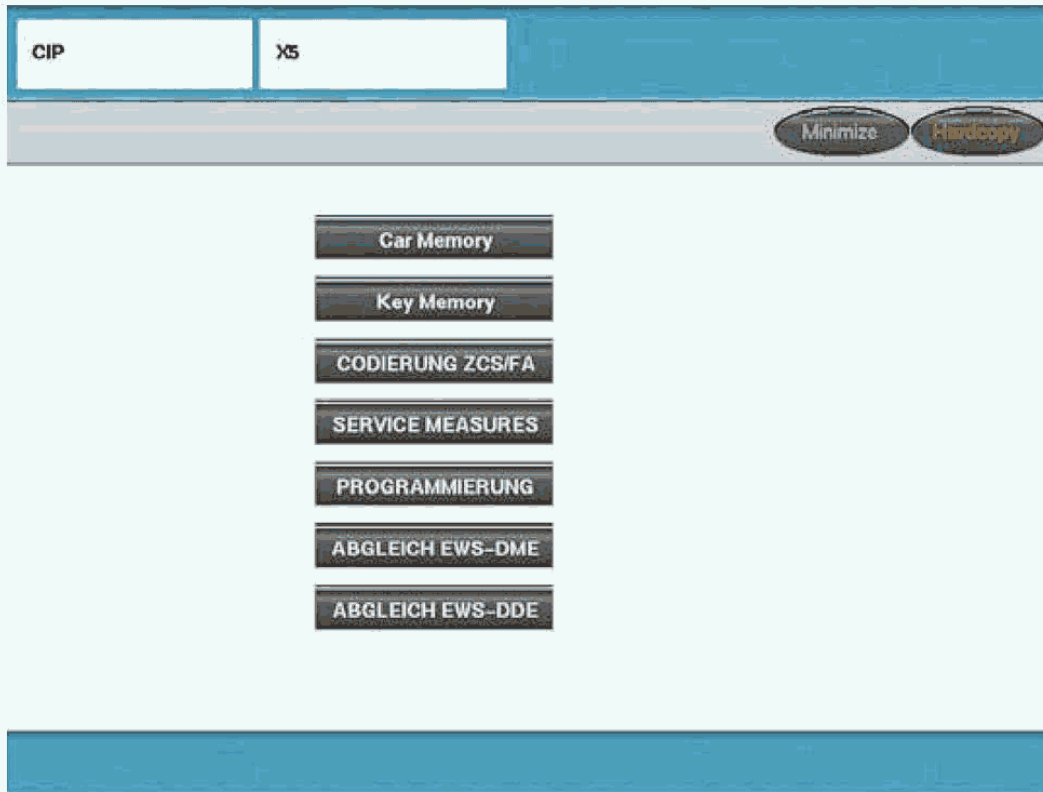


G03397984

Fig. 130: Selecting "E53" Button
Courtesy of BMW OF NORTH AMERICA, INC.

The screen now displays the SGC/Unix screen previously accessed via the DISplus/GT1 when coding and programming was selected.

At this point select the desired function and proceed as stated in the respective Service Information Bulletin for the procedure being performed.



G03397985

Fig. 131: Displaying SGC/Unix Screen
Courtesy of BMW OF NORTH AMERICA, INC.

Access CIP Functions For E60/E62/E63/E64/E65/E83/E85...

Select desired model series

For this examples an E60 is being used, therefore "5 Series" is selected

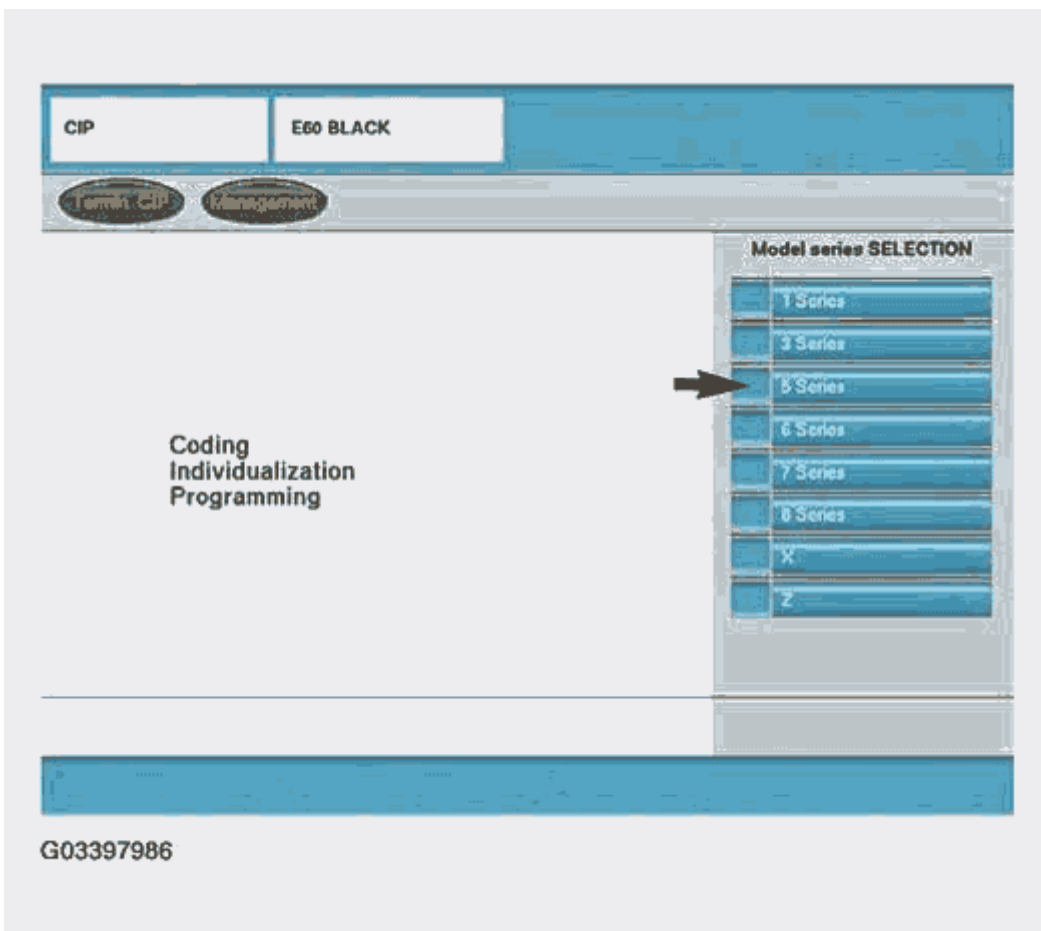
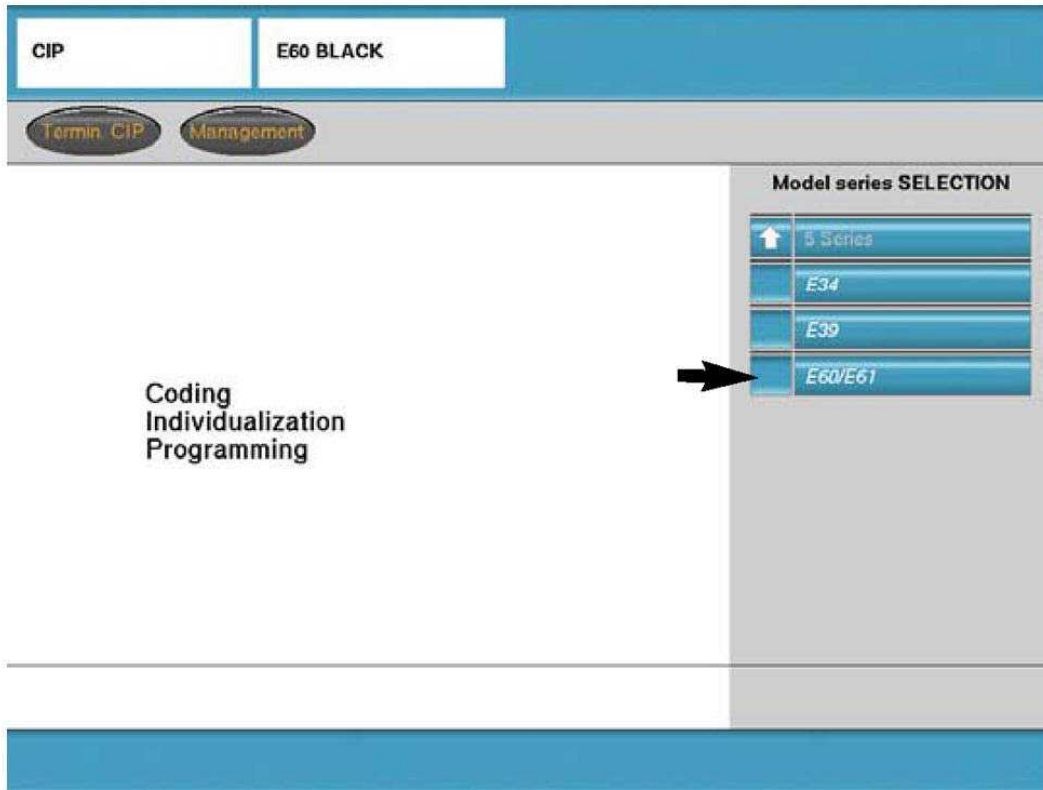


Fig. 132: Selecting 5 Series Button

Courtesy of BMW OF NORTH AMERICA, INC.

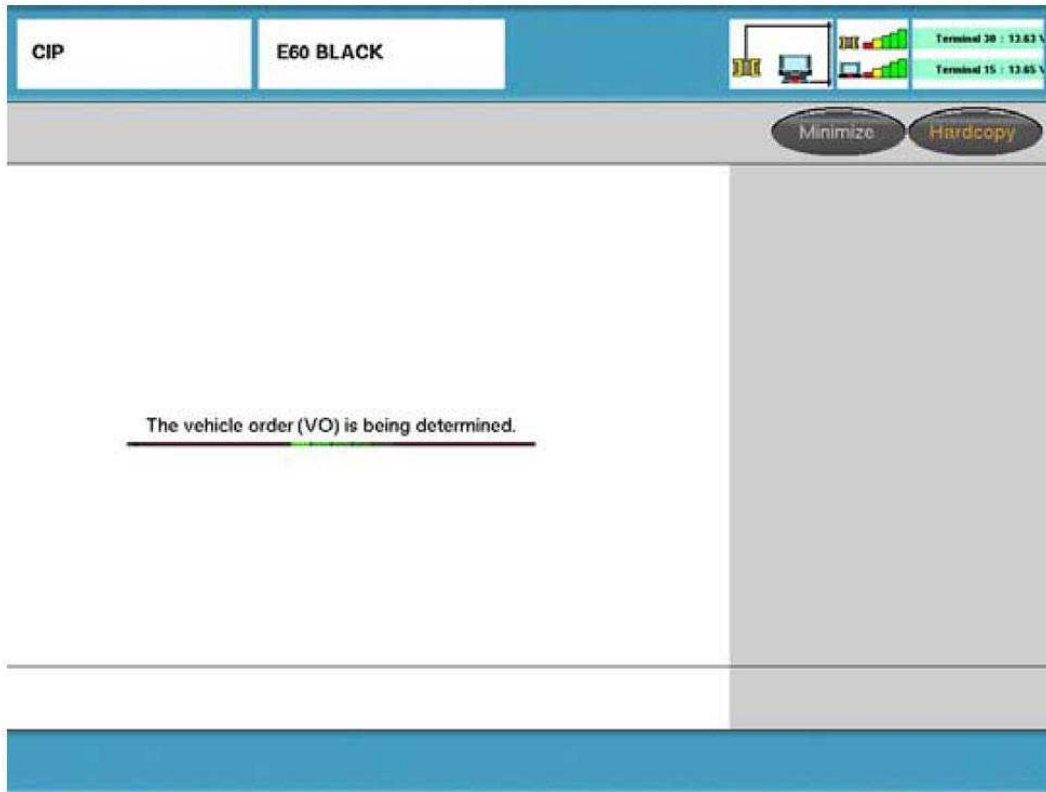
Select E60



G03397987

Fig. 133: Selecting E60/E61 Button
Courtesy of BMW OF NORTH AMERICA, INC.

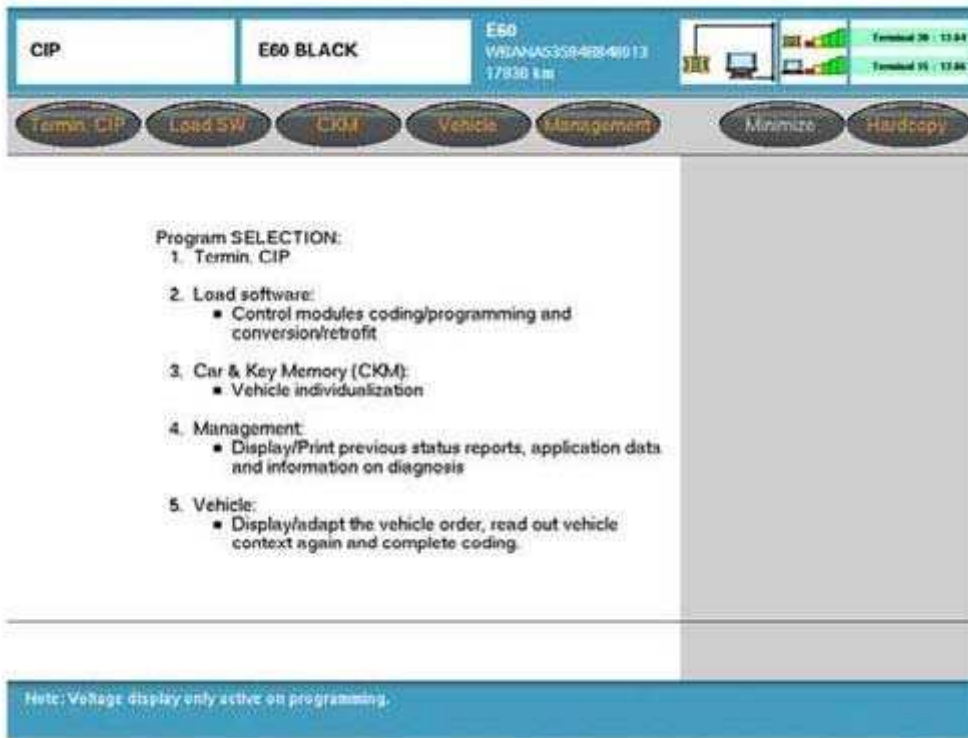
CIP is determining the vehicle order for the vehicle being accessed.



G03397988

Fig. 134: Display Vehicle Order (VO) Determined
Courtesy of BMW OF NORTH AMERICA, INC.

From this screen select the desired function.



G03397989

Fig. 135: Selecting Desired Function

Courtesy of BMW OF NORTH AMERICA, INC.

Return To Progman "Home" Screen

Select "Minimize"

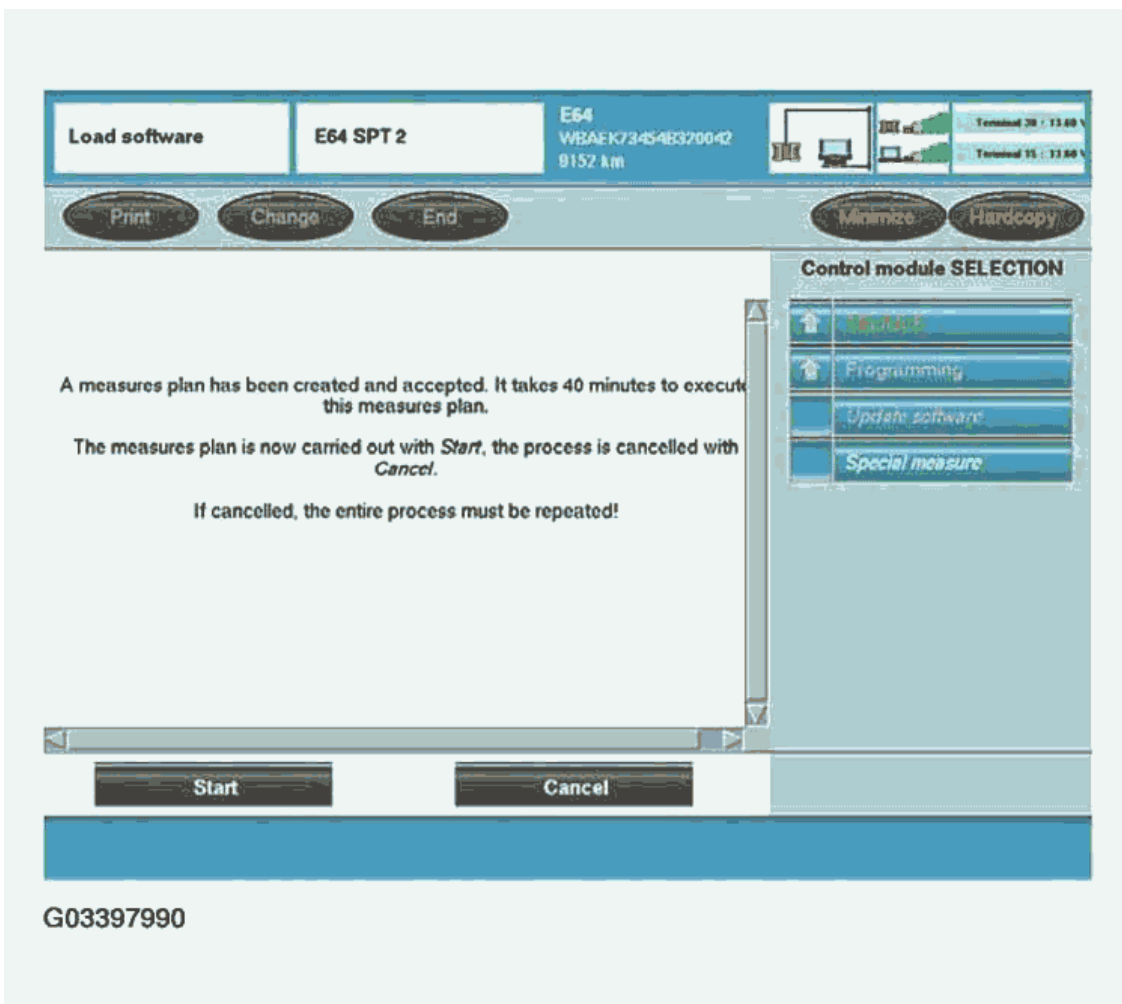
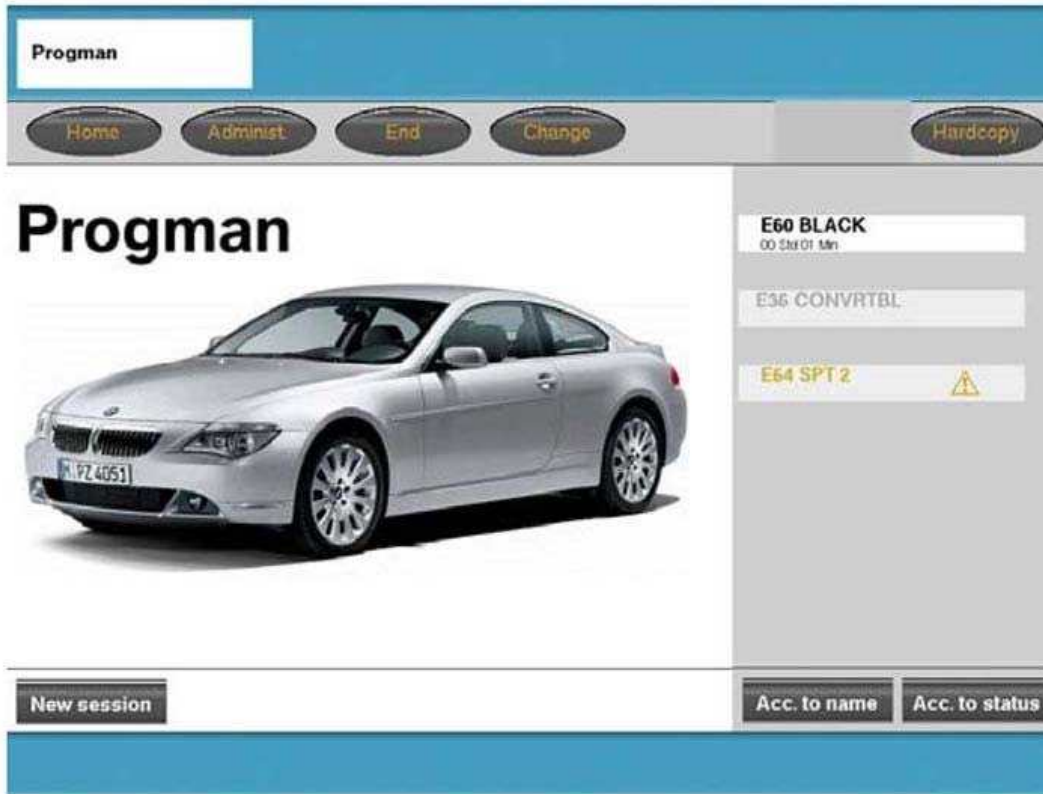


Fig. 136: Selecting Minimize Button
Courtesy of BMW OF NORTH AMERICA, INC.

The Progman "Home" screen is displayed, from here a new session can be started or a current session reviewed.

If using a GT1 a change to diagnostics can also be made.



G03397991

Fig. 137: Display Progman - Home Screen (1 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

Progman "Home" Screen Session Status

The Progman "Home" screen displays all sessions that are running on a particular SSS and allows any of the sessions to be reviewed.

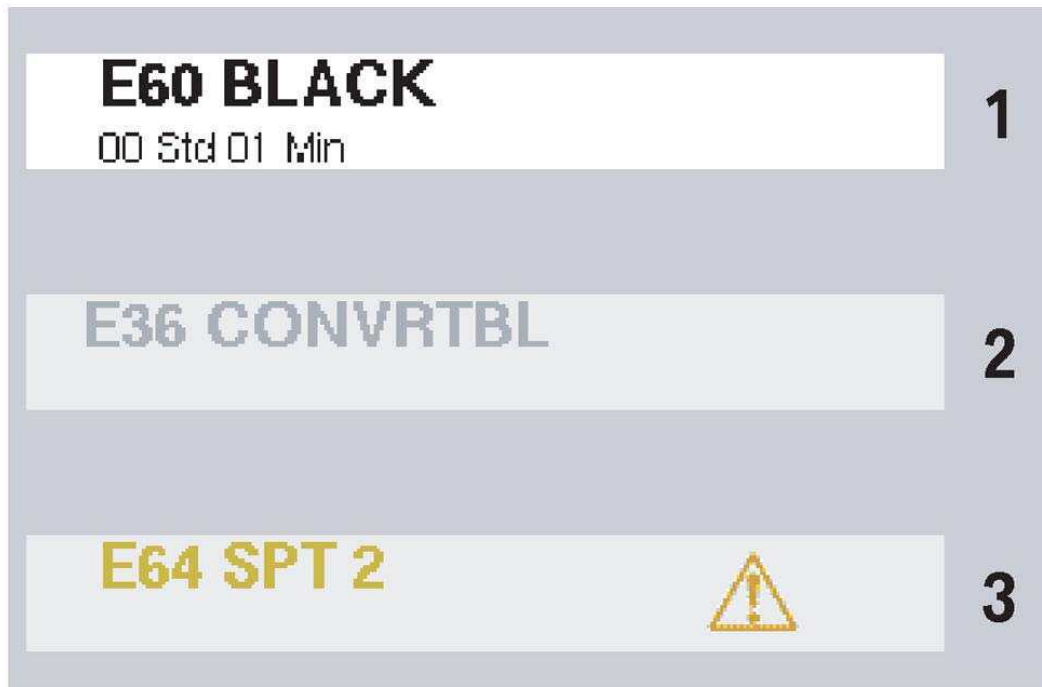


G03397992

Fig. 138: Display Progman - Home Screen (2 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

Explanation of session status indicators:

- 1 - Black text with white background indicates that session is running and does not require any input, the status of the session can be reviewed.
- 2 - Grey text indicates a session is active/in progress and is currently being accessed or reviewed by another user. This session can not be accessed by an additional user.
- 3 - Orange text indicates that input is required before program can continue, this session should be accessed and reviewed to provide required input.



G03397993

Fig. 139: Display Session Status Indicators Explanation
Courtesy of BMW OF NORTH AMERICA, INC.

Going From Progman To Diagnosis On GT1

If using a GT1 it is possible to switch from Progman to a diagnostic function.

From the Progman home screen select "Change"

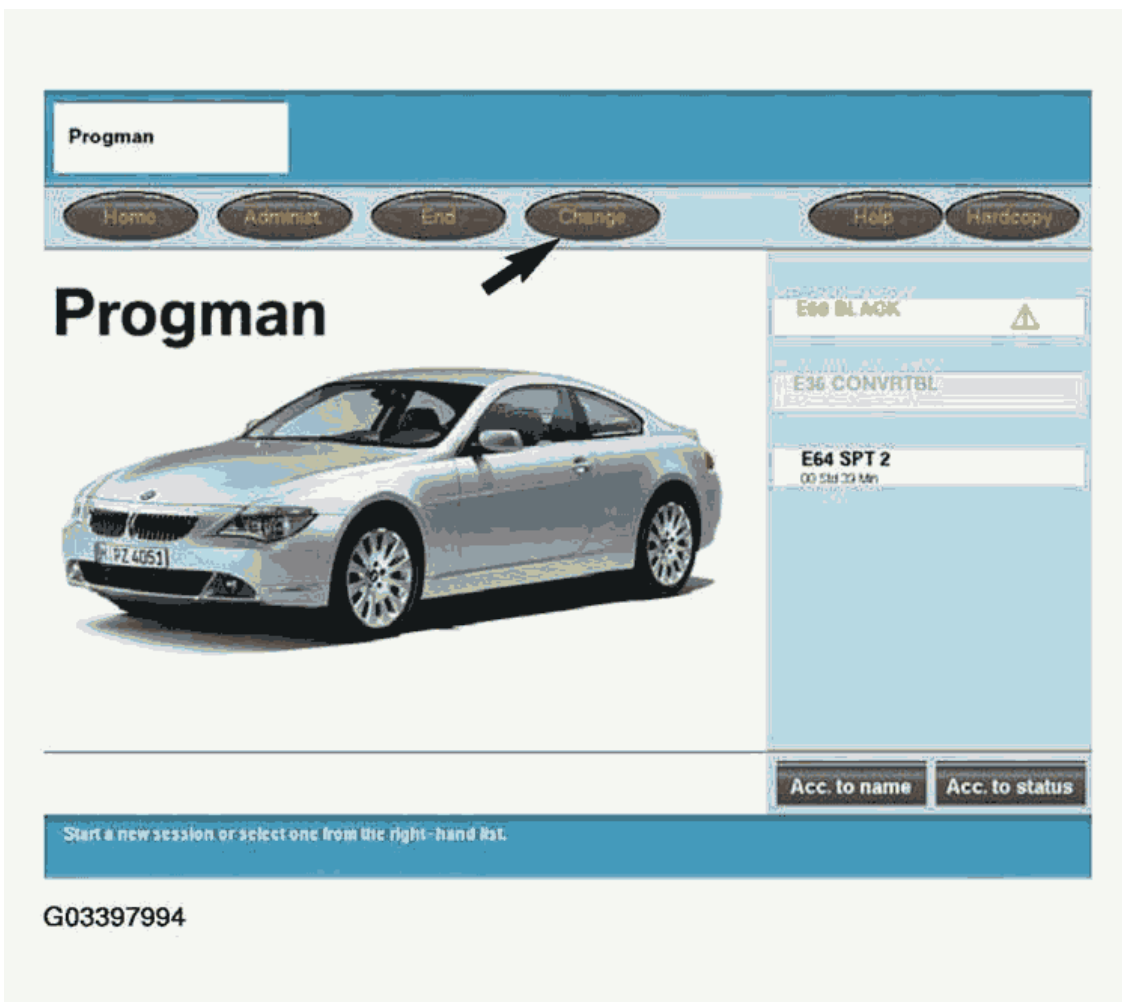


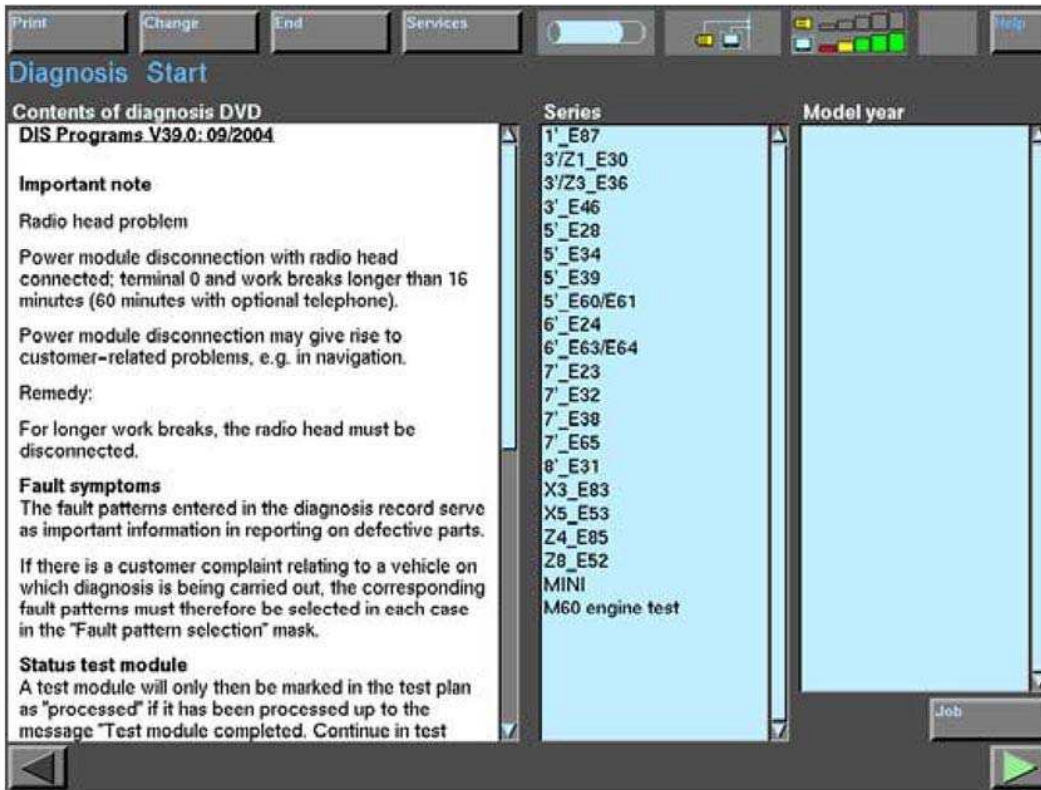
Fig. 140: Selecting Change Button

Courtesy of BMW OF NORTH AMERICA, INC.

The GT1 will switch to diagnostics and a new diagnostic session can be started by connecting to an available interface, if nothing was previously active.

Or

If a diagnostic session was previously active then the system will return to that point, prior to having switched over to Progman.



G03397995

Fig. 141: Display Diagnostic Start Menu
 Courtesy of BMW OF NORTH AMERICA, INC.

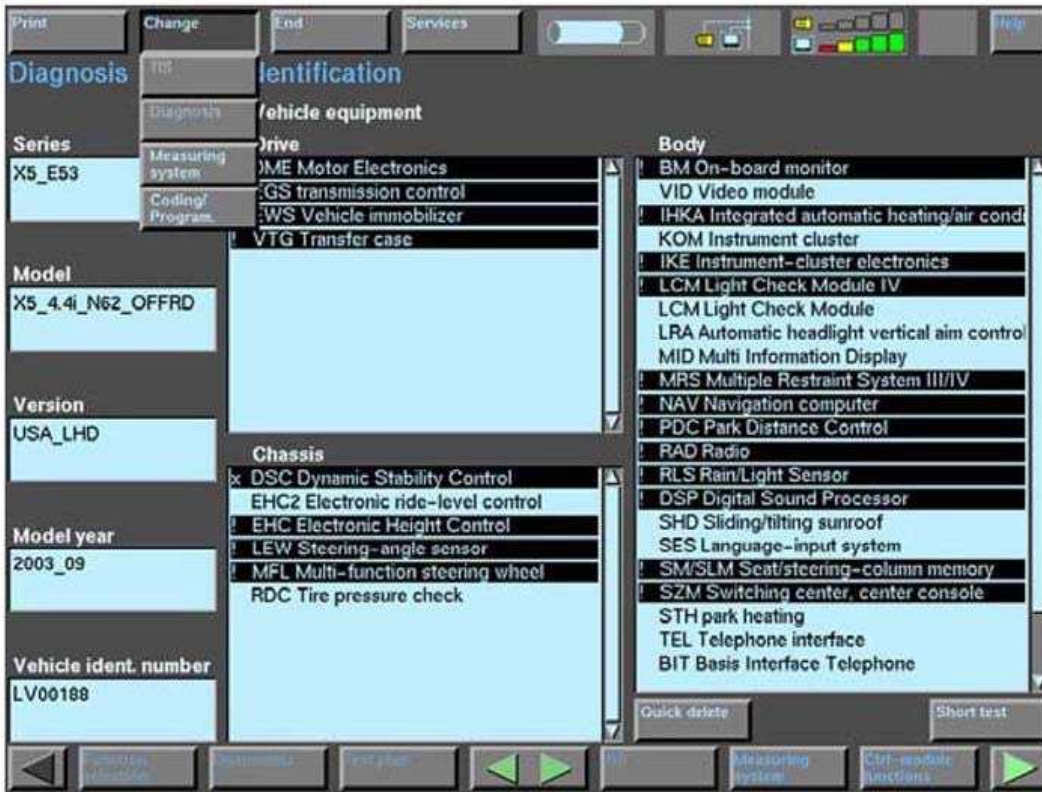
Going From Diagnosis To Progman On GT1

If using a GT1 it is possible to switch from a diagnostic function to Progman to check the status of an active session.

From the diagnostic screen:

Select "Change"

Select "Coding/Program"



G03397996

Fig. 142: Selecting Change And Coding/Program Button
 Courtesy of BMW OF NORTH AMERICA, INC.

Select the SSS on which the session is to be checked

SSS selection

SSS overview (total: 1)

Please select from the following list an SSS to which your terminal is to be connected.

Note: Programming sessions are performed from the selected SSS. Select if possible the SSS that shows the lowest load.

Operating status	Sessions connected	Version CIP	SSS name	IP address	External SSS
usable	0 / 5	14.0.6	ZU-A-24 Engrmg	170.34.228.31	

Continue

Available SSS selected

G03397997

Fig. 143: Selecting SSS

Courtesy of BMW OF NORTH AMERICA, INC.

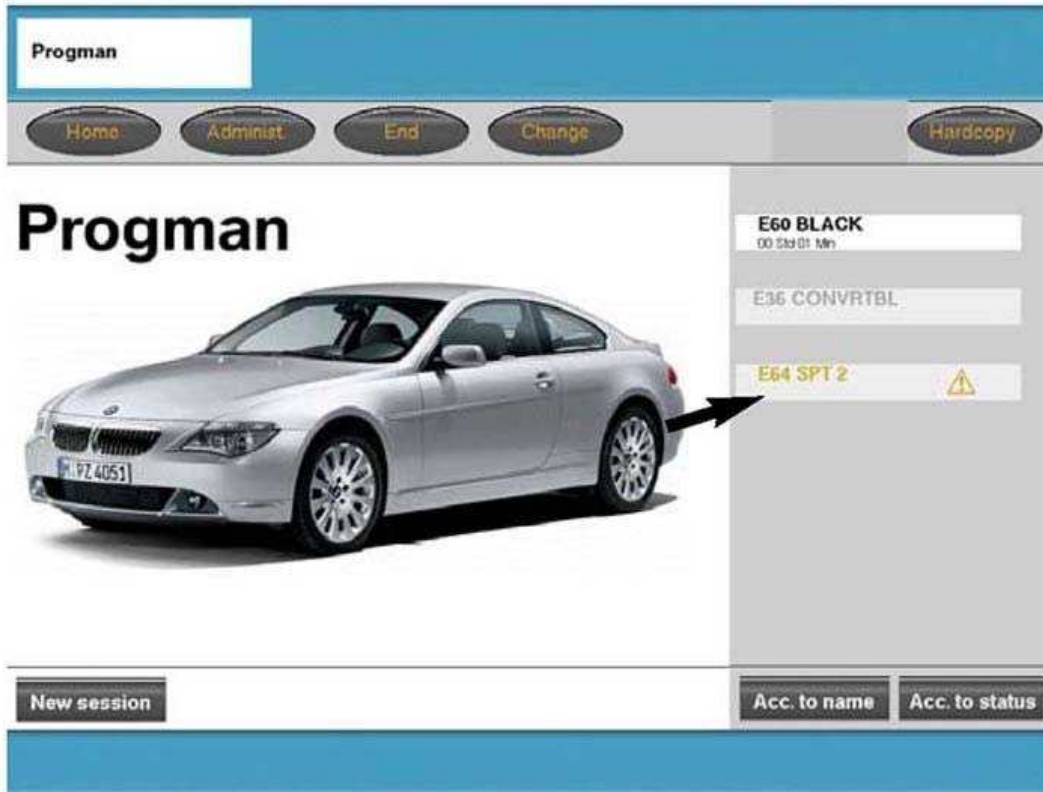
The GT1 will switch to the Progman session.

Select the session to be checked.

Example:

The E64 SPT 2 session is highlighted in orange, which indicates that a user input is required.

Select "E64 SPT 2"



G03397998

Fig. 144: Selecting E64 SPT 2
Courtesy of BMW OF NORTH AMERICA, INC.

The status information for the selected session states that it is "Waiting for user action"

Select "Continue" to view/access the session

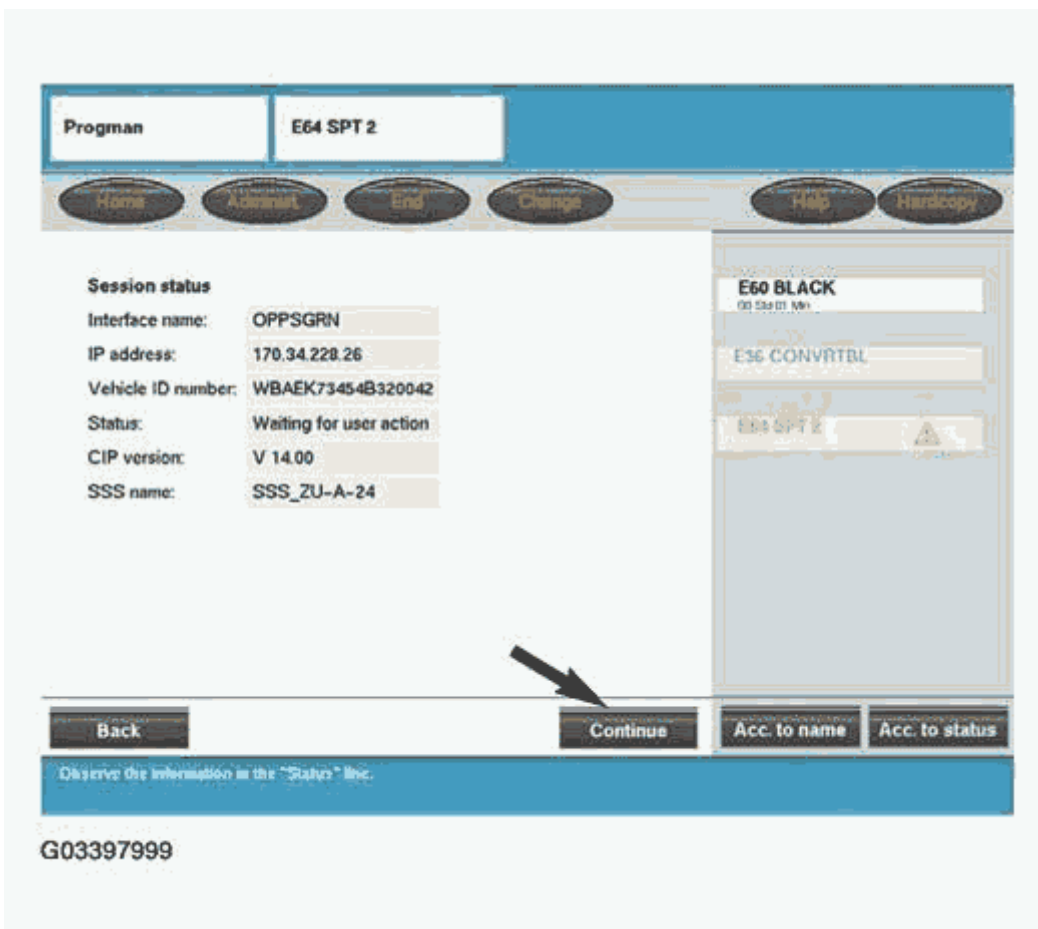


Fig. 145: Selecting Continue Button

Courtesy of BMW OF NORTH AMERICA, INC.

Select "Start" to initiate/carryout the measures plan

Or

Select "Cancel" to end the process and return to the previous module selection screen of CIP.

Or

Select "Minimize" to return to the home screen of Progman.

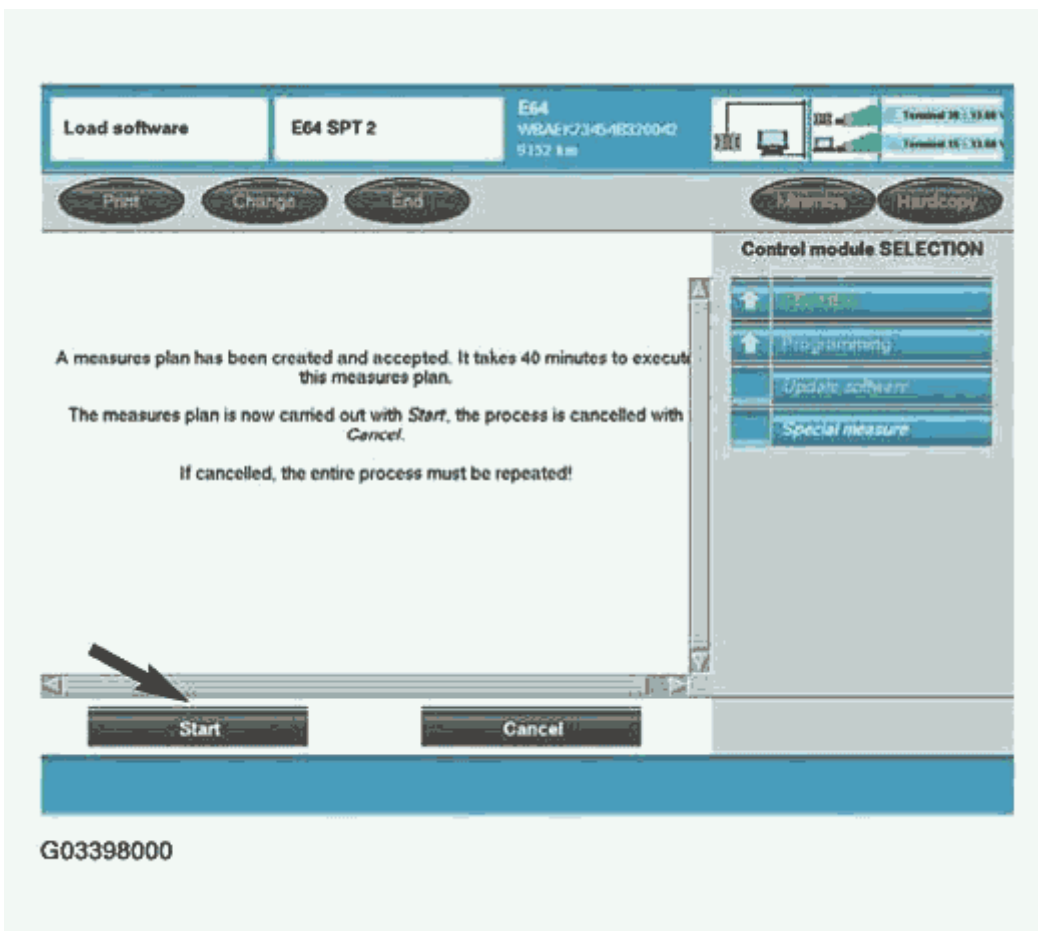
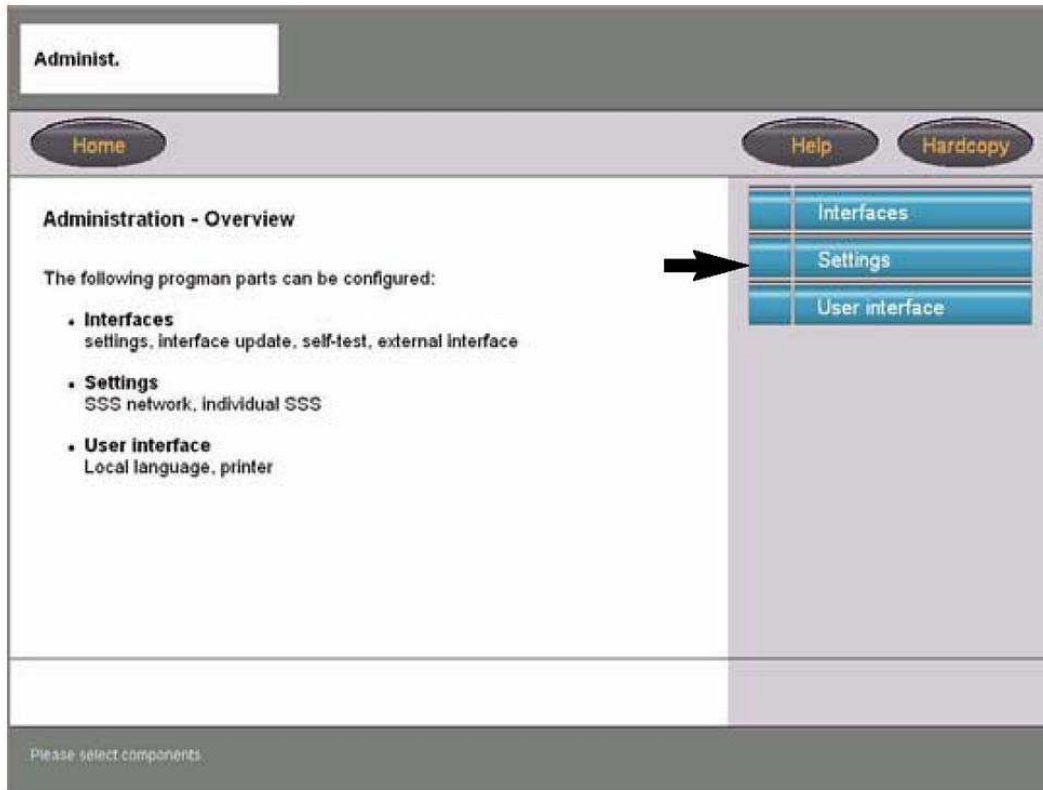


Fig. 146: Selecting Start Button

Courtesy of BMW OF NORTH AMERICA, INC.

SHUTTING DOWN THE SSS

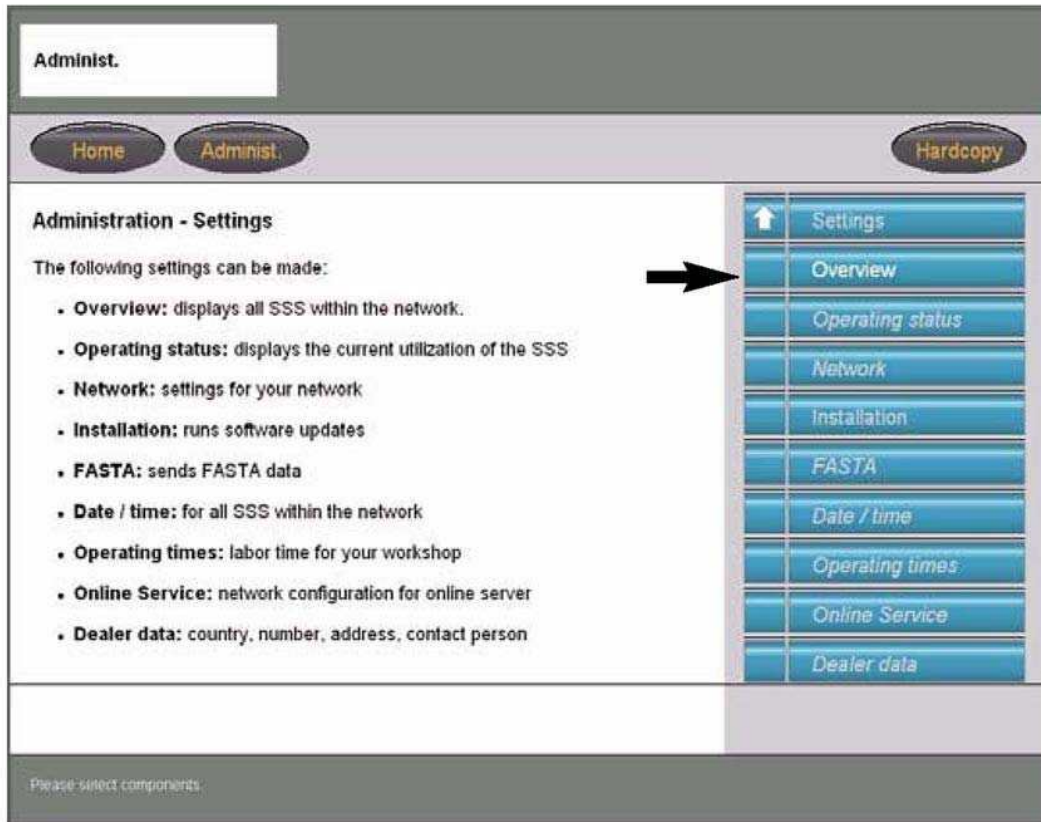
After selecting "Administ." on the Progman Home screen select "Settings".



G03398001

Fig. 147: Selecting Setting Button
Courtesy of BMW OF NORTH AMERICA, INC.

Select "Overview"



G03398002

Fig. 148: Selecting Overview Button
Courtesy of BMW OF NORTH AMERICA, INC.

Select the specific SSS to be shutdown

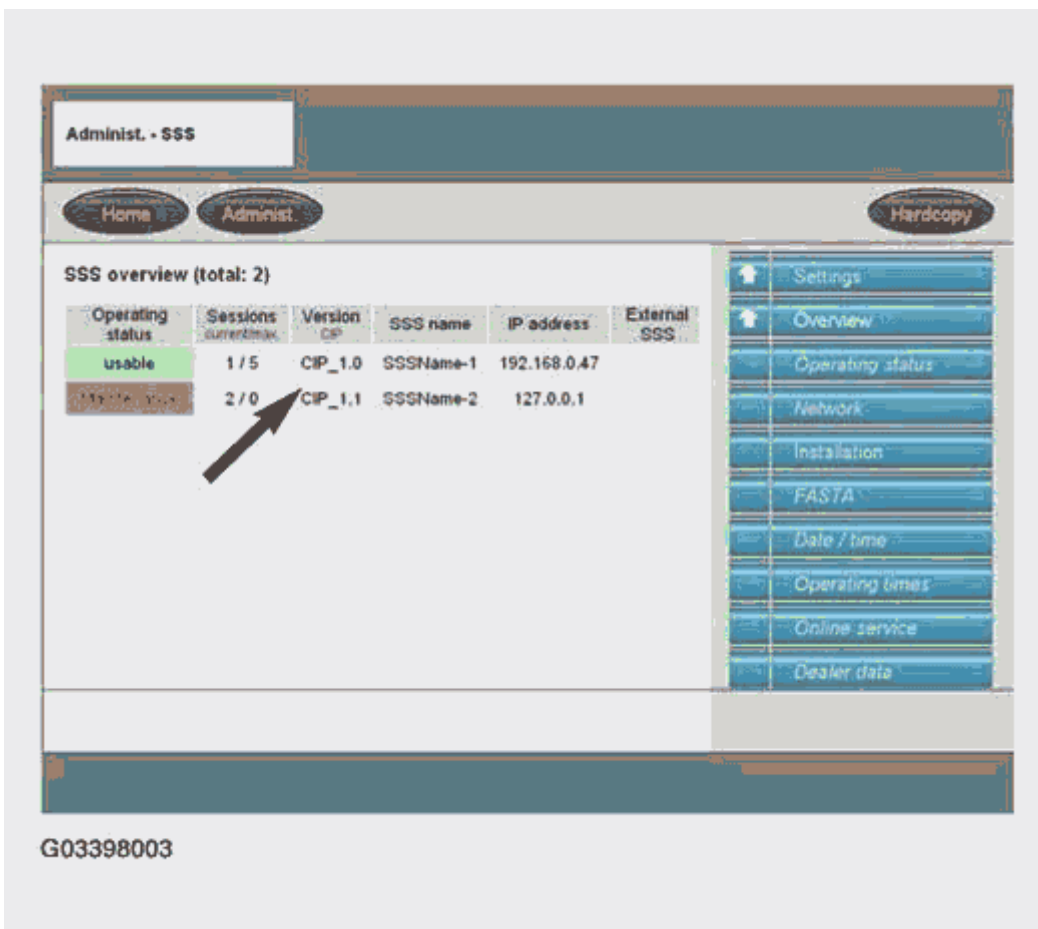
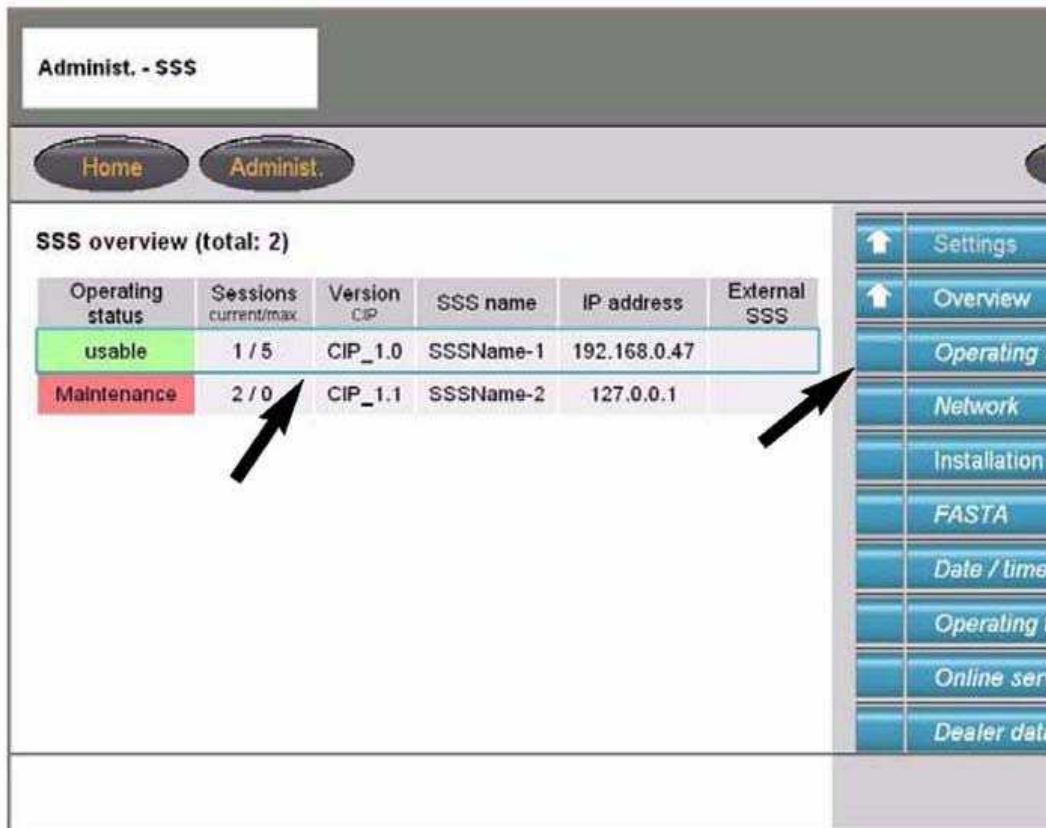


Fig. 149: Display SSS Overview Menu
Courtesy of BMW OF NORTH AMERICA, INC.

After selecting the specific SSS, select "Operating Status".



G03398004

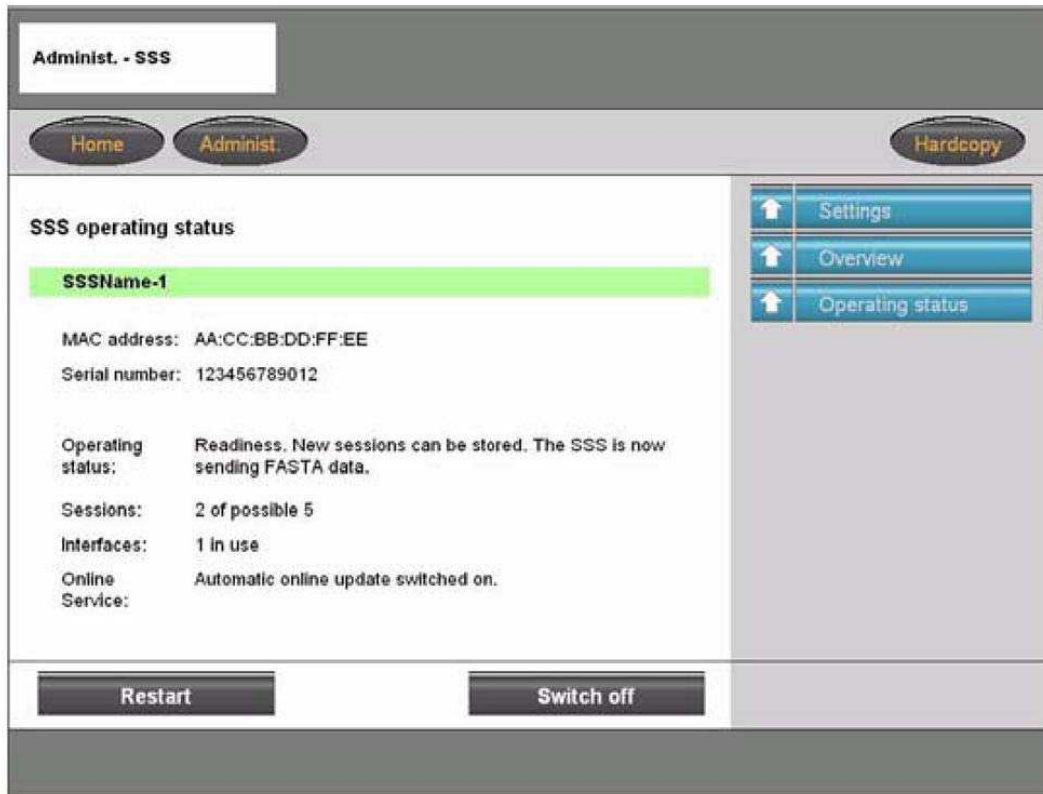
Fig. 150: Selecting Operating Status Button
 Courtesy of BMW OF NORTH AMERICA, INC.

This is the only location from which the SSS should be restarted or shutdown using the buttons at the bottom of the screen.

Selecting "Restart" will switch the SSS off and then back on.

Selecting "Switch off" will turn the SSS off.

NOTE: The on/off button located directly on the computer should not be used to turn OFF the SSS.



G03398005

Fig. 151: Display SSS Operating Status
 Courtesy of BMW OF NORTH AMERICA, INC.

Workshop Exercise - Access CIP & ZCS

1. Access CIP for an E60.
2. Access ZCS functions to obtain the central coding key on an E53 or Vehicle order on an E46.

CODING, INDIVIDUALIZATION & PROGRAMMING (CIP)

Model: All

Production: All

CODING, INDIVIDUALIZATION & PROGRAMMING

Introduction

With the introduction of the E65 in 2001, BMW not only introduced a vehicle loaded with the latest technology

but also introduced a new way of performing vehicle coding and programming. In order to code and program an E65, a software program commonly referred to as CIP was introduced. The acronym CIP stands for **C**oding, **I**ndividualization & **P**rogramming and with the introduction of Progran & CIP 15.0 it has become the sole software tool for coding and programming vehicles.

Initially CIP was developed for use on the E65/E66 and newer models but has since been expanded to include all vehicles produced prior to the introduction of the E65 that utilize a an SGC/UNIX programming structure.

The intention of the CIP program is to insure that whenever a module is updated or replaced it will still be compatible with all the other modules installed in the vehicle (equipped with a MOST bus). Since all of the communication between the various modules installed in a vehicle is over a bus network structure, it is very important that all of the installed modules be able to communicate with each other without problems.

To ensure compatibility/seamless integration between control modules, the CIP software reads out the part numbers of all the control modules installed in the vehicle as well as the software levels of the respective modules. The information from the various installed modules is then cross referenced against a "master reference list" to determine if a module(s) needs to be updated and how this update will effect the other installed modules. Once this cross reference process is started it can result in additional issues such as:

- If the software level in a selected module is updated will the hardware of the module still be able to function correctly.
- If the software to be installed is not going to be compatible with the installed hardware then the module will need to be replaced.
- If updated software is installed in the selected module will this have any impact on any other installed modules and will they need to have the software updated or will the hardware need to be updated in additional modules in order to install the revised software.

***Example:** A desktop computer originally built with a Pentium I, 75 Mhz processor using Windows 95 is not able to operate using Windows 2000. In order to operate with Windows 2000 this old desktop computer needs to be upgraded with new hardware. However, a desktop computer designed to operate with Windows 2000 can be updated to Windows XP without having to upgrade the hardware of the computer.*

All hardware devices that utilize software/programs to operate can only have the installed software updated a certain number of times before the operating capacity of the installed hardware is exceeded and no longer compatible, this results in the device no longer being able to function. In order for these devices to continue to operate the installed hardware/control modules will need to be updated, which is what happens in our vehicles or desktop computers over time.

Integration Levels

All new models produced as of the E65 have a minimum allowable software level, based on production date, which is referred to as an integration level or data status. The integration level defines the software level that all the control modules installed into a particular model, at time of production, must be at in order to ensure compatibility. Once an integration level for a specific production period is defined/"locked", the modules installed in those vehicles can not be updated beyond that level.

The Integration level or data status for vehicles equipped with a most bus is provided in the "Status report" or

"Measures plan" as shown below.

Vehicle data status: E060-04-09-503

Target data status: E060-04-09-55

If the vehicle data status and target data status are not the same, this indicates that some of the installed control modules need to be updated to bring the vehicle up to the latest level.

If the software levels were not locked it would be quite complex to track all software and hardware variations for all models through all production ranges. It would be extremely difficult to determine what software and hardware level is compatible with each module installed in a specific vehicle(s) and exactly what needs to be updated if one module is updated or replaced, therefore a limit or locked point must be define for specific production periods by model.

***Example:** MY2002 vehicles can not be programmed with software that is assigned to MY2003 vehicles since the defined integration level for each Model Year is different. Similarly Windows 2000 can not be installed & operated on a computer originally developed to run with Windows 95.*

Measures Plan

A measures plan is generated by CIP to identify what if any control modules need to be updated in order to bring a vehicle up to the latest integration level or data status. The measures plan also identifies the part number of the old/installed programmed control module and also what the new part number will be after the update is performed.

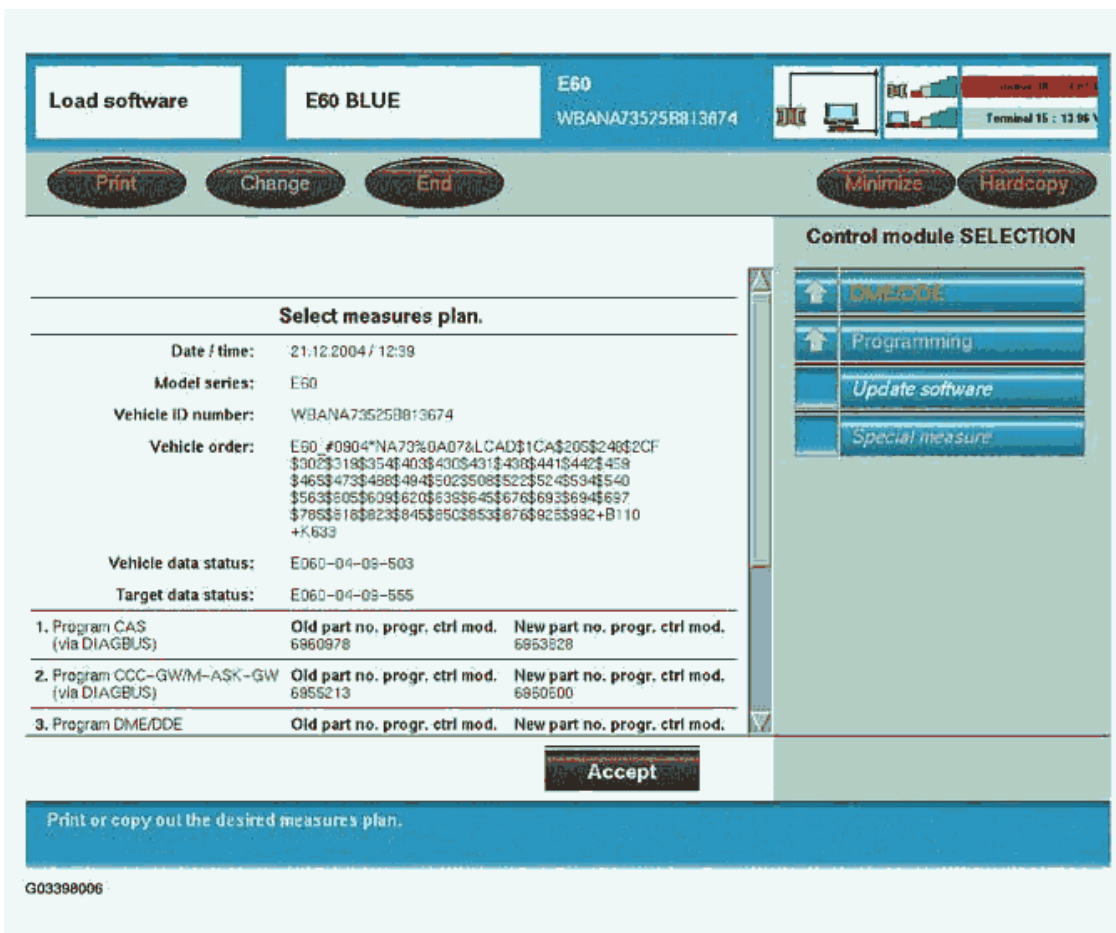


Fig. 152: Display Select Measures Plan Screen
 Courtesy of BMW OF NORTH AMERICA, INC.

By accepting the defined plan all modules that are listed will be updated "automatically".

IMPORTANT: Whenever a measures plan is defined it should always be printed out before proceeding in order to document the work performed, by attaching it to the repair order.

NOTE: An all inclusive status report or measures plan is only generated for vehicles equipped with a MOST-bus, to ensure compatibility. For all other vehicles a measures plan is generated only for the module selected to be updated (i.e. DME, TCU, EGS...) no evaluation of the other modules in the vehicle is made.

Initial CIP Screen



Fig. 153: Display Initial CIP Screen

Courtesy of BMW OF NORTH AMERICA, INC.

From the initial CIP screen select the model for which a coding or programming session is to be performed.

CIP Main Selection Screen

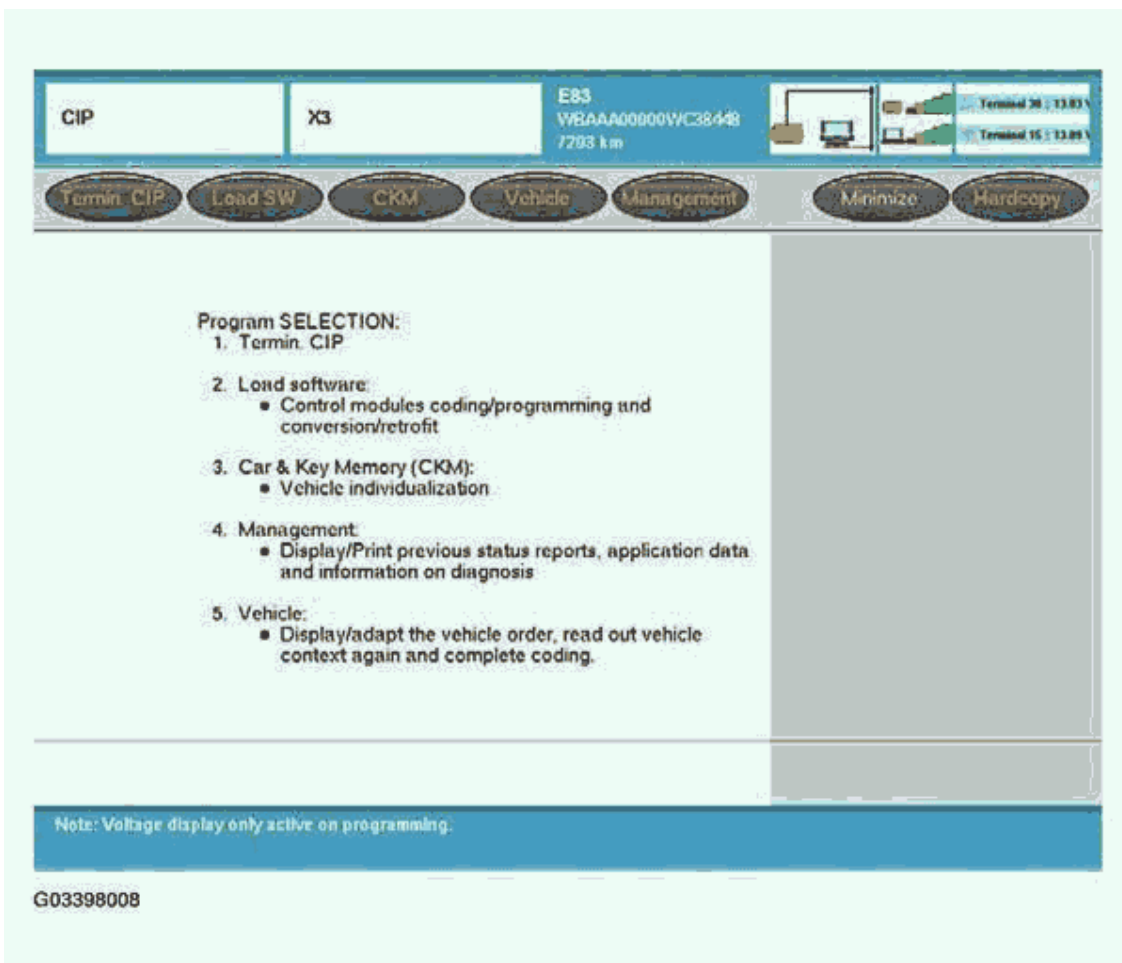


Fig. 154: Display CIP Main Selection Screen
 Courtesy of BMW OF NORTH AMERICA, INC.

Selection of CIP functions/options:

Termin. CIP - End the CIP program and return to Progman home screen

Load SW - Load software function to be selected if:

- Control module has been replaced
- Retrofit process is to be carried out
- Vehicle software is to be updated
- Coding/programming of one or more module(s) is to be performed

CKM - Vehicle and Key Memory/Individualization allows various driver selectable features (such as drive way locking, seat memory, central locking/unlocking, daytime running lights etc.) to be coded to the vehicle or individual keys.

Management - Provides the ability to:

- display the current version of CIP installed
- print previously performed Service Measure Reports
- run a test on the software currently installed on system (SSS)

Vehicle - Allows access to:

- Vehicle Order
- Initialization
- Service Functions
- Complete vehicle coding

Control Module Replacement Yes/No

Load software X3 E83 WBAAA00000WC44237 2871 km Terminal 30 : 13.71 V Terminal 15 : 13.83 V

Print Change End Minimize Hardcopy

Have control modules been replaced on this car?
 Note: For retrofits press *No*.

Yes No

G03398009

Fig. 155: Display Control Module Replacement Menu
 Courtesy of BMW OF NORTH AMERICA, INC.

At this screen information is needed to determine which path is to be followed.

Answer "Yes" if:

- A previously installed control module has been replaced.

Answer "No" if :

- No control module(s) has been replaced but an update on one or more modules needs to be performed.
- A retrofit needs to be performed on the vehicle (such as installation of CD player, ULF, phone cradle installation, activation of bluetooth, etc...).
- A control module for a new system/accessory is installed as part of a retrofit installation.

CIP FUNCTIONS - IF NO (NON MOST-BUS VEHICLES WITH VO)

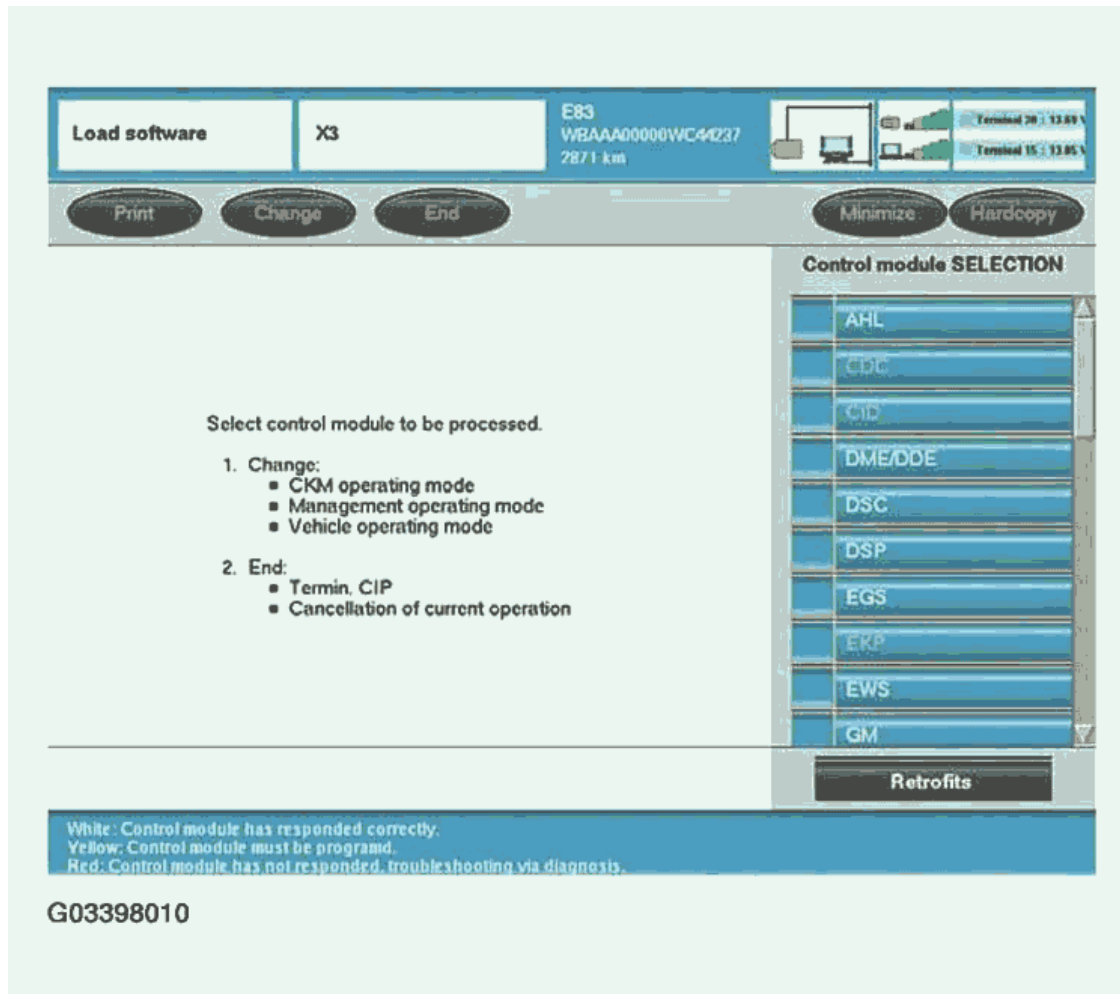


Fig. 156: Display Select Control Module Menu
 Courtesy of BMW OF NORTH AMERICA, INC.

Select the module to be reprogrammed

Or

Select "**Retrofits**" if an accessory function/feature is to be added or deleted.

Example: DME/DDE was selected on previous screen.

Programming is selected if:

- Checking for availability of updated software for selected control module.
- It is known that updated software is available for the selected control module. Replacement is selected if a module was replaced.

EWS is selected if:

- Alignment of EWS & DME must be performed

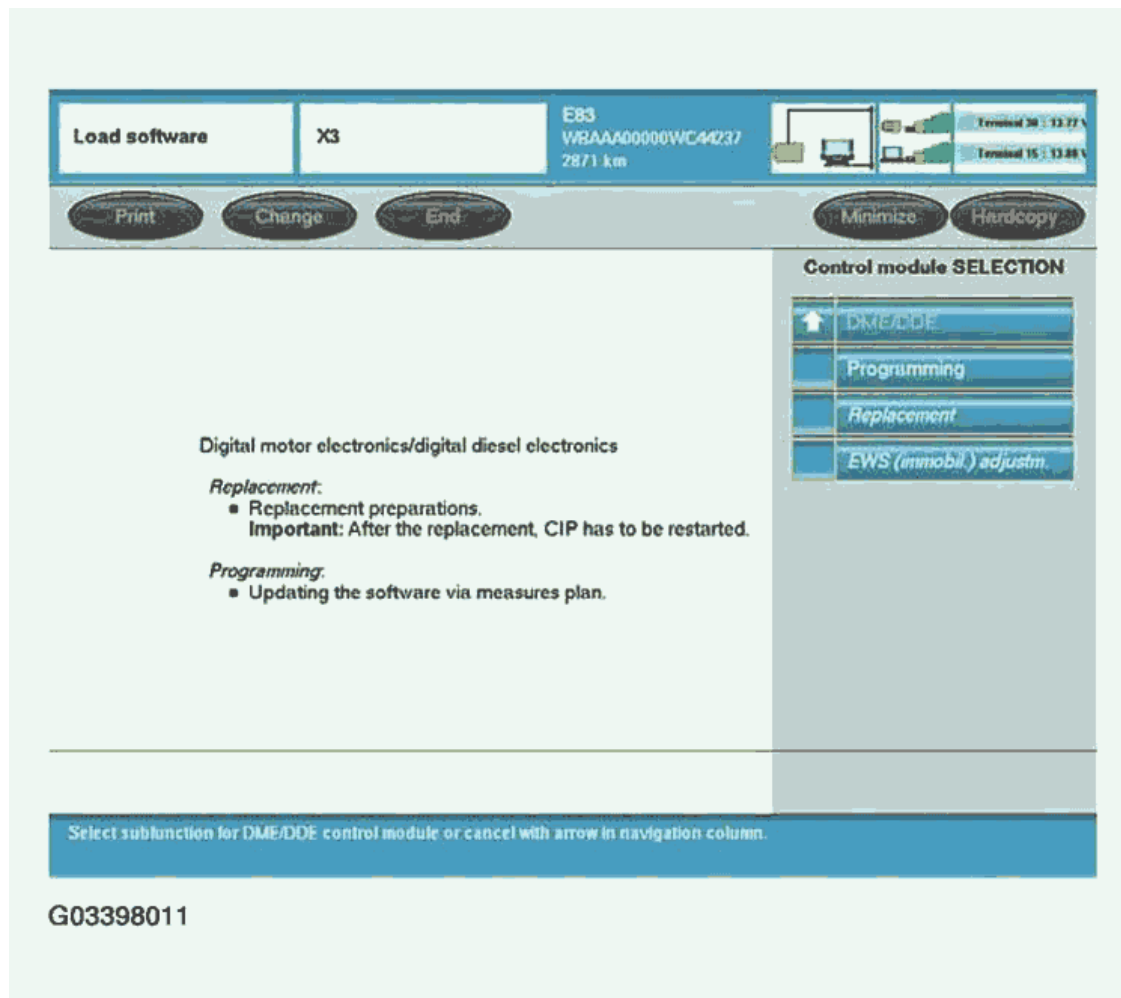


Fig. 157: Selecting Programming Button
Courtesy of BMW OF NORTH AMERICA, INC.

Example: Programming was selected on previous Screen.

Upon selecting "**Update software**" a measures plan will be generated that is specific to the module selected.

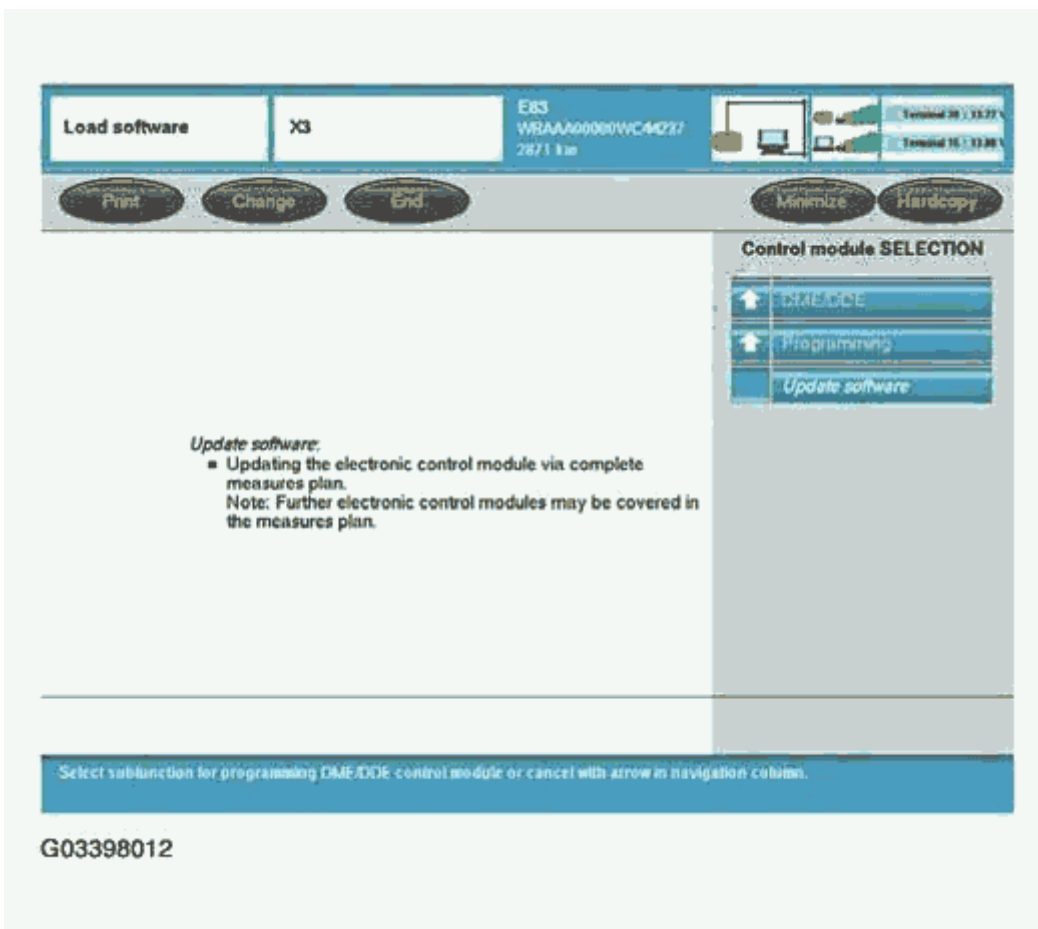


Fig. 158: Selecting Update Software

Courtesy of BMW OF NORTH AMERICA, INC.

A measures plan for the selected system/module is displayed.

A measures plan identifies the programmed part number for the control module(s) installed:

- "Old part no. progr. ctrl. mod." - indicates p/n for software currently installed.
- "New part no. progr. ctrl. mod." - indicates the p/n if the module is updated, by accepting the displayed measures plan the module will be updated to the new number and software.

NOTE: **The "update" does not need to be performed if the two part numbers are the same.**



G03398013

Fig. 159: Display Select Measures Plan Screen
 Courtesy of BMW OF NORTH AMERICA, INC.

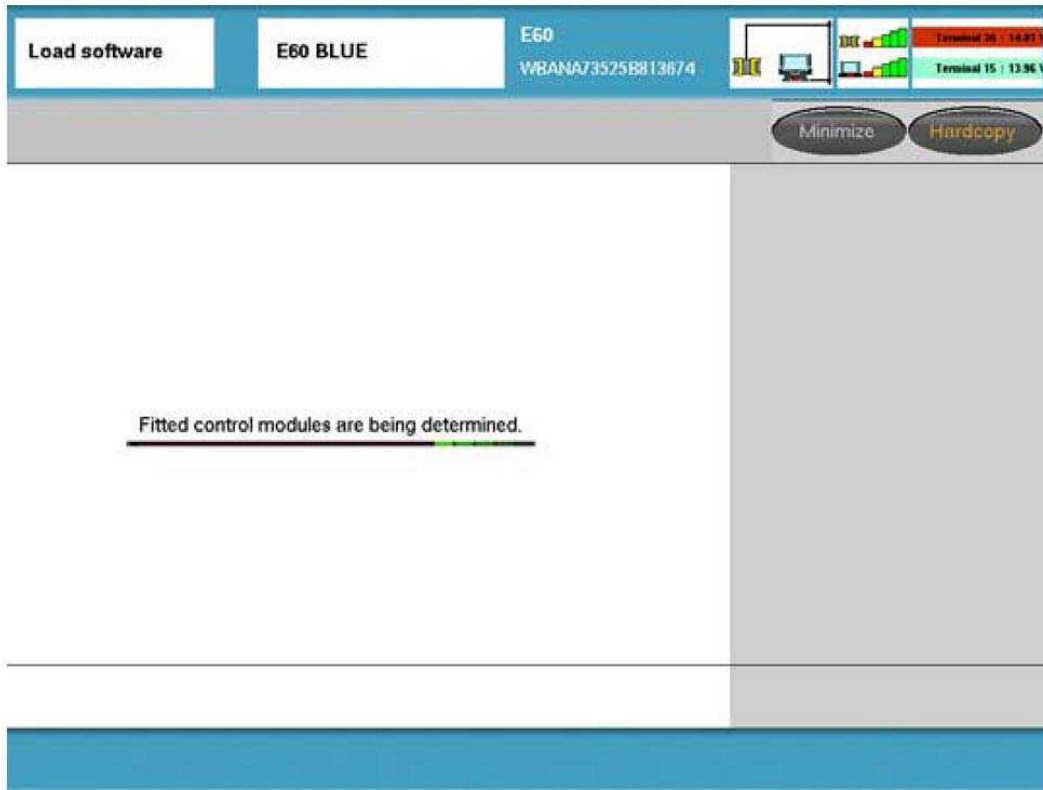
On vehicles without a MOST-Bus, a "Measures plan" provides information on updates that are available for the selected control module. By selecting accept, only the module listed in the measures plan will be updated.

NOTE: Prior to selecting accept, printout a copy of the measures plan and attach it to the repair order to document the work performed.

IMPORTANT: If the measures plan identifies any control modules that will need to be replaced exit CIP.

CIP FUNCTIONS - IF NO (MOST-BUS VEHICLES)

After selecting "No" CIP evaluates the installed control modules to determine if any updates are required.



G03398014

Fig. 160: Display Fitted Control Module Determined
Courtesy of BMW OF NORTH AMERICA, INC.

Once the evaluation is completed and CIP determines that there are updates available a "Status report" is generated.

NOTE: Status report is similar to a measures plan.

The status report identifies the control modules for which an update is available and also indicates if the module will need to be reprogrammed or replaced.

Information is also provided indicating the current programmed part number and also what the number should be after an update is performed.

Load software E60 BLUE E60
WBANA73525B813674

Print Change End Minimize Hardcopy

Status report

Date / time: 21.12.2004 / 12:05
 Model series: E60
 Vehicle ID number: WBANA73525B813674
 Vehicle data status: E060-04-09-503
 Target data status: E060-04-09-555

Following ctrl mod.s have failed to respond or have responded incorr..

CAS	must be reprogrammed	Part no., progr. ctrl mod.: 6950978 (is) 6963828 (should)
CCC-GWM-ASK-GW	must be reprogrammed	Part no., progr. ctrl mod.: 6955213 (is) 6960600 (should)
DME/DDE	must be reprogrammed	Part no., progr. ctrl mod.: 7549080 (is) 7550067 (should)
KBM/SMBF/SMFA	must be reprogrammed	Part no., progr. ctrl mod.: 6957526 (is)

Start Update Cancel Update

G03398015

Fig. 161: Display Status Report

Courtesy of BMW OF NORTH AMERICA, INC.

If "Cancel update" is selected or if CIP determines that there are no updates needed or available for the vehicle then the "Control module selection" screen is displayed.

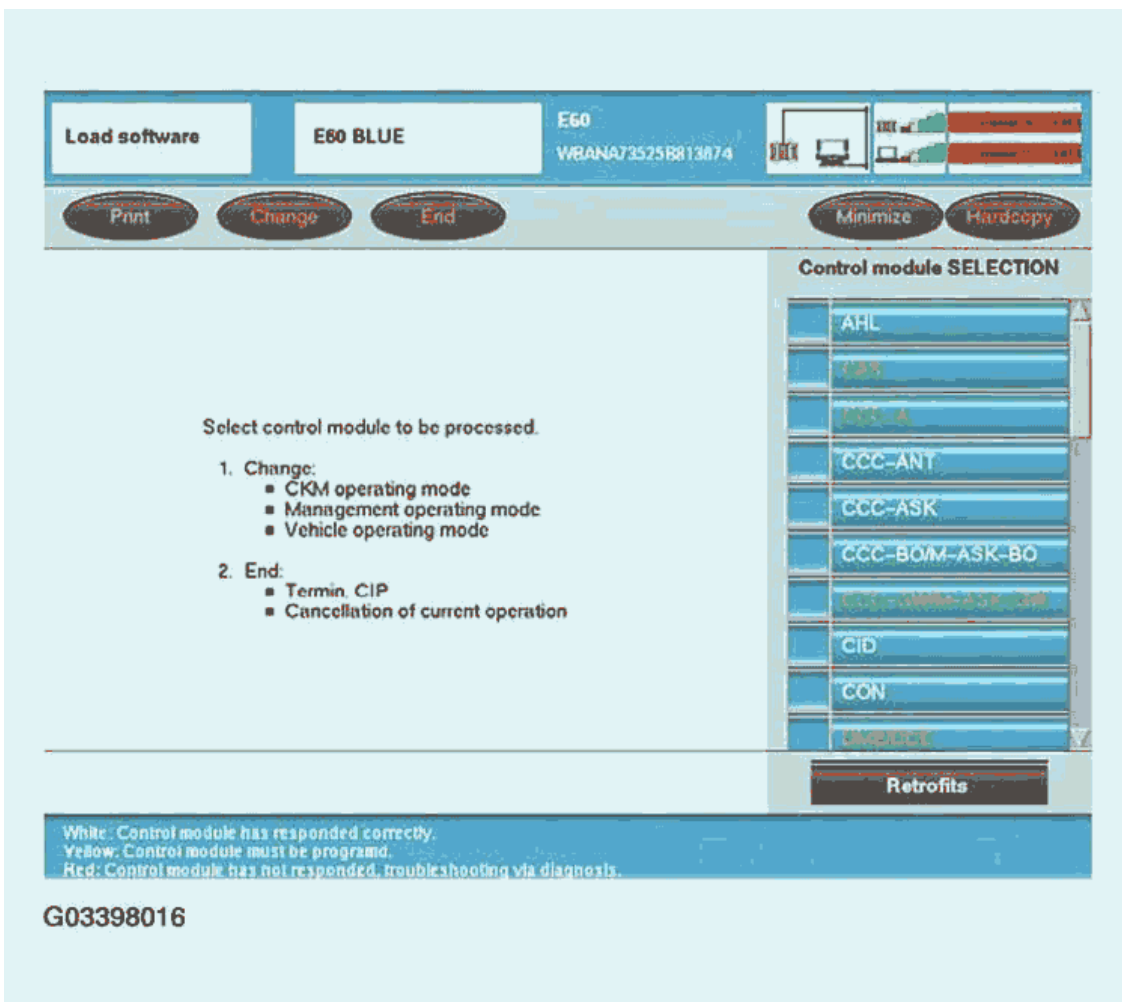


Fig. 162: Display Control Module Selection Screen (1 Of 2)
 Courtesy of BMW OF NORTH AMERICA, INC.

CONTROL MODULE SELECTION - PROGRAMMING - UPDATE SOFTWARE

From the "Control module selection" screen specific control modules can be selected for reprogramming.

Or

Select "**Retrofits**" if an accessory function/feature is to be added or deleted

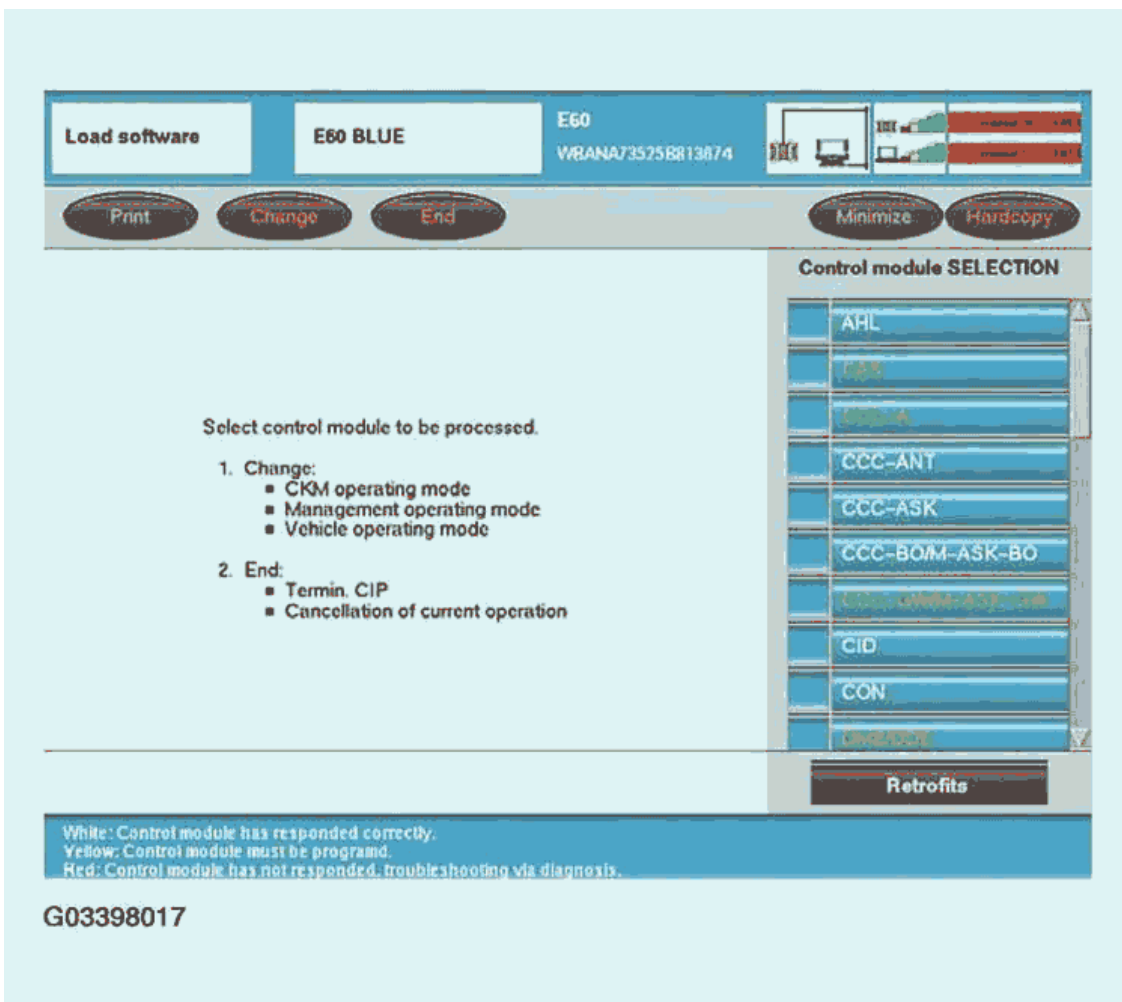
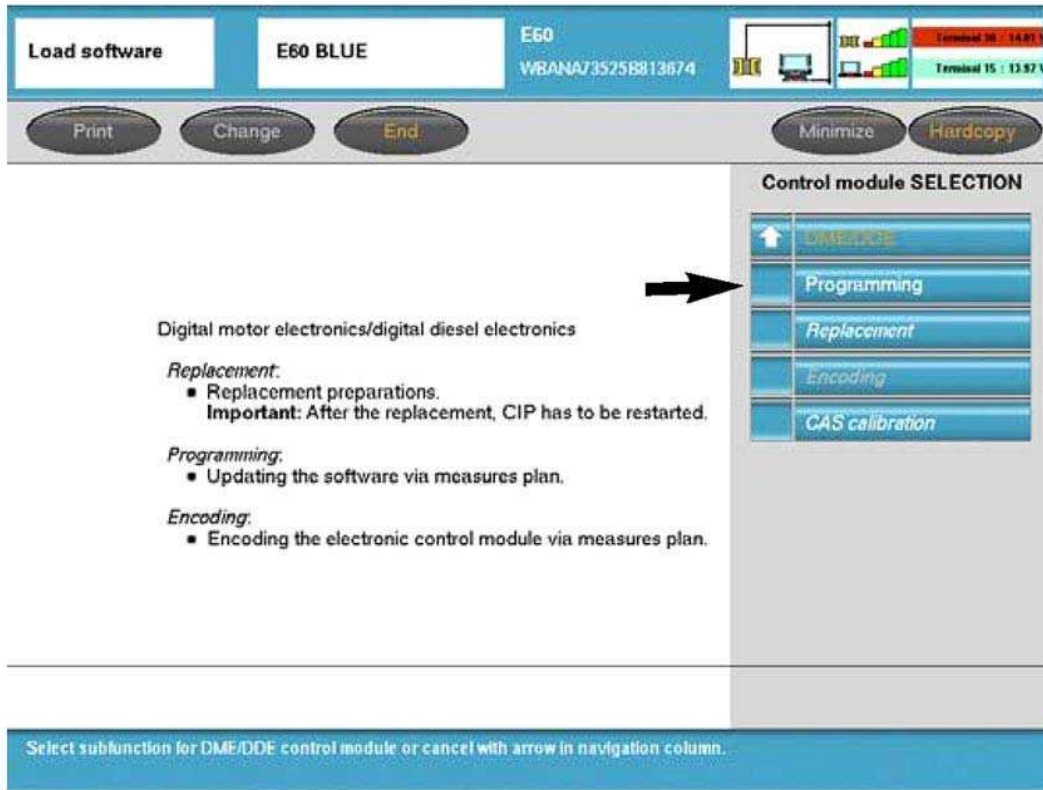


Fig. 163: Display Control Module Selection Screen (2 Of 2)
 Courtesy of BMW OF NORTH AMERICA, INC.

Example: DME DDE is selected on the previous screen.

By selecting "**Programming**" the software of the selected module can be updated or a measures plan for all installed modules can be obtained and updated.



G03398018

Fig. 164: Selecting Programming Button
Courtesy of BMW OF NORTH AMERICA, INC.

By selecting "Update Software" a measures plan will be generated that will indicate what updates if any are available not only for the DME but for all modules installed in the vehicle.

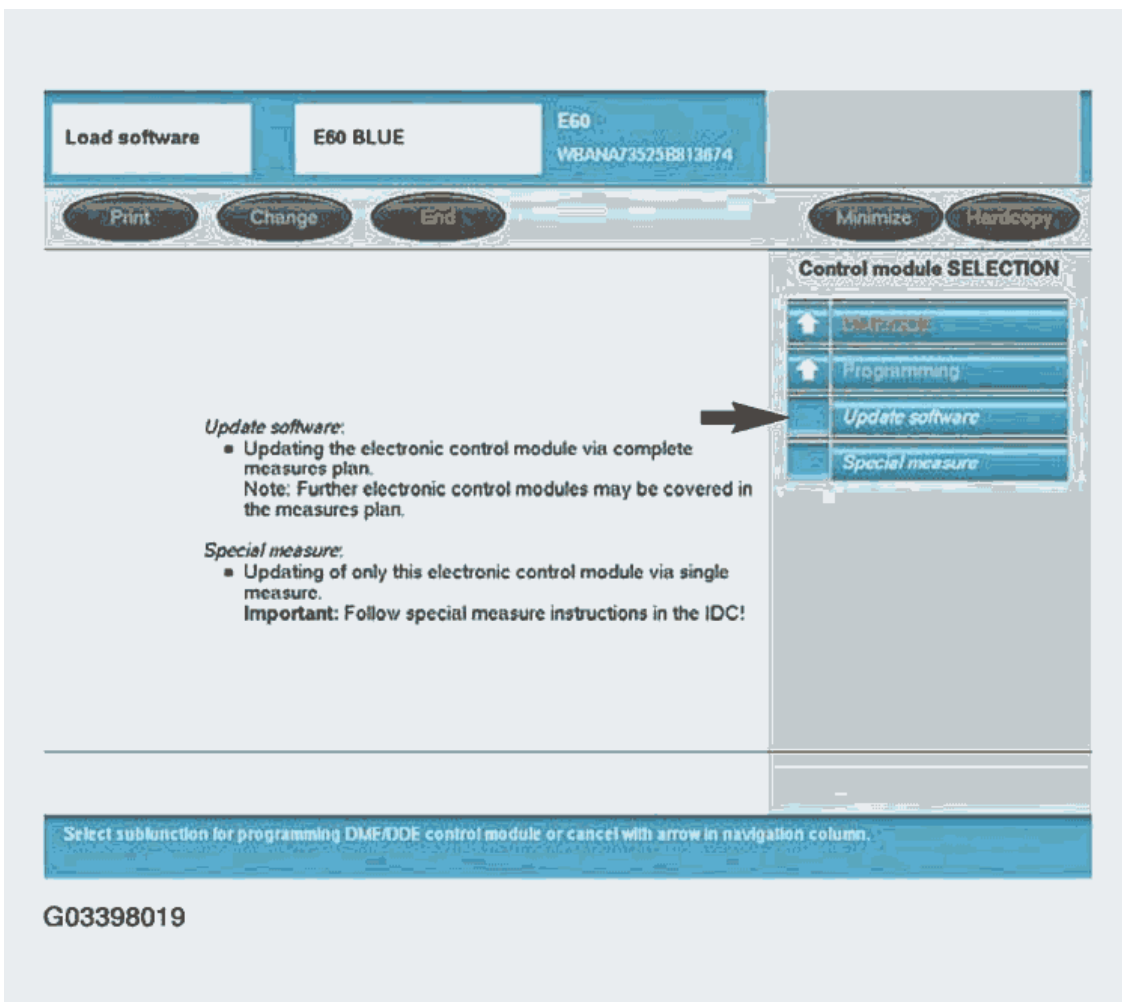


Fig. 165: Selecting Update Software Button

Courtesy of BMW OF NORTH AMERICA, INC.

A "Measures plan" provides information on updates that are available for all installed control modules. By selecting accept, all modules listed in the measures plan will be updated.

NOTE: Prior to selecting accept printout a copy of the measures plan and attach it to the repair order to document the work performed.

IMPORTANT: If the measures plan identifies any control modules that will need to be replaced exit CIP.

Load software

E60 BLUE

E60
WBANA73525B813674

Print

Change

End

Minimize

Hardcopy

Select measures plan.

Date / time: 21.12.2004 / 12:39

Model series: E60

Vehicle ID number: WBANA73525B813674

Vehicle order: E60 #0904*NA7350A07&LCAD\$1CA\$205\$240\$2CF
\$302\$310\$354\$403\$430\$431\$438\$441\$442\$459
\$465\$473\$488\$494\$502\$508\$522\$524\$534\$540
\$563\$605\$609\$620\$635\$645\$676\$693\$694\$697
\$705\$810\$823\$846\$850\$853\$876\$925\$982+B110
+K633

Vehicle data status: E060-04-09-503

Target data status: E060-04-09-555

1. Program CAS (via DIAGBUS)	Old part no. progr. ctrl mod. 6960978	New part no. progr. ctrl mod. 6963828
2. Program CCC-GWM-ASK-GW (via DIAGBUS)	Old part no. progr. ctrl mod. 6955213	New part no. progr. ctrl mod. 6960600
3. Program DME/DDE	Old part no. progr. ctrl mod.	New part no. progr. ctrl mod.

Accept

Control module SELECTION

↑

Special measures

↑

Programming

↑

Update software

↑

Program CAS

Print or copy out the desired measures plan.

G03398020

Fig. 166: Display Select Measures Plan Table
 Courtesy of BMW OF NORTH AMERICA, INC.

Control Module Selection-Programming-Special Measures

IMPORTANT: The "Special Measures" function is only to be used in the event that a control module(s) can not be programmed during the "Update Software" process that is executed as a result of a developed "Measures plan"/"Status report" or specific instructions are given in a Service Information Bulletin which require the use of special measures to update a module.

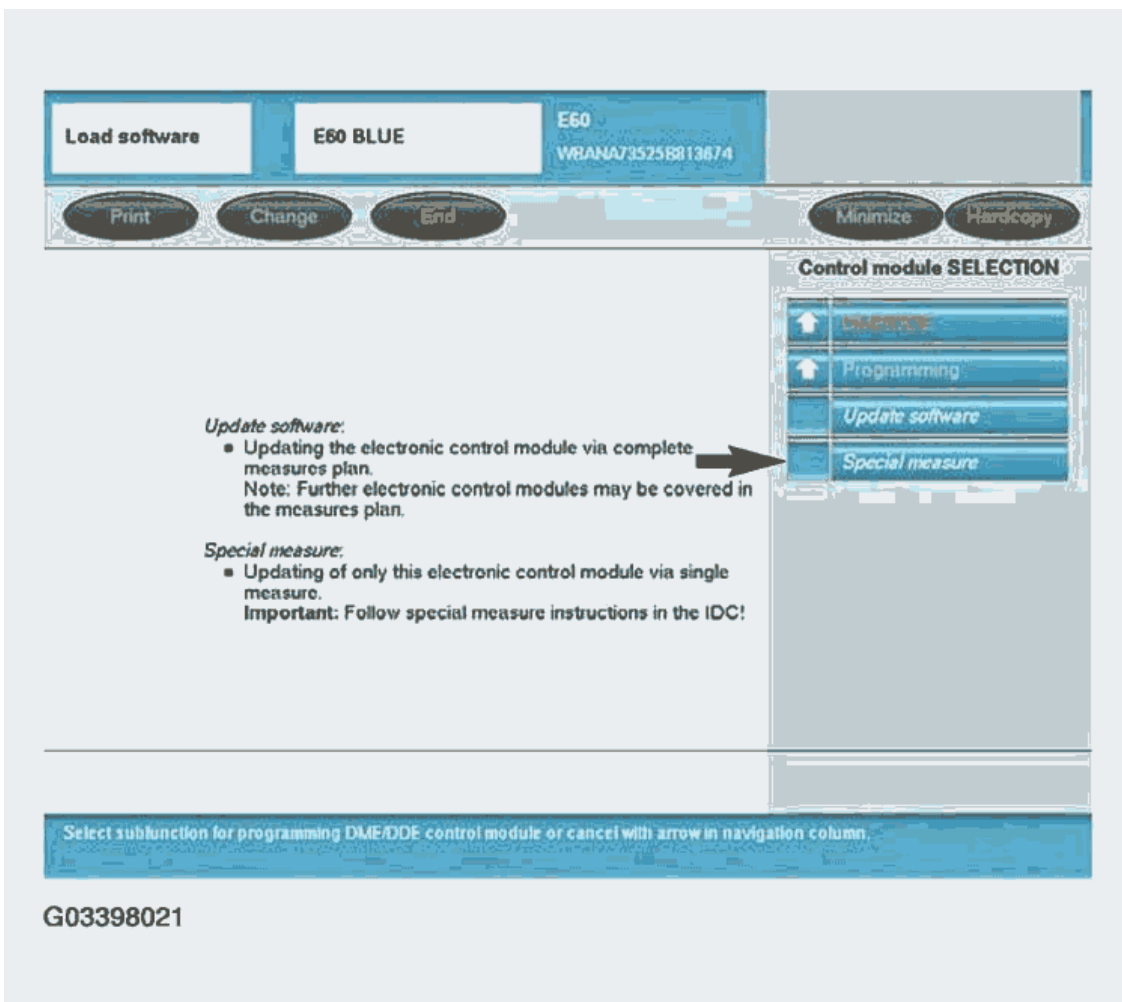
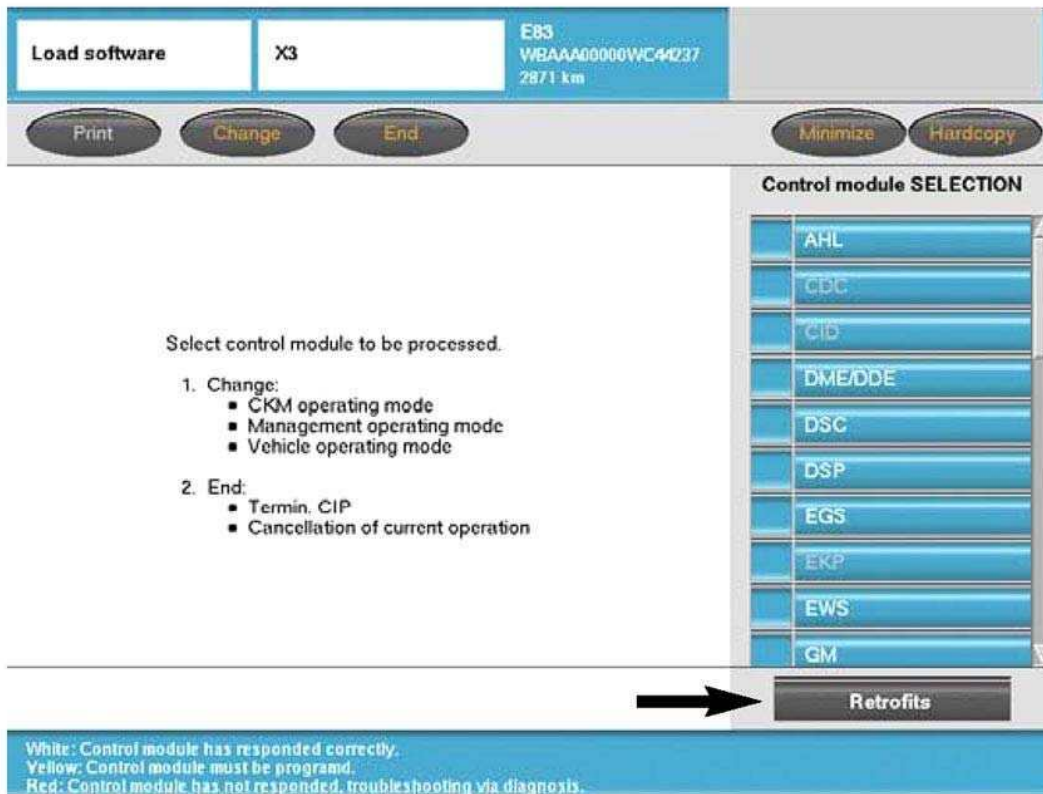


Fig. 167: Selecting Special Measure Button
Courtesy of BMW OF NORTH AMERICA, INC.

In the event that a control module(s) can not be programmed successfully the information will appear next to the specific module(s) in the final report, which is generated upon completion of an update or "Measures plan".

Retrofits

Select "**Retrofits**" to view a list of functions/features that can be modified or installed.



G03398022

Fig. 168: Selecting Retrofits Button

Courtesy of BMW OF NORTH AMERICA, INC.

The initial screen displays information pertaining to:

- Airbag activation/deactivation
- Telematics On/Off
- Language (setting control display/monitor language)
- Maintenance interval - reset/checking
- USA-Canada conversion
- Retrofits - listing accessories installed or available for installation.

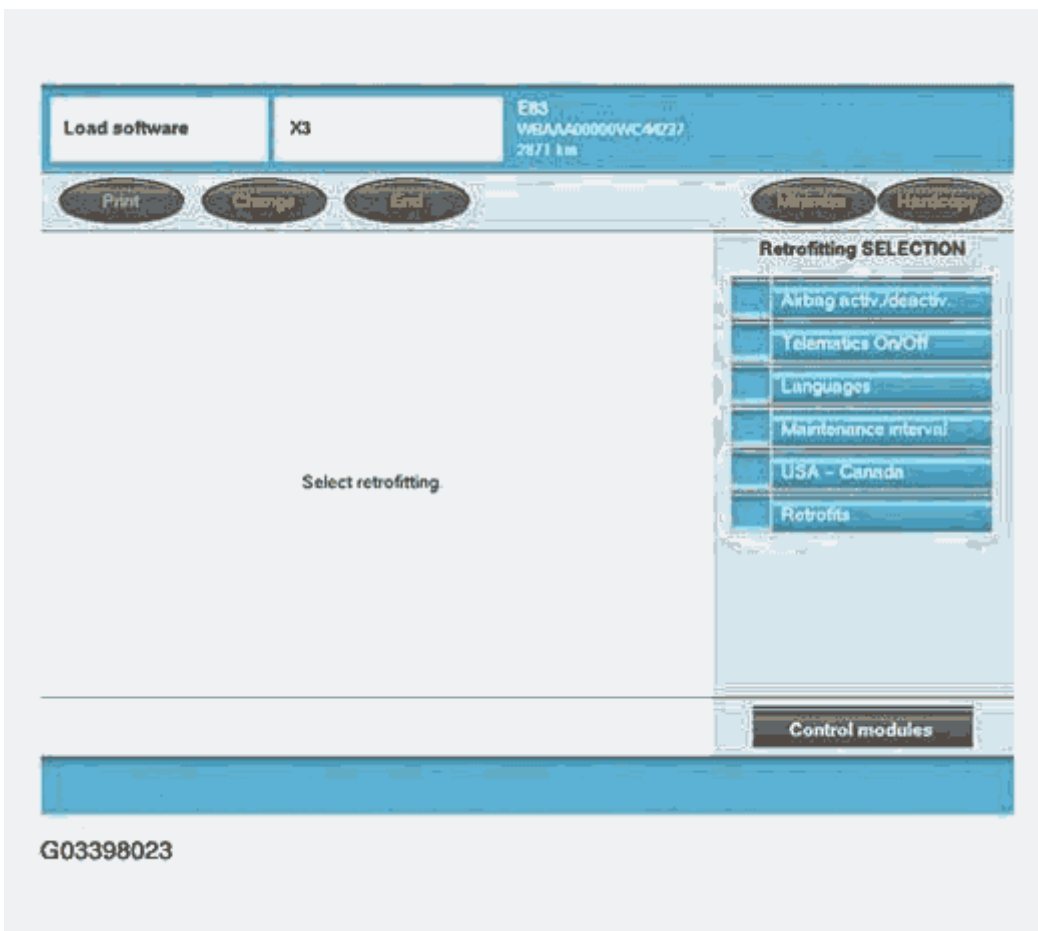
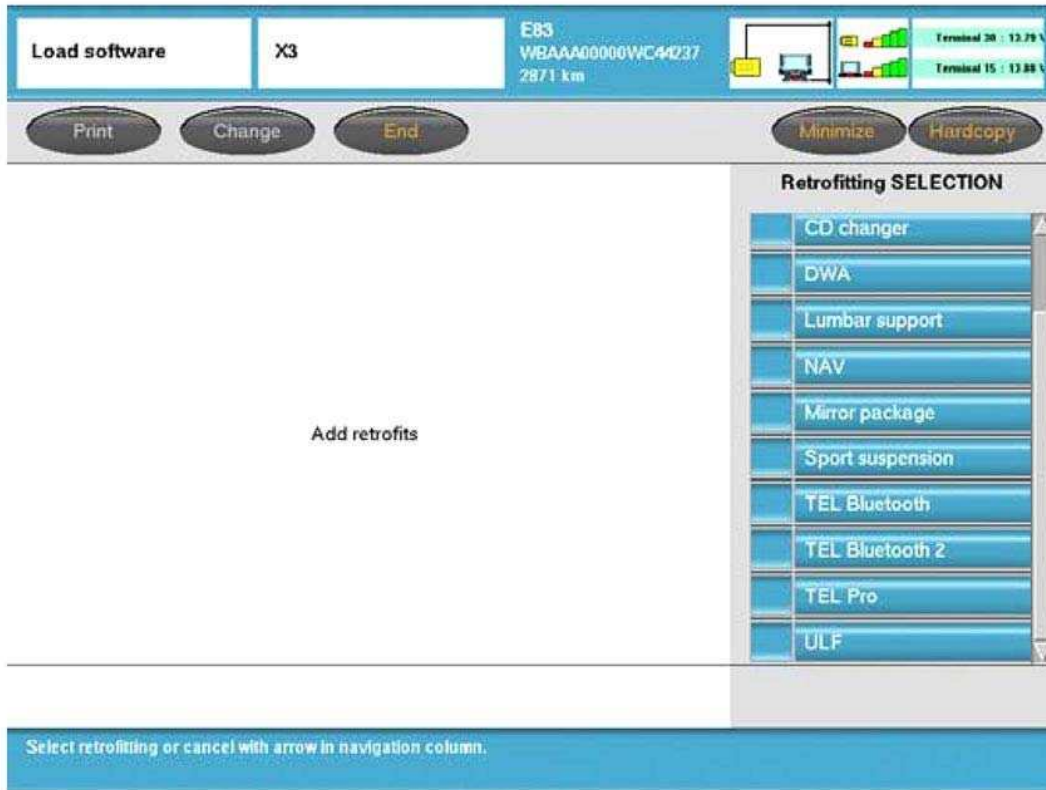


Fig. 169: Display Retrofitting Selection Screen
Courtesy of BMW OF NORTH AMERICA, INC.

By selecting "**Retrofits**" on the previous screen a list of accessory systems available for installation is obtained.

NOTE: **Some of the items listed may not be available as retrofits for US vehicles.**



G03398024

Fig. 170: Display Add Retrofits
Courtesy of BMW OF NORTH AMERICA, INC.

Example: ULF was selected on previous screen.

If this system/module is installed the vehicle order will be modified to reflect the addition of this module/accessory to the vehicle by selecting "**Continue**".

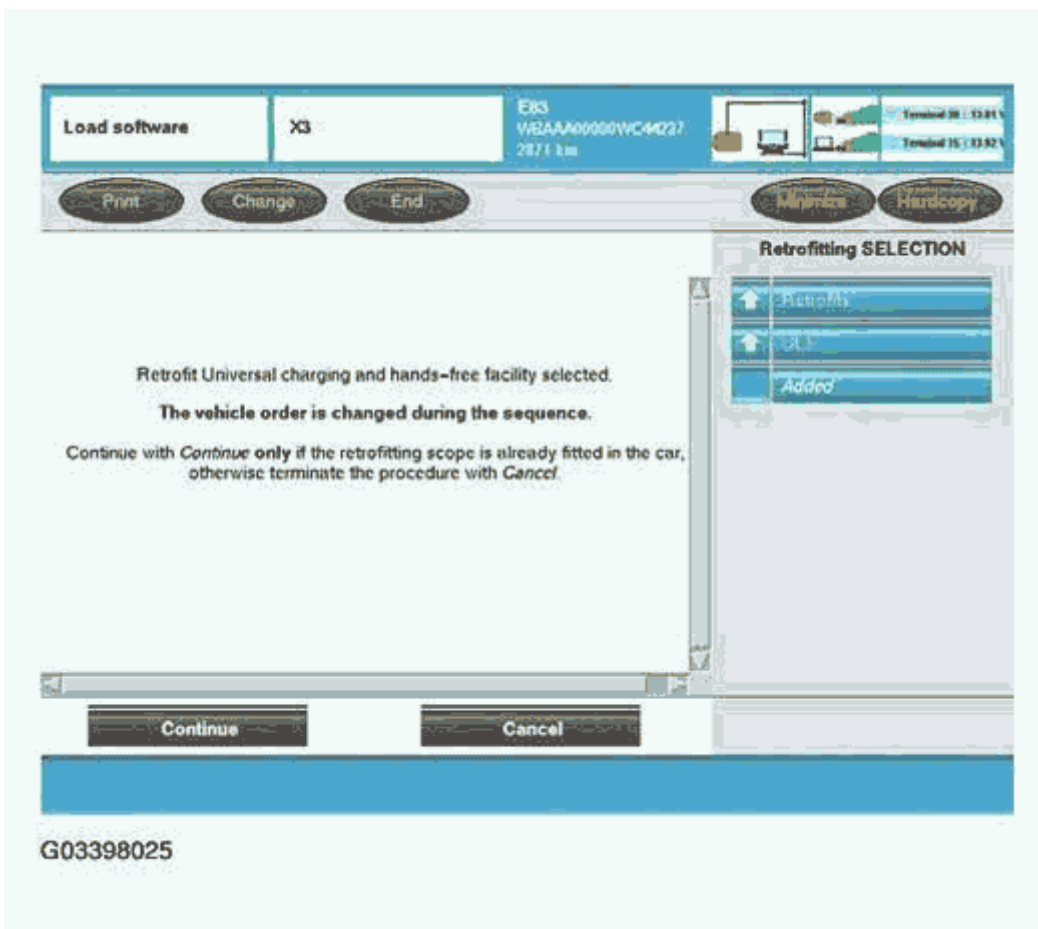


Fig. 171: Selecting Continue Button

Courtesy of BMW OF NORTH AMERICA, INC.

MANAGEMENT

"Management" can be selected from the main/initial CIP screen.



Fig. 172: Selecting "Management" From Main/Initial CIP Screen (1 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

Or

"Management" can be selected from the Main CIP Selection screen.

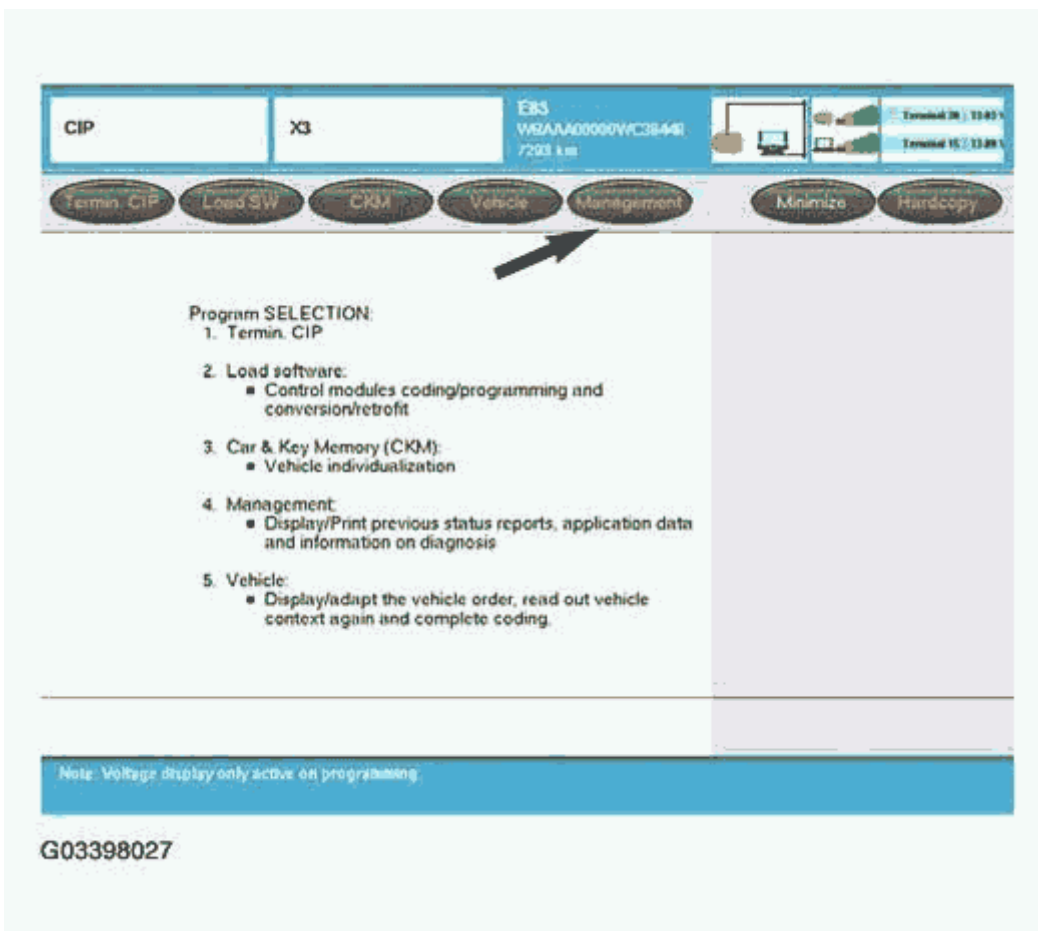


Fig. 173: Selecting "Management" From Main/Initial CIP Screen (2 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

By selecting "Management" the following functions can be accessed:

- Print previously performed Service Measure reports
- Display the current version of CIP installed
- Run a test on the software currently installed on the system (SSS)

Management - Reports

To access the most recently generated measures plans select "**Reports**".

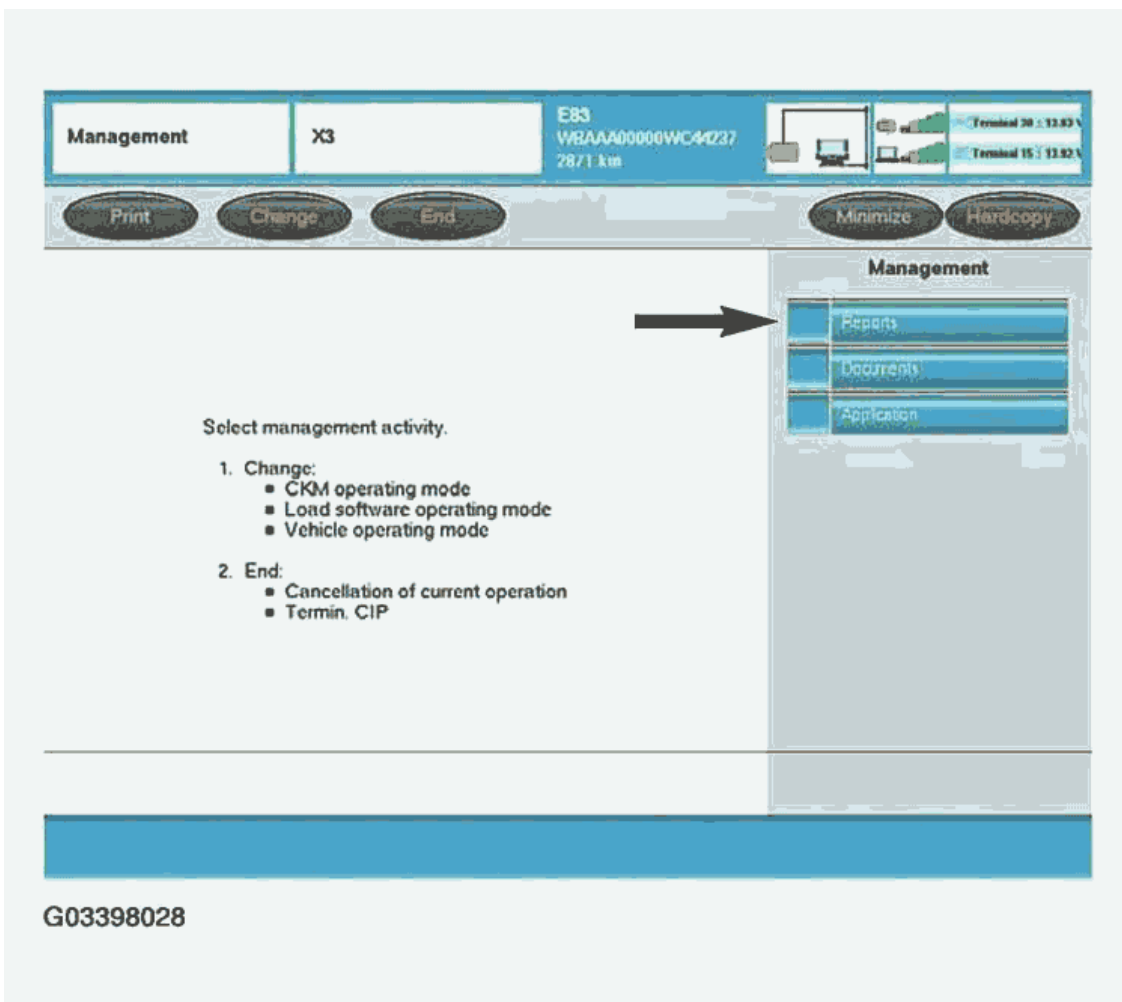


Fig. 174: Selecting Reports Button

Courtesy of BMW OF NORTH AMERICA, INC.

The 16 most recently generated measures plans can be accessed/viewed.

NOTE: The reports are not specific to the vehicle currently connected but are a cumulative listing of vehicles recently connected/accessed using CIP via a specific SSS.

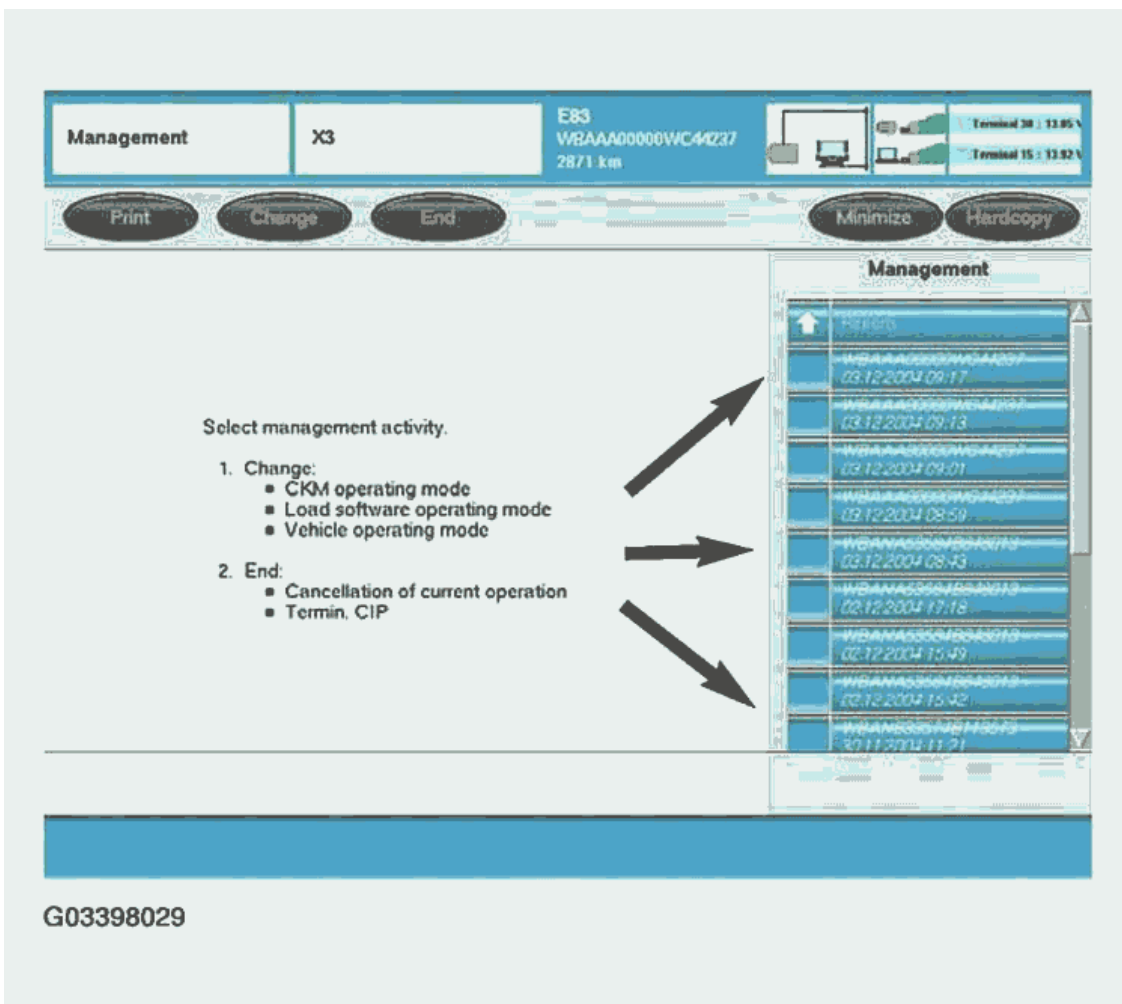


Fig. 175: Display Management Screen
 Courtesy of BMW OF NORTH AMERICA, INC.

Management - Application - Test & Version

The "Application" function provides the ability to:

- Run a system test
- Determine information regarding the version of CIP currently installed

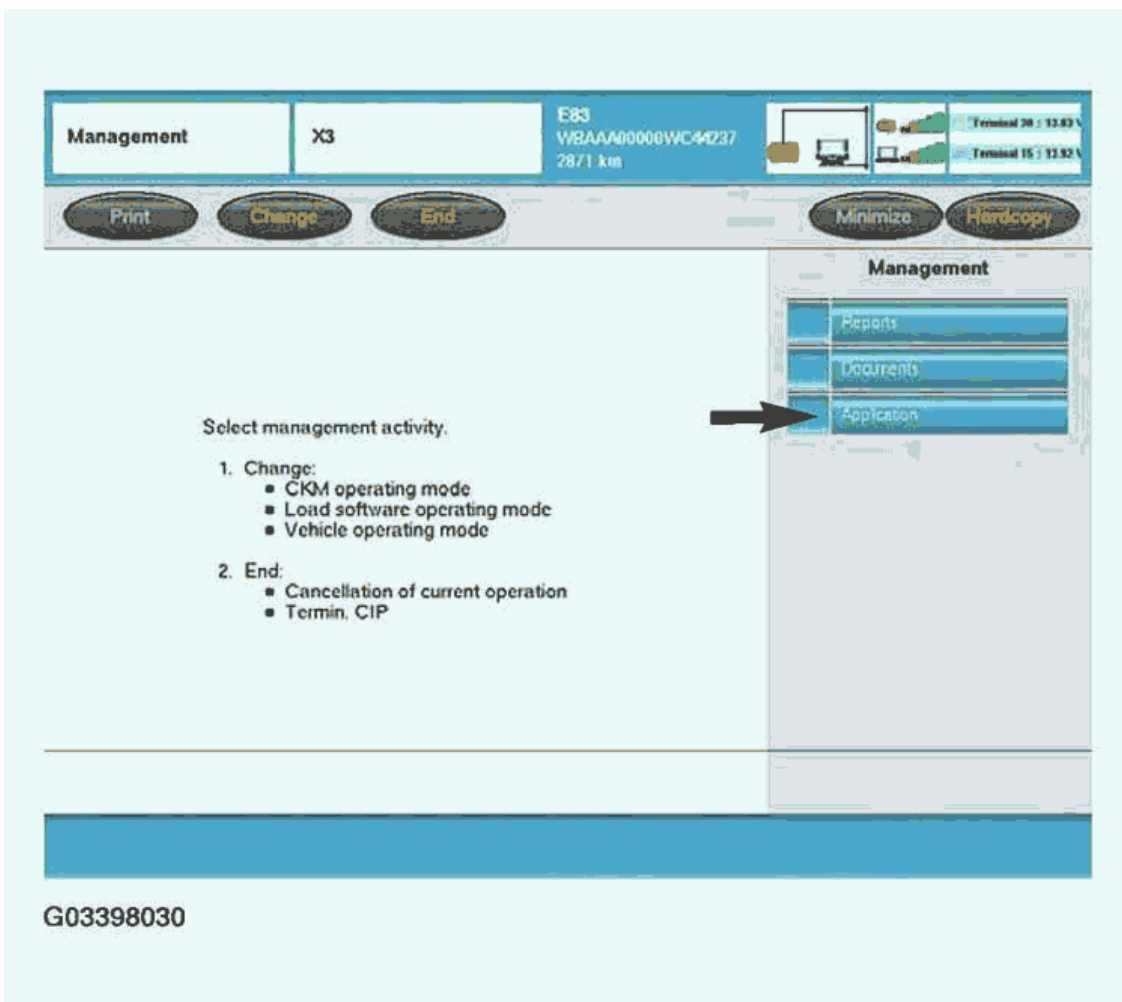


Fig. 176: Selecting Application Button
Courtesy of BMW OF NORTH AMERICA, INC.

Select "Test" if system files are to be checked.

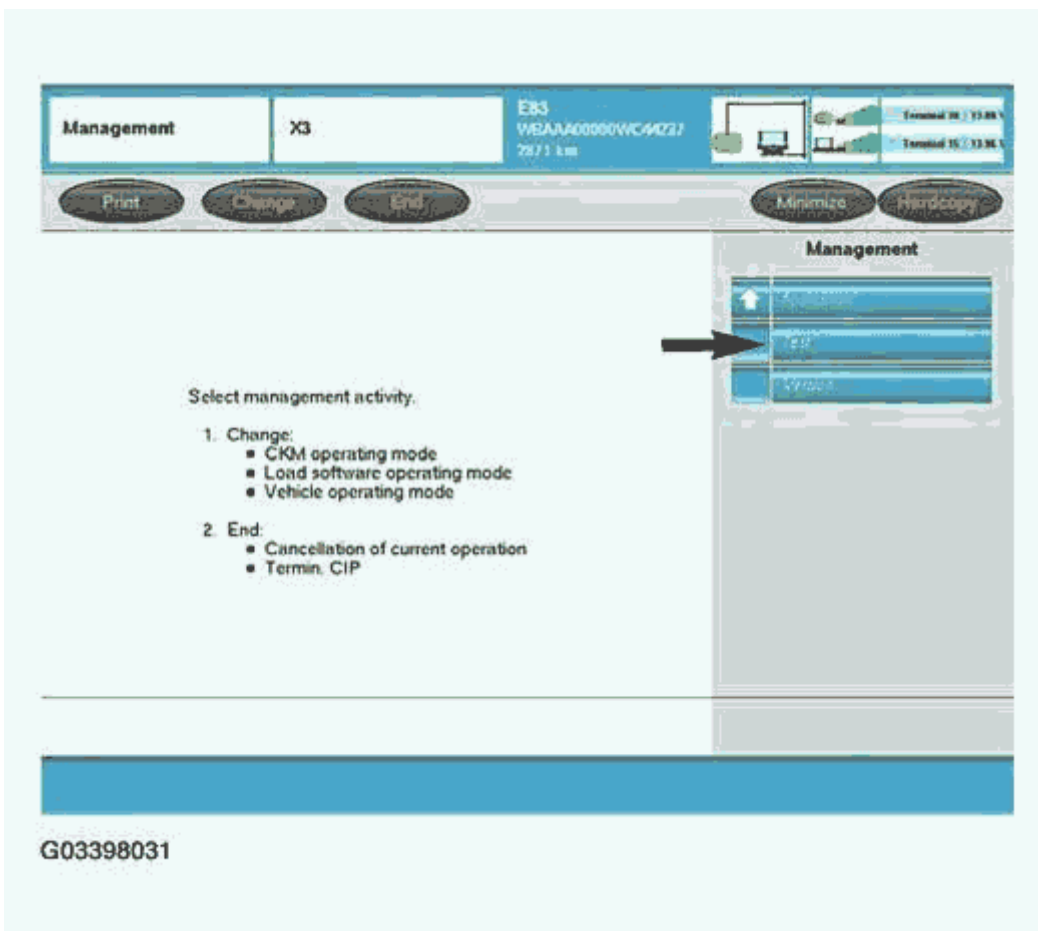


Fig. 177: Selecting Test Button

Courtesy of BMW OF NORTH AMERICA, INC.

By selecting the "Start" button a brief test of the system files will be performed.

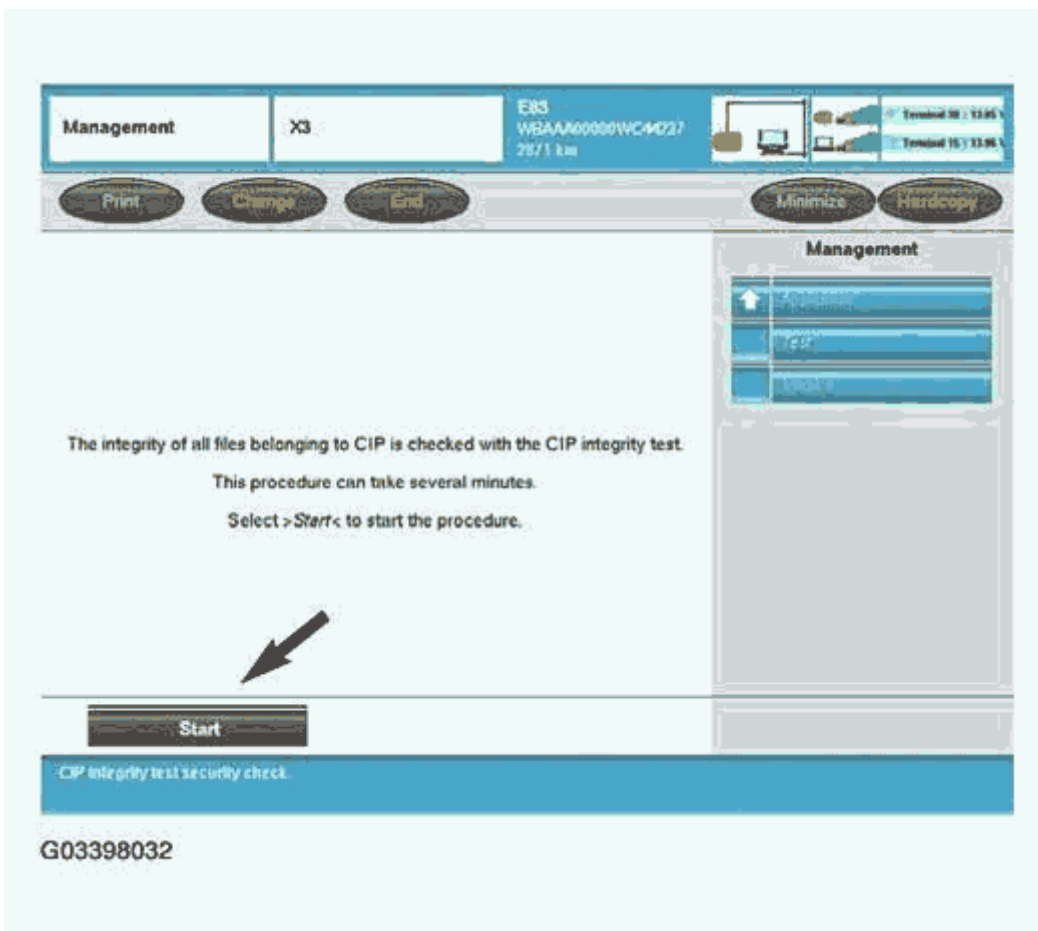


Fig. 178: Selecting Start Button

Courtesy of BMW OF NORTH AMERICA, INC.

By selecting "Version" installed application information will be displayed.

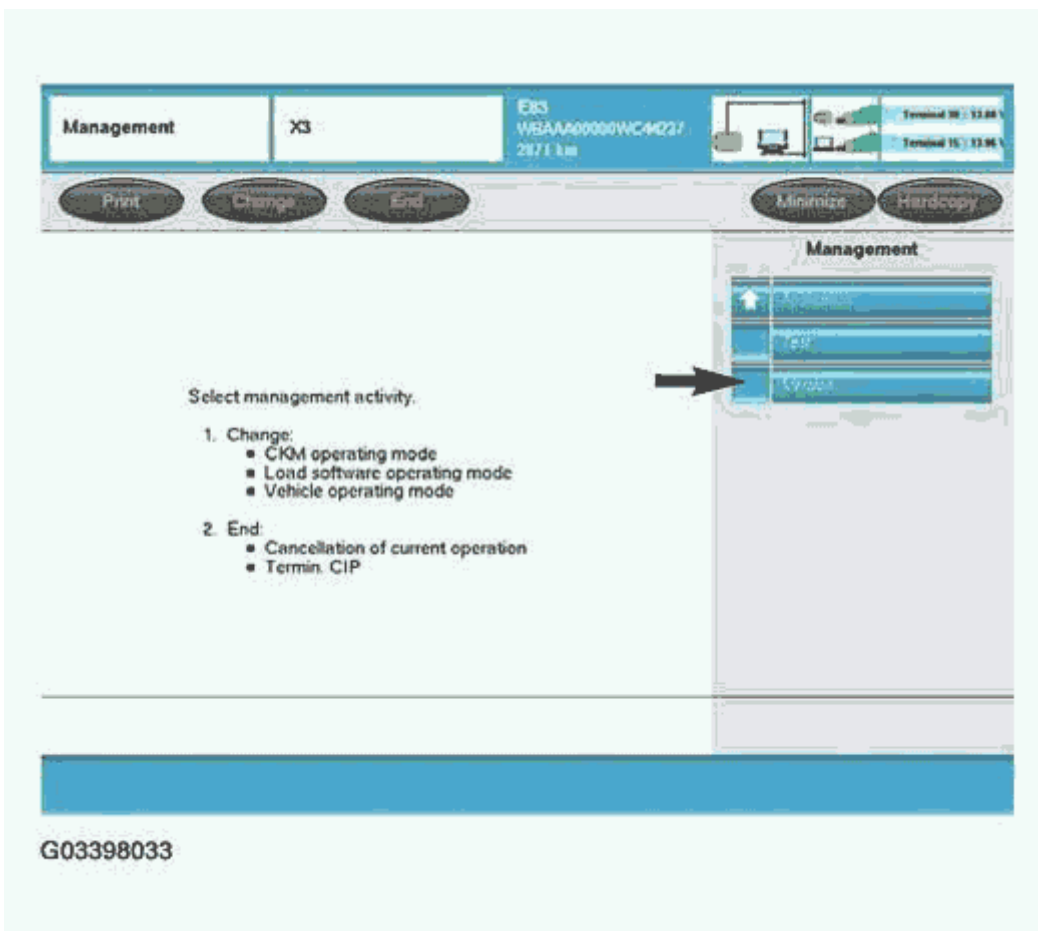


Fig. 179: Selecting Version Button

Courtesy of BMW OF NORTH AMERICA, INC.

A list of the various files/applications installed as well as their software levels is displayed.

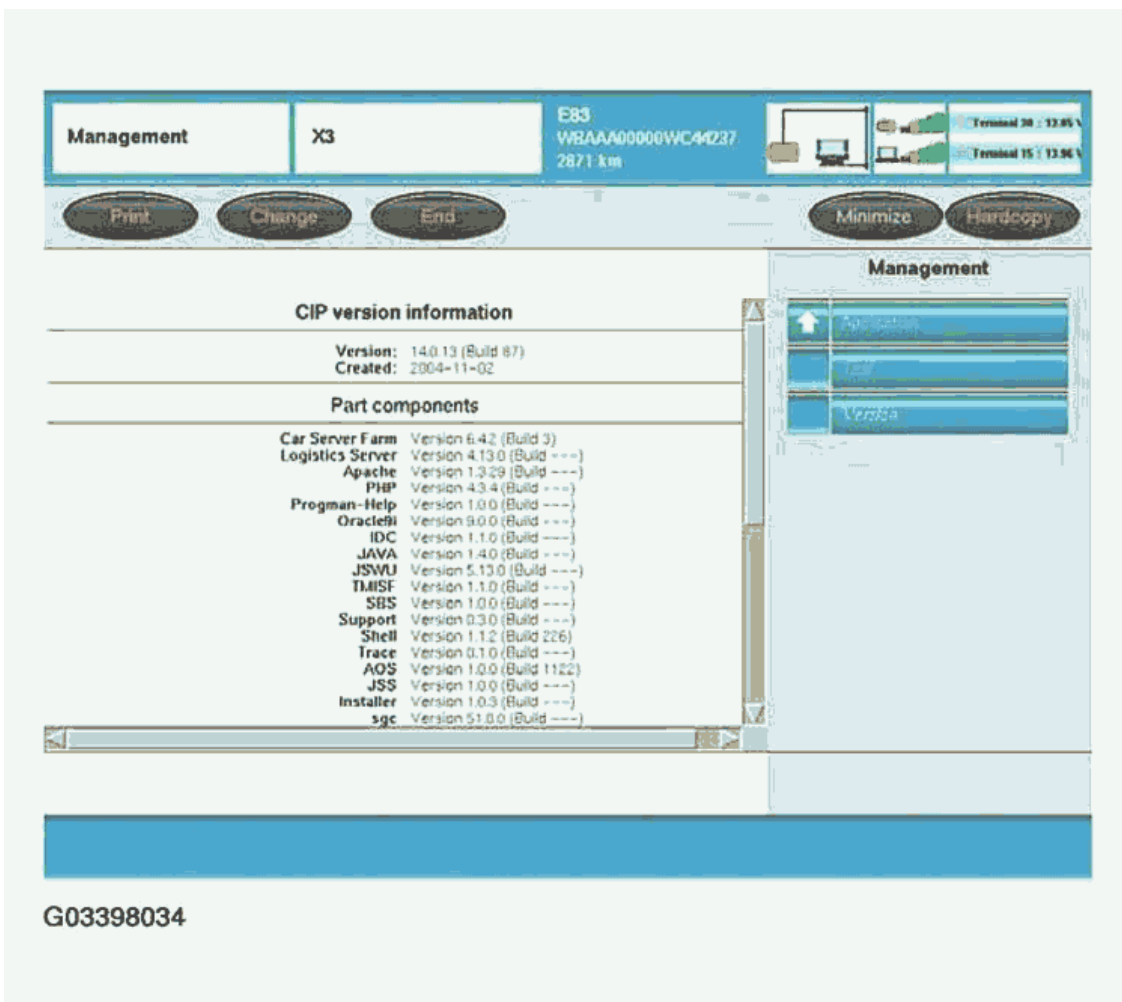


Fig. 180: Display CIP Version Information List
 Courtesy of BMW OF NORTH AMERICA, INC.

VEHICLE

"Vehicle" can be selected from the main CIP selection screen to access additional functions:

- Vehicle order
- Initialization
- Service functions
- Complete encoding

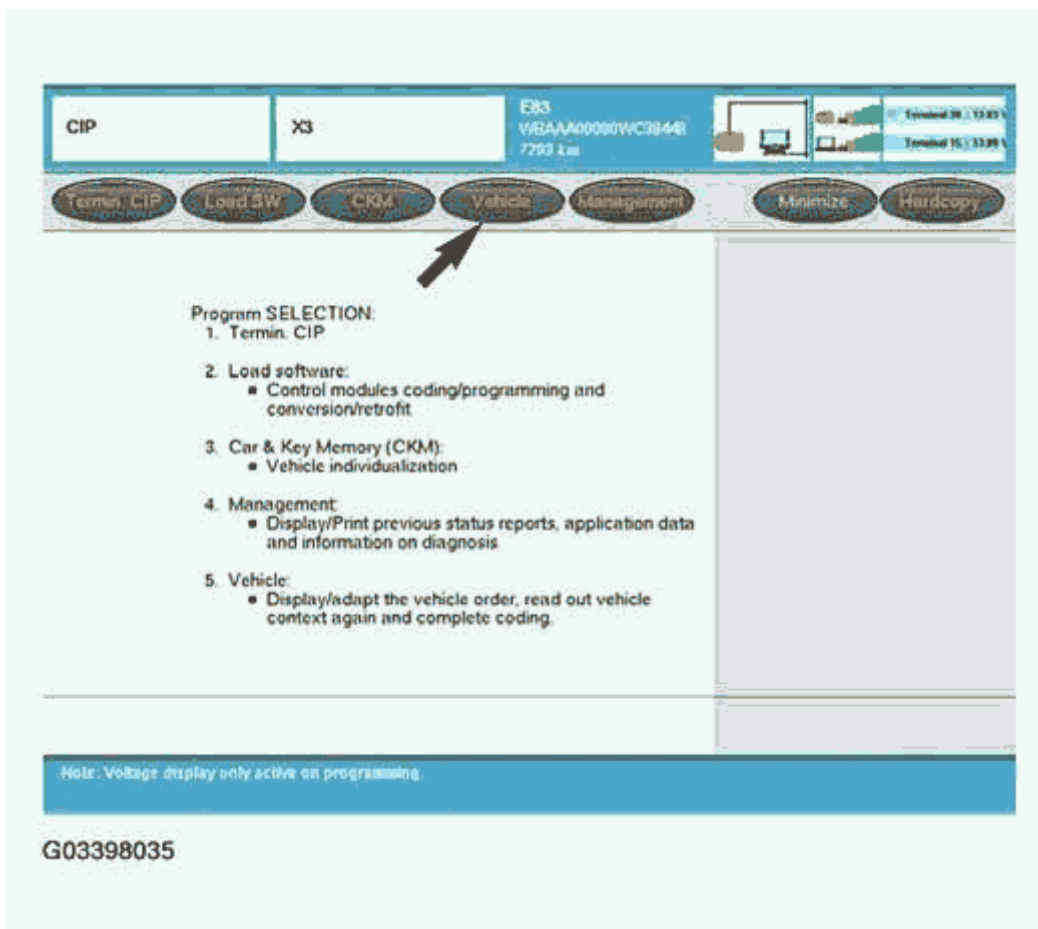


Fig. 181: Selecting Vehicle Button From Main CIP Selection Screen
Courtesy of BMW OF NORTH AMERICA, INC.

By selecting "Vehicle" the following functions can be accessed:

- Vehicle Order
- Initialization
- Service functions
- Complete encoding

Vehicle - Vehicle Order

By selecting "**Vehicle order**" the ability to adapt/modify the vehicle order can be accessed.

NOTE: Changing the vehicle order may affect vehicle operation. Modifying the vehicle order should only be performed when directed to do so by the Technical Hotline, Service Information Bulletin or Aftersales Installation Instructions.

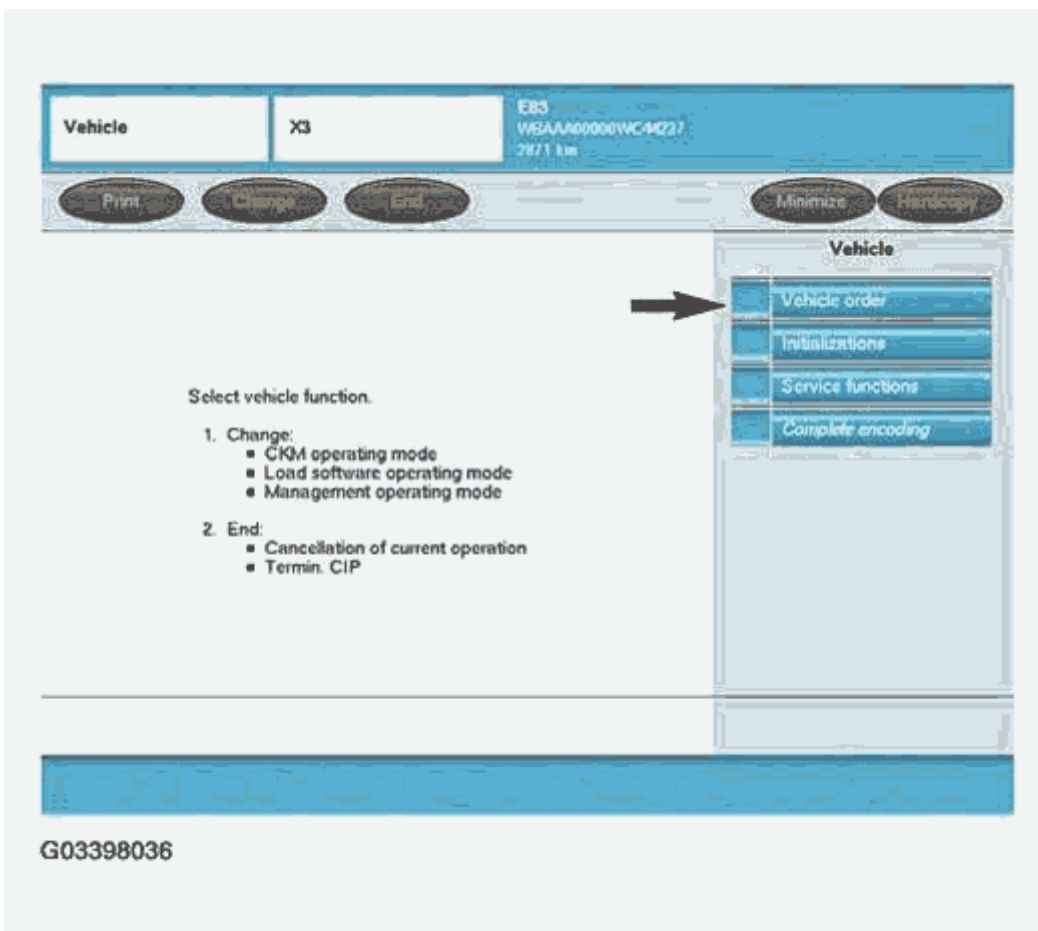


Fig. 182: Selecting Vehicle Order Button

Courtesy of BMW OF NORTH AMERICA, INC.

Selection of "Adapt VO" provides the ability to install a modified Vehicle Order file.

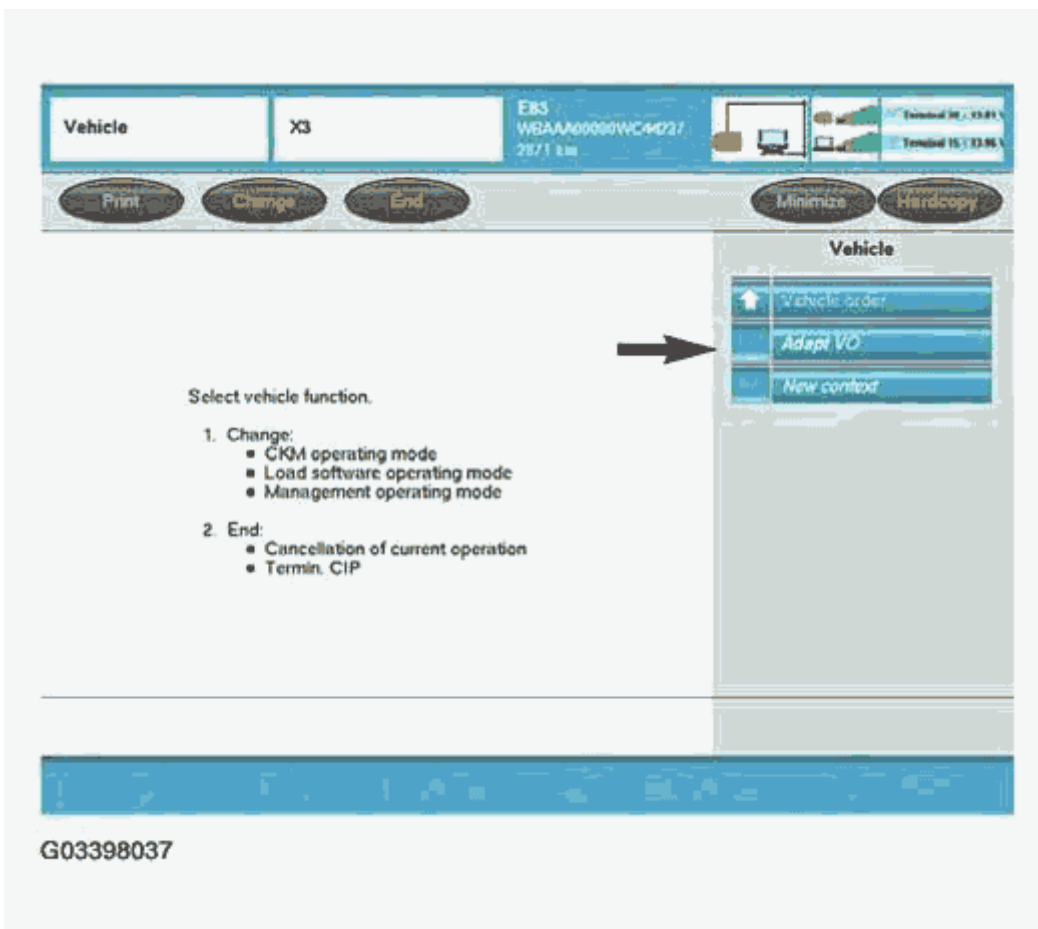
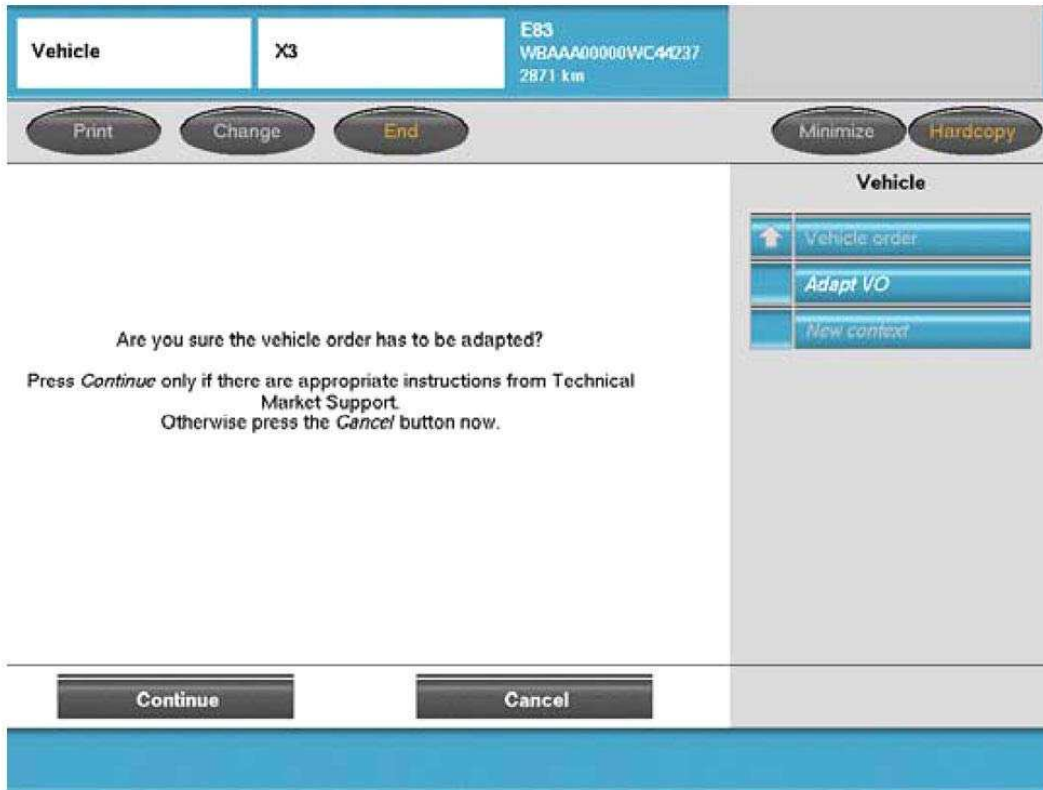


Fig. 183: Selecting Adapt VO Button

Courtesy of BMW OF NORTH AMERICA, INC.

Before selecting "Continue" a floppy disk (1.44) containing the modified/new vehicle order must be inserted into the disk drive of the SSS.

NOTE: The modified VO file is obtained from the Technical Hotline by submitting a PUMA case requesting a modified VO, the PUMA case should indicate what accessory/feature needs to be added or removed. The modified file will be sent via E-mail and must be copied on to a 1.44" floppy disk. Do not attempt to open the received file on a PC, as this may corrupt the data contained in the file.



G03398038

Fig. 184: Selecting Continue Button
Courtesy of BMW OF NORTH AMERICA, INC.

Vehicle - Initialization

The "**Initialization**" function provides access to three different functions:

- Start system time - Used to synchronize all modules contained on the vehicles bytflight bus.
- Delete fault memory
- CAS or EWS calibration

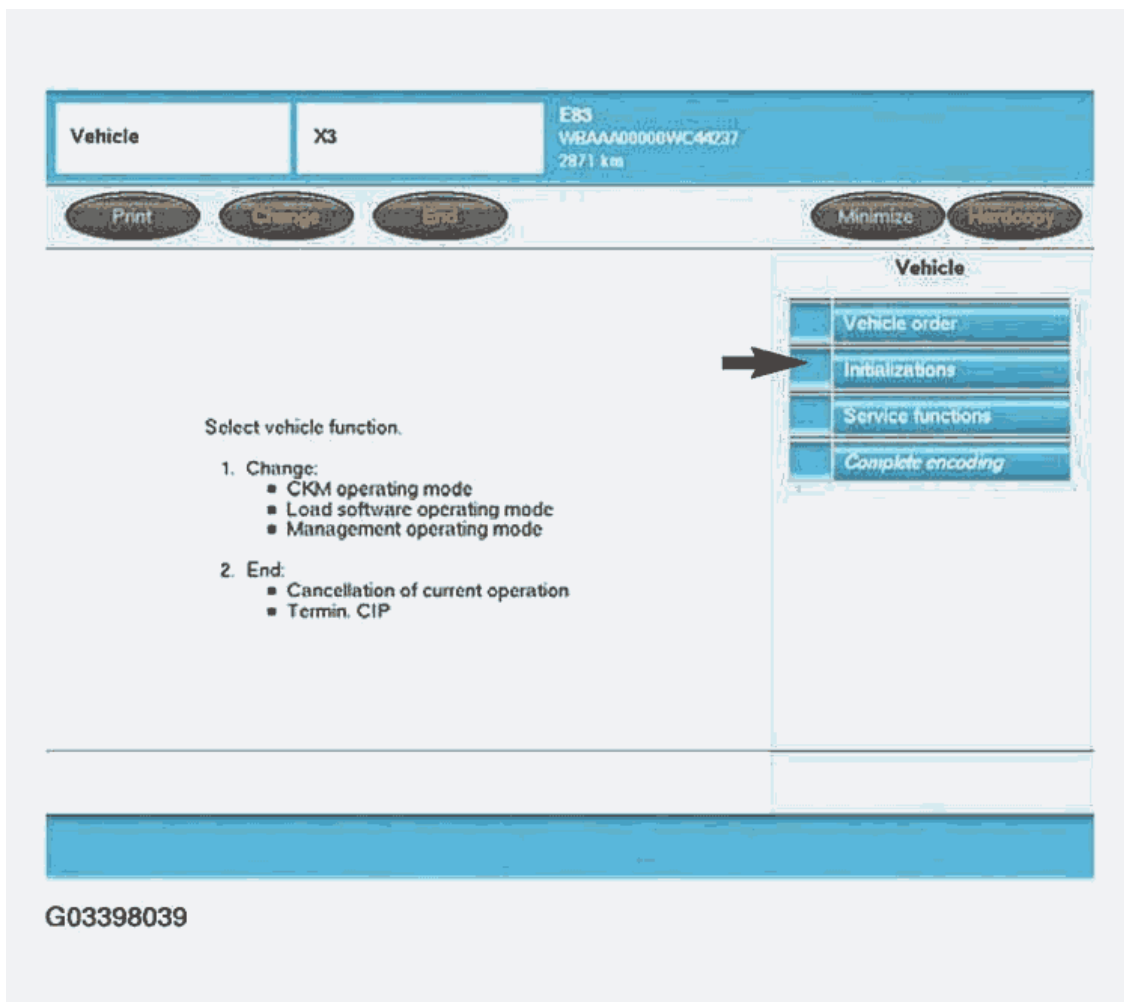


Fig. 185: Selecting Initialization Button
Courtesy of BMW OF NORTH AMERICA, INC.

By selecting "Delete fault memory" the fault memory of all installed control modules will be cleared.

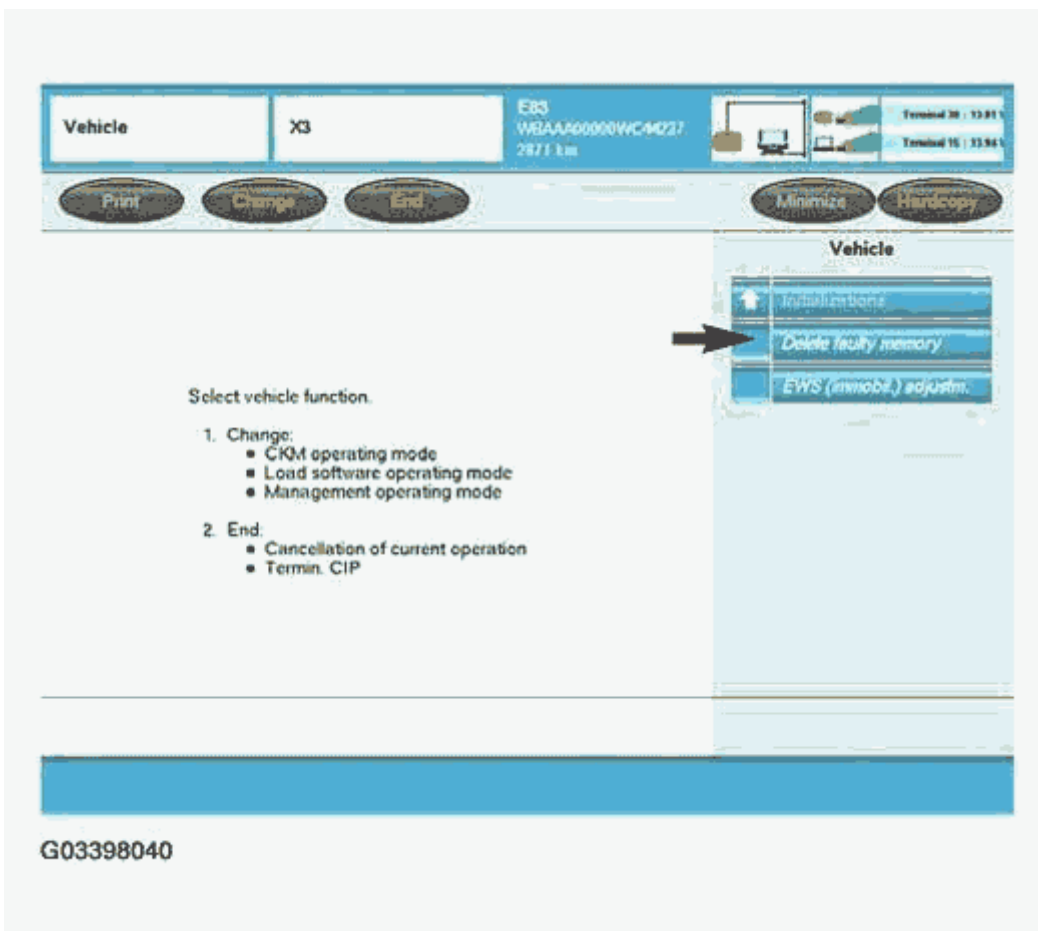


Fig. 186: Selecting Delete Fault Memory Button
Courtesy of BMW OF NORTH AMERICA, INC.

Displays a report pertaining to the clearing of the fault memory on all installed modules.

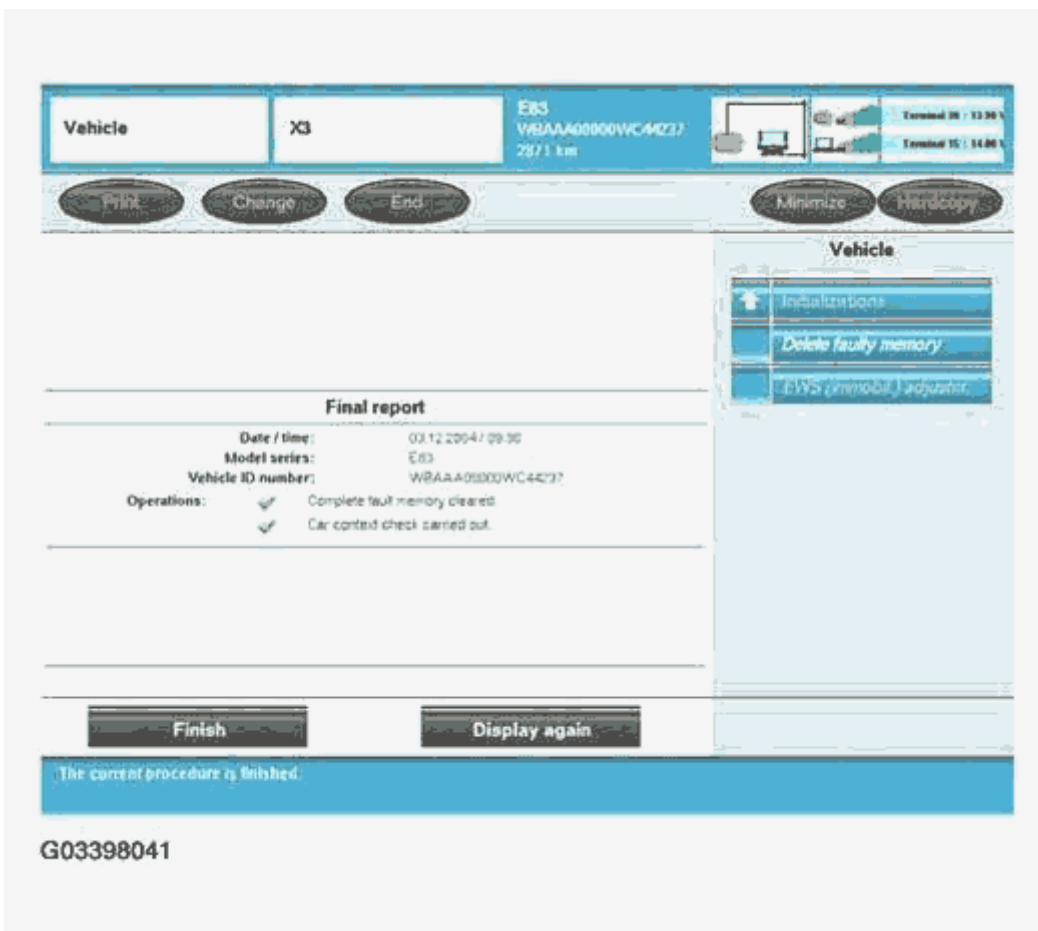


Fig. 187: Display Final Report

Courtesy of BMW OF NORTH AMERICA, INC.

By selecting "EWS adjustm." or "CAS Calibration" the rolling code tables can be initialized.

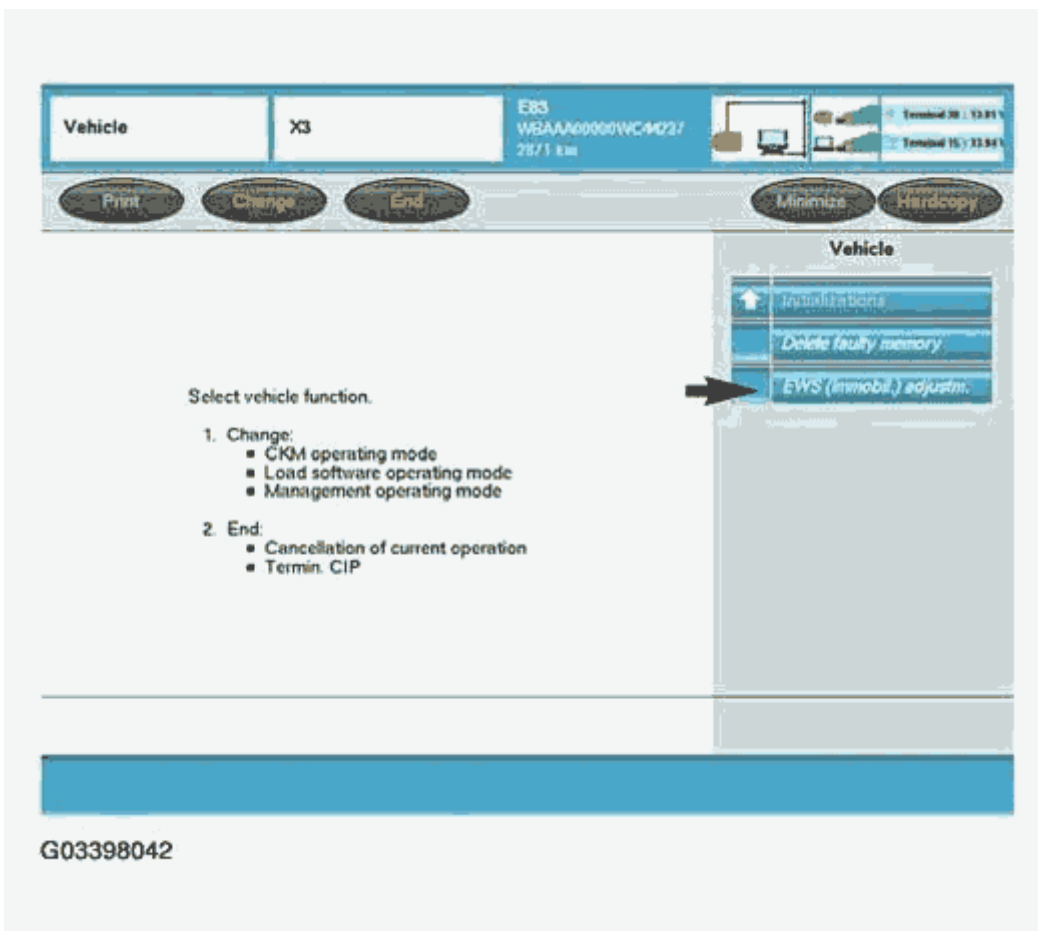


Fig. 188: Selecting EWS Adjustment Button
Courtesy of BMW OF NORTH AMERICA, INC.

By selecting "Yes" the calibration/initialization of the rolling code tables in the DME and CAS or EWS modules will be carried out.



Fig. 189: Selecting YES Button

Courtesy of BMW OF NORTH AMERICA, INC.

Vehicle - Service Function

The "Service function" feature provides access to various calibration functions.

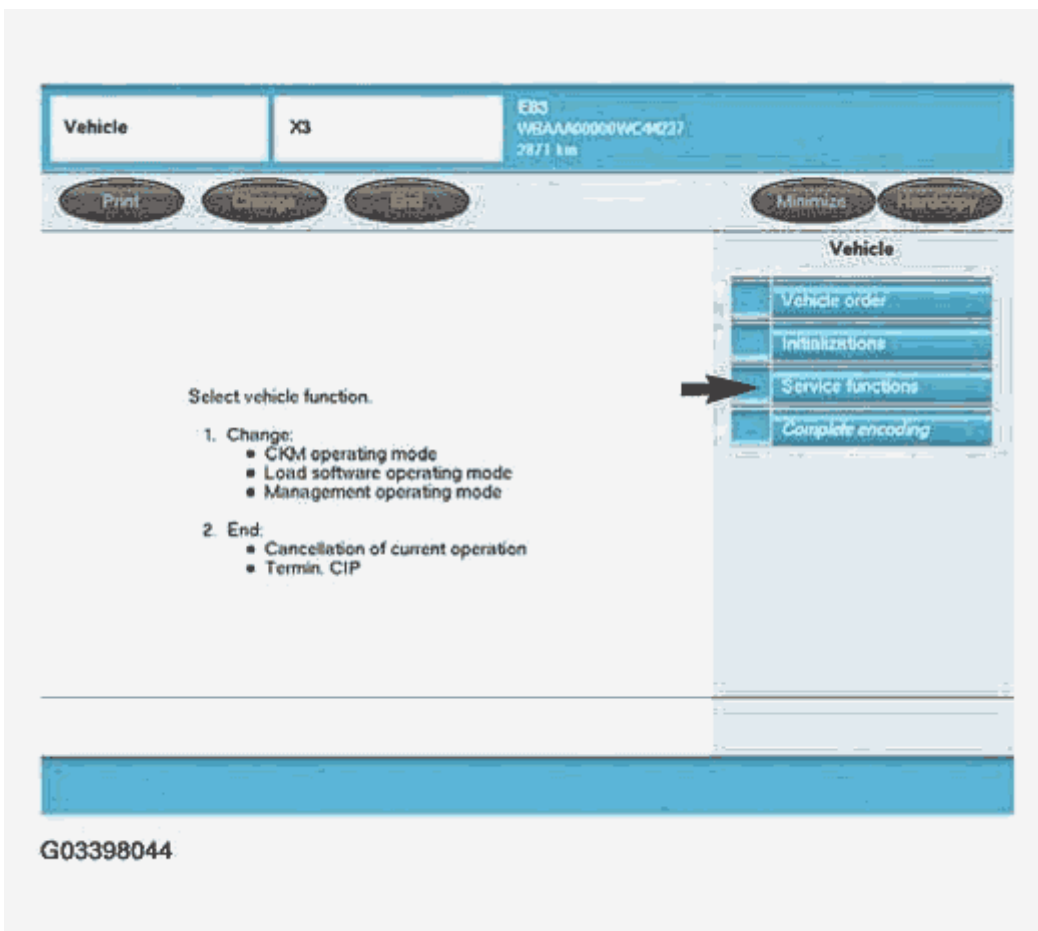


Fig. 190: Selecting Service Function Button

Courtesy of BMW OF NORTH AMERICA, INC.

Selecting "LWS" will provide the ability to calibrate the steering angle sensor.

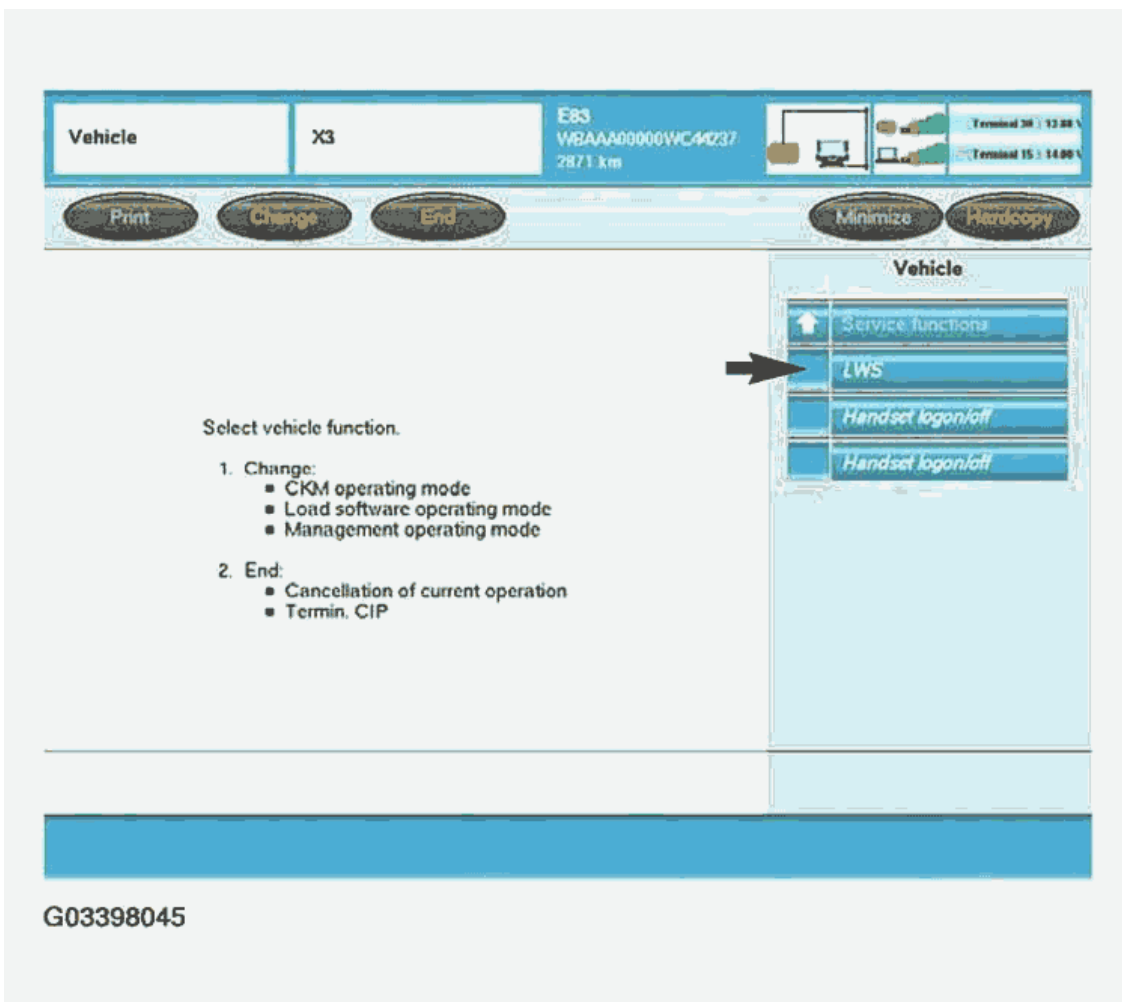


Fig. 191: Selecting LWS Button

Courtesy of BMW OF NORTH AMERICA, INC.

By selecting continue the process to calibrate the steering angle sensor will be carried out.

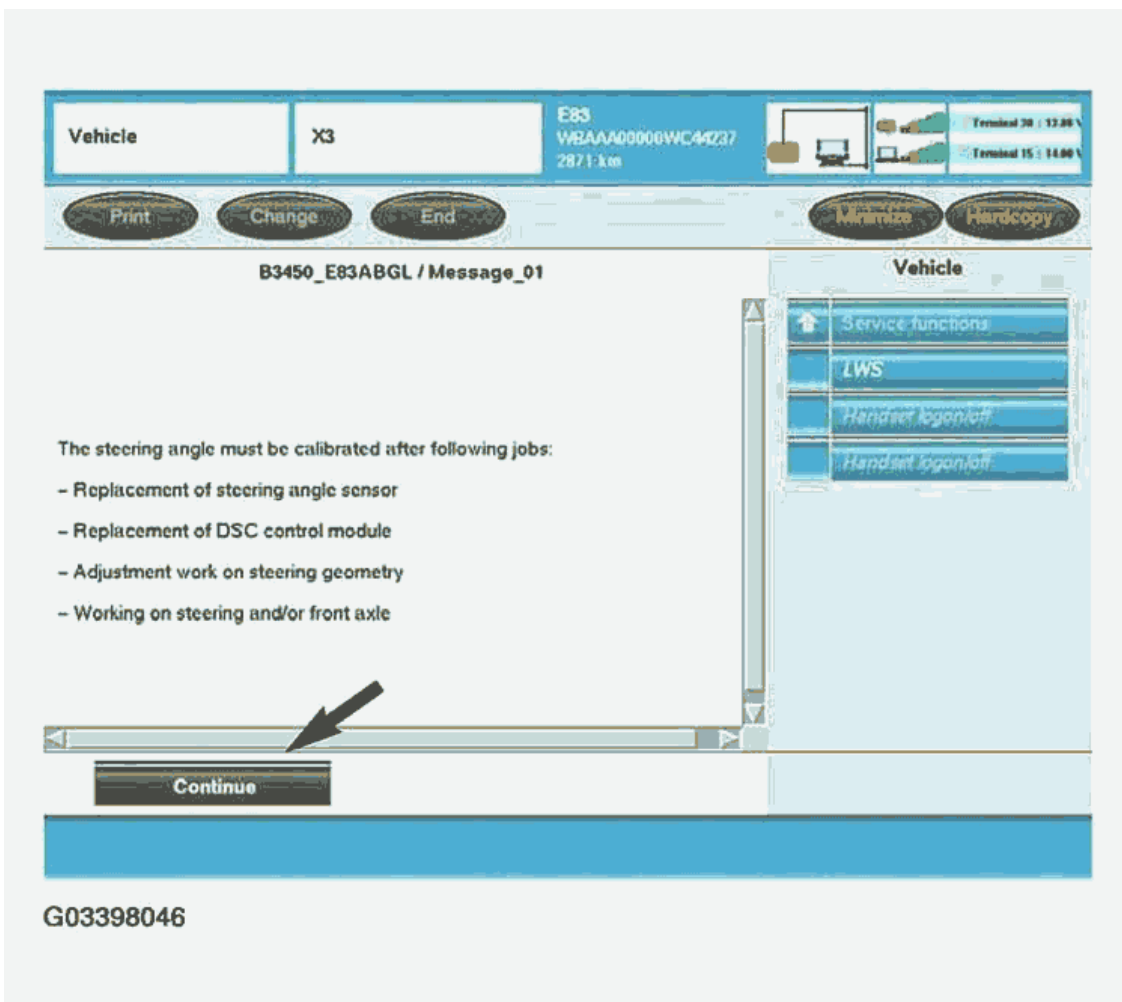


Fig. 192: Selecting Continue Button
Courtesy of BMW OF NORTH AMERICA, INC.

Vehicle - Complete Encoding

"Complete encoding" provides the ability to code/recode all control modules installed in the vehicle.

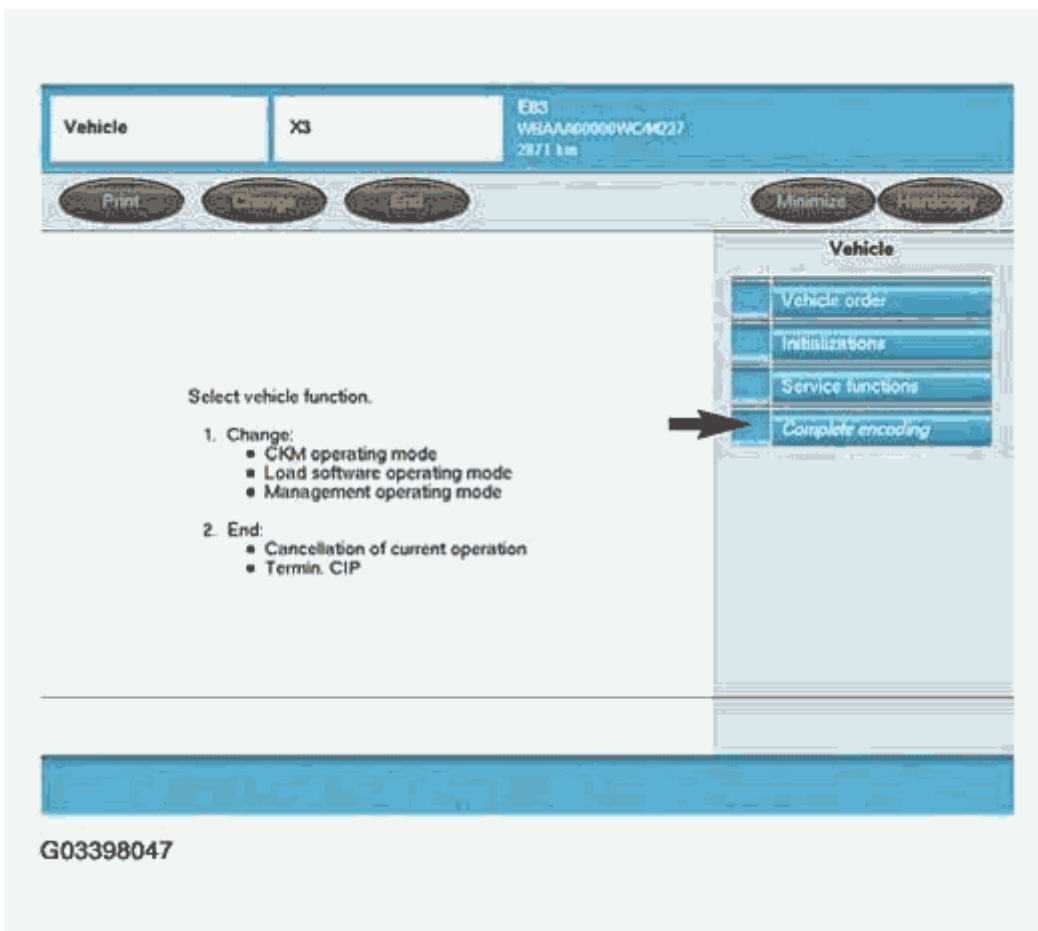


Fig. 193: Selecting Complete Encoding Button
Courtesy of BMW OF NORTH AMERICA, INC.

Recoding all the installed control modules may result in the loss of initialization or system settings such as radio station presets or seat/mirror memory.

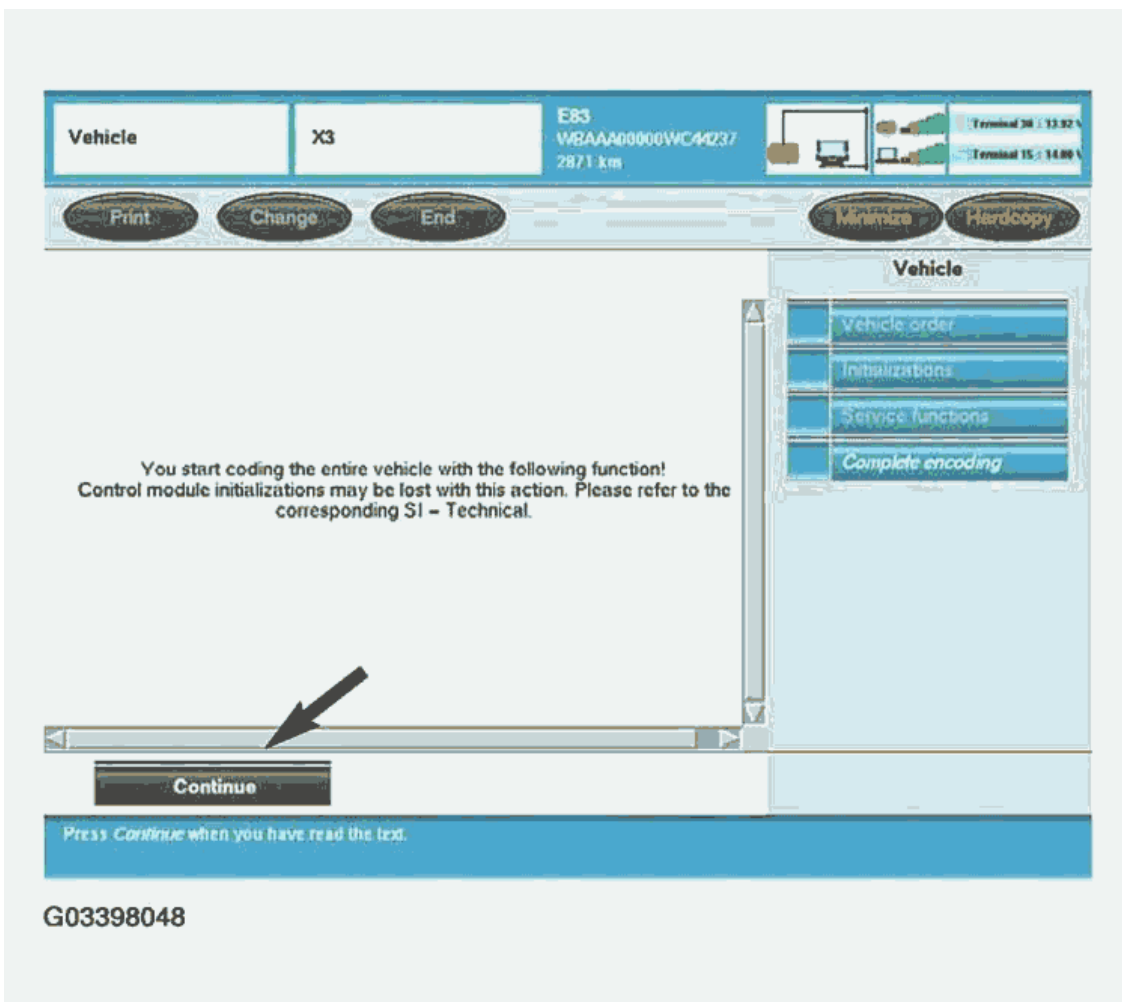


Fig. 194: Selecting Continue Button

Courtesy of BMW OF NORTH AMERICA, INC.

By selecting "Yes" all installed control modules will be recoded based on the information contained in the Vehicle Order.

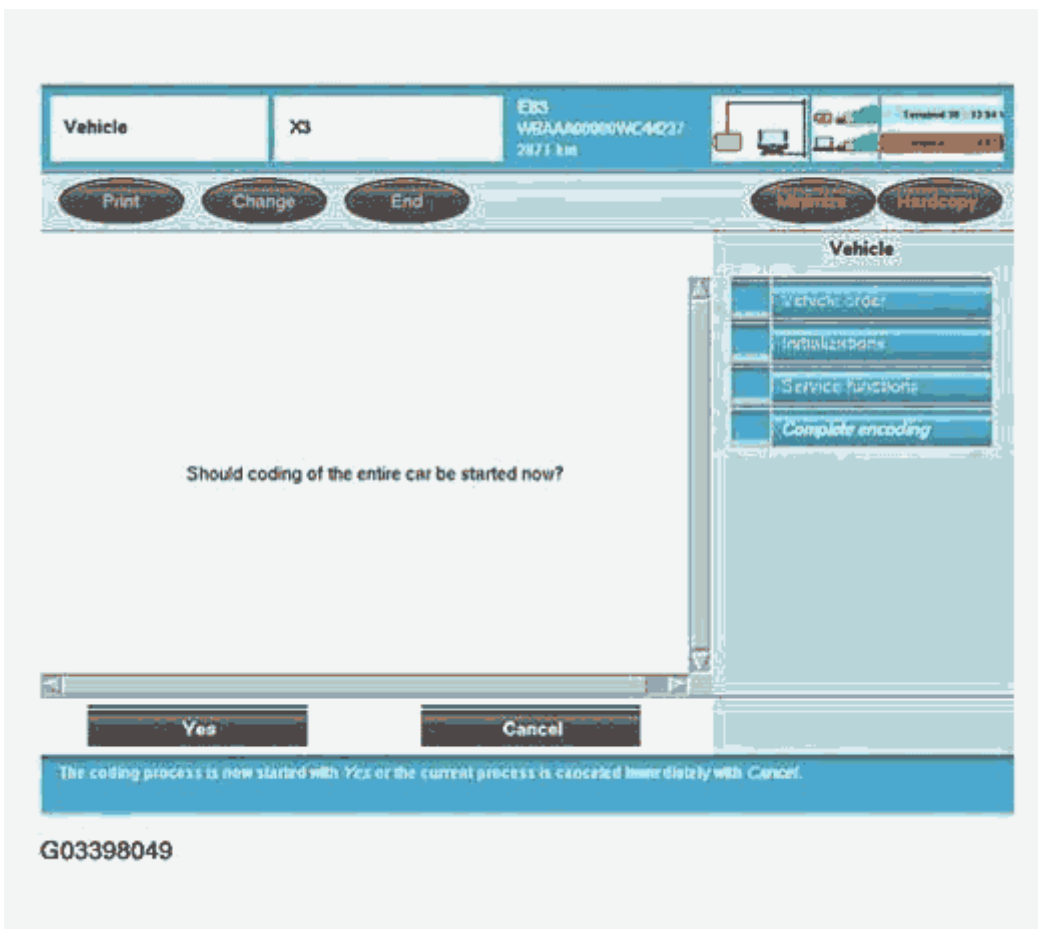
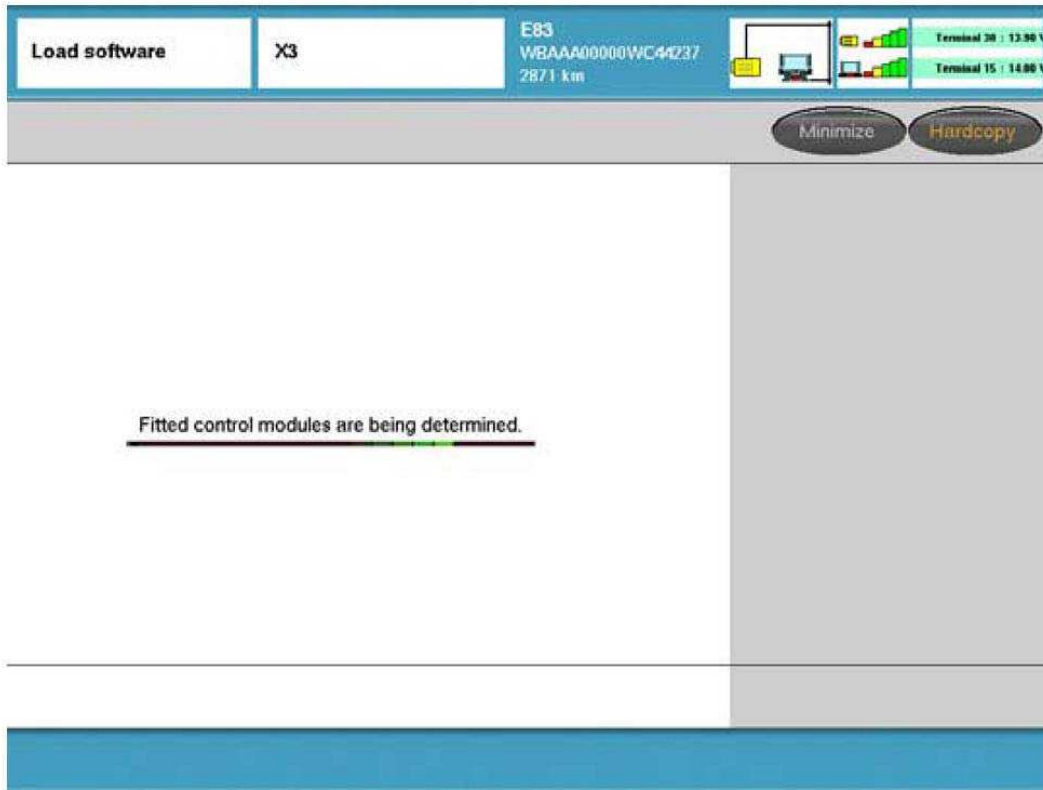


Fig. 195: Selecting YES Button

Courtesy of BMW OF NORTH AMERICA, INC.

CIP FUNCTIONS - IF YES

After selecting "Yes" on the Yes/No selection screen a determination/check of all installed control modules is performed.



G03398050

Fig. 196: Display Fitted Control Modules Determined Message
Courtesy of BMW OF NORTH AMERICA, INC.

Upon completing a check of the installed control modules, a list highlighting the installed control modules is displayed.

Select the control module(s) that were replaced and select continue.

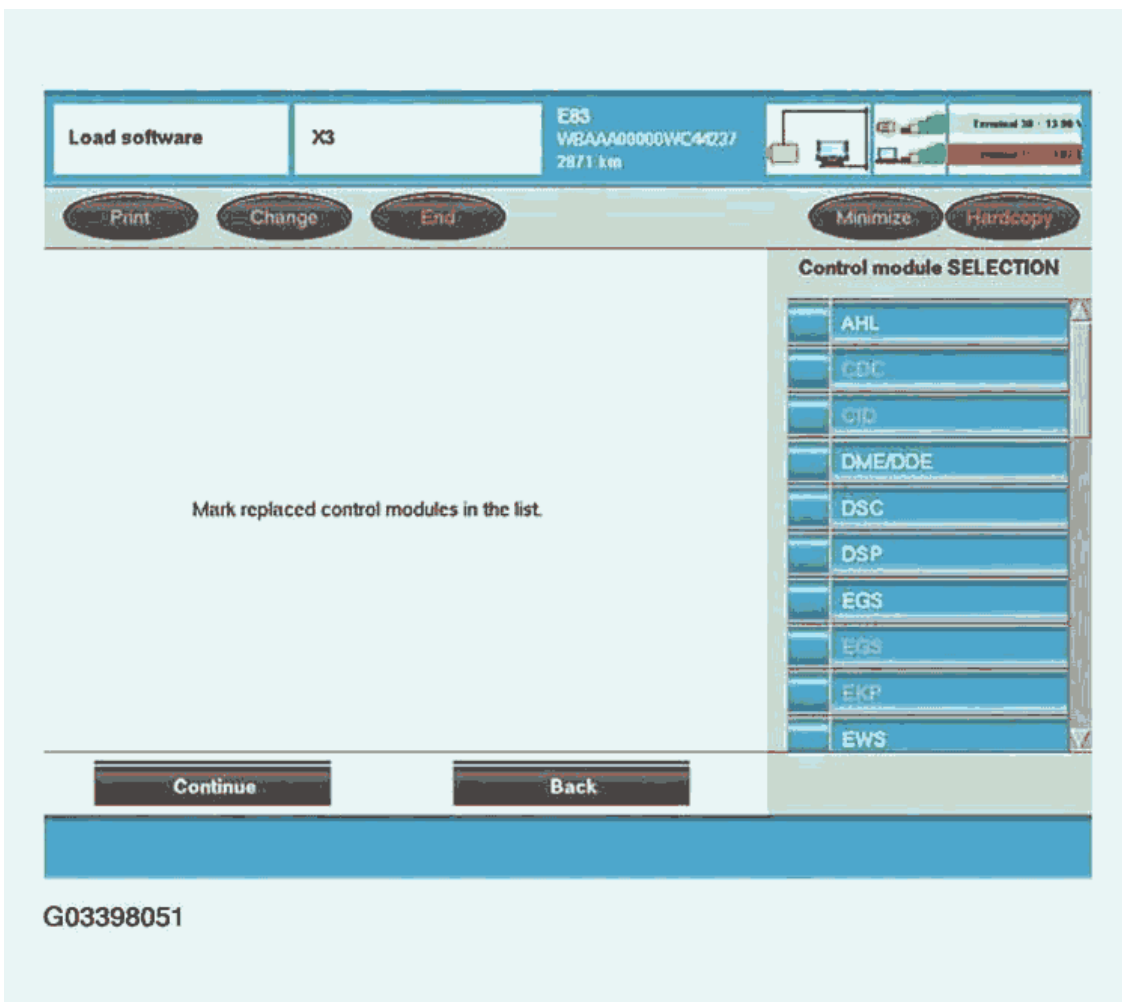


Fig. 197: Display Control Module Selection Screen
Courtesy of BMW OF NORTH AMERICA, INC.

After selecting the replaced module(s) and selecting continue a measures plan will be generated which compares the integration levels (actual vs. target) for not only the modules replaced but for all installed modules as well. If any of the installed control modules do not match the target level they will be updated along with the replacement modules.

CKM - INDIVIDUALIZATION (VEHICLE & KEY MEMORY)

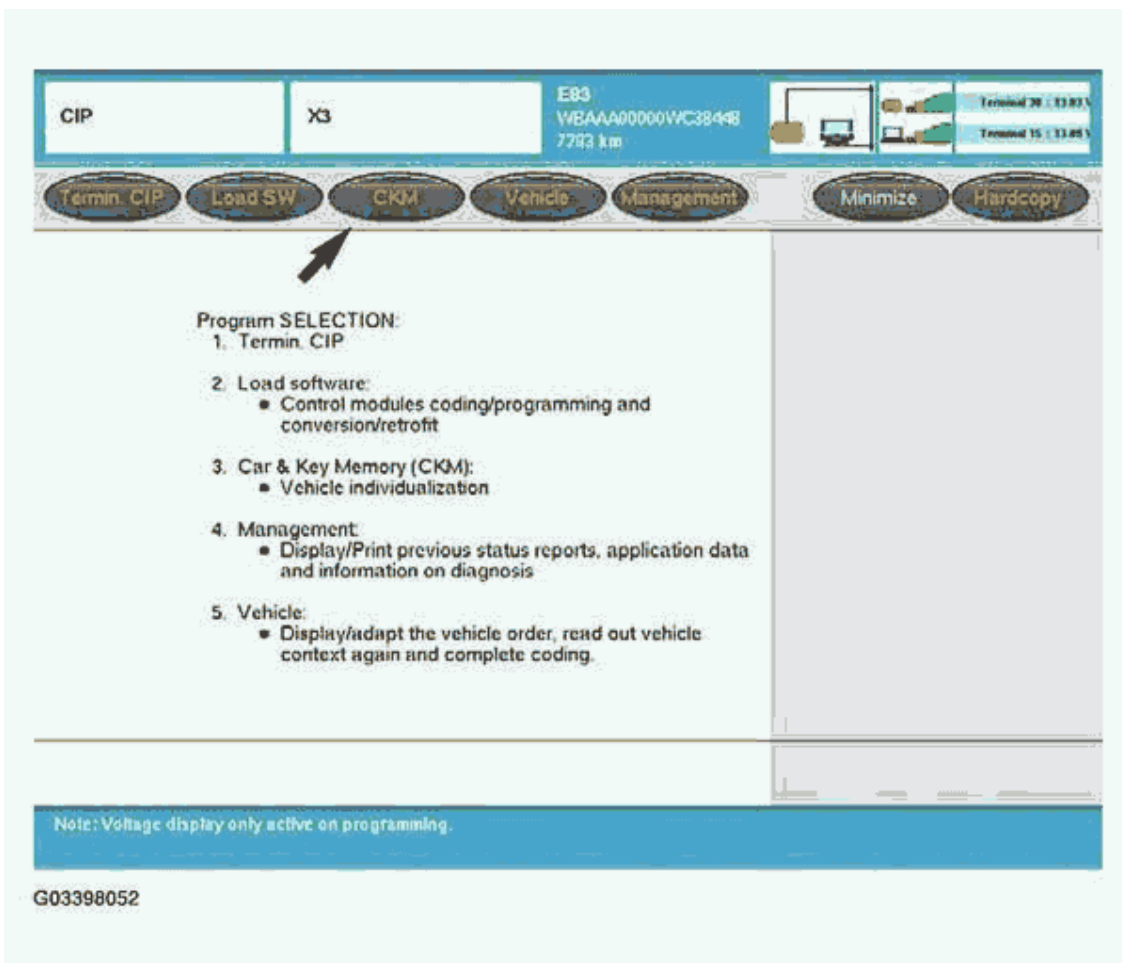


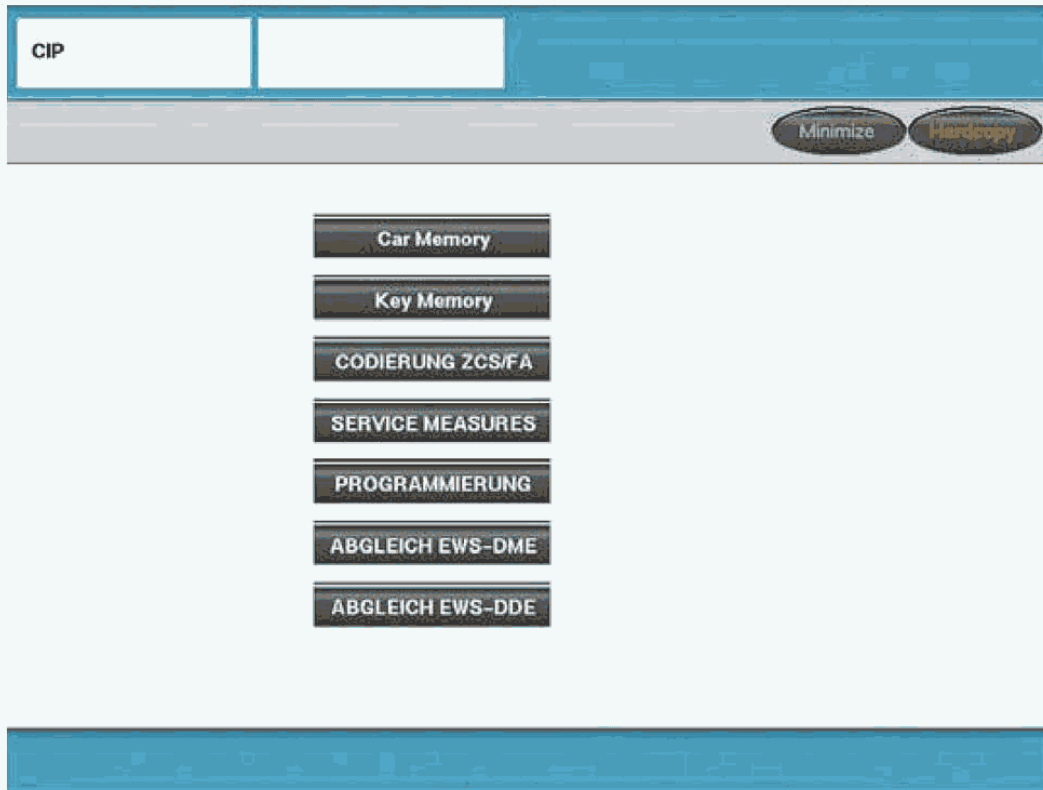
Fig. 198: Selecting CKM Button

Courtesy of BMW OF NORTH AMERICA, INC.

The CKM feature contained in CIP (for models produced as of the E65) provides the ability to "customize" certain vehicle and key functions to meet the specific preferences of the customer. It is important to note that the functions/features that can be "customized" will vary depending on model, equipment level and vehicle software level.

Upon selecting "CKM" a check of the current vehicle and key settings is made and displayed. The displayed settings list should be printed out and provided to the customer in order for them to select how the available functions should be set. The CKM function contained within CIP allows settings for both vehicle and keys to be made directly, the older version separates the key settings from the vehicle setting as different functions.

On older vehicles the Car Memory and Key Memory settings can be accessed via the SGC/UNIX function.

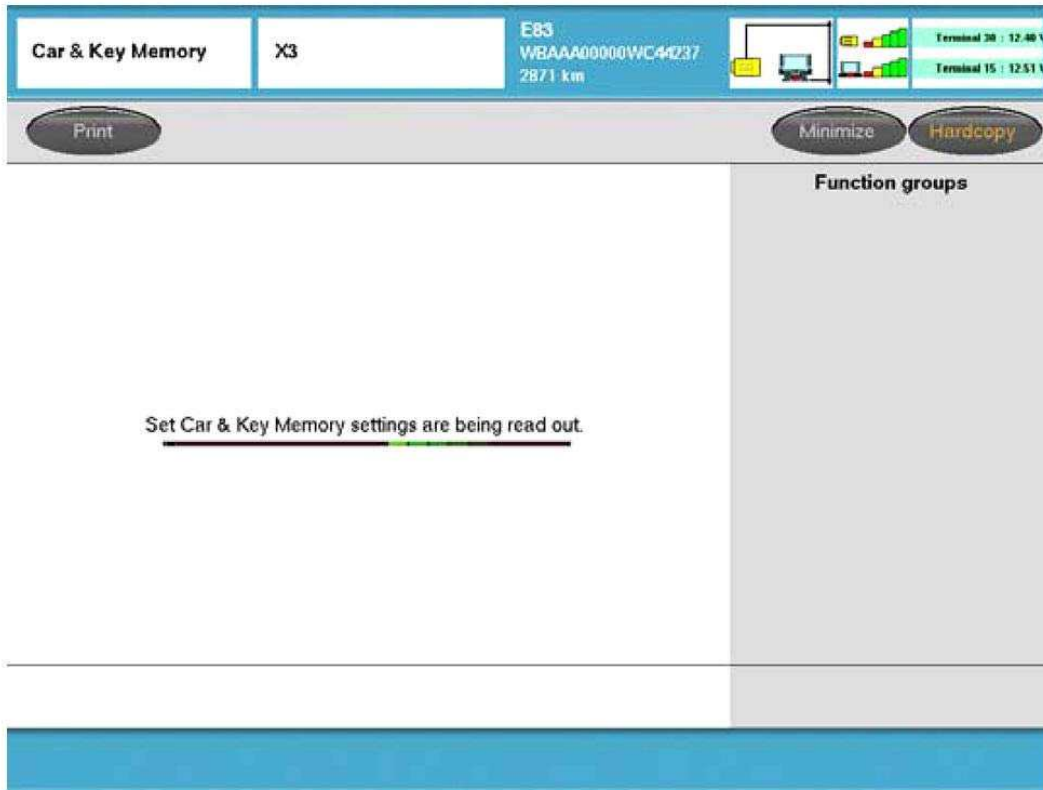


G03398053

Fig. 199: Display Car Memory And Key Memory Settings Button
Courtesy of BMW OF NORTH AMERICA, INC.

Detailed information pertaining to CKM configuration is available in *SI B09 03 98*.

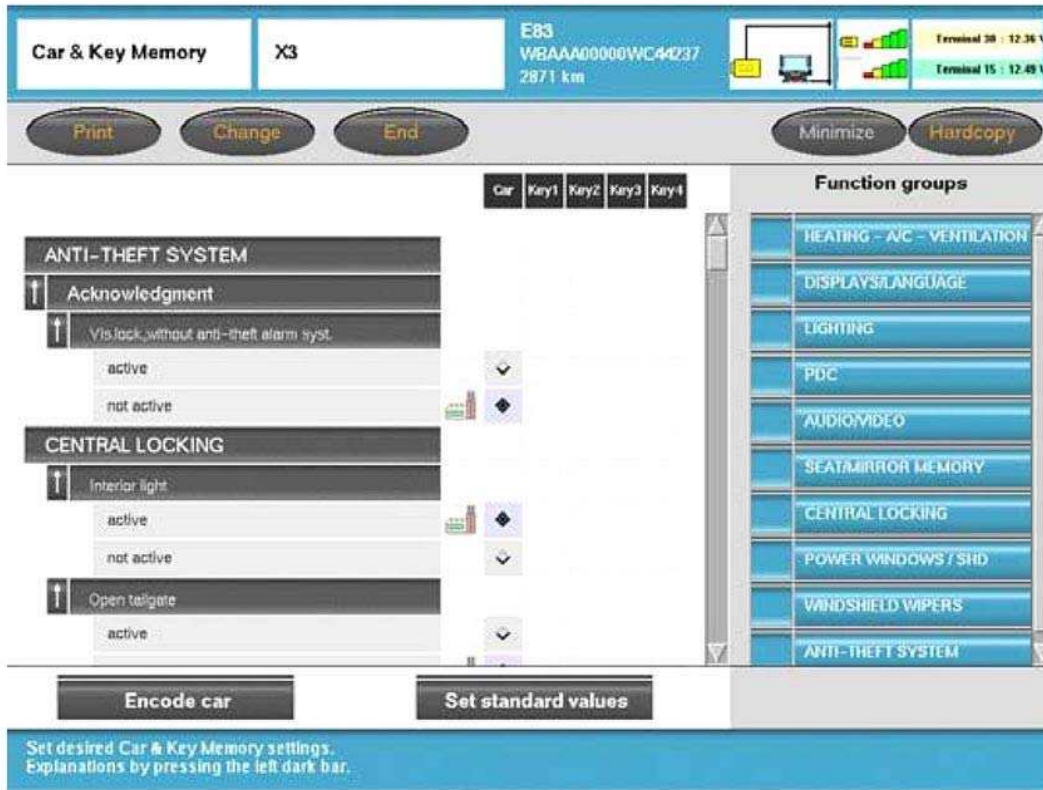
Upon selecting "CKM" a check of the current vehicle and key settings is made.



G03398054

Fig. 200: Selecting CKM Button
Courtesy of BMW OF NORTH AMERICA, INC.

Once the check is complete the current settings are displayed and can be printed out.

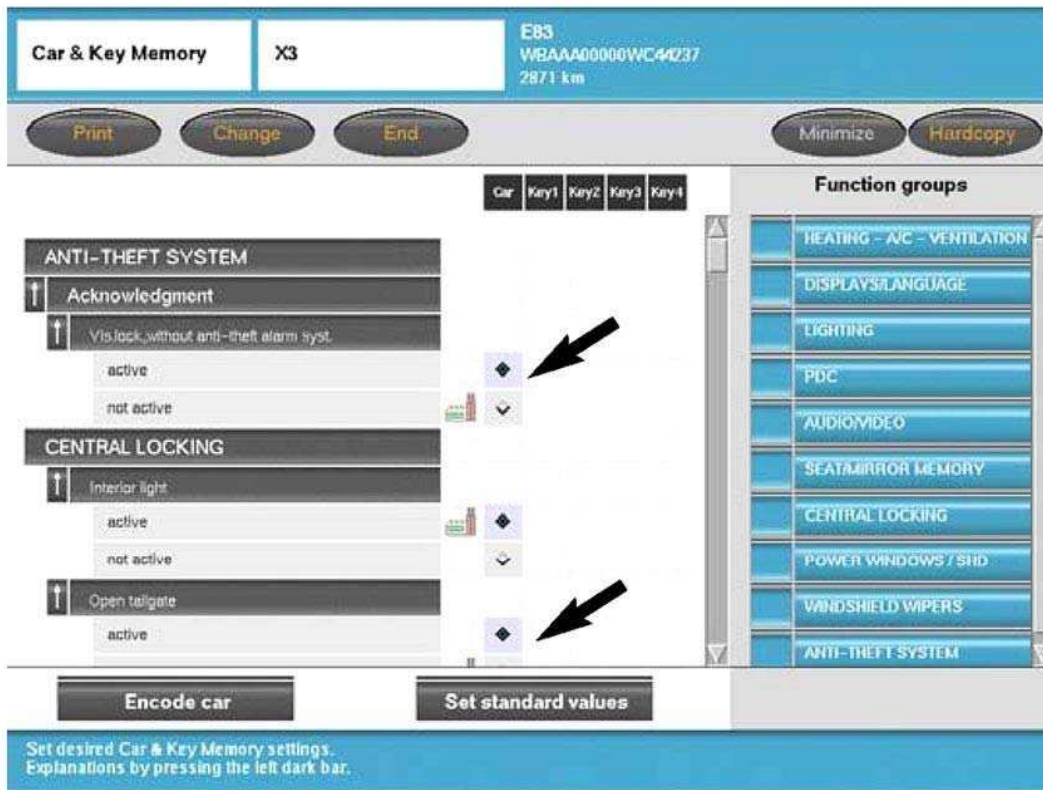


G03398055

Fig. 201: Display Current Setting Screen
 Courtesy of BMW OF NORTH AMERICA, INC.

Changes to the current settings can be made by selecting the preferred function.

NOTE: Some preference settings can be made that are specific to the key being used.

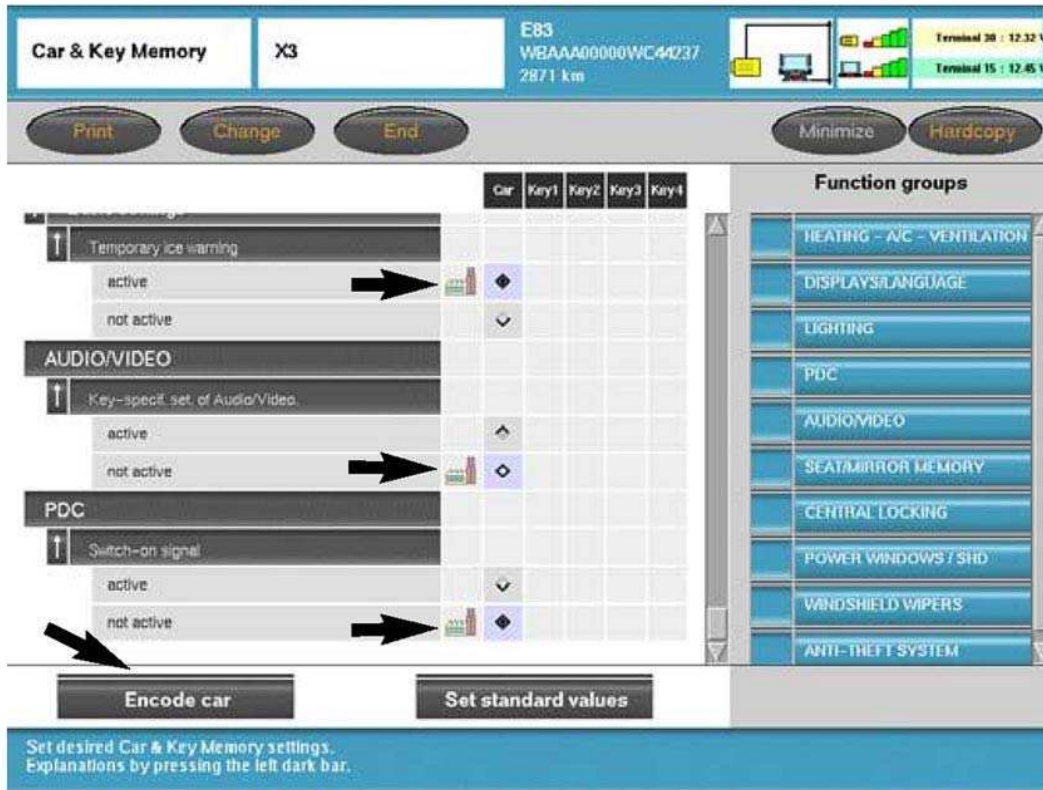


G03398056

Fig. 202: Selecting Preferred Function
 Courtesy of BMW OF NORTH AMERICA, INC.

The factory default settings are identified by a "factory" symbol.

To except/code the new setting to the vehicle or key select "**Encode car**".

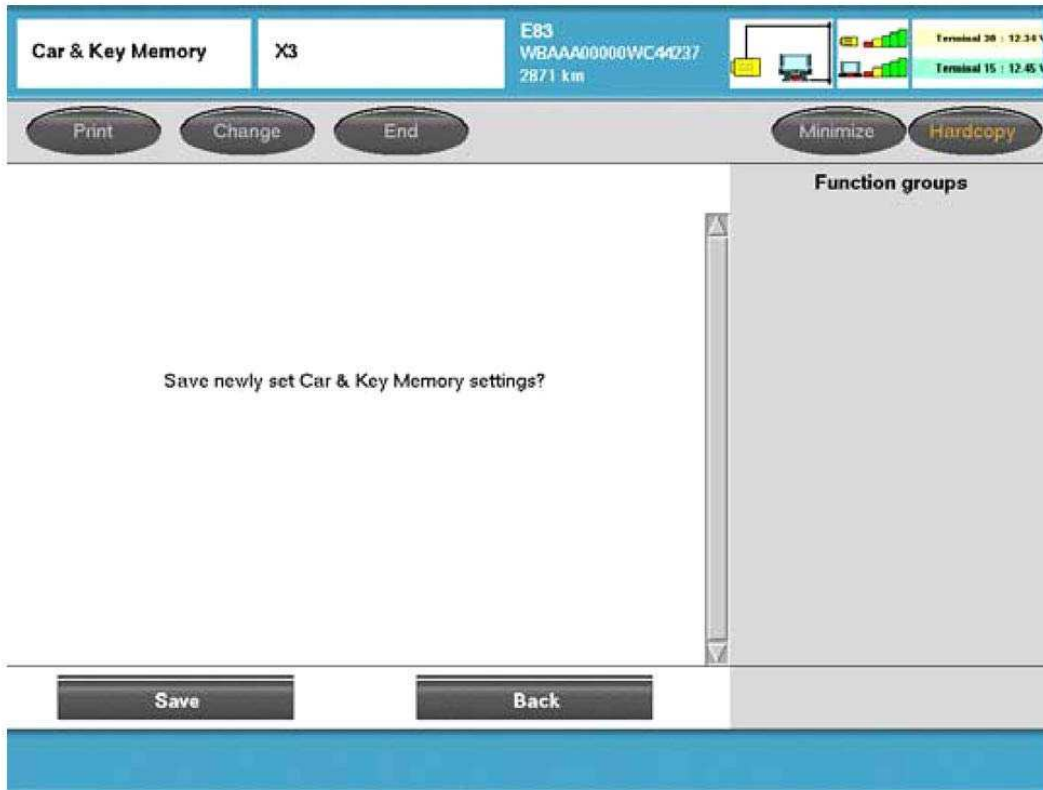


G03398057

Fig. 203: Selecting Encode Car Button
 Courtesy of BMW OF NORTH AMERICA, INC.

To lock the changes to the vehicle and/or keys select "**Save**".

By selecting back additional changes can be selected or the function aborted.



G03398058

Fig. 204: Selecting Save Button

Courtesy of BMW OF NORTH AMERICA, INC.

Once the new values are stored/set a final report showing the new setting will be displayed. The report will also show if the effected modules did or did not accept the changes.

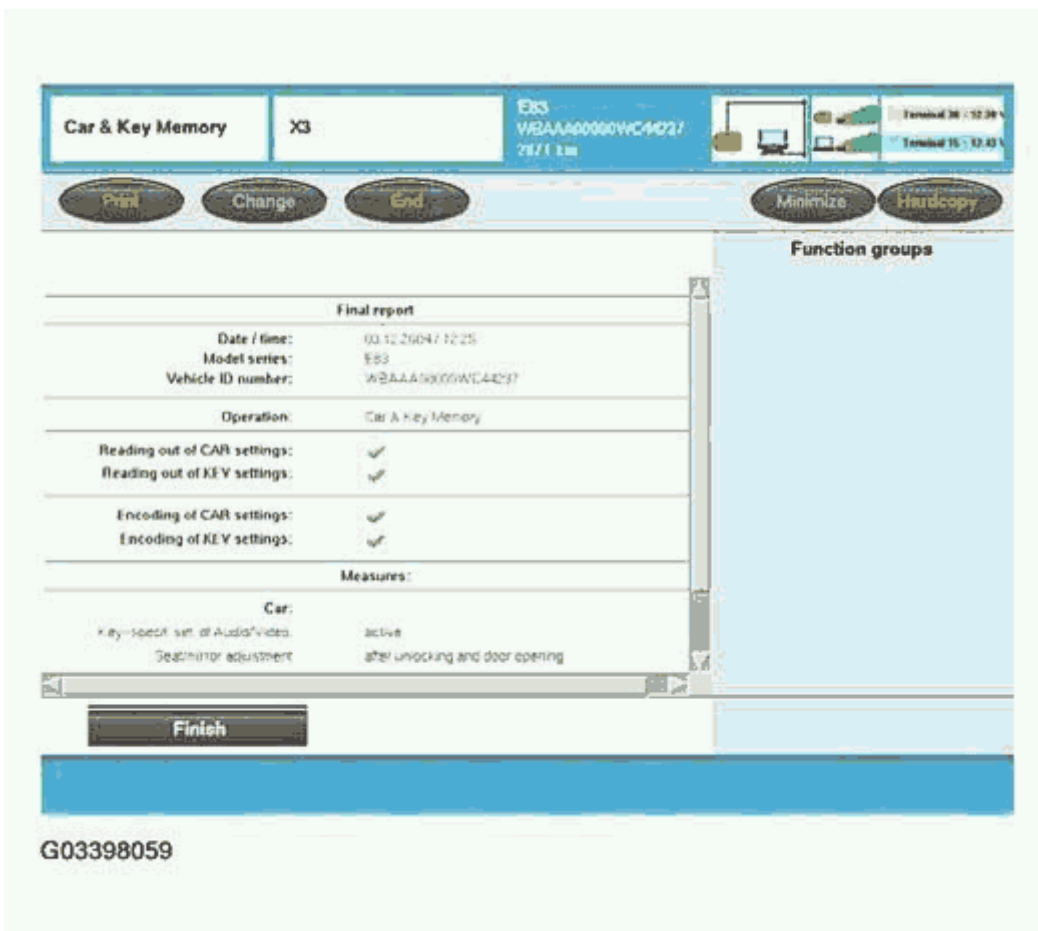


Fig. 205: Display Final Report

Courtesy of BMW OF NORTH AMERICA, INC.

ZCS CODING PROCEDURE

The ZCS coding procedure can currently be performed with the DISplus using DIS CDs until DIS CD 42 is released at which time all SGC/Unix coding and programming functions will be available only via Progman using the GT1 or SSS.

There are two methods of encoding replacement control modules:

- Manual input of ZCS
- Automatic ZCS retrieval and coding

Coding Control Modules That Store The ZCS

On earlier production vehicles when replacing a control module that stores the ZCS code (i.e Kombi/Instrument Cluster) the information must be entered manually in order to code the replacement module. The ZCS code from the label located in the vehicle or a printout of the code stored in the module to be replaced must be entered into the new module.

The control modules that store the ZCS and require manual input are:

- IKE - E38
- EKM - E31
- Instrument Cluster - E32/34 (After 9-91) & E36 (except 318ti and Z3 Roadster)
- EWS II - 318ti & Z3 Roadster

NOTE: As long as the defective EWS II control module can communicate with the coding equipment, automatic encoding is possible.

On later production vehicles where the ZCS information is stored in two modules, redundant data storage, the ZCS information to code the replacement module can be obtained from the second/backup module.

Vehicles which have redundant ZCS data storage are:

- E36 (Z3) - Instrument Cluster & EWS II as of 9/98
- E39 - Instrument Cluster & EWS II
- E46 - Instrument Cluster & LSZ
- E53 - Instrument Cluster & LSZ

NOTE: E46 changed from ZCS to a Vehicle Order (VO/FA) vehicle data structure in 9/01.

Manual Input of ZCS Data

From Progman establish a connection to the interface connected to the vehicle and access CIP.

To perform the procedure from CIP the Model series must be selected (**3 series, 7 series ...**).

Then select the body (**E32, E36 ...**).



G03398060

Fig. 206: Display Model Series Selection Menu
Courtesy of BMW OF NORTH AMERICA, INC.

Select "**Codierung ZCS/FA**".

Then advance screen to the right two times to enter the vehicle series selection screen.

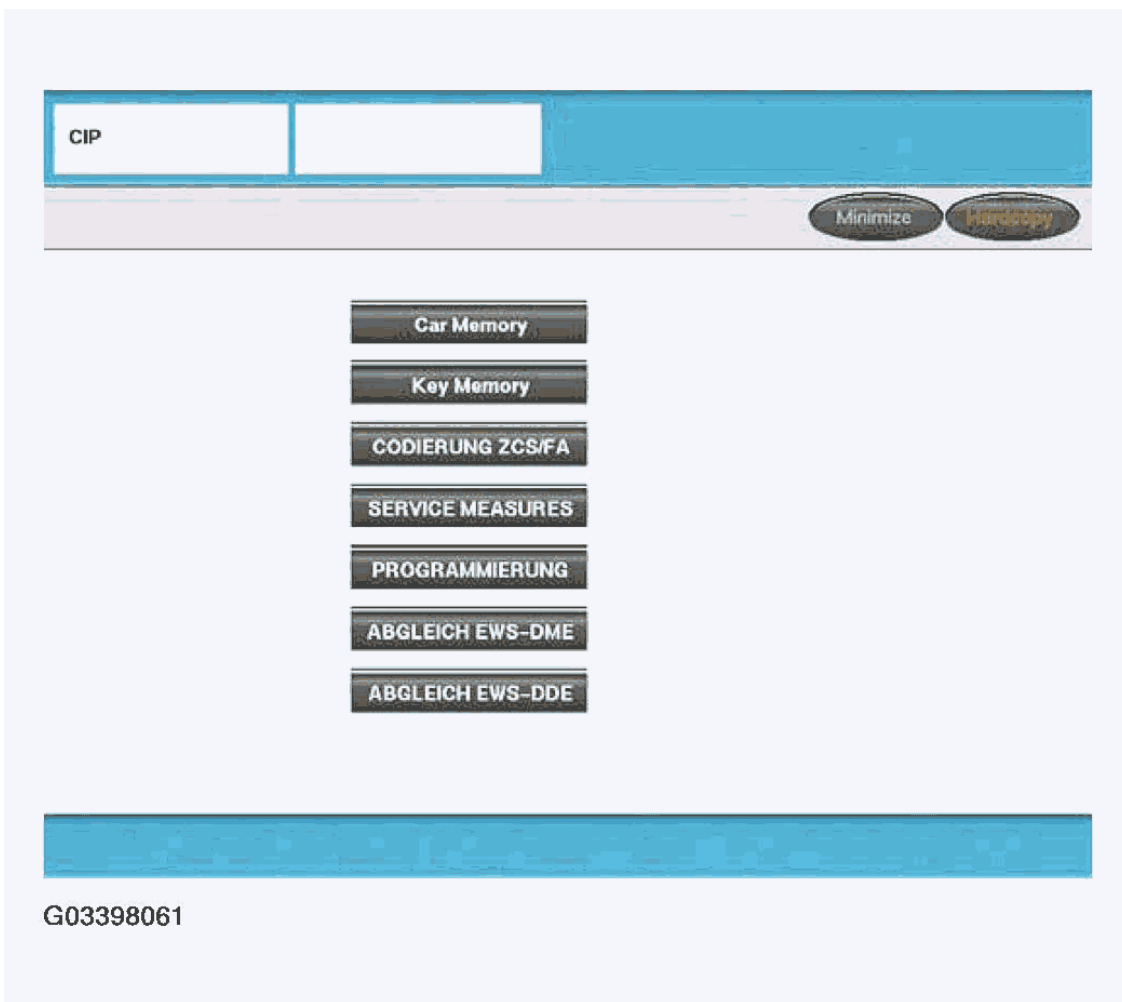
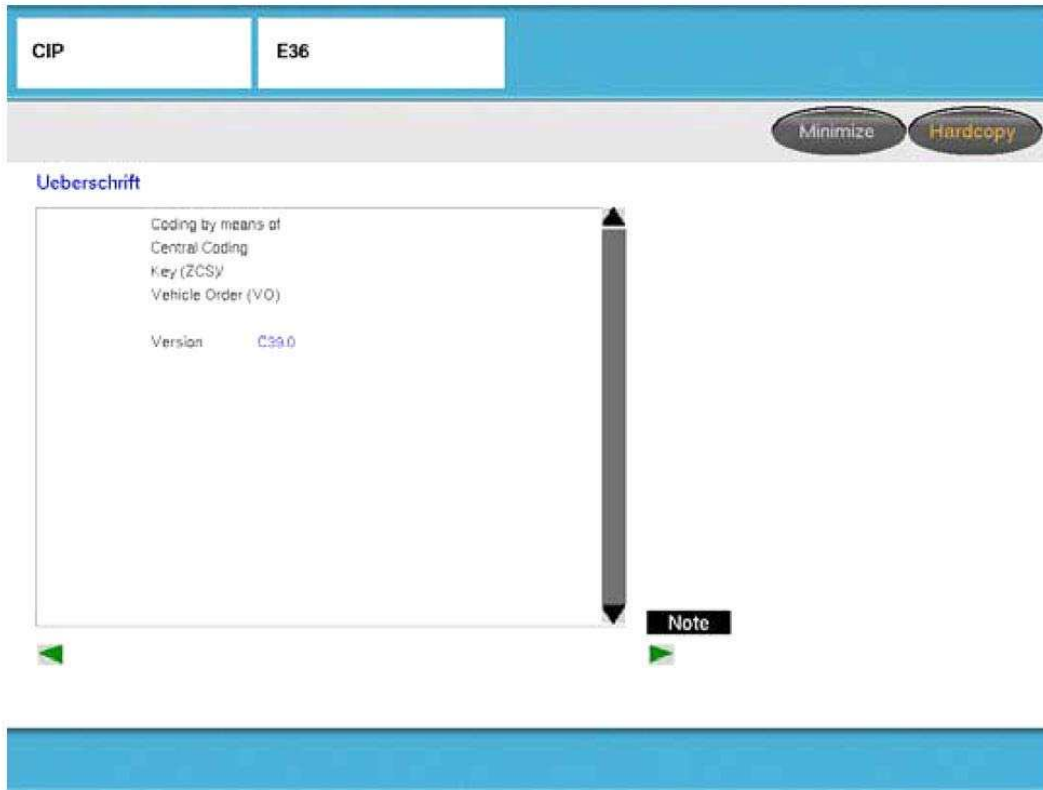


Fig. 207: Selecting Codierung ZCS/FA Button
Courtesy of BMW OF NORTH AMERICA, INC.

The version ID page is displayed.

Make sure it is the most up-to-date version of the software for the encoding procedure.

Press the right arrow.



G03398062

Fig. 208: Display Version ID Page
Courtesy of BMW OF NORTH AMERICA, INC.

Select vehicle series (i.e "E36 Series").



G03398063

Fig. 209: Selecting Vehicle Series
Courtesy of BMW OF NORTH AMERICA, INC.

Select "**Recoding**".

Then advance screen to the right.



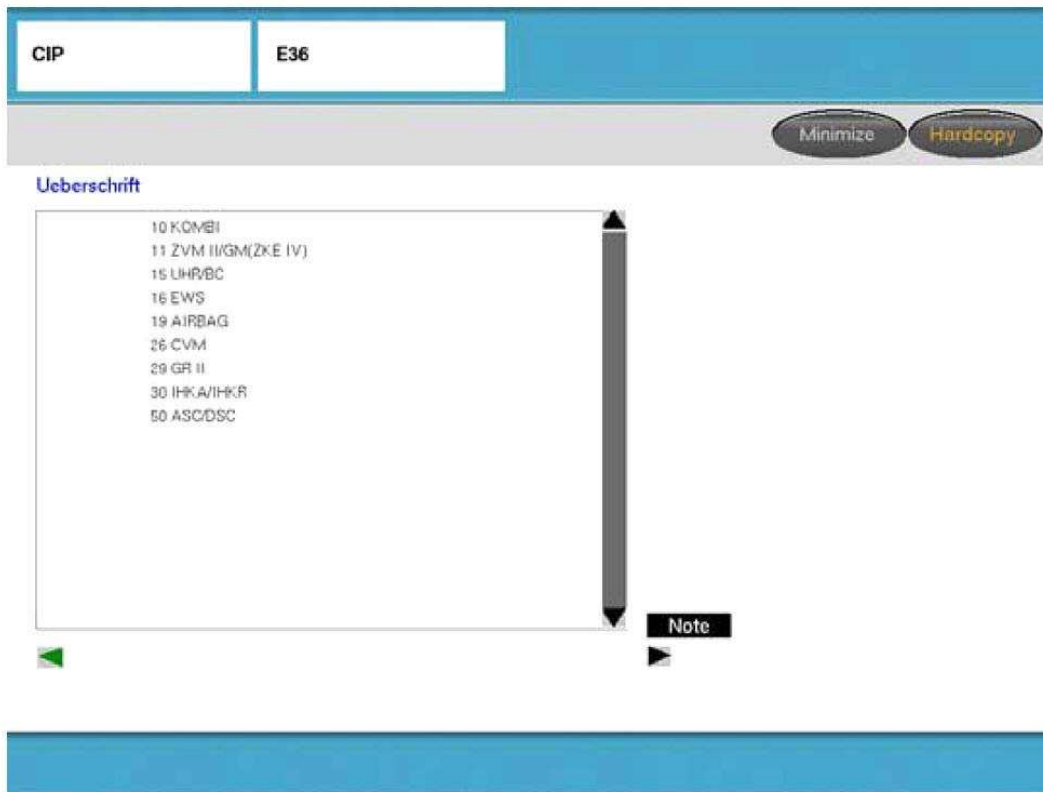
G03398064

Fig. 210: Selecting Recoding Button
Courtesy of BMW OF NORTH AMERICA, INC.

Displays control modules that are ZCS codable.

Example:

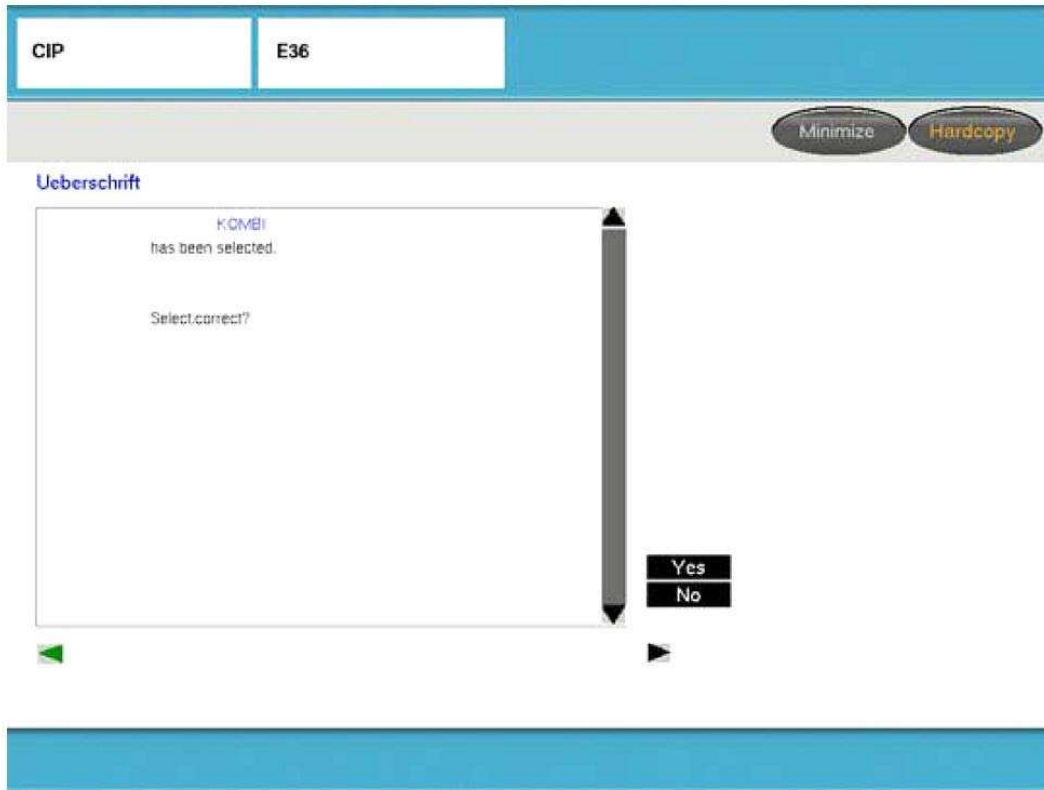
Select "**KOMBI**".



G03398065

Fig. 211: Selecting COMBI Button
Courtesy of BMW OF NORTH AMERICA, INC.

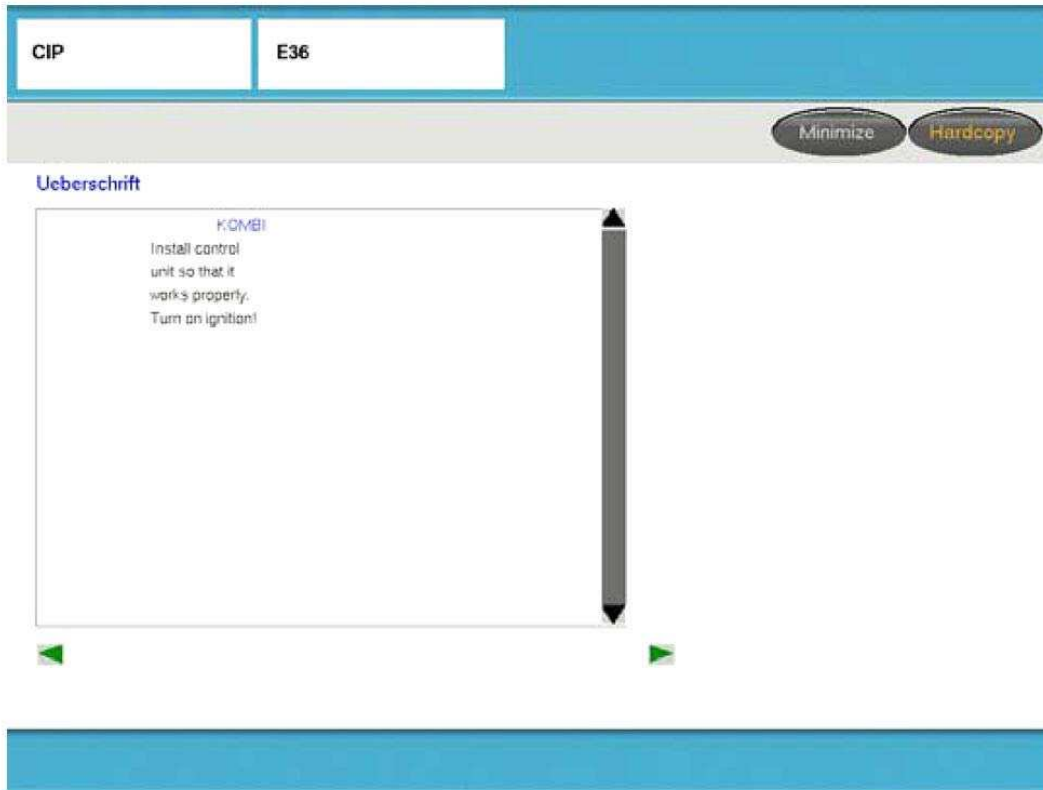
Select "Yes" to recode KOMBI.



G03398066

Fig. 212: Selecting YES Button
Courtesy of BMW OF NORTH AMERICA, INC.

Follow the instructions given on screen.



G03398067

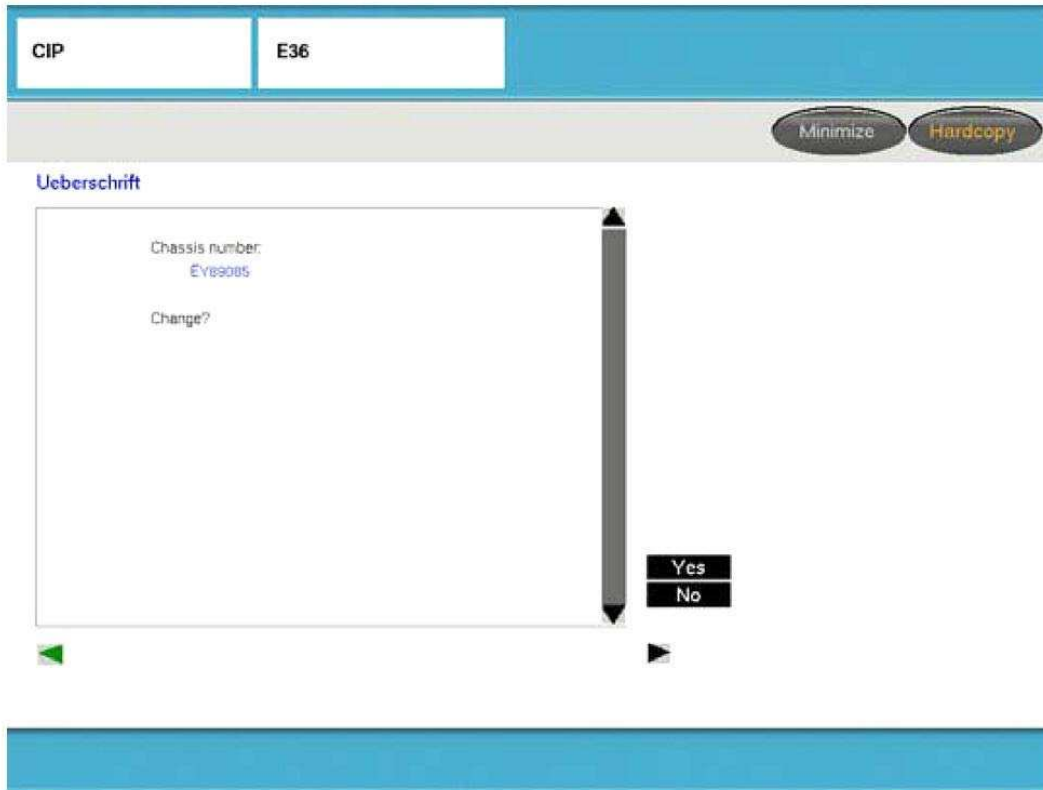
Fig. 213: Display Instructions
Courtesy of BMW OF NORTH AMERICA, INC.

Chassis number of vehicle is displayed.

Select "Yes" to accept VIN.

Select "No" if VIN needs to be changed.

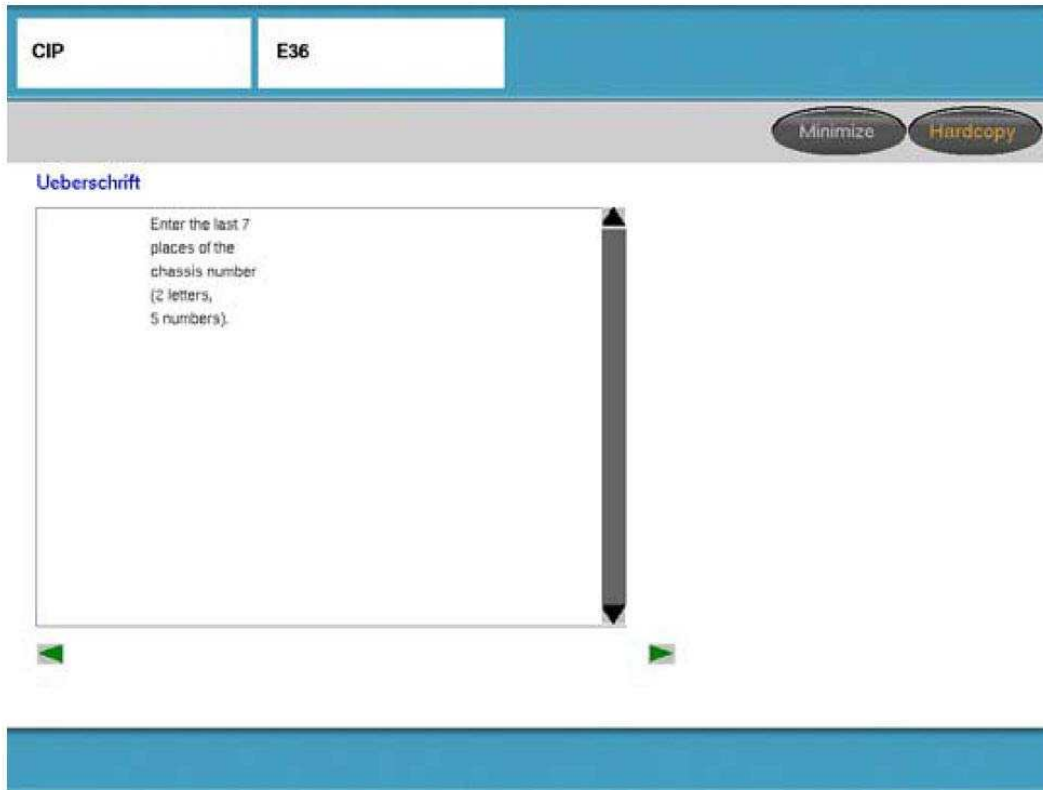
When installing a new module the last 7 digits of the VIN will need to be entered.



G03398068

Fig. 214: Selecting YES Button
Courtesy of BMW OF NORTH AMERICA, INC.

Follow the instructions given on screen.



G03398069

Fig. 215: Display Instructions

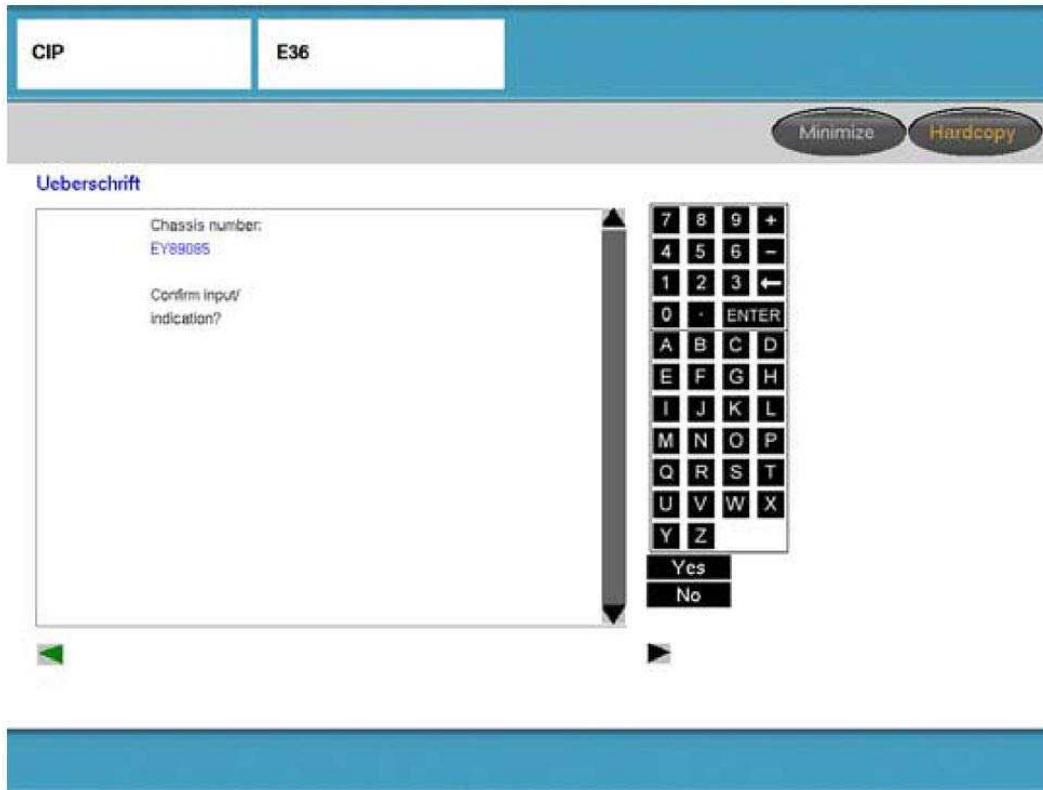
Courtesy of BMW OF NORTH AMERICA, INC.

Chassis number of vehicle is displayed, enter VIN using touch screen pad or the keyboard on an SSS.

Select "Yes" to accept VIN.

Select "No" if VIN needs to be changed/corrected.

When installing a new module the last 7 digits of the VIN will need to be entered.



G03398070

Fig. 216: Display Chassis Number Of Vehicle
Courtesy of BMW OF NORTH AMERICA, INC.

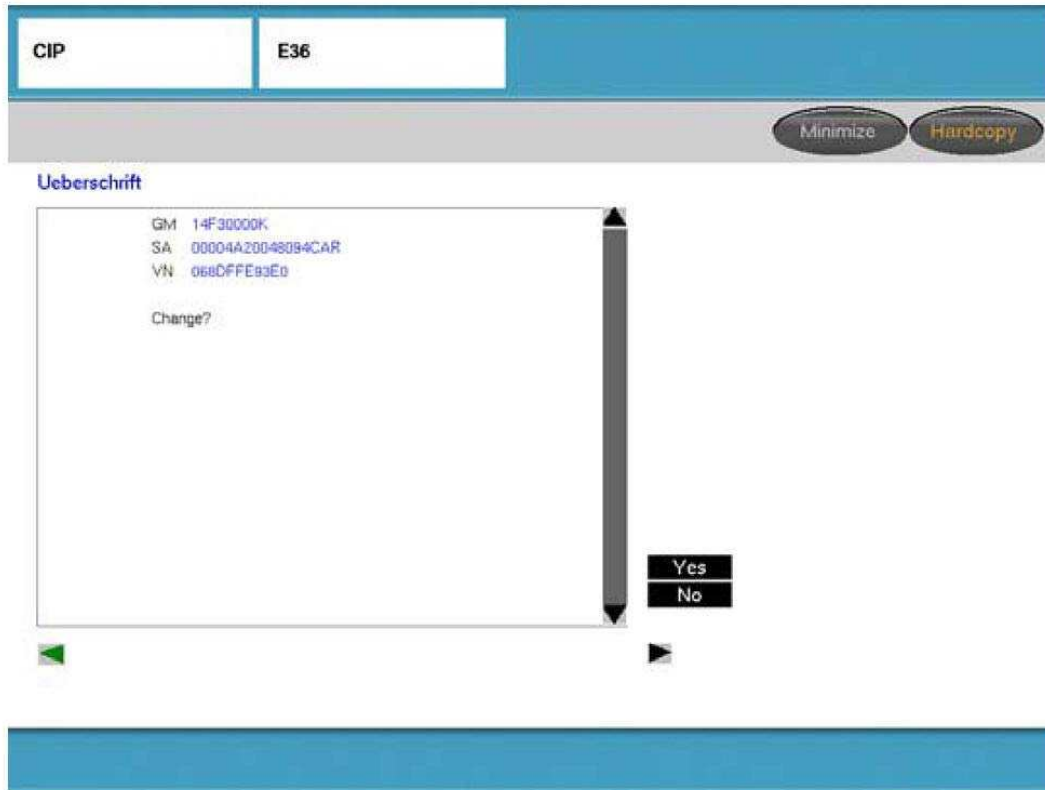
Current ZCS code is displayed

Select **"YES"** to accept current code

Select **"No"** to change the ZCS data

When installing a new module the ZCS code of the vehicle will need to be entered. The information can be obtained from:

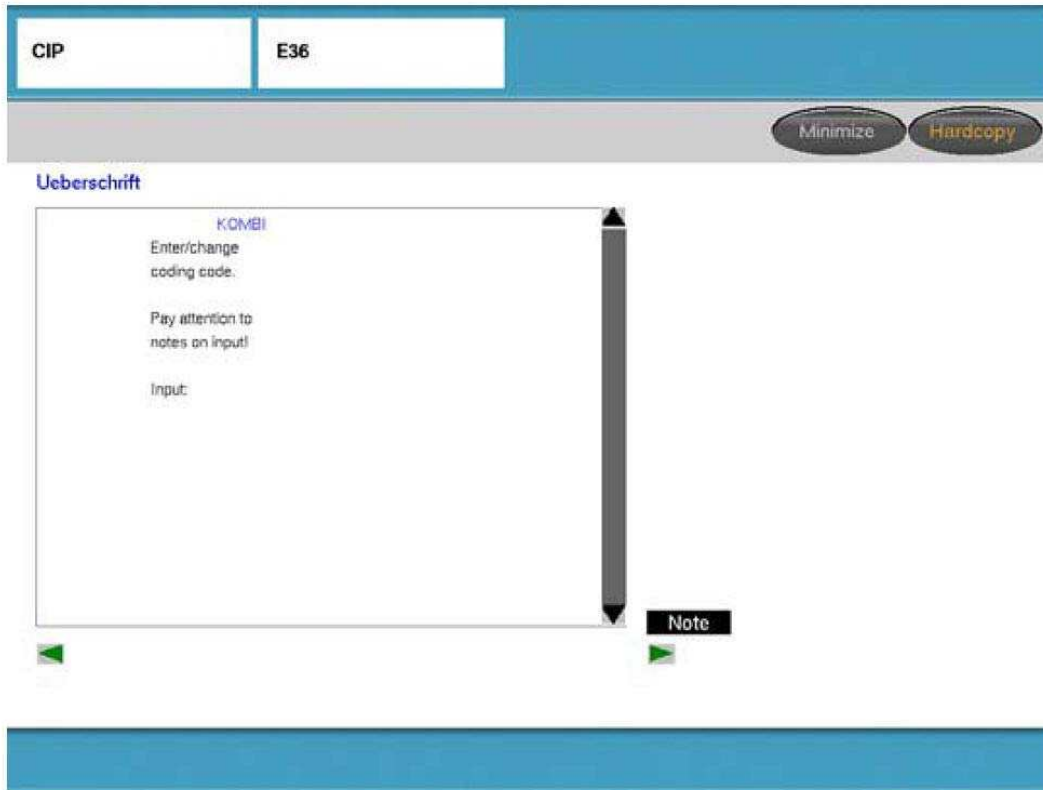
- ZCS print out of old module before removal
- ZCS label located in vehicle



G03398071

Fig. 217: Selecting Yes Button
Courtesy of BMW OF NORTH AMERICA, INC.

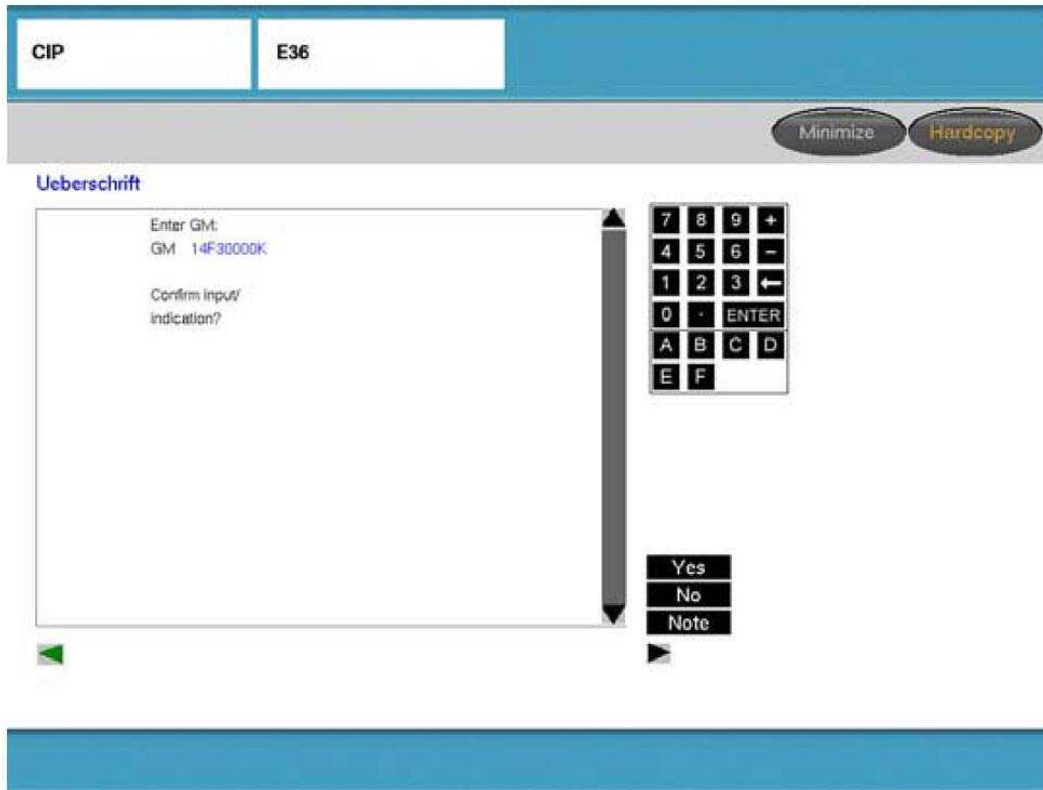
If the ZCS code must be changed follow the instruction given on screen and enter the required information exactly as indicated on the ZCS label or printout of ZCS code before removal of module.



G03398072

Fig. 218: Display Instruction
Courtesy of BMW OF NORTH AMERICA, INC.

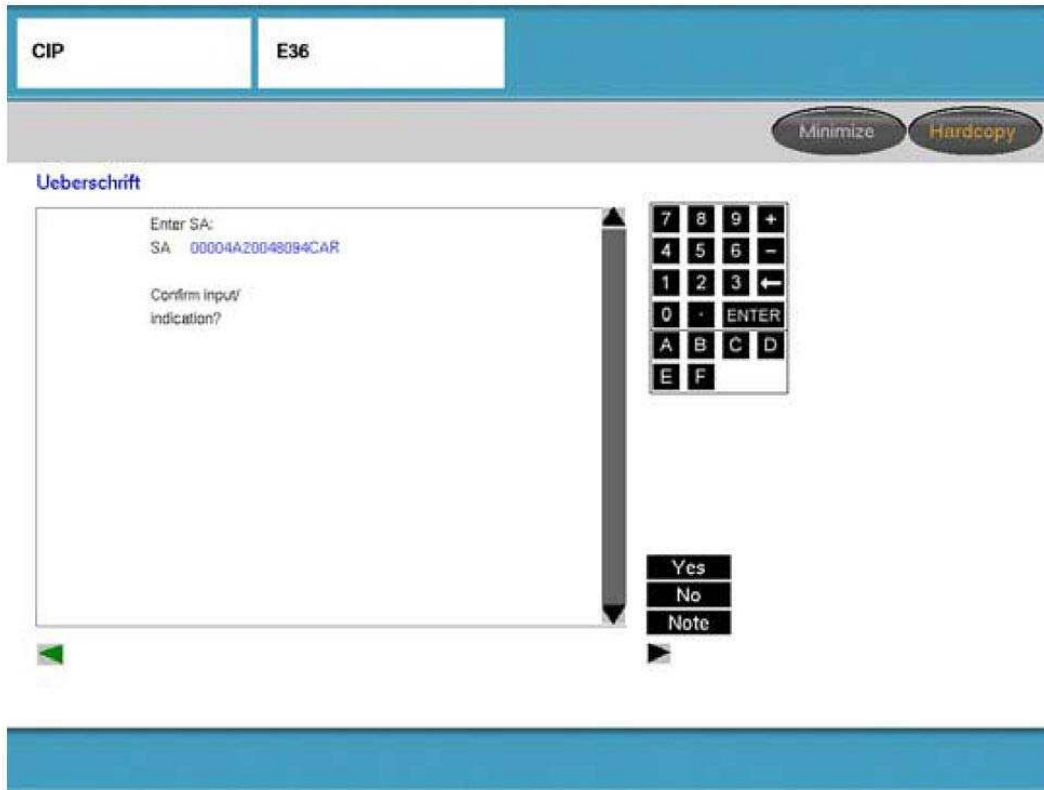
Confirm or enter new GM information.



G03398073

Fig. 219: Entering New GM Information
Courtesy of BMW OF NORTH AMERICA, INC.

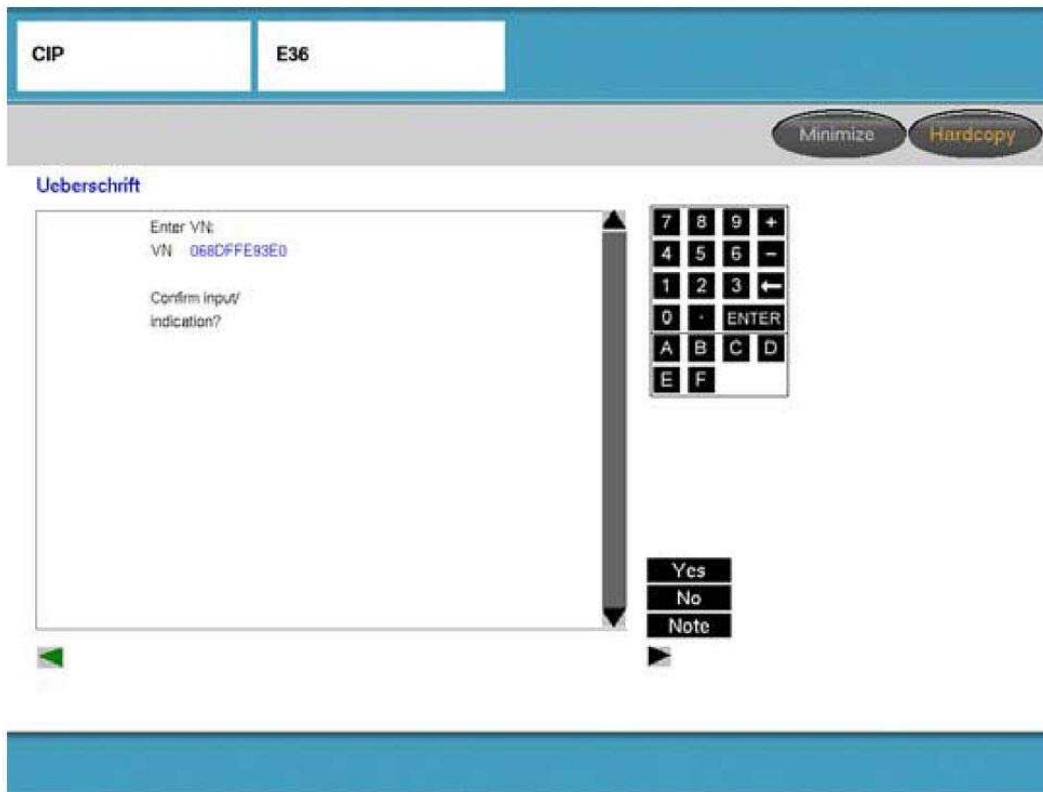
Confirm or enter new SA information.



G03398074

Fig. 220: Entering New SA Information
Courtesy of BMW OF NORTH AMERICA, INC.

Confirm or enter new VN information.

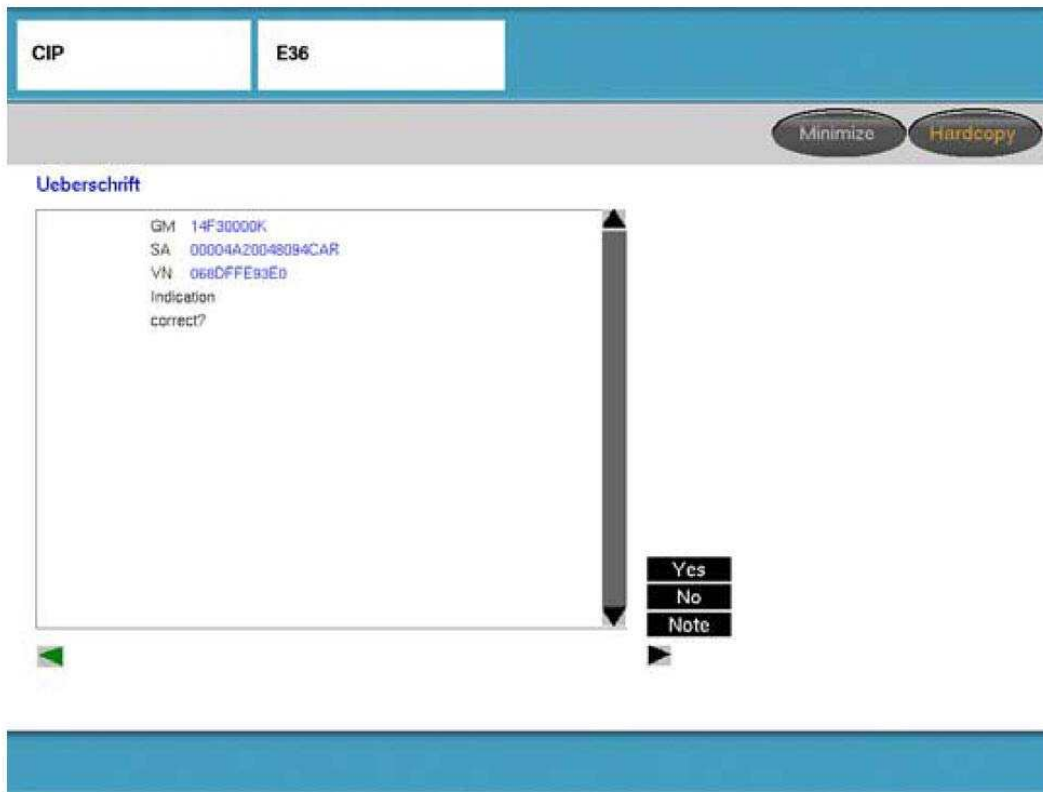


G03398075

Fig. 221: Entering New VN Information

Courtesy of BMW OF NORTH AMERICA, INC.

Confirm or correct ZCS information.



G03398076

Fig. 222: Confirming Correct ZCS Information
Courtesy of BMW OF NORTH AMERICA, INC.

Select "Yes" to begin the coding process for the installed/selected module.

Upon completion of the coding process print out a copy of the ZCS information displayed and attach it to the repair order to be maintained with vehicle file.

Switch ignition off for 10 seconds, then check for proper system operation.



G03398077

Fig. 223: Selecting Yes Button

Courtesy of BMW OF NORTH AMERICA, INC.

Automatic Coding Procedure

When a control module is replaced that does not store the ZCS code, the replacement module is coded automatically using the ZCS code stored in the Kombi, EWS or LSZ.

From Progman establish a connection to the interface connected to the vehicle and access CIP.

To perform the procedure from CIP the Model series must be selected (**3 series, 7 series ...**).

Then select the body (**E32, E36 ...**).

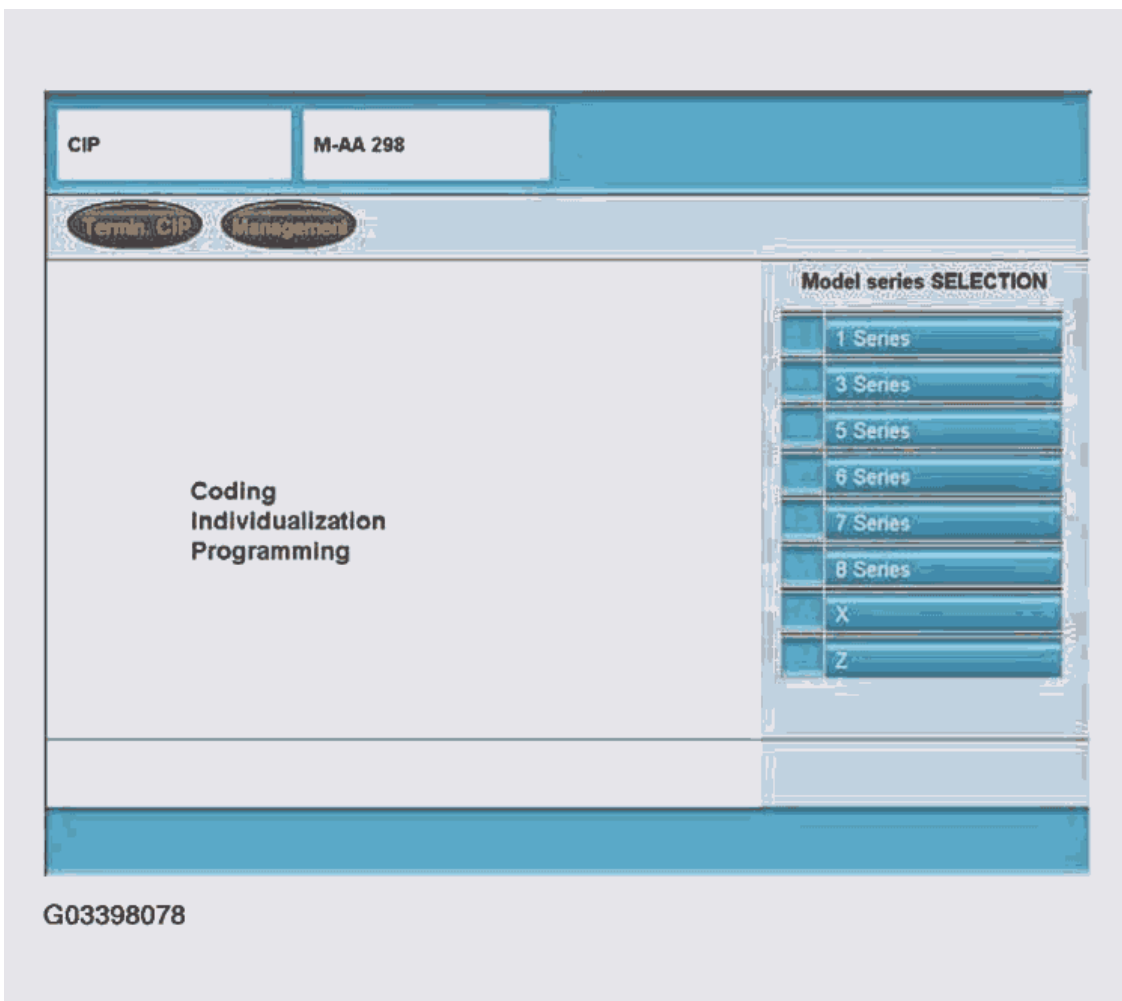


Fig. 224: Display Model Series Selection Screen
Courtesy of BMW OF NORTH AMERICA, INC.

Select "**Codierung ZCS/FA**".

Then advance screen to the right two times to enter the vehicle series selection screen.

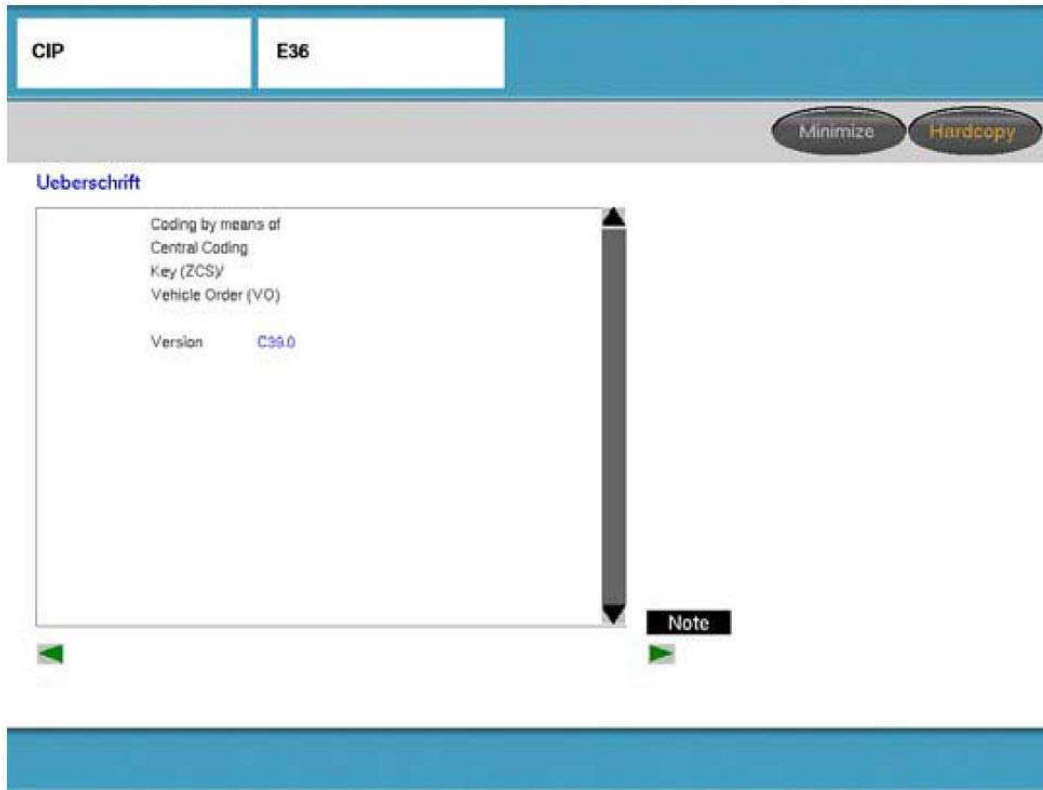


Fig. 225: Selecting Codierung ZCS/FA Button
Courtesy of BMW OF NORTH AMERICA, INC.

The version ID page is displayed.

Make sure it is the most up-to-date version of the software for the encoding procedure.

Press the right arrow.



G03398080

Fig. 226: Pressing Right Arrow
Courtesy of BMW OF NORTH AMERICA, INC.

Select vehicle series (i.e "E36 Series").

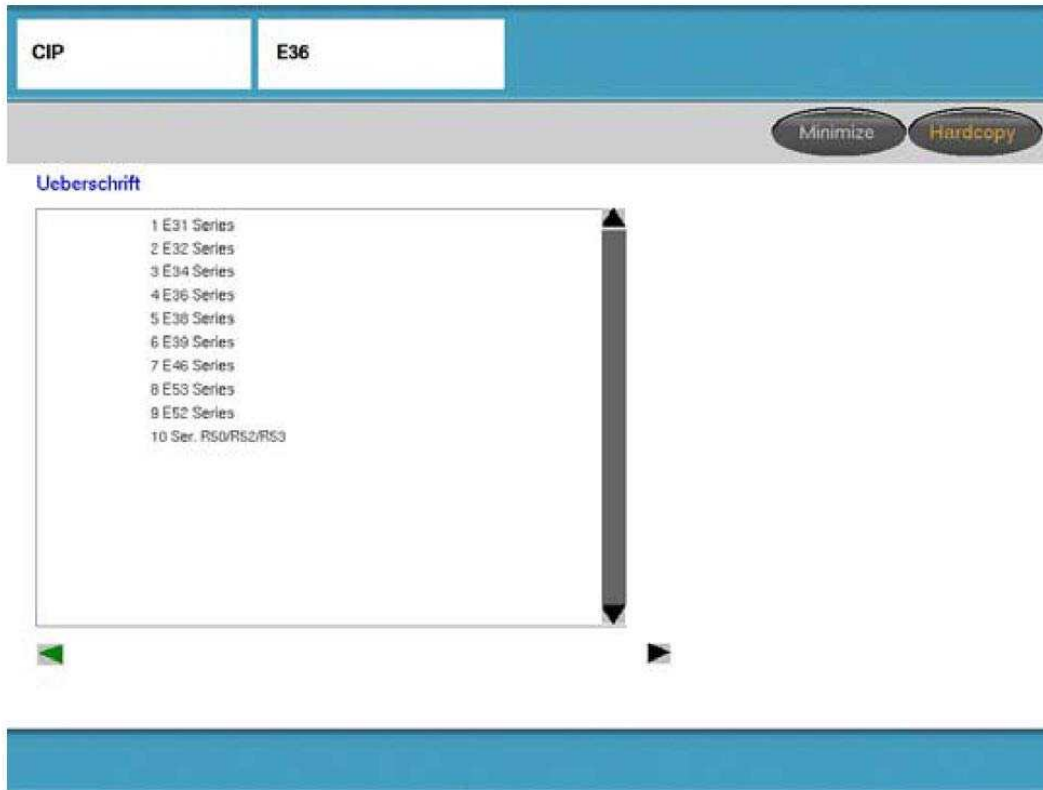
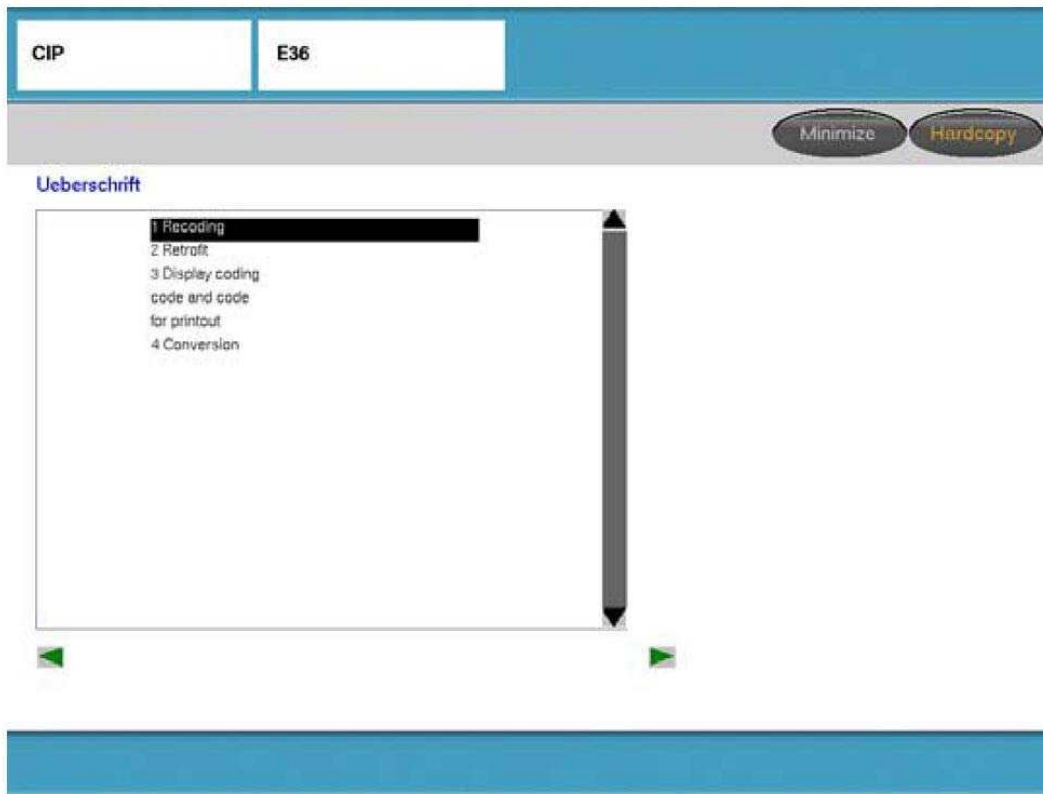


Fig. 227: Selecting Vehicle Series
Courtesy of BMW OF NORTH AMERICA, INC.

Select "**Recoding**"

Then advance screen to the right.



G03398082

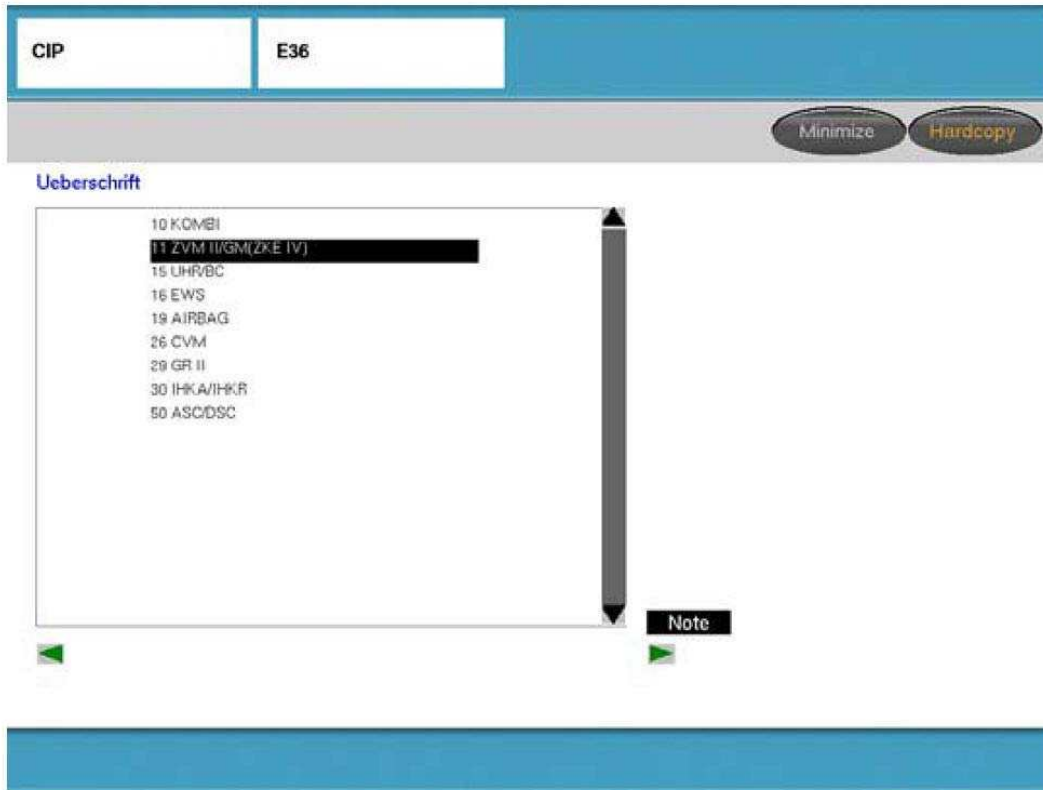
Fig. 228: Selecting Recoding Button

Courtesy of BMW OF NORTH AMERICA, INC.

Displays control modules that are ZCS codable.

Example:

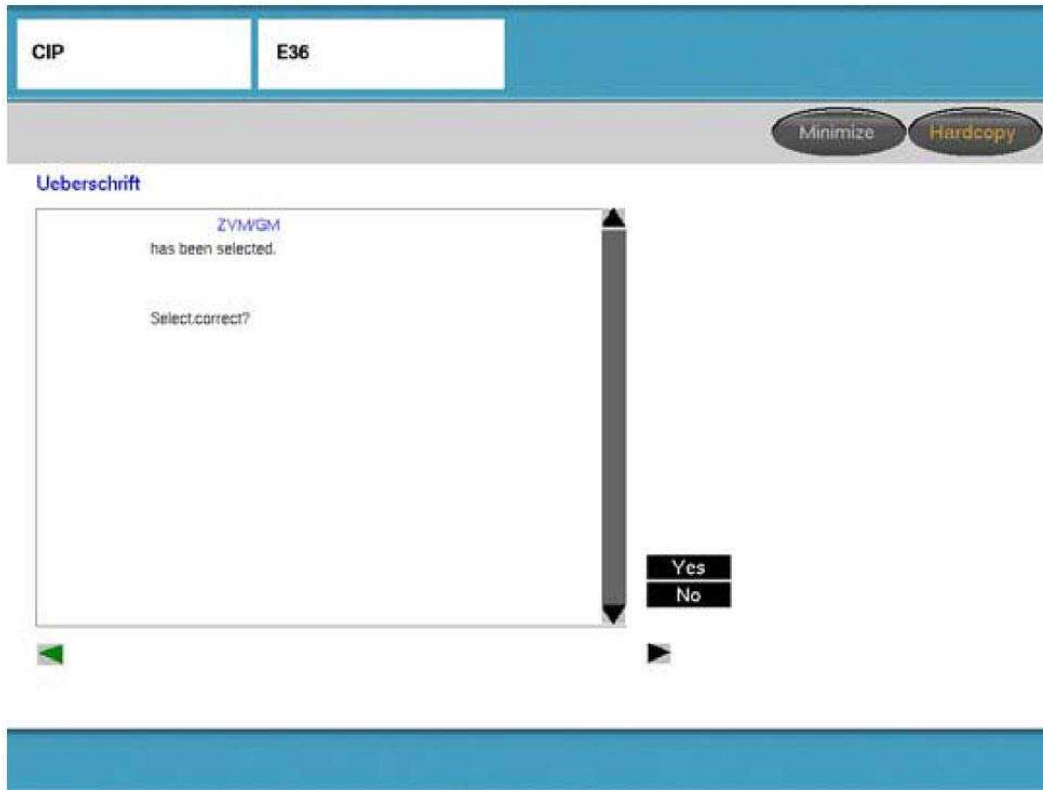
Select "ZVN II/GM (ZKE IV)".



G03398083

Fig. 229: Selecting ZVN II/GM (ZKE IV) Button
Courtesy of BMW OF NORTH AMERICA, INC.

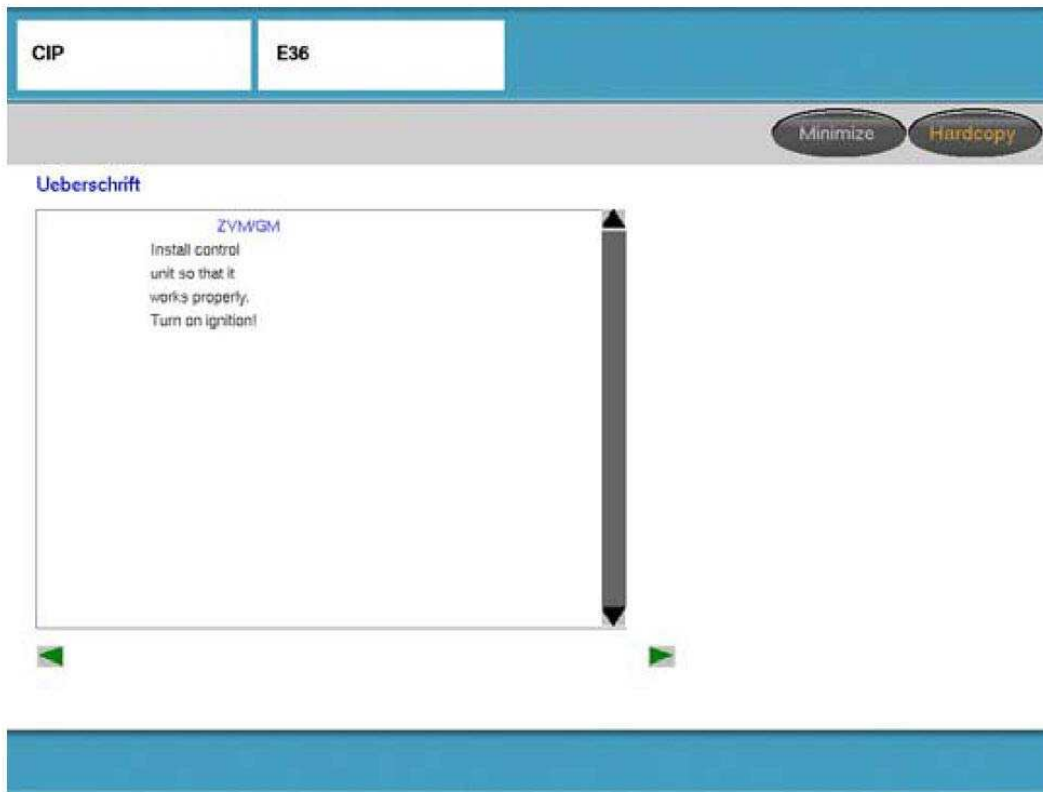
Confirm module selection.



G03398084

Fig. 230: Confirming Module Selection
Courtesy of BMW OF NORTH AMERICA, INC.

If a replacement module is to be installed install it now.



G03398085

Fig. 231: Display ZVM/VM
Courtesy of BMW OF NORTH AMERICA, INC.

Select yes to begin coding or recoding the selected module.

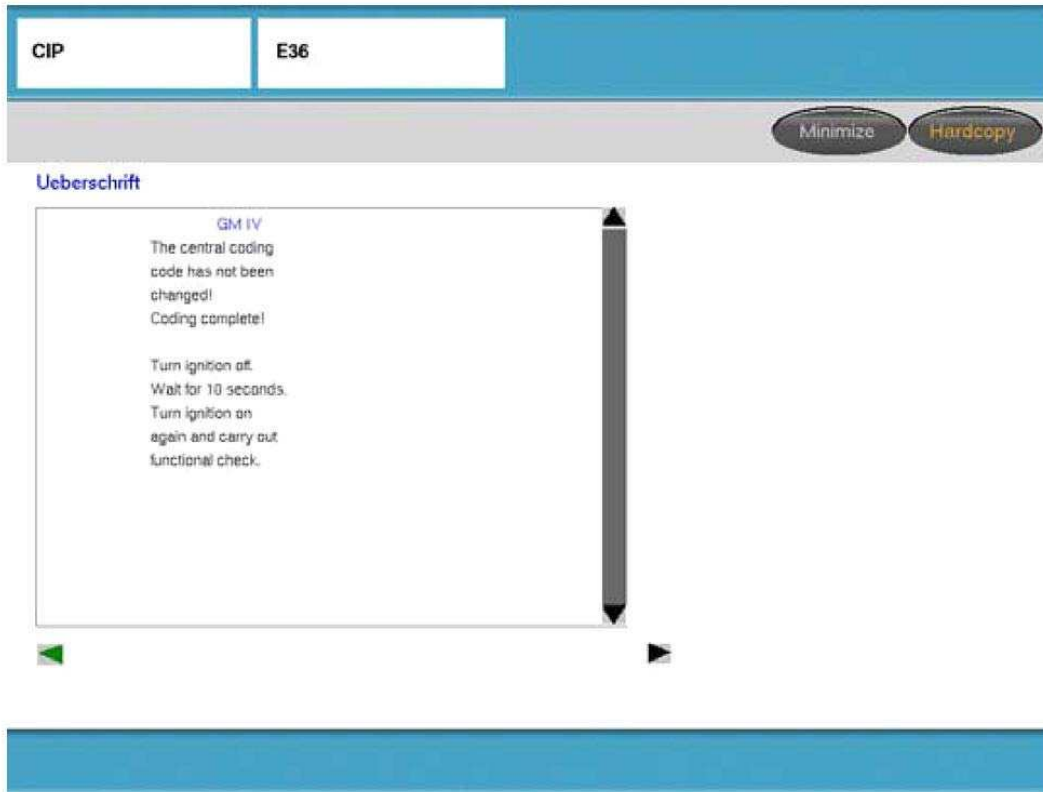


G03398086

Fig. 232: Selecting Yes Button

Courtesy of BMW OF NORTH AMERICA, INC.

Coding/recoding process of selected module is complete, follow the instructions given.



G03398087

Fig. 233: Display Instruction

Courtesy of BMW OF NORTH AMERICA, INC.

Additional ZCS Coding Functions



Fig. 234: Selecting Recoding Button
Courtesy of BMW OF NORTH AMERICA, INC.

Retrofit

The retrofit function allows options or accessory equipment to be added after the vehicle is manufactured.

By selecting to install a new option/accessory from the list of available retrofits for the specific vehicle, the ZCS information will be updated to reflect the addition of the new option or accessory that was installed. Updating of the ZCS information will ensure that the new component is recognized and able to communicate with the other modules in the vehicle.

Conversion

The conversion function allows specific features of certain control modules/systems to be modified, similar to the way Individualization (Vehicle & Key Memory) is used on newer models to "customize" a vehicle.

GENERAL INFORMATION

Complete Vehicle - E83

COMPLETE VEHICLE E83



G03305998

Fig. 1: Viewing Complete Vehicle

Courtesy of BMW OF NORTH AMERICA, INC.

HIGHLIGHTS IN BRIEF

The technical highlights of the BMW X3 are:

- xDrive, the new all-wheel drive system with variable drive torque distribution to the front and rear axles
- a multifunctional Panorama glass sunroof

The general electrical system of the E83 is largely based on the electrical system of the E46.

The E83 also employs state-of-the-art technology in its information and communication systems, based on the systems in the E85.

The following topics are briefly described below:

- **Body**

- Design
- Interior
- Bulkhead
- **Electrics/electronics**
 - Vehicle circuit structure
 - Panorama glass sunroof
 - Adaptive headlights
 - Multiple restraint system
 - Information and communication systems
 - Starter actuation
 - Instrument cluster
 - Service interval indicator
 - Centre console switch cluster
 - General module
- **Suspension**
 - Runflat indicator
 - Wheels and tyres
 - Servotronic
 - Front axle
 - Rear axle
 - Trailer stabilisation control
- **Power plants**
 - xDrive
 - Engine
 - Transmission

Some of the topics are dealt with in detail in the BMW Technical bulletins stated.

Body

○ **Design**

The BMW X3 has unmistakable, typically BMW proportions.

These include:

- the long, striking bonnet
- the roof contour the drops steeply to the rear
- a sloping rear end
- short overhangs

- a long wheelbase

The striking design of the headlights, the broad grille frame and the contoured lines of the bonnet are the defining features of the front end of the BMW X3.

Protruding wheel housing give the vehicle a sporty appearance.



G03305999

Fig. 2: Viewing Front End Of Vehicle
Courtesy of BMW OF NORTH AMERICA, INC.

The lines of the rear side windows are especially conspicuous: The lower edge of the rear side window departs from the waist line and climbs dynamically to the D-pillar.

The large tailgate is made of a single element.



G03306000

Fig. 3: Viewing Rear Side Of Window
Courtesy of BMW OF NORTH AMERICA, INC.

○ **Interior**

The interior is functional and yet sporty. Modern layout, right down to the finest detail make the BMW X3 what it is (e.g. intricate areas on the door handle).

Various materials are employed, from sporty aluminium to elegant full leather and wood.



G03306001

Fig. 4: Viewing Interior Of Vehicle
Courtesy of BMW OF NORTH AMERICA, INC.

○ **Bulkhead**

The bulkhead is bolted and for the first time on a BMW made of a steel/plastic composite.

IMPORTANT: If the bulkhead is damaged in an accident, do not attempt to straighten it but rather replace it.

The rigidity of the bulkhead is only provided in the original condition.



G03306002

Fig. 5: Viewing Bulkhead Of Vehicle
Courtesy of BMW OF NORTH AMERICA, INC.

Electrics/Electronics

- **Vehicle circuit structure**

The control units are networked in a similar manner to the E46. The following data buses are available on the E83:

- **Body bus**

The body bus (K bus) networks the following components:

- Components of the general electrical system
- Components of the information and communication systems
- Components of the passive safety system.

The major part of these systems and components have been taken from other models and

adapted for the E83.

The control units for the Panorama glass sunroof and the multiple restraint system 4 (MRS) are connected to the K bus.

- **Powertrain CAN**

The powertrain CAN (PT-CAN or powertrain controller area network) links the control units for the drive and running gear control systems.

New features of the PT-CAN are: the control unit for the transfer box (VTG) and the control unit for the servotronic.

The transfer box control unit controls the distribution of drive forces between the front axle and the rear axle.

The servotronic control unit controls the speed-dependent power steering.

- **LIN bus**

The LIN bus (Local Interconnect-Network bus) is serial, single-wire bus, standardised for the automotive industry. The LIN bus links the components for the electric exterior mirrors: switch block, base module and exterior mirrors.

The LIN bus also connects the control unit for the adaptive headlights (AHL) with the stepper motor controllers. (The stepper motor controllers control the stepper motors for the headlight-range adjustment and for the AHL).

- **Diagnosis bus**

The diagnosis bus (D-bus) is connected to the entire vehicle electrical system. The individual control units are either connected directly to the D-bus or via the control unit in the instrument cluster.

- **Panorama glass sunroof**

The fully automatic Panorama glass sunroof comprises 2 glass sunroofs: The front glass sunroof works like a sliding/tilt sunroof, the rear glass sunroof is a tilting glass sunroof.

The drive for the Panorama glass sunroof consists of 2 DC motors.

The wind deflector reduces wind noise inside the vehicle interior. The wind deflector is automatically extended, depending on the road speed.

For more information, refer to **PANORAMA GLASS SUNROOF - SI TECHNIQUES - E53, E61, E83, E91**

○ **Adaptive headlights**

The adaptive headlights (AHL) directs the beam of the headlights towards the inside of the curve when cornering - the curve is illuminated better. Visibility is thus improved.

When cornering, the driver is not looking into a "black hole" - instead, the adaptive headlights allow the driver to see the curve of the road. Adaptive headlights is an item of special equipment.

○ **Multiple restraint system**

The new multiple restraint system 4 (MRS) is an advanced development of the current MRS.

MRS consists of a control unit, several external sensors for recording an impact, a seat-occupancy detector and gas generators for triggering the airbags.

The external sensors are:

- 2 airbag front sensors
- Airbag sensor, front left door
- Airbag sensor, front right door
- Airbag sensor, B-pillar left
- Airbag sensor, B-pillar right

US version: Seat-occupancy detector

In the US version, the seat-occupancy detector is able to detect the weight class of the occupant:

- The seat-occupancy detector mat contains pressure-sensitive sensors.
- The pressure generated by the person sitting on the seat-occupancy detector mat is recorded by the sensors.
- The electronic evaluation unit uses the sensor signals to determine the weight class of the person on the front-passenger seat.

For more information, refer to **AUDIO, NAVIGATION AND ANTI-THEFT** .

Information And Communication Systems

The information and communication systems have the following new features/modifications:

- Different telephone systems are employed on the E83.

The permanently installed units use the "Everest" platform, bluetooth mobile phones work with the "universal charging and hands-free facility" (ULF).

- The audio system available are taken from the E85.

The loudspeaker systems are new developments and have been adapted to the acoustic conditions in the E83.

- The CD changer is installed in a user-friendly manner in the front armrest between the driver's and front-passenger seat.
- The hi-fi amplifier in the luggage compartment of the E83 is a modified version of the hi-fi amplifier from the E85 and E46. The 10-channel hi-fi amplifier has been made into a 6-channel hi-fi amplifier through a series of modifications to the internal circuitry.
- Option 209 "Navigation system Professional" includes a folding central information display (CID). The CID is located in the middle of the instrument panel.
- **US version: Satellite Digital Audio Radio Service (SDARS)**

In the USA, BMW uses the SDARS of "Sirius Satellite Radio Inc."

SDARS allows digital signal (audio and information signals) to be transmitted.

Audio signals are, e.g.:

- Music
- Speech

Information signals are, e.g.:

- Radio station
- Artist
- Music track

Signals are transmitted via 3 satellites (by the national radio station "Sirius Satellite Radio Inc." in New York).

The satellites transmit the signals to the mobile SDARS tuner in the vehicle and to stationary aerials on the ground (to enlarge the reception area).

- **Starter actuation**

The E83 employs the EWS3 plus (EWS = electronic immobilizer). With the EWS3 plus system, the information "terminal 50 ON" is not forwarded to the DME / DDE (digital engine electronics / digital diesel electronics) by the starter, but rather directly by the EWS control unit.

- **Instrument cluster**

The E83 instrument cluster differs from the E85 instrument cluster as follows:

The instrument cluster on the E83 has the same software as that on the E85. All other function are identical.

- The reading on the speedometer is restricted to a scale reading of 250 km/h

- Additional warning light for washer fluid level in windscreen washer fluid reservoir
- Additional indicator and warning light for the digital diesel electronics (DDE)

This indicator and warning light fulfils the same functions as the indicator and warning light for the electronic engine output control (EML). The EML warning lamp lights up if a fault develops in the engine electronics.

○ **Service interval indicator**

The service interval indicator (SIA 4) is installed on the E83.

Condition Based Service (CBS) is not employed on the E83.

○ **Centre console switch cluster**

The Centre console switch cluster (SZM) has been taken from the E53.

The SZM button for opening the upper tailgate is not longer fitted as the E83 does not have a 2-section tailgate.

○ **General module**

General module 5 (GM) is introduced with the E85 and on the E83 also controls the exterior mirrors (via the LIN bus).

Suspension

○ **Servotronic**

On the E83, the servotronic (SVT) is integrated in a separate control unit.

The SVT control unit is connected to the powertrain CAN (PT-CAN) and to the body bus (K bus).

For more information, refer to **STEERING AND WHEEL ALIGNMENT - SI TECHNIQUES - E83**.

○ **Front axle**

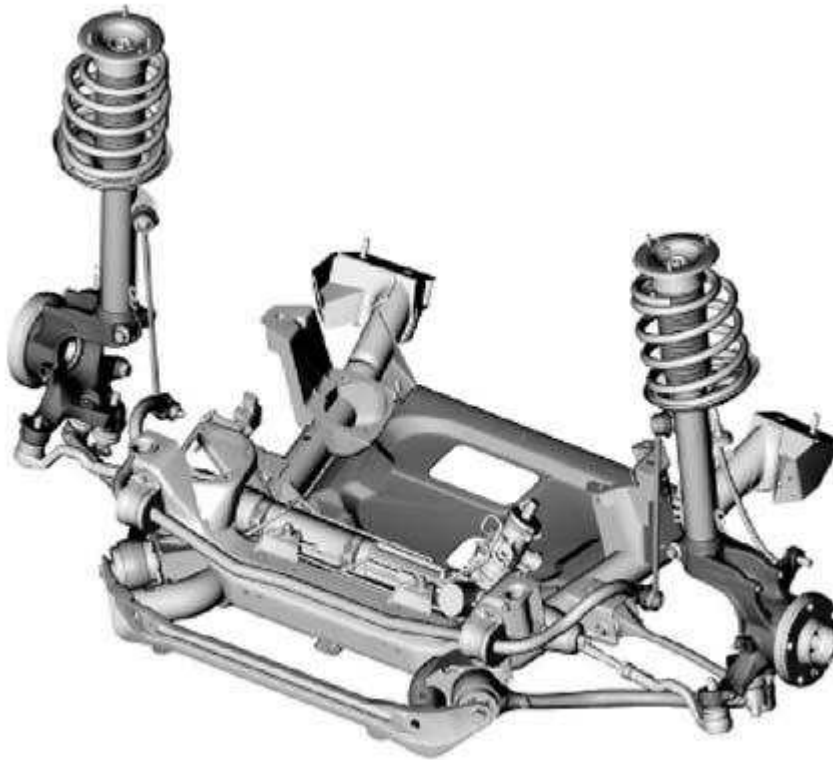
The front axle is a double pivot spring-strut axle with tension strut, transverse link and rack-and-pinion power-steering.

The E83 front axle differs from the E53 front axle as follows:

- Modified level sensor (identical component as on rear axle) with elongated hole and tab (locking device)
- New bellows on steering track rod, transverse link and tension strut
- Front axle carrier made of high-strength steel tubing and clipped plastic cover as protection against

stone impact

- Screw connection for hinged bracket with different nuts at top and bottom
- Double screw connection for front axle carrier left and right



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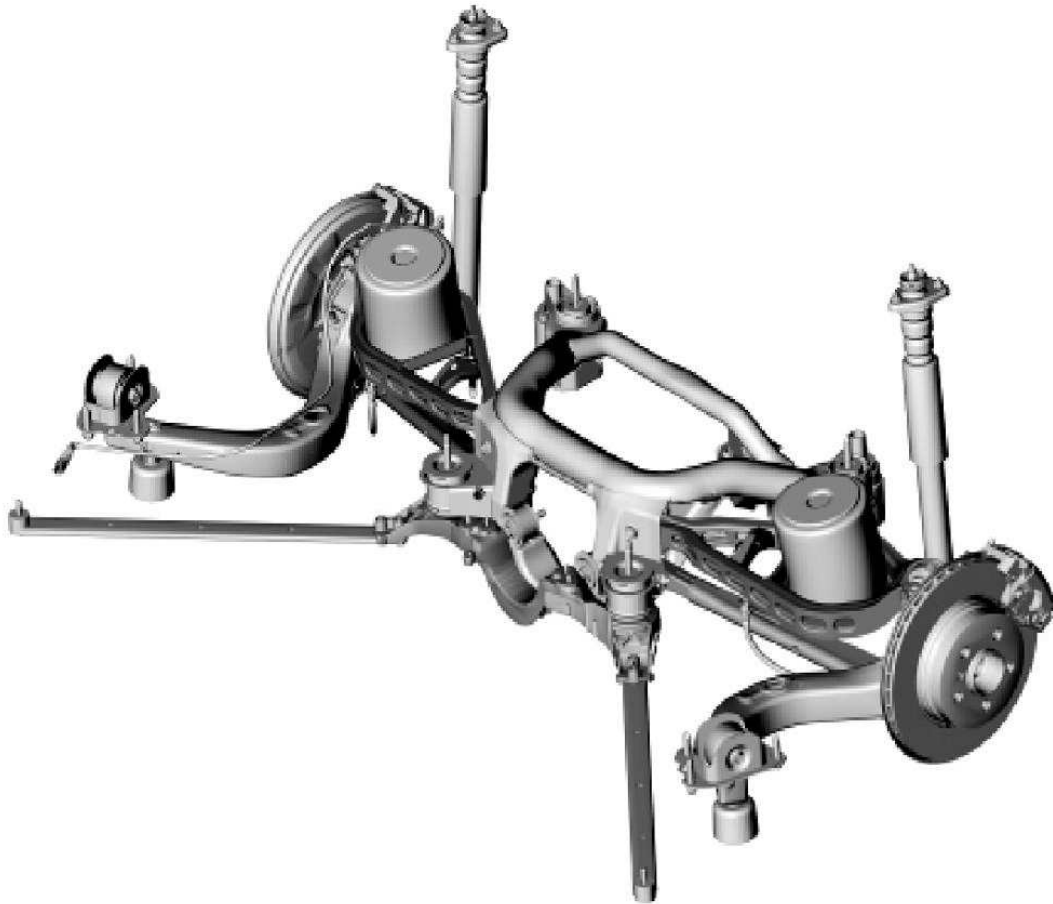
Fig. 6: Viewing Double Pivot Spring Strut Axle E38 Front Suspension
Courtesy of BMW OF NORTH AMERICA, INC.

○ Rear axle

The rear axle is a central-link rear axle with subframe and double-elastic differential mounting.

The E83 rear axle differs from the rear axle of the E46 all-wheel drive as follows:

- Stabilizer mounting on rear-axle member uses clamps
- Front mounting of rear axle with bolts with additional guide washer
- Torque arm with holder for tension strut
- Transverse link made of galvanizes sheet steel plate
- Hinged bracket with ball joint secured directly on the transverse link (without additional bracket)
- Damper bolted to body with 3 bolts (mounting on body)



G03306004

Fig. 7: Viewing Central Link Rear Axle
Courtesy of BMW OF NORTH AMERICA, INC.

○ **Wheels and tyres**

- All-season tyres

The E83 runs as standard on 17 inch aluminium wheels with size 235 all-season tyres. In addition, 18 inch wheels are available in different designs and with several tire sizes.

- Emergency wheel

In series production, all versions are equipped with an emergency wheel (4B x 17 IS18 steel rim with T135/90 R17 104 M tire).

The E83 has an emergency wheel tray for the emergency wheel on the floor of the vehicle, under the luggage compartment. The emergency wheel tray is released and lowered from the luggage

compartment.

The emergency wheel tray has a special service opening. This allows the tire pressure to be checked from the outside, without having to lower the emergency wheel tray.

○ **Runflat indicator**

The E83 is equipped as standard with a runflat indicator (RPA). The RPA monitors the tire pressure throughout the journey. The RPA indicates that a tire has lost a significant amount of pressure relative to the other tyres via an indicator and warning light any an acoustic signal.

The runflat indicator is integrated in the DSC control unit. By comparing the speed signals for all four wheels, the system detects differences in rolling circumference at the individual wheels.

○ **Trailer stabilisation control**

Option 235 "Trailer coupling with detachable ball head" also includes trailer stabilisation control (familiar from the E53).

Trailer stabilisation control is integrated in the Dynamic Stability Control (DSC).

The system provides detects at an early stage when the trailer starts to fishtail and automatically brakes the vehicle as follows:

- Automatic brake application (by DSC)
- Reduced engine torque (by DSC)

Drive Train

○ **xDrive**

xDrive is an innovative all-wheel drive system that comprises the Dynamic Stability Control (DSC) system and an electronically controlled multi-plate clutch in the transfer box.

Drive torque is smoothly distributed between the front and rear axles by an electronically controlled multi-plate clutch according to requirements (controlled by DSC).

xDrive distributes the drive torque to both axles as required, providing the following benefits:

- Superb operating stability up to the limits imposed by the laws of physics
- Optimal forward momentum
- Excellent traction in all road situations

For more information, refer to **XDRIVE (TRANSFER BOX) - SI TECHNIQUES - E53 & E83**.

○ **Engine**

The following familiar engines will be available on market launch:

- 6-cylinder spark-ignition engine M54B25
- 6-cylinder spark-ignition engine M54B30
- 6-cylinder diesel engine M57D30

○ **Transmission**

The following familiar transmission will be available on market launch:

- 6-speed manual transmission, standard
- 5-speed automatic transmission, special equipment (option 205)

Subject to change.

2004-05 GENERAL INFORMATION

Drive - Overview - X3

E83 DRIVE

PURPOSE OF THE SYSTEM

Drive

The E83 is available with the following engine and transmission variants in the US market:

E83 ENGINE AND TRANSMISSION VARIANTS SPECIFICATIONS

Engine	Manual Transmission	Automatic Transmission	Transference	Final Drive
M54B25 M54B30	GS6X37BZ	GA5R390R	ATC400	188K i = 3.64 (man. and auto.)

The vehicles are all fitted with the VAG 174 front axle drive.

Drive Modifications

The following modifications have been made to the engine for use in the E83:

- Modified Belt Drive - the position of the deflection pulley on the alternator (150 A Bosch/Valeo) has been modified slightly.
- M54B25 manual and automatic transmission and M54B30 manual transmission equipped vehicles use Siemens MS45.0 engine management system. This system is LEV emission compliant.
- M54B30 automatic transmission equipped vehicles use Siemens MS45.1 engine management system. This system is ULEV II emission compliant.

Exhaust System

The following exhaust system is used at the start of E83 series production:

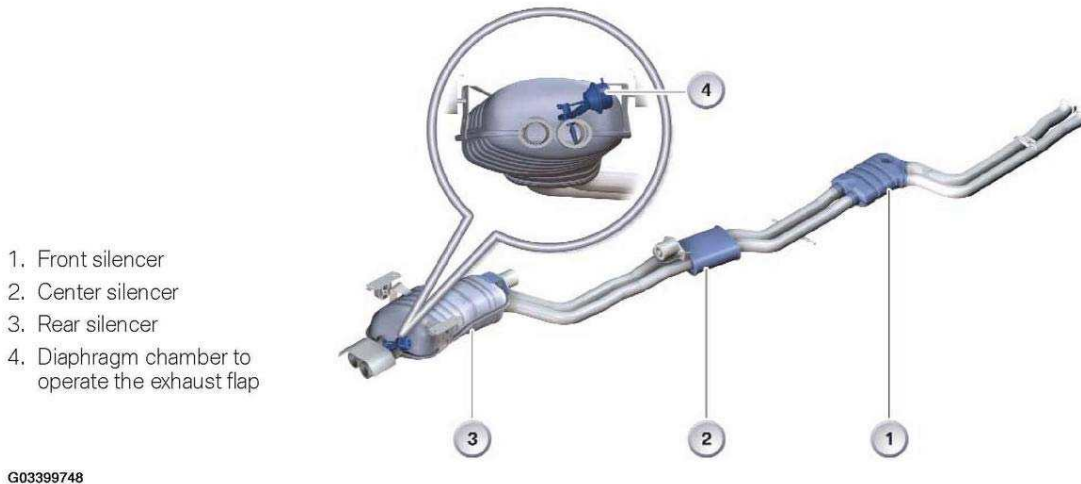


Fig. 1: Identifying Exhaust System
Courtesy of BMW OF NORTH AMERICA, INC.

The E83 exhaust system is made of stainless steel. The exhaust system connected to the M54 engine is one piece from the exhaust manifolds to the rear silencer (muffler). However, the system is available in sections for service replacement.

As on current BMW M54 engines, each exhaust manifold is equipped with metal base catalytic converters, 2 pre-catalyst and 2 post catalyst oxygen sensors.

The rear silencer is equipped with an exhaust flap (similar to the E46). It reduces noise in the lower engine RPM range. The exhaust flap is operated by a Diaphragm (4). It is controlled by a solenoid valve, which is controlled in turn by the ECM (DME). The rear silencer has an 18.5 liter volume.

Cooling System

This section describes the cooling module installed in the E83 in conjunction with the M54B25 and M54B30. The following components of the cooling module were adopted from the E46 and E85:

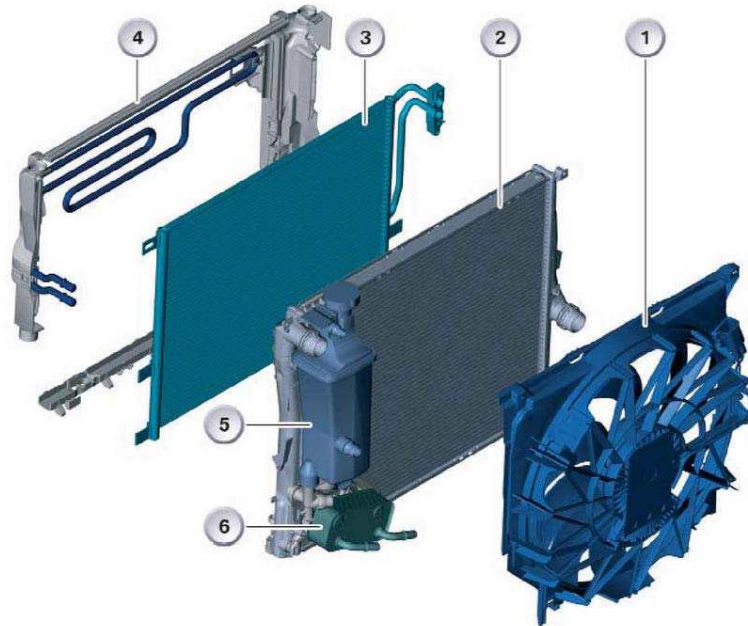
- Module carrier
- Fan
- Transmission oil cooler (oil-water heat exchanger)
- Expansion tank

The following components were physically modified for use in the E83:

- Radiator - performance increased
- Fan shroud
- A/C condenser - performance increased
- PS cooler - performance increased

Cooling Module Components

1. Electric fan (600 W) and shroud
2. Radiator
3. A/C condenser
4. P/S cooler (hose loop)
5. Expansion tank
6. Automatic transmission cooler (heat exchanger)



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Fig. 2: Identifying Cooling Module Components
Courtesy of BMW OF NORTH AMERICA, INC.

E83 Fuel System Modifications

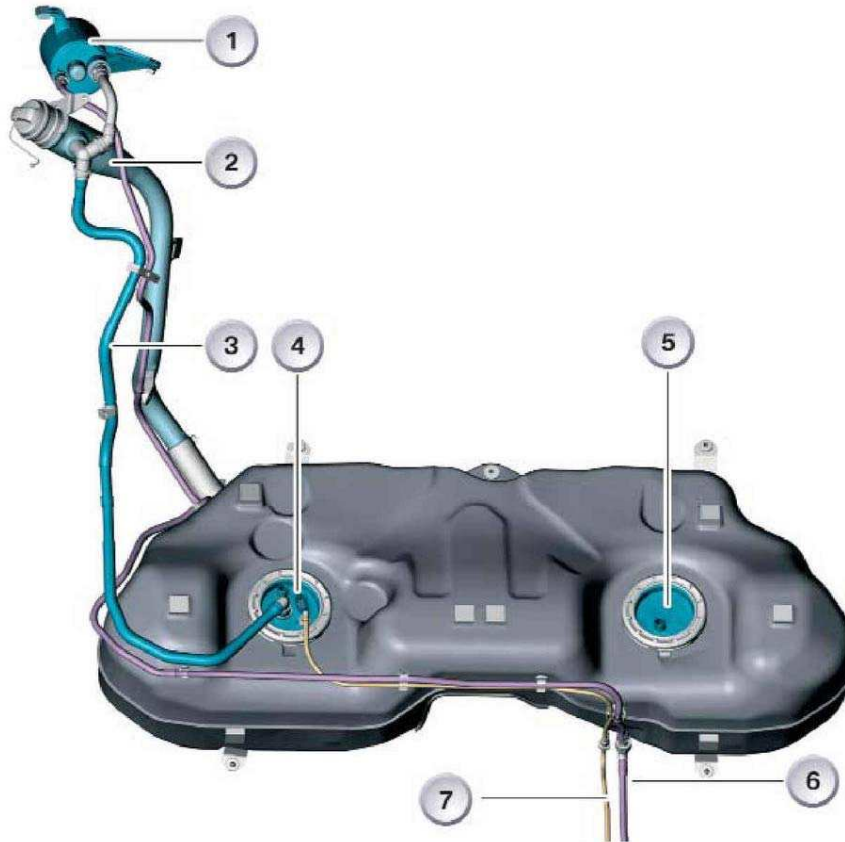
To comply with ever increasing emissions laws, the E83 fuel system has a further decrease in the number of openings and ports over previous series production. On the E83, the filler valves and service breather valves are completely encapsulated by the fuel tank.

The only ports/openings except the fuel filler neck are located in the two service access cover plates.

Components

The fuel tank is located above the drive shaft in front of the rear axle (similar to E46) and is secured by two tensioning straps. The fuel tank capacity is 67 liters, including 8 liters of reserve fuel. It is made of plastic (multi-layer HDPE) with an intermediate layer (barrier layer).

Access to the fuel filter, pressure regulator, the two fuel level sensors and the electric fuel pump are through the two service access covers. The fuel filler neck is secured to the right hand side of the fuel tank with hose clamps.



1. Activated charcoal filter with DM TL
2. Filler pipe
3. Vent line
4. Right service access cover

5. Left service access cover
6. Evaporative purge line
7. Fuel delivery line

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Fig. 3: Identifying Fuel System Components
Courtesy of BMW OF NORTH AMERICA, INC.

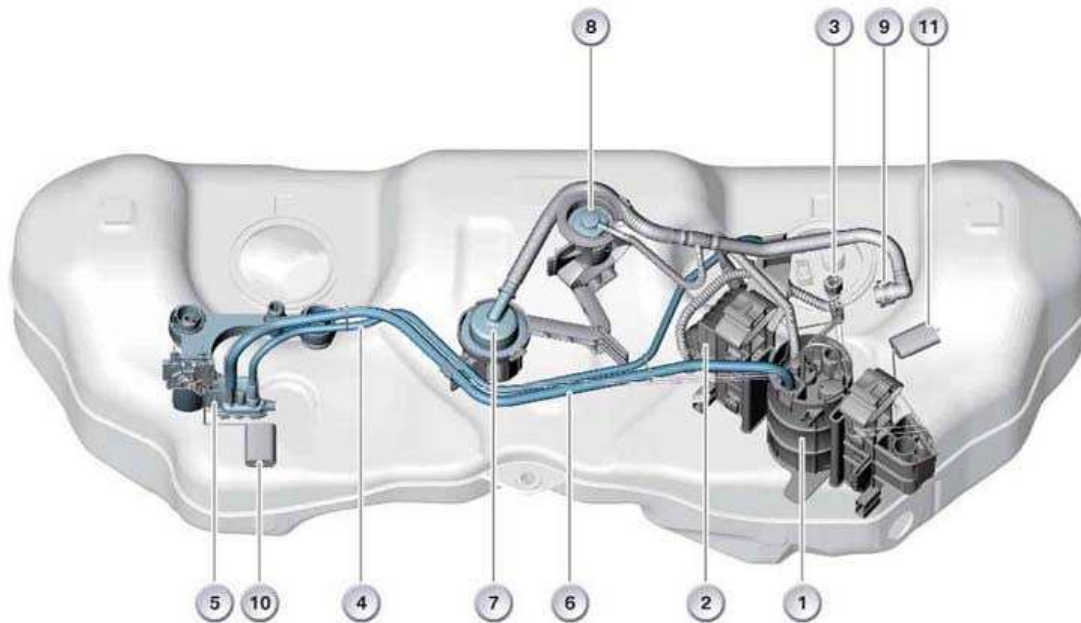
The fuel delivery unit comprises the following components in the right hand side of the fuel tank:

- Fuel baffle with electric fuel pump and right hand suction-jet pump
- Right hand fuel level sensor
- Fuel filter with pressure regulator.

In the left hand side of the fuel tank:

- Left hand fuel level sensor
- Left hand suction-jet pump

The components are accessible through the two service access covers.



- | | |
|---|---|
| 1. Fuel baffle chamber with electric fuel pump (EKP) | 7. Filler breather valve |
| 2. Fuel filter with pressure regulator (3.5 bar) | 8. Service breather valve |
| 3. Fuel feed (port in the service access cover) | 9. Vent line (port in the service access cover) |
| 4. Return flow from the pressure regulator for the left hand suction-jet pump | 10. Left hand fuel level sensor |
| 5. Left hand suction-jet pump | 11. Right hand fuel level sensor |
| 6. Return flow from the left hand suction-jet pump into the fuel baffle chamber | |

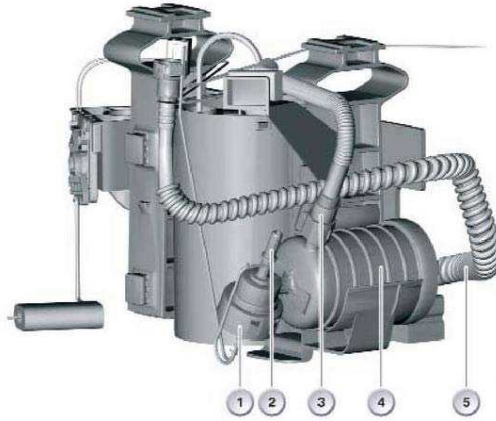
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Fig. 4: Identifying Fuel Delivery Unit And Fuel Tank
Courtesy of BMW OF NORTH AMERICA, INC.

The fuel filter and the pressure regulator form one component, the pressure regulator for the M54 engines are 3.5 bar.

The fuel filter is replaced together with the pressure regulator for service repairs.

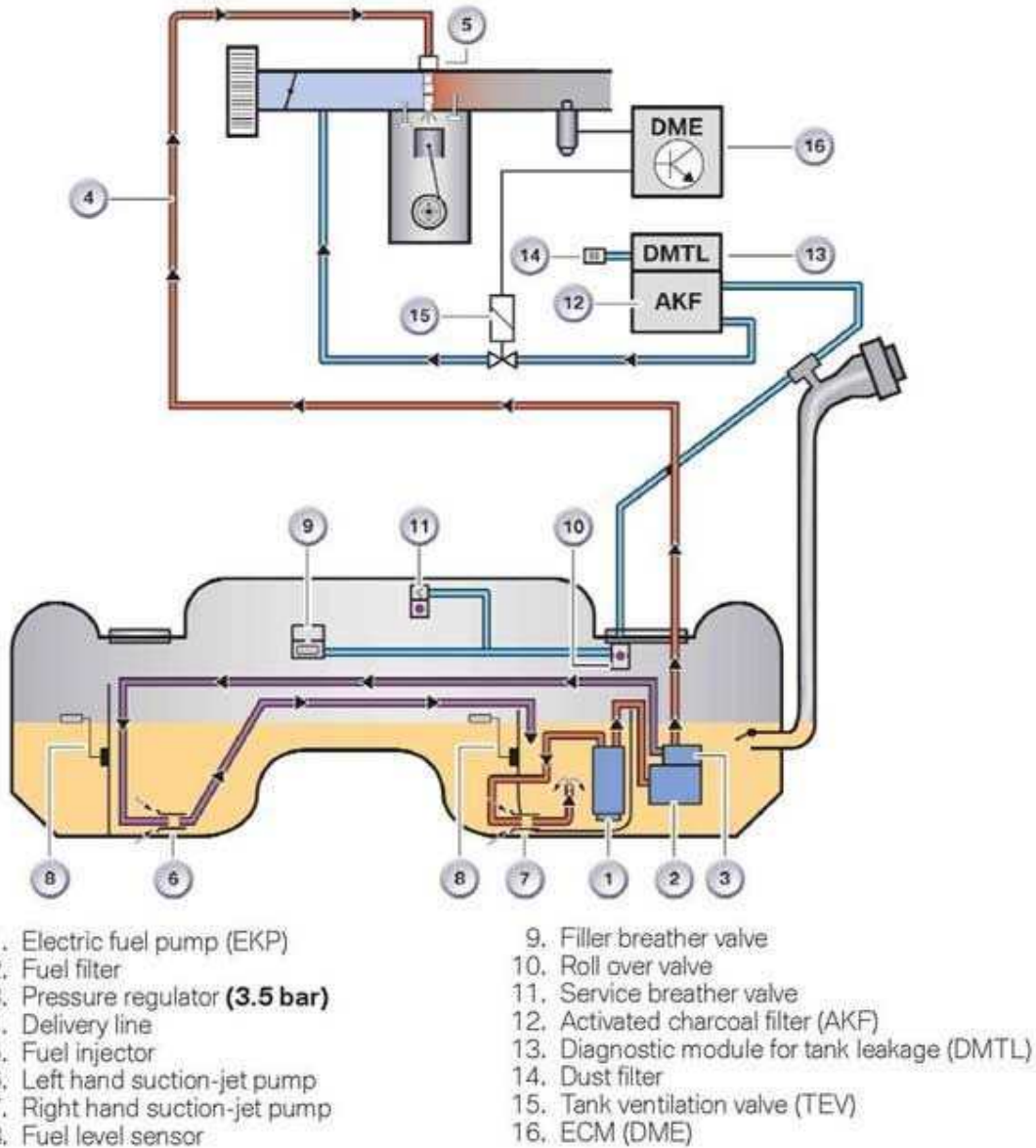
1. Pressure regulator
2. Port for return line
3. Supply from the electric fuel pump (EKP)
4. Fuel filter
5. Supply to fuel rail



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Fig. 5: Identifying Pressure Regulator
Courtesy of BMW OF NORTH AMERICA, INC.

Fuel System Overview



G03399753

Fig. 6: Identifying Fuel System Overview

Courtesy of BMW OF NORTH AMERICA, INC.

Fuel Delivery

The fuel is supplied to the engine from the fuel tank as follows:

- From the right hand half of the fuel tank
- Through the non-return valve inside the fuel baffle chamber (only for initial filling of the fuel baffle)
- Into the fuel baffle chamber
- Pumped out by the electric fuel pump (EKP)

- Into the fuel filter
- Through the line in the right hand service access cover to the engine
- Pumped out by the electric fuel pump in parallel through a separate fuel line to the right hand suction-jet pump, then from the right hand half into the fuel baffle (level increase)

Fuel Pressure Regulation

With pressure regulation, fuel is fed through the fuel tank as follows:

- Fuel pressure controlled by the pressure regulator (3.5 bar)
- To the suction-jet pump in the left hand half of the fuel tank
- Into the fuel baffle chamber

At the same time, the suction-jet pumps draw the fuel from the right and left hand sides of the fuel tank. This ensures that the fuel baffle and the electric fuel pump are supplied with fuel at all times.

Filler Venting

To provide filler venting, there is a breather unit in the fuel tank consisting of a service breather valve (11) and filler breather valve (9). There is also a roll over valve (10) on the right hand service access cover. The filler breather valve allows air and fuel vapors to escape from the fuel tank when the vehicle is refuelled (venting).

When the vehicle is refuelled, the air and fuel vapors vent via:

- The filler breather valve
- Through the vent line
- To the roll over valve
- Through the T-fitting on the fuel filler neck
- Into the activated charcoal filter

When the maximum capacity is reached, the filler breather valve is closed by the fuel lifting the internal float valve. The fuel level rises in the fuel filler neck and trips the fuel pump nozzle. A vapor barrier (approximately 15 liters) remains in the tank above the filler breather valve after the tank has been filled. This provides internal liquid/vapor separation.

Service Breather Valve

The fuel vapors produced are vented:

- Through the filler breather valve
- Through the service breather valve if the filler breather valve is closed
- To the roll over valve
- Through the vent line
- Through the T-fitting on the fuel filler neck

- Into the activated charcoal filter (AKF)
- Through the evaporative purge line
- Through the evaporative purge valve (TEV)
- To the engine intake manifold

The service breather valve only opens if the filler breather valve is closed (fuel tank full to capacity). The service breather valve location is higher in the tank than the filler breather valve and opens at a pressure of 50 mbar. When the fuel tank is not full, vapors are vented through the filler breather valve.

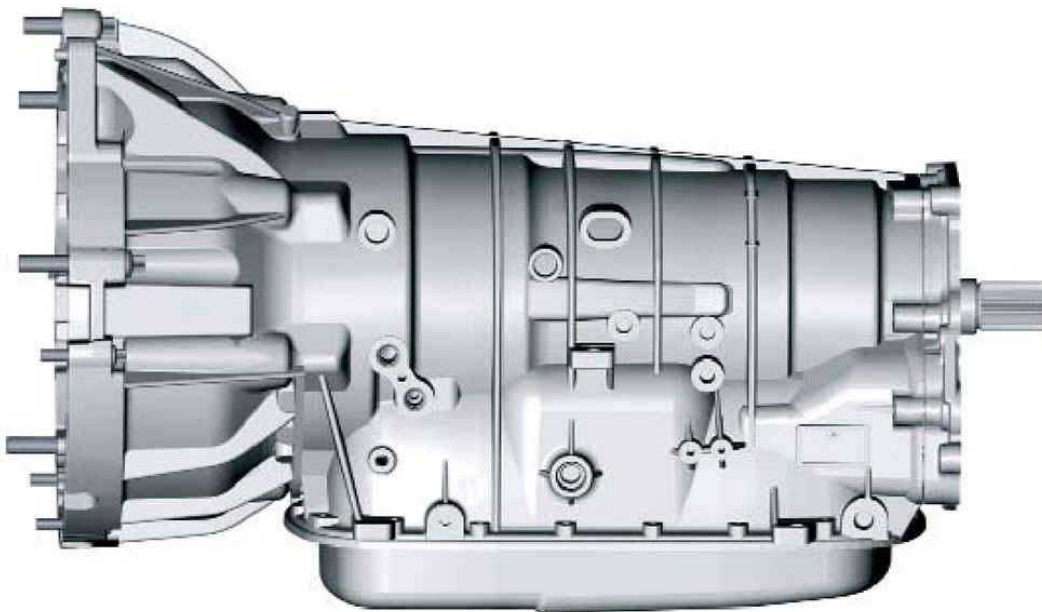
Notes:

Automatic Transmission

The previously used 5-speed GM5 automatic transmission is used in the E83 and E53 MU.

The transmission designation is GA5R390R.

Modifications have been made to the output shaft and tail housing to accommodate the ATC 400/500 transfer case.



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Fig. 7: Identifying Automatic Transmission
Courtesy of BMW OF NORTH AMERICA, INC.

AUTOMATIC TRANSMISSION TECHNICAL DATA

Index	Explanation
Type	Automatic gearbox with five forward gears. 5th gear is designed as an overdrive gear.
Power transmission	The maximum torque is 390N.m in 1st/2nd/3rd and 5th gear and 410N.m in 4th gear with the converter clutch closed.
Torque converter	With M54B30 = W245 with controlled converter clutch
Gear ratios	1st gear 3.24 2nd gear 2.22 3rd gear 1.60 4th gear 1.00 5th gear 0.75 Reverse gear 3.03
Selector positions	P-R-N-D and Steptronic
Control	Electrohydraulic with adaptive shift characteristic control
Weight with oil ⁽¹⁾	77 to 78 kg depending on the version
(1) Lifetime oil fill	

Transmission Control

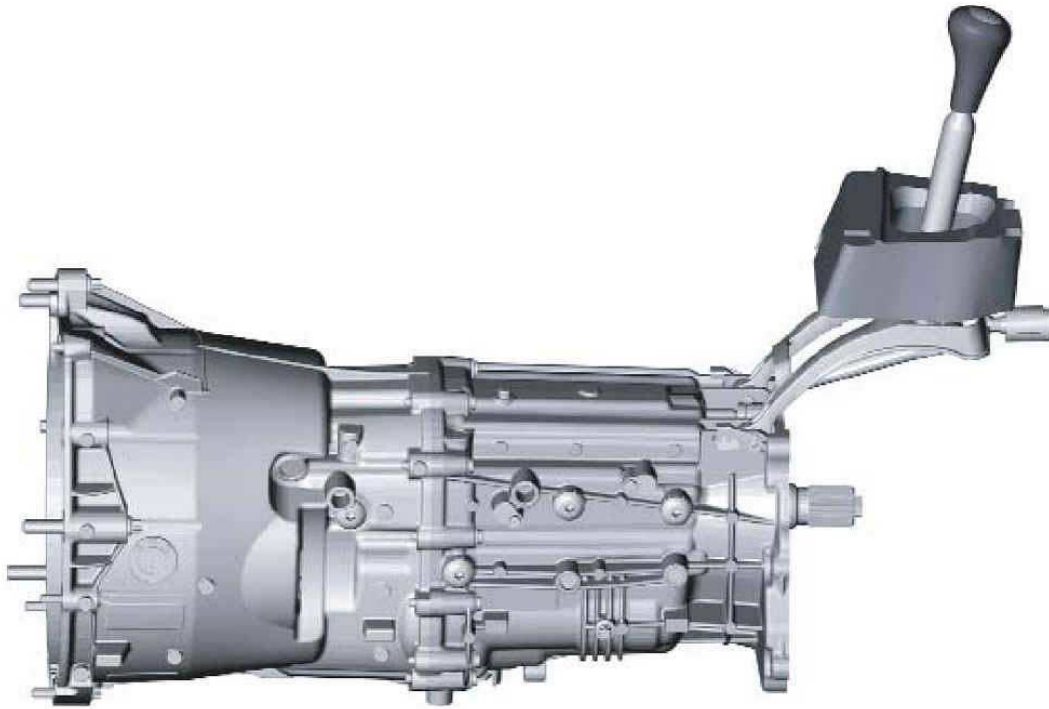
The transmission control has been adopted from the E46. The transmission control unit (GS20 as on E46) is located in the electronics box in the engine compartment and is on the PT-CAN.

Manual Transmission

The 6 speed manual transmission in the E83 and E53 MU was previously used in series production.

The transmission designation is GS6X37BZ (H-gearbox) with the M54 engine.

Modifications have been made to the external gearshift mechanism as well as the output shaft and tail housing to accommodate the ATC 400/500 transfer case.



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Fig. 8: Identifying Manual Transmission
 Courtesy of BMW OF NORTH AMERICA, INC.

Technical Data

MANUAL TRANSMISSION TECHNICAL DATA

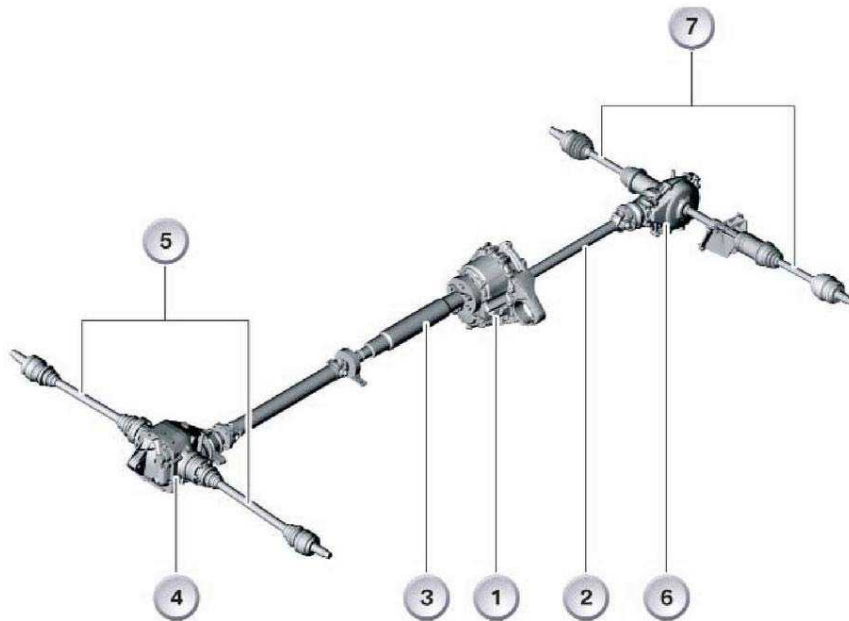
Gear	Gear ratio GS6-37BZ (H-gearbox)
1	4.35
2	2.50
3	1.67
4	1.23
5	1.00 (direct drive)
6	0.85 (overdrive)
R	3.93
Lifetime oil fill.	

Drive Train

The E83 drive train has been largely adopted from the E46/3-16 (3 Series, Touring, all wheel drive).

Components

1. Transfer case
2. Front drive shaft
3. Rear drive shaft
4. Final drive
5. Rear output shafts
6. Front axle drive
7. Front output shafts

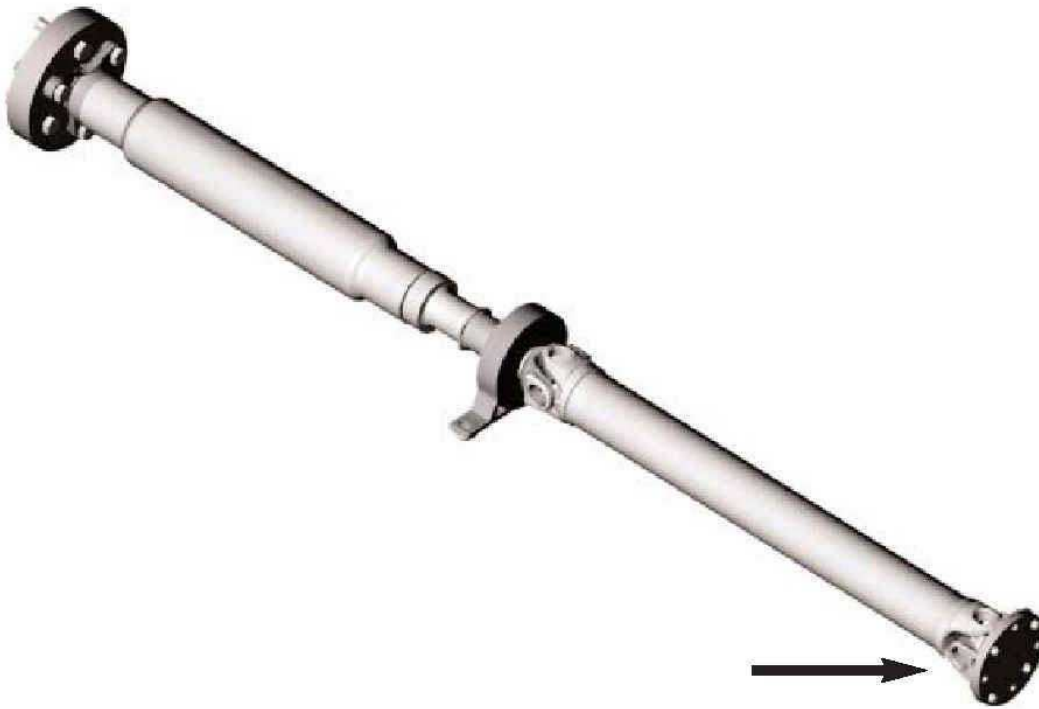


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Fig. 9: Identifying Drive Train Components
Courtesy of BMW OF NORTH AMERICA, INC.

Rear Driveshaft

The rear drive shaft in the E83 with the M54 engine is a steel universal joint shaft (arrow on the right).



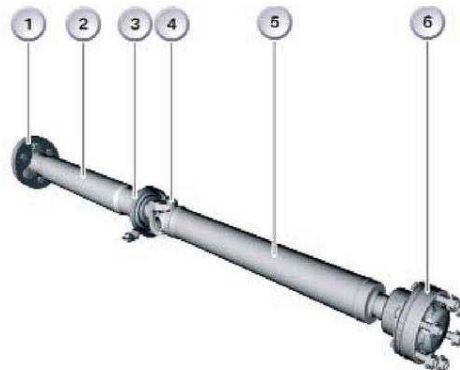
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Fig. 10: Identifying Rear Driveshaft

Courtesy of BMW OF NORTH AMERICA, INC.

To minimize noise, a constant velocity joint shaft is used in the E53 MU.

1. Flexible coupling
2. Front section of drive shaft (collapsing tube)
3. Center bearing
4. Universal joint
5. Rear section of drive shaft
6. Constant velocity joint



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Fig. 11: Identifying Constant Velocity Joint Shaft

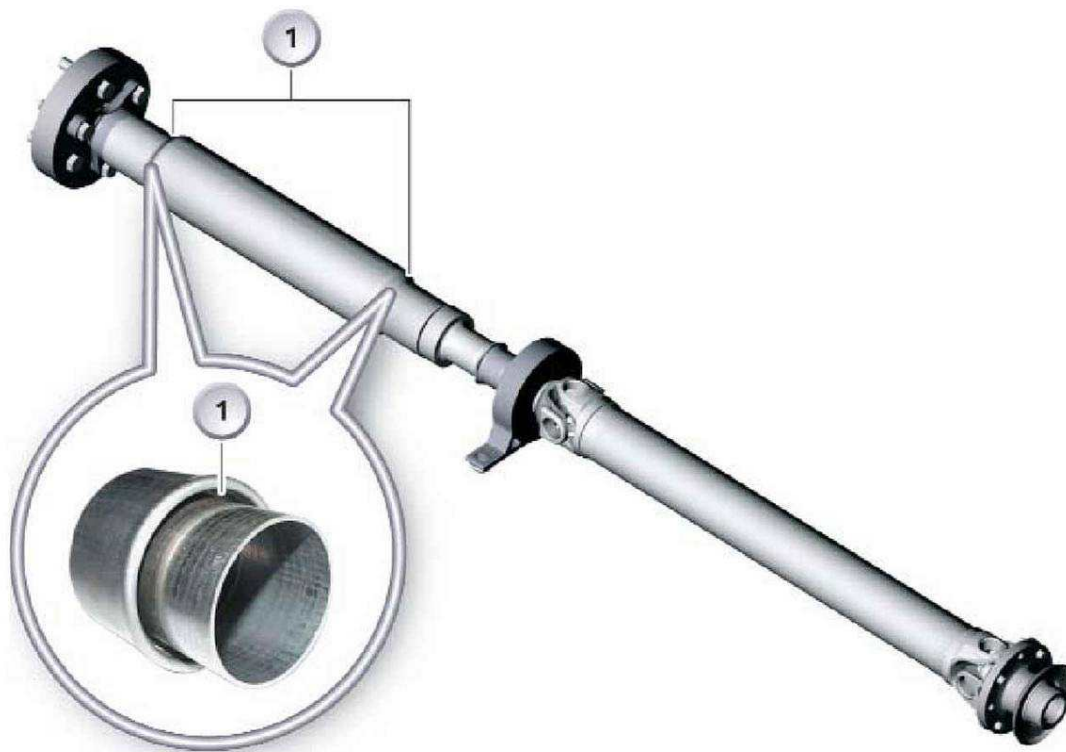
Courtesy of BMW OF NORTH AMERICA, INC.

Both style rear drive shafts are equipped with a deforming element.

The front section of the drive shaft is designed as a collapsing tube (1).

When the drive shaft is compressed (collapsed) it absorbs a defined force.

After collision or accident repairs, the drive shafts must always be checked for compression of the collapsing tube.



G03399759

Fig. 12: Identifying Front Section Of Drive Shaft (Collapsing Tube)

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: When the collapsing tube is deformed, the drive shaft must be replaced.

Front Drive Shaft

The front drive shaft connects the transfer case to the front axle drive. It is designed as a one piece section without a center bearing and has two universal joints.

Rear Axle Final Drive

The 188 K (ring gear size) final drive is known from the previous model series productions. The final drive ratio

varies depending on the engine/gearbox combination. For the US with M54 engines, the ratio is 3.64:1 for both automatic and standard transmissions.

Front Axle Drive

The vehicles are equipped with the familiar VAG 174 front axle drive, regardless of the engine and transmission variant. The front axle ratio is always identical to the final drive ratio (3.64:1 for US with M54 engines).

NOTE: Lifetime oil fill on both axles.

Rear Output Shafts

The rear output shafts have sliding joints for length compensation on both wheel side (1) and axle side (2).

NOTE: There is a difference in shaft tube length of approximately 54 mm between the right and left output shaft.

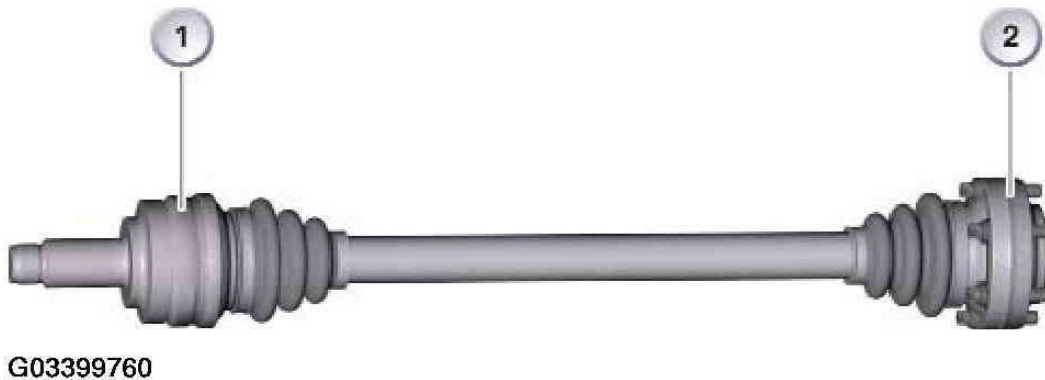
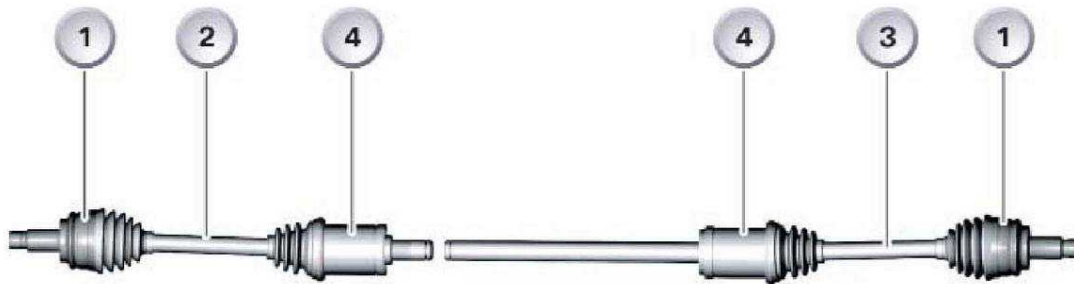


Fig. 13: Identifying Rear Output Shafts
Courtesy of BMW OF NORTH AMERICA, INC.

Front Output Shafts

The locking angle of wheel side fixed joint (1) is 50°. The axle side joint (4) slides to compensate for differences in length caused by suspension/axle movements.



1. Constant velocity joint (fixed joint), wheel side
2. Front left output shaft
3. Front right output shaft
4. Triple roller joint (sliding joint), axle side

G03399761

Fig. 14: Identifying Front Output Shafts

Courtesy of BMW OF NORTH AMERICA, INC.

GENERAL INFORMATION

DVOM - Overview

THE DVOM

Model: All

Production Date: All

INTRODUCING THE DVOM

The ability to measure voltage, current flow, and resistance is important in the diagnosing of electrical problems. Without the results of these measurements troubleshooting in an electrical system is a futile process.

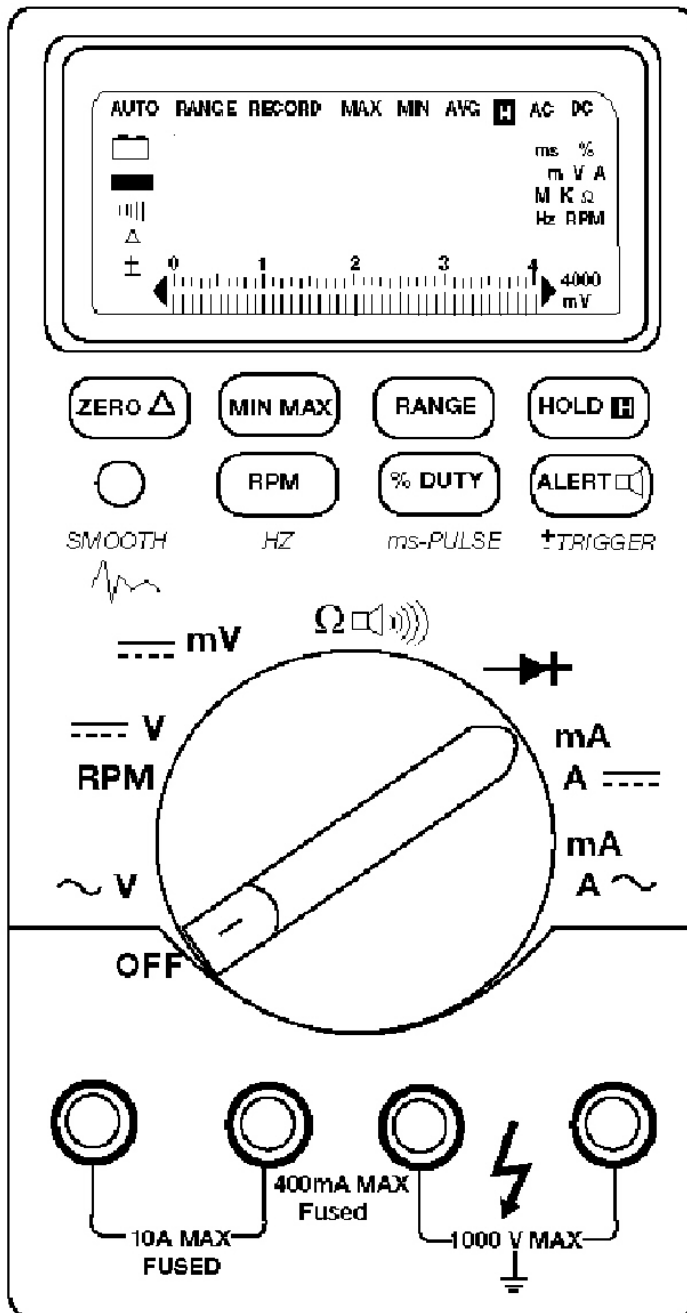
The instrument most commonly used to make electrical measurements is called the Digital Voltage-Ohm Meter (DVOM).

Basic DVOM's are capable of measuring:

- AC Voltage.
- DC Voltage.
- Millivolts.
- Resistance.
- Conductance.
- Capacitance.
- Continuity.
- Diode Test.
- Amps/Milliamps.
- Microamps.

Advanced DVOM's add:

- Frequency.
- RPM.
- Duty Cycle.
- Pulse Width.



G03388894

Fig. 1: Identifying DVOM

Courtesy of BMW OF NORTH AMERICA, INC.

The DVOM provides for a method of accurate measurements.

Even though accurate measurements are the key to electrical diagnosis, the following four factors determine the effectiveness of the measurements:

- Accuracy of the measuring instrument.
- Correct installation in the circuit of the measuring instrument.
- Ability of the Technician to read the instrument.
- Skill of the Technician in interpreting the results.

As it is clearly seen, only one of the factors depends on the DVOM (e.g. accuracy), the rest will always depend on the ability of the technician to read and interpret the results.

CHOOSING A DVOM

A good choice of a DVOM is the DISplus or the MoDic, as the measuring system of each contains a highly accurate DVOM.

Choosing a handheld DVOM from a reputable manufacturer, however, leaves the DISplus and MoDic free to perform other tasks that a DVOM can not do (e.g. Retrieval of fault codes).

In choosing a DVOM several factors need to be considered, one of which is **Impedance**.

Impedance is the combined resistance to current created by the resistance, capacitance and inductance of the meter. Impedance is measured in '**Ohms per Volt**'.

Meters with the highest '**Ohms per Volt**' impedance are the most accurate. More importantly using a meter with high impedance will not cause damage to sensitive electronic circuitry.

When a Meter is connected across a circuit to measure voltage, it must be connected in parallel. This adds parallel resistance. The total resistance in a parallel circuit is less than the lowest resistance in that circuit (Ohms Law). Using a Meter with low impedance will reduce the total resistance of the circuit and allow more current to flow.

A meter with low impedance can draw enough current to cause inaccurate measurement, voltage drops or damage sensitive electronic circuit boards. A high impedance meter will draw little current and insure accurate readings.

Using older type meters with low impedance values (20,000 to 30,000 ohms-per-volt) can damage modern electronic circuits and components or give inaccurate readings.

Test lights should be avoided for the same reason. They lower the total resistance of the circuit and cause increased current flow.

Other factors in choosing the proper DVOM are:

- Cost.
- Features.

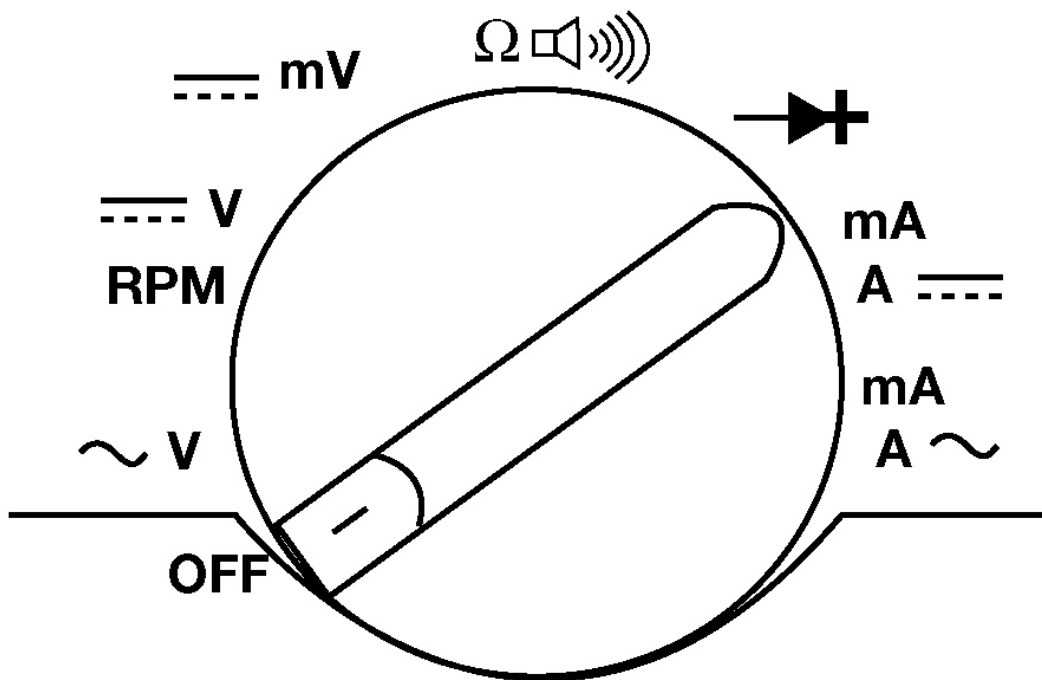
Basic DVOM's are available reasonably priced. These basic models may be more than sufficient for use in BMW Centers, given the availability of the DISplus and MoDic for advanced measurement and scope functions.

Advanced features and price go hand in hand. The more features added the higher the cost. Some of those features may be worth the increase in cost (e.g. frequency, duty cycle and pulse width). Other features may not (e.g. oscilloscope, graphing).

Choose a DVOM wisely based on personal preference and cost. Like many other tools it is valuable in the diagnosis and repair of BMW's. Experience has shown if the technician is not comfortable with the DVOM or confident in the results of the measurements, the DVOM will not be used. Considering the technology in BMW automobiles, diagnosing with a quality DVOM certainly makes repairing the problem correctly and expediently a more manageable task.

THE FUNCTIONS

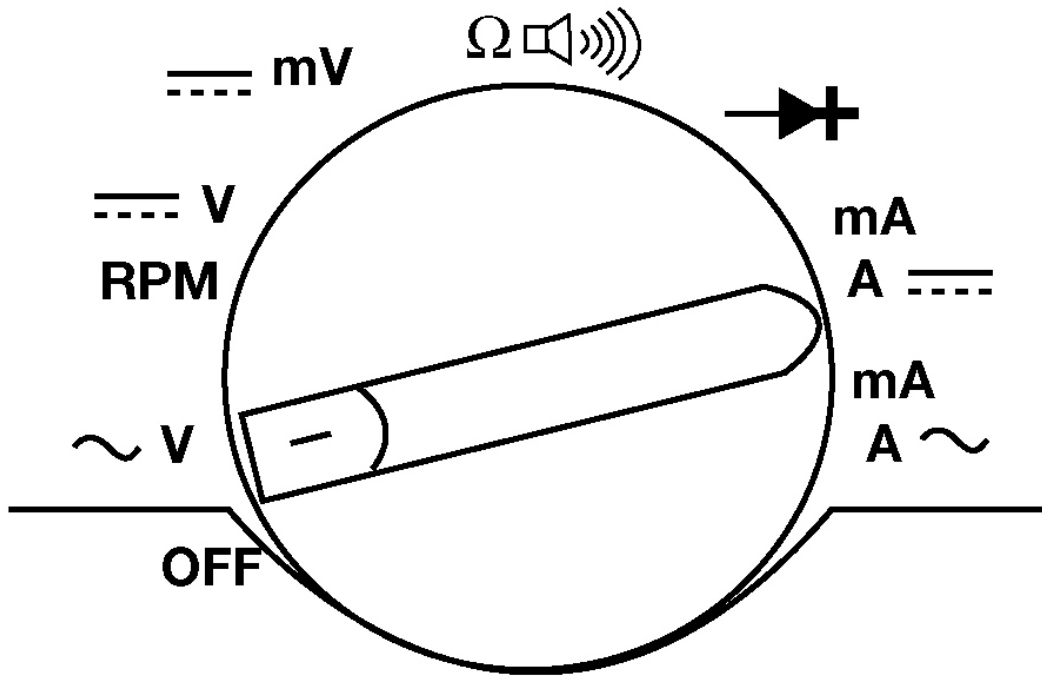
Function Selector Rotary Switch



G03388895

Fig. 2: Identifying Function Selector Rotary Switch (Off)
Courtesy of BMW OF NORTH AMERICA, INC.

Power to the meter is turned off.



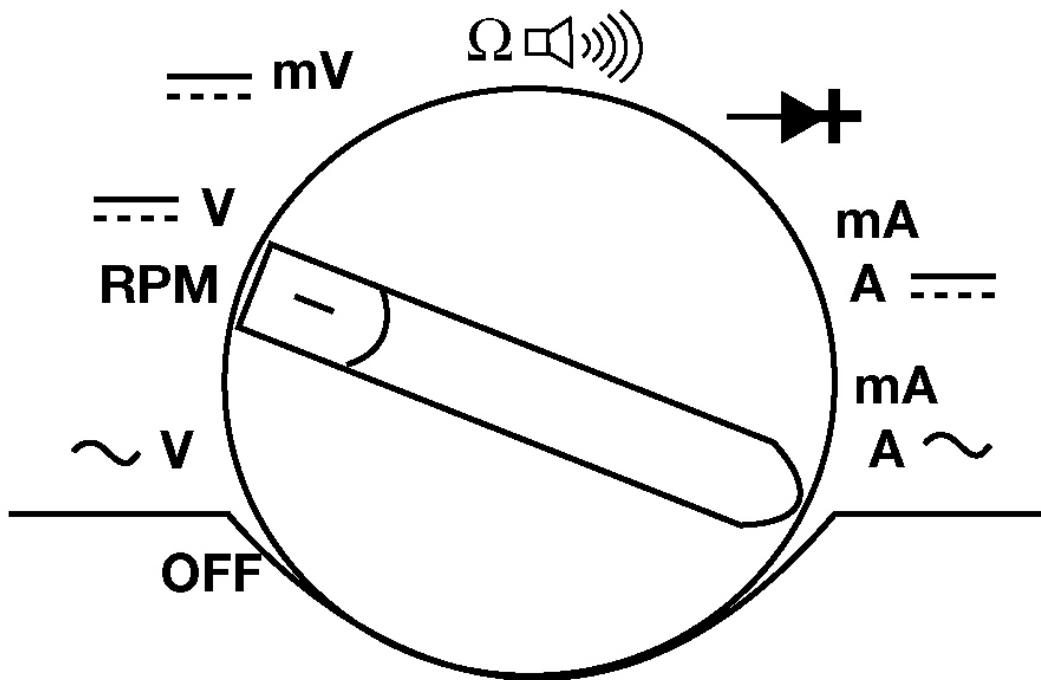
G03388896

Fig. 3: Identifying Function Selector Rotary Switch (Volts AC)
 Courtesy of BMW OF NORTH AMERICA, INC.

Volts AC.

Measures AC voltage.

Ranges 400mV, 4V, 400V, 1000V.



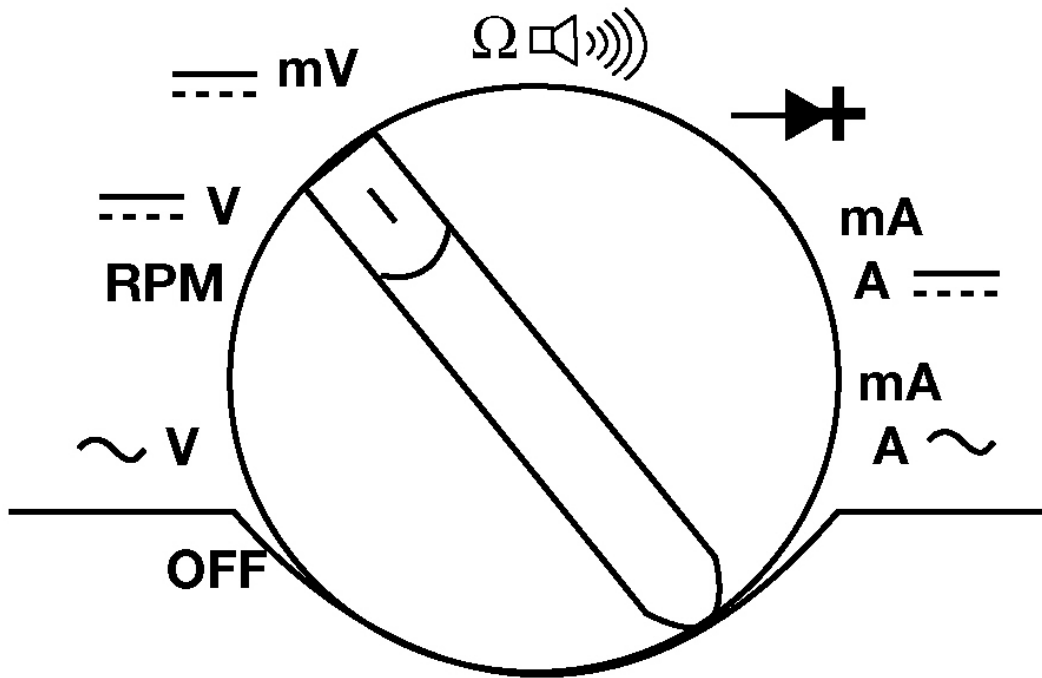
G03388897

Fig. 4: Identifying Function Selector Rotary Switch (Volts DC, RPM)
 Courtesy of BMW OF NORTH AMERICA, INC.

Volts DC, RPM.

Measures DC Voltage.

Ranges 4V, 40V, 400V, 1000V.



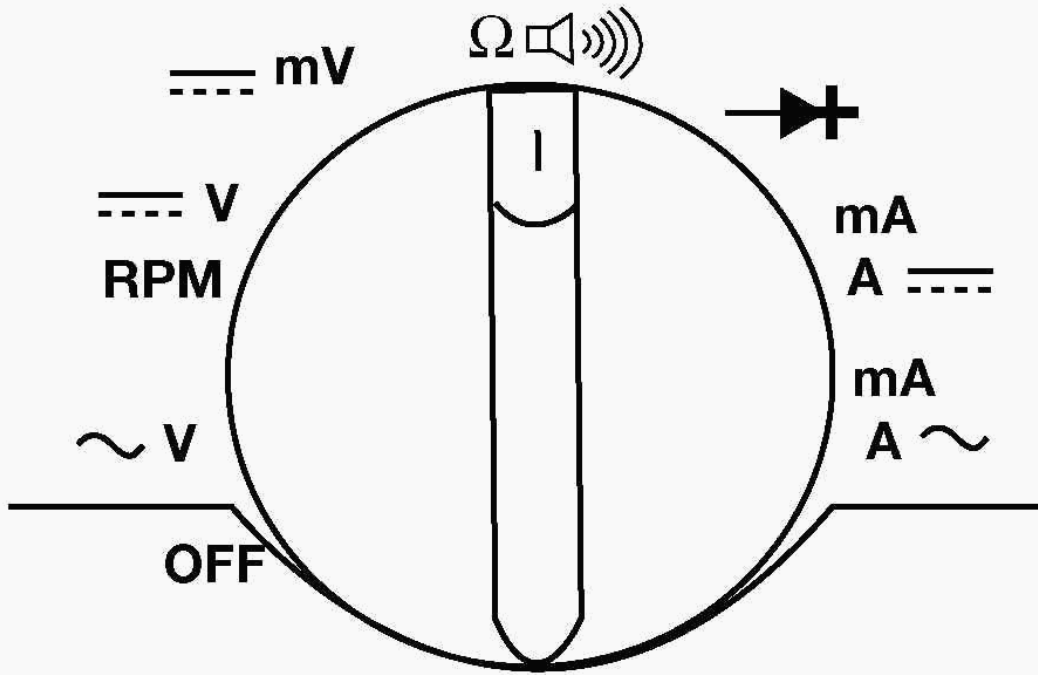
G03388898

Fig. 5: Identifying Function Selector Rotary Switch (mV)
 Courtesy of BMW OF NORTH AMERICA, INC.

mV.

Measures DC Millivolts.

Range: 400mV.



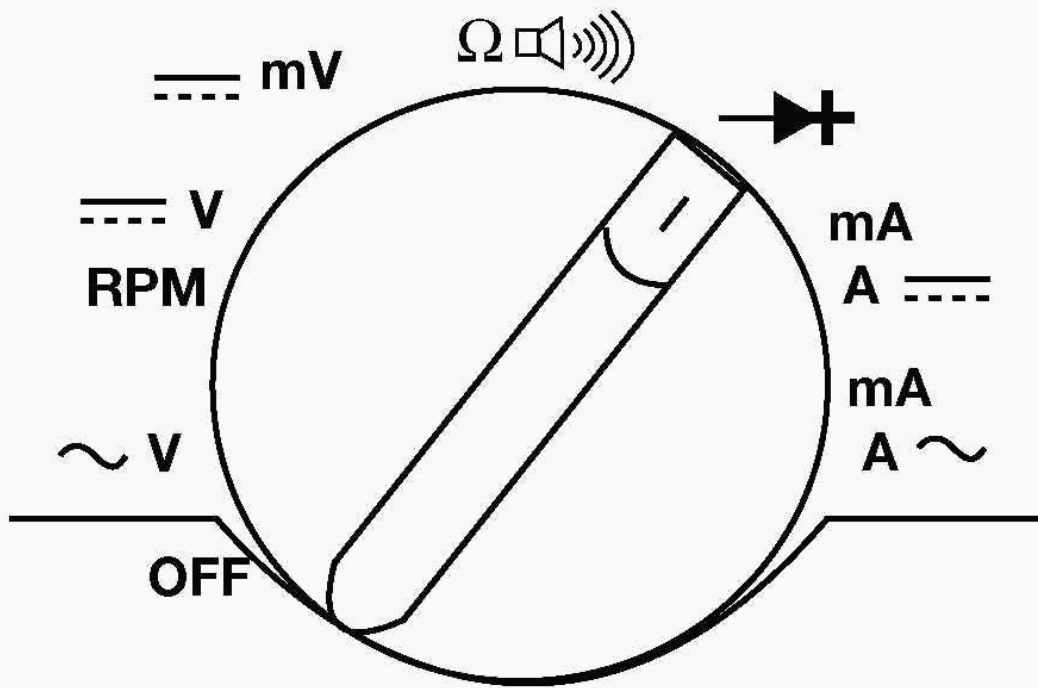
G03388899

Fig. 6: Identifying Function Selector Rotary Switch (Continuity/Ohms)
 Courtesy of BMW OF NORTH AMERICA, INC.

Continuity/Ohms.

Measures Continuity and Ohm.

Ranges: 400ohms,4kohms, 400kohms, 4Mohms, 40Mohms.



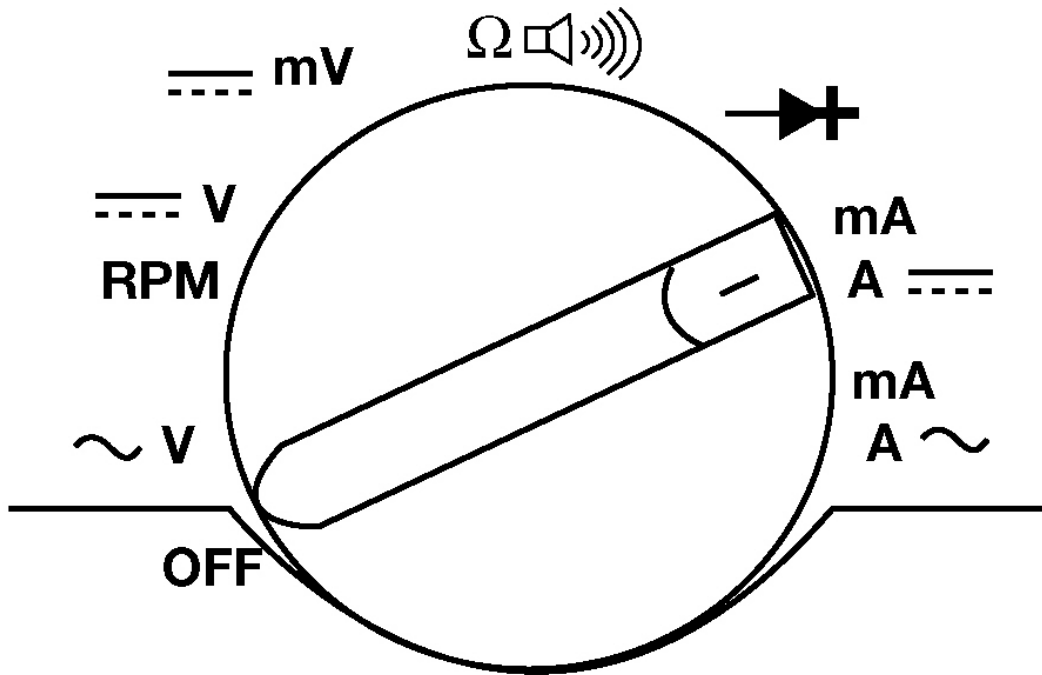
G03388900

Fig. 7: Identifying Function Selector Rotary Switch (Diode Test)
 Courtesy of BMW OF NORTH AMERICA, INC.

Diode Test.

Test diode operation.

Range: 3.000V.



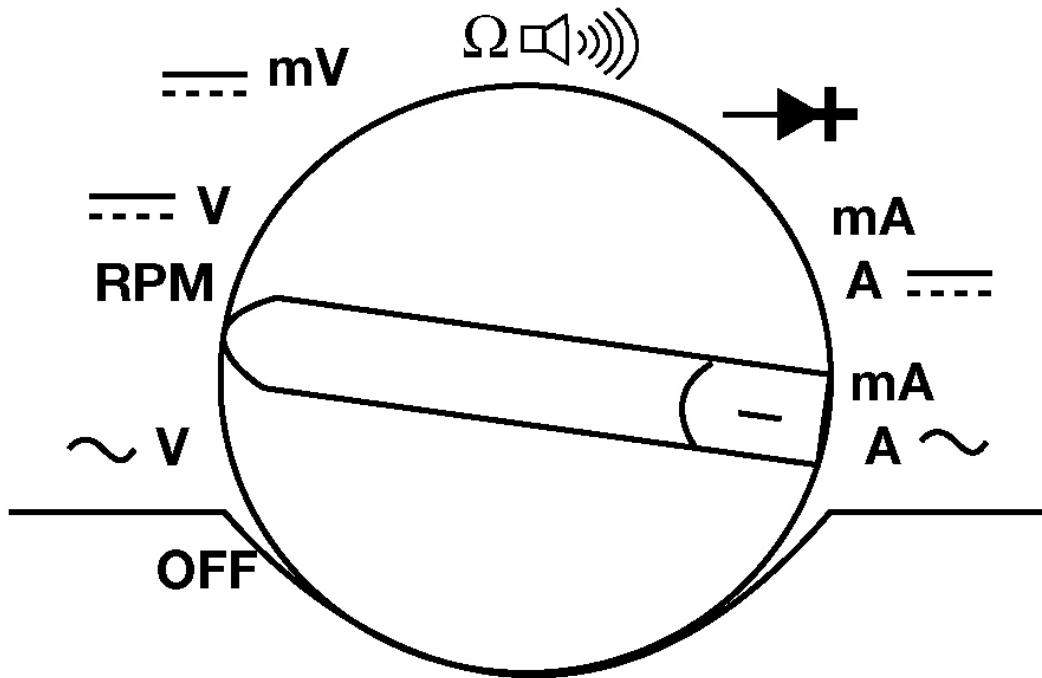
G03388901

Fig. 8: Identifying Function Selector Rotary Switch (Amps DC)
 Courtesy of BMW OF NORTH AMERICA, INC.

Milliamp or Amps DC.

Measures DC Milliamps or amps.

Ranges: 40mA or 400mA for mA input 4000mA or 10 A for A input.



G03388902

Fig. 9: Identifying Function Selector Rotary Switch (Amps AC)
 Courtesy of BMW OF NORTH AMERICA, INC.

Milliamps or Amps AC.

Measures AC Milliamps or amps.

Ranges: 40mA or 400mA for mA input 4000mA or 10 A for A input.

PUSH BUTTON FUNCTIONS



SMOOTH

HZ

ms-PULSE

± TRIGGER



G03388903

Fig. 10: Identifying Push Button Functions

Courtesy of BMW OF NORTH AMERICA, INC.

Zero (Relative Reading) Function:

Displays difference between the measured value and the stored value.



G03388904

Fig. 11: Identifying Zero (Relative Reading) Push Button
Courtesy of BMW OF NORTH AMERICA, INC.

Minimum (Min), Maximum (Max), Average (AVG) Recording:

Records minimum, maximum and calculates the true average.



G03388905

Fig. 12: Identifying Min/Max, AVG Recording Push Button
Courtesy of BMW OF NORTH AMERICA, INC.

Manual Range or Autorange:

In Manual Range user selects fixed range. Meter stays in that range until user changes it, selects Autorange or turns meter off. In Autorange meter selects range automatically.



G03388906

Fig. 13: Identifying Manual Range or Autorange Push Button
Courtesy of BMW OF NORTH AMERICA, INC.

Touch Hold:

Touch Hold holds last stable reading on display. A new stable reading causes beeper to sound and display to update.

If meter is in MIN MAX Recording, RPM, Duty Cycle, Pulse Width or Hz, Touch Hold interrupts the function. The display is frozen, but recorded readings are not erased.



G03388907

Fig. 14: Identifying Touch Hold Push Button

Courtesy of BMW OF NORTH AMERICA, INC.

RPM / HZ.

RPM 2, RPM 1, or frequency.

RPM 2, 4-cycle engines.

RPM 1, 2-cycle engines.

Hz. counts frequency between 0.5 Hz and 200 kHz.



HZ

G03388908

Fig. 15: Identifying RPM / HZ Push Button

Courtesy of BMW OF NORTH AMERICA, INC.

Duty Cycle or Pulse Width.

Duty Cycle between 0.0 and 99.9% displayed.

Pulse Width between 0.002 and 1999.9 ms displayed.



ms-PULSE

G03388909

Fig. 16: Identifying Duty Cycle Or Pulse Width Push Button
Courtesy of BMW OF NORTH AMERICA, INC.

Change Alert, Continuity Beeper or +/- Trigger.

In voltage or current functions selects Change Alert.

In ohms function selects Continuity Tests.

In Duty Cycle or Pulse Width selects trigger slope.



+ TRIGGER

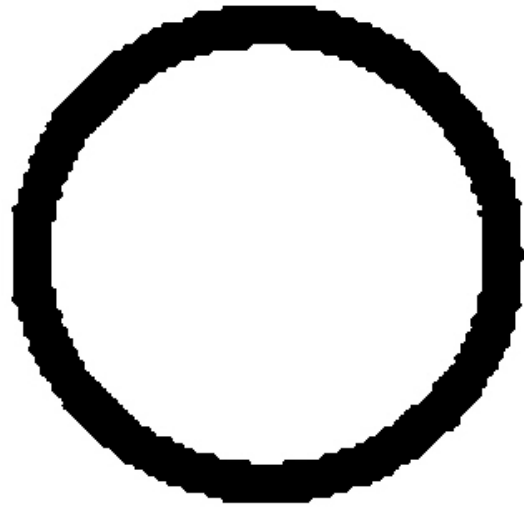
G03388910

Fig. 17: Identifying Change Alert Push Button
Courtesy of BMW OF NORTH AMERICA, INC.

Smoothing Function and Back-light display (advance model only).

Smooth displays average of last eight readings.

Press Yellow button to turn on or off back-light.



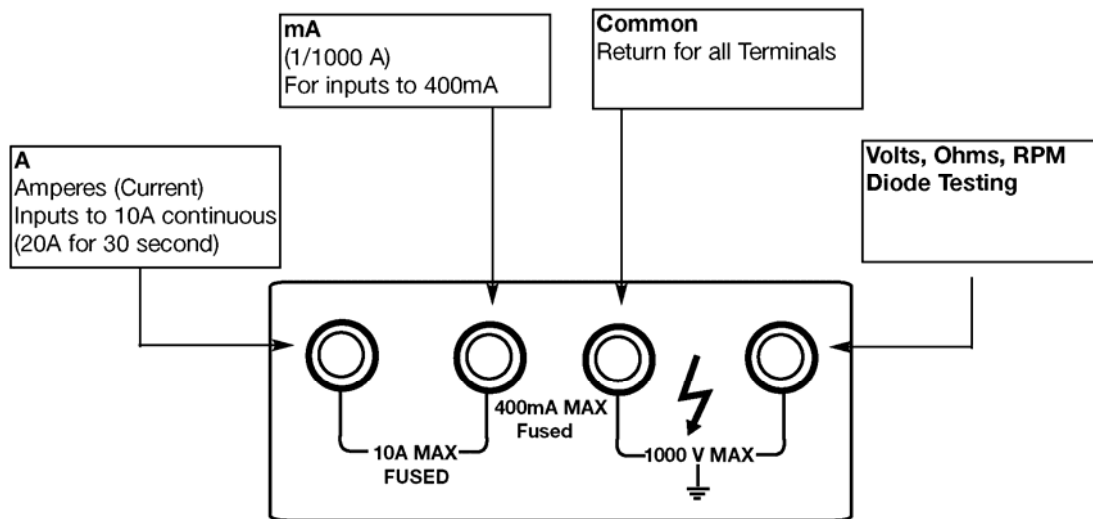
SMOOTH



G03388911

Fig. 18: Identifying Smoothing Function Push Button
 Courtesy of BMW OF NORTH AMERICA, INC.

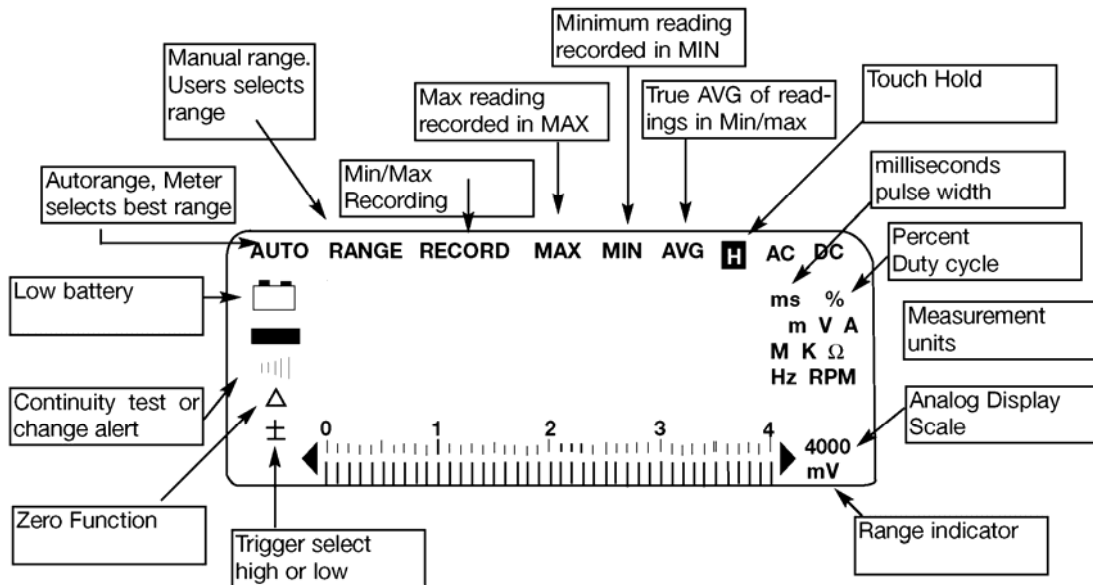
INPUT TERMINALS



G03388912

Fig. 19: Identifying Input Terminals
 Courtesy of BMW OF NORTH AMERICA, INC.

DISPLAY



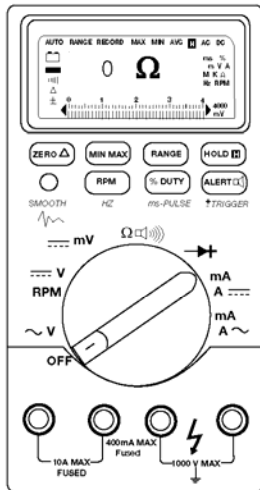
G03388913

Fig. 20: View Of Functions Display

Courtesy of BMW OF NORTH AMERICA, INC.

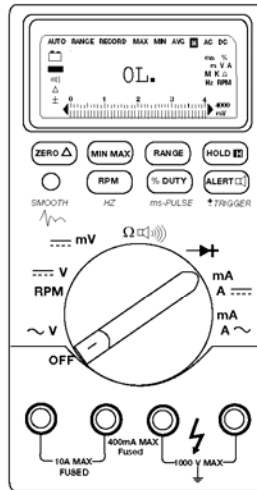
INFINITY DISPLAY

While most displays of DVOMs are standard (i.e. mV means millivolt, mA means milliamp) the display or symbol for infinity or open circuit can be confusing. A display of 0ohms indicates no or little resistance. It means the circuit or portion of the circuit being measured has continuity or is complete. A reading of OL means the circuit is open or not complete, the resistance is said to be "INFINITY". Some meters may use the symbol "INFINITY" for Infinity. Be aware of which reading the meter being used will give for infinity or open circuit.

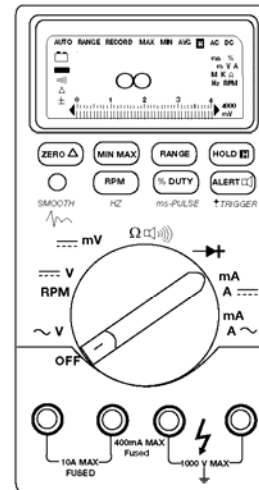


Meter 1

G03388914



Meter 2



Meter 3

Fig. 21: Infinity Display

Courtesy of BMW OF NORTH AMERICA, INC.

VOLTAGE TESTING

The voltmeter (DVOM) must be connected in parallel with the load or circuit.

The DVOM has a high resistance and taps off a small amount of current.

A voltmeter must be used with the current on and with the correct polarity.

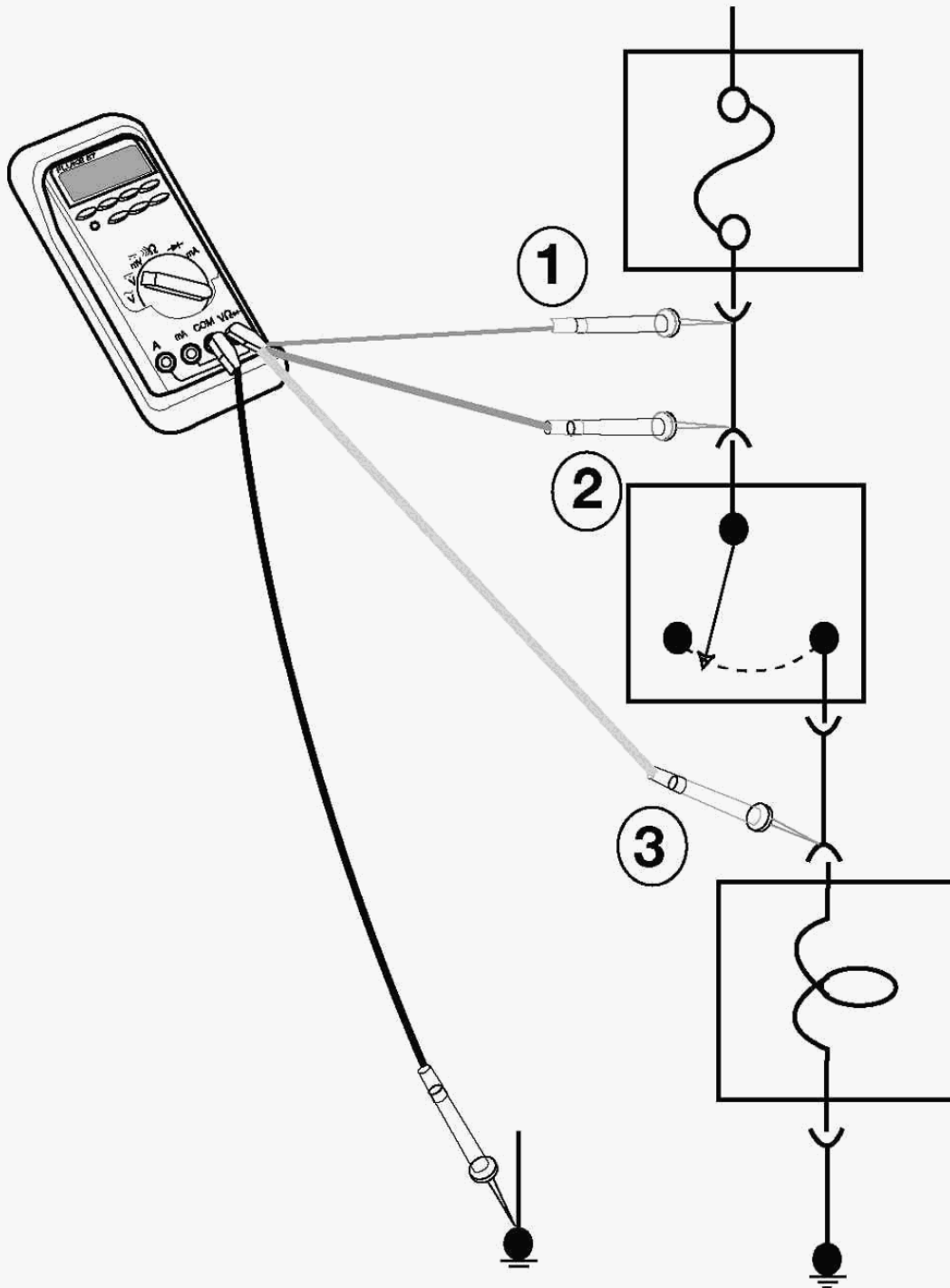
The red lead should be connected to the B⁺ side of the circuit and the black lead to the B⁻ side of the circuit.

If the leads are reversed the reading will be a negative number.

Typical Application of Voltage Testing

- Checking Power Supply.

- Charging System.
- Complete Basic Circuits.
- Control Module Functions (Input/Output).



G03388915

Fig. 22: Identifying Voltage Testing
Courtesy of BMW OF NORTH AMERICA, INC.

Measure at different points checking for change or interruption in the voltage supply.

- Select proper function and range of DVOM.
- Connect (-) lead of meter to battery B- or known good ground.
- Connect (+) lead of meter to test circuit.

DVOM will indicate supply or available voltage at that point.

AMPERAGE TESTING

To measure amperage the meter must be installed in series in the circuit. The current flow of the circuit must flow through the meter itself.

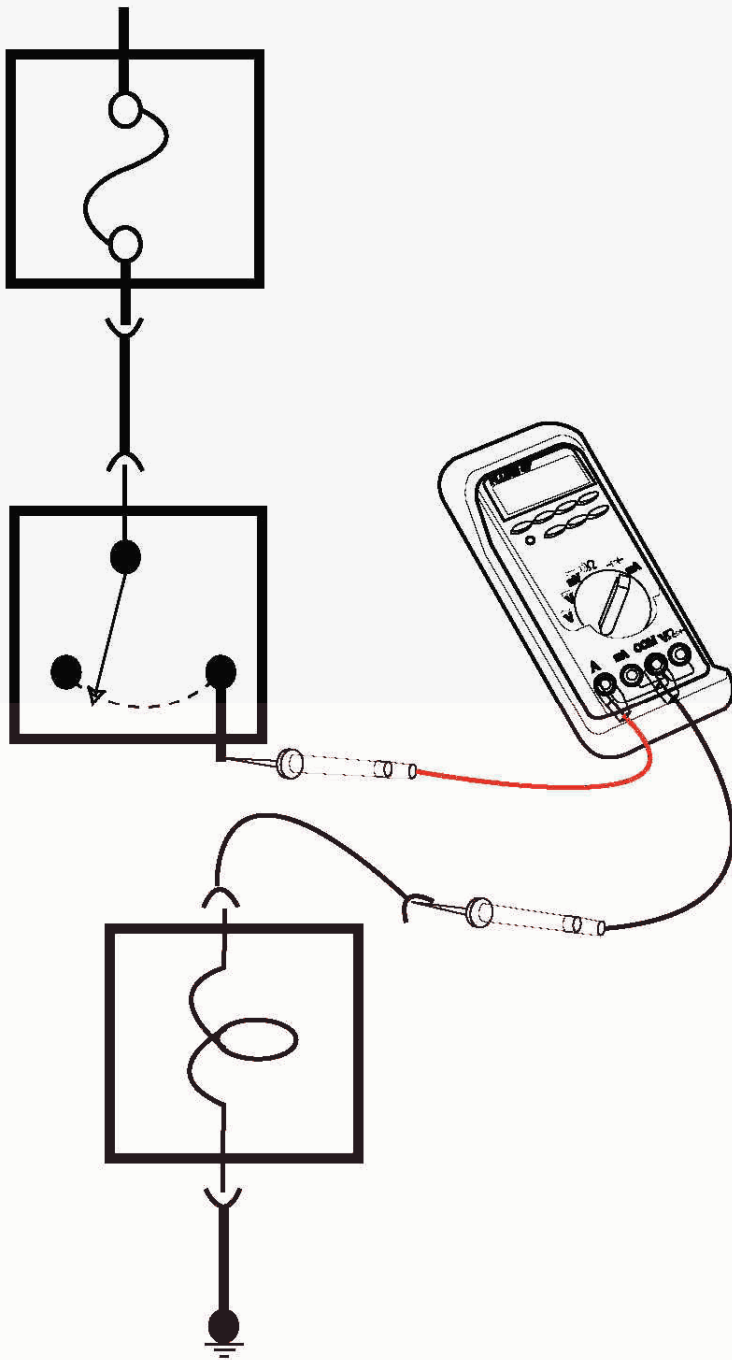
Current must be flowing in the circuit.

Installing the meter in parallel with the circuit may cause damage to the meter, because of the increased current flow in the circuit, due to the low resistance in the meter.

**CAUTION: Most ampere meters or DVOMs are rated for no more than 10 amps.
Current flow above 10 amps will damage the internal fuse of the DVOM and
render it unable to measure amperage.**

Typical Application of Amperage Testing

- Proper Component Operation (Correct Current Draw).
- Parasitic Draw Testing.



G03388916

Fig. 23: Identifying Amperage Testing
Courtesy of BMW OF NORTH AMERICA, INC.

Ensure meter is capable of handling current flow.

Use caution when activating additional consumers.

- Select proper function of DVOM and move leads to proper position.
- Connect meter in series with (+) lead on the B⁺ side of the circuit.
- Connect (-) lead of meter to complete circuit.

NOTE: If the expected load may exceed the range of the meter, use a meter with a higher range (DISplus inductive pick-up) for initial testing. A convenient location to apply meter (e.g. across fuse terminals). DVOM will indicate current flow (Amps) through circuit.

RESISTANCE TESTING

When set for resistance testing (Ohms) the DVOM must never be connected in a live circuit.

The component or portion of a circuit being measured, must be isolated from the power source.

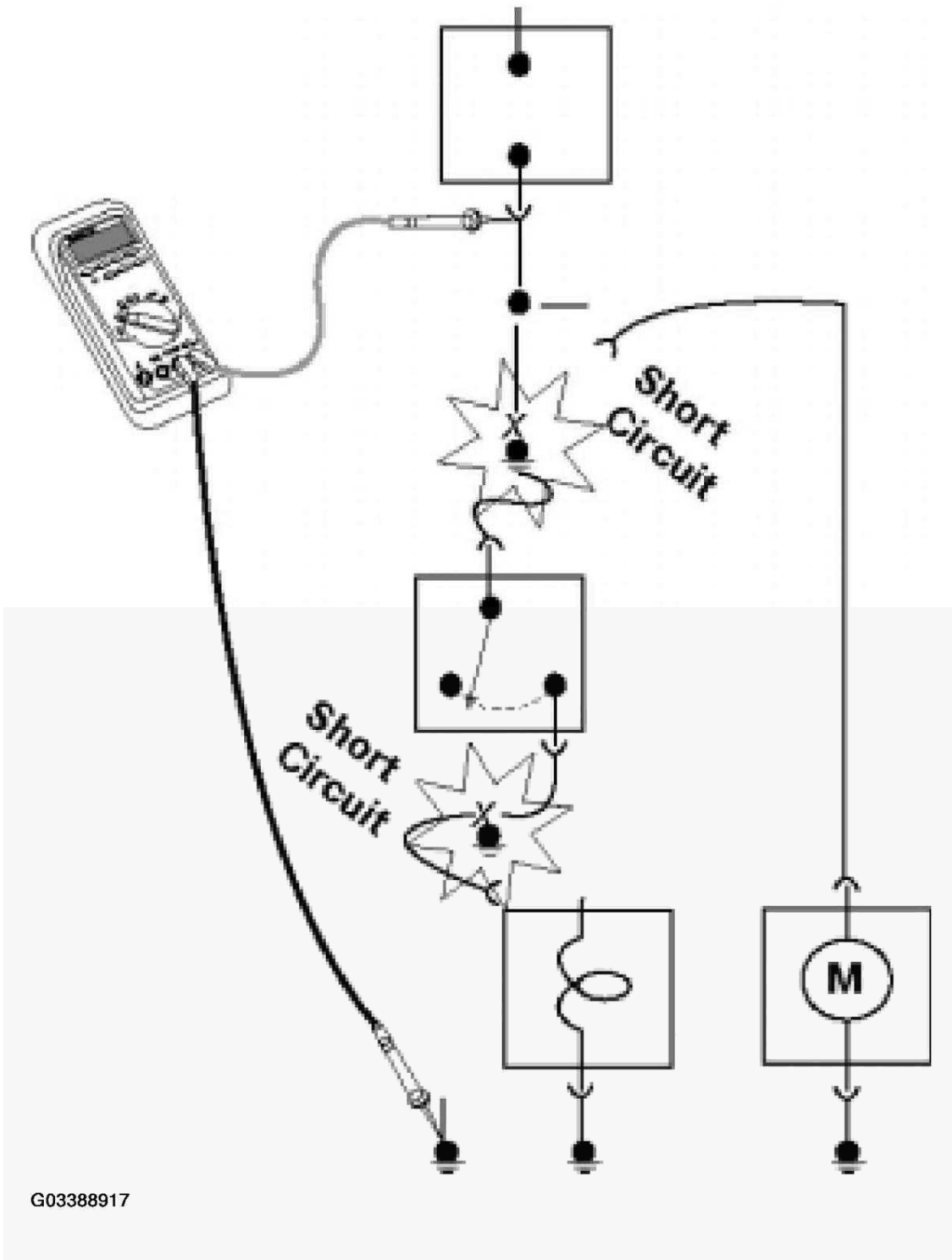
Most modern day DVOM's are self ranging when set to measure resistance, so the meter can not be damaged by out of range measurements.

The test leads may be used without regard for polarity, unless the circuit contains a diode.

The DVOM functions by placing a very small amount of current on the circuit being tested, the red lead must be placed on the anode side of the diode.

Typical Application of Resistance Testing

- Locating a Short to Ground (As Shown).
- Determining Resistance of Components (e.g. Temp Sensors and Injectors).



G03388917

Fig. 24: Identifying Resistance Testing
 Courtesy of BMW OF NORTH AMERICA, INC.

An Ohmmeter uses its internal power to test a circuit or component.

- Select correct function and range (Most meters are self ranging in this function).
- Disconnect power to circuit.
- Disconnect any circuit wired in parallel with circuit being tested.
- Connect test leads.

NOTE: **There must be NO current available to the circuit during the resistance (Ohmic) test. DVOM will indicate resistance (Ohms) of component or circuit being tested.**

CONTINUITY TESTING

The DVOM may have a separate setting for continuity testing.

When set for continuity testing the DVOM must never be connected in a live circuit.

The power source must be disconnected from the circuit being tested. Any circuits wired in parallel with the circuit being tested must also be disconnected.

The DVOM uses its own internal power supply to test the continuity of the circuit.

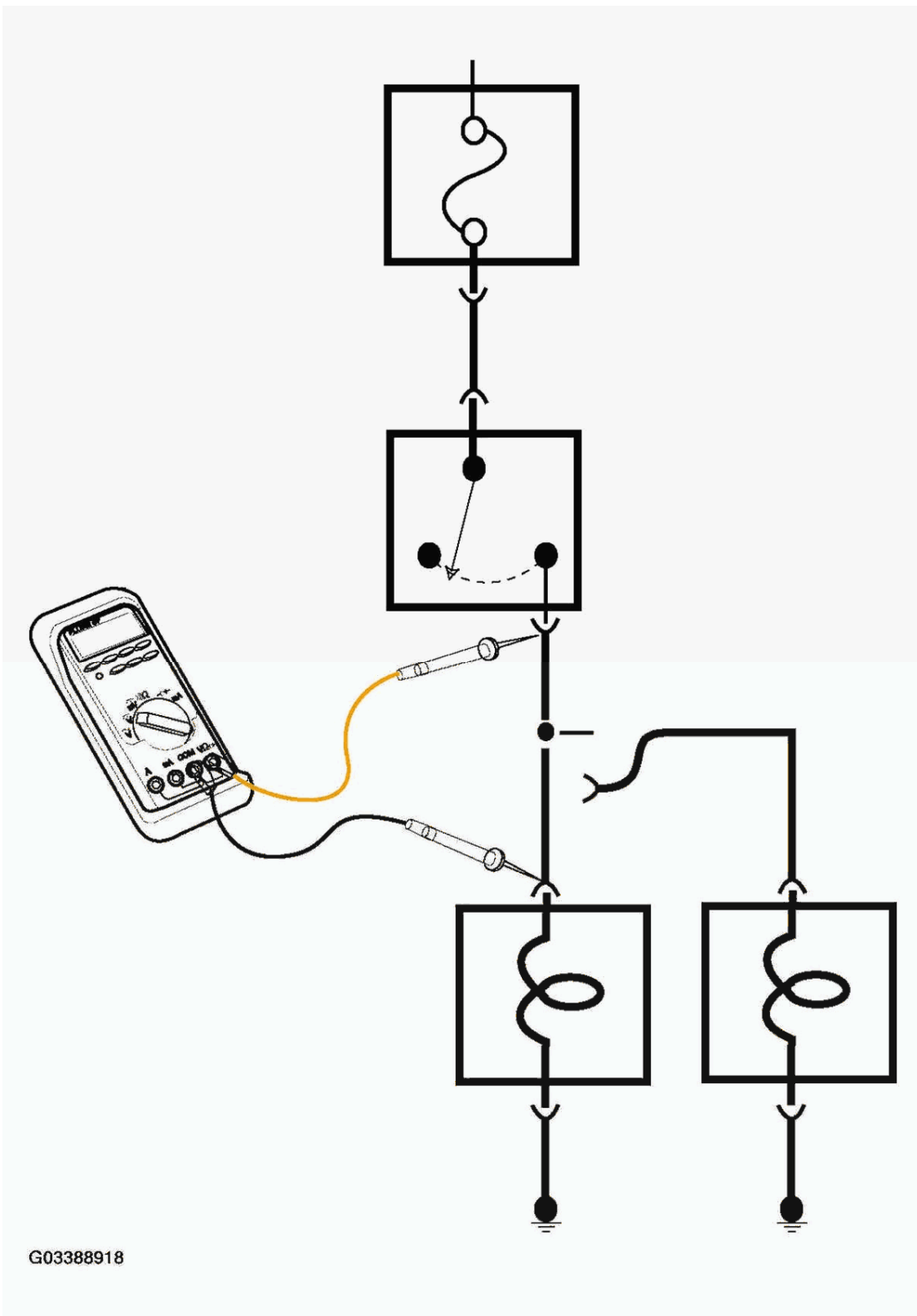
Continuity testing verifies that circuit connections are intact. The continuity mode is extremely fast and is used to detect either shorts or opens that last as little as 1ms.

When a change is detected the beeper tone is stretched to last at least 1/4 second so both shorts and opens can be audibly detected.

This is a valuable troubleshooting aid when diagnosing intermittent faults associated with wiring, connections, switches and other components of the circuit.

Typical Application of Continuity Testing:

- Circuit Continuity.
- Intermittent Wiring Harness Faults.



G03388918

Fig. 25: Identifying Continuity Testing

Courtesy of BMW OF NORTH AMERICA, INC.

- Select correct function and range of DVOM.
- Disconnect power to the circuit.
- Disconnect any circuits wired in parallel.
- Connect DVOM leads to the circuit to be tested.

NOTE: **There must be NO current available to the circuit during the continuity test. DVOM display will indicate continuity of circuit.**

VOLTAGE DROP TESTING

Voltage Drop Tests determine the resistance of an active circuit, a circuit with current flowing.

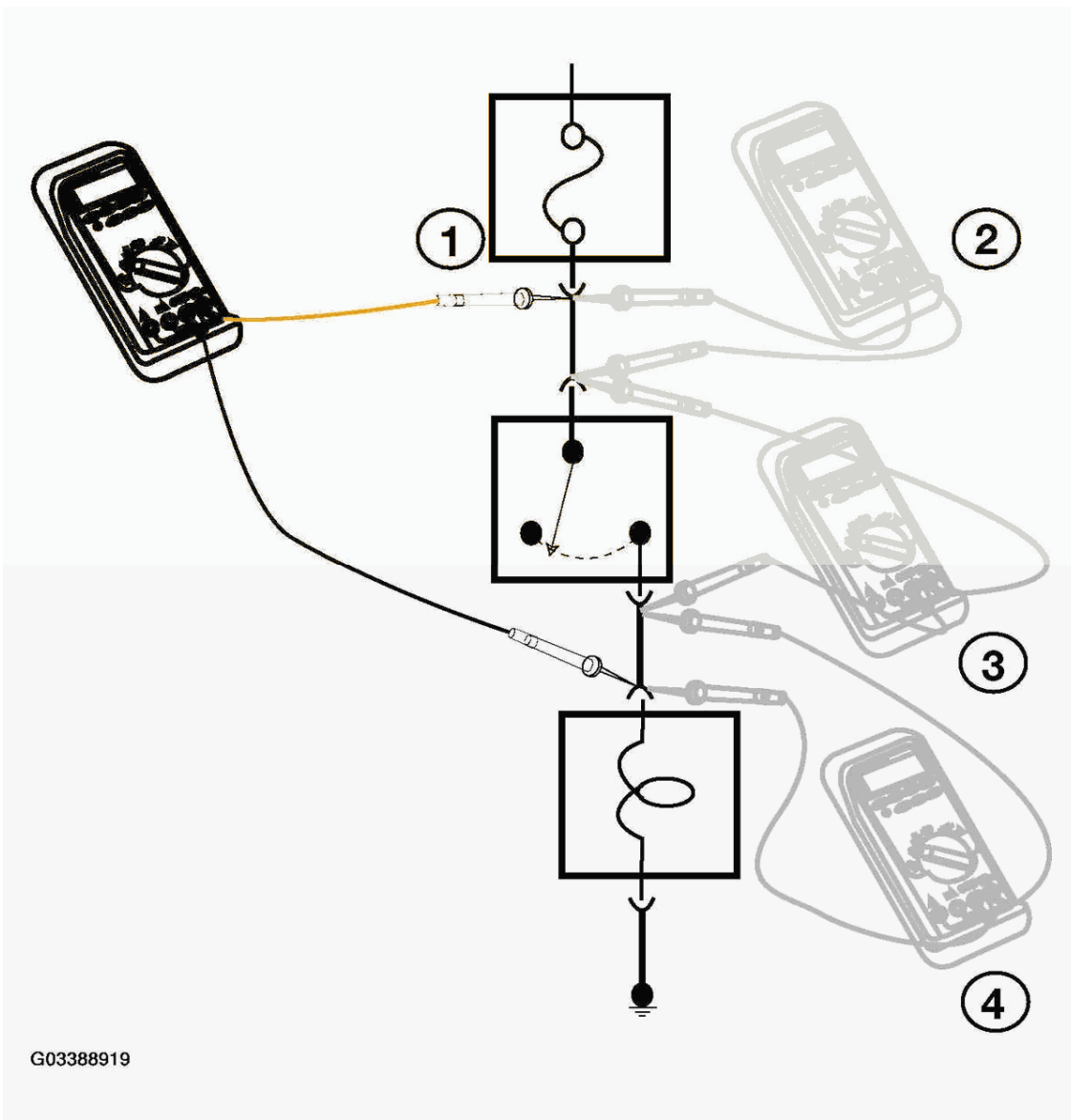
Voltage drop tests are preferred over simple resistance measurements because the power source is not removed from the circuit.

By measuring the voltage on both sides of a load, the amount of voltage consumed by the load is measured.

The voltage drops of each part of a series circuit added together must equal the power supply for that circuit while it is active.

Typical Application of Voltage Drop Testing:

- Determine proper component operation.
- Active circuit continuity.
- Active circuit resistance.



G03388919

Fig. 26: Identifying Voltage Drop Testing
 Courtesy of BMW OF NORTH AMERICA, INC.

As a "Dynamic" test with the circuit operational, a voltage drop in any non-resistive part of the circuit indicates a fault in the circuit,

- Select proper function and range of DVOM.
- Connect (+) lead to the B+ side of the circuit or component being tested.
- Connect (-) lead to the B- side of the circuit or component.

NOTE: All consumers of the test circuit should be active during the test. Always include ground circuit as part of voltage drop test. DVOM display will indicate the voltage drop in the circuit tested between the DVOM leads.

GENERAL INFORMATION

E83 Product Overview - X3

E83 LIFE CYCLE IMPULSE

Model: E83 X3 3.0si

Production: from August 2006

INTRODUCTION

The BMW X3 has been available on the market as of the 2004 model year and represents a premium product in the segment of compact luxury SUVs.

As of August 2006 production, the E83 will undergo a redesign in order to maintain its leading position in the market and to fend off the ever increasing number of competitors.

This model redesign, known as LCI (Life Cycle Impulse), includes a pronounced visual upgrade, the introduction of new engines as well as a whole series of improvements in details as well as in the range of interior trim and fittings.

As of September 2006, the E83 X3 3.0i with M54B30 (170 kW/231 bhp) will be replaced with the X3 3.0si with N52B30O1 (191 kW/260 bhp).



Fig. 1: BMW X3 Model

Courtesy of BMW OF NORTH AMERICA, INC.

BODY

Bodyshell

The only technical change is to the openings for the reversing lights in the inner panel of the rear hatch. Due to the higher positioning of these lights, it was also necessary to displace the clearance for their bulbs further upward.

The carrier, sheet metal components and assembly concept remain unchanged. Only the underbody paneling has been adapted to the new engines as part of the model redesign. Modifications to the bodyshell components are solely restricted to details such as the repositioning of threaded connections, pins or securing elements for the adapted wiring harnesses.

All parts of the bodyshell (hood/tailgate, side panels, doors, sills and weatherstrips) remain unchanged. The same also applies to the body connection points.

Front

The redesigned E83 can be immediately distinguished from its predecessor by the partly painted bumpers and the double kidney grill that extends further downward.

The newly designed front bumper which was previously two-piece is now three pieces. A top section painted in the car color and a bottom cover that is also painted are now clipped onto the black-structured, bolted carrier. These painted parts can be individually replaced as required by removing the complete bumper.



Front view - Left: E83 up to 8/06, Right: E83 LCI

Fig. 2: Front View Of BMW - Left E83 Up To 8/06, E83 LCI

Courtesy of BMW OF NORTH AMERICA, INC.

The kidney grills now extend further downward is available only with light titanium bars.

The grill between the double kidney and bumper as well as the lower grill are black on all vehicles.

Rear

The rear bumper on the E83 LCI is also a new design. It is now made up of four main parts (previously one-piece). Two black side panels and one exhaust finisher also in black are fitted on a carrier painted in the car color.

In the same way as the front bumper, the rear bumper can also be dismantled for repairs and paint work (after disassembly).

Two separate reflectors are clipped on to the left and right of the exhaust finisher. The PCD sensors of the rear bumper are located in the painted area and are therefore painted in the car color (unchanged black at the front).

The panel at the lower edge of the rear hatch is now also painted in the car color, thus making a decisive contribution to the overall higher grade impression of the X3's rear end.

Vehicle Exterior Lighting

Headlights

The front headlights retain their outer contour and connection points. However, vehicles with halogen headlights are now equipped with new open-design segments for high beam and low beam reflector. The tube body, cover frame and housing are new. In addition, vehicles with bi-xenon lights now have lights with four light coronas (previously two).

The previous headlight washer system with free-standing water jets has now been replaced by a system with retractable washer jets.

Fog Lights

The new fog lights for the X3 have been modified.

A new cornering light function has been added. This function is controlled by means of signals from the direction indicator and steering angle sensor. When turning, the respective fog light is switched on thus optimally illuminating the turn-off area.

Turn Indicators

The design of the front direction indicator lights has been slightly modified in the same way as the side repeater lights which are white. The vehicle is additionally equipped with side markers.

Taillights

The tail lights have also undergone a facelift. A new chamber arrangement (reversing lights now further up) as well as the use of active light guides for the tail light function (instead of the previous bulbs) give the rear end of the X3 a modern appearance.

The lights on the side panels retain their outer contour and connection points while the contour of the lights on the rear hatch have been modified.



Rear view - Left: E83 up to 8/06, Right: E83 LCI

Fig. 3: Rear View Of BMW - Left E83 Up To 8/06, E83 LCI
Courtesy of BMW OF NORTH AMERICA, INC.

INTERIOR DESIGN

Cockpit

The dashboard has been upgraded by numerous details. The instrument cluster shroud (previously attached) provides for a wider color separation groove and a more harmonious general impression. The dashboard, shroud, and airbag cover also have a new structure finish.

The cover of the glove compartment is positioned slightly lower.

The trim covers for the fresh air grills, the light switch cluster and the cup holder are now coated with soft paint (three different colors - depending on interior color).

Both the basic steering wheel as well as the sports steering wheel now feature a new steering wheel rim and a new cover.

In addition, the sports steering wheel features new spokes and a new backing. Both steering wheels have 3 spokes, the previous 4-spoke basic steering wheel is no longer available.

As in other model series, the interior rear-view mirror in the E83 is available with a digital compass.



Cockpit - Left: E83 up to 8/06, Right: E83 LCI

Fig. 4: Identifying Cockpit - Left E83 Up To 8/06, Right E83 LCI
Courtesy of BMW OF NORTH AMERICA, INC.

Door Panels

The door mirrors have also been distinctly upgraded by new surface structuring and geometry. The connection to the dashboard has been improved while the trim covers for the speakers are now larger due to the installation of new speakers.

Storage compartment shelves integrated in the door trim panel replace the previous netshell combination. The finishers for the power window switches are now smaller.



Door trim panel - Left: E83 up to 8/06, Right: E83 LCI

Fig. 5: Door Trim Panels Left E83 Up To 8/06, Right E83 LCI
Courtesy of BMW OF NORTH AMERICA, INC.

Rear Seat

Modifications to the foam material in the seat and the seat cover of the rear bench seat have raised the front edge by 30 mm thus improving the seating comfort in the rear. A seat heating system will be additionally offered for the rear seat.

DRIVETRAIN

N52 Engine

The N52 engine first offered in the E90 will be reengineered for the September 2006 launch and will then be known as the N52K. The exact engine designation will N52B30O1.

Compared to the M54 6-cylinder engine previously fitted in the E83, the N52K is characterized by lower fuel consumption (12% reduction), reduced weight (10 kg less), 35 hp (30 kW) increase in power output and an increase of 11 lb ft torque.



Fig. 6: N52 Engine Assembly

Courtesy of BMW OF NORTH AMERICA, INC.

The exhaust manifold has been slightly adapted to match the geometry of the E83.

The same also applies to the oil pan with modified underbody area and threaded connection to the front axle.

The shape of the engine support has been modified to accept the N52. The power steering oil reservoir is now mounted on the screw connection for the alternator instead of on the frame side member as previously.

Intake Air Duct

For the first time at BMW, the intake silencer is a fixed part in the engine. The unfiltered air duct is crash-optimized. An unfiltered air resonator and a time chamber filtered air resonator are used in order to satisfy acoustics requirements.

Digital Engine Electronics (DME)

The engine management MSV80 is used in connection with the N52K. This system is a further development of the MSV70 and has been adapted in terms of several details.

Exhaust System

For acoustics reasons, the exhaust system is now mounted at the level of the transfer case instead of at the engine support as previously.

NOTE: For detailed information on this engine please refer to the ST613 " " technical training manual.

Gearbox

6-speed Manual Transmission

The synchromesh of the gearshift mechanism has been newly developed to provide outstanding gearshift comfort both at low as well as elevated shift forces.

1st/2nd gearshift now takes place in double cone synchromesh and single-cone synchromesh for 3rd/4th and 5th/6th gear.

A central selector valve connects the gearshift with a shift gate on the inside for the first time. Another new feature is the passive shift lock that guarantees distinctly greater locking reliability in addition to further optimized smoothness of operation.

The pressure diecast aluminum transmission casing is of 2-piece design similar to that of the 5-speed manual transmission.

6-speed Automatic Transmission GM6 (6L45)

The new automatic transmission GM6 replaces the previous transmission GM5 in the E83. As indicated by its designation, the transmission has 6 forward drive ranges (GM5: 5).

The spread and gear ratio are virtually identical to the GM5.

The power transmission capacity of the transmission weighing 170lbs (76.9 kg), including oil, is 258 lb ft (350 Nm). Its main advantages include a 6 % reduction in fuel consumption and improved gearshift dynamics.

The lower fuel consumption results from the use of the so-called neutral idle control (NIC), low converter slip thanks to the use of a turbine-torsion damper as well as reduced drag losses in the clutches.

The structure of the transmission generally corresponds to that of the 6HP19. The main difference in the GM6 is a one-way clutch to ensure stable shift quality when shifting from 1st to 2nd. Thanks to their high drive percentage with the clutch engaged, converters with turbine-torsion dampers provide a direct connection to the engine.

The transmission control unit is accommodated together with the hydraulic control unit in the transmission (mechatronics concept). This arrangement provides advantages in terms of package space and, due to the smaller number of interfaces, it also ensures increased system reliability.

RUNNING GEAR

Rear Axle Differential (final drive)

A new final drive unit (L-axle drive) has been developed to improve the efficiency of the final drive for the X3. The final drive has adopted the new bearing concept from the BMW 3 Series together with the new double

angular contact ball bearings. This results in a considerable reduction in the operating temperature of the final drive, having a positive effect on operation and service life.

At the same time, oil flow losses have been substantially reduced while adapting and optimizing the efficiency of the gearing in terms of the displacement characteristics.

The torque capacities of the final drive units HAG168L and HAG188L have been increased by 10 % making these final drive units heavier. For acoustics reasons, their casings are still made from spheroidal cast iron.

The table below identifies the differential usage and ratio by vehicle equipment options:

DIFFERENTIAL SPECIFICATION

Model/equipment	Differential (ratio)
X3 3.0si manual	HAG188L (3.73 :1)
X3 3.0si automatic	HAG168L (4.44:1)

Two-stage Disc-type Vibration Absorber

For effective acoustic decoupling of the drive train, a two-stage disc-type vibration absorber is fitted between the propeller shaft and transfer case that becomes harder as the applied torque increases.

CHASSIS

Various modifications to the chassis of the E83 have been necessary to accommodate the higher performance N52K engine. Most of these modifications, however, are restricted to geometric adaptations (steering system and heat shields).

Mounts

The engine and transmission mounts are new.

DXC+

The driving dynamics system DXC+ in the E83 features additional functions.

In addition to the known features such as ABS, ASC, CBC, DSC and HDC, the following will be added:

- Dynamic Traction Control (DTC) for ensuring maximum traction irrespective of the driving surface
- Hill starting assistance (Hill-holder)
- Dry brakes in rain
- Brake standby/brake travel reduction
- Brake fading assistance

RDC

All E83 vehicles will be equipped with the tire pressure monitoring system RDC which was introduced in

March 2006.

Power Steering Cooling

The DSC control unit has an additional program module for the power steering cooling. This function increases the fan speed to secure the required cooling capacity under high load conditions (e.g. uphill/downhill driving) at low speed. The signals relating to the driving speed, power output (via HFM) and steering angle lock are used as the control data for this purpose.

ELECTRICAL SYSTEMS

EWS 4.4

The E83 will be equipped with the EWS 4.4 already known from other model series. Thanks to improved logic of the vehicle immobilizer, this electronic control provides increased anti-theft protection, resulting in a more favorable insurance classification of the E83.

Lights Module 2

The lights module 2 replaces the previous light switch cluster in the E83 LCI; it combines its functionality with that of the AHL control unit.

Rear Seat Heating

Rear seat heating will be offered in all X3 models.

Oil Level Indicator

The oil level indicator is now integrated in the instrument cluster.

Radio, CD

The new radio platform of all E83 features a double tuner and station list expansion.

An AUX-In jack is provided on the center console for the connection of external audio sources.

The Random function in the CD changer now only refers to the selected CD and no longer to all (up to six) CDs in the magazine of the changer. This reduced number of selection options substantially shortens the pauses between the music tracks.

Navigation

The computer hardware is now lead-free and therefore recyclable.

SPECIFICATIONS

SPECIFICATIONS

Engine	N52B3001
Type/cylinders/valves	In-line 6/4
Displacement (ccm)	2996
Stroke/bore (mm)	85
Power output (kW/bhp)	260
At engine speed (rpm)	6600
Torque (Nm)	305
At engine speed (rpm)	2500
Governed engine speed (rpm)	6800
Compression ratio	10.7 : 1
Engine electronics	MSV80
Engine weight (kg)	165
Emission stage	ULEV II
Rims	(1)
Tires	(1)
Battery (Ah)	70
Alternator (A/W)	150/2100
Payload (kg)	520
Performance: 0 - 60 mph	Auto 7.1 sec Man 6.9 sec

(1) Value not available when going to print

2005 GENERAL INFORMATION

Electronic Signals - Overview - All Models

ELECTRONIC SIGNALS

Model: All

Production Date: All

PURPOSE OF SIGNALS

Electronic signals move information much like cars move passengers down the highway. It would be difficult to get to work without transportation, and there would be no transportation without signals.

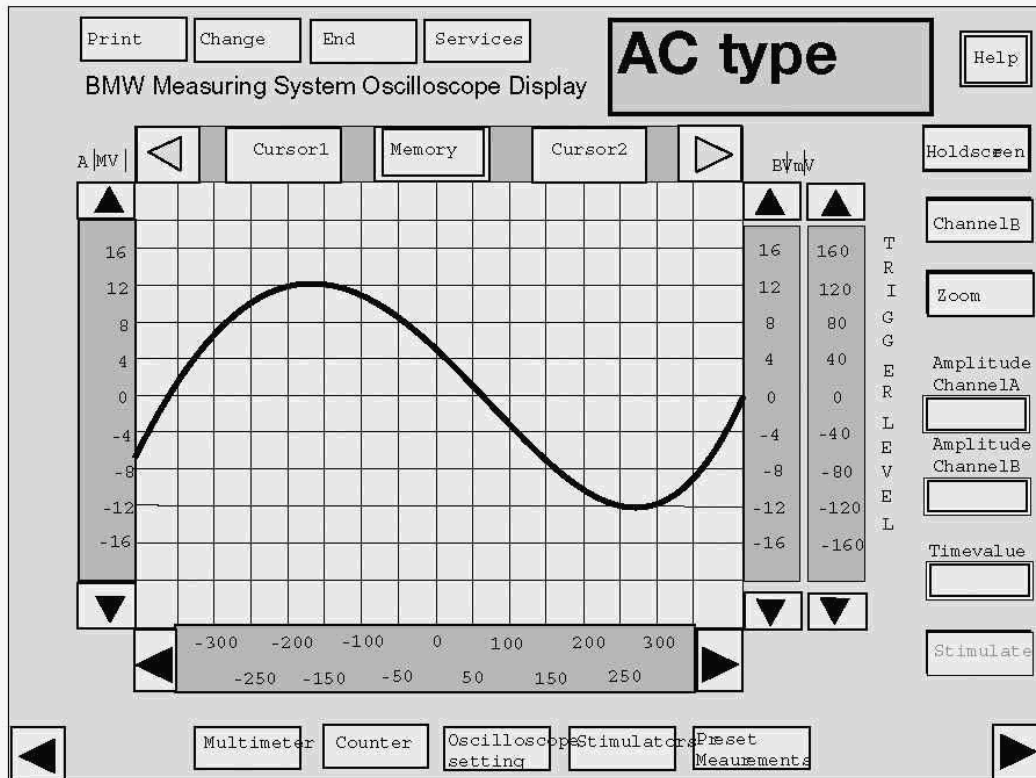
Signals allow devices (e.g. sensors or switches) to communicate with control modules (either complicated processors or simple relays) which in turn perform or request (through more signaling) other functions to be carried out.

Signals inform the Climate Control of the outside air temp or tell the brake lights the right time to illuminate.

The use of electronic signals goes far beyond the basic application of electron flow to control components, enabling complex information to be passed from one component to another.

The data (input or output) is conveyed through various forms of changing voltages, resistances, current or frequency modulation.

1. AC Voltage Signals:
 - A. Inductive Signals.
 - B. Phase Shifted Signals.



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Fig. 1: Identifying AC Voltage Signals
 Courtesy of BMW OF NORTH AMERICA, INC.

2. DC Voltage Signals:
 - A. Analog Signals.
 - B. Digital Signals:
 1. Switched (High/Low) Signals.
 2. Modulated Square Wave Signals:
 - a. Frequency Controlled Signals.
 - b. Pulse Width Controlled Signals.
 - c. Duty Cycle Controlled Signals.
 - C. Designated Value Signals.
 - D. Coded Ground Signals.
 - E. Transistor Signals:
 1. Modulated B+/B- Signals.
 2. Momentary B+/B- Signals.

3. Constant B+/B- Signals.

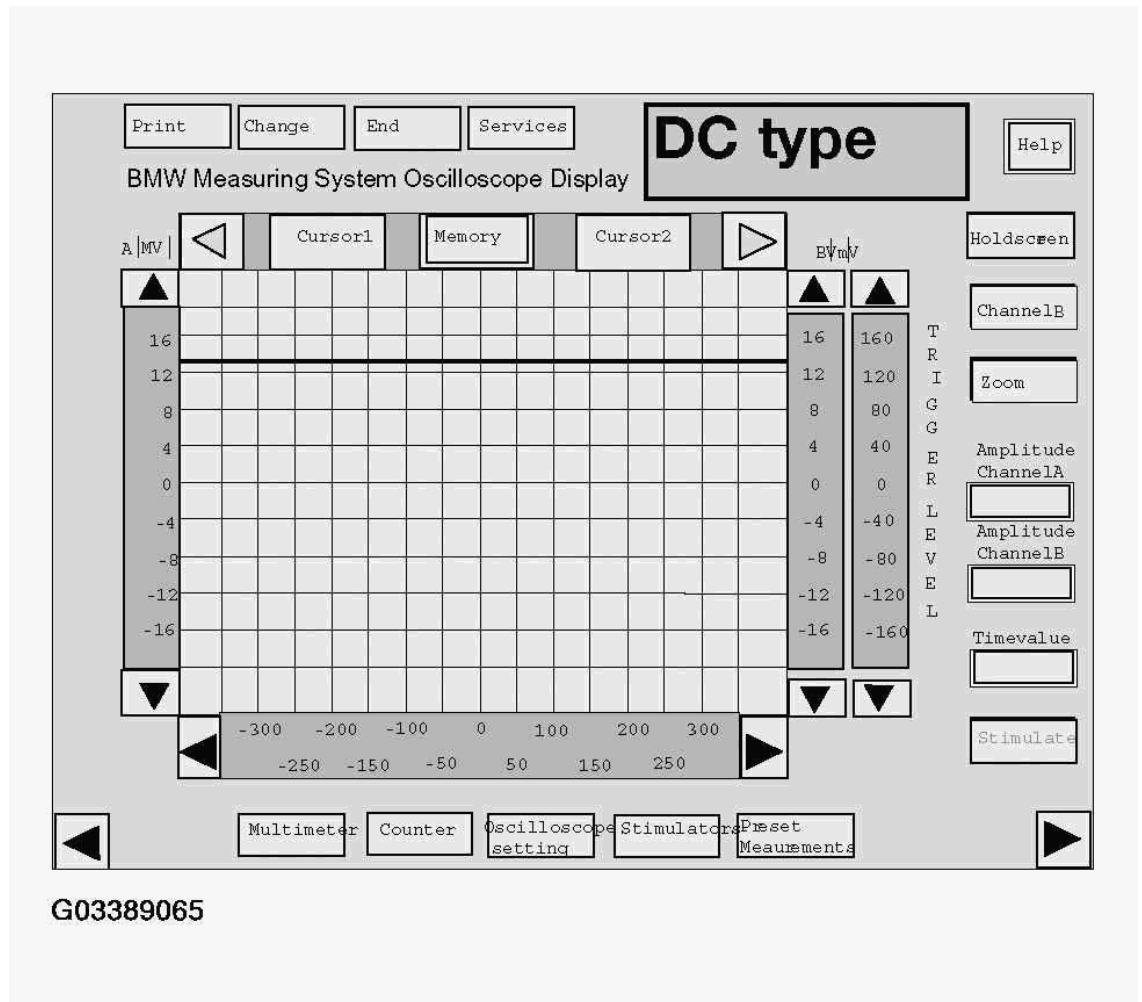


Fig. 2: Identifying DC Voltage Signals
Courtesy of BMW OF NORTH AMERICA, INC.

AC VOLTAGE SIGNALS

Two types of AC Voltage signals are used:

- Inductive Signals (Induced Voltage).
- Phase Shifted Signals (Angle Pulse Generator).

INDUCTIVE SENSORS

Inductive sensors produce an AC Sine Wave signal. The AC voltage is induced by the shifting of a magnetic field. The sensor consists of an impulse wheel (the moving part) and a coil wound magnetic core (the stationary part).

As each tooth of the impulse wheel approaches the sensor tip, the magnetic field of the sensor shifts toward the

impulse wheel and induces a voltage pulse in the windings.

As the teeth move away from the sensor, the magnetic field shifts back inducing a voltage pulse in the opposite direction.

This shifting of the magnetic field produces an alternating current (positive to negative).

Control modules which receive this alternating current, count the impulses (shifts from positive to negative) and interpret the speed of rotation of the impulse wheel.

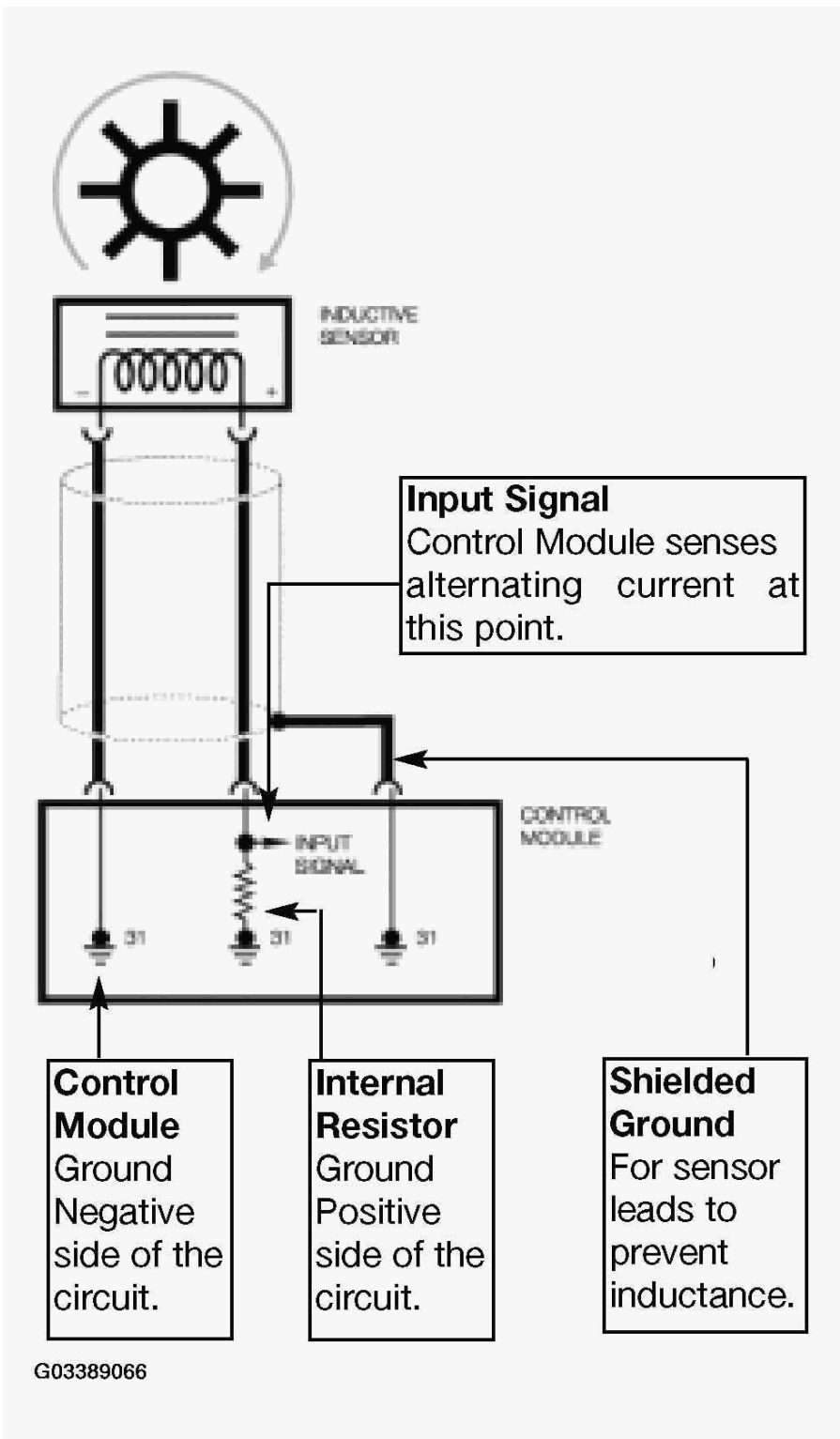
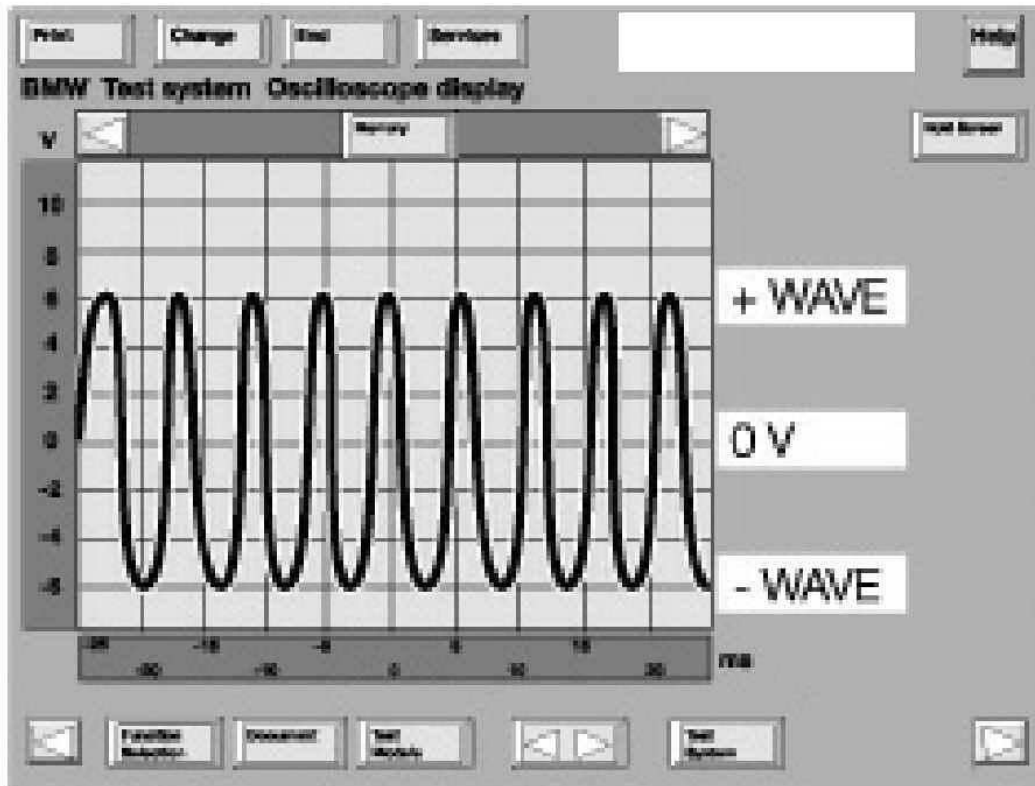


Fig. 3: Inductive Sensor Circuit Diagram

Courtesy of BMW OF NORTH AMERICA, INC.

Typical Application of Inductive Sensors:

- Crankshaft Speed Sensor.
- Camshaft Speed Sensor.
- Transmission Input/Output Speed Sensor.
- Wheel Speed Sensor.



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Fig. 4: Identifying AC Sine Wave Signal
 Courtesy of BMW OF NORTH AMERICA, INC.

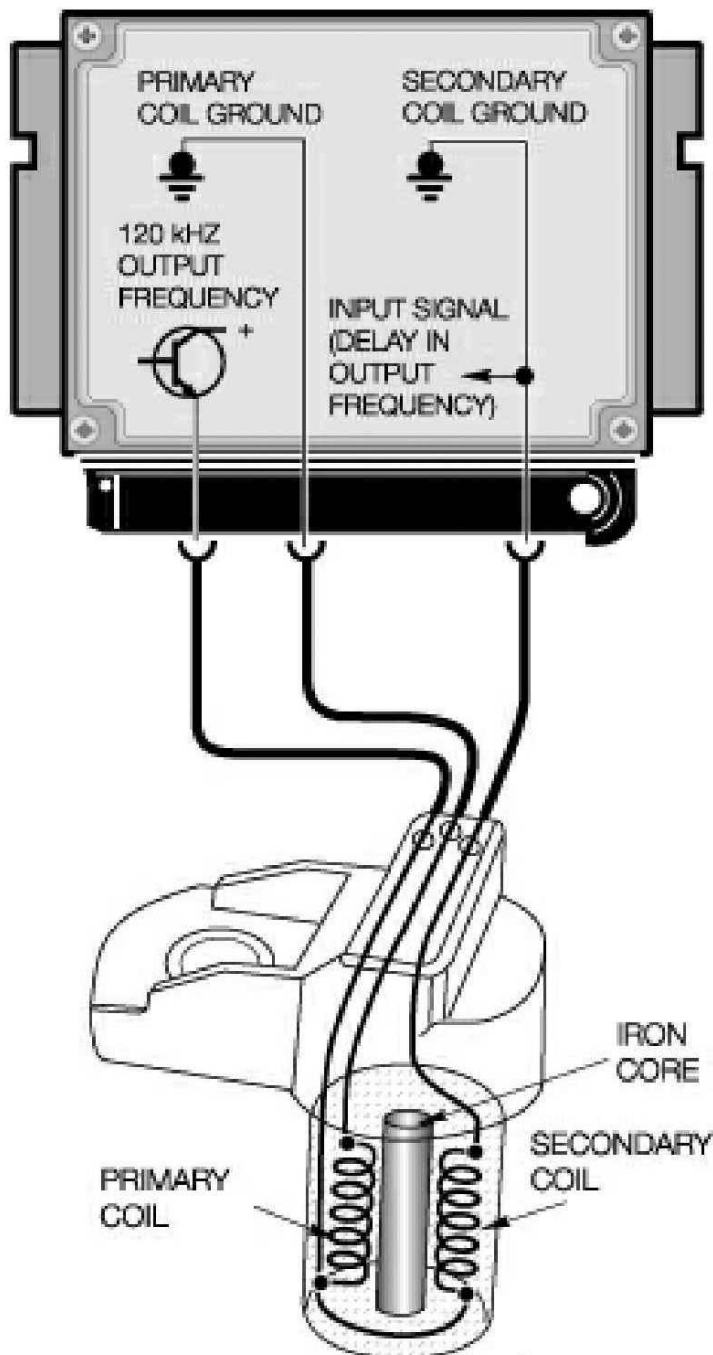
Voltage levels are dependent on sensor design.

Not all inductive sensors produce 12 volts.

ANGLE PULSE GENERATOR

An Angle Pulse Generator Sensor acts on an existing AC voltage signal rather than produce a new one.

The sensor consists of two windings (primary and secondary) that are connected together at one end and a magnetic iron core (stationary) along with a trigger wheel (movable).



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Fig. 5: Checking Angle Pulse Generator
 Courtesy of BMW OF NORTH AMERICA, INC.

The primary winding (coil) is supplied with a 120kHz AC signal by the control module. The magnetic coupling (core) causes a voltage at the same frequency to be induced in the secondary winding. The induced frequency

has a slight phase shift due the induction time delay.

The trigger wheel influences the magnetic field of the sensor and causes the phase shift to increase as the disc of the wheel moves closer to the sensor.

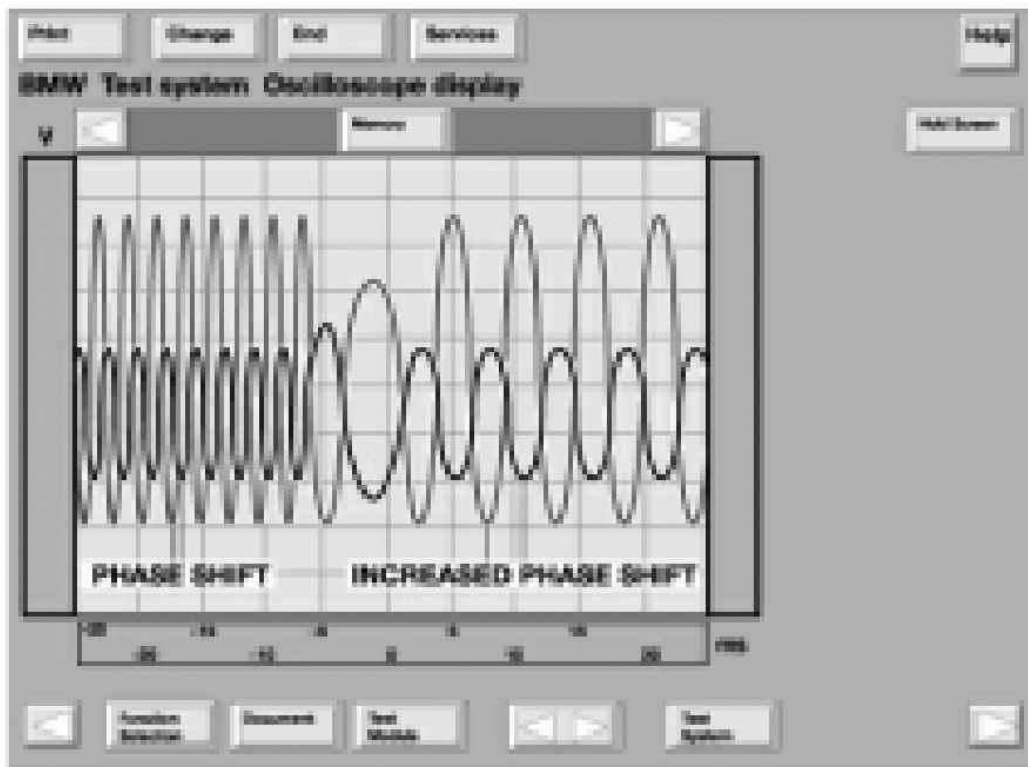
This changing of the phase shift (time delay) from a smaller time period to a larger time period and back again provides the control module with trigger wheel position.

The angle pulse generator provides position information regardless of movement. Trigger wheel position is established with the application of an output frequency from the control module and the return of the phase shifted signal.

Typical Application of Angle Pulse Generator

- Camshaft Sensor MS41.1.
- Pedal Request Sensor EML.

(a bank of three)



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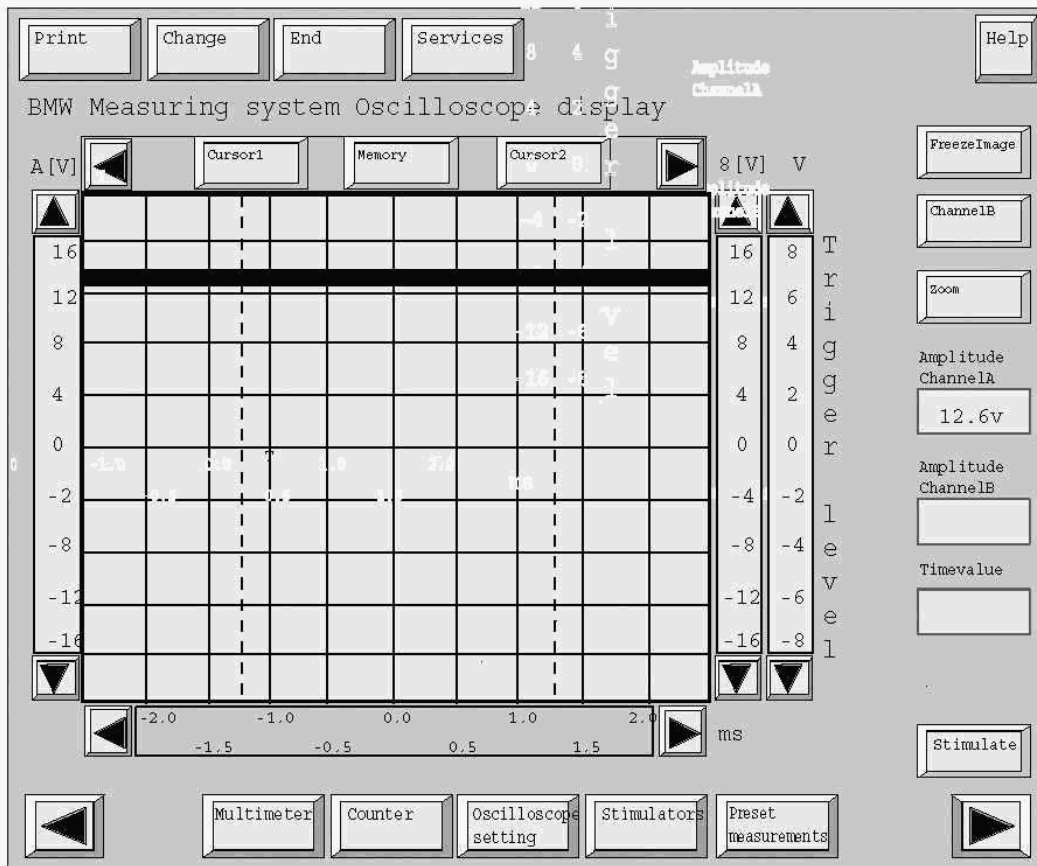
Fig. 6: Angle Pulse Generator Wave Signal
Courtesy of BMW OF NORTH AMERICA, INC.

DC VOLTAGE SIGNALS

Five Types of DC Voltage Signals Are Used:

- Analog Signals.
- Digital Signals.
- Designated Value Signals.
- Coded Ground Signals.
- Transistor Signals.

DC voltage signals are based on either 5 volts or 12 volts.



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Fig. 7: Identifying DC Voltage Signals

Courtesy of BMW OF NORTH AMERICA, INC.

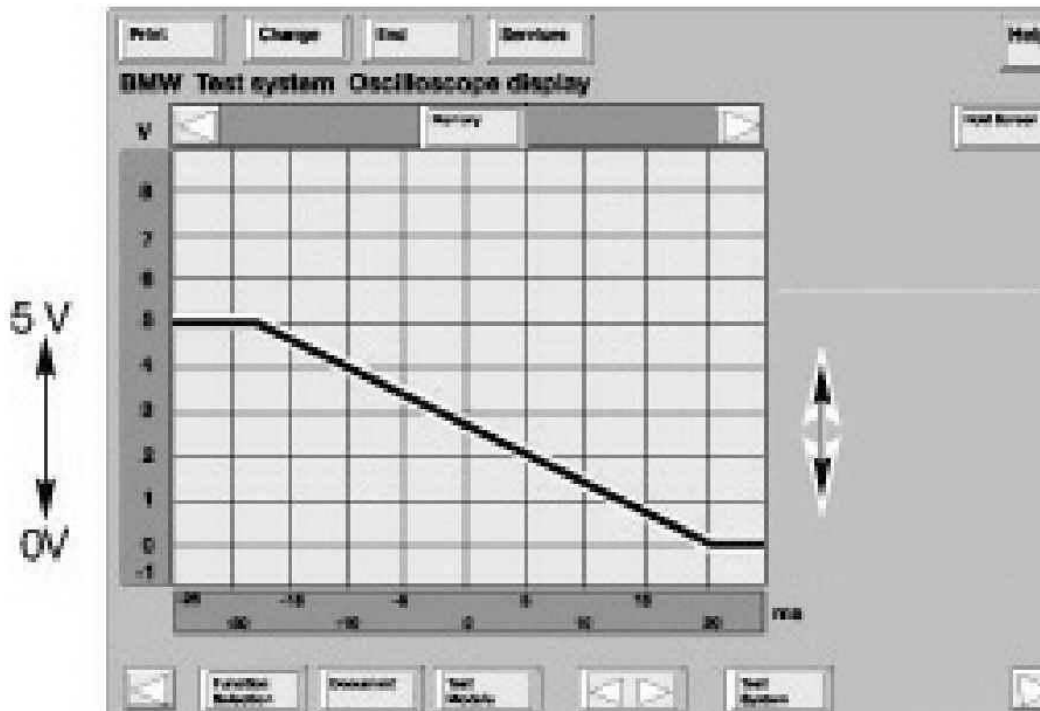
ANALOG SIGNALS

Analog signals transmit information through an electrical circuit by regulating or changing the current or voltage.

The voltage of the signal has no fixed value. The value may be anywhere in the operating range of the signal.

Three sources of analog signals are:

- NTC Sensors.
- PTC Sensors.
- Potentiometers.



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Fig. 8: Identifying Analog Signals

Courtesy of BMW OF NORTH AMERICA, INC.

NTC SENSORS

NTC (Negative Temperature Coefficient) sensors change resistance based on temperature. As the temperature

goes up the resistance goes down. This decrease in resistance causes the voltage drop across the sensor to decrease and the input signal voltage at the control module decreases.

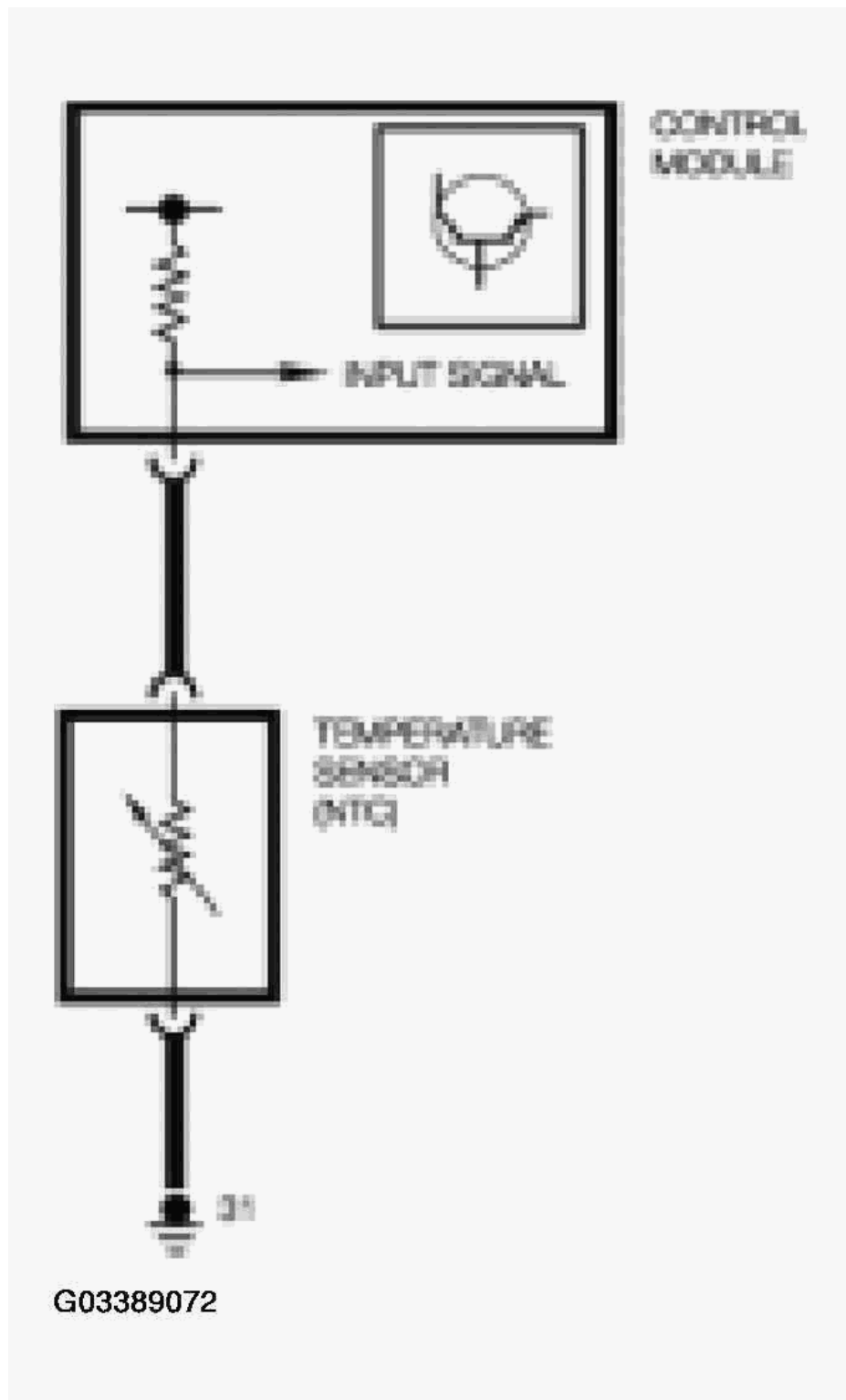


Fig. 9: NTC Sensor Circuit Diagram

Courtesy of BMW OF NORTH AMERICA, INC.

Examples Of NTC Sensors

Intake Air Temperature Sensor

The intake air temp sensor provides a 0--5 volt analog signal to the DME indicating temperature of the incoming air.

The intake air temp sensor is located either in the intake manifold or integrated in the mass air flow meter.

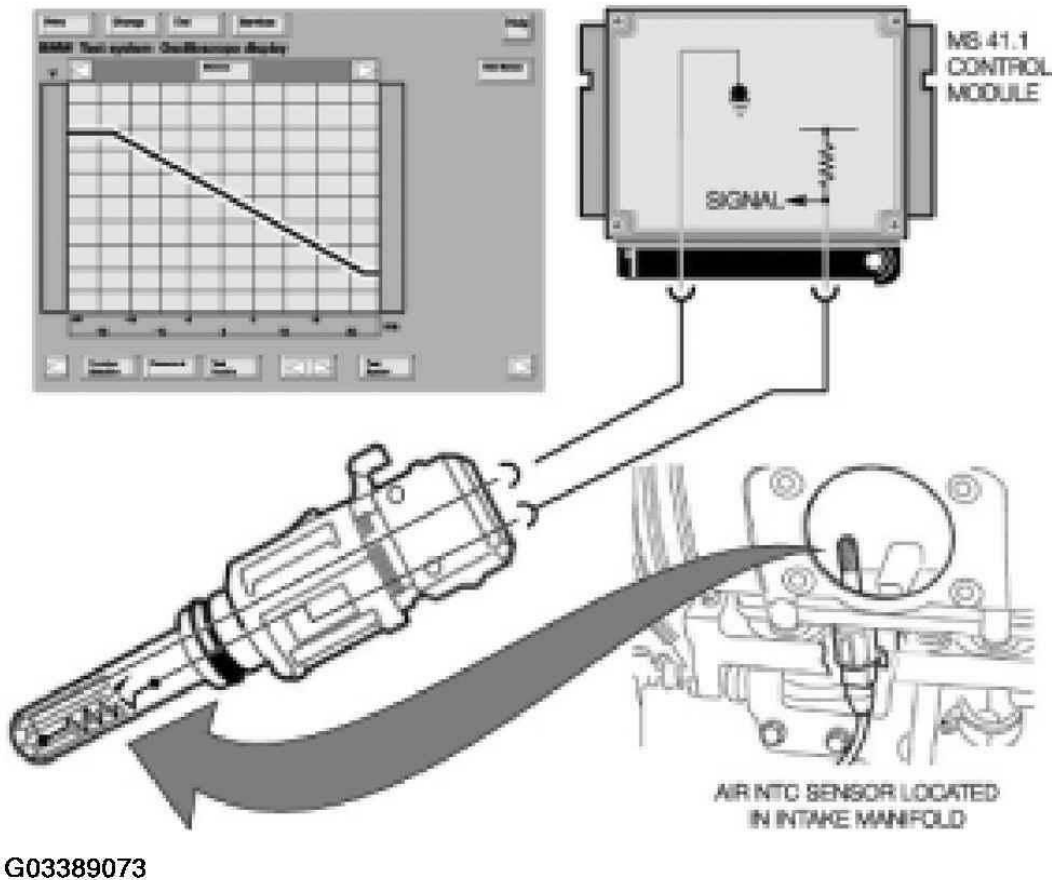


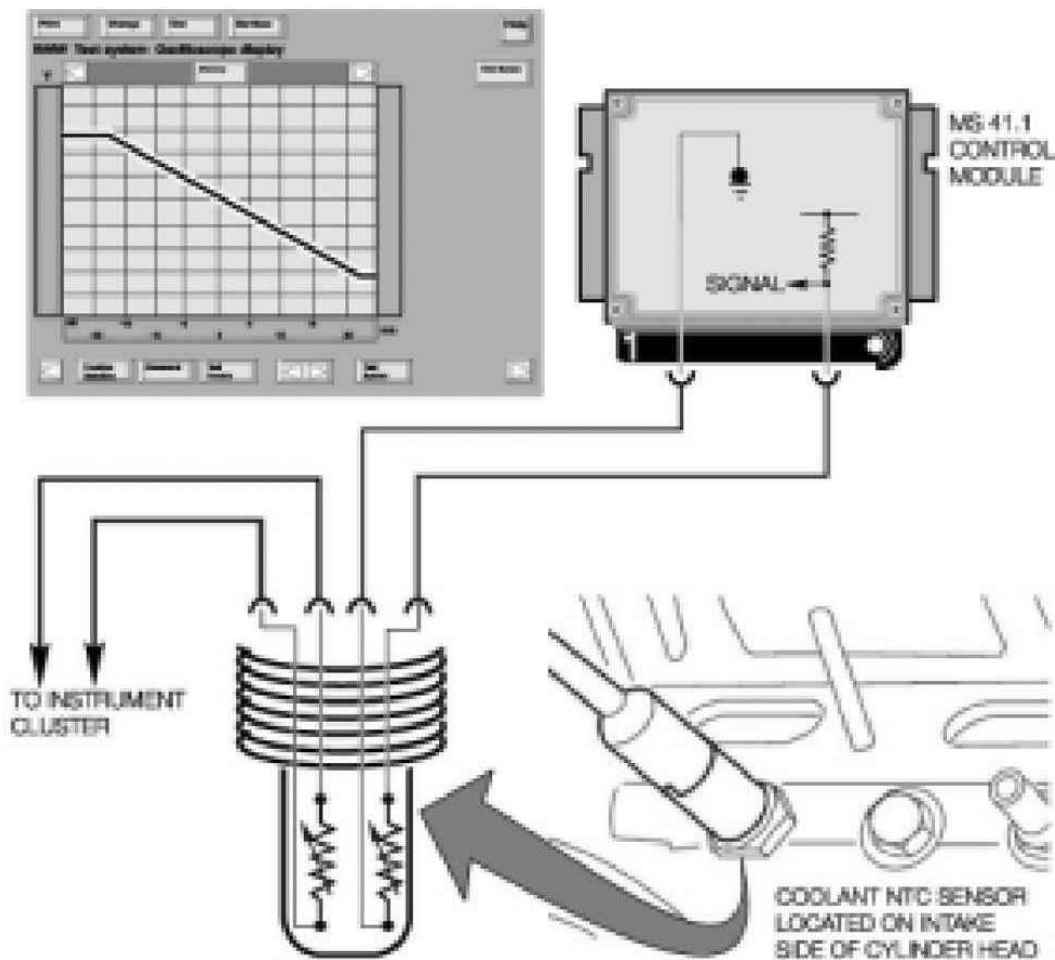
Fig. 10: Checking Intake Air Temperature Sensor
Courtesy of BMW OF NORTH AMERICA, INC.

Engine Coolant Temperature Sensor

A dual sensor is used for engine temp. Operation is the same as other NTC sensors, 0-5 volt operating range, except that two independent sensors are housed in one assembly.

One is for the engine temperature input to the DME.

The other sensor is used to input engine temp to the instrument cluster.



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Fig. 11: Checking Engine Coolant Temperature Sensor
Courtesy of BMW OF NORTH AMERICA, INC.

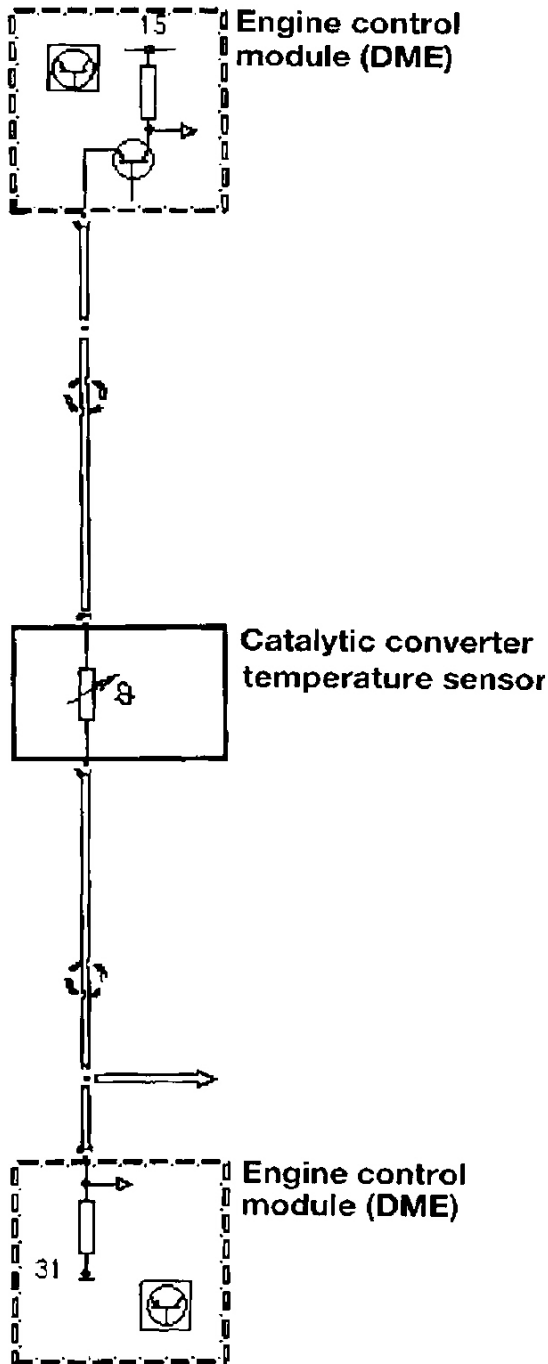
Typical Application of NTC Type sensor:

- Engine Coolant Temp Sensor.
- Intake Air Temp Sensor.
- Transmission Temp Sensor.

PTC SENSOR

PTC (Positive Temperature Coefficient) sensors also change resistance based on temperature. In a PTC sensor

as the temperature goes up the resistance also goes up. The increase in resistance causes the voltage drop across the sensor to increase and the input voltage signal at the control module increases.



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Fig. 12: PTC Sensor Circuit Diagram
Courtesy of BMW OF NORTH AMERICA, INC.

Typical Application of A PTC Type Sensor:

- Exhaust Temp Sensor.
- Transmission Temp Sensor.

Example of PTC Sensor

A M5 Catalytic Converter uses a PTC type sensor to monitor exhaust temperature.

A 0-12v signal is supplied to the DME indicating catalyst temperature.

Workshop Hints NTC/PTC Sensors:

When troubleshooting a faulty input display, the input signal must be verified as "good" BEFORE the control module is replaced.

When checking a NTC Sensor look for these voltages and problems:

0 volts = no supply voltage or shorted to ground.

2v = sensor is indicating a warm condition for system being measured.

4v = sensor is indicating a cold condition for system being measured.

5v = sensor or wiring harness is open.

Remember a PTC type sensor will indicate opposite results on intermediate readings (i.e. 4 volts = warm).

POTENTIOMETERS

A Potentiometer produces a gradually changing voltage signal to a control module. The signal is infinitely variable within the operating range of the sensor.

This varying voltage reflects a mechanical movement or position of the potentiometer wiper arm and its related components.

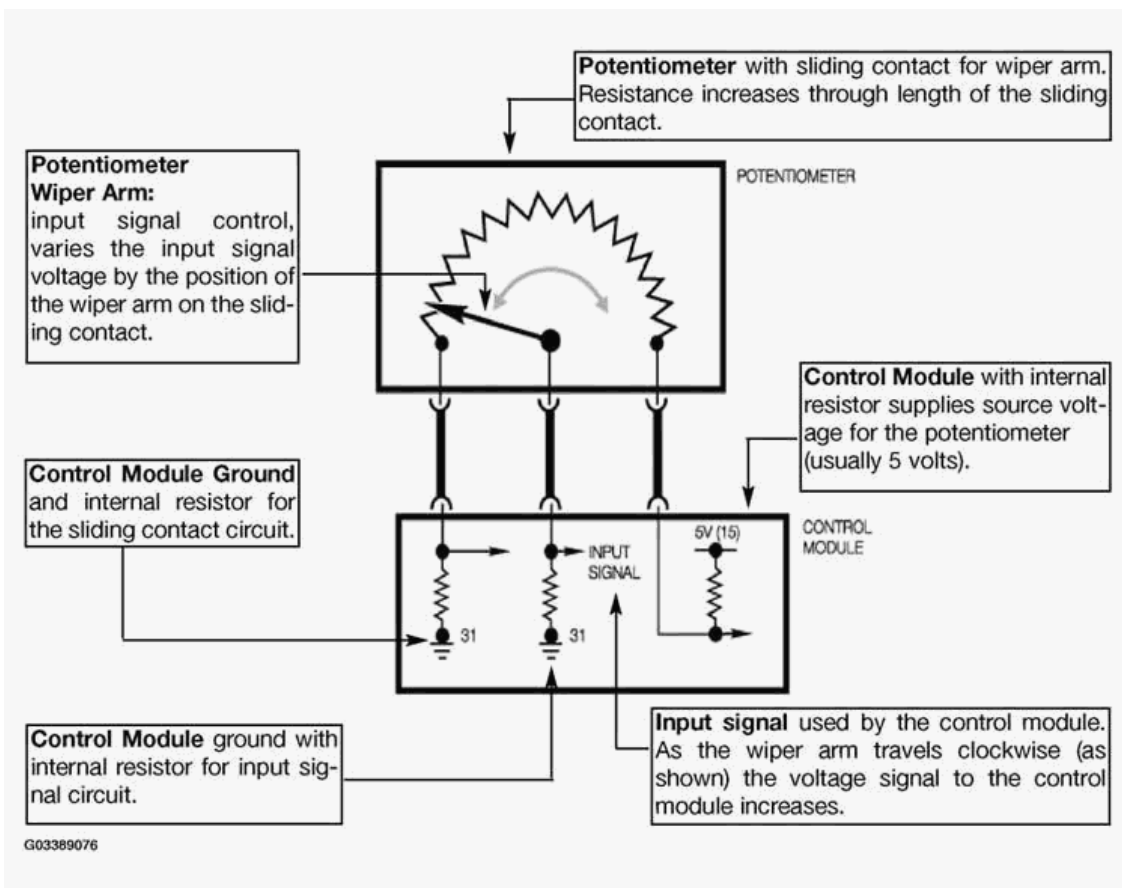


Fig. 13: Identifying Potentiometer
 Courtesy of BMW OF NORTH AMERICA, INC.

Typical Application of Potentiometers:

- Air Flow Meter.
- Pedal Position Sensors.
- Seat and Mirror Memory Position.
- Throttle Position Sensors (Also Feedback Potentiometers).

DIGITAL SIGNALS

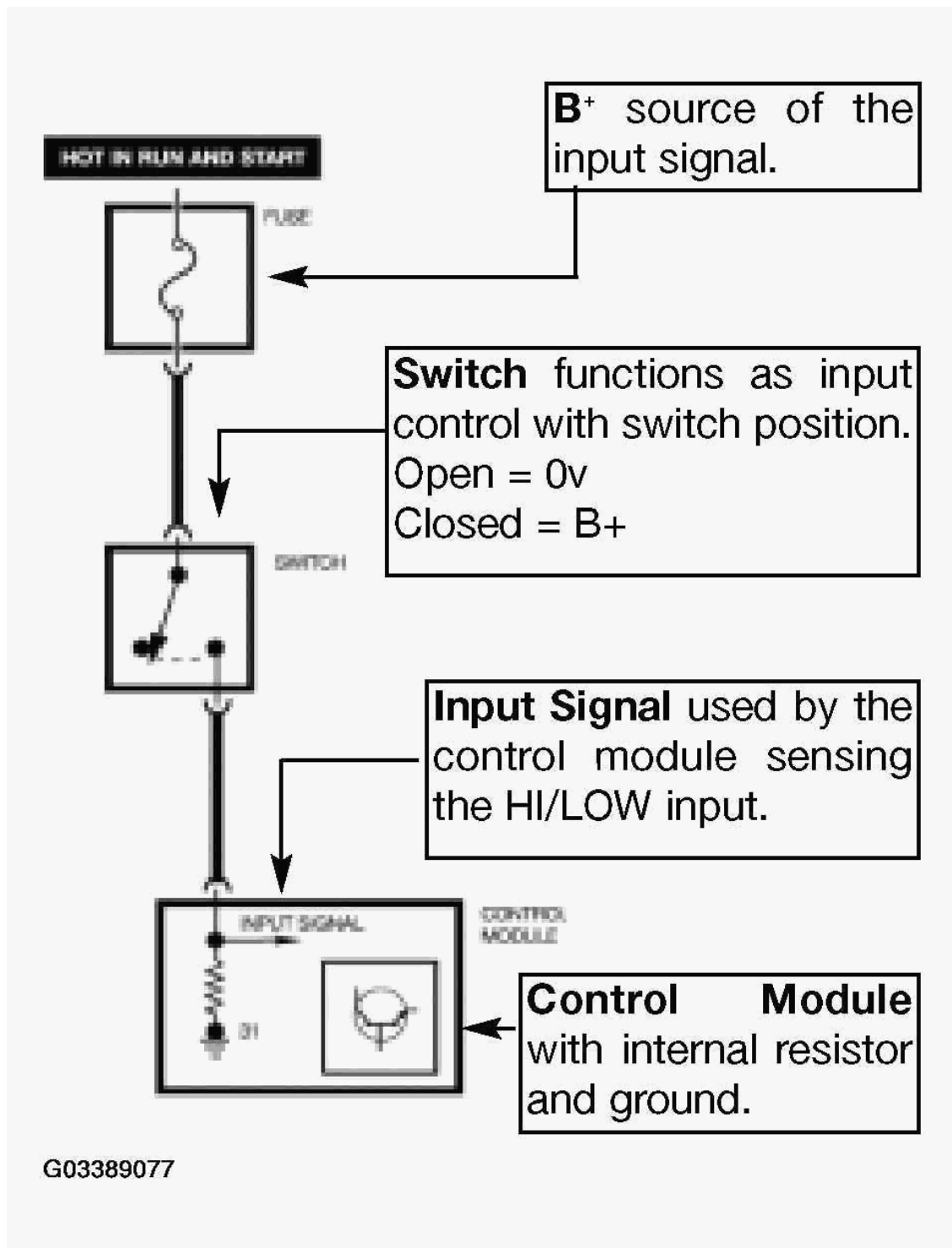
Digital Signals transfer information through an electrical circuit by switching the current on or off. Unlike analog signals which vary voltage, a digital signal has only two possible states, control voltage or 0 voltage.

Two types of Digital Signals:

- Switched (High/Low) Signals.
- Modulated Square Wave signals.

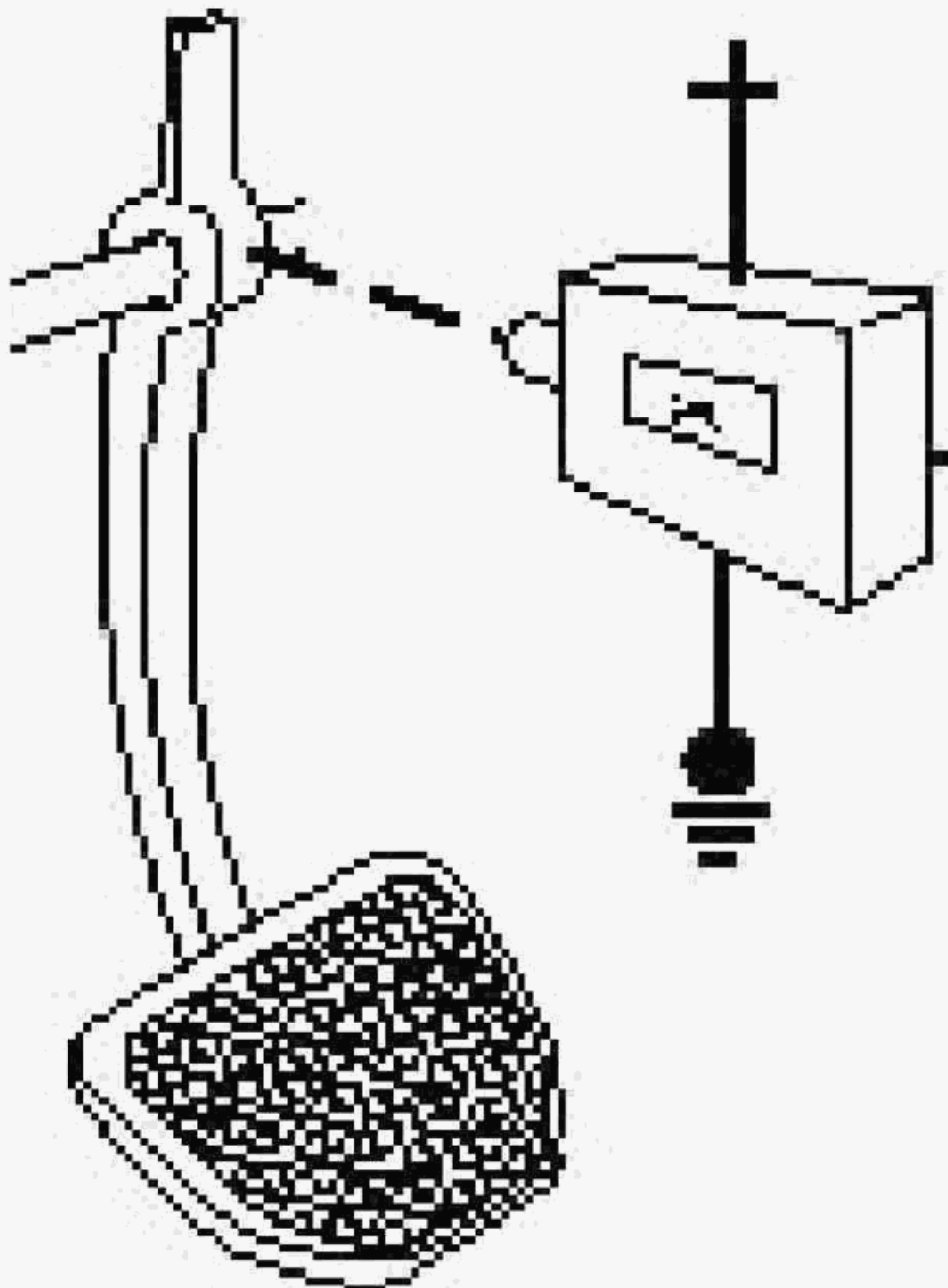
SWITCHED B+ SIGNAL

This DC voltage signal produces a YES/NO type input to the control module. The voltage level will indicate a specific operating condition.



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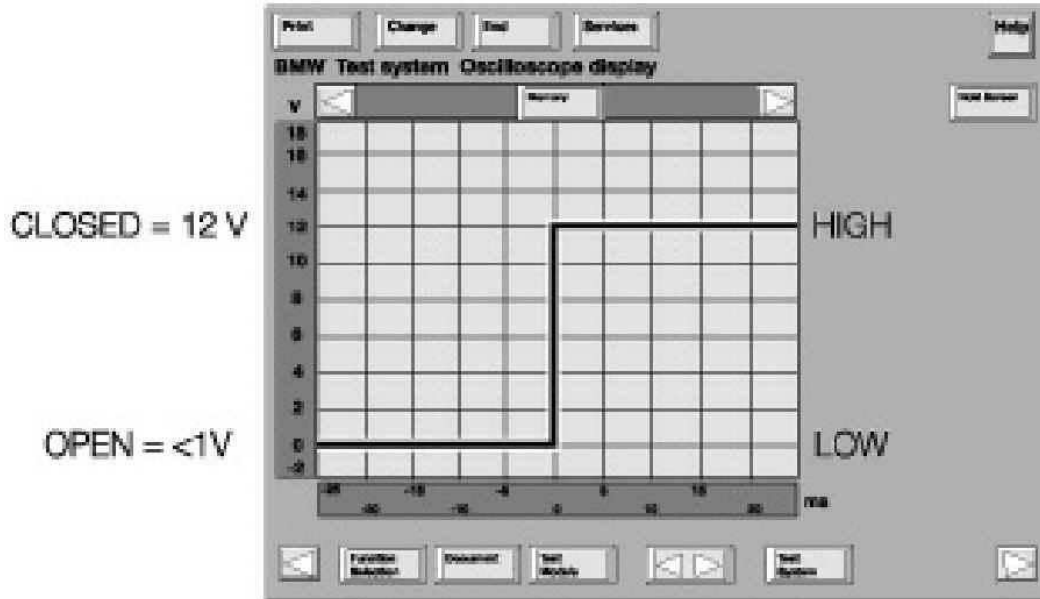
Fig. 14: Digital Signals Transfer Information Chart
Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 15: Identifying Brake Light Switch
Courtesy of BMW OF NORTH AMERICA, INC.

Hall effect Brake Light Switch



G03389079

Fig. 16: Identifying DC Voltage Signal
Courtesy of BMW OF NORTH AMERICA, INC.

Typical Application of Switched B+:

- Ignition Switch.
- Seat Belt Switch.
- Light Switch.
- Hall Effect Switch (e.g. Brake Light Switch).
- Reed Switch.

SWITCHED B- SIGNAL

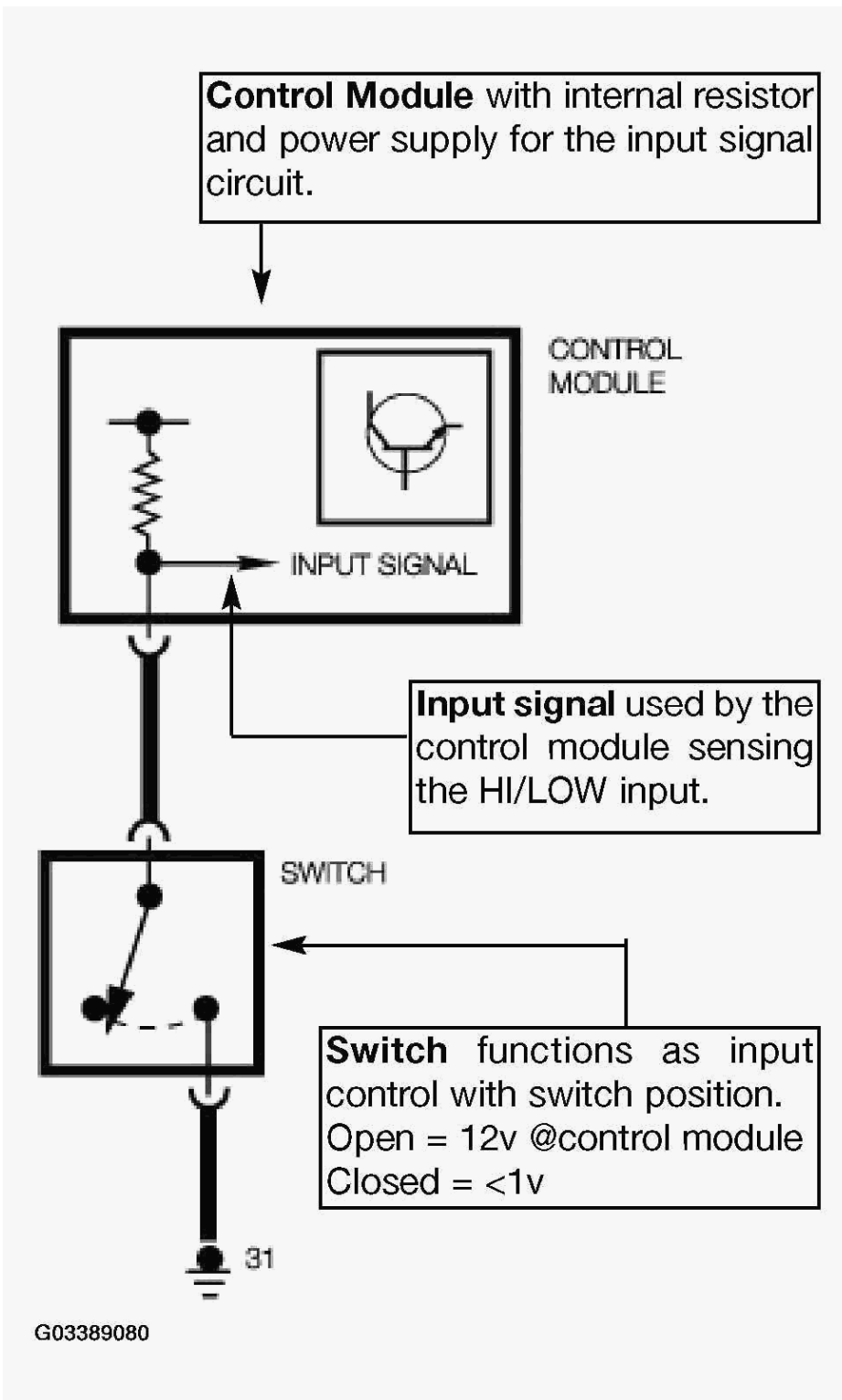
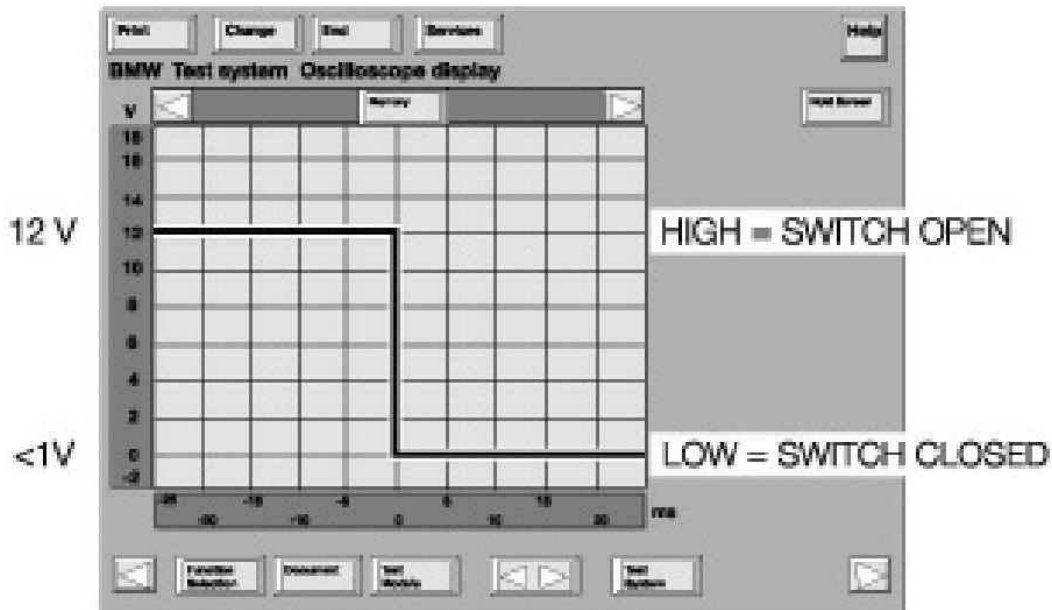


Fig. 17: Identifying (High/Low) Signal
 Courtesy of BMW OF NORTH AMERICA, INC.

This Ground Signal produces a YES/NO type input to the control module. The voltage level will indicate a specific operating condition.



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Fig. 18: Identifying Ground Signal

Courtesy of BMW OF NORTH AMERICA, INC.

Typical Application of Switched B-

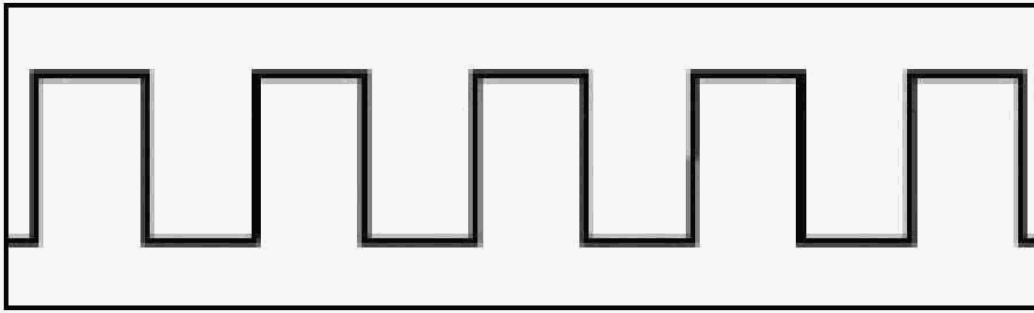
- Door Position Switch.
- Kickdown Position Switch.
- A/C Pressure Switch.

MODULATED SQUARE WAVE

A Modulated Square Wave is a series of High/Low signals repeated rapidly.

Like the switched signals (B+, B-) the square wave has only two voltage levels.

A high level and a low level.



A Modulated Square Wave appears as a High/Low signal repeated rapidly over and over.

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Fig. 19: Identifying Modulated Square Wave

Courtesy of BMW OF NORTH AMERICA, INC.

A modulated square wave has 3 characteristics that can be modified to vary the signal:

- Frequency.
- Pulse Width.
- Duty Cycle.

Frequency

The frequency of a modulated square wave signal is the number of complete cycles or pulses that occur in one second. This number of cycles or frequency is expressed in **Hertz (Hz)** . 1Hz = 1 complete cycle per second.

An output function may use a fixed or varied frequency.

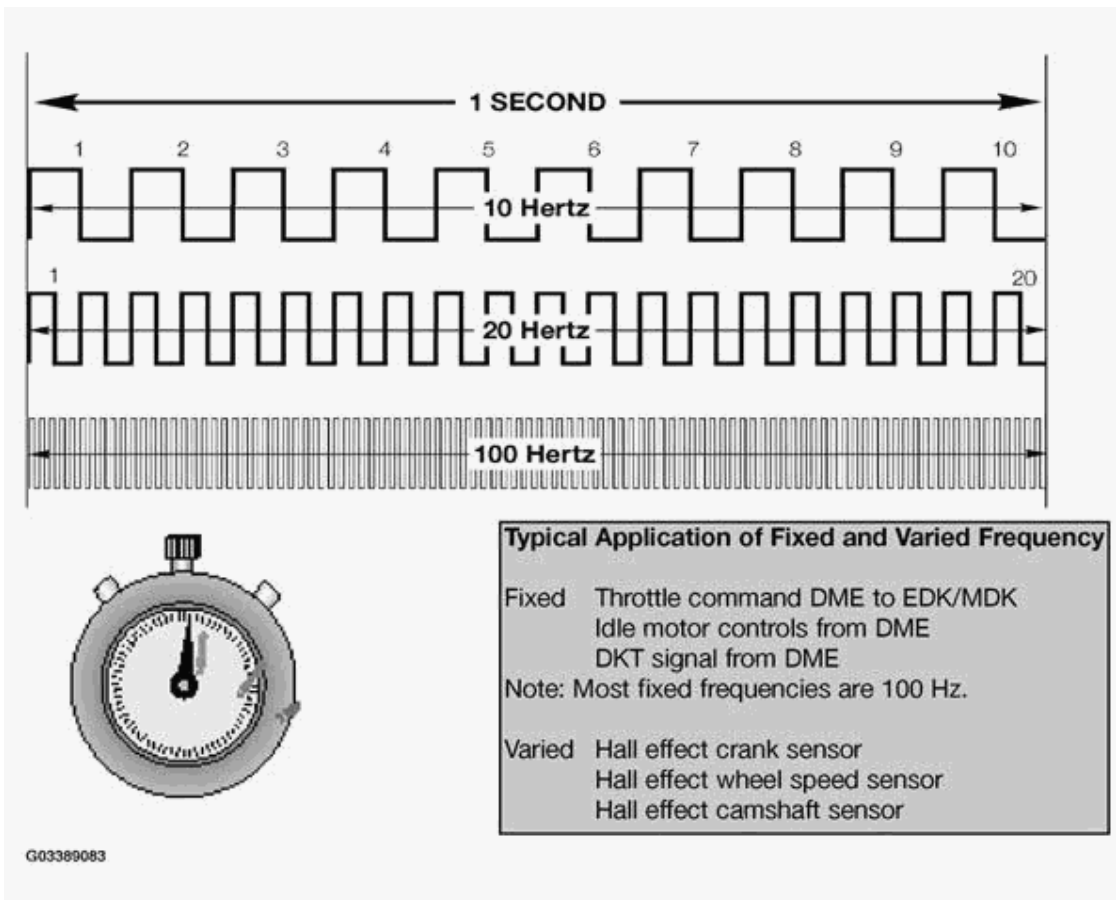


Fig. 20: Identifying Modulated Square Wave Signal
 Courtesy of BMW OF NORTH AMERICA, INC.

Pulse Width

The Pulse Width of a square wave is the length of time one pulse is ON. Vehicle systems may use fixed or varied ON times or pulse width. Pulse width is expressed in **milliseconds** (ms).

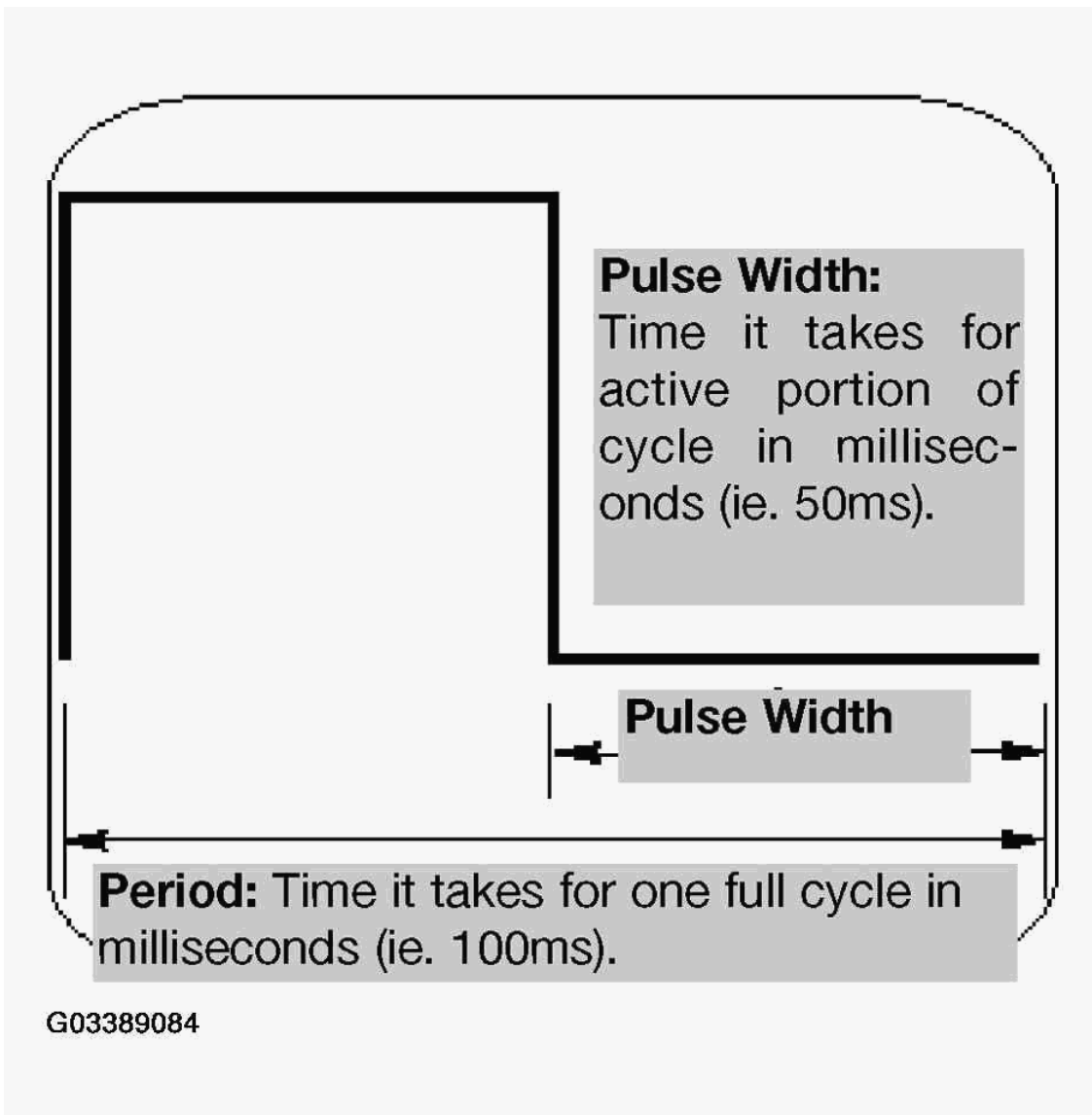


Fig. 21: Identifying Pulse Width Display

Courtesy of BMW OF NORTH AMERICA, INC.

Duty Cycle

The Duty Cycle of a square wave is the ratio of ON time to OFF time for one cycle.

Duty cycle is expressed in %.

Vehicle systems use both fixed duty cycle signals and variable duty cycle signals.

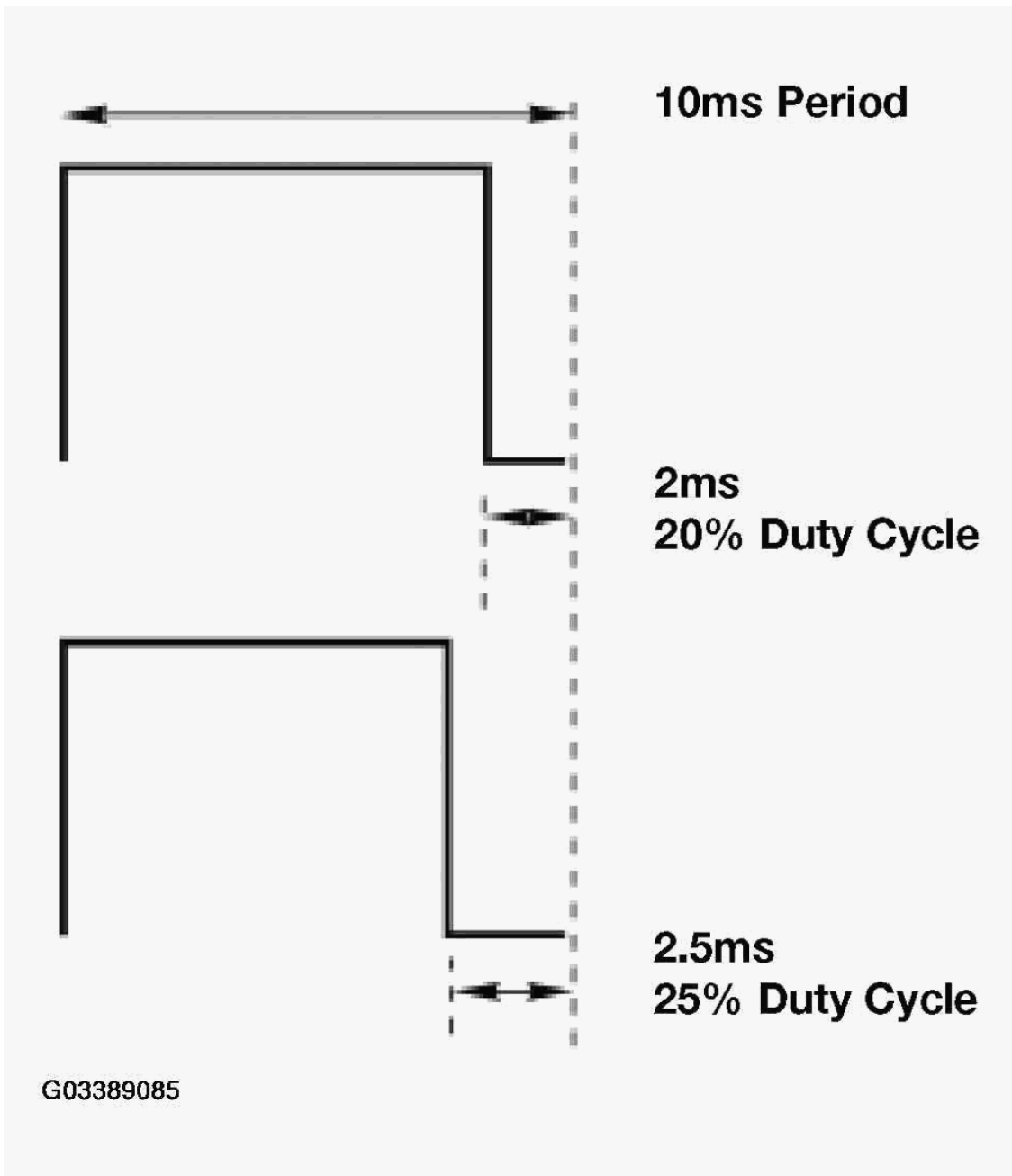
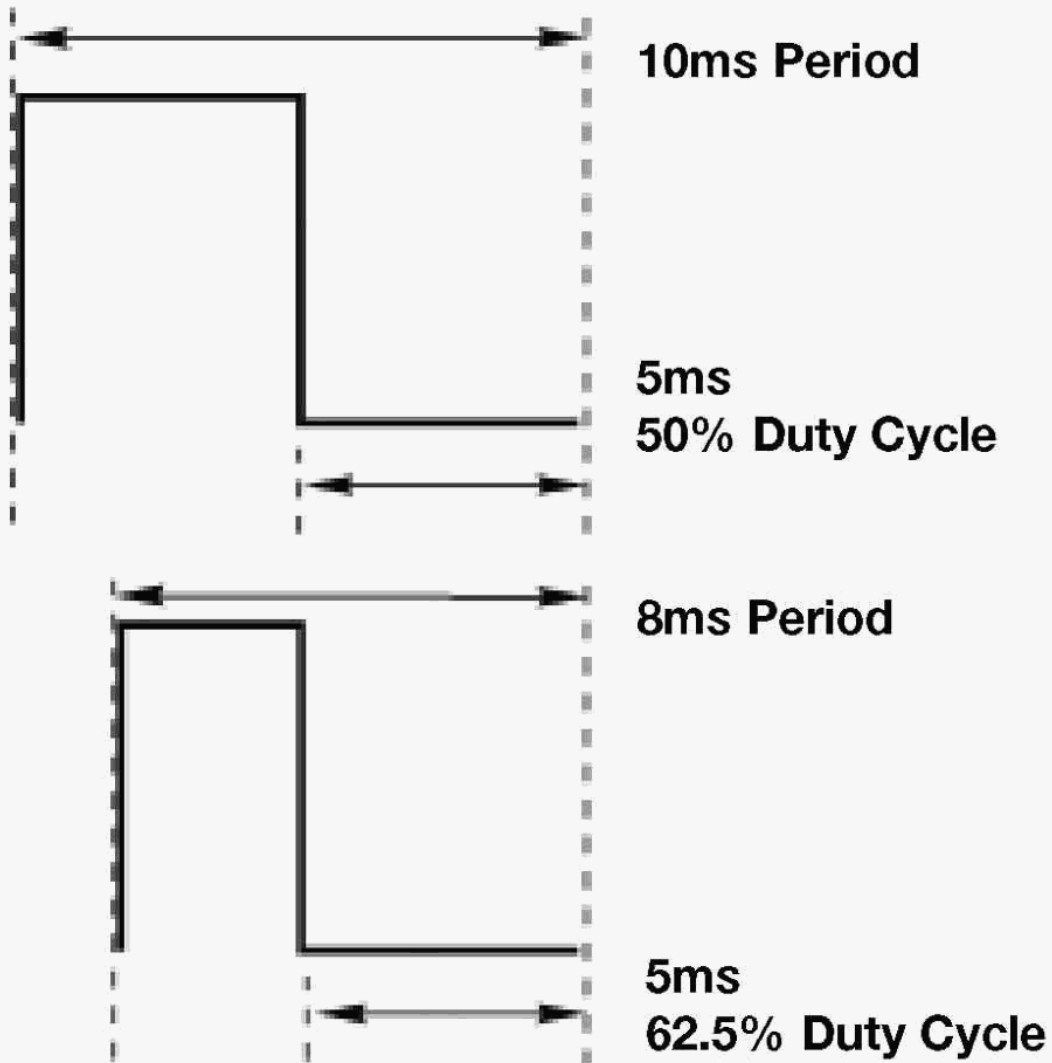


Fig. 22: Identifying Duty Cycle (1 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 23: Identifying Duty Cycle (2 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

Time

1 second = 1000 milliseconds (ms).

1/2 second = 500 milliseconds.

1/4 second = 250 milliseconds.

1/10 second = 100 milliseconds.

1/100 second = 10 milliseconds.

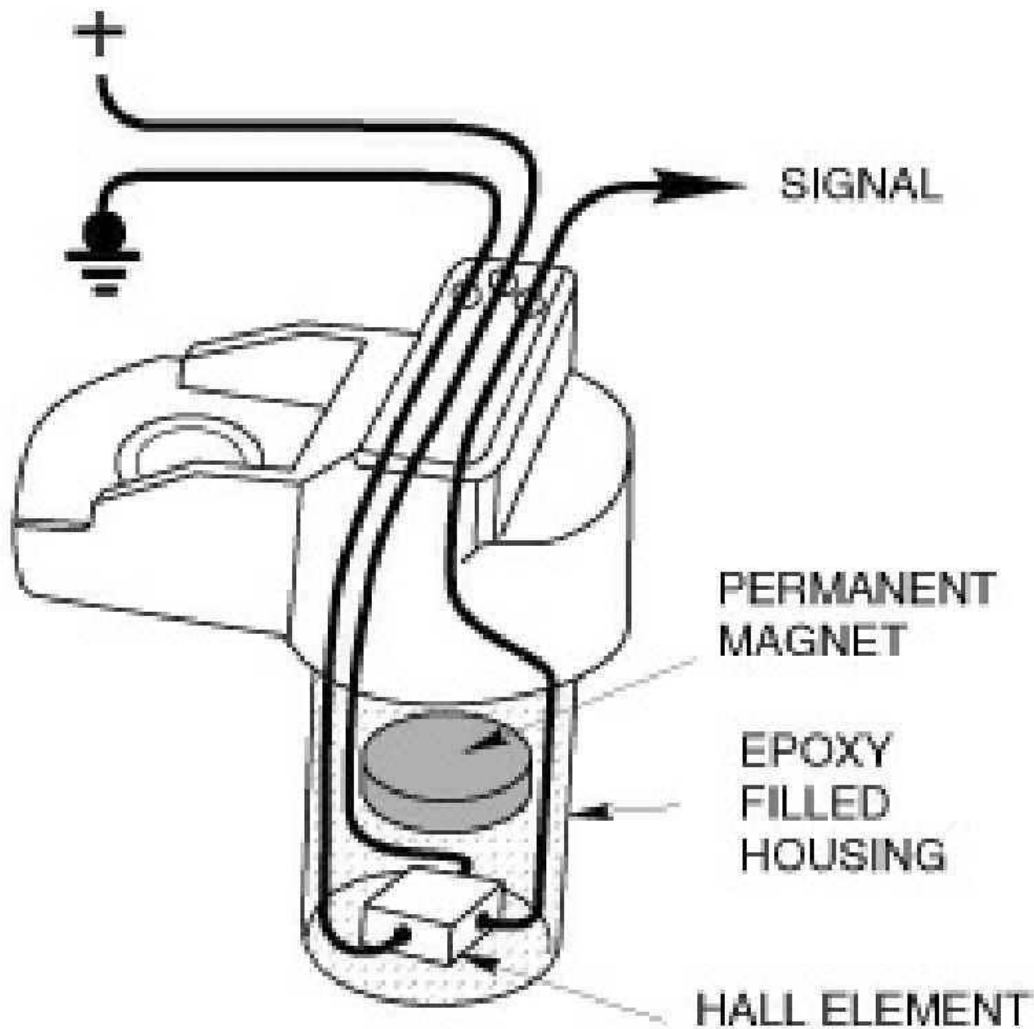
1/1000 second = 1 milliseconds.

HALL-EFFECT SENSORS

Hall Effect Sensors produce a modulated square wave.

Hall Effect Sensors are electronic switches that react to magnetic fields to rapidly control the flow of current or voltage ON and OFF.

The Hall Sensor consists of an epoxy filled non-magnetic housing containing a hall element and a magnet, and a trigger wheel.



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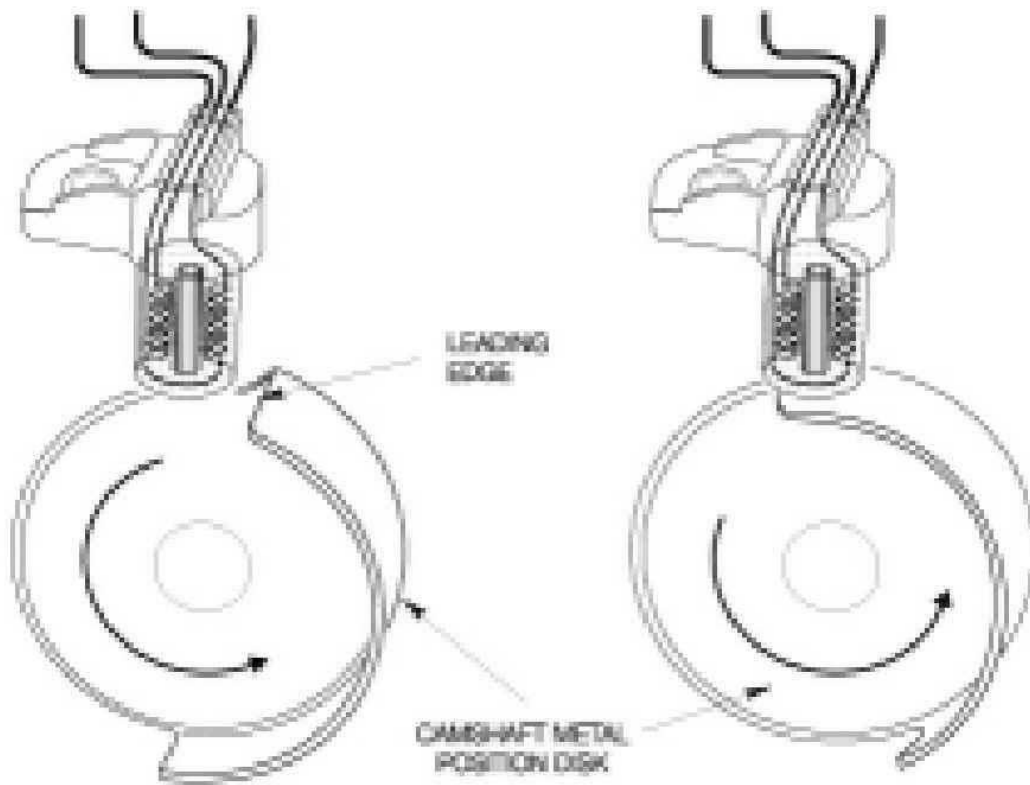
Fig. 24: View Of Hall Effect Sensors

Courtesy of BMW OF NORTH AMERICA, INC.

The Hall element is a thin non-magnetic plate which is electrically conductive. (Voltage will flow through the plate.) Electron flow is equal on both sides of the plate.

Since everything between the magnet and the hall element is non-magnetic the magnet (magnetic field) has no effect on the current flow.

As a metal disk or solid area of a toothed wheel, flywheel or other trigger device approaches the sensor, a magnetic field is created between the magnet and the disk.



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Fig. 25: Identifying Magnetic Field
 Courtesy of BMW OF NORTH AMERICA, INC.

The magnetic field cause the electron flow to stop on one side of the plate. Electrons continue to flow on the other side of the plate.

The Hall Sensor Signal is a measurement of the voltage drop between the two sides of the plate or element.

When the magnetic field increases (disc or solid toothed area in front of sensor) the voltage drop across the two sides of the element increases. High voltage on one side, little on the other. The signal output from the sensor is High.

As the disc moves away from the sensor the magnetic fields weakens and is lost. The loss of the magnetic field (blank toothed or open area of the wheel in front of the sensor) produces very little voltage drop across the two sides of the element. The output signal is Low.

This rapid switching of the voltage ON/OFF produces a HIGH/LOW signal that the control module uses to recognize speed and position.

Examples of Hall Effect Sensors

Motor Position Hall Sensors

Hall sensors are used on many electric motors to monitor speed and position. (i.e. electric window motors and sunroof motors.)

The Hall Effect principal is the same except the magnet is placed on the shaft of the motor.

The magnet is aligned to rotate in a precise position in front of the element. The polarization of the magnetic ring causes a polarity switch in the Hall element to occur as it rotates. The square wave produced provides speed and position information to the control module.

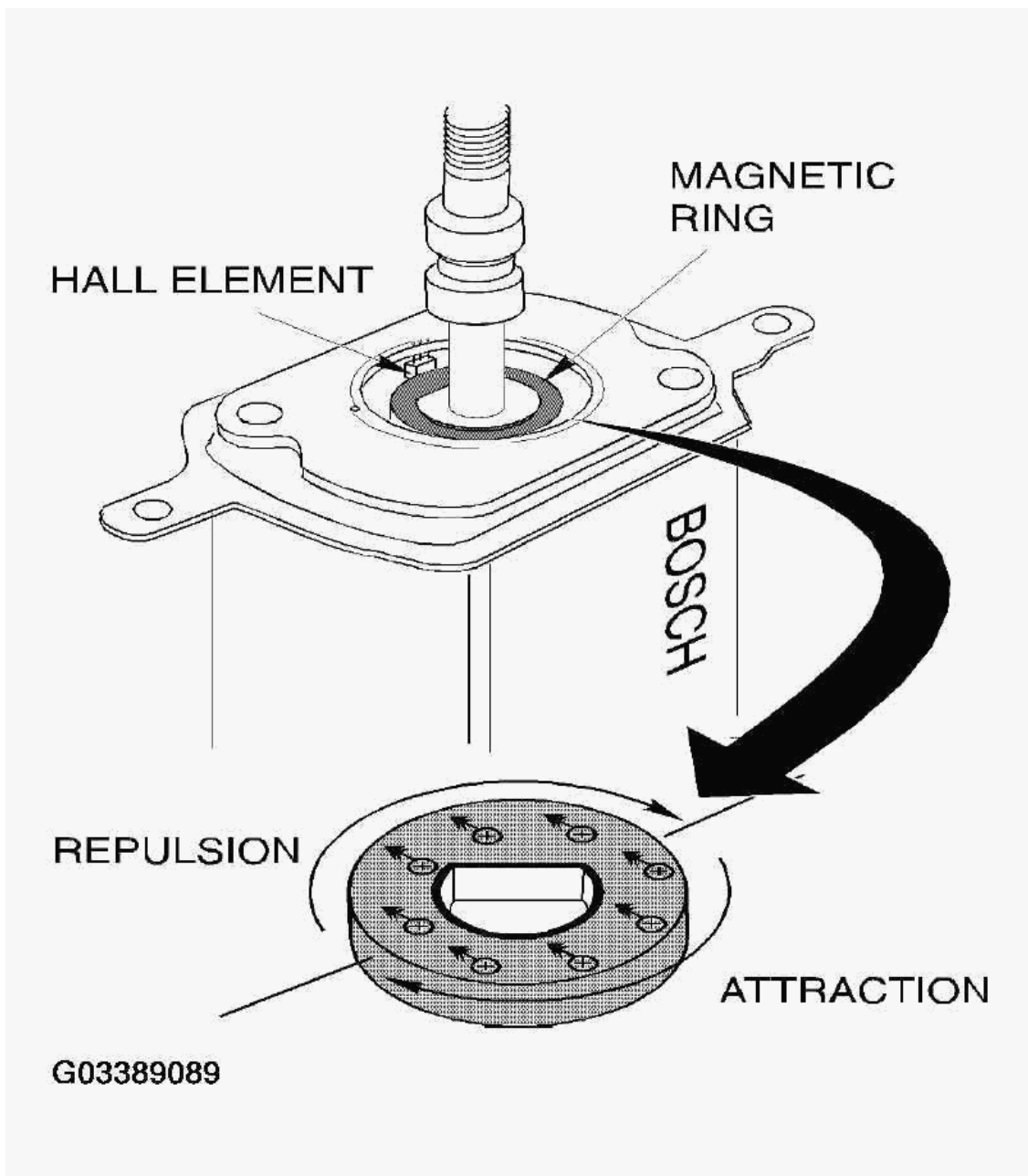


Fig. 26: Identifying Motor Position Hall Sensors
Courtesy of BMW OF NORTH AMERICA, INC.

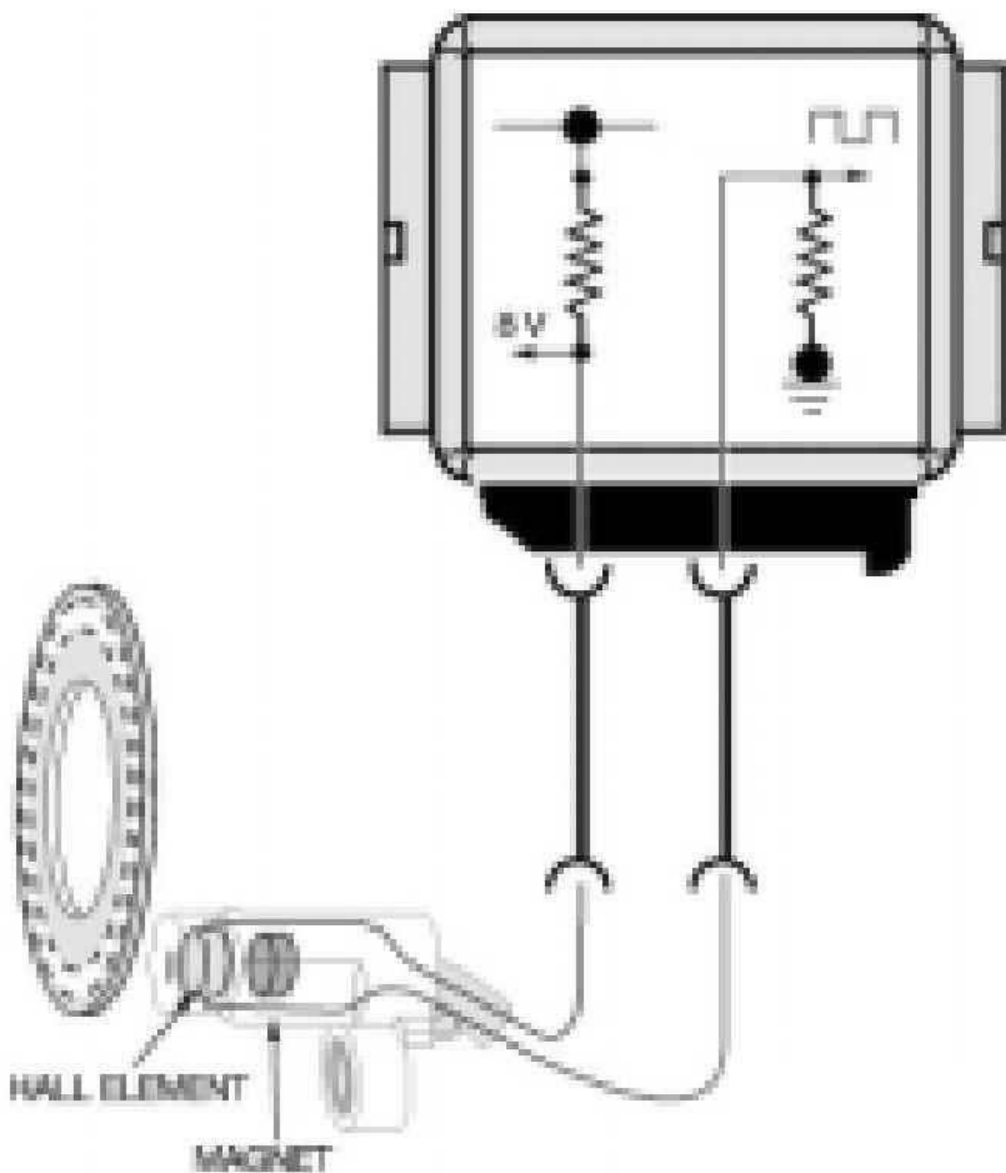
Wheel Speed Hall Effect Sensors

Hall Effect sensors are used to indicate wheel speed.

Conventional Hall Effect Sensors use three wires, power supply (usually 5v or 12v) a ground wire and a signal wire back to the control module.

The Hall Effect sensors used as wheel speed sensors are unique in that they are two wire Hall Effect Sensors.

The two wire sensors eliminate the separate ground wire and the signal wire functions as the ground also.



G03389090

Fig. 27: Identifying Wheel Speed Hall Effect Sensors
Courtesy of BMW OF NORTH AMERICA, INC.

The unique two wire arrangement provides the control module with a HIGH/LOW signal having a low voltage of .75 volts and a high voltage of 2.5 volts.

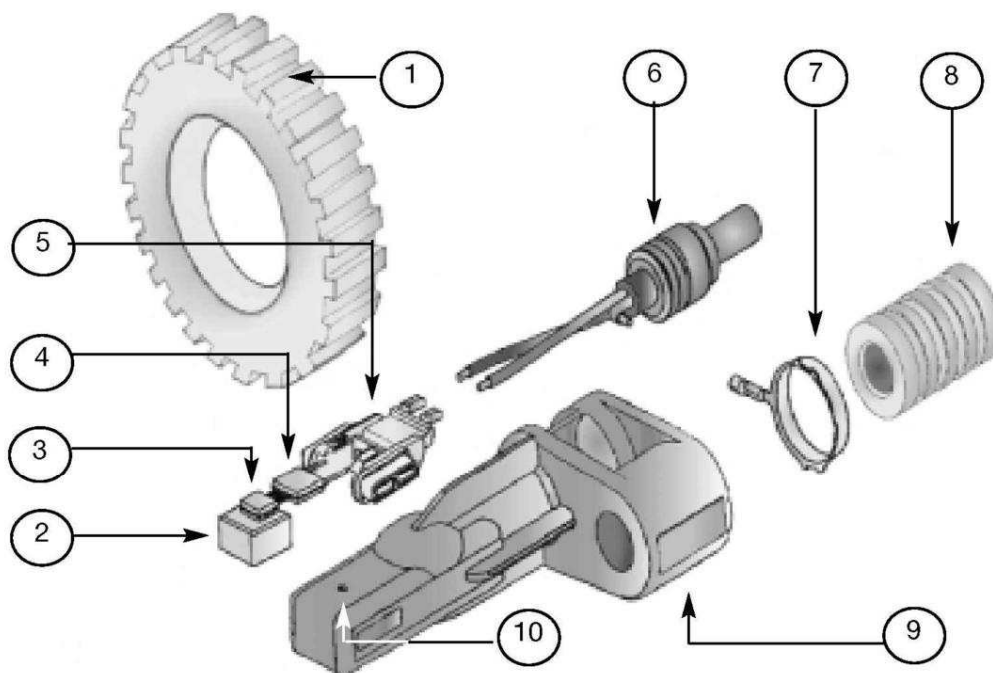
Typical Application of Hall Effect sensors

- Crankshaft Sensors.
- Motor Position and Speed Sensors (e.g. Window Motor, Sunroof Motor).
- Camshaft Sensors.
- Wheel Speed Sensors.

MAGNETORESISTIVE SENSORS

The active sensing of the Magnetoresistive Sensor is particularly suitable for advanced stability control applications in which sensing at zero or near zero speed is required.

A permanent magnet in the sensor produces a magnetic field with the magnetic field stream at a right angle to the sensing element.



1. Metal Pulse Wheel
2. Magnet
3. Sensor Element
4. Evaluation Module
5. Support for Sensor Element

6. Sensor Wiring With Weather Boot
7. Ground Contact Ring
8. Fastening Element
9. Sensor Housing
10. Pick-Up Surface

G03389091

Fig. 28: Exploded View Of Magnetoresistive Sensors
Courtesy of BMW OF NORTH AMERICA, INC.

The sensor element is a ferromagnetic alloy that changes its resistance based on the influence of magnetic fields.

As the high portion of the pulse wheel approaches the sensing element a deflection of the magnetic field stream is created. This creates a resistance change in the thin film ferromagnetic layer of the sensor element.

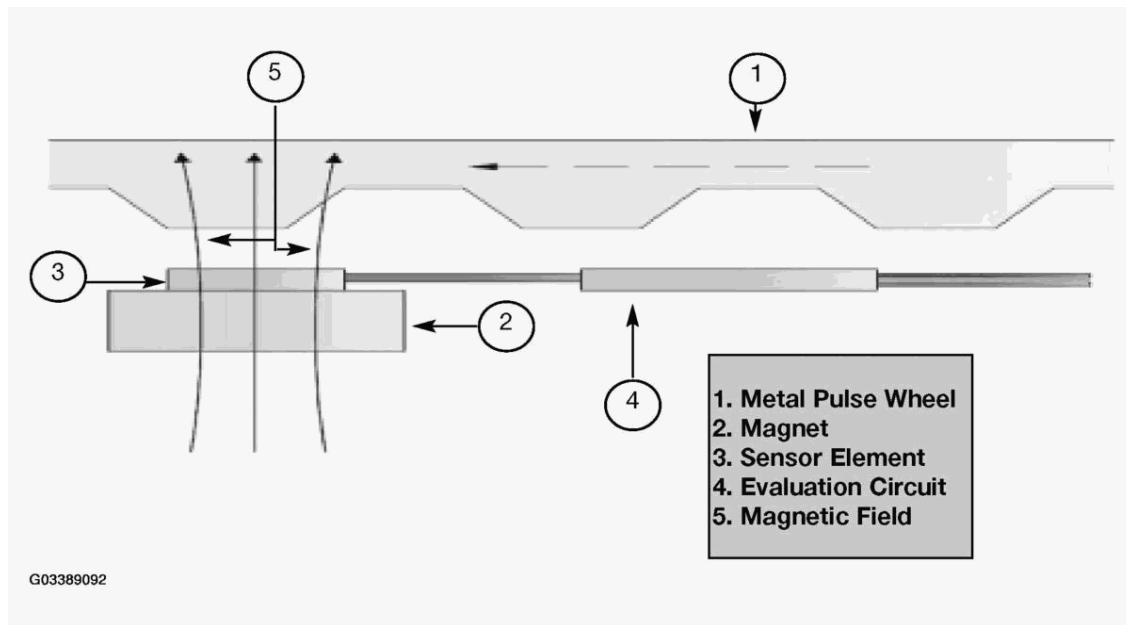


Fig. 29: View Of Sensor Element
Courtesy of BMW OF NORTH AMERICA, INC.

The sensor element is affected by the direction of the magnetic field, not the field strength. The field strength is not important as long as it is above a certain level. This allows the sensor to tolerate variations in the field strength caused by age, temperature, or mechanical tolerances.

The resistance change in the sensor element affects the voltage that is supplied by the evaluation circuit. The small amount of voltage provided to the sensor element is monitored and the voltage changes (1 to 100mv) are converted into current pulses by the evaluation module.

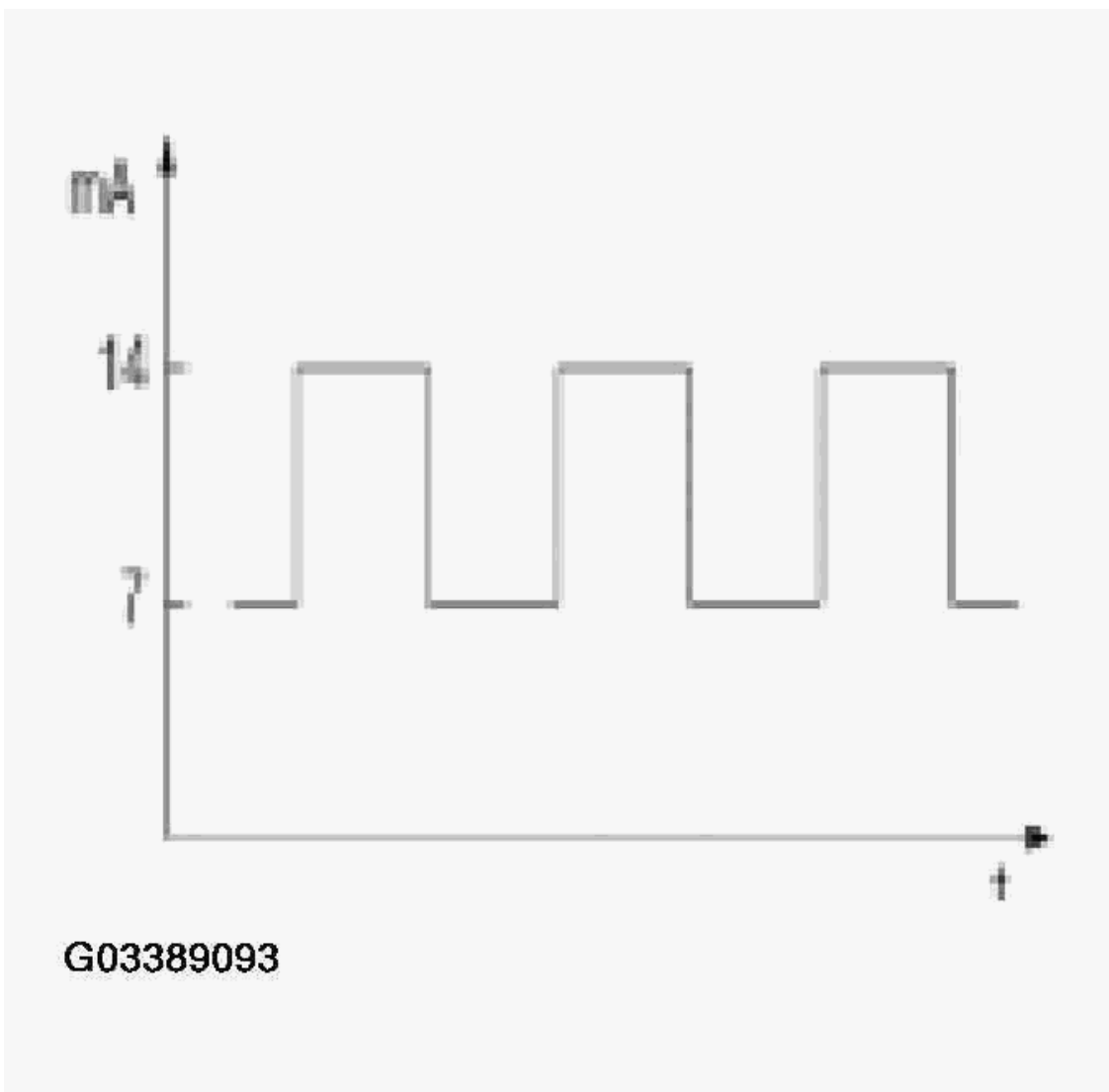


Fig. 30: Identifying High And Low Current Pulses
 Courtesy of BMW OF NORTH AMERICA, INC.

- Signal Low-7mA .
- Signal High-14mA .

The sensor is supplied 12V by the control unit. Output voltage from the sensor is approximately 10V. The control unit counts the high and low current pulses to determine the wheel speed.

Typical Application of Magnetoresistive Sensor:

- Found Currently on E46 with Teves DSCIII MK-60.

DESIGNATED VALUE SIGNALS

Designated values are produced through fixed resistance positions of a multi-position switch. As the switch is

operated the voltage drop across the resistor(s) of each switch position causes the voltage level of the input signal to change to a predetermined voltage value.

These predetermined (designated) voltages signal the control module to perform specific functions.

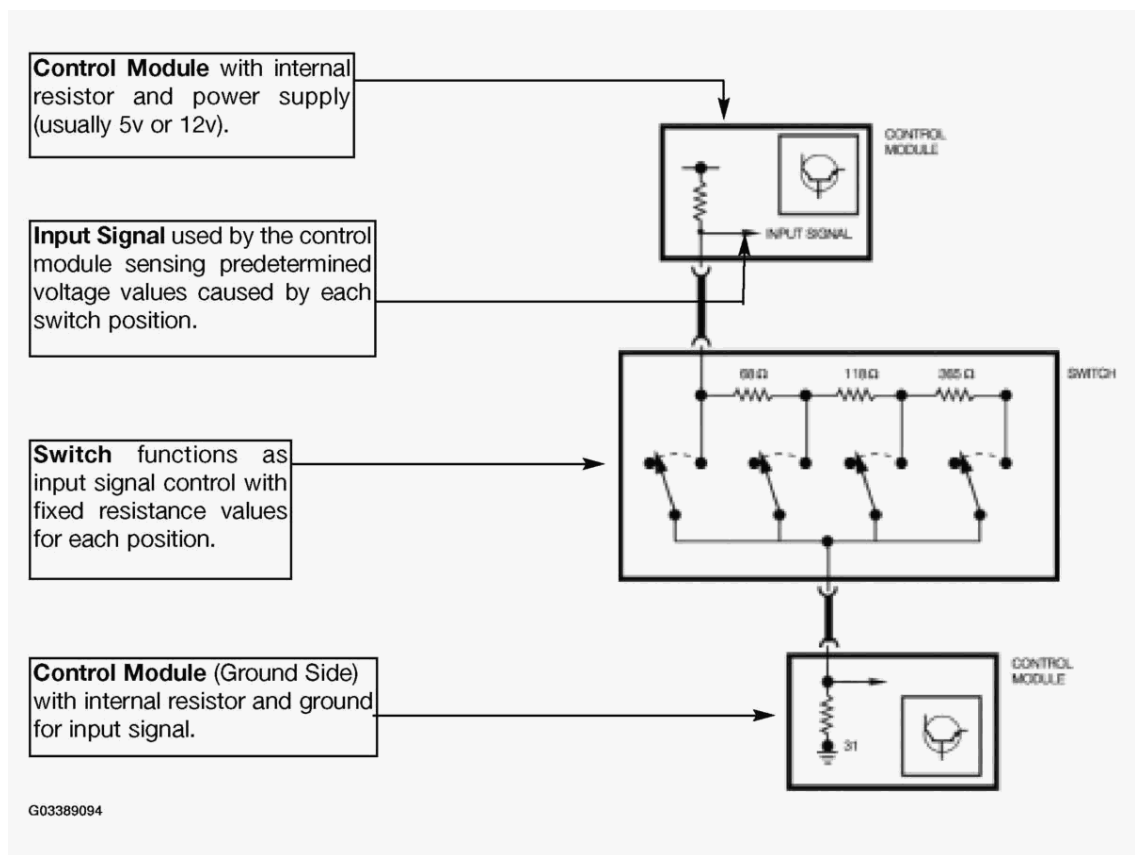


Fig. 31: Identifying Designated Value Signals
 Courtesy of BMW OF NORTH AMERICA, INC.

Voltage Values seen as input by control module.

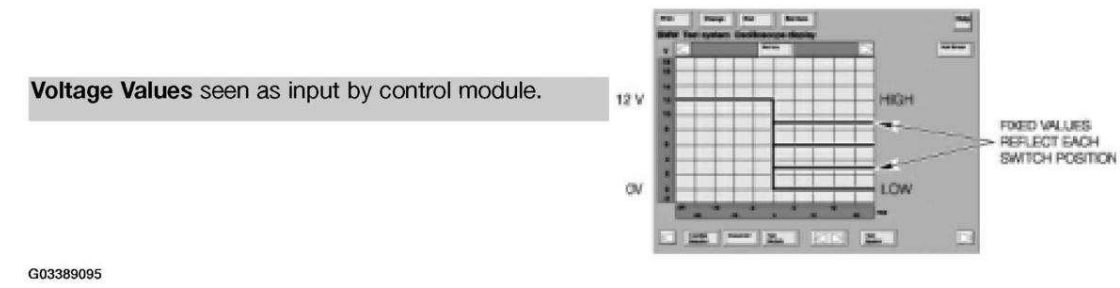


Fig. 32: Voltage Values Display
 Courtesy of BMW OF NORTH AMERICA, INC.

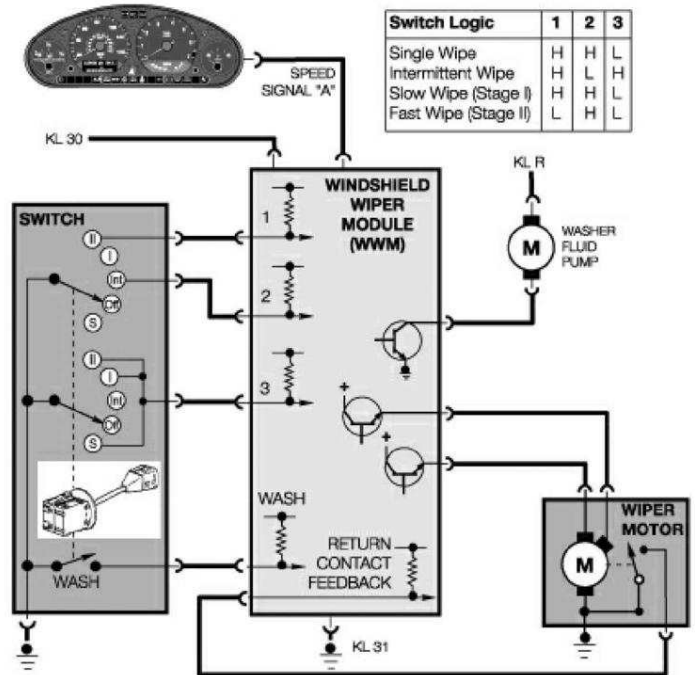
Typical Application of Designated Values:

- Cruise Control Switch On E 32.
- Seat and Mirror Memory Position Buttons.

Coded Ground Signals

Coded ground signals produce a set of High/Low requests, the combination (pattern) of which is interpreted by the control module to perform a specific function. Coded ground signals are generated through a switch or series of switches signaling the control module requests for operation.

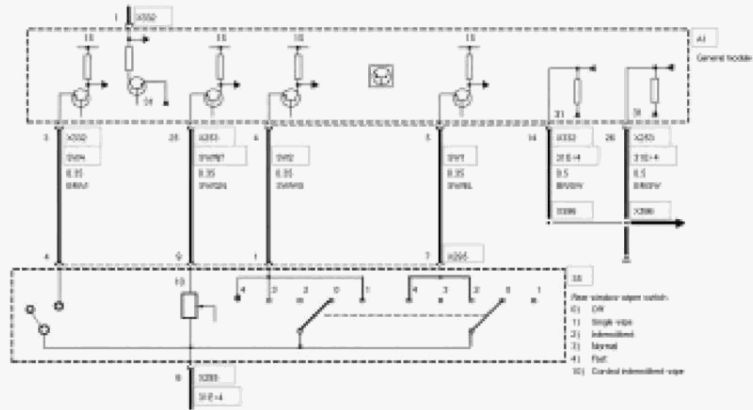
E 36 Wiper Circuit
 3 Circuits to wiper switch provide coded ground signals to Wiper Module for operation requests.



G03389096

Fig. 33: Identifying E 36 Wiper Circuit
 Courtesy of BMW OF NORTH AMERICA, INC.

E 39 Wiper
 2 circuits to wiper switch provide coded requests to General Module.



Switch Logic	1	2
Single Wipe		
Intermittent		
Normal		
Fast		

Typical Applications of Coded Ground Signals

- Wiper Switch

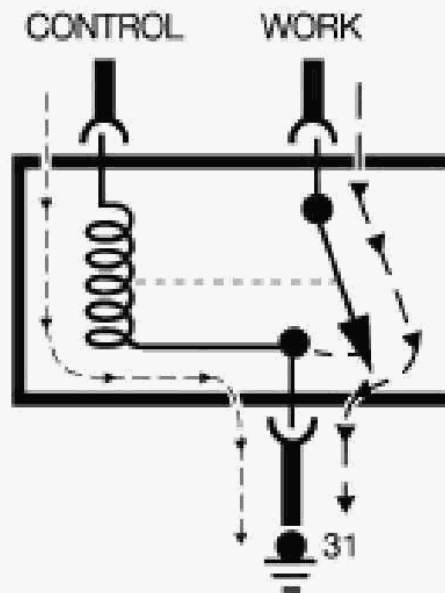
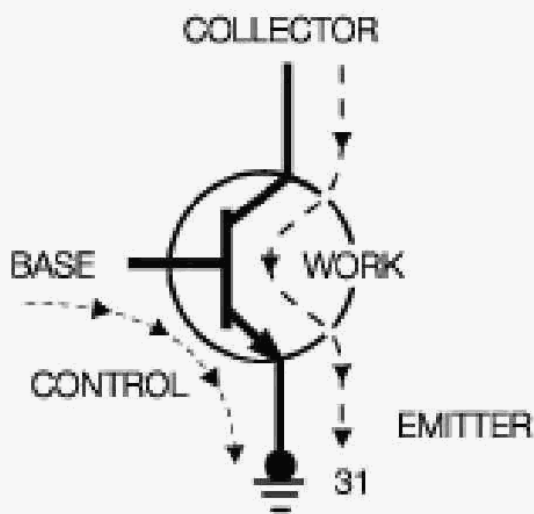
G03389097

Fig. 34: Identifying E 39 Wiper Circuit
 Courtesy of BMW OF NORTH AMERICA, INC.

TRANSISTOR FUNCTION

The transistor takes on a number of applications that must be understood to effectively analyze a circuit.

The transistor in operation functions as two parts much like a relay. Both the relay and the transistor control high currents with a low current signal.



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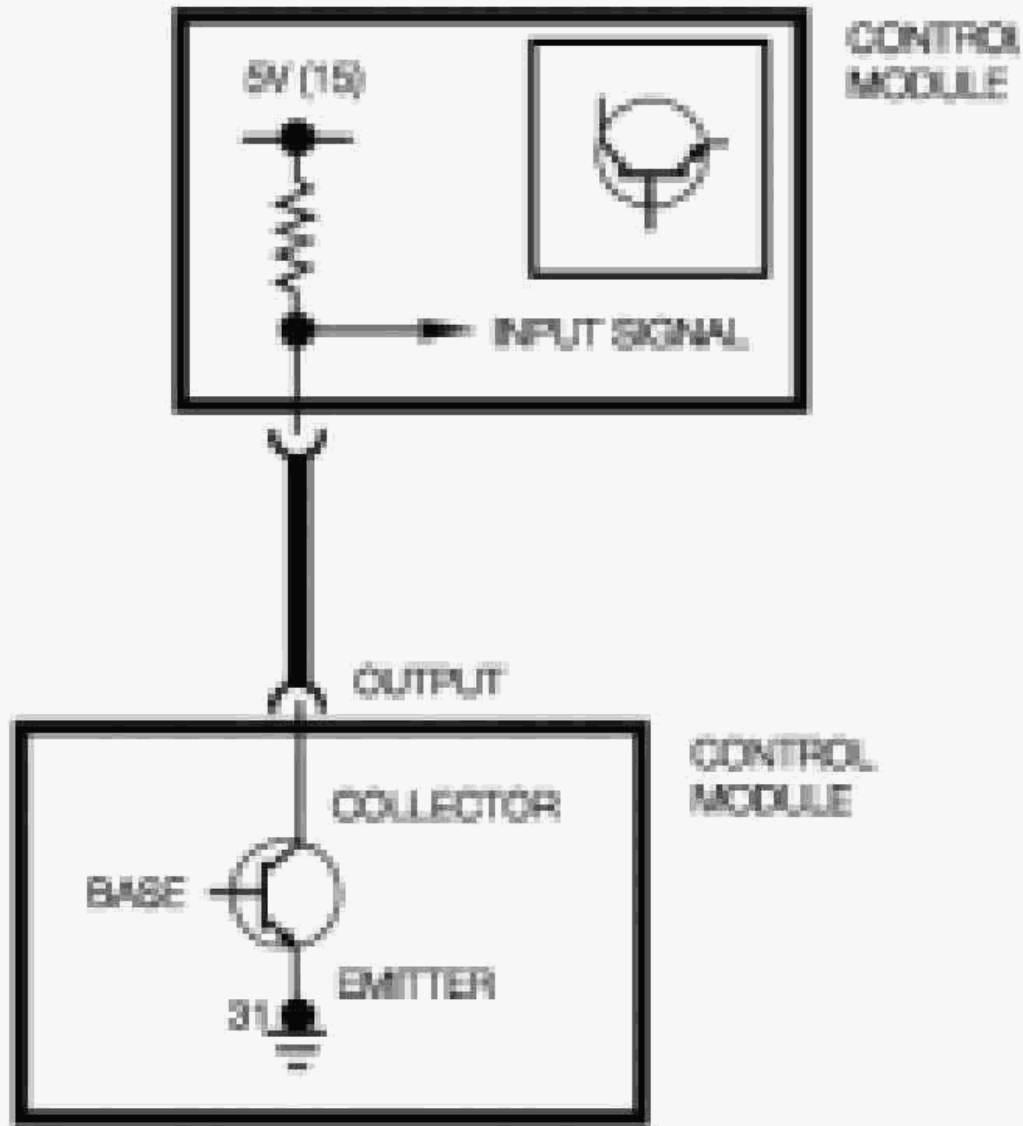
Fig. 35: Identifying Transistor Final Stage Function (1 Of 2)
 Courtesy of BMW OF NORTH AMERICA, INC.

The base/emitter path functions as the control circuit activated by the control module to oversee or control the work.

The collector/emitter path functions as the work side of the circuit, supplying power or switching on the work.

In operation the transistor can be switched ON momentarily, or supply a constant power or ground.

The transistor can also be modulated or pulsed to supply a modulated square wave signal.



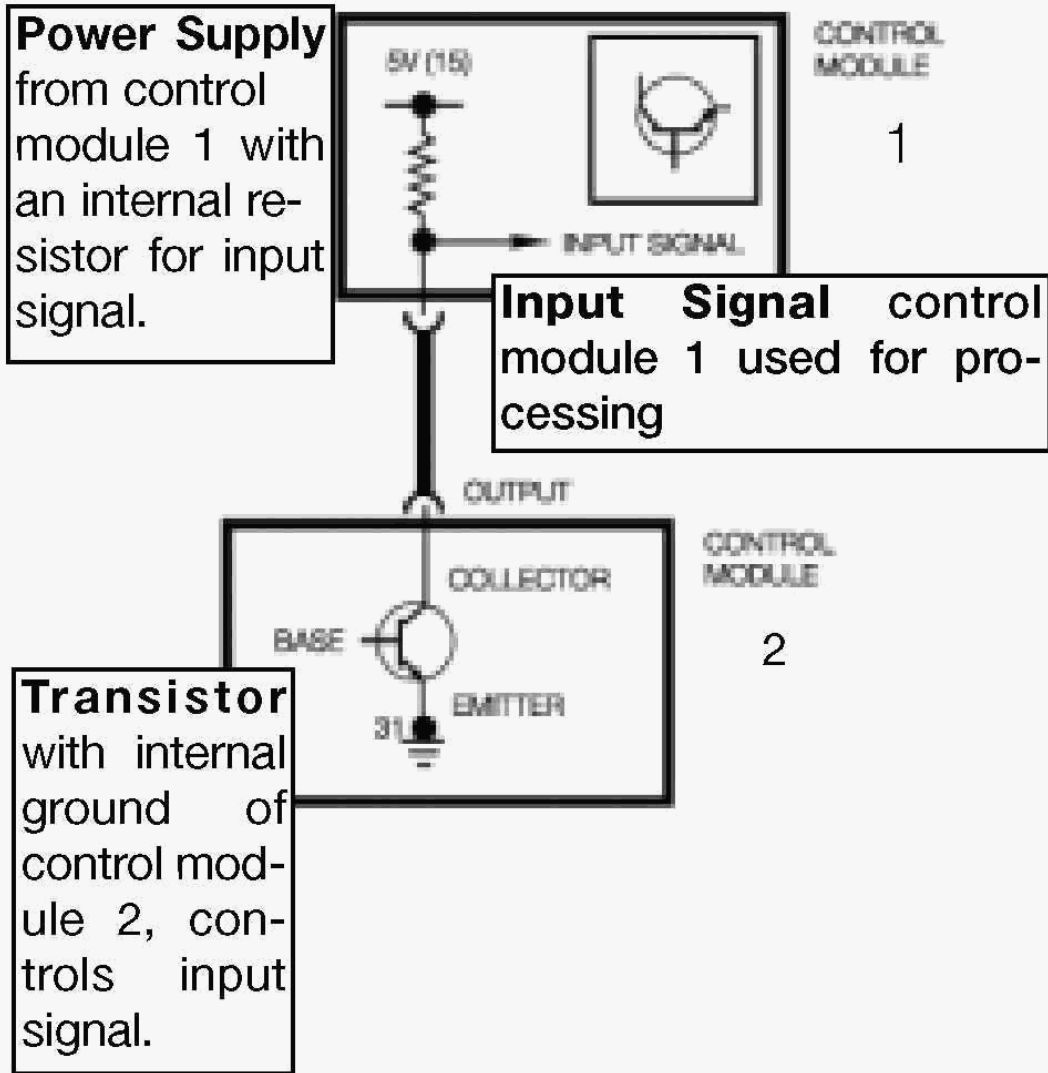
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Fig. 36: Identifying Transistor Final Stage Function (2 Of 2)
 Courtesy of BMW OF NORTH AMERICA, INC.

Modulated, Momentary, Constant B- as Input/Output

The input signal of control module 1 is an output signal of control module 2.

Control module 2 through activation of its internal transistor provides a ground input for control module 1.



G03389100

Fig. 37: Identifying Modulated, Momentary, Constant B- As Input/Output Function
 Courtesy of BMW OF NORTH AMERICA, INC.

The input signal at control module 1 is either a momentary/constant signal (i.e torque convertor signal from TCM to DME) or a modulated signal (i.e. vehicle speed signal ASC to DME).

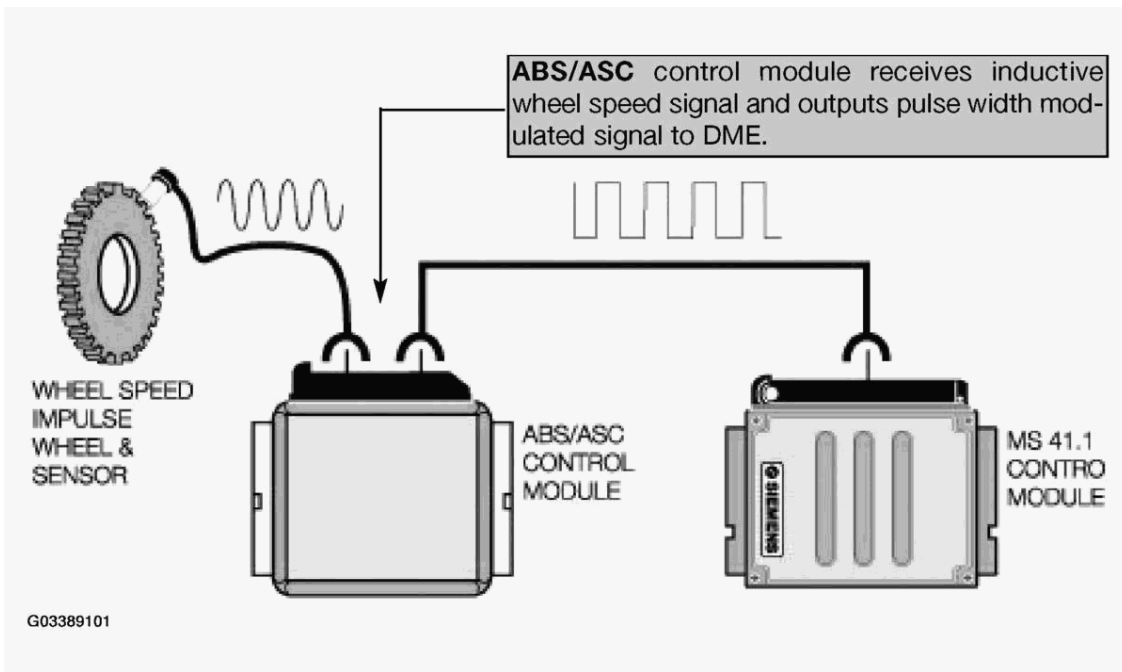


Fig. 38: Identifying Wheel Speed Signal And Output Pulse
 Courtesy of BMW OF NORTH AMERICA, INC.

Typical Application of Modulated, Momentary, Constant B- as Input/Output Signal:

- A/C KO Signal.
- Speed Signal From ABS/ASC.
- TI/TD Output Signal From DME.

Momentary/Constant B⁺ as an Input/Output Signal

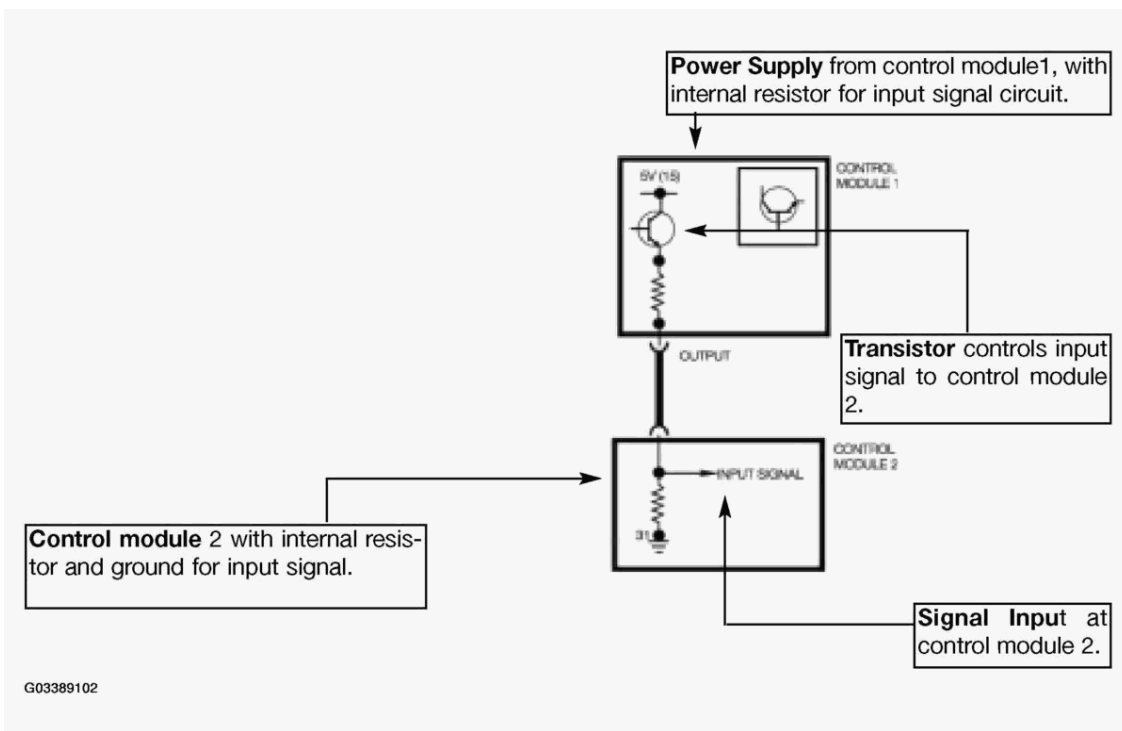


Fig. 39: Identifying Momentary/Constant B As An Input/Output Signal Function
 Courtesy of BMW OF NORTH AMERICA, INC.

Typical Application of Momentary/Constant B⁺ as an Input/Output Signal:

- OBC Code Signal to DME.
- A/C Signal to DME.

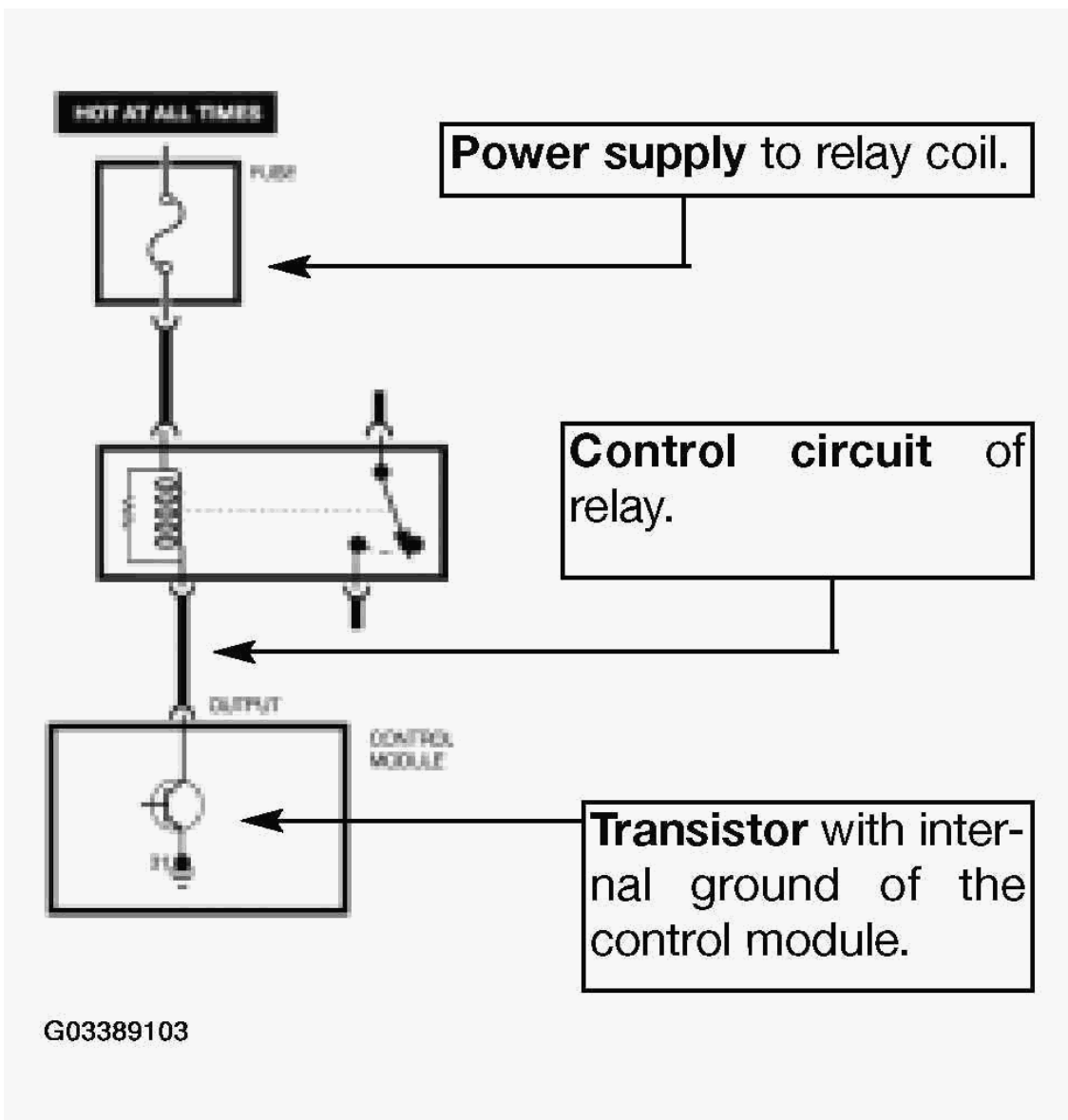
Constant B-/B+ To Energize a Component

Constant B-

Output function to energize a component.

Relay is energized by control module.

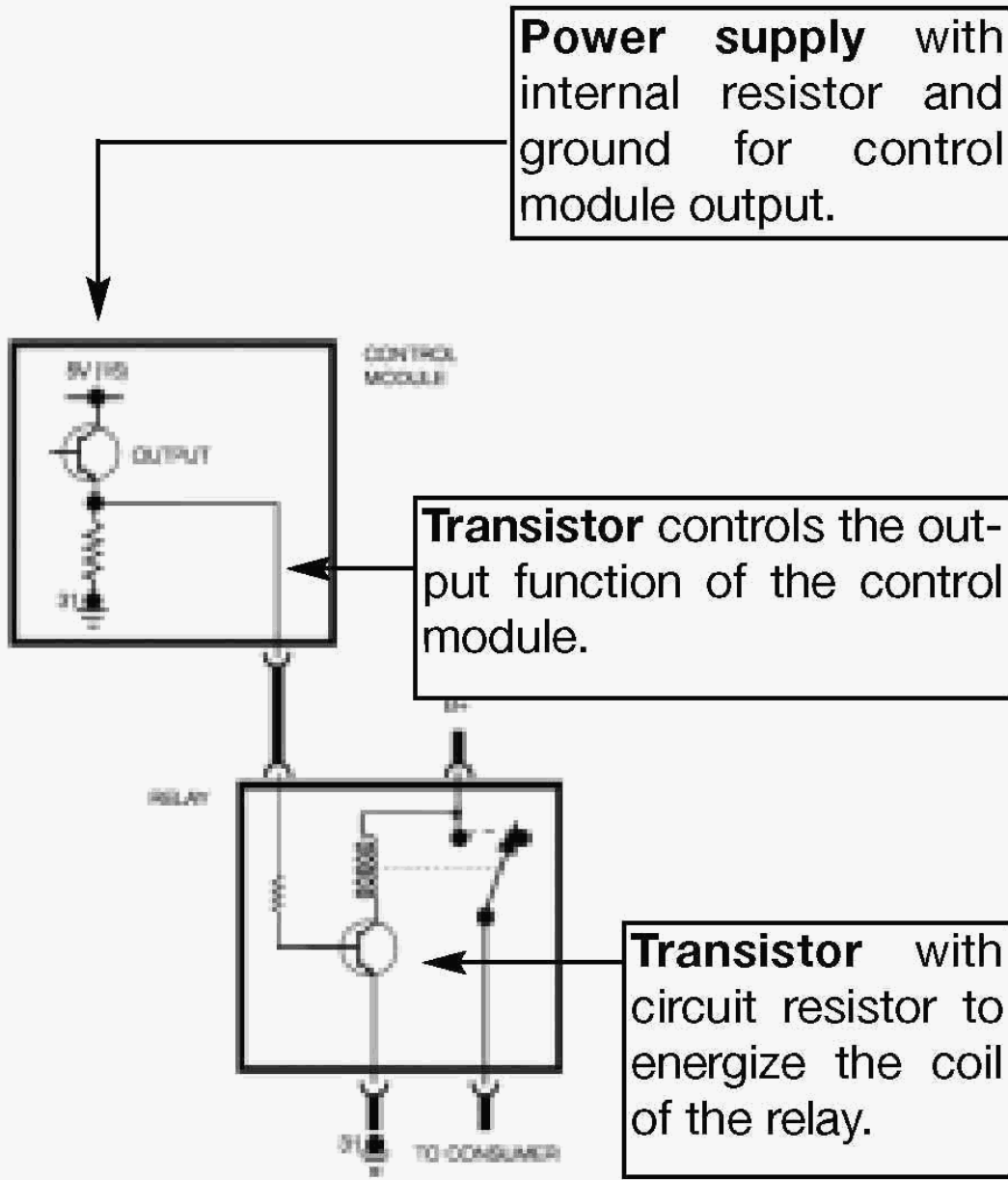
Internal activation of the transistor provides a ground for the relay coil.



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Fig. 40: Identifying Output Function To Energize Component (Constant B-)
 Courtesy of BMW OF NORTH AMERICA, INC.

Constant B+



G03389104

Fig. 41: Identifying Output Function To Energize Component (Constant B+)
 Courtesy of BMW OF NORTH AMERICA, INC.

Control module output function to energize a component.

Transistor controls output function of the control module.

Control module supplies power to the relay. The relay is activated by the control module through internal activation of the transistor which provides a ground for the relay coil.

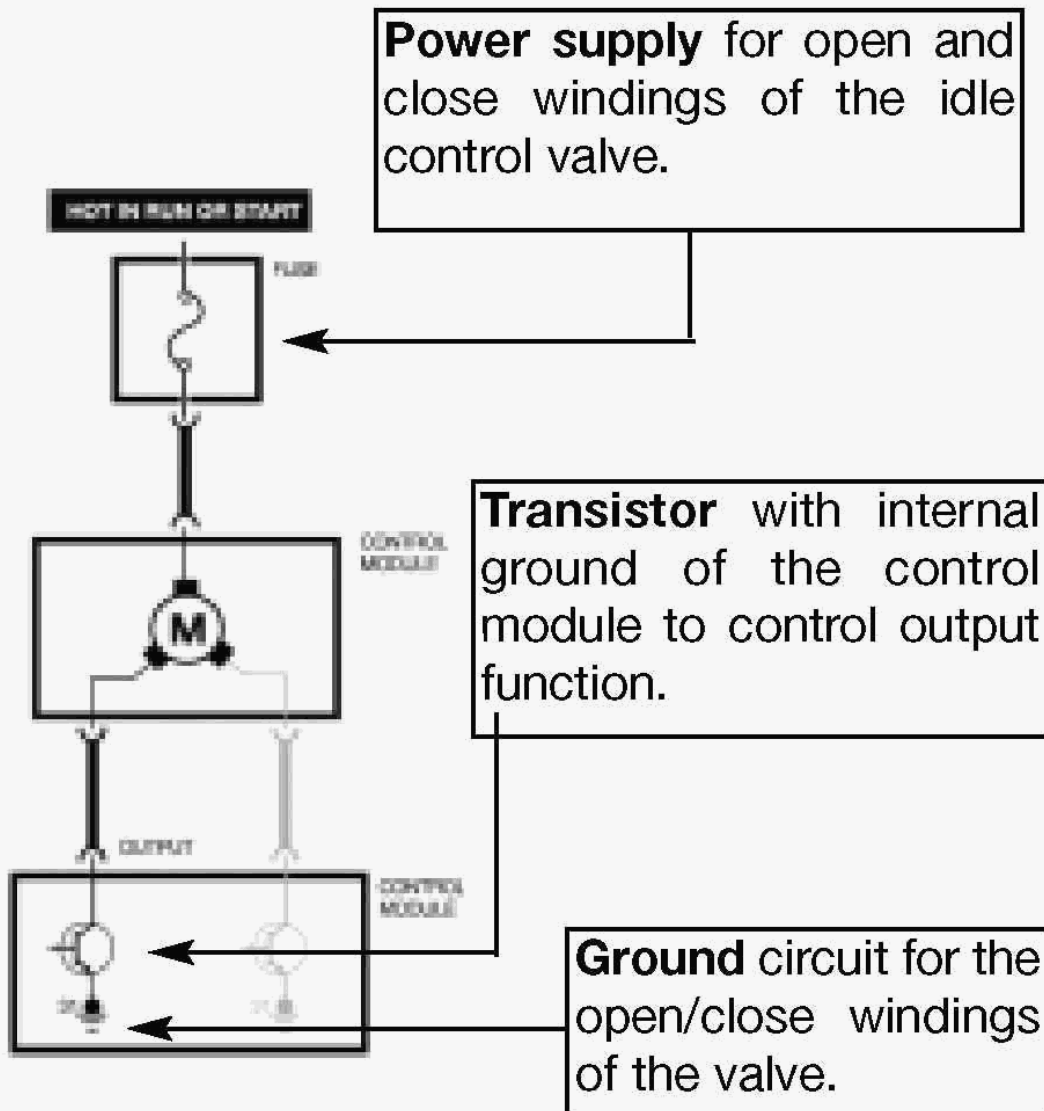
Modulated B-/B+ To Operate A Component

Modulated B-

Output function to operate a component.

The idle valve motor is operated by the control module through internal activation of the transistor which provides a ground for the open winding of the valve.

The idle control valve is operated by regulation of the duty cycle at a specific frequency.

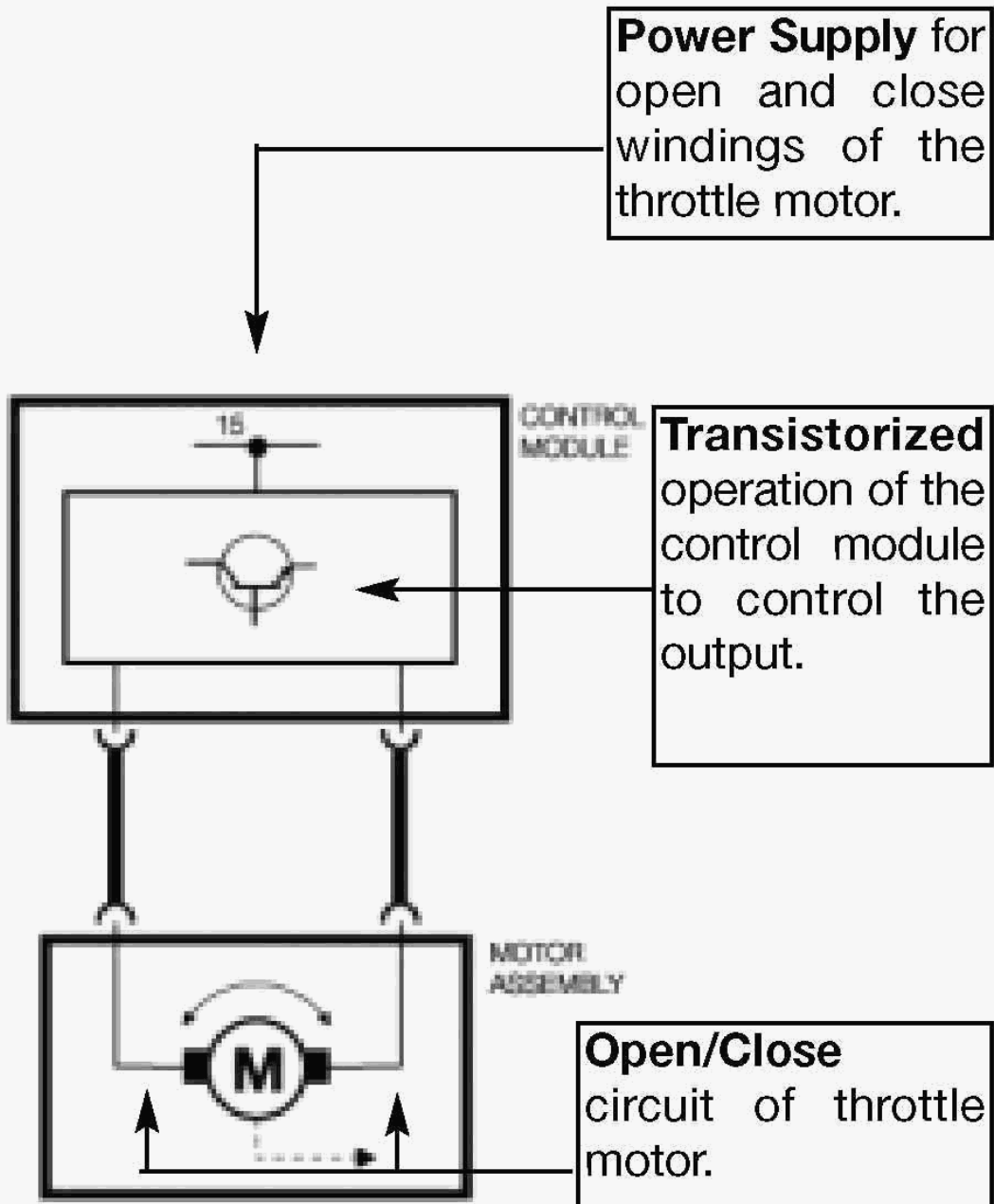


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Fig. 42: Identifying Output Function To Operate Component (Modulated B-)
 Courtesy of BMW OF NORTH AMERICA, INC.

Typical Application of modulated B-

- Idle Control Motor.
- Purge Valve.
- Injector.
- Ignition Coil.



G03389106

Fig. 43: Identifying Output Function To Operate Component (Modulated B+)
Courtesy of BMW OF NORTH AMERICA, INC.

Output function to operate a component.

The motor is controlled by a transistorized function of the control module, which provides a modulated voltage at a specific frequency to the motor. The throttle position is changed by altering the Duty Cycle of the pulses.

GENERAL INFORMATION

Emissions - Overview

EMISSION OVERVIEW

Models: All Equipped with OBD II

Production Date: 1995 to Present

Manufacturer: Bosch and Siemens Engine Control Modules

Pin Connector: 88 and 134 Pins

EMISSIONS OVERVIEW

What Is OBD?

Today many of the engine's control systems such as throttle opening, fuel injection, ignition, emissions and performance are controlled by an electronic control module and the related sensors and actuators. The first on-board diagnostic (OBD) systems were developed by the manufacturer as a way to detect problems with the electronic systems.

Beginning with 1994 model year, requirements for OBD systems have been established by the EPA and CARB. The purpose of the OBD system is to assure proper emission control system operation for the vehicle's lifetime by monitoring emission-related components and systems for deterioration and malfunction. This includes also a check of the tank ventilation system for vapor leaks.

The OBD system consists of the engine and transmission control modules, their sensors and actuators along with the diagnostic software. The control modules can detect system problems even before the driver notices a driveability problem because many problems that affect emissions can be electrical or even chemical in nature.

What Happens If A Problem Is Detected?

When the OBD system determines that a problem exists, a corresponding "Diagnostic Trouble Code" is stored in the control module's memory.

The control module also illuminates a yellow dashboard Malfunction Indicator Light indicating "Check Engine" or "Service Engine Soon" or displays an engine symbol.

Have you seen this light?



A short introduction to OBD

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Fig. 1: Identifying OBD System

Courtesy of BMW OF NORTH AMERICA, INC.

This light informs the driver of the need for service, NOT of the need to stop the vehicle. A blinking or flashing dashboard light indicates a rather severe level of engine misfire.

After fixing the problem the Fault code is deleted to turn off the light. If the conditions that caused a problem are no longer present the vehicle's OBD system can turn off the dashboard light automatically. If the OBD system evaluates the component or system three consecutive times and no longer detects the initial problem, the dashboard light will turn off automatically.

What Is The Most Common Problem Detected By OBD?

Fuel Filler Cap

If the fuel filler cap is not properly closed after refueling, the OBD system will detect the vapor leak that exists from the cap not being completely tightened.

If you tighten the cap subsequently, the dashboard light should be extinguished within a few days or after deleting the Fault code. This is not an indication of a faulty OBD system. The OBD system has properly diagnosed the problem and accordingly alerted the driver by illuminating the dashboard light.

Please check the fuel filler cap first when the dashboard light comes on to avoid unnecessary diagnostic time. To check the fuel filler cap turn the cap to the right until you hear a click or the cap reaches the full stop. Make sure that the retaining strap is not caught between the filler pipe and the fuel filler cap. If the light should stay on further in depth evaporative leak diagnosis is required.

Misfire Detection

As part of the CARB/OBD II regulations the Engine Control Module must determine if misfire is occurring and also identify the specific cylinder(s). The ECM will determine severity of the misfire event, and whether it is emissions relevant or catalyst damaging. In order to accomplish these tasks the ECM monitors the crankshaft for acceleration losses during firing segments of cylinder specific firing order. If the signal is implausible an erroneous reference mark can be obtained by the ECM which will result in a misfire fault being set.

Possible causes of cylinder misfire faults (actual field findings):

- Vehicle ran low or out of fuel
- Poor fuel quality (ex. water in fuel, customer uses an additive, etc.)
- Low/high fuel pressure
- Ignition coil
- Fouled spark plug(s)
- Restricted/contaminated fuel injector(s)
- Crankshaft position sensor
- Poor combustion due to low compression or high leakage
- Blocked/restricted catalyst

ENGINE MISFIRE DIAGNOSIS

Engine Misfire is the result of inefficient combustion in one or more cylinders. The causes of Engine Misfire are extensive but can be grouped into the following sub-systems. Consider the charts below as an additional diagnostic aid once the DISplus/ModIC is connected, the correct fault symptom has been chosen and the fault memory has been interrogated. Follow the Test Module as displayed by the DISplus/ModIC.

- COMPONENT
- POSSIBLE CONDITION
- TEST
- CORRECTION
- **Spark Plug:**
 - Incorrect spark plug installed
 - Electrode gap closed or too small
 - Electrode(s) missing
 - Oil or fuel fouled spark plug
 - Ceramic insulation cracked
- Secondary Ignition DISplus Preset Measurement
 - Verify correct spark plug
 - Replace if necessary
 - Swap with another cylinder
- **Secondary circuit: (wiring, M73-cap, rotor)**

- Wet or moist due to water infiltration.
- High resistance due to corrosion.
- Check water ingress, repair, replace
- Check resistance value, replace
- **Ignition Coil(s):**
 - Secondary/Primary Circuits open or shorted.
 - Housing cracked, damaged.
- Secondary and Primary
 - Inspect and replace if necessary
 - Swap with another cylinder
- **Ignition Coil & Engine Harness Connectors**
 - Power supply, Primary control and ground (shunt signal) circuits impaired.
- Primary Ignition & Term 4A feedback Preset Measurements
 - Look for open, loose connector, corrosion, crossed or backed out pins (also consider ignition unloader or ECM relay on MY97 and newer cars).
 - Determine defective condition, repair or replace.
 - A secondary ignition oscilloscope display provides vital information about the ignition system's condition.
 - Follow the precautions in group 12 of the Repair Instructions.
 - Use the following scope patterns as a guideline for ignition system diagnosis. Use the preset measurement function of DISplus.

Evaluation of secondary signal amplitude at idle speed.

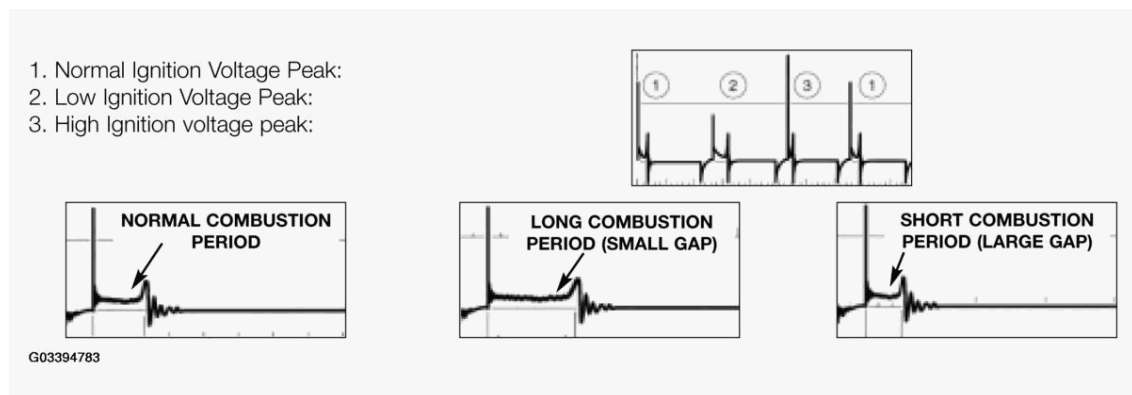


Fig. 2: Identifying Evaluation Of Secondary Signal Amplitude At Idle Speed
 Courtesy of BMW OF NORTH AMERICA, INC.

- COMPONENT
- POSSIBLE CONDITION
- TEST
- CORRECTION

- **Pistons, Rings, Valves, Camshaft:**
 - Hole in piston crown, ring(s) broken, valve(s) not seating, valve(s) bent, valve spring(s) broken, camshaft lobe cracked, etc.
 - Idle Quality - Rough Running Preset.
 - Cylinder compression & leakdown tests.
 - Correct condition as required.
- **Hydraulic Valve Actuator (HVA):**
 - HVA oil bore restricted or blocked.
 - Engine oil pressure builds up too slow.
 - **Intermittent Misfire Fault** - Not Currently Present.
 - HVA binding/sticking in bore.
 - Idle Quality - Rough Running Preset.
 - Listen to HVA
 - Check Oil Pressure
 - Cylinder leakdown
 - Always consider mechanical components when diagnosing misfire.
 - Inspect for scoring.
- **Vacuum Leaks:**
 - Unmetered vacuum leaks causing a "**lean**" operating condition. Possible "**Excessive Mixture Deviation**" fault codes.
 - Idle Quality - Rough Running Preset. Test for vacuum leaks.
 - Interpret Add. & Multipl. adaptation values
 - Correct condition as required
 - COMPONENT
 - POSSIBLE CONDITION
 - TEST
 - CORRECTION
- **Fuel (quality):**
 - Contaminated fuel, (water, other non combustible).
 - Clean fuel system, replace fuel.
- **Fuel Delivery:**
 - Fuel pump delivery pressure low, restriction in fuel line to fuel rail or running loss valve.
 - Fuel filter restricted (clogged).
 - Low fuel in tank.
 - Check fuel pressure & volume.
 - Check fuel pump power and ground
 - Determine restriction/flow reduction, replace component as necessary.
 - Interpret Additive and Multiplicative adaptation values.

- **Running Loss Valve:**
 - Valve stuck in "small circuit" position.
 - Check valve
 - Display "diagnosis requests" in DISplus and test valve for proper function, replace valve as necessary.
- **Fuel Injectors:**
 - Leaking fuel injector pintle seats cause rich engine starts with hot ambient temperatures.
 - Blocked (dirty) injector(s).
 - Ti Preset & status page.
 - Sec Ign scope pattern.
 - Check injectors for leakage.
 - Swap suspect injector with another cylinder.
 - Inspect injector, replace if necessary.
- **Fuel Pressure Regulator:**
 - Regulator defective, causes fluctuation in the injected quantity of fuel causing mixture adaptation faults.
 - Fuel pressure
 - Check nominal fuel pressure value with engine operating under varied speeds.
- **Evaporative System:**
 - Defective evaporative system vent causing fuel tank collapse and fuel starvation.
 - DISplus status, EVAP test with pressure tool, purge valve func. test.
 - Check the fuel tank condition and vent line.
 - Check Fresh Air Valve on TLEV E36 vehicles or LDP/DM TL and filter on ORVR vehicles for proper system "breathing".
 - COMPONENT
 - POSSIBLE CONDITION
 - TEST
 - CORRECTION
- **Crankshaft Position Sensor or Increment Wheel:**
 - Implausible signal for misfire detection.
 - Increment wheel loose or damaged (internal on M44, M52 and M54, external on M62 & M73).
 - Air gap between sensor and wheel.
 - Noticeable at higher RPM.
 - DISplus preset measurement.
 - Determine defective sensor or increment wheel and replace.
- **Catalyst Damaged:**
 - Excessive exhaust back pressure (bank specific fault present, more noticeable under heavy load and high RPM).

- DISplus preset measurement of oxygen sensor.
- Back pressure test per SIB with Special Tool.
- Determine catalyst condition, replace or repair as necessary.
- **Oxygen Sensor:**
 - Excessive mixture deviation, **possible vacuum leaks.**
 - Monitor oxygen sensor signal via DIS preset.
 - Swap sensor from other bank (if applicable) and see if fault transfers to other bank.
- **Engine Control Module**
 - Internal control module fault.
 - Misfire Reprogramming.
 - Check fault memory.
 - Highly unlikely but must be considered.
 - Check Model/Prod range - reprogram

When diagnosing a Misfire fault code, Remember:

"Misfire" is caused by a defect in the internal combustion engine or a defect in the control of the engine operation.

"Misfire" is the result of improper combustion (variation between cylinders) as measured at the crankshaft due to:

- Engine mechanical defects; breakage, wear, leakage or improper tolerances.
- Excessive mixture deviation; air (vacuum leaks), fuel and all the components that deliver air/fuel into the combustion chambers.
- Faulty ignition; primary, secondary including spark plugs.
- Faulty exhaust flow; affecting back pressure.
- Tolerance parameters; ECM programming.

A Misfire fault code(s) is the "symptom" of a faulty input for proper combustion. When diagnosing a misfire, review the charts to assist you in finding the faulty input.

OBD HISTORY

As a result of low fuel costs, together with a high standard of living and a dense population, the state of California was affected particularly heavily by air pollution. This spurred the state to pass the most comprehensive and stringent emissions and consumption laws in the world. The automobile manufacturers were reminded of their obligations and this drove them on to comply with the new regulations at enormous expense.

- In continuing efforts to improve air quality, the Environmental Protection Agency (EPA) amended the Clean Air Act in 1990. The Clean Air Act was originally mandated in 1970. The Clean Air Act has a direct impact on automobile manufactures whereby they are responsible to comply with the regulations set forth by the EPA. The 1990 amendment of the Clean Air Act set forth all of the changes currently

being introduced on vehicles sold in the United States today.

- In 1967, the State of California formed the California Air Resources Board (CARB) to develop and carryout air quality improvement programs for California's unique air pollution conditions. Through the years, CARB programs have evolved into what we now know as ON Board Diagnostics and the National Low Emission Vehicle Program.
- The EPA has adopted many of the CARB programs as National programs and laws. One of these earlier programs was OBD I and the introduction of the "CHECK ENGINE" Light.
- BMW first introduced OBD I and the check engine light in the 1987 model year. This enhanced diagnosis through the display of "flash codes" using the check engine light as well as the BMW 2013 and MoDIC. OBD I was only the first step in an ongoing effort to monitor and reduce tailpipe emissions.
- By the 1989 model year all automotive manufactures had to assure that all individual components influencing the composition of exhaust emissions would be electrically monitored and that the driver be informed whenever such a component failed.
- Since the 1996 model year all vehicles must comply with OBD II requirements. OBD II requires the monitoring of virtually every component that can affect the emission performance of a vehicle plus store the associated fault code and condition in memory.

If a problem is detected and then re-detected during a later drive cycle more than one time, the OBD II system must also illuminate the "CHECK ENGINE" Light in the instrument cluster to alert the driver that a malfunction has occurred. **However, the flash code function of the Check Engine Light in OBD I vehicles is not a function in OBD II vehicles.**

- This requirement is carried out by the Engine Control Module (ECM/DME) as well as the Automatic Transmission Control Module (EGS/AGS) and the Electronic Throttle Control Module (EML) to monitor and store faults associated with all components/systems that can influence exhaust and evaporative emissions.

OBD I

The essential elements here are that electrical components which affect exhaust emissions are monitored by the motor-electronics system and an optical warning signal (CHECK ENGINE Light) is issued in the event of an OBD I-relevant malfunction. The corresponding fault can be read out via a flashing code without the aid of a testing device.

OBD II

Since January 1996, OBD II has been compulsory on all vehicles in the US market. The main difference from OBD I is that not only are the purely electrical components monitored but also all the systems and processes that affect exhaust emissions and fuel system evaporative emissions.

The operational reliability of the exhaust-treatment system must be guaranteed for 5 years and/or 100,000 miles; this is maintained by emission certification. In this case, the data relevant to exhaust/evaporative emissions are read out via a standardized interface with a universal "diagnosis device". If a violation is identified, the vehicle manufacturer in question is legally bound to eliminate the fault throughout the entire vehicle series.

Objectives Of OBD II

- Permanent monitoring of components relevant to exhaust emissions in all vehicles.
- Immediate detection and indication of significant emission increases over the entire service life of each vehicle.
- Permanently low exhaust emissions in the field.

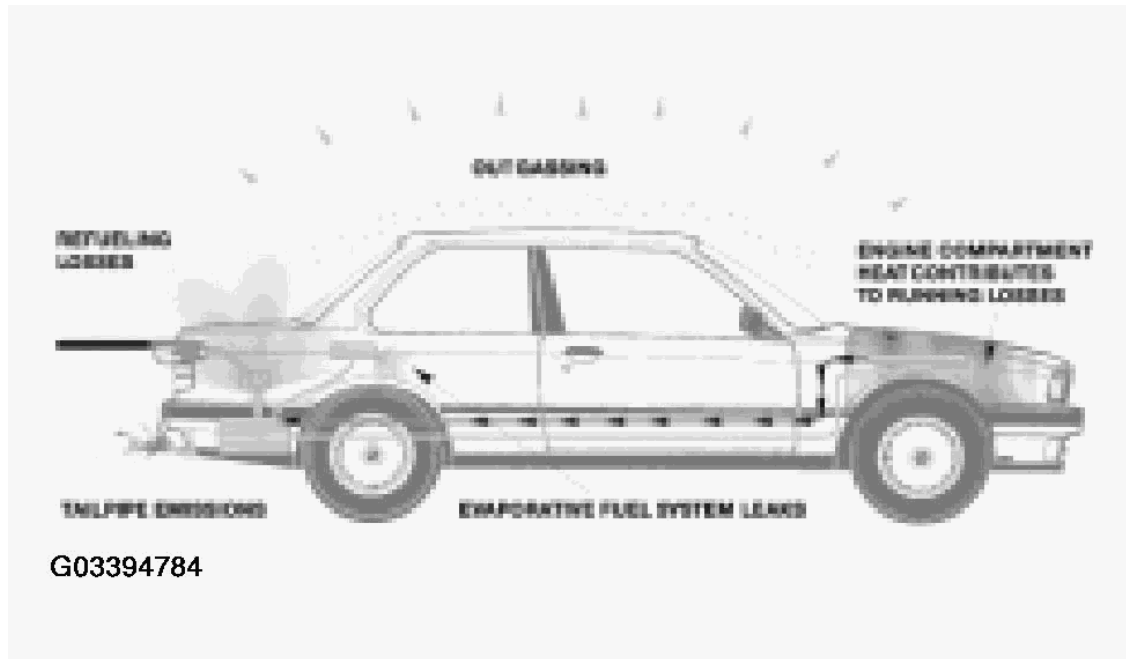


Fig. 3: Identifying Objectives Of OBD II
 Courtesy of BMW OF NORTH AMERICA, INC.

OVERVIEW OF THE NATIONAL LOW EMISSION VEHICLE PROGRAM

Emission Reduction Stages:

While OBD II has the function of monitoring for emission related faults and alerting the operator of the vehicle, the National Low Emission Vehicle Program requires a certain number of vehicles produced (specific to manufacturing totals) *currently* comply with the following emission stages;

TLEV : Transitional Low Emission Vehicle

LEV: Low Emission Vehicle

ULEV: Ultra Low Emission Vehicle.

Prior to the National Low Emission Vehicle Program, the most stringent exhaust reduction compliancy is what is known internally within BMW as **HC II** . The benefit of exhaust emission reductions that the National Low Emission Vehicle Program provides compared with the HC II standard is as follows:

TLEV- 50% cleaner.

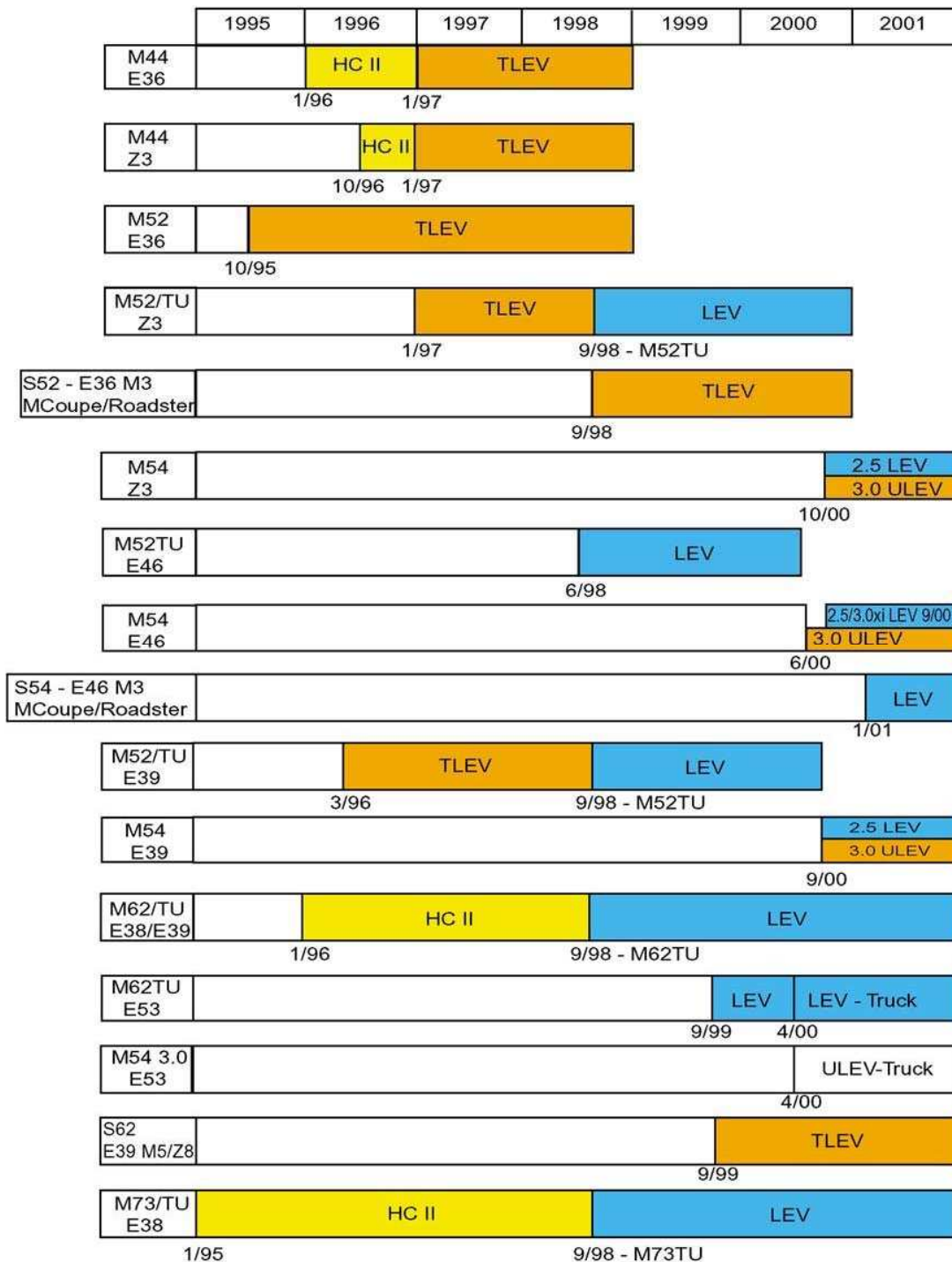
LEV- 70% cleaner.

ULEV -84% cleaner.

- Compliance Level
- NMHC Non Methane Hydrocarbon
- CO Carbon Monoxide
- NOx Oxide(s) of Nitrogen
- TLEV
- 0.250
- 3.4
- 0.4
- LEV
- 0.131
- 3.4
- 0.2
- ULEV
- 0.040
- 1.7
- 0.2
- Compliance Level
- NMHC Non Methane Hydrocarbon
- CO Carbon Monoxide
- NOx Oxide(s) of Nitrogen
- TLEV
- 0.125
- 3.4
- 0.4
- LEV
- 0.075
- 3.4
- 0.2
- ULEV
- 0.040
- 1.7
- 0.2
- Compliance Level
- NMHC Non Methane Hydrocarbon
- CO Carbon Monoxide

- NO_x Oxide(s) of Nitrogen
- TLEV
- 0.156
- 4.2
- 0.6
- LEV
- 0.090
- 4.2
- 0.3
- ULEV
- 0.055
- 2.1
- 0.3

OBD II Emission Compliance Chart



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Fig. 4: Identifying OBD II Emission Compliance
 Courtesy of BMW OF NORTH AMERICA, INC.

SYSTEM MONITORING

Within the framework of OBD II, certain components/systems must be monitored once per driving cycle while other control systems (e.g. misfire detection) must be monitored permanently. A *"driving cycle" consists of engine startup, vehicle operation (exceeding of starting speed), coasting and engine stopping.*

Permanent Monitoring

Permanently monitored systems are monitored according to temperature immediately after startup. In the event of malfunctions (e.g. oxygen sensor), the Malfunction Indicator Light will illuminate immediately.

The following are monitored permanently:

- Misfire Detection
- Fuel System (duration of injection)
- All emission related electrical circuits, components and systems of the ECM, TCM and EML (if equipped).

Cyclic Monitoring

Systems monitored once per driving cycle will only result in a fault being registered after the corresponding operating conditions have been completed. Therefore, there is no possibility for checking when the engine is started up briefly and then shut down.

The following are monitored once per driving cycle:

- Oxygen Sensor Function
- Secondary Air Injection System
- Catalytic Converter Function (efficiency)
- Evaporative Vapor Recovery System

Due to the complexity involved in meeting the test criteria within the defined driving cycle, all tests may not be completed within one "customer driving cycle". The test can be successfully completed within the defined criteria, however customer driving styles may differ and therefore may not always monitor all involved components/systems in one "trip".

Drive Cycle

The following diagram shows how a drive cycle is set (test drive) in order for all the systems to be monitored once. The test conditions can be created in any desired order after startup.

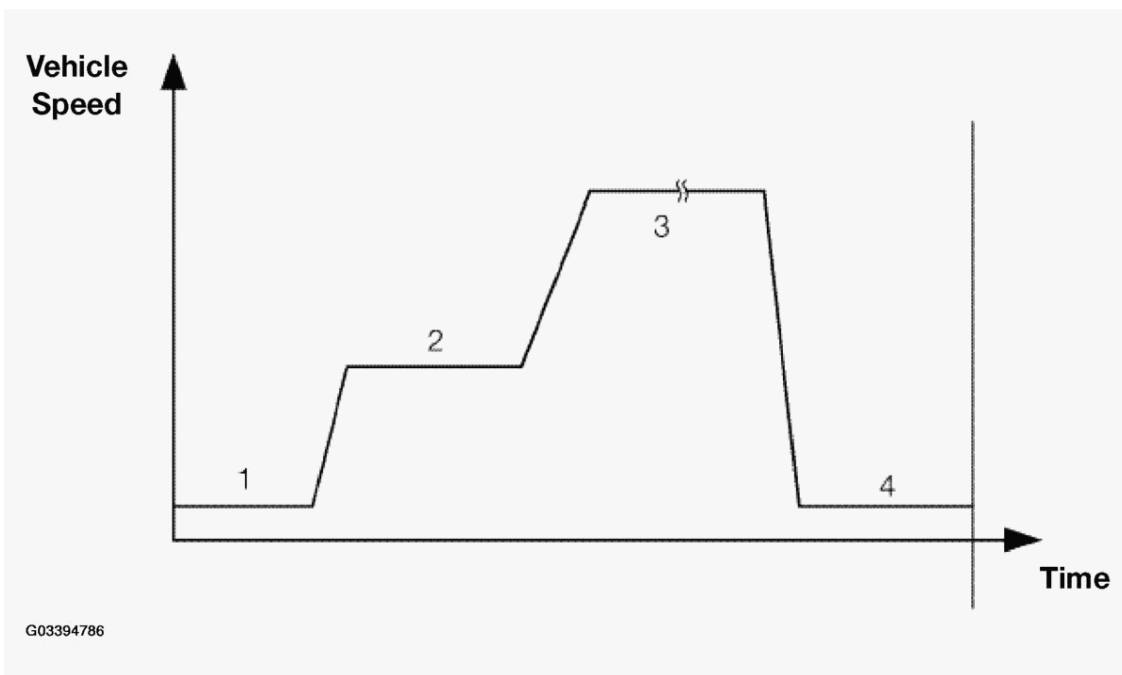


Fig. 5: Identifying Drive Cycle Graph

Courtesy of BMW OF NORTH AMERICA, INC.

1. Engine cold start, idling, approximately 3 minutes. Evaluated:
 - **Secondary Air System**
 - **Evaporative Leak Detection (LDP Equipped Vehicles)**
2. Constant driving at 20 to 30 MPH, approximately 4 minutes. Evaluated:
 - **Oxygen Sensors - Achieved "Closed Loop" Operation**
 - **Oxygen Sensors - Response Time and Switching Time (Control Frequency)**
3. Constant driving at 40 to 60 MPH, approximately 15 minutes (sufficient vehicle coasting phases included). Evaluated:
 - **Catalytic Converter Efficiency**
 - **Oxygen Sensors - Response Time and Switching Time (Control Frequency)**
4. Engine idling, approximately 5 minutes. Evaluated:
 - **Tank-Leak Diagnosis (DM TL Equipped Vehicles after KL 15 is switched OFF)**

NOTE: The diagnostic sequence illustrated above will be interrupted if:

- **The engine speed exceeds 3000 RPM.**
- **The driving speed exceeds 60 MPH.**
- **Large fluctuations in the accelerator pedal position.**

THE "MALFUNCTION INDICATOR LIGHT" (MIL) WILL BE ILLUMINATED UNDER THE FOLLOWING CONDITIONS

- Upon the completion of the next consecutive driving cycle where the previously faulted system is monitored again and the emissions relevant fault is again present.
- Immediately if a "Catalyst Damaging" fault occurs (Misfire Detection).

The illumination of the light is performed in accordance with the Federal Test Procedure (FTP) which requires the lamp to be illuminated when:

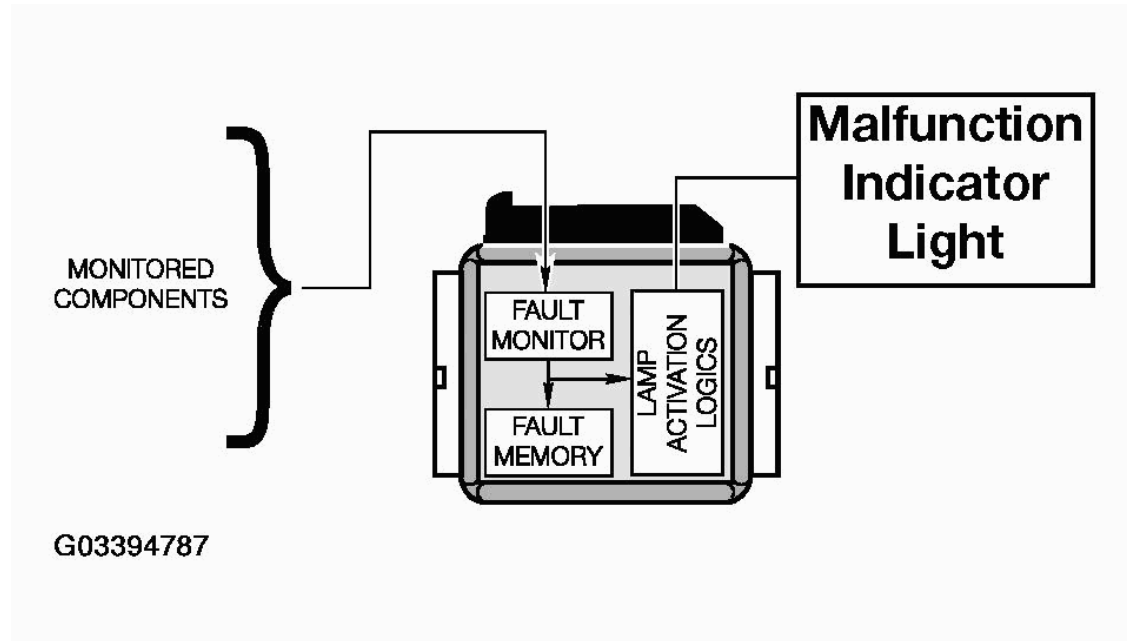


Fig. 6: Identifying Malfunction Indicator Light
 Courtesy of BMW OF NORTH AMERICA, INC.

- A malfunction of a component that can affect the emission performance of the vehicle occurs and causes emissions to exceed 1.5 times the standards required by the (FTP).
- Manufacturer-defined specifications are exceeded.
- An implausible input signal is generated.
- Catalyst deterioration causes HC-emissions to exceed a limit equivalent to 1.5 times the standard (FTP).
- Misfire faults occur.
- A leak is detected in the evaporative system, or "purging" is defective.
- ECM fails to enter closed-loop oxygen sensor control operation within a specified time interval.
- Engine control or automatic transmission control enters a "limp home" operating mode.
- Ignition is on (KL15) position before cranking = **Bulb Check Function**.

Within the BMW system the illumination of the Malfunction Indicator Light is performed in accordance with the regulations set forth in CARB mail-out 1968.1 and as demonstrated via the Federal Test Procedure (FTP). The following page provides several examples of when and how the Malfunction Indicator Light is illuminated based on the "customer drive cycle".

TEXT NO.	DRIVE CYCLE # 1			DRIVE CYCLE # 2			DRIVE CYCLE # 3			DRIVE CYCLE # 4			DRIVE CYCLE # 5			* DRIVE CYCLE # 43		
	FUNCTION CHECKED	FAULT CODE SET	MIL STATUS CHECK ENGINE	FUNCTION CHECKED	FAULT CODE SET	MIL STATUS CHECK ENGINE	FUNCTION CHECKED	FAULT CODE SET	MIL STATUS CHECK ENGINE	FUNCTION CHECKED	FAULT CODE SET	MIL STATUS CHECK ENGINE	FUNCTION CHECKED	FAULT CODE SET	MIL STATUS CHECK ENGINE	FUNCTION CHECKED	FAULT CODE ERASED	MIL STATUS CHECK ENGINE
1.	YES	YES	OFF															
2.	YES	YES	OFF	YES	YES	ON												
3.	YES	YES	OFF	NO	NO	OFF	YES	YES	ON									
4.	YES	YES	OFF	YES	NO	OFF	YES	NO	OFF	YES	YES	OFF	YES	YES	ON			
5.	YES	YES	OFF	YES	YES	ON	YES	NO	ON	YES	NO	ON	YES	NO	OFF			
6.	YES	YES	OFF	YES	YES	ON	YES	NO	ON	YES	NO	ON	YES	NO	OFF	YES	FAULT CODE ERASED	OFF

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Fig. 7: Checking Bulb Function

Courtesy of BMW OF NORTH AMERICA, INC.

1. A fault code is stored within the ECM upon the first occurrence of a fault in the system being checked.
2. The "Malfunction Indicator Light" will not be illuminated until the completion of the second consecutive "customer driving cycle" where the previously faulted system is again monitored and a fault is still present or a catalyst damaging fault has occurred.
3. If the second drive cycle was not complete and the specific function was not checked, the ECM counts the third drive cycle as the "next consecutive" drive cycle. The "Malfunction Indicator Light" is illuminated if the function is checked and the fault is still present.
4. If there is an intermittent fault present and does not cause a fault to be set through multiple drive cycles, two complete consecutive drive cycles with the fault present are required for the "Malfunction Indicator Light" to be illuminated.
5. Once the "Malfunction Indicator Light" is illuminated it will remain illuminated unless the specific function has been checked without fault through three complete consecutive drive cycles.
6. The fault code will also be cleared from memory automatically if the specific function is checked through 40 consecutive drive cycles without the fault being detected or with the use of either the DIS, MODIC or Scan tool.

NOTE: In order to clear a catalyst damaging fault (see MISFIRE DETECTION) from memory, the condition must be evaluated for 80 consecutive cycles without the fault reoccurring.

With the use of a universal scan tool, connected to the "OBD" DLC an SAE standardized DTC can be obtained, along with the condition associated with the illumination of the "Malfunction Indicator Light". Using the DISplus or MODIC, a fault code and the conditions associated with its setting can be obtained prior to the illumination of the "Malfunction Indicator Light".

READINESS CODE

The readiness code provides status (Yes/No) of the system having completed all the required monitoring functions or not. The readiness code is displayed **with an aftermarket Scan Tool or the DISplus/MoDIC** . The code is a binary (1/0) indicating;

- 0 = Test Not Completed or Not Applicable - six cylinder vehicles (not ready - V8 and V12)
- 1 = Test Completed - six cylinder vehicles (ready - V8 and V12)

A "readiness code" must be stored after any clearing of fault memory or disconnection of the ECM. A readiness code of "0" will be stored (see below) after a complete diagnostic check of all components/systems, that can turn on the "Malfunction Indicator Light" is performed.

The readiness code was established to prevent anyone with an emissions related fault and a "Malfunction Indicator Light" on from disconnecting the battery or clearing the fault memory to manipulate the results of the emissions test procedure (IM 240).

Interpretation of the Readiness Code by the ECM(s) (SAE J1979)

The complete readiness code is equal to "one" byte (eight bits). Every bit represents one complete test and is displayed by the scan tool, as required by CARB/EPA. For example:

0 = EGR Monitoring (=0, N/A with BMW)

1 = Oxygen Sensor Heater Monitoring

1 = Oxygen Sensor Monitoring

0 = Air Condition (=0, N/A with BMW)

1 = Secondary Air Delivery Monitoring

1 = Evaporative System Monitoring

0 = Catalyst Heating

1 = Catalyst Efficiency Monitoring



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Fig. 8: Identifying Secondary Air Delivery Monitoring
 Courtesy of BMW OF NORTH AMERICA, INC.

Drive the car in such a manner that all tests listed above can be completed (refer to the **DRIVE CYCLE**). When the complete "readiness code" equals "1" (ready) then all tests have been completed and the system has established its "readiness".

Readiness Code Using DISplus/MoDIC

The readiness code can be checked with the DISplus/MoDIC. This is particularly helpful in verifying that "drive cycle" criteria was achieved. **A repair can be confirmed before returning the vehicle to the customer by a successfully completed drive cycle.**

Using an MS43 system for example, the readiness code is found under "**Service Functions**"

BMW Diagnosis Operation and component selection

Operations	Digital Motor Electronics	Go
Complete vehicle	DME(DOE) - EWS-III calibration	
Component and signal information	CO calibration	
Service functions	Calibration, idle speed	
Drive	Calibration, consumption indicator	
Digital Motor Electronics	Reset adaptations	
Electronic transmission control	Setpoint/actual-value comparison, id	
Electronic car immobilization sys	Diagnostic function	
Chassis	Function test, mixed-up oxygen sen	
Body	Activation, DMTL pump	

- Drive
- Digital Motor Electronics
- Diagnostic Function

Select "Own Test Plan" → OB2 II Readiness preconditions and description is shown:

BMW Diagnosis Test plan

OB2 II Function Check, Knowledge

The DME control unit cannot completely check the engine management system before certain operating conditions have been achieved. For this purpose, a test drive should be carried out under the specified criteria.

The following preconditions must be met to ensure that all tests are conducted:

- No problems defined before test drive
- Any stored fault codes were worked through beforehand
- Fault code memory of engine control unit has been deleted

Test drive procedure:

- Start test drive with vehicle cold (for secondary air system test)
- Drive vehicle at a constant speed within the range between 55 and 95 km/h in 4th gear/selector lever position 4 for about 10 minutes (for oxygen sensors, oxygen sensor heating and catalytic converter monitoring)

OB2 II OB2 II / Message 00

Certain operating conditions must be reached before checking the engine management system. For this purpose, clear fault memory before test drive. Carry out test drive and observe diagnostic function on following pages. The DME system is OK when all diagnostic functions are carried out and no fault codes are stored in the fault memory.

Examples of functions/components checked are shown below:

Diagnosis of:

- Oxygen sensor heating: 1
- Oxygen sensors: 1
- Secondary air: 1
- Fuel tank leak diagnosis: 1
- Catalytic converter: 1

Evaluation:

- 0: not completed
- 1: completed

Monitoring of:

- Remaining components: 1
- Fuel supply: 1
- Combustion misfiring: 1
- Oxygen sensor heating: 1
- Oxygen sensors: 1
- Secondary air: 1
- Fuel tank leak diagnosis: 1
- Catalytic converter: 1
- Evaluation: 0: not supported; 1: supported

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Fig. 9: Identifying Readiness Code Using Displus/MoDIC
 Courtesy of BMW OF NORTH AMERICA, INC.

OBD II DIAGNOSTIC TROUBLE CODES (DTC)

The Society of Automotive Engineers (SAE) established the Diagnostic Trouble Codes used for OBD II systems (SAE J2012). The DTC's are designed to be identified by their alpha/numeric structure. The SAE has designated the emission related DTC's to start with the letter "P" for Powertrain related systems, hence their *nickname* "P-code".

For example:

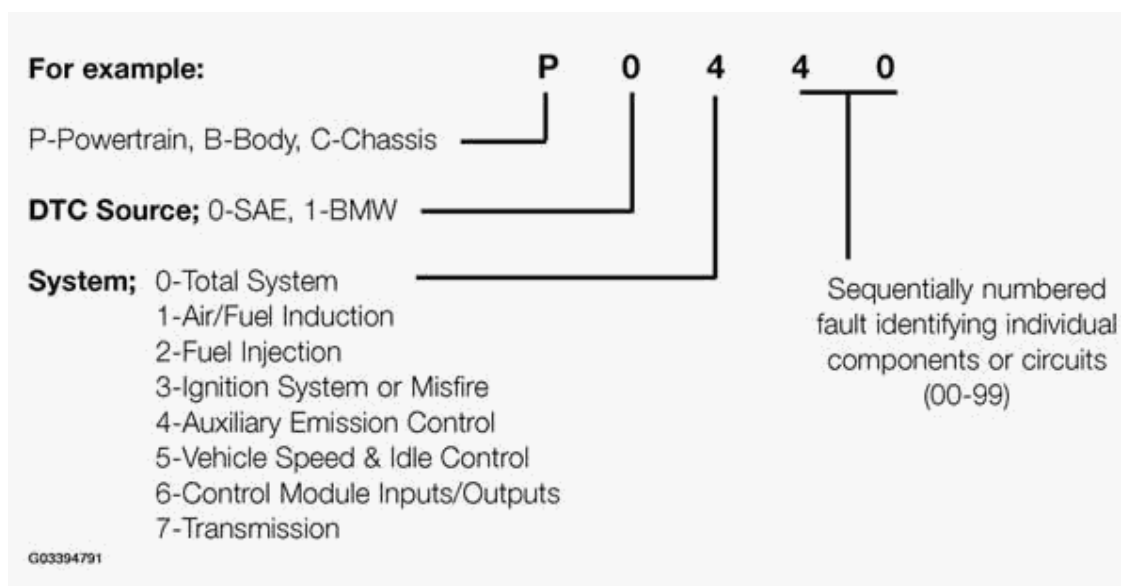


Fig. 10: Identifying Obd II Diagnostic Trouble Codes (DTC)
Courtesy of BMW OF NORTH AMERICA, INC.

- DTC's are stored whenever the "Malfunction Indicator Light" is illuminated.
- A requirement of CARB/EPA is providing universal diagnostic access to DTC's via a standardized Diagnostic Link Connector (DLC) using a standardized tester (scan tool).
- DTC's only provide one set of environmental operating conditions when a fault is stored. This single "Freeze Frame" or snapshot refers to a block of the vehicles environmental conditions for a specific time when the fault first occurred. The information which is stored is defined by SAE and is limited in scope. This information may not even be specific to the type of fault.

SCAN TOOL CONNECTION

Starting with the 1995 750iL, soon after on all 1996 model year and later BMW vehicles, a separate OBD II Diagnostic Link Connector (DLC) was added.

The DLC provides access for an aftermarket scan tool to all emission related control systems:

- ECM - Engine Management Monitored Emissions Functions/Components
- TCM (AGS/EGS) -Transmission Control
- EML - Electronic Throttle Control

This diagnostic communication link uses the existing TXD II circuit in the vehicle through a separate circuit on

the DLC when the 20 pin cap is installed.

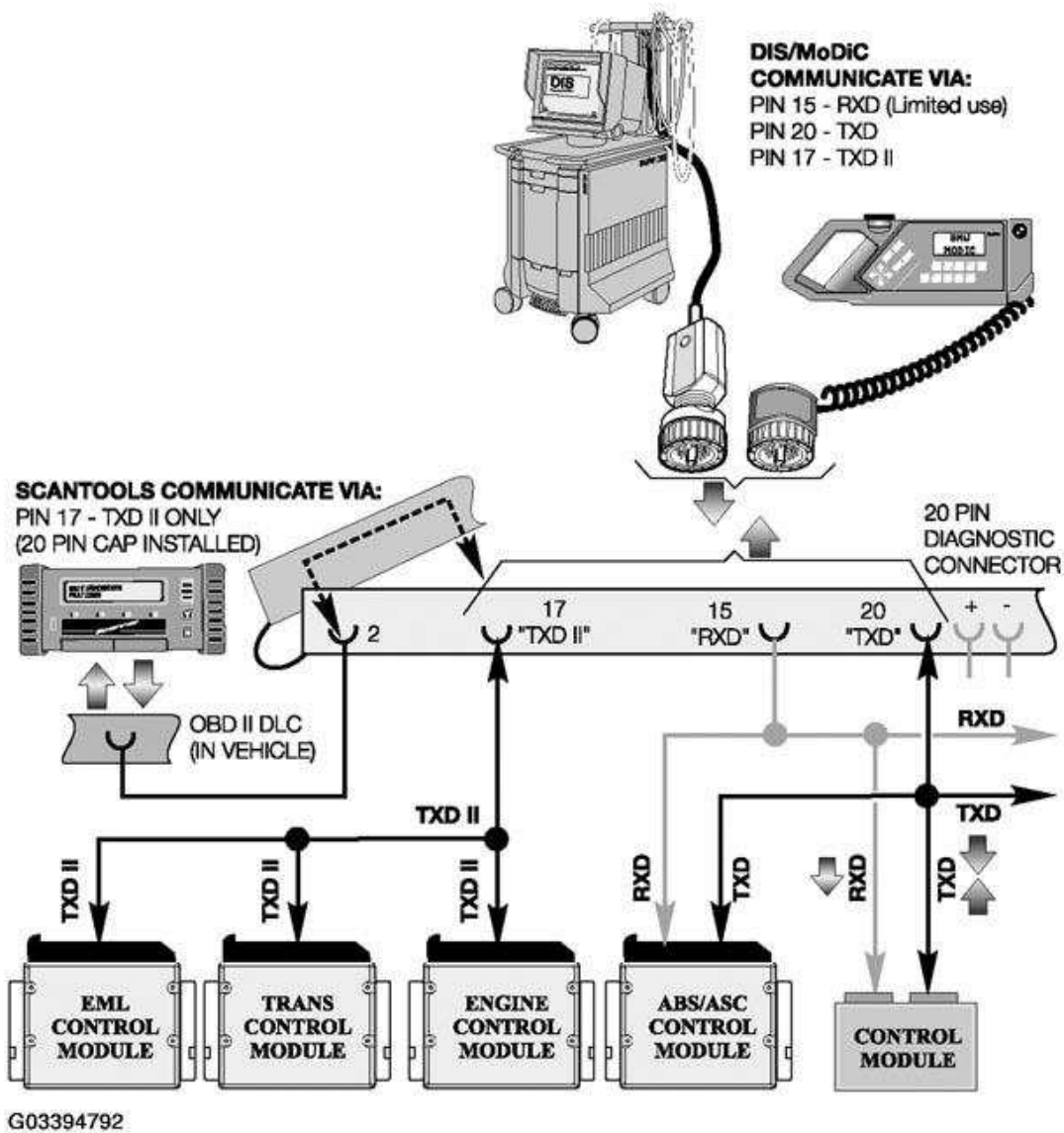
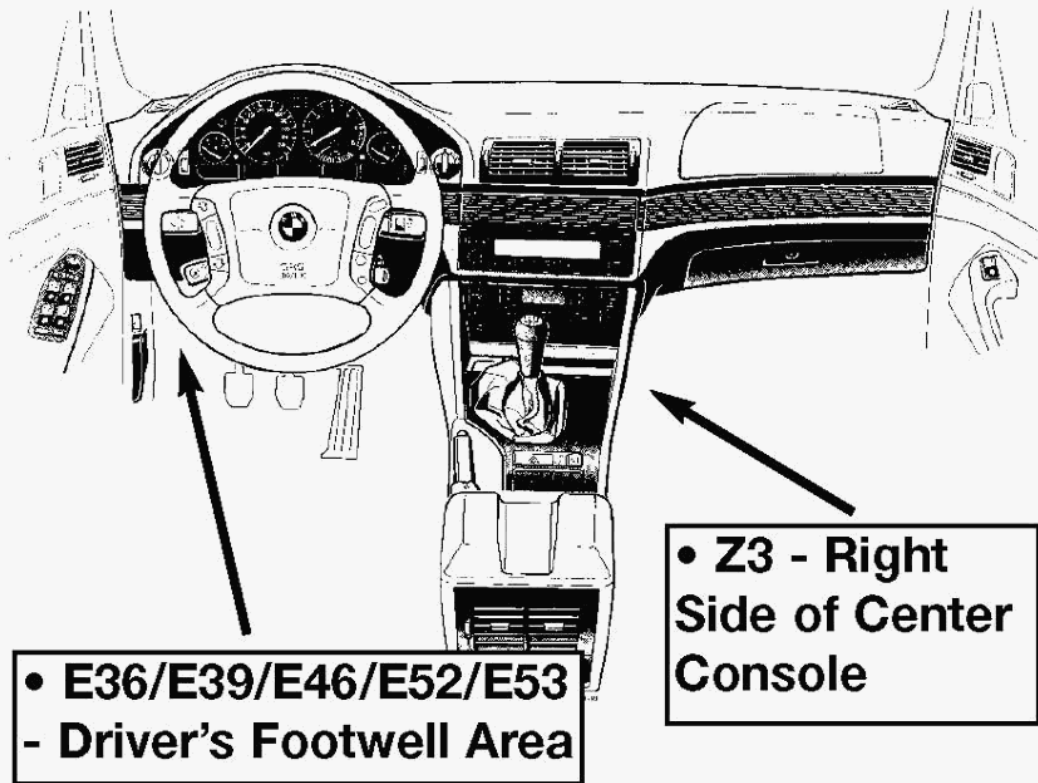


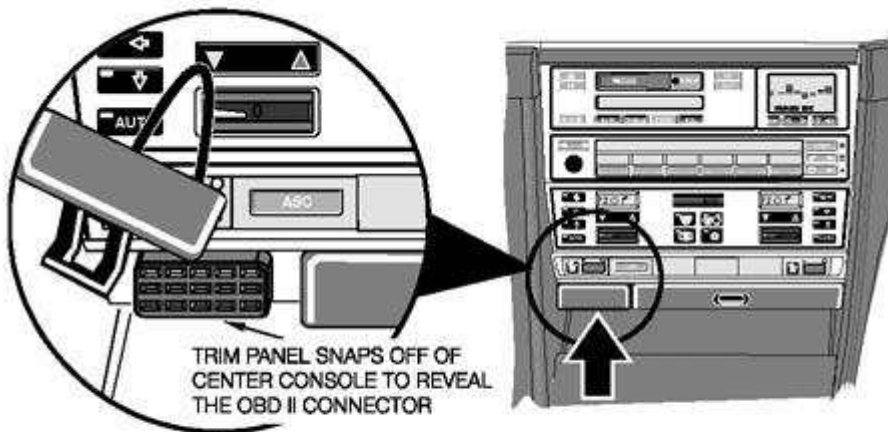
Fig. 11: Identifying Scan Tool Connection
Courtesy of BMW OF NORTH AMERICA, INC.

The DLC Connector bridging cap is marked "OBD II" and is found:



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Fig. 12: Identifying DLC Connector Bridging Cap
Courtesy of BMW OF NORTH AMERICA, INC.



- **E38 Center Console (next to cup holder)**

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Fig. 13: Identifying E38 Center Console
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: E38 and older models have a cosmetic cover and a secured DLC cover.

20 Pin Diagnostic Socket Deletion

Model And Production Date: E46 From 6/00 E39, E52, E53 From 9/00

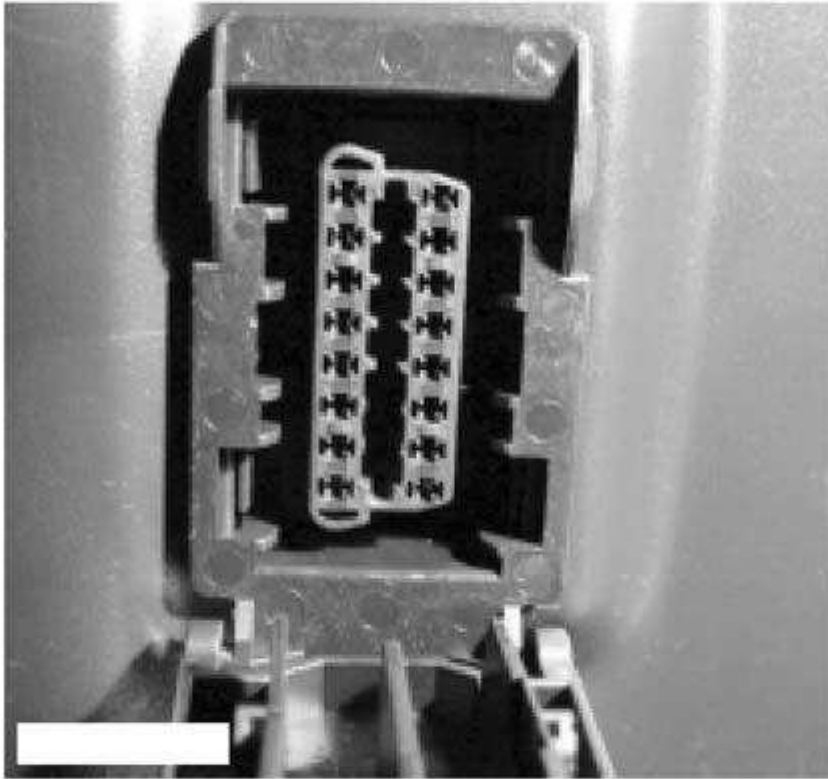
For model year 2001 the E39, E46 and E53 will eliminate the 20 pin diagnostic connector from the engine compartment. The 16 pin OBD II connector located inside the vehicle will be the only diagnosis port.

The E38 and Z3 will continue to use the 20 pin connector until the end of production.

The 16 pin OBD II connector has been in all BMWs since 1996 to comply with OBD regulations requiring a standardized diagnostic port.

Previously before 2001, only emissions relevant data could be extracted from the OBD II connector because it did not provide access to TXD (D-bus).

The TXD line is connected to pin 8 of the OBD II connector on vehicles without the 20 pin diagnostic connector.



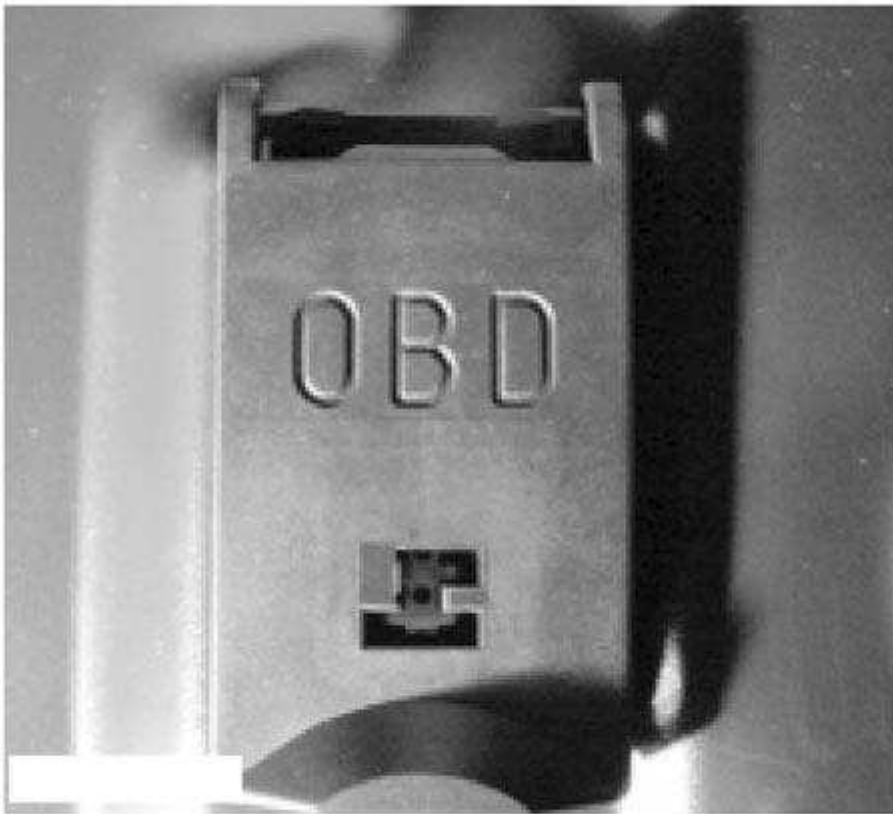
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Fig. 14: Identifying 20 Pin Diagnostic Socket
Courtesy of BMW OF NORTH AMERICA, INC.

The cap to the OBD II connector contains a bridge that links KL 30 to TXD and TXD II. This is to protect the diagnostic circuit integrity and prevent erroneous faults from being logged.

The OBD II connector is located in the driver's footwell to the left of the steering column for E39, E46 and E53 vehicles.

Special tool 61 4 300 is used to connect to the 20 pin diagnostic lead of the DIS until the introduction of the DISplus.



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Fig. 15: Identifying OBD II
Courtesy of BMW OF NORTH AMERICA, INC.

Diagnostics Via OBD II Connector

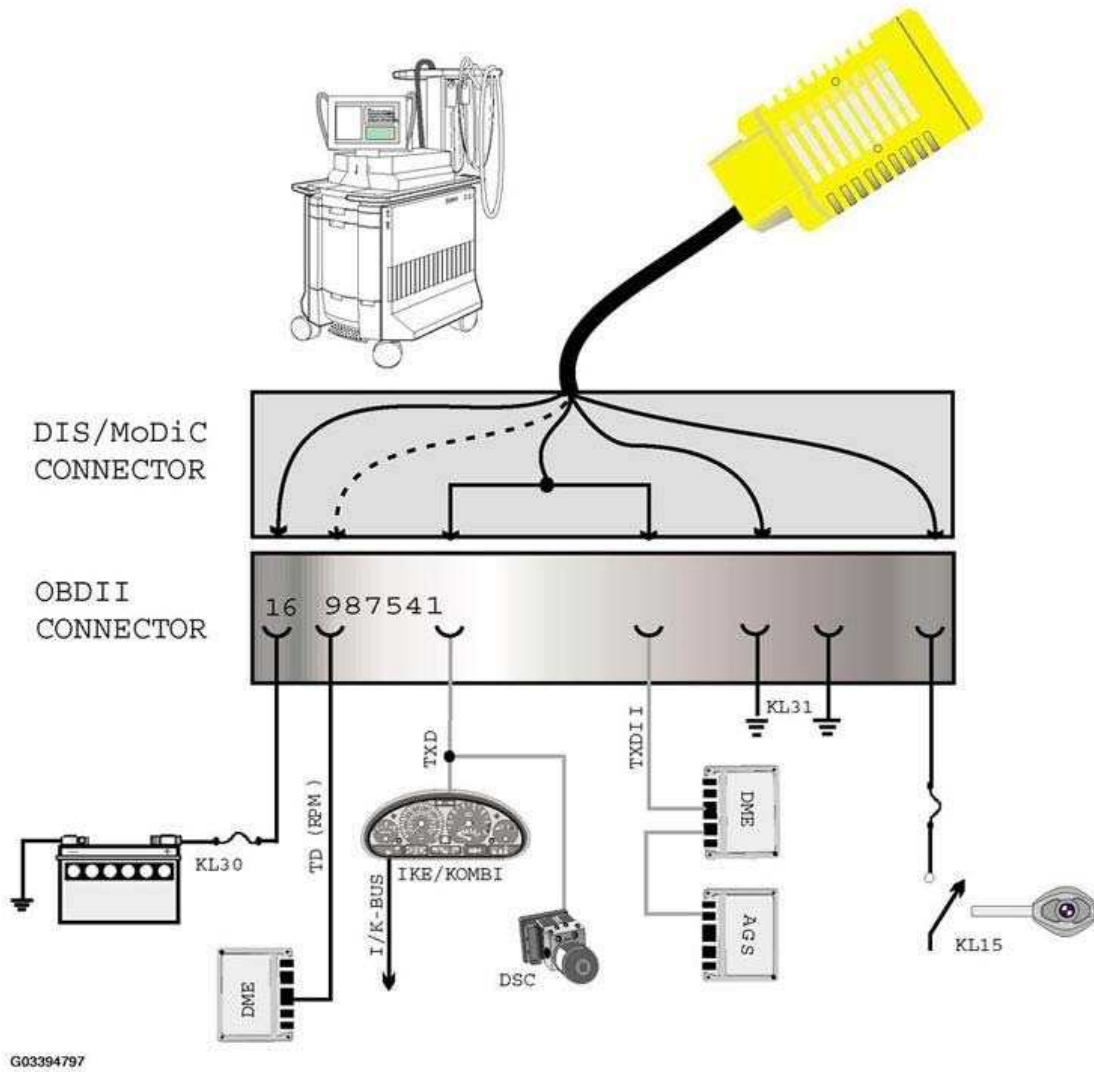


Fig. 16: Diagnostics Via OBD II Connector
 Courtesy of BMW OF NORTH AMERICA, INC.

BMW FAULT CODE (DISPLUS/MODIC)

- BMW Codes are stored as soon they occur even before the "Malfunction Indicator Light" comes on.
- BMW Codes are defined by BMW, Bosch and Siemens Engineers to provide greater detail to fault specific information.
- **Siemens systems** - one set from four fault specific environmental conditions is stored with the first fault occurrence. This information can change and is specific to each fault code to aid in diagnosing. A maximum of ten different faults containing four environmental conditions can be stored.
- **Bosch systems** - a maximum of four sets from three fault specific environmental conditions is stored within each fault code. This information can change and is specific to each fault code to aid in diagnosing. A maximum of ten different faults containing three environmental conditions can be stored.
- BMW Codes also store and displays a "time stamp" when the fault last occurred.

- A fault qualifier gives more specific detailed information about the type of fault (upper limit, lower limit, disconnection, plausibility, etc.).
- BMW Fault Codes will alert the Technician of the current fault status. He/she will be advised if the fault is actually still present, not currently present or intermittent.

The fault specific information is stored and accessible through DISplus/MoDIC.

- BMW Fault Codes determine the diagnostic output for BMW DISplus/MoDIC.

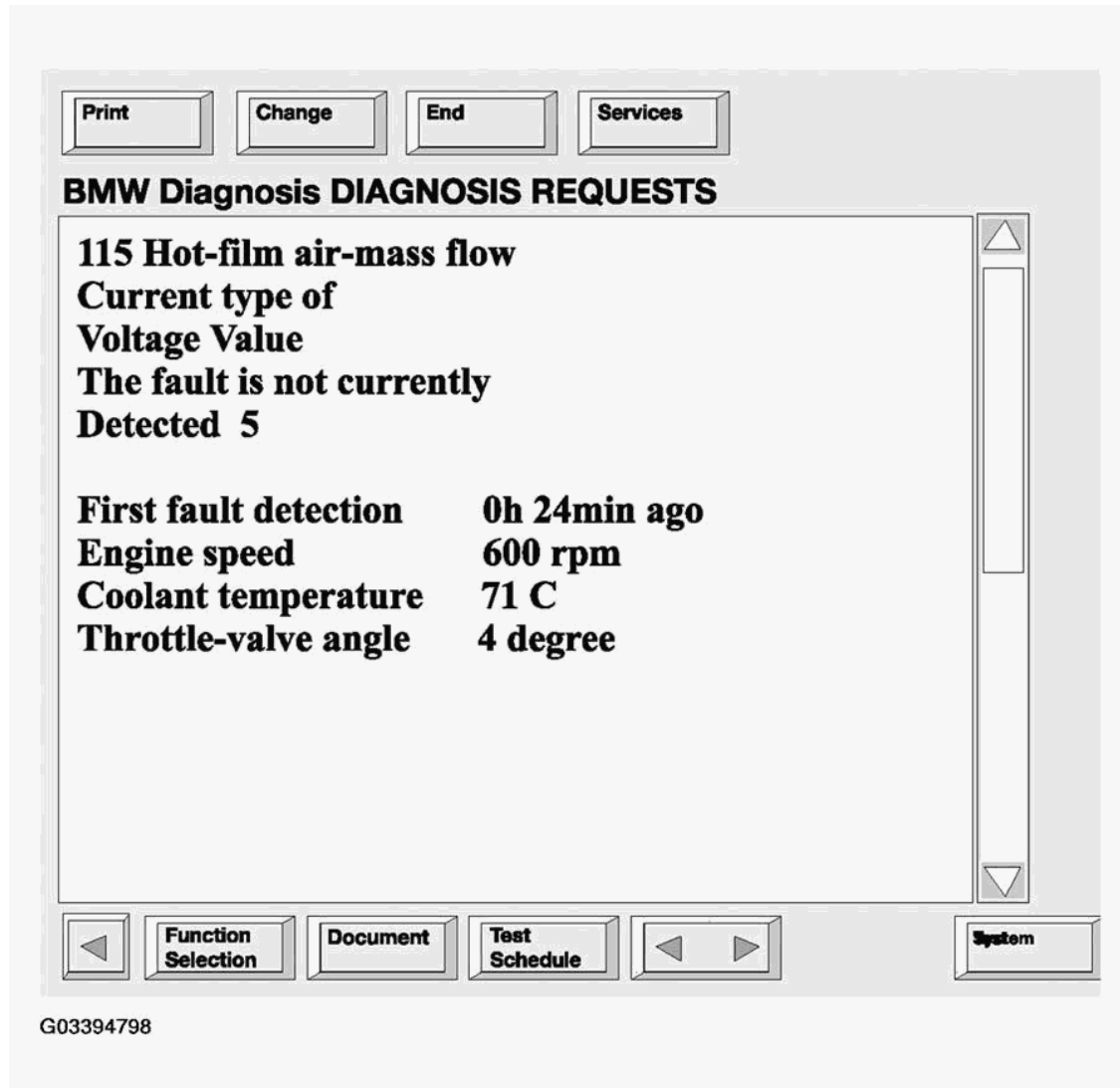


Fig. 17: Identifying BMW Diagnosis Requests
 Courtesy of BMW OF NORTH AMERICA, INC.

OBD II Fault Memory and Fault Codes

Within the framework of OBD II, a diagnosis of all emission-related components/functions must take place during driving. Faults will be stored and displayed if necessary. For this purpose, the ECM includes OBD II

memory. The standardized P codes for malfunctions are stored in this memory. The memory can be read out with the DISplus/ModIC or a Scantool.

Emission Control Function Monitoring & Comprehensive Component Monitoring

OBD II regulations are based on section 1968.1 of Title 13, California Code of Regulations (CCR), The law set forth in section 1968.1 requires an increased scope of monitoring emission related control functions including:

- Catalyst Monitoring
- Heated Catalyst Monitoring (currently used on BMW 750iL vehicles)
- Misfire Monitoring
- Evaporative System Monitoring
- Secondary Air System Monitoring
- Air Conditioning System Refrigerant Monitoring (Not applicable for BMW vehicles)
- Fuel System Monitoring
- Oxygen Sensor Monitoring
- Exhaust Gas Recirculation (EGR) System Monitoring (Not applicable for BMW vehicles)
- Positive Crankcase Ventilation (PCV) System Monitoring (Not required at this time).
- Thermostat Monitoring (if equipped)

Monitoring these emission requirements is a function of the ECM which uses "data sets" while monitoring the conditions of the environment and the operation of the engine using existing input sensors and output actuators.

The data sets are programmed reference values the ECM refers to when a specific monitoring procedure is occurring. If the ECM cannot determine the environmental and/or engine operating conditions due to an impaired or missing signal, it will set a fault and illuminate the "Malfunction Indicator Light".

This input or control signal monitoring falls under another category called "***Comprehensive Component Monitoring***". The ECM must recognize the loss or impairment of the signal or component. The ECM determines a faulted signal or sensor via three conditions:

1. Signal or component shorted to ground.
2. Signal or component shorted to B+.
3. Signal or component lost (open circuit).

Specific fault codes are used to alert the diagnostician of these conditions.

GENERAL INFORMATION

Engine Diagnosis - Overview

ENGINE DIAGNOSIS

ENGINE DIAGNOSIS

When attempting to diagnose driveability complaints, always consider the basics. Regardless of the level of technology employed on an engine, it still needs a few basic things to occur in order to run properly. Whether the engine is very basic or uses so-called "New Generation" technology always refer to the basic principles first.

Any engine using four-cycle spark-ignition principles must meet the same fundamental conditions to run properly. Most engine related driveability problems fall into a few basic categories:

- No Start/No Crank
- Extending cranking before engine start
- Rough Running Cold Idle
- Rough Running Warm Idle
- Rough Running Under Load
- Lack of Power
- Check Engine Light (MIL)



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Fig. 1: Sectional View Of Engine
Courtesy of BMW OF NORTH AMERICA, INC.

When referring to engine basics, all engines need fuel, air and spark to run. However, in order for a spark-ignition engine to run properly, a few things must be taken into consideration. The fuel, air, spark principle can be broken down further into the following categories:

- Sufficient engine compression with a leak-free combustion chamber.
- Sufficient amount of ignition voltage (spark) at the correct time.
- Proper fuel pressure and volume.
- Properly functioning fuel injection system (Engine management).

- Properly functioning air management system (Electronic throttle systems).
- Correct valve timing (VVT and VANOS).

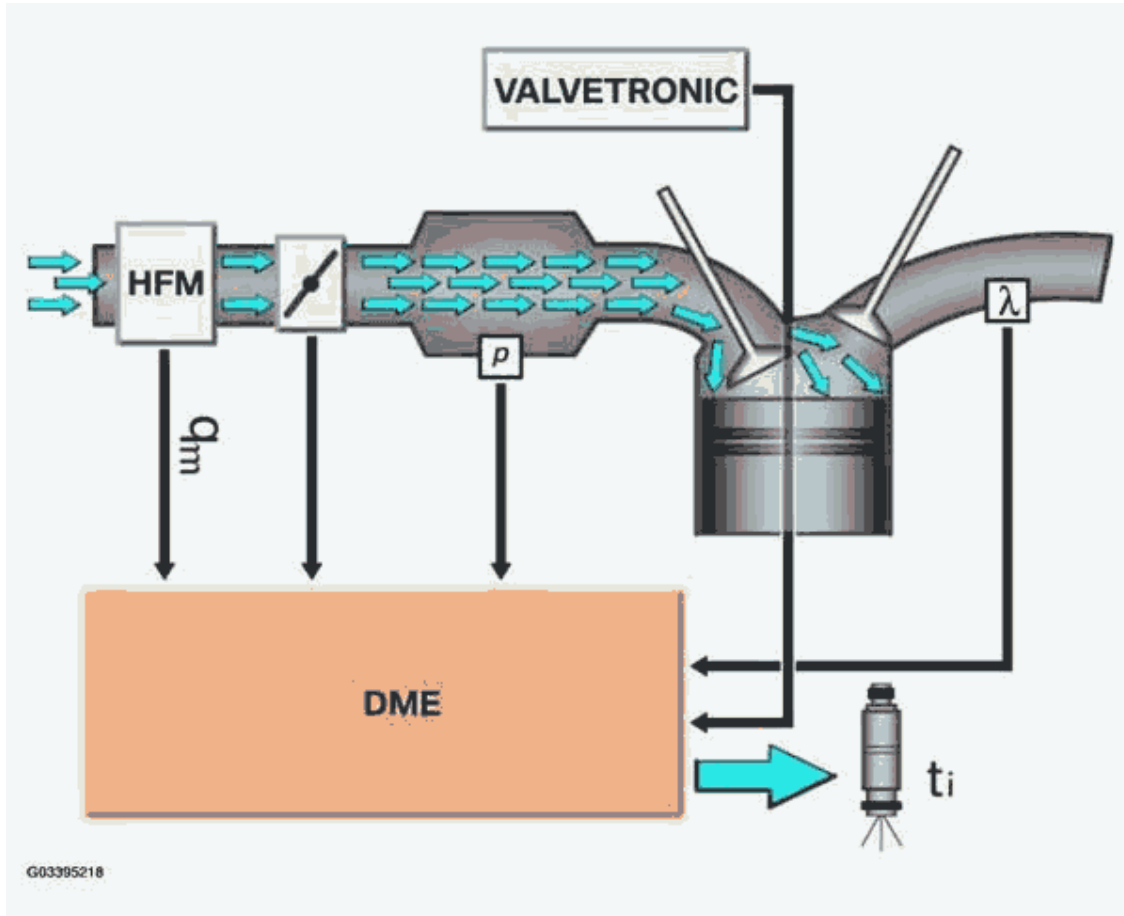


Fig. 2: Operation Of Valvetronic
 Courtesy of BMW OF NORTH AMERICA, INC.

Compression Testing

In order for an engine to run smoothly and efficiently, the combustion chamber must be free of leakage. An engine with low compression in one or more cylinders is inefficient and will run rough or lack in performance. Low compression may or may not cause the MIL to illuminate.

Low compression can be caused by the following:

- Leaking valves caused by burned valves or seats. The valve guide can also be worn causing the valve not to seat properly. Valves can also be bent from piston contact (from over-rev).
- Piston Rings which can be worn from high mileage or poor maintenance. Also, the rings can be damaged from foreign material or improper installation.
- Cracks in cylinder head or engine block. Cracks can be caused by overheating resulting in misfires or rough running.
- Defective cylinder head gasket. The cylinder head gasket can fail due to overheating which can cause

cylinder leakage resulting in misfire, low compression and rough running.

- Bent connecting rod. A connecting rod can be bent from a defective fuel injector or water ingress into the combustion chamber causing hydrostatic lock.

Compression testing can be performed using a conventional compression gauge. There are some preliminary tasks and safety precautions that must be carried out before starting the compression test:

- Remove the fuel pump fuse and or relay, start the vehicle and allow vehicle to stall out on residual fuel
- Disable ignition by unplugging all ignition coils and remove **ALL** sparkplugs.
- Connect battery charger to vehicle
- Ensure that the throttle is wide open during cranking
- Crank engine until compression gauge stops increasing. Be sure to crank engine equally between cylinders.
- Continue compression test on **ALL** cylinders so comparisons can be done. Record readings.
- If necessary, re-check cylinders with suspect readings.
- If some cylinder readings come up low, add a few drops of oil and re-check. This can differentiate between valves/rings.

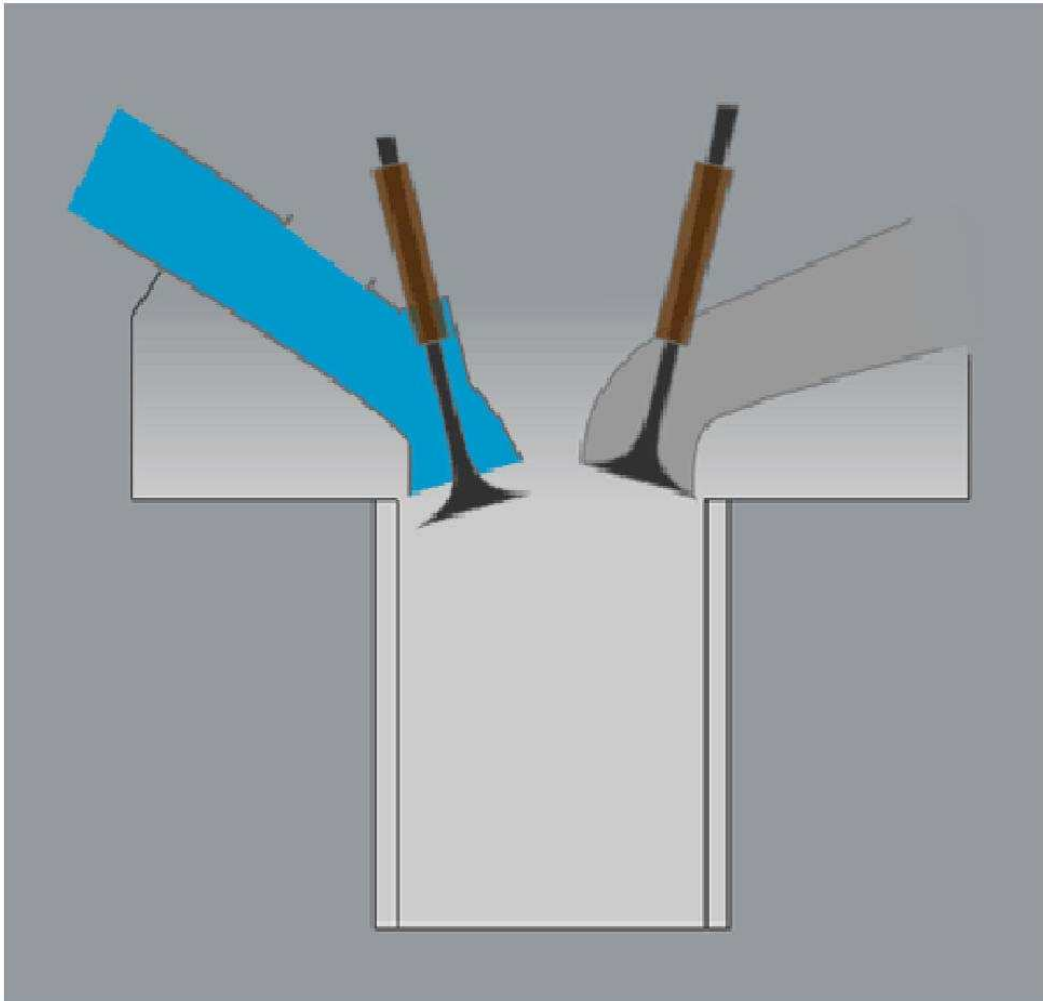
Cylinder Leakage Testing

Once a problem cylinder is detected via a compression test or by other means, a cylinder leakage test is used to pinpoint the problem area.

The leakage test uses a gauge and compressed air to indicate the percentage of air loss. By listening and observing at key points, the problem can be narrowed down before the engine needs to be disassembled.

The piston (one or more) should be brought to TDC, compressed air should be introduced into the cylinder using the cylinder leakage tester. Be sure the engine does **NOT** rotate, if the engine rotates, the engine was not at true TDC.

Check the gauge on the tester, it should read in percentage of leakage. Check the engine specification for permissible leakdown. A general rule of thumb is 15 % or less for a good cylinder. However, some engine have a tighter tolerance. Most BMW engines should be at 8 % or less.



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Fig. 3: Testing Cylinder Leakage
Courtesy of BMW OF NORTH AMERICA, INC.

If any cylinder shows excessive leakdown, check for leakage by listening or observing the following points:

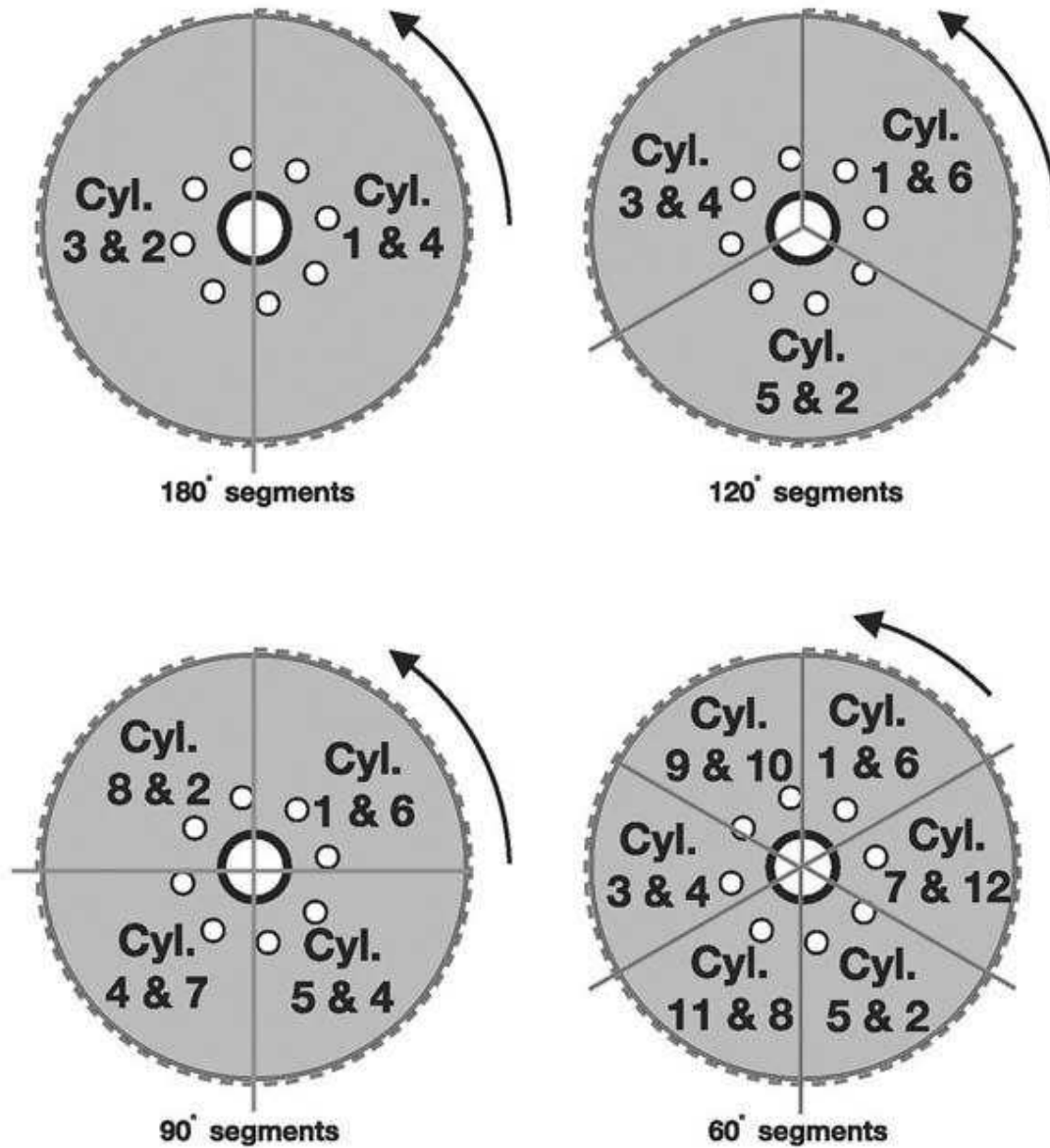
- Listen for air (hissing) at the tailpipe. This would indicate leakage at the exhaust valves on that cylinder.
- Listen for air (hissing) at the throttle. This would indicate leakage at the intake valves on that cylinder. (Be sure throttle is wide open and listen at throttle opening)
- Open the oil cap and listen for air. This would indicate air leakage into the crankcase. This would be piston rings or cylinder bore concerns.
- Observe the coolant reservoir and or remove the radiator cap. Bubbles in the coolant would most likely indicate head gasket leakage or cracked block/head.

Workshop Hints on Cylinder Leakage Testing

When performing cylinder leakage tests, the following tips might be helpful:

Remove all spark plugs to allow easier rotation of the engine. (If this test is done after a compression test, the plugs should already be out).

- Perform the leakage test on all cylinders, not just the problem cylinder. This would indicate any other problems which can be rectified. This eliminates any repeat repairs and wasted diagnostic time.
- Perform the leakage test in cylinder firing order starting with cylinder #1. It takes two revolutions of the engine to complete the leakage test. Start at cylinder #1 and rotate the engine to the next cylinder in the firing order. Divide the number of cylinders into 720, the result is the number of degrees that each cylinder fires. For example, if you divide a 6 cylinder into 720, this equals 120 degrees. If you start at cylinder 1 and rotate the engine 120 degrees in the direction of rotation, you can check the next cylinder in the firing order. This process eliminates the need to rotate the engine an excessive amount.



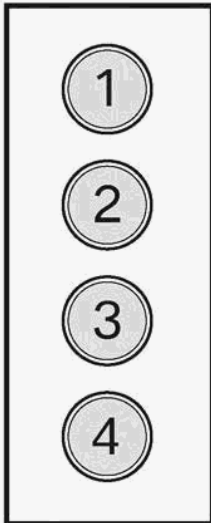
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Fig. 4: Cylinder Leakage Testing Tips
 Courtesy of BMW OF NORTH AMERICA, INC.

Cylinder Arrangement And Firing Order

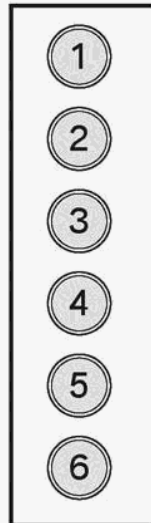
Front of Engine

4-Cylinder



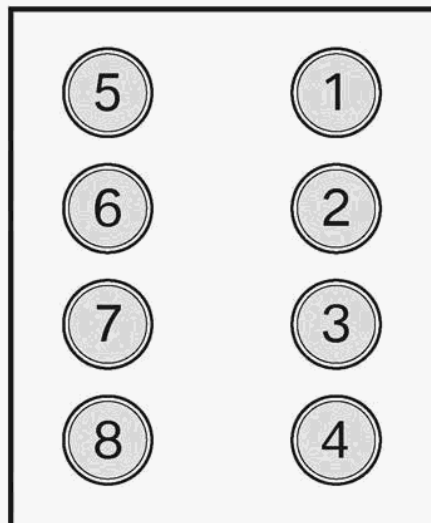
Firing Order 1-3-4-2

6-Cylinder



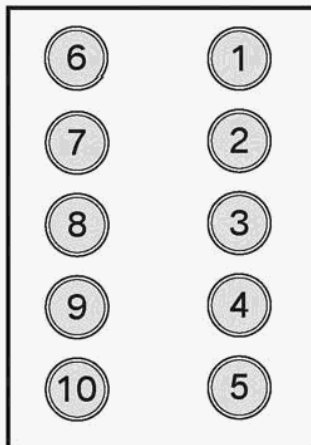
Firing Order 1-5-3-6-2-4

8-Cylinder



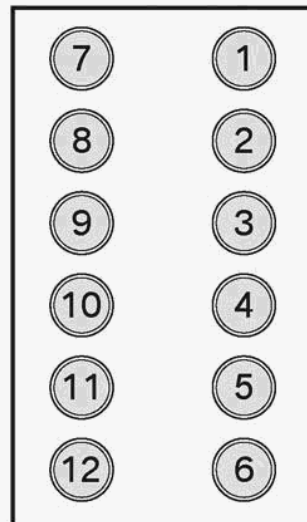
Firing Order 1-5-4-8-6-3-7-2

10-Cylinder



Firing Order 1-6-5-10-2-7-3-8-4-9

12-Cylinder



Firing Order 1-7-5-11-3-9-6-12-2-8-4-10

G03395221

Fig. 5: Identifying Firing Order

Courtesy of BMW OF NORTH AMERICA, INC.

The ignition system on modern BMW engines consist of one ignition coil per cylinder. This arrangement is known as RZV, or Direct Stationary Ignition. The ignition coil receives fused power usually from the DME main relay or IVM (N62).

The ignition coil primary circuit is controlled (triggered) by the engine control module (ECM). The ECM controls dwell and ignition timing on all cylinders individually. Electrical circuit faults on the primary circuit are recorded in the ECM and can be read out using the DISplus or GT-1.

Most new engines use the "pencil" type coil. This design houses the coil windings for the primary and secondary circuit as well as the spark plug boot which includes the secondary circuit resistance.

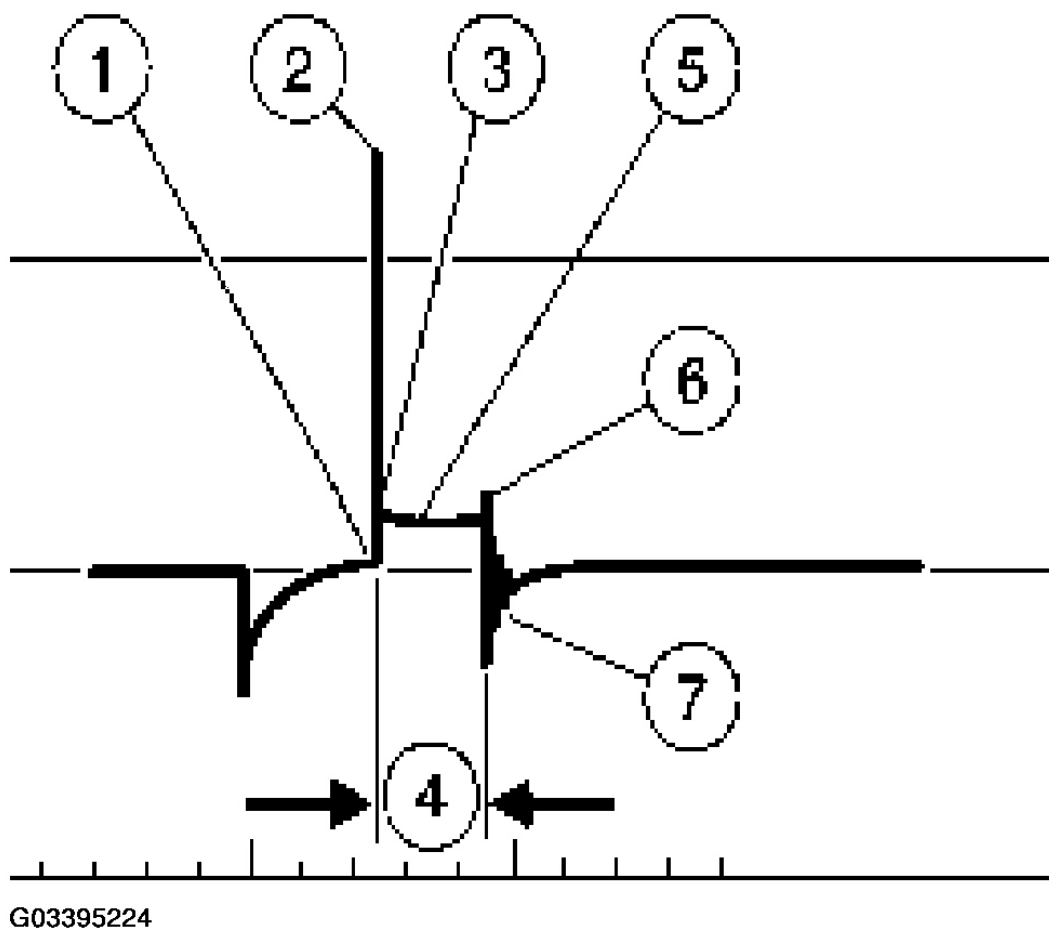


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Fig. 6: Identifying Pencil Coil
Courtesy of BMW OF NORTH AMERICA, INC.

Due to the compact design of the ignition coil, much of the diagnosis is simplified. Misfire faults and/or ignition related faults can be easily diagnosed by swapping the coils between cylinders. If the fault moves with the coil, then it is obvious that the coil is at fault. If the fault stays in the cylinder, then the spark plug can be moved etc.

This greatly simplifies engine diagnosis. However sometimes, the diagnosis is not always as simple as swapping parts.



G03395224

Fig. 7: Ignition Diagnosis Cyclic Diagram

Courtesy of BMW OF NORTH AMERICA, INC.

This is where the oscilloscope function of the DISplus/GT-1 can aid in diagnosis. A good knowledge of fundamental ignition diagnosis can be helpful. The illustration above is broken down as follows.

1. This point represent the start of the ignition process, also known as "transistor off". The ECM turns off the primary circuit causing the magnetic field to collapse. This begins the production of the secondary voltage needed to fire the spark plug.
2. The is called the firing line as it represents the voltage needed to overcome the secondary resistance and cross the spark plug electrode gap. This voltage level will increase as secondary circuit resistance increases. Also lean mixture will cause this line to increase as well. On RZV ignition systems, this line should be around 3-5kV.
3. This line indicates the start of the combustion process. This is also referred to as the spark line. The line should start relatively level and should be about 1/3 to 1/2 of the height of the firing line. Also, there should be no rapid upward or downward slope.
4. This period of time represented here is the combustion period. This area indicates the integrity of the

combustion event. Problems such as low compression, lean or rich mixture problem would be indicated here.

5. This line represent the voltage present during the combustion period. This line should be mostly level. Upward or downward sloping can indicate mixture or engine compression problems.
6. This point represents the end of the combustion process. Combustion has ended and the remaining voltage available is the coil will start to dissipate.
7. This is known as the coil or decay oscillation period. Any excess voltage not used in the combustion process will "decay" and dissipate. The number and pattern of the oscillations is dependent on the coil type. Different types of coils and different coil manufacturers will be a factor on this pattern. Anywhere from 2 to 6 oscillations may be seen here. If no oscillations are present, this would indicate ignition coil internal problems.

Most newer engine use a "multiple spark" discharge when the ignition coil is triggered. This is to aid in startup. When diagnosing these ignition systems, the additional peaks do not need to be factored into your diagnosis.

Referring to the illustration below, the relevant portion of the scope pattern is at point 1.

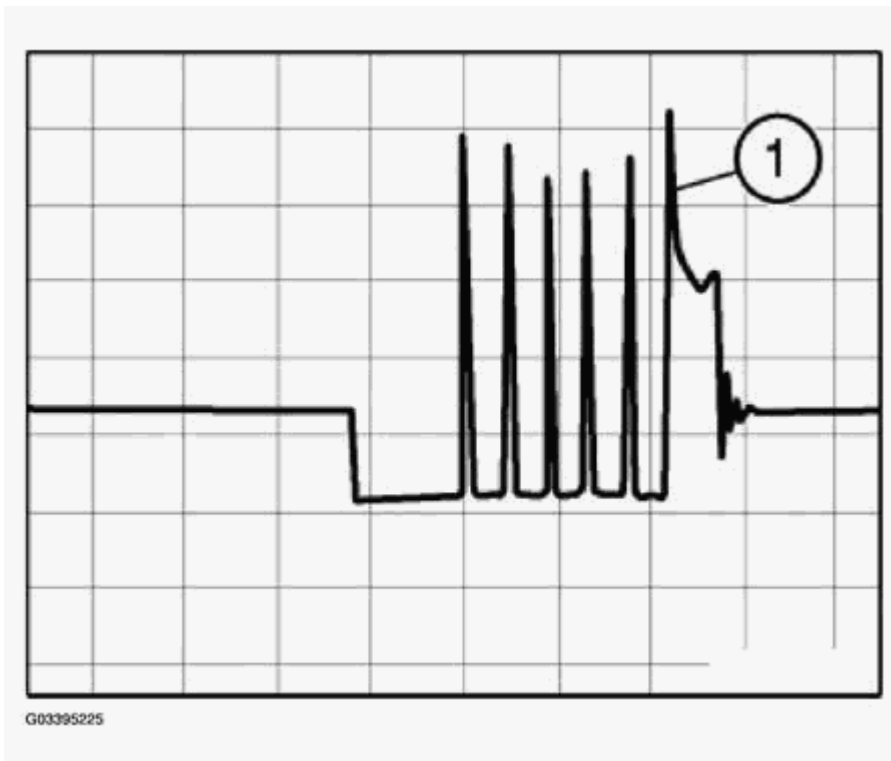


Fig. 8: Identifying Scope Pattern
Courtesy of BMW OF NORTH AMERICA, INC.

Fuel System Testing

Fuel systems need to be checked for proper fuel pressure as well as sufficient volume. When diagnosing fuel system complaints, you must take into account the type of fuel system and how the fuel is delivered to the engine.

Malfunctions in the fuel system can cause driveability complaints which include:

- No start condition
- Hard start/extended cranking time
- Lack of power
- Check Engine (MIL) Light along with mixture related faults
- Excessive exhaust emissions (High CO and/or HC)

When a no start condition is experienced, it is important to start with the basics. Does the vehicle have any fuel in the tank? Don't assume that there is fuel, the fuel gauge or sender circuit may be faulty. Also, the siphon jet system may be defective. Check the fuel level using the instrument cluster test steps if necessary. Check to be sure that there is fuel available on the right side of the fuel tank.

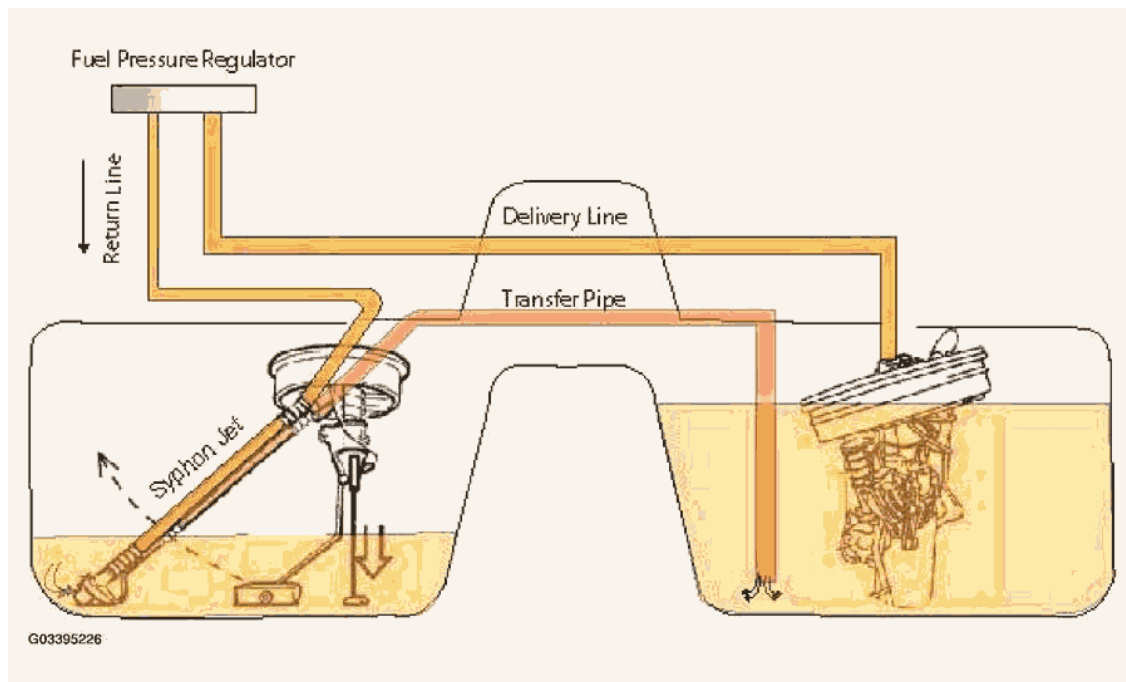


Fig. 9: Checking Fuel System

Courtesy of BMW OF NORTH AMERICA, INC.

Once it has been determined there is fuel in the tank. The fuel system can be tested for proper pressure. Fuel pressure specifications vary between vehicles. Until recently, most fuel systems used a pressure of 3.5 bar. Some of the new systems use up to 5 or 6 bar. Direct injection systems use 6 bar for the fuel supply system and up to 120 bar pressure to the fuel injectors.

The fuel supply system should be tested using the appropriate fuel pressure gauge. Depending upon the vehicle, the testing methods and connections for the fuel pressure testing equipment differ.

Some vehicles have testing ports with a Schrader valve for easy hookup. Earlier vehicles did not have a test port. Testing fuel pressure required the use of a "T" connector to connect into the fuel system.

Most recently, M56 equipped (SULEV) vehicles have a sealed fuel system which require the use of a special tool.

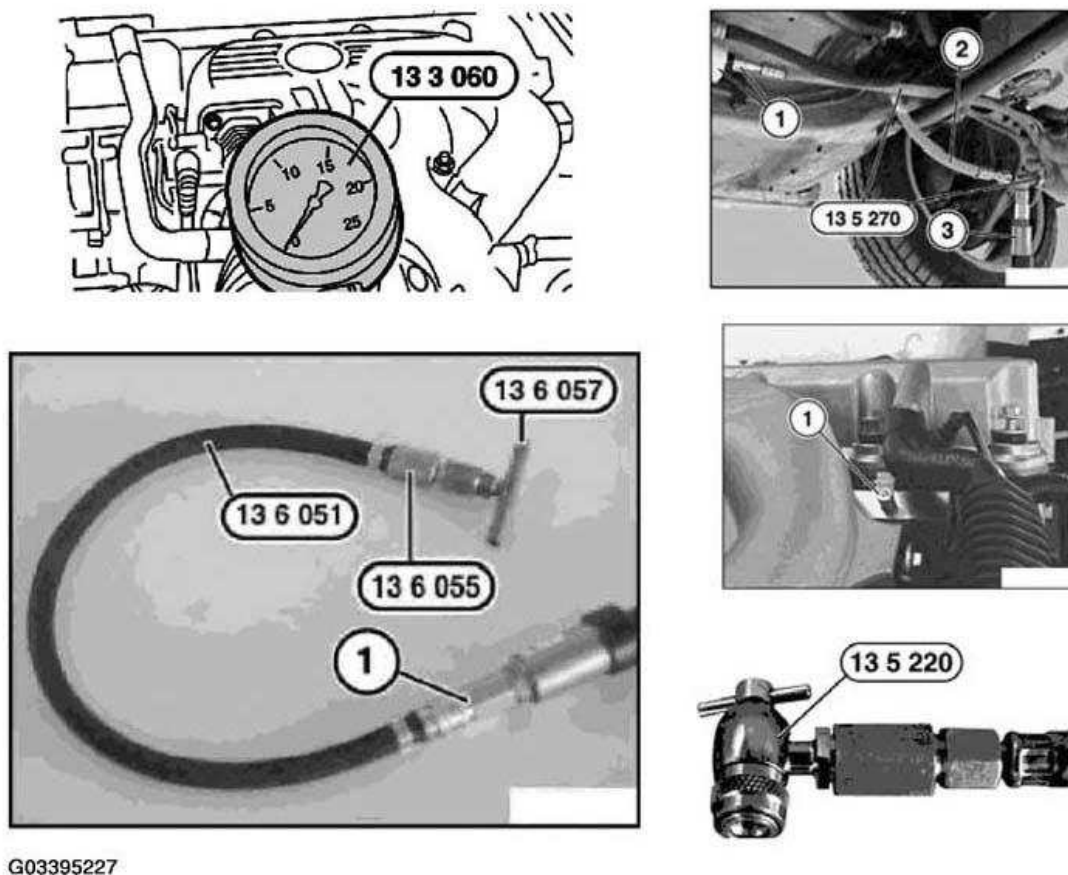


Fig. 10: Identifying "T" Connector
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Always observe all safety regulations when working on fuel systems. Obey all local and state fire safety laws regarding fuel handling. Always have the proper fire extinguisher on hand when performing testing and/or repair to the fuel system.

Once it has been determined that what the fuel pressure is, compare your reading to the proper specification. If the fuel pressure is low or zero, the fuel circuit must be checked over.

See if the fuel pump is energized. Check the voltage supply and ground to the fuel pump using proper electrical testing procedures (i.e voltage drop etc.). Make sure that you analyze the fuel pump circuit. Check the fuses, connections and appropriate relays.

Also, understand the operation of the fuel pump circuit. Older vehicles were somewhat straightforward, on the other hand, the newer vehicles are using more elaborate circuits for fuel pump operation.

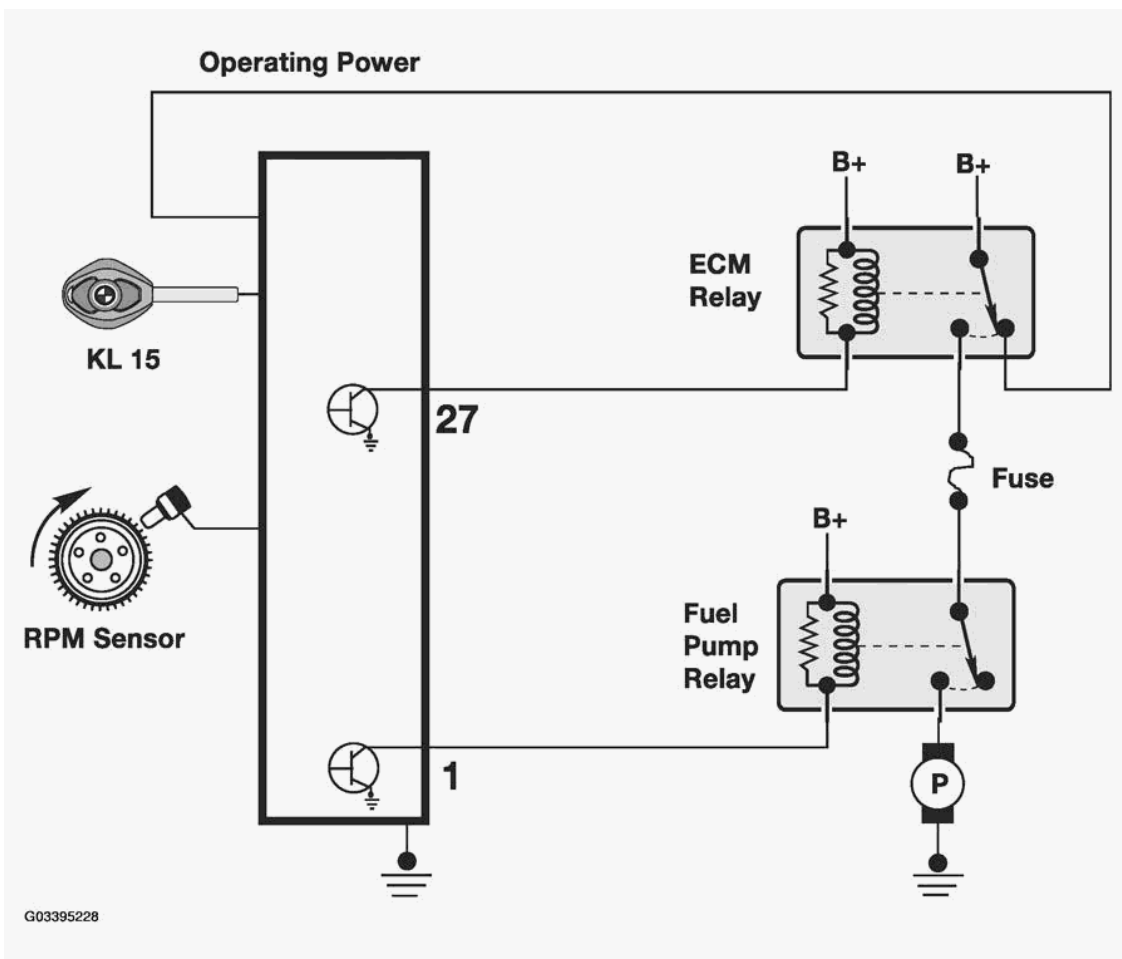


Fig. 11: Operating Power Circuit Diagram
 Courtesy of BMW OF NORTH AMERICA, INC.

Some vehicles, now use a control module to control the speed and flow rate of the fuel pump. The M3, M5 and vehicles equipped with the M56 engine use a fuel pump control module. The E65/E66 uses the SBSR to control the fuel pump. Take this into consideration when performing diagnosis on these vehicles.

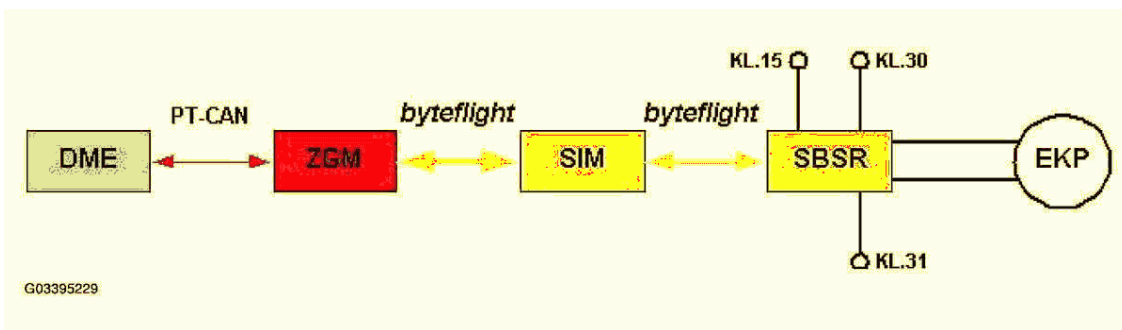


Fig. 12: Fuel Pump Control Module Diagram
 Courtesy of BMW OF NORTH AMERICA, INC.

Always use available resources such as wiring diagrams, SI Bulletins and training material to better understand circuit operation.

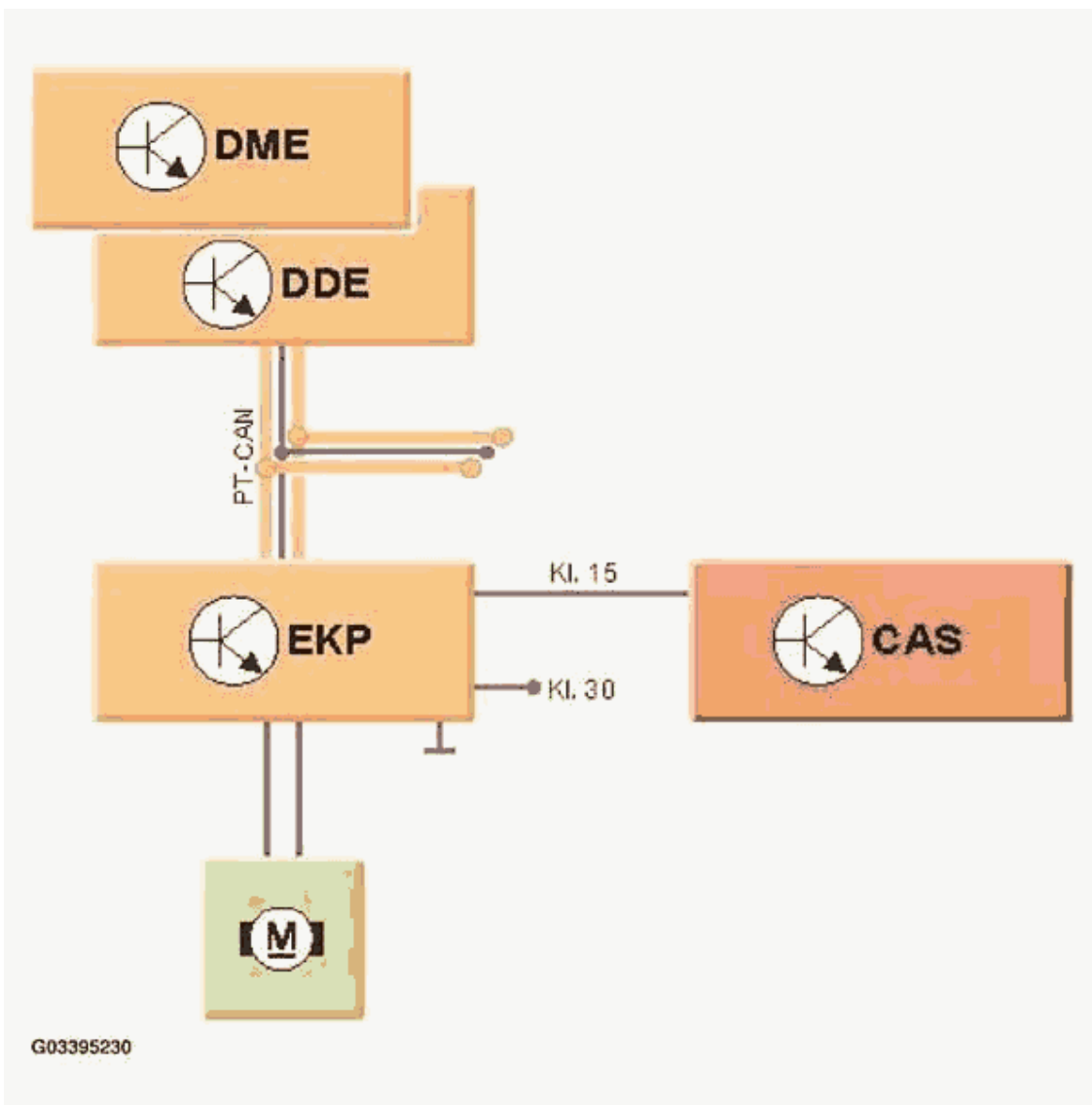


Fig. 13: Fuel System Circuit Diagram
 Courtesy of BMW OF NORTH AMERICA, INC.

Fuel Volume Testing

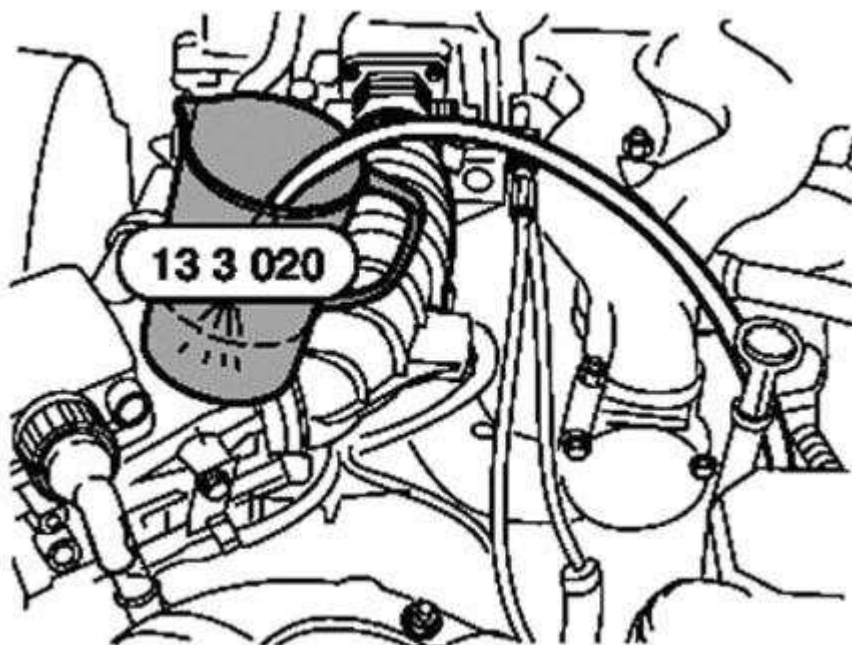
Some driveability concerns are related to incorrect fuel volume. Vehicles with lack of power complaints and mixture related fault codes may have insufficient fuel volume supplied to the fuel injection system. These vehicles may actually pass a fuel pressure test.

Fuel volume issues can be caused by faulty fuel pumps, fuel pressure regulators, clogged or restricted fuel filters and/or fuel lines.

If these driveability concerns are present, then a fuel volume test should be performed. A fuel volume test measures the amount of fuel delivered in a specific time frame.

The fuel pump is activated during this test using the proper test leads to ensure no arcing sparks are present. The

fuel feed line is directed to a non-breakable (fuel-proof plastic) measuring can that has graduations for measurement.



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Fig. 14: Checking Fuel Volume Using Measuring Can
Courtesy of BMW OF NORTH AMERICA, INC.

A general specification for fuel volume would be approximately one liter in 30 seconds.

Residual Pressure

Fuel injection systems require a residual pressure to present after the engine is switched off. This allows the engine to start immediately after the vehicle has been parked.

If the residual fuel pressure diminishes after the vehicle has been shut off. Upon restart, there will be an extended cranking period before engine start. This is due to the fuel pump attempting to supply enough fuel for startup.

When the fuel system is at rest, there are three components which allow the fuel system to retain sufficient residual pressure. These items are, the fuel pump check valve, the fuel pressure regulator and the fuel injectors.

Fuel System - E32 with M60

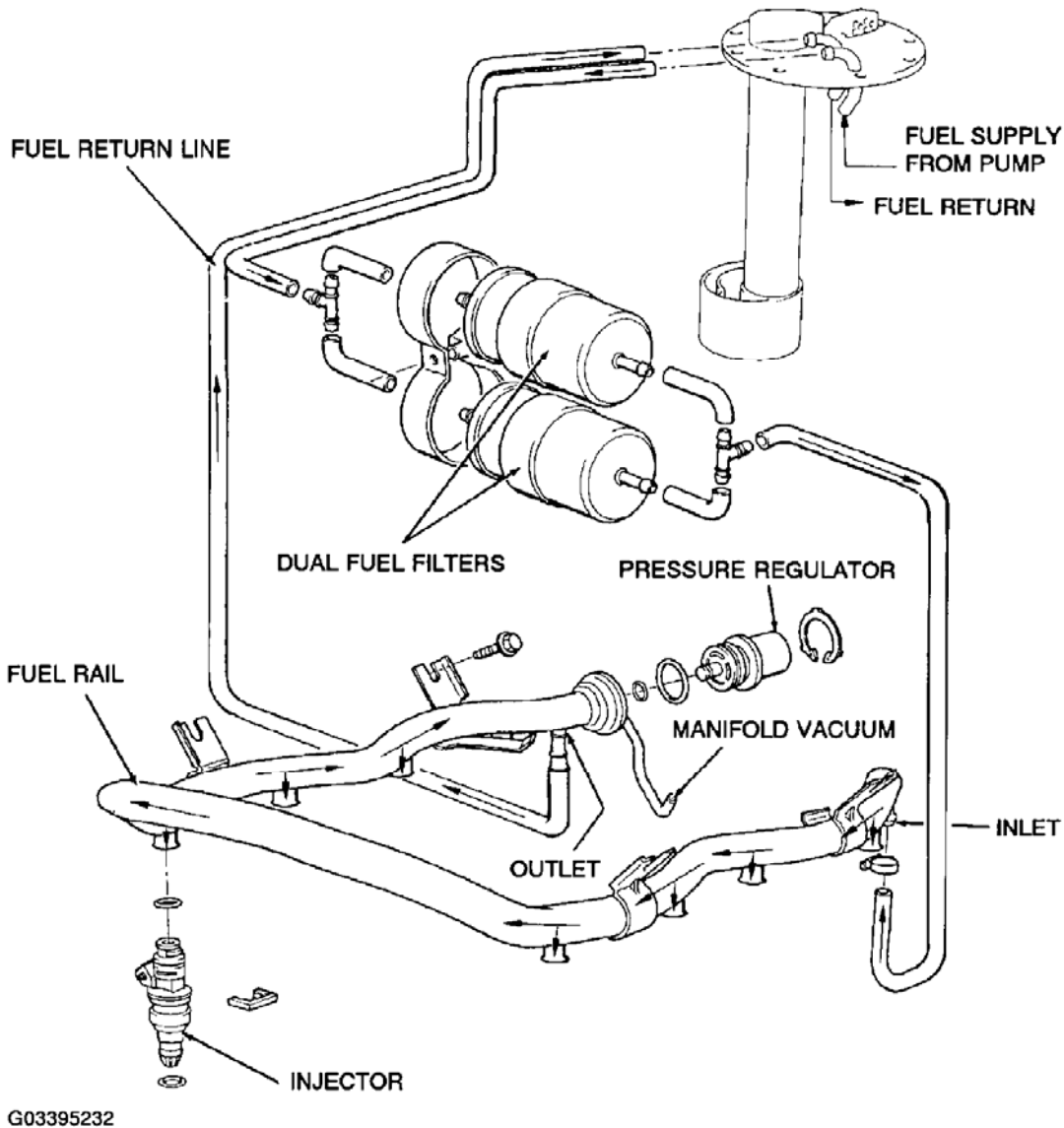
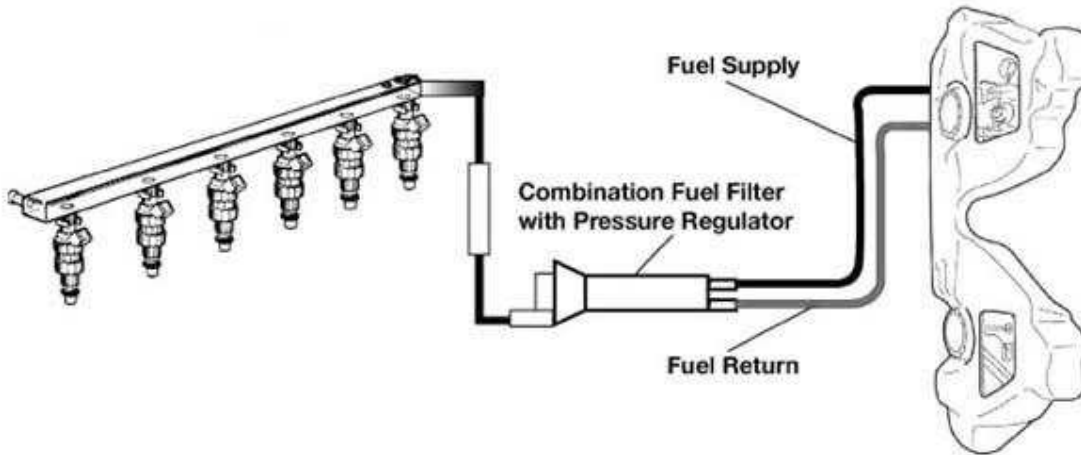


Fig. 15: Identifying Fuel System - E32 With M60 Components
 Courtesy of BMW OF NORTH AMERICA, INC.

If any of these items are leaking and fail to hold pressure in the fuel rail, the vehicle will be difficult to start. The cranking time will be excessive and possibly not start at all. For example, If the fuel injectors are leaking, the vehicle will exhibit black smoke on startup.

Diagnosis of these concerns requires a fuel pressure gauge. The residual pressure is monitored on the fuel pressure gauge when the engine is shutoff. Diagnosis is determined by watching the drop in fuel pressure over time. The fuel pressure should not drop more than .5 bar in 30 minutes. If the pressure drops more than .5 bar, the concern should be investigated.

Fuel System - E39/E46 with M54

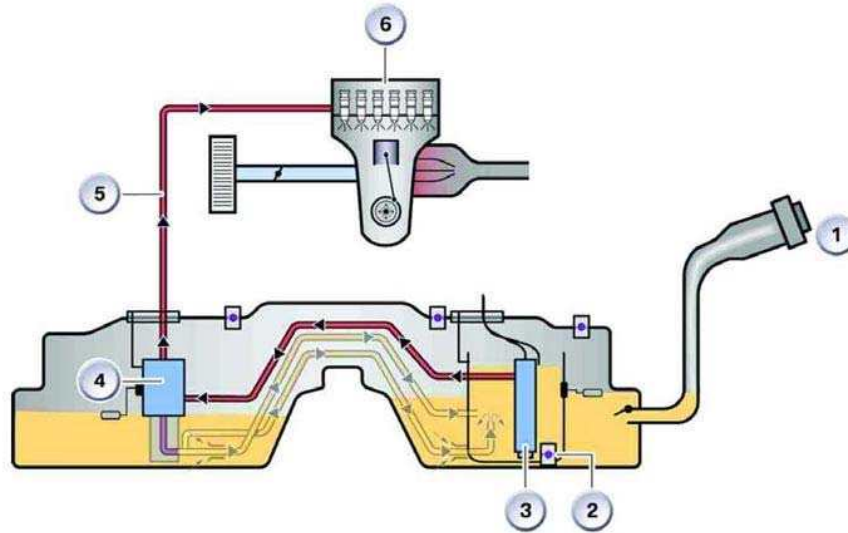


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Fig. 16: Identifying Fuel System - E39/E46 With M54 System Diagram
Courtesy of BMW OF NORTH AMERICA, INC.

Depending on the type of fuel system used, diagnosis will vary. On older fuel systems, diagnosis is simplified due to the ability to clamp off certain components to determine, the origin of the leakdown.

Fuel System - E60



Index	Explanation	Index	Explanation
1	Fuel Filler Pipe	4	Fuel Filter
2	Outlet Protection Valve	5	Feed Line
3	Electric Fuel Pump	6	Fuel Injectors/Fuel Rail

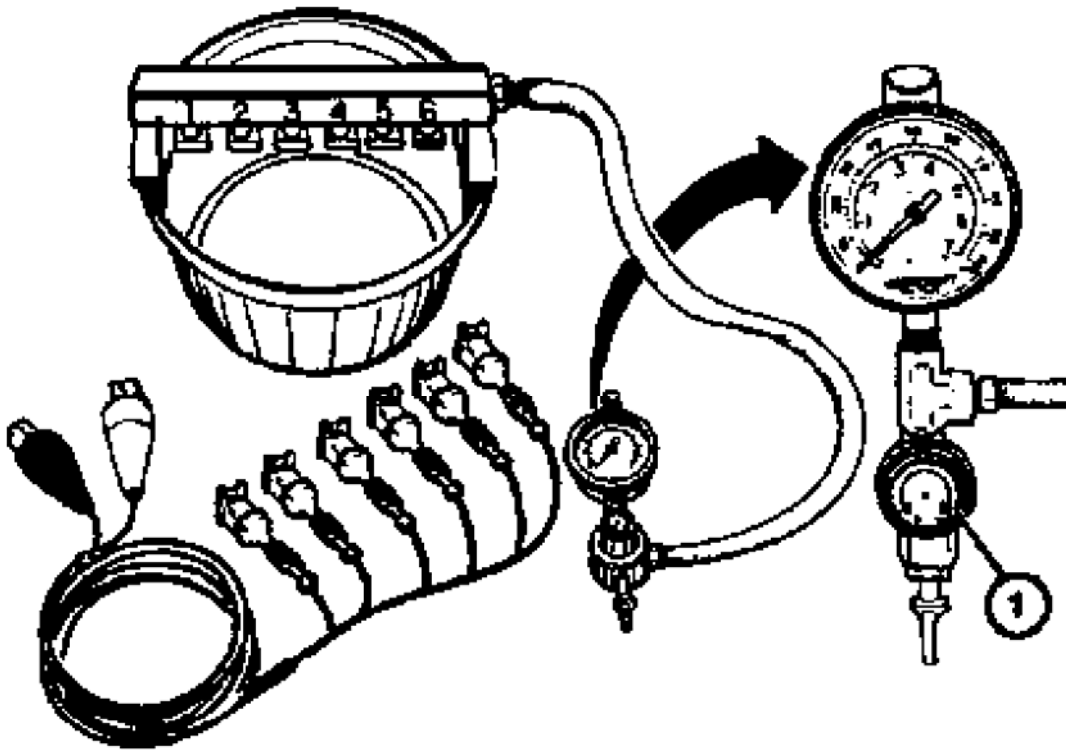
G03395234

Fig. 17: Identifying Fuel System - E60 Components
Courtesy of BMW OF NORTH AMERICA, INC.

Newer fuel systems use a non-return type fuel system with some components mounted externally. Most recently, many of the new vehicles have most of the fuel system components mounted in the fuel tank. This includes the fuel pump, fuel filter and fuel pressure regulator. The only fuel system component outside the fuel tank is the fuel feed line, fuel rail and fuel injectors.

This makes the diagnosis of residual pressure concerns more difficult. Diagnosis of this type of system sometimes requires a process of elimination.

If one or more of the fuel injectors is suspected as the cause of the loss in residual fuel pressure, they can be tested using a special tool to "bubble test" the injectors.



G03395235

Fig. 18: Testing Bubbles In Injectors Using Special Tool
 Courtesy of BMW OF NORTH AMERICA, INC.

First the injectors are connected to the test fuel rail supplied with the tool. Then, the fuel injectors are subjected to compressed air. The injectors are then triggered by the test harness to "blow out" any residual fuel.

The test harness is disconnected and the tips of the injectors are immersed in water. The injector tips are observed for any bubbles over time. Any excessive bubbles indicate a defective injector.

Engine Adaptation Values

Engine adaptation values can be broken down into two categories:

- **Additive Mixture Adaptation** - additive adaptation refers to "long term fuel trim". These adaptation are made by the ECM (DME) at idle during "closed loop" fuel control. These values are measured in milliseconds and are expressed in negative and positive values.
- **Multiplicative Mixture Adaptation** - multiplicative adaptation occurs during part load conditions and are performed by the ECM during "closed loop" fuel control. These values are measured in percent and are also expressed as negative and positive values. This is also referred to as "short term fuel trim".

Additive mixture adaptation corrects for variations in idle mixture. The ECM monitors the oxygen sensor signals to evaluate the exhaust mixture. When a lean (or rich) mixture is detected, the ECM increases (or

decreases) the injector "on-time" to correct accordingly.

As long as the fuel trim correction is not excessive, the ECM will not register a fault code. The ECM will correct in increments of +/- .1 ms. When the fuel trim correction exceeds a predetermined threshold value, the check engine light (MIL) will illuminate and store appropriate fault codes for additive mixture adaptation.

Additive values which are excessively positive, would indicate a lean condition. This can be caused by:

- Un-metered air leaks - such as broken vacuum lines or a leaky intake manifold or gasket.
- Faulty crankcase ventilation system - crankcase vent valve stuck open.
- Low fuel pressure - Faulty fuel pressure regulator or fuel pump.
- Faulty HFM - can be sending erroneous load signal information which would cause the ECM to falsely enrich the mixture.

Additive values which are excessively negative, would indicate a rich condition. This can be caused by:

- An air restriction - any restriction to airflow such as a clogged air filter would create a rich fuel mixture. (this may also be indicated by negative multiplication values)
- Faulty crankcase ventilation system - crankcase vent valve stuck closed.
- High fuel pressure - Possible faulty fuel pressure regulator or restricted return line
- Faulty HFM - can be sending erroneous load signal information which would cause the ECM to falsely lean out the mixture.

NOTE: Some newer engine management systems use the term mg/stroke or milligrams per stroke. Treat these values as you would millisecond values.

Multiplicative mixture adaptation corrects for variations in fuel mixture under part load conditions. The ECM monitors the oxygen sensor signals to evaluate the exhaust gas mixture. When a lean (or rich) mixture is detected the ECM adjusts the injector "on-time" accordingly over a "short term" period to adapt for the existing situation.

Multiplicative values are expressed in percent and can be negative or positive. Negative values indicate a rich mixture and positive values indicate a lean mixture. When the Multiplicative values exceed a predetermined threshold value, the check engine light (MIL) will illuminate and store relevant fault codes for Multiplicative adaptation.

When multiplicative values are excessively positive, a lean condition exists. The ECM is attempting to add fuel to maintain the proper fuel mixture (close to lambda value 1). This situation can be caused by a faulty HFM, low fuel volume, restricted fuel filter or faulty fuel pressure regulator.

When the values are negative, the ECM is attempting to lean out (remove fuel) the fuel mixture to compensate for a rich condition. This can be caused by:

- Excessive fuel pressure - from a faulty fuel pressure regulator or restriction in the return line.
- A faulty HFM - the HFM can be sending erroneous load signal information which would cause the ECM

to falsely enrich the mixture.

- An Air restriction - any restriction to airflow such as a clogged air filter would create a rich fuel mixture.
- Any system failure which would cause the mixture to be falsely enriched. This could be caused by erroneous signal information from sensors such as the engine coolant temperature sensor or intake air temperature sensor.

Engine Misfire Diagnosis

Engines which have been produced since 1996 are OBDII compliant. The CARB/OBD regulations require the ECM to be capable of detecting misfires. Also, the ECM must be able to determine if the misfires increase engine emissions and/or are catalyst damaging.

The ECM detects engine misfires by monitoring crankshaft speed. The ECM receives the input from the crankshaft sensor and determines if there is a misfire present by comparing crankshaft speed variations between combustion events on each cylinder.

The crankshaft must rotate 720 degrees (2 rotations) to fire all of the cylinders in an engine regardless of the number of cylinders. Therefore each firing event is spaced apart and occurs at a specific time. By monitoring the crankshaft signal the ECM can determine which cylinder is misfiring and also the severity of the misfire.

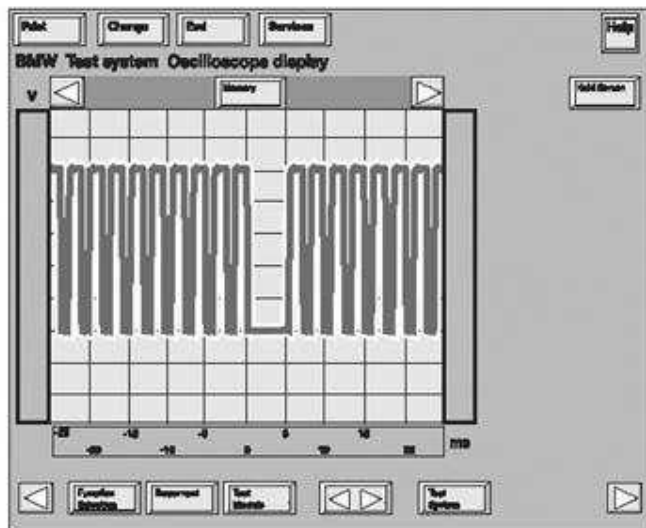
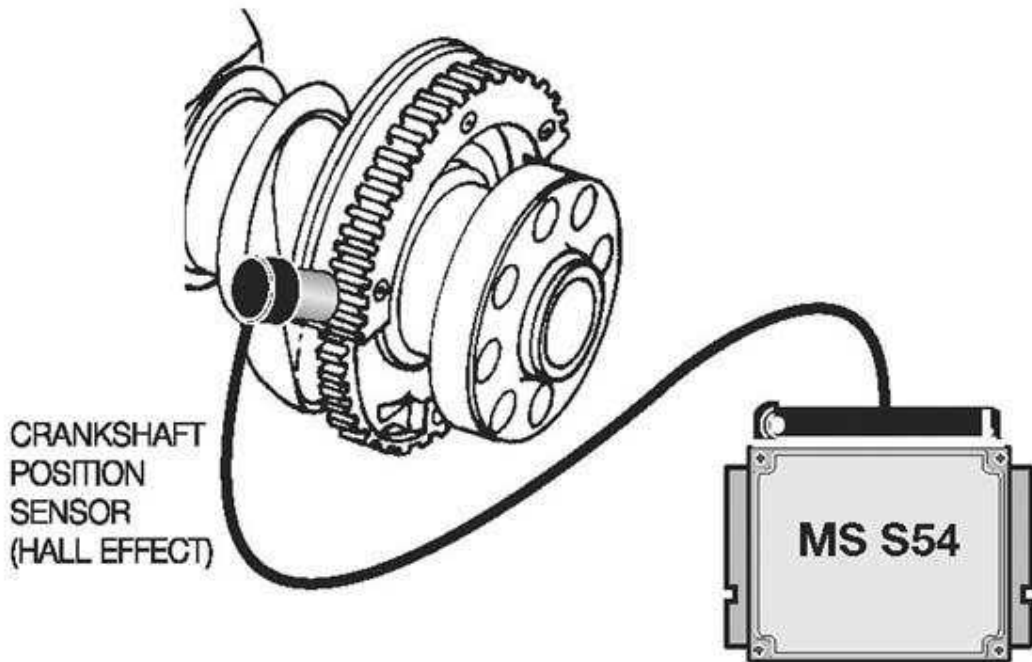
Misfires are classified in 2 levels of severity:

- Misfires which increase emission levels - These misfires occur within an interval of 1000 crankshaft revolutions. The ECM counts and adds the detected misfire events for each cylinder. If the sum of all cylinder misfire incidents exceeds the predetermined value, a fault code will be stored and the "MIL" will be illuminated.

If more than one cylinder is misfiring, all misfiring cylinders will be specified and the individual fault codes will be stored. The "MIL will be illuminated".

- Misfires which are catalyst damaging - These misfires are determined when the sum of the misfiring events occurs within 200 crankshaft revolutions. These misfires are considered catalyst damaging and the "MIL" will be illuminated.

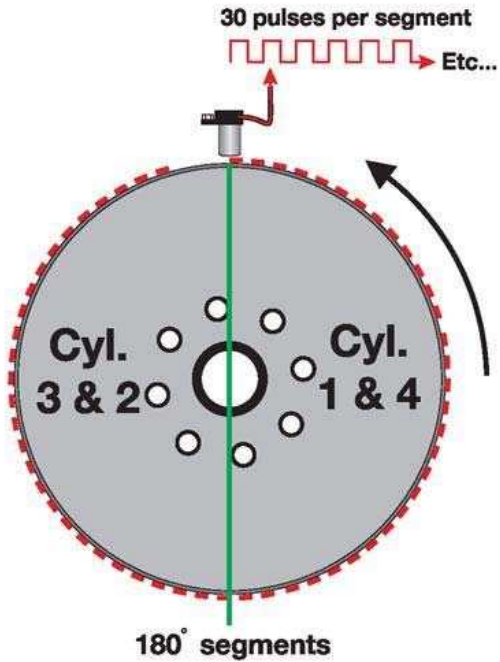
The ECM will take the following measures - the oxygen sensor control will be switched to "open loop", a cylinder selective fault code will be stored for one or more cylinders and the relevant fuel injector(s) will be deactivated.



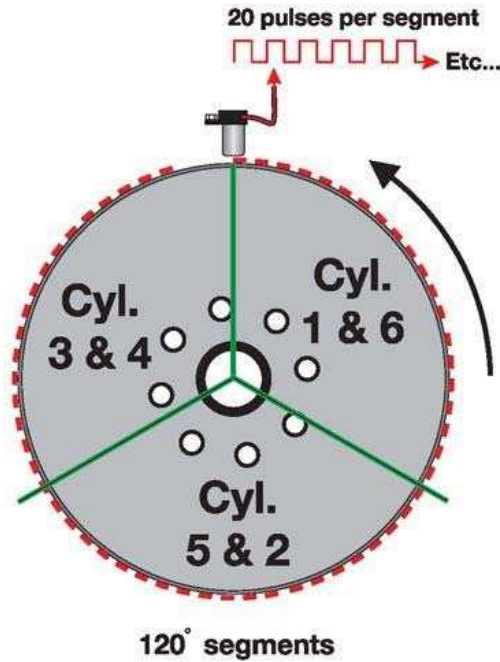
**SMOOTH RUNNING ENGINE
(NOTE SQUARE WAVE SIGNAL)**

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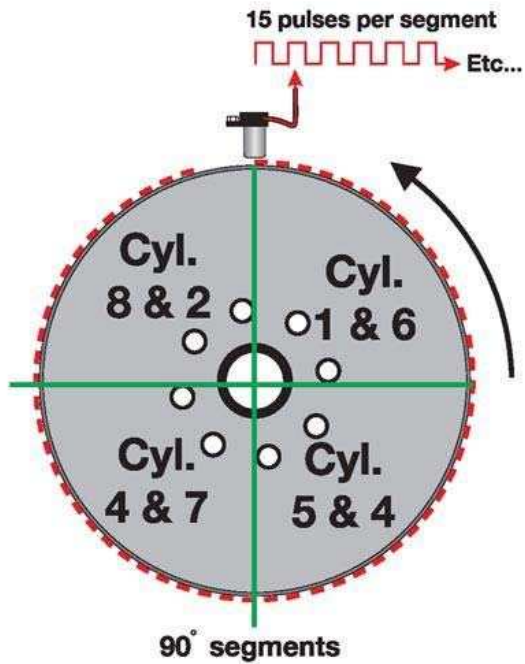
Fig. 19: Identifying Crankshaft Positioning Sensor
Courtesy of BMW OF NORTH AMERICA, INC.



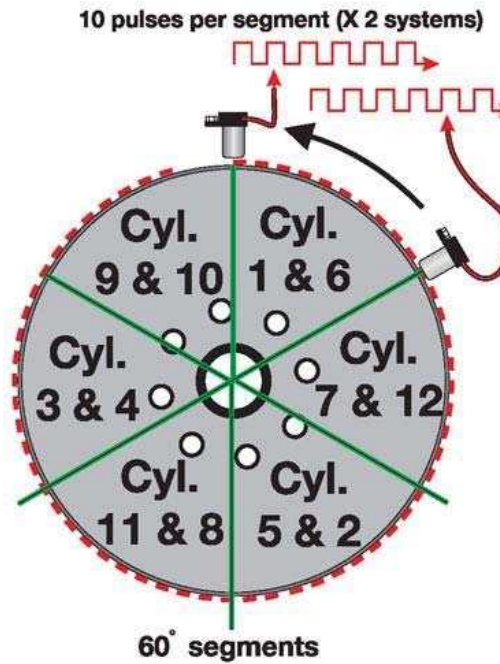
Internal pulse wheel- M44, 4 cylinder



Internal pulse wheel- M52, 6 cylinder



External flywheel incremental pulse wheel- M62, 8 cylinder



External flywheel incremental pulse wheel- M73, 12 cylinder
(2 systems monitoring same crankshaft)

Fig. 20: Displaying Smooth Running Engine Waves

Courtesy of BMW OF NORTH AMERICA, INC.

The causes of engine misfires include:

- Ignition System - spark plugs, ignition coils, secondary circuit components and primary/secondary circuit wiring.
- Engine Mechanical - piston, piston rings, valves, camshaft and any valvetrain related components including Valvetronic. Valvetronic components include eccentric shaft, intermediate levers etc.

The crankcase ventilation system should also be considered. This includes the crankcase ventilation valve and if applicable, the hose connections as well.

- Fuel System - fuel injectors, fuel pump, fuel filter and pressure regulator etc. This includes fuel quality as well. Other fuel system components include fuel tank vent valve (purge) as well as running losses components such as the 3/2 valve etc.
- Engine Electronics - any implausible input from a sensor such as the crankshaft sensor and camshaft sensor. Also any sensor which affects fuel mixture including HFM, coolant/intake air temperature sensors etc.
- Other items include the catalyst which could be restricted and/or the muffler.

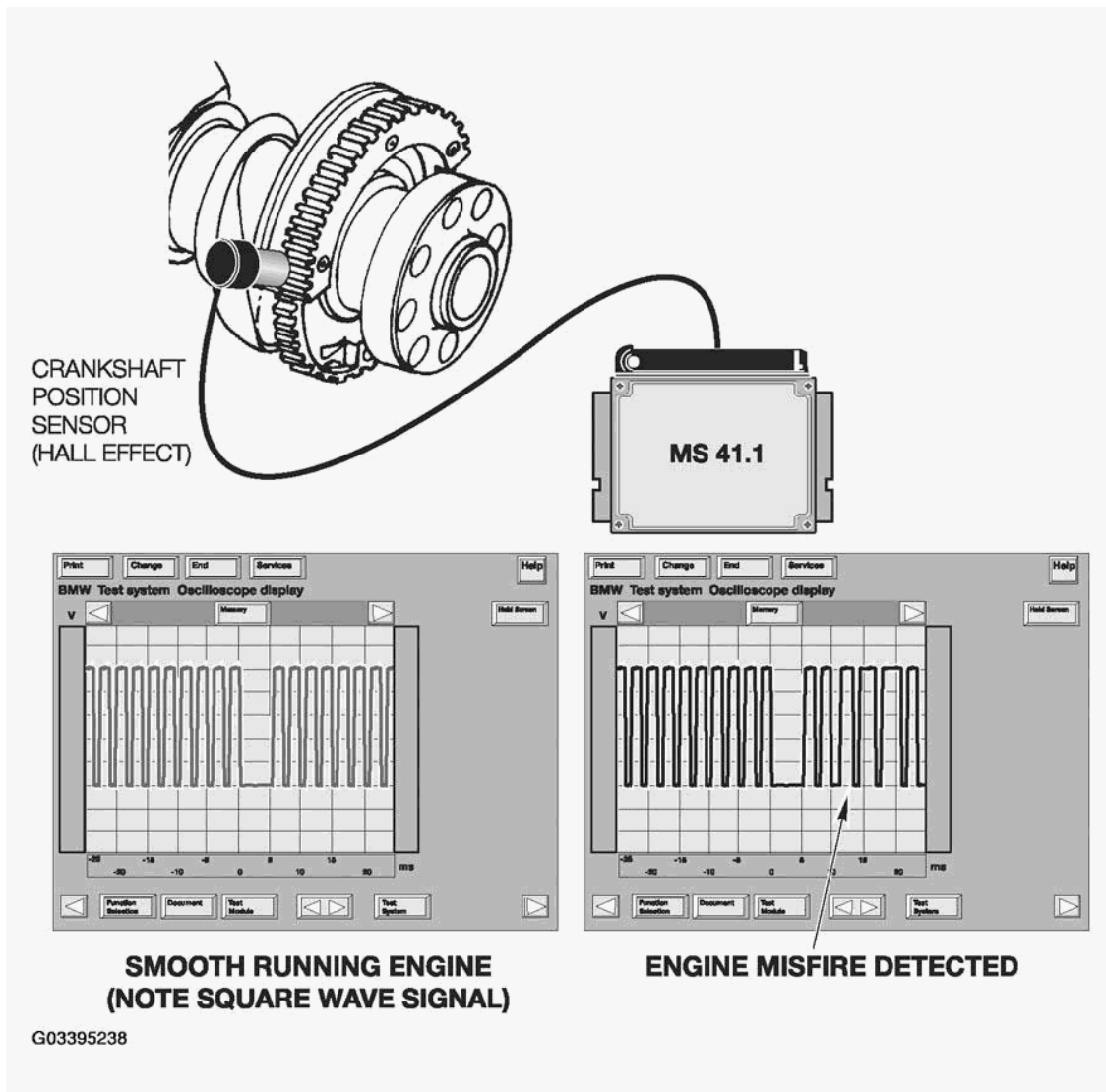


Fig. 21: Displaying Engine Misfire Waves
 Courtesy of BMW OF NORTH AMERICA, INC.

Smooth Running Measurement

The DISplus/GT-1 are helpful in pinpointing the cause of an engine misfire. Once the short test is completed, the fault memory of the ECM can be read out to determine which cylinder or cylinders have set misfire faults. There may or may not be any faults present. The engine could be running rough, however no misfire thresholds may have been exceeded.

Engine smoothness can be further evaluated by looking at the smooth running values. In the "Control Unit Functions" screen under "Diagnosis Requests" there is a value indicated for each cylinder which can be compared for each cylinder. This value is an indication of crankshaft speed variations in each cylinder.

Diagnosis Control unit functions

Control modules	Functions	Part functions
CCC-GW Gateway	Identification	- Sensor heater behind cat., cyl. 1-4
DME Engine management ME9	Identification long	- Sensor heater behind cat., cyl. 5-8
PDC Park Distance Control	Read fault memory	= Rough-running value, cylinder 1
MPM Micro-power module	Clear fault memory	= Rough-running value, cylinder 2
RLS Rain/driving lights sensor	Physical hardware number	= Rough-running value, cylinder 3
SBSL Satellite, B-pillar, left	Read test code	= Rough-running value, cylinder 4
SBSR Satellite, B-pillar, right	Clear mixture adaptation	= Rough-running value, cylinder 5
SFZ Satellite vehicle center	Component activation	= Rough-running value, cylinder 6
SGM-SIM Safety and Gateway M	Diagnosis requests	= Rough-running value, cylinder 7
TMFA Door module, driver		= Rough-running value, cylinder 8
TMBF Door module, front passeng		- Lift, intake valves, cyl. 1-4
SZL Switch center, steering colum		- Lift, intake valves, cyl. 5-8
VTC1 Valvetronic, bank 1		- Calibration angle, cyl. 1-4
VTC2 Valvetronic, bank 2		- Calibration angle, cyl. 5-8

Display

Messages and results		
Rough running, cylinder 1	-0.95	1/s ²
Rough running, cylinder 2	-0.06	1/s ²
Rough running, cylinder 3	0.43	1/s ²
Rough running, cylinder 4	0.11	1/s ²
Rough running, cylinder 5	0.55	1/s ²
Rough running, cylinder 6	-0.22	1/s ²
Rough running, cylinder 7	0.62	1/s ²
Rough running, cylinder 8	-0.47	1/s ²

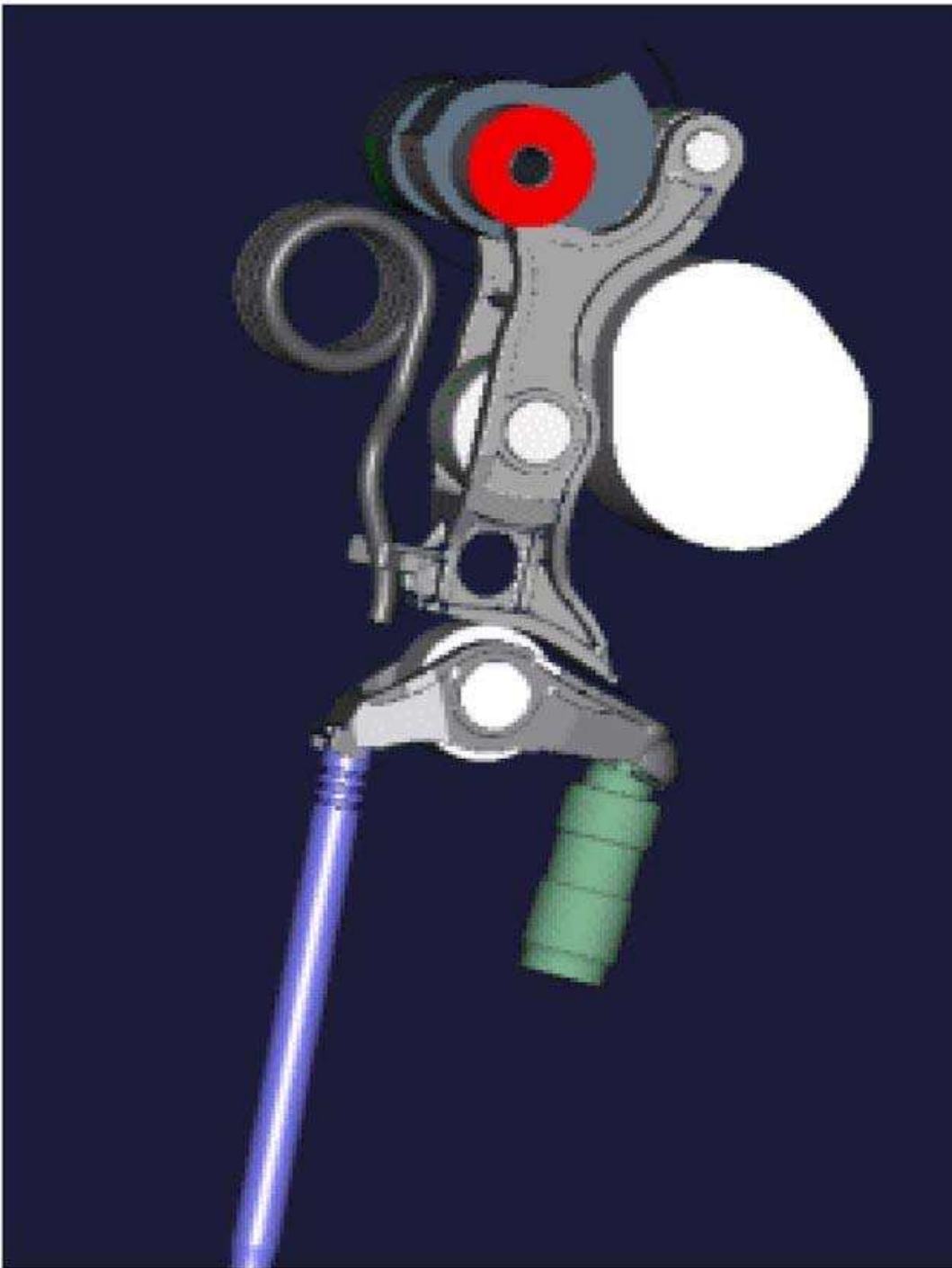
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Fig. 22: Displaying Smooth Running Measurement
 Courtesy of BMW OF NORTH AMERICA, INC.

Valvetronic N62

In addition to the usual valvetrain diagnosis, the Valvetronic system has some additional components which need to be taken into consideration during diagnosis. The tolerances on the eccentric shaft and intermediate levers are critical in maintaining proper cylinder filling especially at idle. Any deviations in tolerances of these components will contribute to rough running complaints.

The intermediate levers are available in 5 classifications, the classification numbers are marked on the levers. On the N62, each cylinder head must use intermediate levers with the same classification. It is not necessary to have the same classification between cylinder heads.



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Fig. 23: Identifying Valvetronic N62
Courtesy of BMW OF NORTH AMERICA, INC.

Depending on the engine/vehicle, the minimum valve lift can be set from .3 to .8 mm. At these low valve lifts,

any variation in tolerance will affect idle quality. When a diagnosis determines that there is a problem in the Valvetronic system, the components need to be inspected. The intermediate levers or eccentric shaft can be worn. The intermediate levers could be of the wrong classification.

The illustration below shows a worn eccentric shaft. The areas shown should be inspected for any wear. Grooves and scoring indicate a worn eccentric shaft which should be replaced.



Fig. 24: Identifying Camshaft Grooves

Courtesy of BMW OF NORTH AMERICA, INC.

The following pages contain testing information which will assist in the diagnosis of idle quality concerns on the N62.

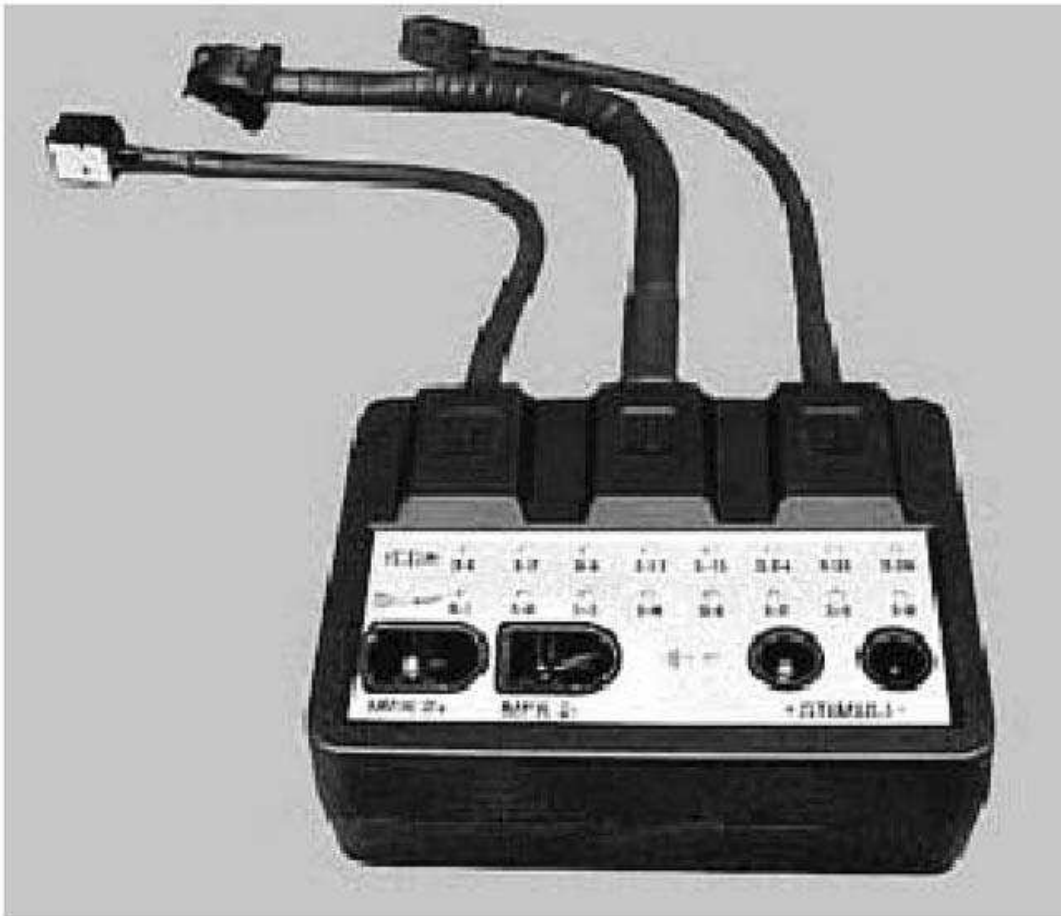
N62 Engine Testing

The N62 engine features Valvetronic which requires some specialized diagnostic procedures. Due the variable valve lift feature, there are some additional steps regarding engine and compression testing.

MKA Adapter

The Multi-Channel Adapter (MKA) tool is used in conjunction with the DISplus to diagnose ignition and injection system concerns on the N62 engine. The MKA adapter is installed (in series) between the ECM and the engine harness at connectors 1, 3 and 5. In addition the four cables of MFK 2 are plugged into the MKA as

well.



G03395242

Fig. 25: Identifying MKA Adapter
Courtesy of BMW OF NORTH AMERICA, INC.

The MKA test module is found under the path > Service Functions > Drive > Engine Management ME9 > Test Runs > Ignition and Injection diagnosis N62.

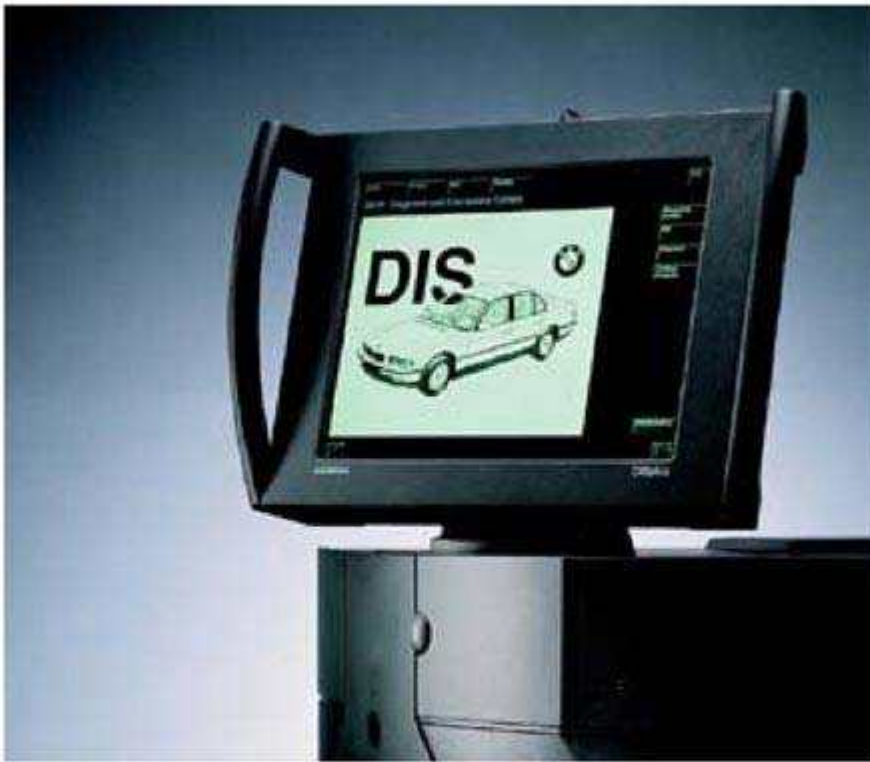
The MKA engine test checks the integrity of the ignition system by looking at the primary ignition voltage on each cylinder.

The injection system is also checked by examining the voltage pattern of the injection circuit.

Compression Test N62

The compression can be tested on the N62 using the DISplus. The DISplus can perform a relative compression test and provide a comprehensive engine analysis report.

The compression test can be done at minimum valve lift as well as at maximum valve lift. This difference between these reading can assist in determining the root cause such as wear in Valvetronic components.



G03395243

Fig. 26: Identifying DIS

Courtesy of BMW OF NORTH AMERICA, INC.

When performing this test the following connections/cables are needed:

- Diagnostic head (can be hardwired or wireless)
- TD Cable connection to diagnostic head
- 25 Bar Pressure transducer connected to pressure connection #2.
- Compression adapter (quick disconnect)
- 1000 Amp clamp

The test module will prompt you to warm up the engine to 90°C. Once warmed up, you will be directed to run the engine at idle to set the minimum valve lift. Follow the on screen prompts. Once the minimum valve lift has been obtained (0.2 to 0.4 mm), disconnect both VVT motors to lock in the minimum adjustment.

Once this step is completed, shut the engine off and remove the #1 spark plug. Install the compression adapter into the spark plug hole. (Note: any cylinder can be used as long as the DISplus is set to the cylinder in use).

Follow prompts until test is completed.



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Fig. 27: Identifying Compression Adapter
Courtesy of BMW OF NORTH AMERICA, INC.



G03395245

Fig. 28: Identifying TD Cable
Courtesy of BMW OF NORTH AMERICA, INC.

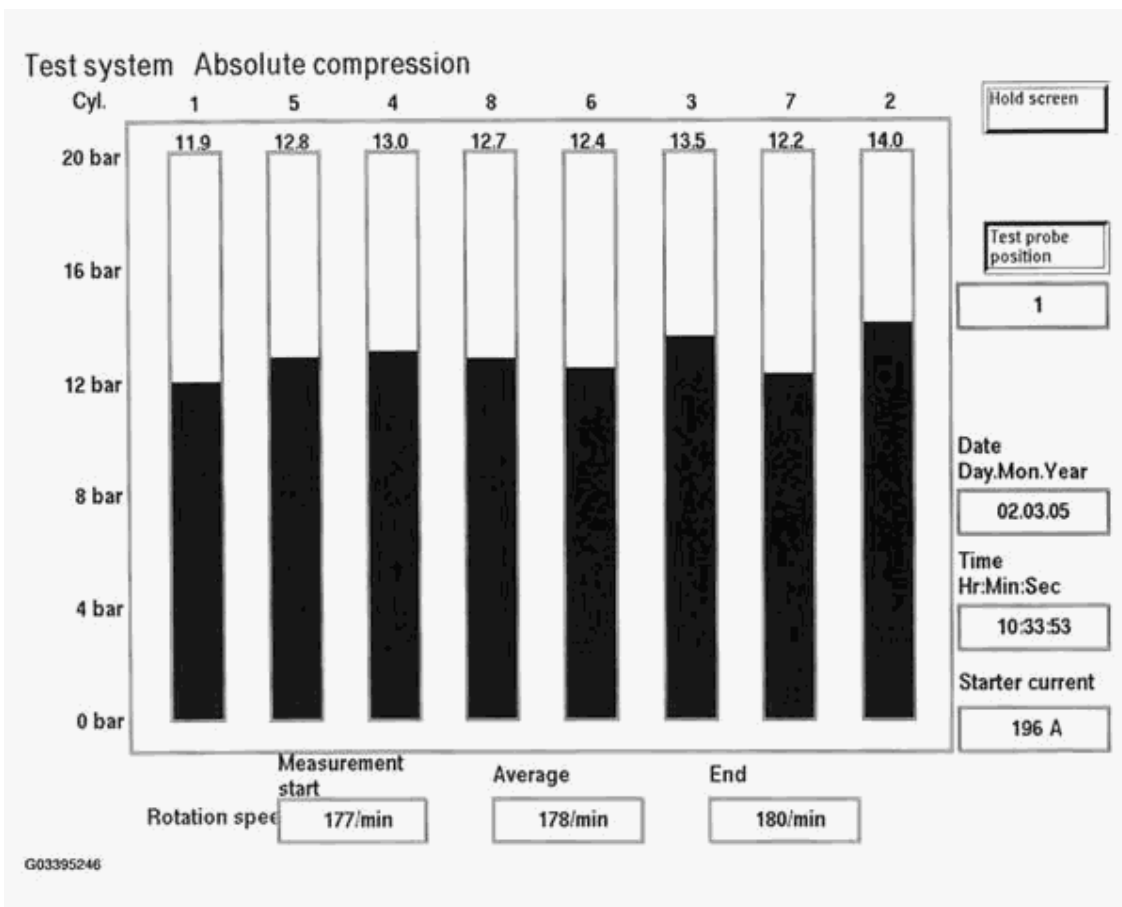


Fig. 29: Absolute Compression Bar Graph
 Courtesy of BMW OF NORTH AMERICA, INC.

Once the test is completed, perform the same steps for the maximum valve lift. Compare the results, the results from the test at maximum valve lift should be slightly higher. Any cylinders that show low results on the minimum valve lift test which show improvements when the maximum valve lift test is performed should be checked for Valvetronic wear concerns.

During the final analysis portion of this test module, there may be on screen recommendations of repairs involving eccentric shaft or intermediate lever replacement. There may be a recommendation of changes to the classification of intermediate levers as well.

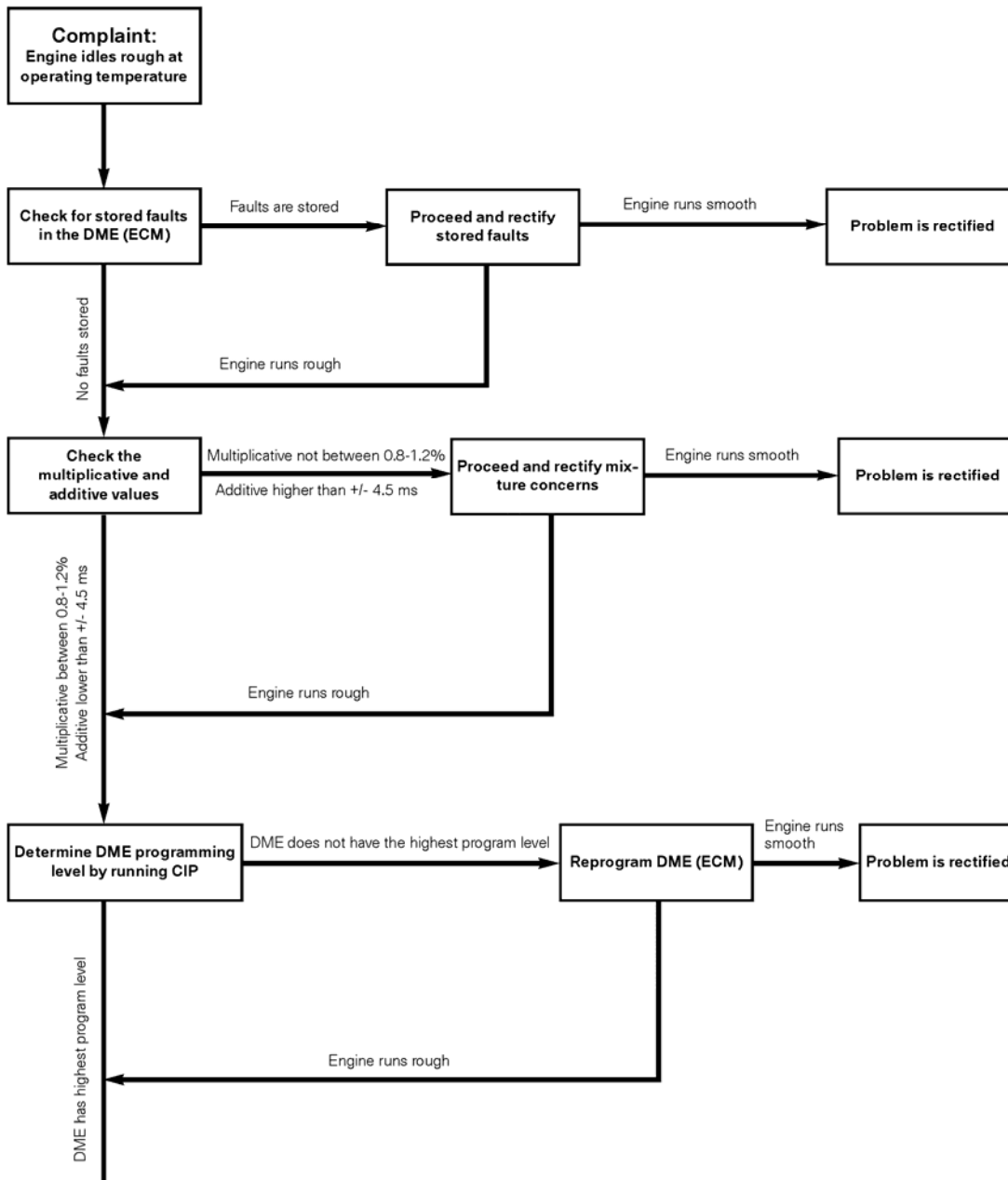
Manual Compression Test (N62)

Manual compression testing can also be done on the N62. However, the DISplus must still be used to set the minimum/maximum valve lift. To access the test module for manual compression testing, go to path > Service Functions > Drive > Engine Management ME9 > Test Runs > Compression Test.

Rough Running Diagnosis (N62)

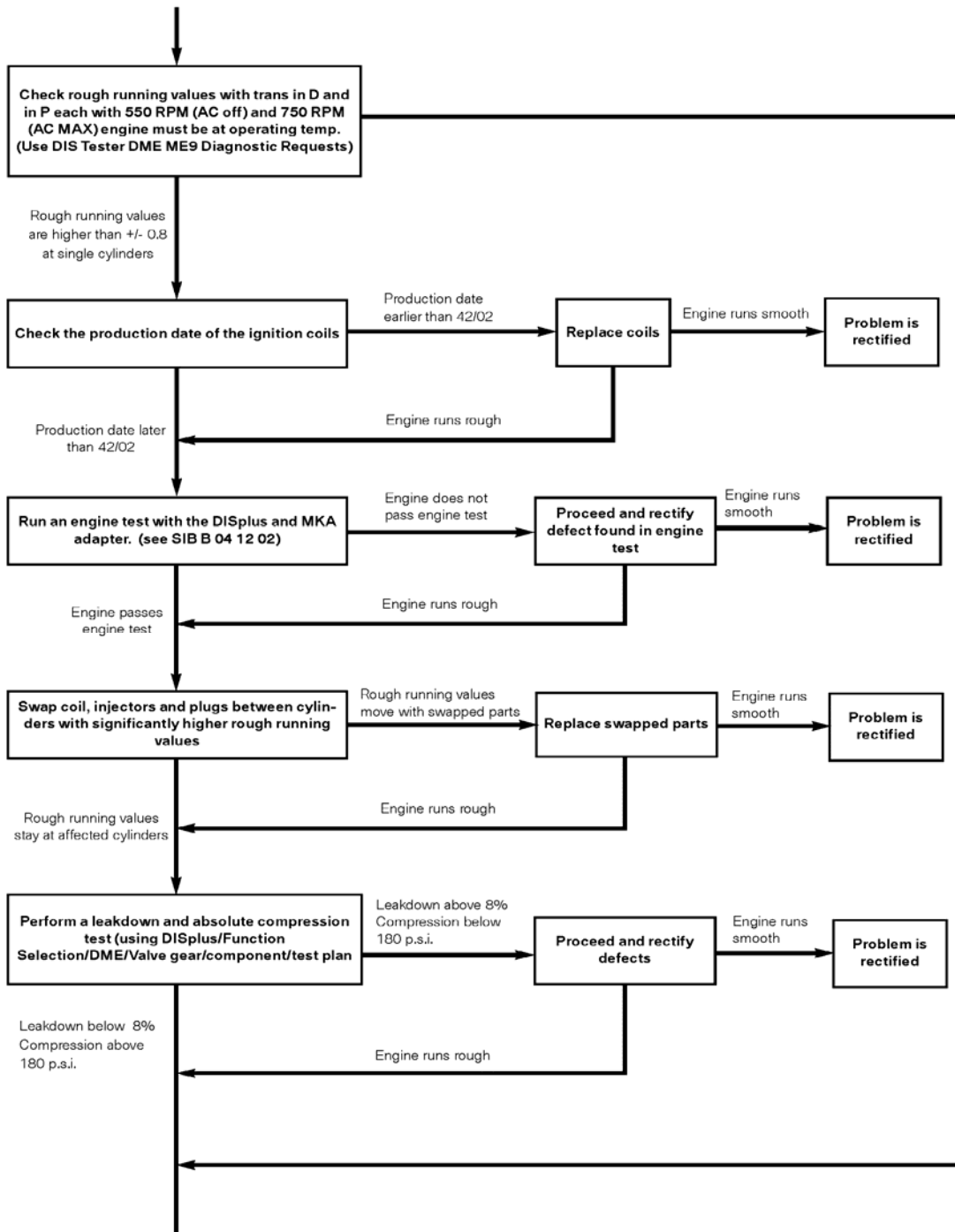
Due to the design of the Valvetronic system, there are special diagnostic considerations when diagnosing rough running concerns on vehicles equipped with the N62 engine.

The following diagnostic flow chart should be used as a diagnostic aid when attempting to rectify idle quality complaints when the engine is at operating temperature.



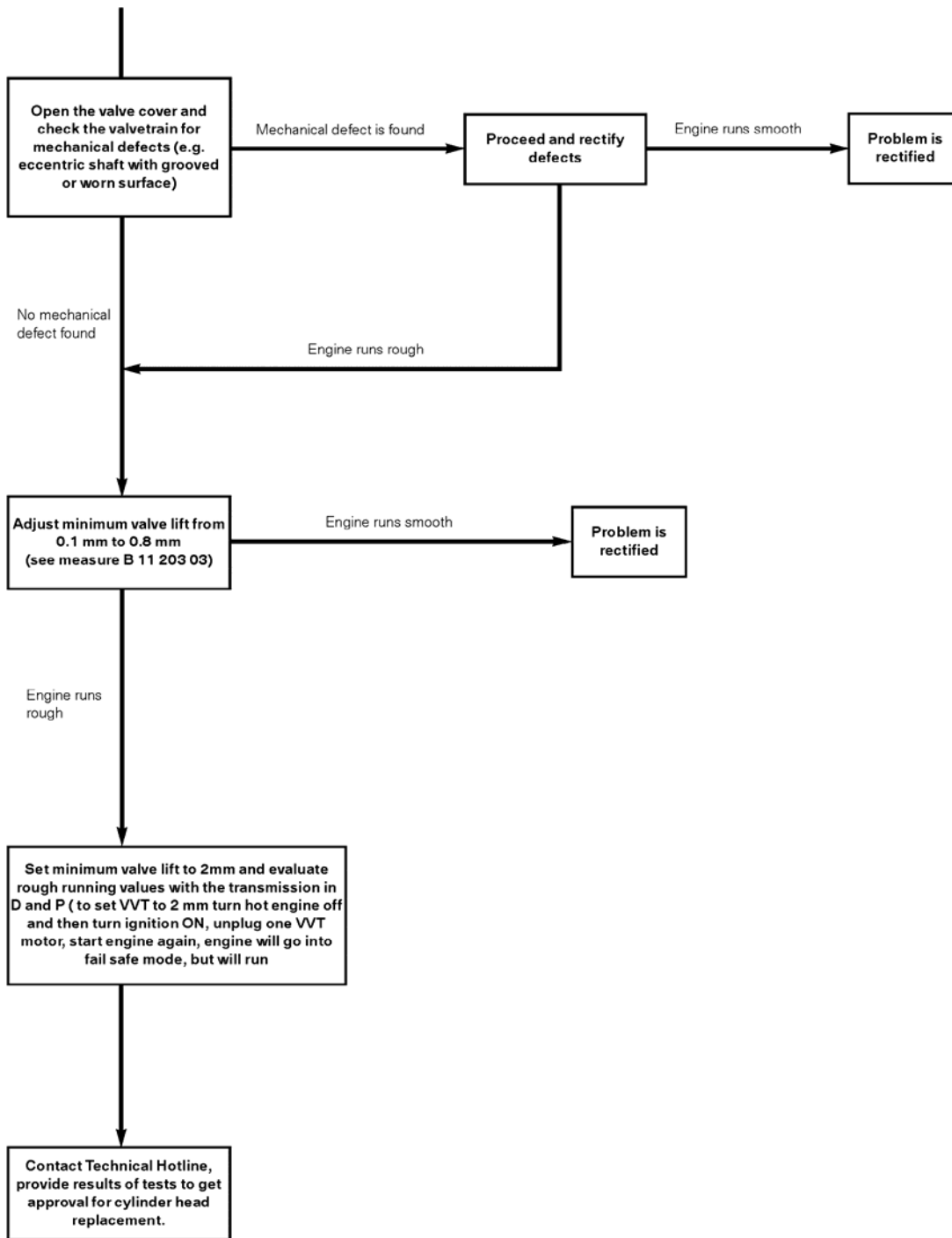
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Fig. 30: Rough Running Diagnosis (N62) Diagnostic Flow Chart (1 Of 3)
 Courtesy of BMW OF NORTH AMERICA, INC.



G03395248

Fig. 31: Rough Running Diagnosis (N62) Diagnostic Flow Chart (2 Of 3)
 Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 32: Rough Running Diagnosis (N62) Diagnostic Flow Chart (3 Of 3)
 Courtesy of BMW OF NORTH AMERICA, INC.

GENERAL INFORMATION

Engine Service Information - 328i, 328xi, 335i, 335xi, X3, X5

2007 NG6 ENGINE

Model: All with NG6-cylinder from 2007

Production: from 9/2006

NG6 ENGINE

Previously in 2005, BMW introduced the beginning of a new generation of six cylinder engines with the N52. Now, for the 2007 model year, BMW has 3 new variations of the NG6 engine family.

The first of the new engines is the N54, which will debut in the new 3-series coupe in September 2006. The N54 engine is turbocharged and uses the second generation of direct injection (DI 2). This engine will power the new 335i coupe in the fall of 2006.



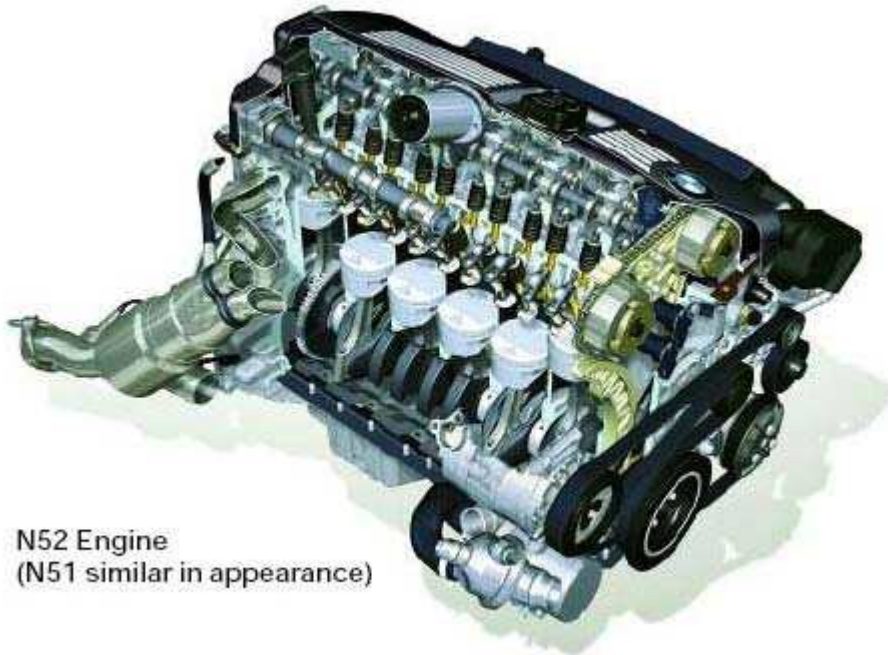
N54 Engine

Fig. 1: Identifying Engines - N54

Courtesy of BMW OF NORTH AMERICA, INC.

The N52 will eventually be replaced by the new N52KP. The N52 KP engine is an improved and cost optimized version of the N52. The N52 KP will be available in the 328i and xi coupe from September and will replace the

N52 in various models.



N52 Engine
(N51 similar in appearance)

Fig. 2: Identifying Engine - N52

Courtesy of BMW OF NORTH AMERICA, INC.

Finally, the N51 which is a SULEV II compatible engine, will be phased into selected production models from 9/06. The N51 features many of the same features of the previous SULEV engine (M56) including a "Zero EVAP" system.

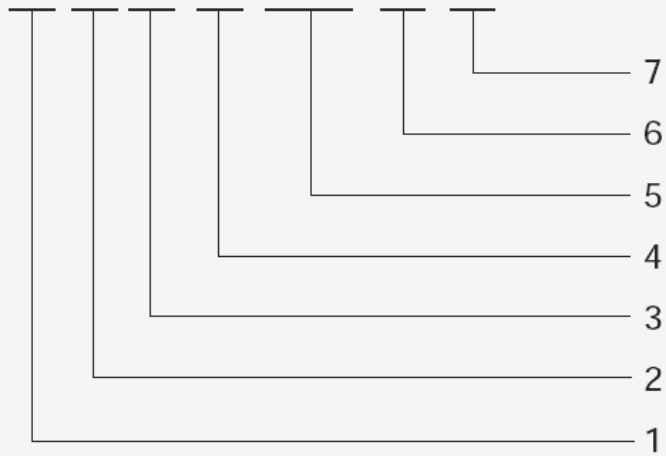
New Engine Designations

Along with the new engines for 2007, there is a new system for engine designations. The first few digits such as "N54B30" are familiar from the past, however the suffix has been changed.

The former "TU" designation has been dropped in favor of two additional digits.

The breakdown is as follows:

N52B30O1



Index	Designation	Code	Description
1	Engine Generation	M	BMW Engines up to 2001
		N	BMW Engines from 2001 (New Generation)
		S	BMW M GmbH
		W	External Engines (i.e. Tritec MINI)
2	Engine Type	4	4-cylinder in-line engine
		5	6-cylinder in-line engine
		6	8-cylinder "V" engine
		7	12-cylinder "V" engine
		8	10-cylinder "V" engine
3	Engine System	0	Basic engine
		1	SULEV or PZEV
		2	Valvetronic
		3	Gasoline direct injection
		4	Gasoline direct injection with turbocharger
		5	Double VANOS with Valvetronic
4	Fuel type/ operating mode	7	Diesel direct injection with turbocharger
		B	Gasoline
		D	Diesel
		E	Electric
		G	Gas (natural)
5	Displacement in 1/10 liter	H	Hydrogen
		30	3.0 liter (example)
6	Power output class	T	Top
		O	Upper output class (standard)
		M	Medium output class
		U	Lower output class
		K	Lowest output class
		0	New development
7	Version	1-9	Redesign/facelift version (TU etc.)

Fig. 3: Identifying Engine Identification Numbers (1 Of 2)
 Courtesy of BMW OF NORTH AMERICA, INC.

Crankcase Identification

The engine identification numbers are stamped on the block near the high pressure pump.

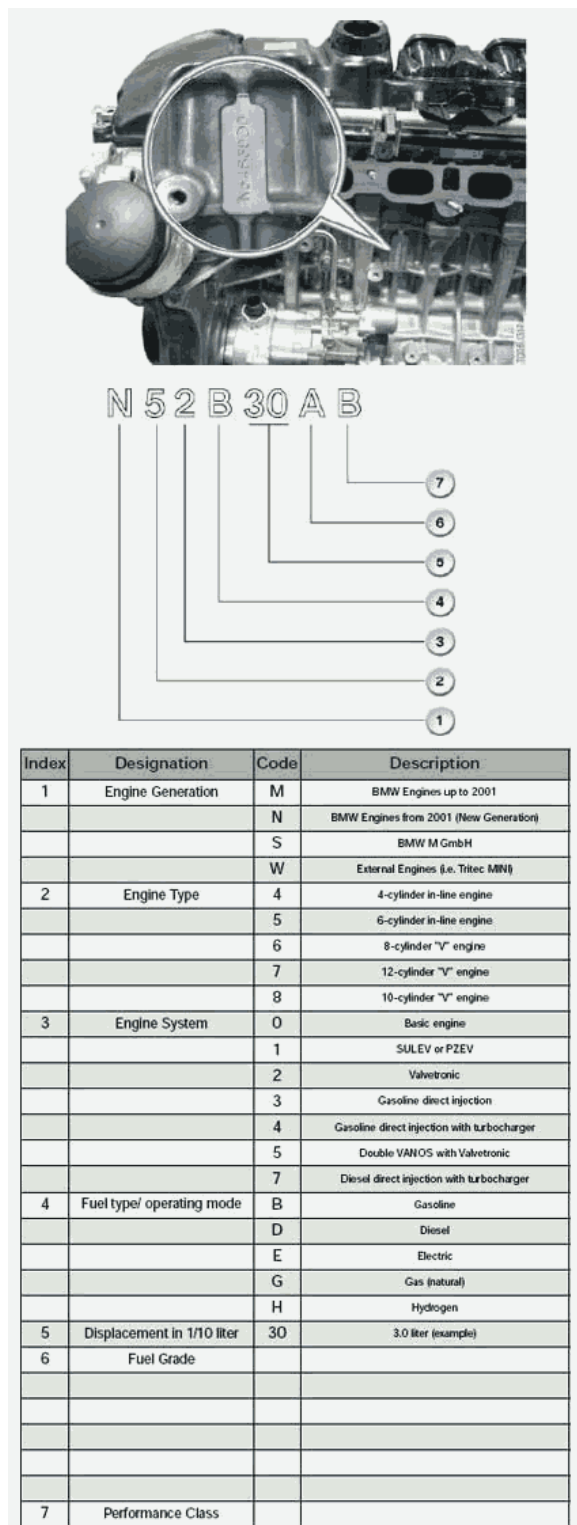


Fig. 4: Identifying Engine Identification Numbers (2 Of 2)
 Courtesy of BMW OF NORTH AMERICA, INC.

New NG6 Versions

The new N54 engine is designated the "N54B3000". The "O" in the engine designation indicates the "upper" output range.

The last digit, which is a "0", indicates the first version in this range of engines (N54). If the N54 engine is updated, then the last digit will change to a "1" rather than the former "TU" suffix.

The N52KP, which replaces the N52, will have three possible variants as shown below:

N52B30O1

N52B30M1

N52B30U1

Fig. 5: Identifying NG6 Versions

Courtesy of BMW OF NORTH AMERICA, INC.

All of the N52KP engines have a last digit of "1", which indicates that "KP" engines are an updated version of the N52. There are three variants, the upper output (O), the medium output (M) and the lower output (U). Each engine has specific characteristics and power output. The "O" engine has 260 horsepower, while the "M" version has about 230 horsepower. The "U" engine is a possible future variant with 215 horsepower.

The N51 engine uses the designation - "N51B30M0". This engine is SULEV II compliant with 230 horsepower.

New Vehicles for 2007

The new engine variants will be initially installed into some new and updated vehicles for 2007. The new E92 coupe will be available with the N54B30O0 (335i) and the N52B30M1 (328i).



Fig. 6: Identifying Vehicles For 2007
Courtesy of BMW OF NORTH AMERICA, INC.

The N52B3001 will be initially available in the E83 LCI (X3 3.0 si) from 9/2006 and the new E70 (X5 3.0 si) from SOP.



Fig. 7: Identifying E70 (X5)
Courtesy of BMW OF NORTH AMERICA, INC.

ENGINE MECHANICAL OVERVIEW

Crankcase

As far as the physical appearance and dimensions, the crankcase on the N54 is the same as the N52. The main change is in the materials, the N54 uses an all aluminum alloy crankcase. There is also cast iron cylinder liners similar to the previous M54 engine.

The reason for using the all aluminum configuration is to be more compatible with the increased torque output and cylinder pressure in the N54.

N54 crankcase - all aluminum alloy



Fig. 8: Identifying Aluminum Alloy Crankcase
Courtesy of BMW OF NORTH AMERICA, INC.

The N54 engine continues to use the "two-piece" crankcase featuring the "bedplate" design.

The N52KP and N51 engines continue to use the composite magnesium/aluminum alloy engine from the existing N52.

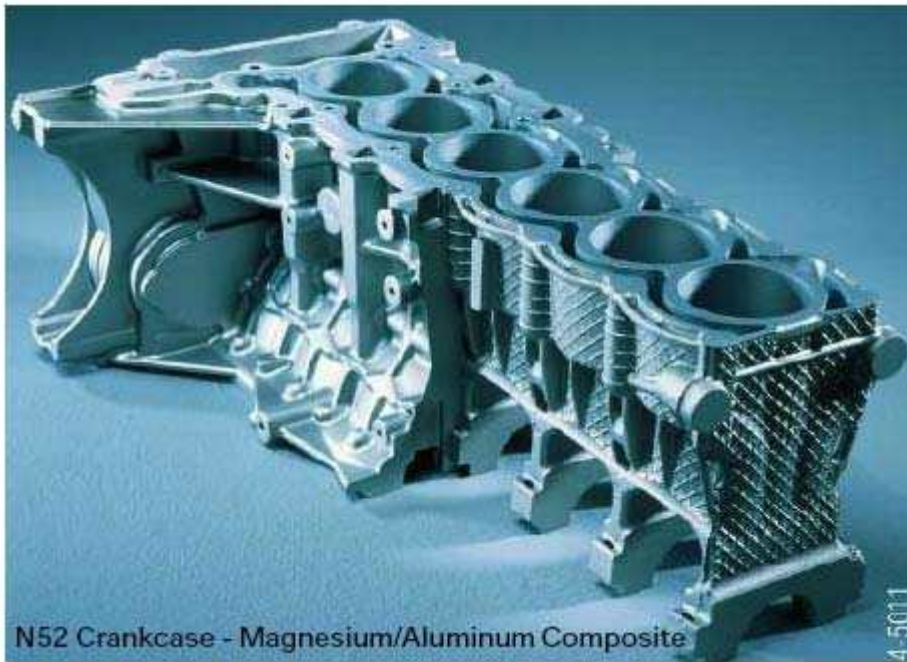


Fig. 9: Identifying "Two-Piece" Crankcase
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The N54 engine has a different bolt pattern on the transmission mounting (bellhousing) area.

Therefore, a new special tool is needed to mount the engine to an engine stand. The new tool has slots which will accommodate all NG6 engines

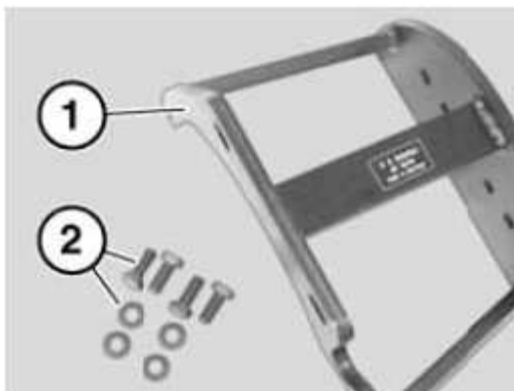


Fig. 10: Identifying Bolt Pattern On Transmission Mounting
Courtesy of BMW OF NORTH AMERICA, INC.

Bolts

Although, the N54 engine has an all aluminum crankcase, many of the bolts are still aluminum as on the N52. This is to reduce any potential confusion between steel and aluminum bolts. Some bolts, for example, are steel

such as the cylinder head cover bolts. This is possible, due to the plastic cylinder head cover.



Fig. 11: Identifying Bolt

Courtesy of BMW OF NORTH AMERICA, INC.

The N52KP and N51 engines use the same aluminum bolt configuration as the N52 engine, with little change. The cylinder head cover bolts are like the N54 - steel, due to the plastic cylinder head cover.

The same rules apply to the handling of aluminum bolts as in the past.

Strict adherence to repair instructions is required to ensure proper connections.

Be sure to follow the proper torque/tightening angle sequence as outlined in the "tightening torques" section of TIS.

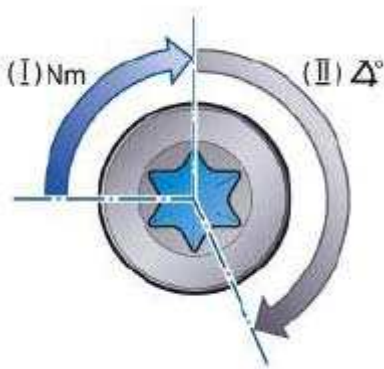


Fig. 12: Identifying Aluminum Bolt

Courtesy of BMW OF NORTH AMERICA, INC.

Cylinder Head Cover

As stated before, the cylinder head cover used on all of the new NG6 engines is made from plastic. However, the design differs between the engines due to engine equipment.

For example, the N54 engine does not use Valvetronic and therefore does not need the accommodation for the VVT motor. Also, the crankcase ventilation system is different on the N54. Some of the crankcase venting components are integrated into the cylinder head cover such as the cyclone separator.

The N52KP and N51 engines have the same cylinder head cover. The cover also includes some of the crankcase venting system components.



Fig. 13: Identifying Cylinder Head Cover
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Some engines with plastic cylinder head covers may have aluminum bolts.

Cylinder Head

Each of the new NG6 engines has a unique cylinder head design. Due to some of the technical requirements, the cylinder heads are not interchangeable between these engines. The cylinder head from the N52KP is carried over from the N52 with little change.

The cylinder head from the N54 engine does not have Valvetronic. The design of the engine also requires accommodation of the "direct" fuel injector in the combustion chamber. Most of the external dimensions are the same as the N52 to accommodate accessories and ancillary components.

The N51 engine is a SULEV II compliant design which has a lower compression ratio. The combustion chamber design has been modified to work in conjunction with the N51 piston to achieve the required emission goals.



Fig. 14: Identifying Fuel Injector In Combustion Chamber
Courtesy of BMW OF NORTH AMERICA, INC.

Valvetrain

The valvetrain on the N52 introduced in 2006, used 5 mm valve stems on both the intake and exhaust. To increase durability, the exhaust valve stems were increased to 6 mm from 6/06 production.

All of the new NG6 engine have adopted the 6 mm valve stem for the exhaust, the intake stem remains at 5 mm. The valves are of the "solid" type design (not Sodium filled). The diameter of the valve head is engine specific.

Camshafts

The lightweight hydroformed camshaft will still be used on the NG6 engines. Be aware that some engines may use the "cast" camshaft design. This is for supply and production reasons.

Cast and hydroformed camshafts are completely interchangeable. For example, a replacement camshaft may differ from the original. This is no problem, they will fit and work properly without any modifications.

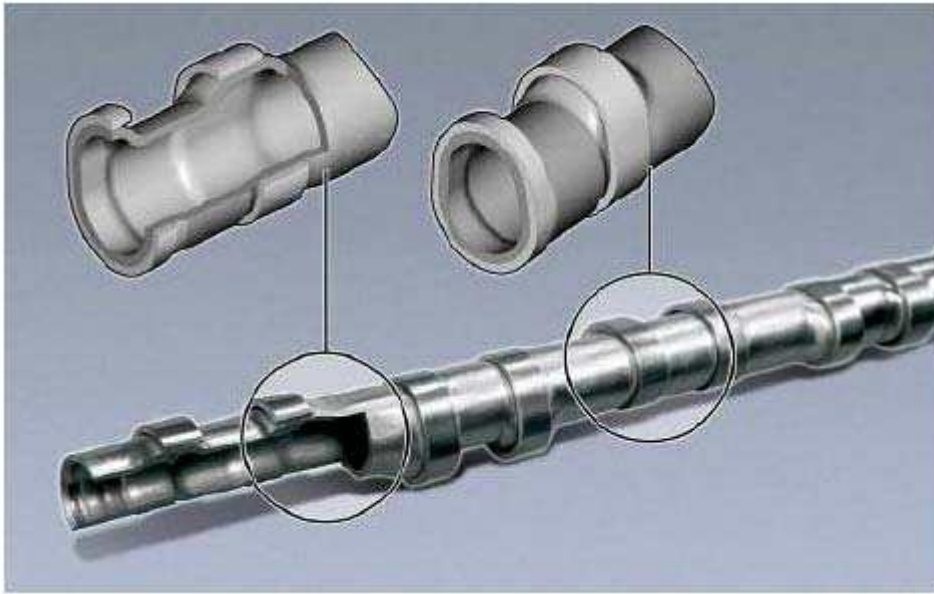
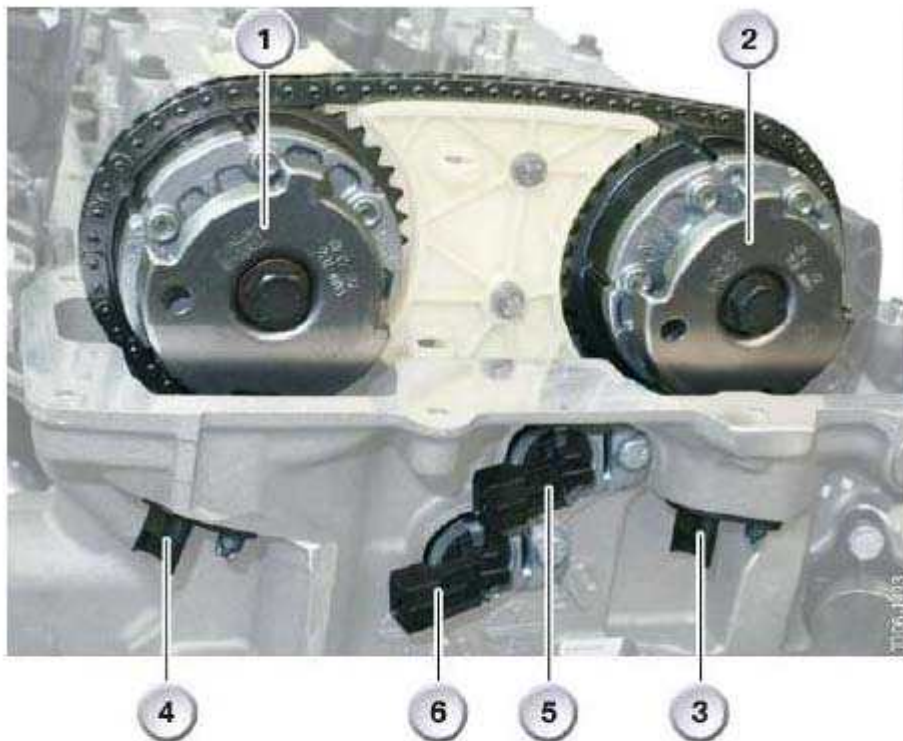


Fig. 15: Identifying Camshaft Diameter
Courtesy of BMW OF NORTH AMERICA, INC.

VANOS

The infinitely variable Bi-VANOS system is still in use on all NG6 engines. The VANOS system still retains the use of the lightweight VANOS adjusting units introduced on the N52. The only change to the system is that the N54 engine uses different spread ranges for compatibility with turbocharged engine operation.



Index	Explanation	Index	Explanation
1	VANOS unit, exhaust	4	Exhaust camshaft sensor
2	VANOS unit, intake	5	VANOS solenoid valve
3	Intake camshaft sensor	6	VANOS solenoid valve

Fig. 16: Identifying Compatibility With Turbocharged Engine Operation
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Do not mix up the intake and exhaust VANOS units. They appear similar, but have different spread ranges. Improper installation can result in valvetrain damage.

Valvetronic

The N51 and N52KP engines retain the already proven Valvetronic system from the N52. The only change for 2007 is an optimized VVT motor which has already been in production from 5/06.

The N54, on the other hand, does not use the Valvetronic system. Valvetronic is designed to reduce pumping losses and improve engine efficiency. The turbocharging system on the N54 is also designed to reduce pumping losses and increase engine efficiency.

Therefore, there is no need to have both systems on one engine. In summary, the efficiency of the N54 is gained through exhaust turbocharging and direct injection rather than Valvetronic.

Valvetronic II - used on N52, N52KP and N51



Fig. 17: Identifying Injection Rather Valvetronic
Courtesy of BMW OF NORTH AMERICA, INC.

Gaskets and Seals

Head Gasket

The head gasket design on the N54 is unique to that engine.

It features a multi-layer steel design. There is no silicone rubber perimeter "shelf" as on the N52. This is not needed due to the aluminum block on the N54.

The N52KP and N51 engines are still using the head gasket that is familiar from N52.



Fig. 18: Identifying Head Gasket

Courtesy of BMW OF NORTH AMERICA, INC.

Oil Pan Gasket

All of the new NG6 engine use the same oil pan gasket as introduced on the N52.

The oil pan gasket design is compatible with the N54, therefore it was not necessary to create an additional part.



Fig. 19: Identifying Oil Pan Gasket

Courtesy of BMW OF NORTH AMERICA, INC.

Bedplate Sealing

The N54 continues to use the injected sealant method for the bedplate.

Crankshaft Drive Components

Crankshaft

The crankshaft on the N52KP and N51 remains a cast iron design. This crankshaft is carried over from the N52.

The additional torque generated by the N54 requires the use of a forged steel crankshaft.

Piston and Connecting Rods

Due to the design requirements of each of the new NG6 engines, the piston design is unique to each version. For instance, the N54 is turbocharged and direct injected and requires a piston which meets the design requirements for compression and mixture formation.

The N51 engine need a piston which has lower compression and meets the SULEV II requirements for emission compliancy.

The N52KP and N52 engines both use the same piston design.

The connecting rods on the new engines use a thicker beam design which has been in production on the N52 since 6/06. The N54 has a special connecting rod with M9 bolts instead of the M8 bolts on the other engines.

Torsional Vibration Damper

The vibration damper has been updated to improve the damping of first order vibrations. The damper is secured with new bolts and has a revised tightening procedure. The procedure differs from the N52 and should therefore not me mixed up. Damage to the belt drive can result from improper tightening procedures.

Intake Manifold

The plastic intake manifold from the N52 is carried over to the new NG6 engines. However, the 3-Stage DISA version of the intake manifold is only used on the "O" version (high output).

The current N51 engine is designated as a medium output "M" version at 230 hp and does not require the 3-stage DISA. The same applies to the "M" version of the N52KP engine as well.

There are small modifications to these intake manifolds due to the fact that the crankcase ventilation system has been updated.

As far as the N54 engine is concerned, the intake manifold is designed specifically for the turbocharging system. The N54 does not require DISA as turbocharging supplies the necessary torque increase when needed.

3-Stage DISA Intake Manifold



Fig. 20: Identifying 3-Stage DISA Intake Manifold
Courtesy of BMW OF NORTH AMERICA, INC.

Intake Manifold - N54



Fig. 21: Identifying Intake Manifold N54
Courtesy of BMW OF NORTH AMERICA, INC.

Crankcase Ventilation

One of the major changes on the new NG6 engines is that the crankcase ventilation system has been upgraded and improved. This applies to all of the new NG6 versions (N52KP, N51 and N54).

There are two distinct versions of crankcase ventilation. One type is unique to the N54 and the other applies to N51 and N52KP.

The N52, which is still in production continues to use the "external" crankcase ventilation system with the electrically heated crankcase ventilation valve/cyclone separator.

Crankcase Ventilation System on N52



Fig. 22: Identifying Crankcase Ventilation System
Courtesy of BMW OF NORTH AMERICA, INC.

Crankcase Ventilation (N51 and N52KP)

The crankcase ventilation system on the N51 and N52KP has been modified as compared to the N52. The system is integrated into the plastic cylinder head cover.

The crankcase gases are regulated by a crankcase ventilation valve similar to the design used on the N62. The crankcase vent valve is currently part of the cylinder head cover and is not replaceable as a separate component.

Oil separation is carried out via a "labyrinth" system and two cyclone separators which are incorporated into the cylinder head cover. By having the system components integrated into the cylinder head cover, the crankcase gases are heated by the engine rather than an electric heater as on the N52. However, there is still one electric

heating element at the manifold inlet.

Once the liquid oil is separated from the crankcase vapors, the oil is allowed to drain back through check valves back into the engine.



Fig. 23: Cylinder Head Cover Components Location
Courtesy of BMW OF NORTH AMERICA, INC.

Crankcase Ventilation (N54)

Since the N54 is a turbocharged engine, the crankcase ventilation system has to meet certain design requirements. For example, when the engine is in turbocharged mode, the increased manifold pressure should not have an adverse effect on the crankcase venting. This is why, there is no crankcase ventilation valve in the system.

The system consists of four small cyclone separators which are integrated into the plastic cylinder head cover. The flow of crankcase gases is metered through a series of restrictions which control the ultimate crankcase pressure.

Cyclone Separator Operation

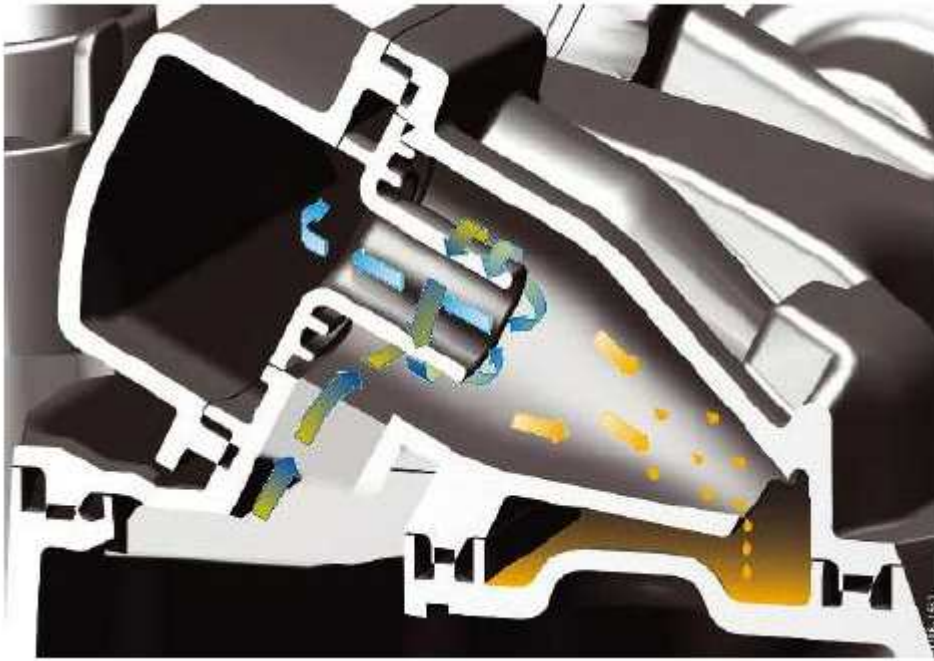


Fig. 24: Cyclone Separator Operation
Courtesy of BMW OF NORTH AMERICA, INC.

One of the main operating principles behind the crankcase venting system on the N54 is that there are two strategies - one for the turbocharged mode and one for "non-turbocharged" operation such as decel. These strategies are dependent upon the intake manifold pressure.

N54 Cylinder Head Cover (cutaway view)

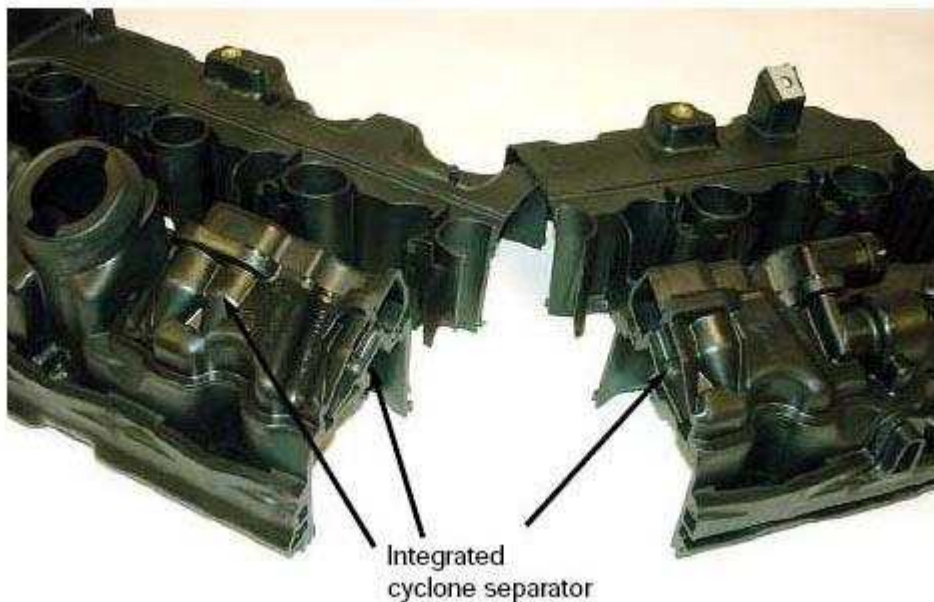


Fig. 25: Cutaway View - Cylinder Head
 Courtesy of BMW OF NORTH AMERICA, INC.

Crankcase Ventilation System Overview (N54)

Crankcase Ventilation System Overview (N54)

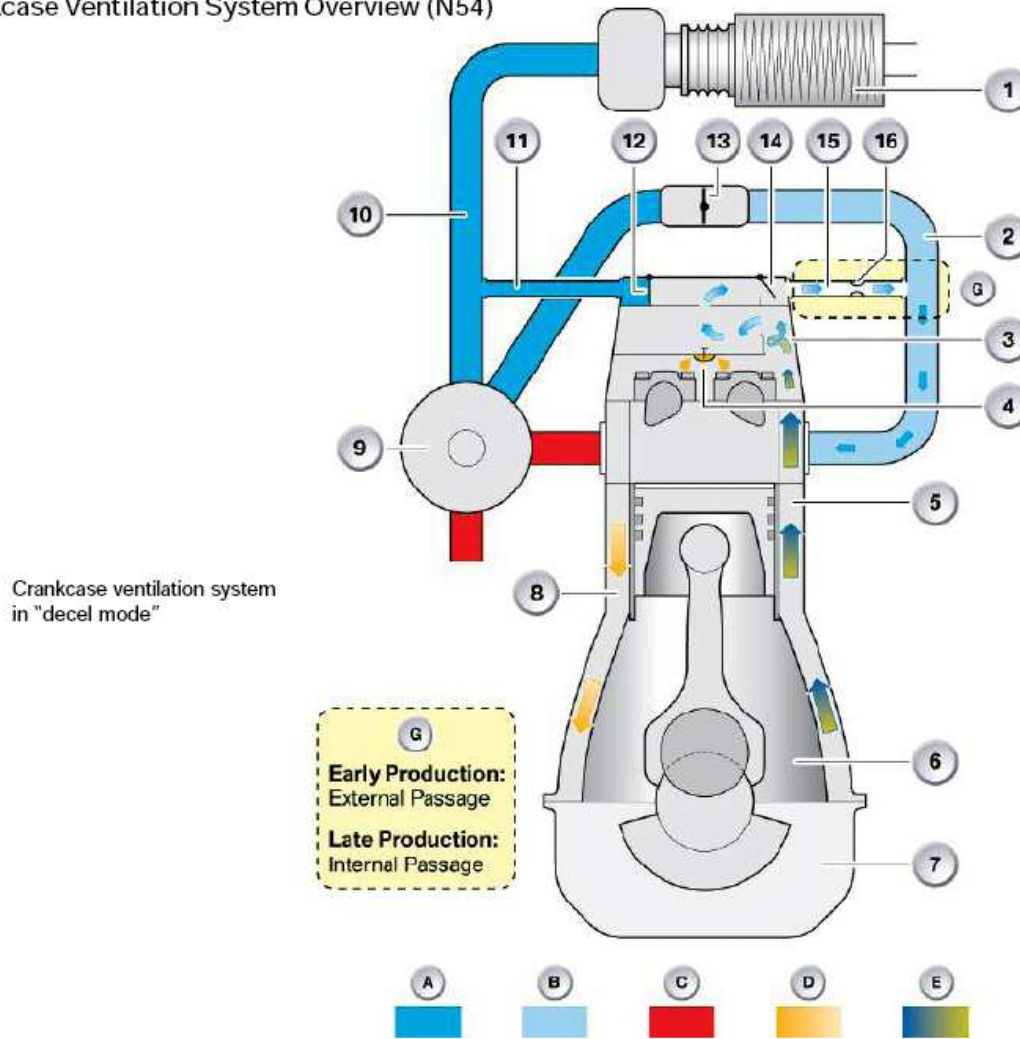


Fig. 26: Identifying Crankcase Ventilation System Diagram - Decel Mode
 Courtesy of BMW OF NORTH AMERICA, INC.

Crankcase Ventilation System Overview (N54)

Crankcase Ventilation System Overview (N54)

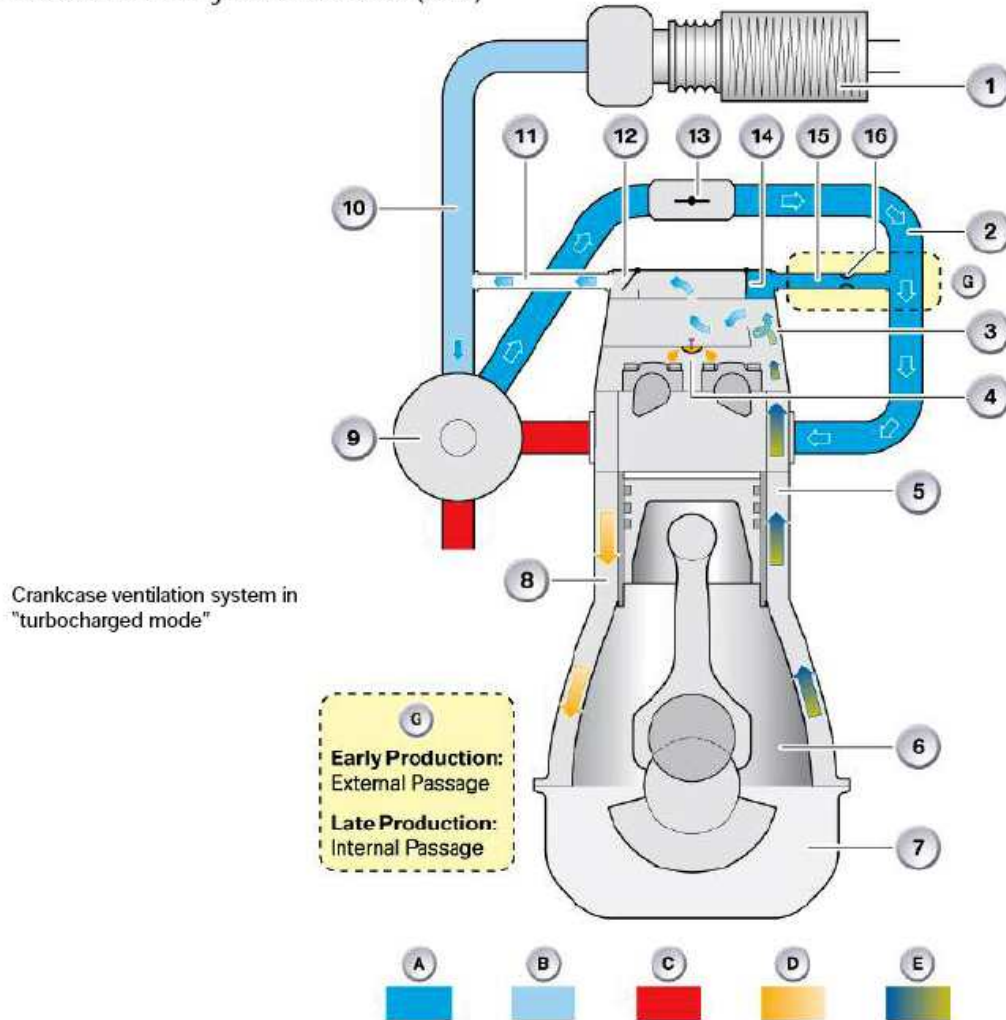


Fig. 27: Identifying Crankcase Ventilation System Diagram - Turbocharged Model
 Courtesy of BMW OF NORTH AMERICA, INC.

CRANKCASE VENTILATION COMPONENTS INDEX

Index	Explanation	Index	Explanation
A	Overpressure	7	Oil Sump
B	Low pressure (vacuum)	8	Oil return channel
C	Exhaust gas	9	Turbocharger
D	Liquid oil	10	-
E	Blow-by gases	11	-
1	Air cleaner	12	-
2	Intake manifold	13	Throttle valve
3	-	14	-
4	-	15	-
5	Venting channel	16	-
6	Crankshaft cavity	-	-



Fig. 28: Identifying Charge Air Suction Pipe
 Courtesy of BMW OF NORTH AMERICA, INC.

Name the components above and their purpose:

Summary of Mechanical Changes

SUMMARY OF MECHANICAL CHANGES

Component/System	N52 Engine	N52KP	N51	N54
Crankcase	Composite magnesium/aluminum	Composite magnesium/aluminum	Composite magnesium/aluminum	All aluminum alloy
Cylinder Head	Aluminum	Aluminum (same as N52)	Aluminum - Specific to N51 due to combustion chamber modifications	Aluminum - specific to N54
Cylinder Head Gasket	Silicone rubber perimeter to prevent contact corrosion	Same as N52	Same as N52	Specific to N54 - multi-layer with no silicone rubber perimeter
Cylinder Head Cover	Magnesium	Plastic with integrated crankcase ventilation	Plastic with integrated crankcase ventilation (same as N52KP)	Plastic with integrated crankcase ventilation (specific to N54)
Crankcase	External crankcase	Crankcase vent valve and "labyrinth" and	Crankcase vent valve and "labyrinth" and	No crankcase vent valve - uses calibrated orifice with

Ventilation	vent valve with cyclone separator.	cyclone oil separation integrated into cylinder head cover.	cyclone oil separation integrated into cylinder head cover.	cyclone separation integrated into cylinder head cover.
Valvetrain	5 mm intake and exhaust valve stems (6 mm exhaust valve stem from 6/06)	5 mm intake and 6 mm exhaust valve stems	5 mm intake and 6 mm exhaust valve stems	5 mm intake and 6 mm exhaust valve stems
VANOS	Infinitely variable Bi-VANOS	Infinitely variable Bi-VANOS	Infinitely variable Bi-VANOS	Infinitely variable Bi-VANOS
Valvetronic	Valvetronic II	Valvetronic II	Valvetronic II	No Valvetronic
Intake Manifold	Plastic with 3-stage DISA on high output version (OL)	Plastic with 3-stage DISA on high output version (O)	Plastic	Plastic (no DISA)
Fuel System	Manifold injection	Manifold injection	Manifold injection	High Precision Injection (HPI)
Cooling System	Electric coolant pump - 200 W	2nd Generation electric coolant pump - 200 W	2nd Generation electric coolant pump - 200 W	2nd Generation electric coolant pump - 400 W
Exhaust System	"Near Engine" catalysts	"Near Engine" catalysts with underbody catalysts (ULEV II)	"Near Engine" catalysts with underbody catalysts (SULEV II)	"Near Engine" catalysts with underbody catalysts (ULEV II)
Pistons/Compression Ratio	10.7 to 1	10.7 to 1	10 to 1	10.2 to 1
Connecting Rods/Crankshaft	Forged Steel with 8 mm bolts "cracked design" (Cast Crankshaft)	Forged Steel (stiffened) with 8 mm bolts "cracked design" (Cast crankshaft)	Forged Steel (stiffened) with 8 mm bolts "cracked design" (Cast crankshaft)	Forged Steel (stiffened) with 9 mm bolts "cracked design" (Forged steel crankshaft)
HFM	Analog	Digital	Digital	Digital

MSD80 ENGINE MANAGEMENT OVERVIEW (E9X)

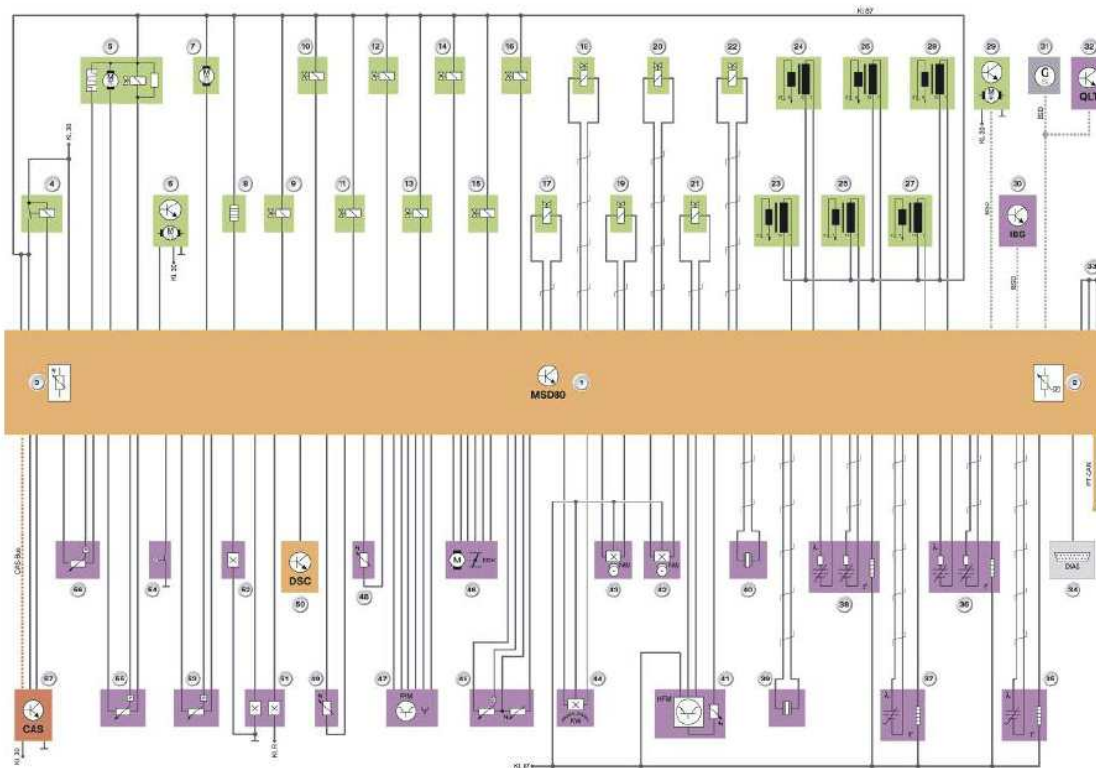


Fig. 29: Identifying Engine Management Communication Diagram - E9X (1 Of 2)
 Courtesy of BMW OF NORTH AMERICA, INC.

Legend for MSD80 Overview

Index	Explanation
1	ECM (DME - MSD80)
2	Temperature sensor in DME control unit
3	Ambient-pressure sensor in DME control unit
4	DME main relay
5	Diagnosis module for fuel tank leakage (DMTL)
6	Electric fan (engine cooling)
7	E-box fan
8	Characteristic map thermostat
9	Fuel tank vent valve (TEV)
10	VANOS solenoid valve, inlet
11	VANOS solenoid valve, exhaust
12	Sound flap
13	Exhaust flap
14	Fuel-supply control valve
15	Wastegate valve, bank 1
16	Wastegate valve, bank 2
17-22	Piezo-injectors
23-28	Ignition coils
29	Electric coolant pump
30	Intelligent battery sensor
31	Alternator
32	Oil condition sensor
33	Ground connection

Index	Explanation
34	Diagnostics connection
35	Oxygen sensor (secondary O2 sensor with discontinuous characteristic)
36	Oxygen sensor (primary O2 sensor with continuous characteristic)
37	Oxygen sensor (secondary O2 sensor with discontinuous characteristic)
38	Oxygen sensor (primary oxygen sensor with continuous characteristic)
39-40	Knock sensors
41	Hot-film air-mass sensor (HFM)
42	Camshaft sensor, inlet
43	Camshaft sensor, exhaust
44	Crankshaft sensor
45	Pressure/temperature sensor before throttle valve (boost pressure)
46	Throttle valve
47	Accelerator pedal module
48	Coolant-temperature sensor at engine outlet
49	Coolant-temperature sensor at radiator outlet
50	DSC control unit (Dynamic Stability Control)
51	Brake-light switch
52	Clutch switch
53	Pressure sensor after throttle valve (intake-manifold pressure)
54	Oil pressure switch
55	Low-pressure fuel sensor
56	High-pressure fuel sensor (rail pressure sensor)
57	CAS control unit (Car Access System)

Fig. 30: Identifying Engine Management Communication Diagram - E9X (2 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

MSV80 ENGINE MANAGEMENT OVERVIEW (E70)

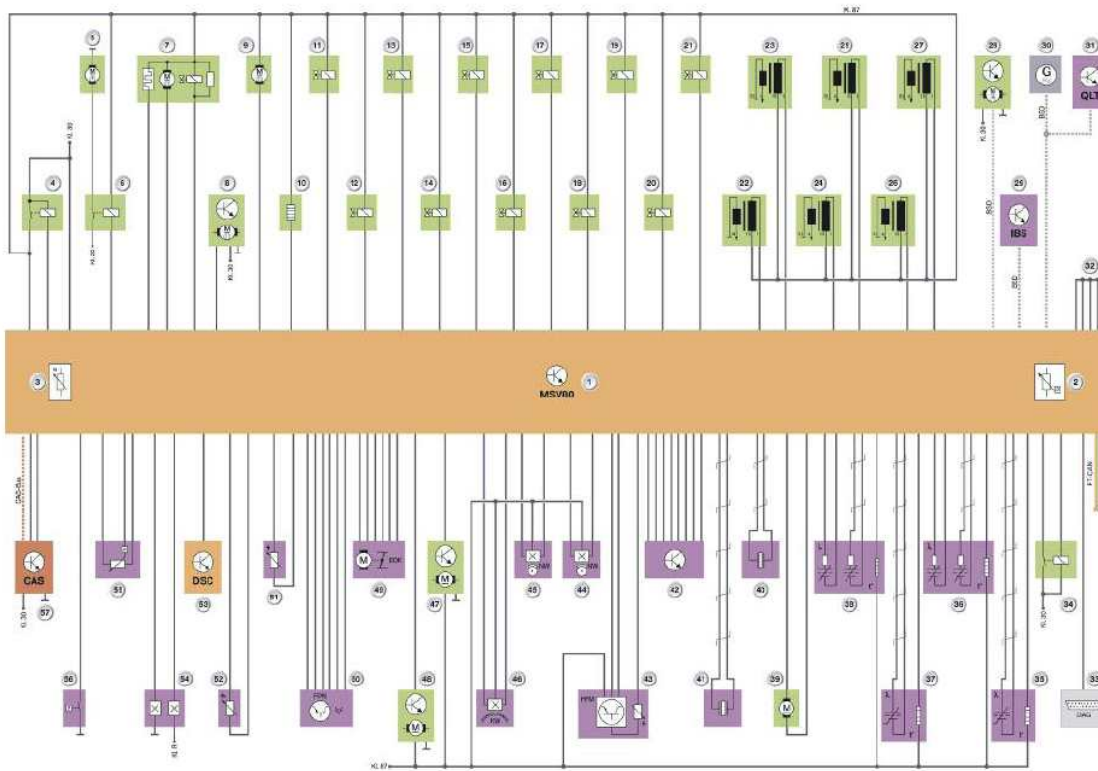


Fig. 31: Identifying Engine Management Communication Diagram - E70 (1 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

Legend for MSV80 Overview

Index	Explanation	Index	Explanation
1	ECM (DME - MSD80)	34	Valvetronic Relay
2	Temperature sensor in DME control unit	35	Oxygen sensor (secondary O2 sensor with discontinuous characteristic)
3	Ambient-pressure sensor in DME control unit	36	Oxygen sensor (primary O2 sensor with continuous characteristic)
4	DME main relay	37	Oxygen sensor (secondary O2 sensor with discontinuous characteristic)
5	Electric Fuel Pump (EKP)	38	Oxygen sensor (primary oxygen sensor with continuous characteristic)
6	EKP Relay	39	Valvetronic actuator motor (VVT)
7	DM-TL	40-41	Knock sensors
8	Electric fan (engine cooling)	42	Eccentric shaft sensor
9	E-box fan	43	Hot-film Air Mass Meter (HFM)
10	Characteristic map thermostat	44	Camshaft sensor, inlet
11	Fuel tank vent valve (TEV)	45	Camshaft sensor, exhaust
12	VANOS solenoid valve, inlet	46	Crankshaft sensor
13	VANOS solenoid valve, exhaust	47	DISA Actuator motor
14	Sound flap	48	DISA Actuator motor
15	Exhaust flap	49	Throttle valve
16-21	Fuel injectors	50	Accelerator pedal module
22-27	Ignition coils	51	Coolant-temperature sensor at engine outlet
28	Electric coolant pump	52	Coolant-temperature sensor at radiator outlet
29	Intelligent battery sensor	53	DSC control unit
30	Alternator	54	Brake light switch
31	Oil condition sensor	55	Differential pressure sensor
32	Ground connection	56	Oil pressure switch
33	Diagnostics connection	57	CAS control unit (Car Access System)

Fig. 32: Identifying Engine Management Communication Diagram - E70 (2 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

AIR MANAGEMENT

Air Management N52KP and N51

As far as the air management system on the N52KP and N51 engines is concerned, the previous intake manifold system on the N52 is carried over. Depending upon application, the engines will use the 3-stage DISA or the single stage (No DISA) intake manifold.

For more information on the DISA system refer to the previous training material in the training course "ST501 - New Engine Technology".



Fig. 33: Identifying Intake Manifold System
Courtesy of BMW OF NORTH AMERICA, INC.

Throttle Valve

All variants of the new NG6 engines receive the new EGAS 08 throttle by Siemens/VDO. The new throttle uses a plastic throttle valve and magneto-resistive feedback to the ECM.

The previous system used a potentiometer, whereas the new throttle uses a "contactless" system featuring magneto-resistive technology which is familiar from the eccentric shaft sensor on Valvetronic systems.



Fig. 34: Identifying Throttle Valve

Courtesy of BMW OF NORTH AMERICA, INC.

The magneto-resistive sensors are integrated into the housing cover. The sensors are also non-wearing.

For plausibility, the one sensor outputs the analog signal in the range from 0.3 to 4.6 V and the other sensor inverts it again from 4.6 to 0.3 V.

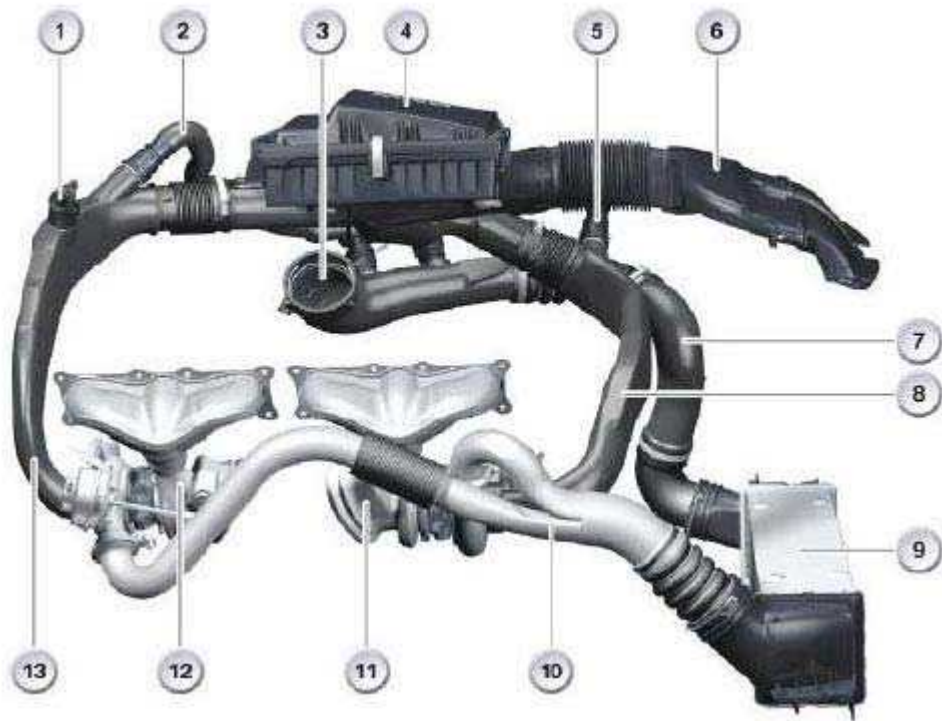
Consequently, the contact force is 10 times greater than that of a conventional plug connector.

NOTE: It is possible to twist the connector before plugging it in. This can cause damage to the harness and connector.

Air Intake Ducting

With regard to the N54 engine, the air intake ducting plays a significant role due to the requirements of a turbocharged engine.

In principle, the energy of the escaping exhaust gases is utilized to "pre-compress" the inducted fresh air and thus introduce a greater air mass into the engine. This is only possible if the air intake ducting is "leak-free" and installed properly.



Index	Explanation	Index	Explanation
1	PTC heater, blow-by gases (in turbo mode)	8	Charge air suction line, bank 1
2	Recirculated air line, bank 2	9	Intercooler
3	Connecting flange, throttle valve	10	Charge air manifold
4	Air cleaner	11	Turbocharger, bank 1
5	Recirculated air line, bank 1	12	Turbocharger, bank 2
6	Air-intake snorkel	13	Charge air suction line, bank 2
7	Charge air pressure line		

Fig. 35: Identifying Air Intake Ducting Components
 Courtesy of BMW OF NORTH AMERICA, INC.

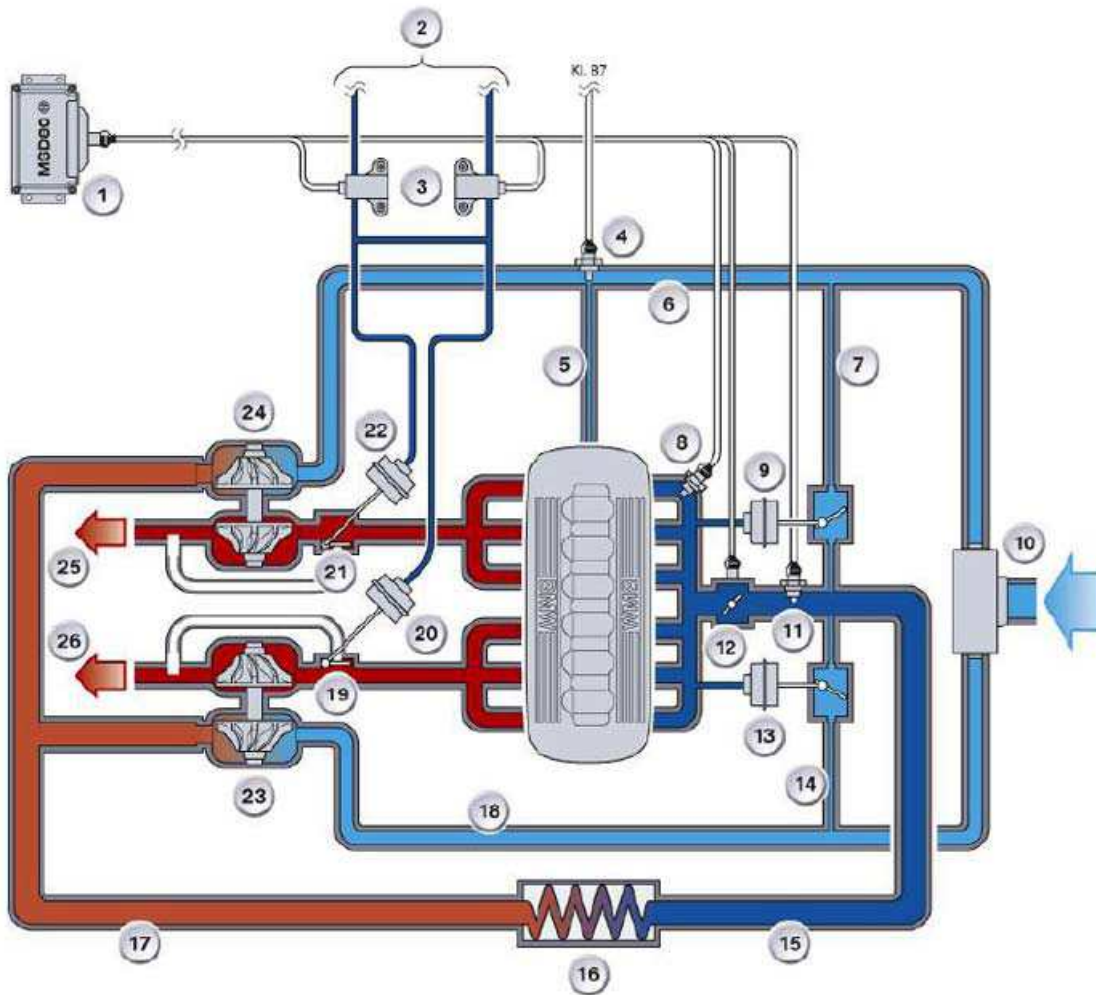
It is important to note, when carrying out work on the air-intake ducting, it is important to ensure that the components are installed in the correct position and that all pipes are connected with tight seals.

A leaking system may result in erroneous boost pressure. This would be detected by the engine management system and will ultimately result in "limp-home" operation. There would also be a noticeable reduction in

engine power.

For some of the duct work, there are special tools to ensure proper connections.

Air Intake Ducting Function



Legend for Air Intake Ducting Function

Index	Explanation	Index	Explanation
1	MSD80 Engine control module	14	Recirculated-air line, bank 1
2	Lines to vacuum pump	15	Charge air pressure line
3	Electro-pneumatic pressure transducer	16	Intercooler
4	PTC heater, blow-by gases	17	Charge air manifold
5	Blow-by line turbocharged operation mode	18	Charge air suction line, bank 1
6	Charge air suction line, bank 2	19	Wastegate flap, bank 1
7	Recirculated-air line, bank 2	20	Wastegate actuator, bank 1
8	Intake manifold pressure sensor	21	Wastegate flap, bank 2
9	Blow-off valve, bank 2	22	Wastegate actuator, bank 2
10	Air cleaner	23	Turbocharger, bank 1
11	Charge air pressure and temperature sensor	24	Turbocharger, bank 2
12	Throttle valve	25	To catalytic converter, bank 2

Fig. 36: Identifying Air Intake Ducting Function Diagram
Courtesy of BMW OF NORTH AMERICA, INC.

The fresh air is drawn in via the air cleaner (10) and the charge-air suction lines (6 + 18) by the compressors of turbochargers (23 + 24) and compressed.

Because the turbochargers can get very hot during operation, they are connected with the engine's coolant and engine-oil circuits. The charge air is greatly heated when it is compressed in the turbocharger, making it necessary for the air to be cooled again in an intercooler (16).

The compressed and cooled charge air is routed from the intercooler via the throttle valve (12) into the intake manifold.

The system is equipped with several sensors and actuators in order to ensure that the load of fresh air is optimally adapted to the engine's respective operating conditions. How these complex interrelationships are controlled is discussed in the following sections.



Fig. 37: Identifying Air Intake Ducting
Courtesy of BMW OF NORTH AMERICA, INC.

Exhaust Gas Turbocharging

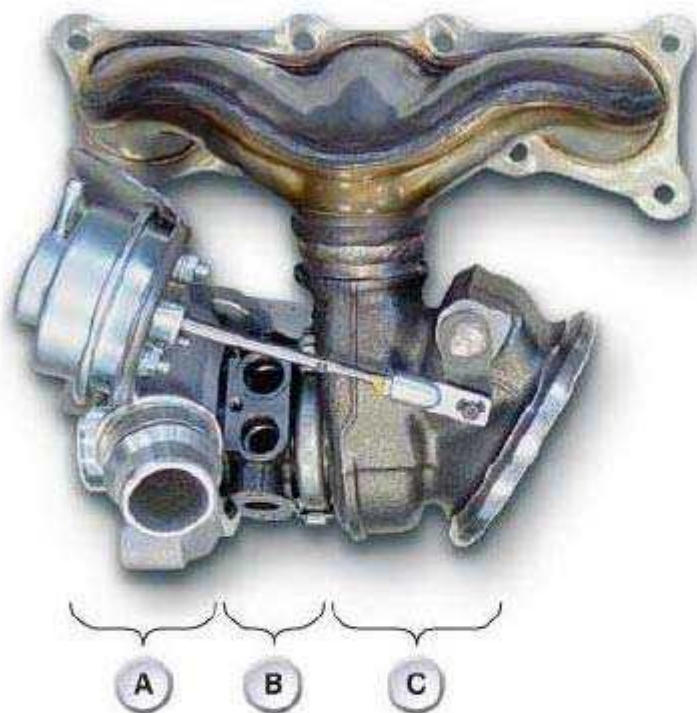
The turbocharger is driven by the engine's exhaust gases, i.e. exhaust gases under pressure are routed by the

turbocharger turbine and in this way delivers the motive force to the compressor, which rotates on the same shaft.

It is here that the induction air is precompressed in such a way that a higher air mass is admitted into the engine's combustion chamber. In this way, it is possible to inject and combust a greater quantity of fuel, which increases the engine's power output and torque.

The turbine and the compressor can rotate at speeds of up to 200,000 RPM. The exhaust inlet temperature can reach a maximum of 1050°C. Because of these high temperatures, the N54 engine's turbochargers are not only connected with the engine-oil system but also integrated in the engine-coolant circuit.

It is possible in conjunction with the N54 engine's electric coolant pump even after the engine has been switched off to dissipate the residual heat from the turbochargers and thus prevent the lube oil in the bearing housing from overheating.



Index	Explanation
A	Compressor
B	Cooling/Lubrication
C	Turbine

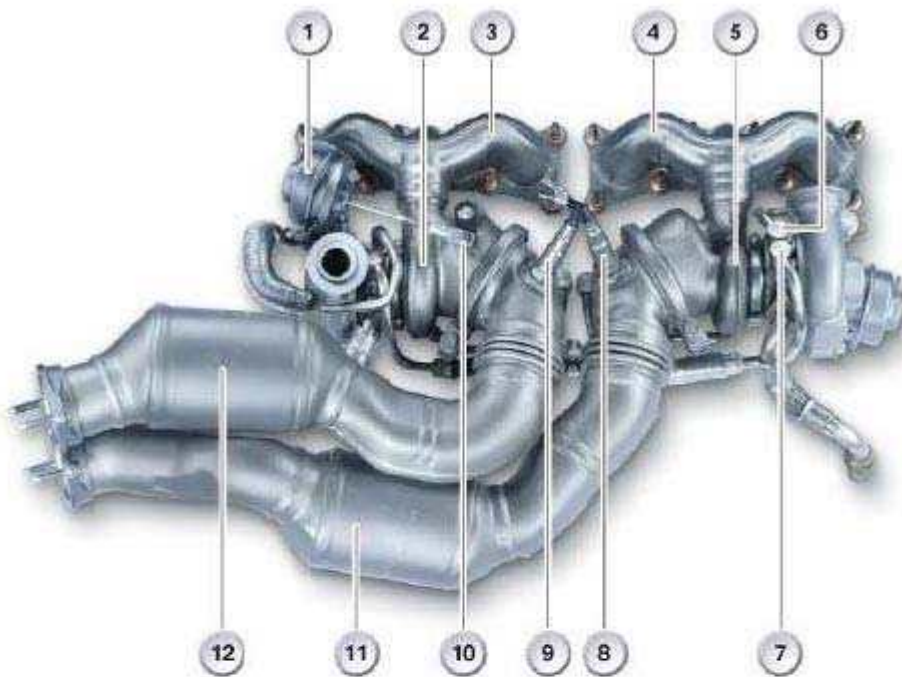
Fig. 38: Identifying Exhaust Gas Turbocharging
Courtesy of BMW OF NORTH AMERICA, INC.

Bi-turbocharging

Utmost importance is attached to turbocharger response in the N54 engine. A delayed response to the driver's command, i.e. the accelerator-pedal position, is not acceptable. The driver therefore must not experience any so-called "turbo lag".

This requirement is met in the N54 engine with two small turbochargers, which are connected in parallel. Cylinders 1, 2 and 3 (bank 1) drive the first turbocharger (5) while cylinders 4, 5 and 6 (bank 2) drive the second (2).

The advantage of a small turbocharger lies in the fact that, as the turbocharger runs up to speed, the lower moment of inertia of the turbine causes fewer masses to be accelerated, and thus the compressor attains a higher boost pressure in a shorter amount of time.



Index	Explanation	Index	Explanation
1	Wastegate actuator, bank 2	7	Coolant supply
2	Turbocharger, bank 2	8	Planar broad-band oxygen sensor, bank 1
3	Exhaust manifold, bank 2	9	Planar broad-band oxygen sensor, bank 2
4	Exhaust manifold, bank 1	10	Wastegate actuating lever
5	Turbocharger, bank 1	11	Catalytic converter, bank 1
6	Coolant return	12	Catalytic converter, bank 2

Fig. 39: Identifying Turbocharging Components
 Courtesy of BMW OF NORTH AMERICA, INC.

Boost-pressure Control

The boost pressure of the turbochargers is directly dependent on the flow of exhaust gas which reaches the turbocharger turbines. Both the velocity and the mass of the exhaust-gas flow are directly dependent on engine speed and engine load.

The engine-management system uses wastegate valves to control the boost pressure. These valves are operated by vacuum-pressure actuators, which are controlled by the electro-pneumatic pressure transducers via the engine-management system.



Index	Explanation	Index	Explanation
1	Oil return, bank 1	5	Coolant return, bank 2
2	Oil supply	6	Wastegate valve
3	Coolant supply	7	Coolant return, bank 1
4	Oil return, bank 2	8	

Fig. 40: Identifying Boost-Pressure Control
 Courtesy of BMW OF NORTH AMERICA, INC.

The vacuum pressure is generated by the permanently driven vacuum pump and stored in a pressure accumulator. The system is designed to ensure that these loads and consumers do not have a negative influence on the brake-boost function.

The exhaust-gas flow can be completely or partially directed to the turbine wheel with the wastegate valves. When the boost pressure has reached its desired level, the wastegate valve begins to open and direct part of the exhaust-gas flow past the turbine wheel.

This prevents the turbine from further increasing the speed of the compressor. This control option allows the system to respond to various operating situations.

In the idle phase, the wastegate valves of both turbochargers are closed. This enables the full exhaust-gas flow available to be utilized to speed up the compressor already at these low engine speeds.

When power is then demanded from the engine, the compressor can deliver the required boost pressure without any noticeable time lag. In the full-load situation, the boost pressure is maintained at a consistently high level when the maximum permissible torque is reached by a partial opening of the wastegate valves. In this way, the compressors are only ever induced to rotate at a speed which is called for by the operating situation.

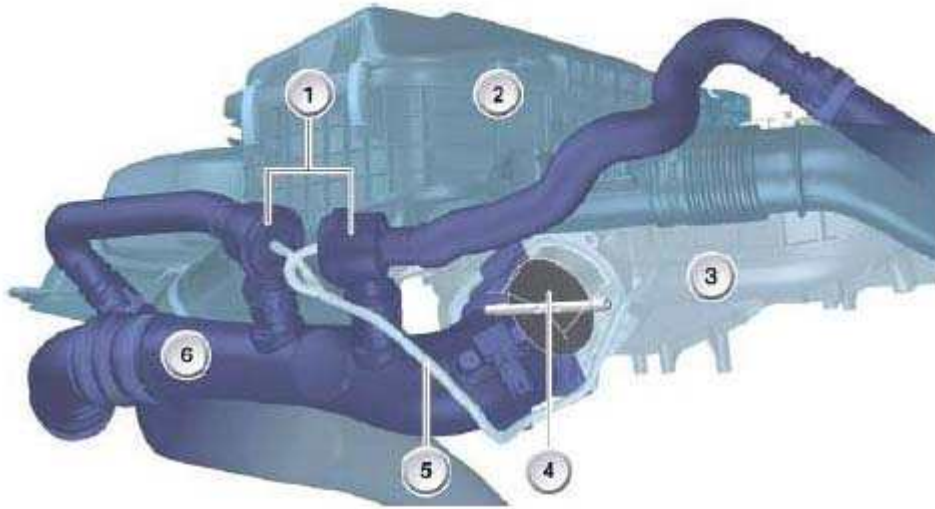
The process of the wastegate valves opening, removes the drive energy from the turbine such that no further increase in boost pressure occurs, which in turn improves overall fuel consumption.

At full-load the N54 engine operates at an overpressure of up to Index Explanation Index Explanation 0.8 bar in the intake manifold.

Blow-off Control

The blow-off valves in the N54 engine reduce unwanted peaks in boost pressure which can occur when the throttle valve closes quickly. They therefore have an important function with regard to engine acoustics and help to protect the turbocharger components.

A vacuum pressure is generated in the intake manifold when the throttle valve is closed at high engine speeds. This leads to a build-up of high dynamic pressure after the compressor which cannot escape because the route to the intake manifold is blocked.



Index	Explanation	Index	Explanation
1	Blow-off valves	4	Throttle valve
2	Air cleaner (ambient pressure)	5	Control line, blow-off valves
3	Intake manifold	6	Charge air pressure line

Fig. 41: Identifying Turbocharger Components
 Courtesy of BMW OF NORTH AMERICA, INC.

This leads to a "pumping up" of the turbocharger which means that:

- a clearly noticeable, disruptive pumping noise can be heard,
- and this pumping noise is accompanied by a component-damaging load being exerted on the turbocharger, since high-frequency pressure waves exert axial load on the turbocharger bearings.

The blow-off valves are mechanically actuated spring-loaded diaphragm valves which are activated by the intake-manifold pressure as follows:

In the event of a pressure differential before and after the throttle valve, the blow-off valves are opened by the intake-manifold pressure and the boost pressure is diverted to the intake side of the compressor. The blow-off valves open starting from a differential pressure of 0.3 bar. This process prevents the disruptive and component-damaging pumping effect from occurring.

The system design dictates that the blow-off valves are also opened during operating close to idle (pressure differential $P_{charger}/P_{suction} = 0.3$ bar). However, this has no further effects on the turbocharging system.

The turbocharger is pressurized with the full exhaust-gas flow at these low speeds and already builds up a certain level of induction-air precharging in the range close to idle.

If the throttle valve is opened at this point, the full boost pressure required is very quickly made available to the engine.

One of the major advantages of the vacuum pressure-actuated wastegate valves is that they can be partially opened in the mid-range in order not to allow excessive induction-air precharging to the detriment of fuel consumption. In the upper load range, they assume the required control position corresponding to the necessary boost pressure.

Charge-air Cooling

Cooling the charge air in the N54 engine serves to increase power output as well as reduce fuel consumption. The charge air heated in the turbocharger by its component temperature and by compression is cooled in the intercooler by up to 80°C.

This increases the density of the charge air, which in turn improves the charge in the combustion chamber. This results in a lower level of required boost pressure. The risk of knock is also reduced and the engine operates with improved efficiency.



Fig. 42: Identifying Charge-Air Cooling Operations Diagram
Courtesy of BMW OF NORTH AMERICA, INC.

Load Control

Load control of the N54 engine is effected by means of the throttle valve and the waste gate valves.

The throttle valve is the primary component in this process. The wastegate valves are actuated to bring about a fine tuning of the boost pressure. At full load the throttle valve is completely open and load control is undertaken by the wastegate valves.

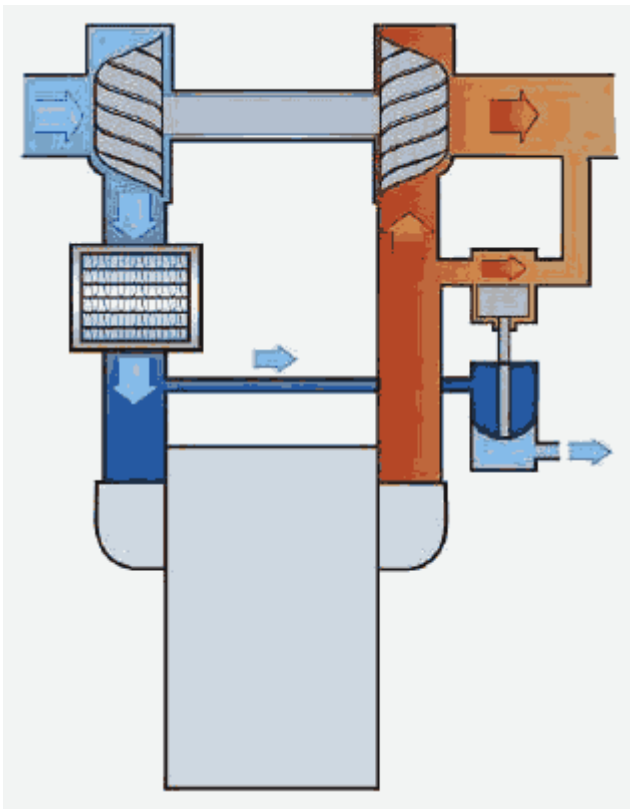


Fig. 43: Identifying Load Control Operations Diagram
 Courtesy of BMW OF NORTH AMERICA, INC.

Controlled Variables

The following variables, among others, influence control of the N54 engine's boost pressure:

- Intake-air temperature
- Engine speed
- Throttle-valve position
- Ambient pressure
- Intake-manifold pressure
- Pressure before the throttle valve (reference variable)

The electro-pneumatic pressure transducers are activated by the engine control unit on the basis of these variables. The result of this activation can be checked from the boost pressure achieved, which is measured before the throttle valve.

There follows a comparison of the boost pressure achieved with the set point data from the program map, which can if necessary give rise to an activation correction. The system therefore controls and monitors itself during operation.

Limp-home Mode

In the event during operation of malfunctions, implausible values or failure of any of the sensors involved in turbocharger control, activation of the wastegate valves is shut down and the valve flaps are thus fully opened. Turbocharging ceases at this point.

The list below sets out those components or functional groups of the N54 engine in which a failure, a malfunction or implausible values result in boost-pressure control being deactivated.

The driver is alerted to a fault of this type via an EML indication.

- High-pressure fuel system
- Inlet VANOS
- Exhaust VANOS
- Crankshaft sensor
- Camshaft sensor
- Boost-pressure sensor
- Knock sensors
- Intake-air temperature sensor

One principle of vehicle repair is particularly important in this respect:

It is important to focus on the causes rather than the effects.

With regard to diagnosis of the turbocharging system, always check the basics first. Look at such items as the vacuum hoses, the solenoids and the vacuum reservoir.

Don't overlook the fundamentals. Check compression, fuel system pressure (low and high), secondary ignition components etc.

The turbochargers are usually the last item to fail, but often one of the first items to be replaced.

Turbocharger Diagnosis

There are three "Golden Rules" to adhere to when diagnosing concerns on the N54 engine:

1. When diagnosing cases of smoke from the exhaust, it is important to avoid unnecessary replacement of the turbochargers. Smoke can be caused by oil consumption such as the crankcase ventilation system. Always evaluate the crankcase venting system completely before condemning any turbocharger components. Also, any engine is also subject to the usual causes such as valve guide wear or piston ring issues as on non-turbocharged engines.
2. Turbocharger damage is usually caused by -
 - Insufficient lubrication and subsequent bearing and seal failure.
 - Foreign bodies can damage the turbine and/or impeller.
 - Oil contamination
 - Restricted air filter

- Ensure that all duct work connections are tight and "leak-free". This situation can also result in engine noise.
3. Do not make any alterations or modifications to the turbocharger. Do not make any adjustments to the boost control linkage or any part of the turbocharger. Higher than normal boost pressure may have adverse and detrimental effects on the engine. Any modification will cause the engine management to enter in the "limp-home" program and will reduce performance and engine reliability.

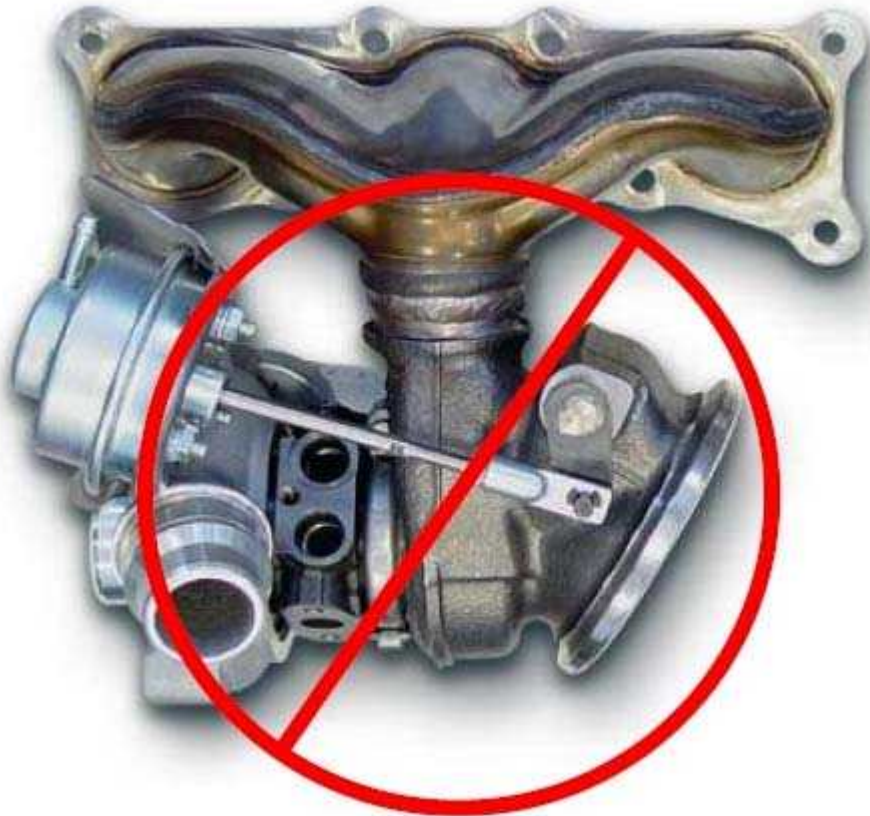


Fig. 44: Identifying Modifications To Turbochargers
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: No Modifications to the turbochargers are permitted.

Date:	Model:	Chassis:	Prod Date:	DISplus/GT-1 Software:		
Using the BMW diagnostic equipment, identify any available diagnostic options that can be used to troubleshoot the listed functions or components and mark each category accordingly.	Component Activation	Status Request	Test Plan	Signal Measurement	Notes/comments: (example: pin and connector assignments, "Function Selection" Path, Notes on Test Plans)	Service Function
	Function/System/Component	Diagnosis Options				
Charge-air pressure control/Wastegate valves						
Charge-air pressure control/Blow-off valves						
Charge-air pressure sensor						
Intake manifold pressure sensor						
Intake manifold temperature sensor						

Measure and record the following values for the listed components under the indicated operating conditions:

Component		Operating Condition		
		High manifold vacuum	Atmospheric pressure	Low to high boost
Wastegate Control Valve	Volts			
	Hz			
	Duty Cycle			
Charge-air Pressure Sensor	Volts			
	Hz			
	Cycle			
Intake Manifold Pressure Sensor	Volts			
	Hz			
	Duty Cycle			

Fig. 45: Identifying Diagnosis Function Table
Courtesy of BMW OF NORTH AMERICA, INC.

Hot-Film Air Mass Meter

Some new NG6 engines use a digital HFM. The output of the sensor is converted to a digital signal. This eliminates the need for signal conversion in the ECM. The signal corresponds proportionally to changes in air mass. The N54 engine uses a virtual HFM. The signal is "calculated" in the ECM from various parameters such as engine speed, intake air temperature, throttle position etc.

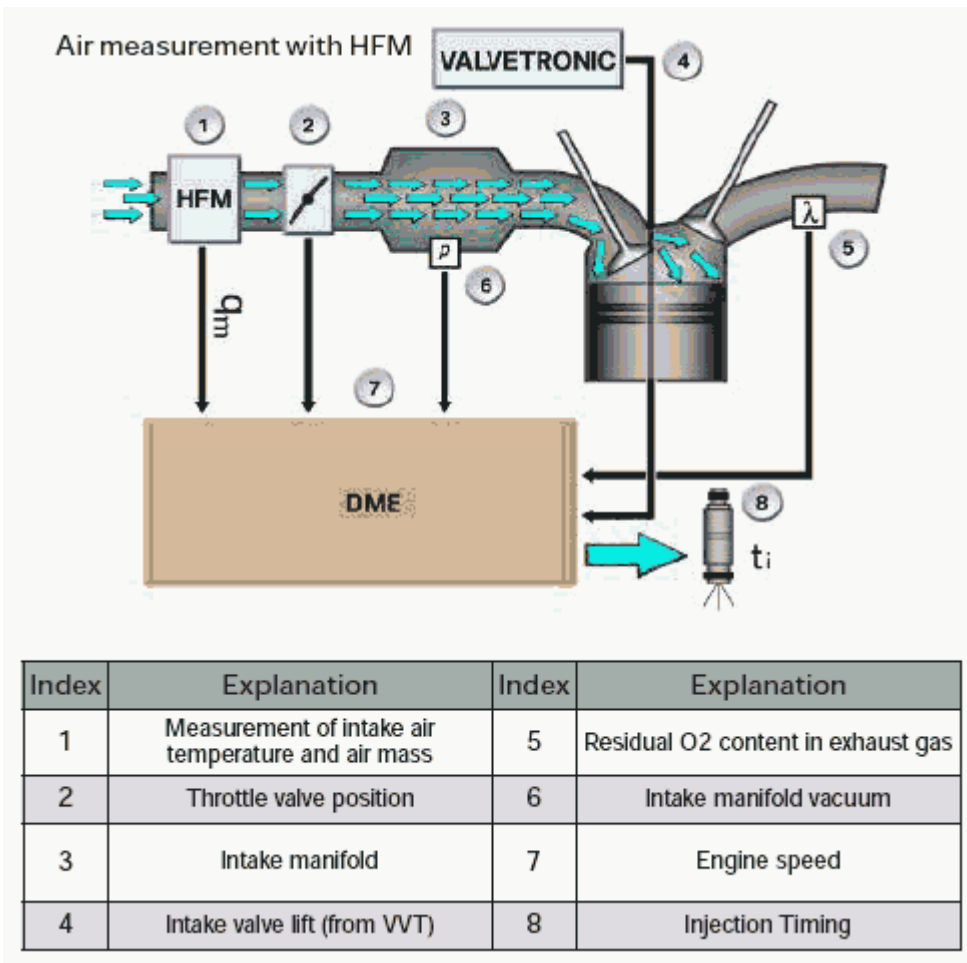


Fig. 46: Identifying Hot-Film Air Mass Meter Diagram (1 Of 2)
 Courtesy of BMW OF NORTH AMERICA, INC.

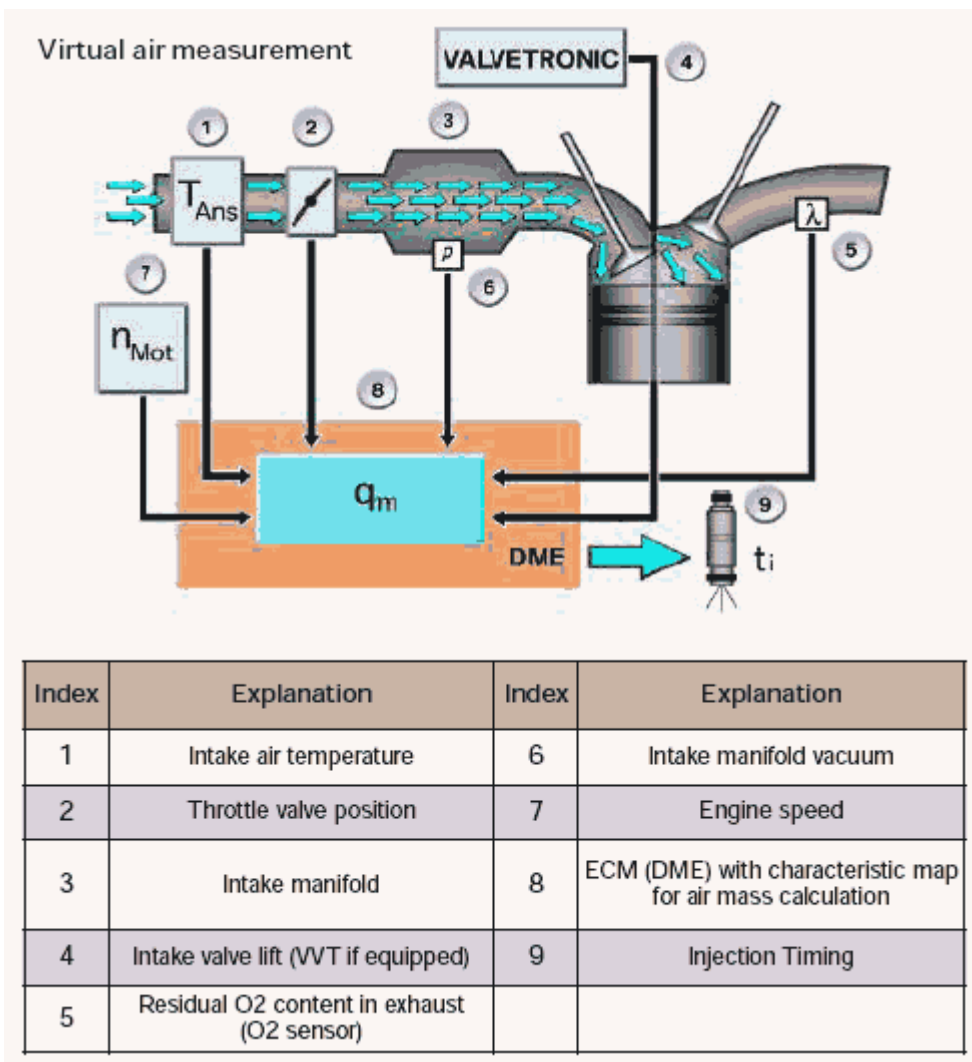


Fig. 47: Identifying Hot-Film Air Mass Meter Diagram (2 Of 2)
 Courtesy of BMW OF NORTH AMERICA, INC.

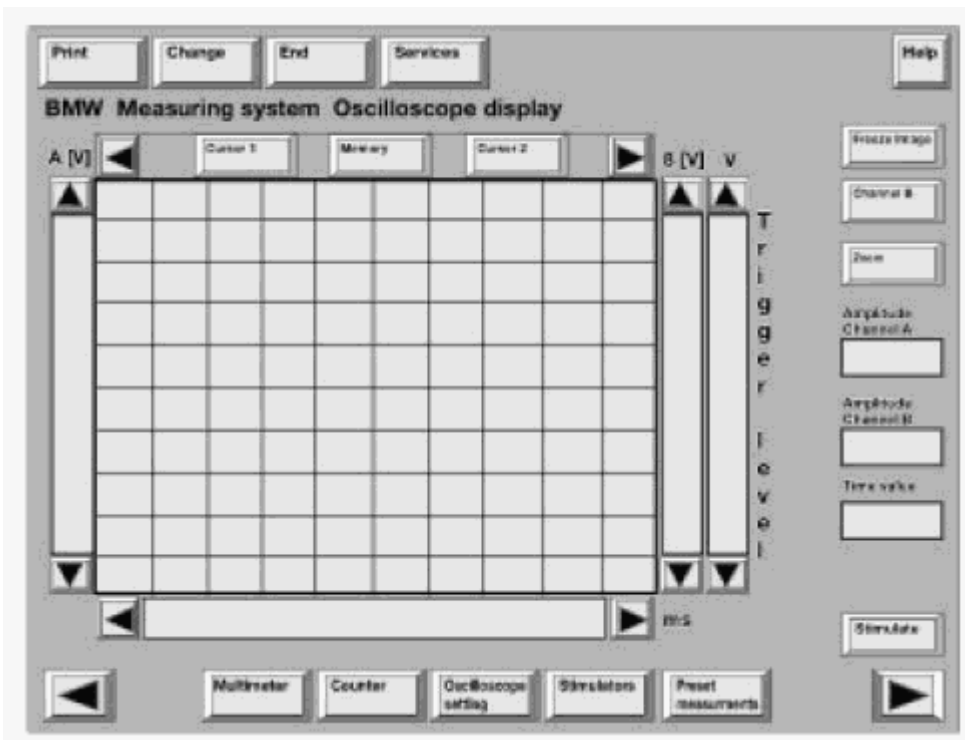


Fig. 48: Identifying BMW Measuring Oscilloscope Display Screen
 Courtesy of BMW OF NORTH AMERICA, INC.

Oscilloscope Settings						
	Channel A			Channel B		
Test Connection	MFK 1	MFK 2	KV	MFK 1	MFK 2	Trigger clip
Type of Measurement	AC	DC		AC	DC	
Frequency Range						
Trigger Source	Channel A	Channel B		Trigger Clip	KL1 (TD)	

Fig. 49: Identifying Oscilloscope Settings Table
 Courtesy of BMW OF NORTH AMERICA, INC.

FUEL SUPPLY AND MANAGEMENT

N52KP and N51 Fuel System

The N52KP and N51 engine continue to use the conventional "manifold injection" system carried over from the N52. The fuel supply components are also carried over with regard to the EKP module, fuel pump etc.

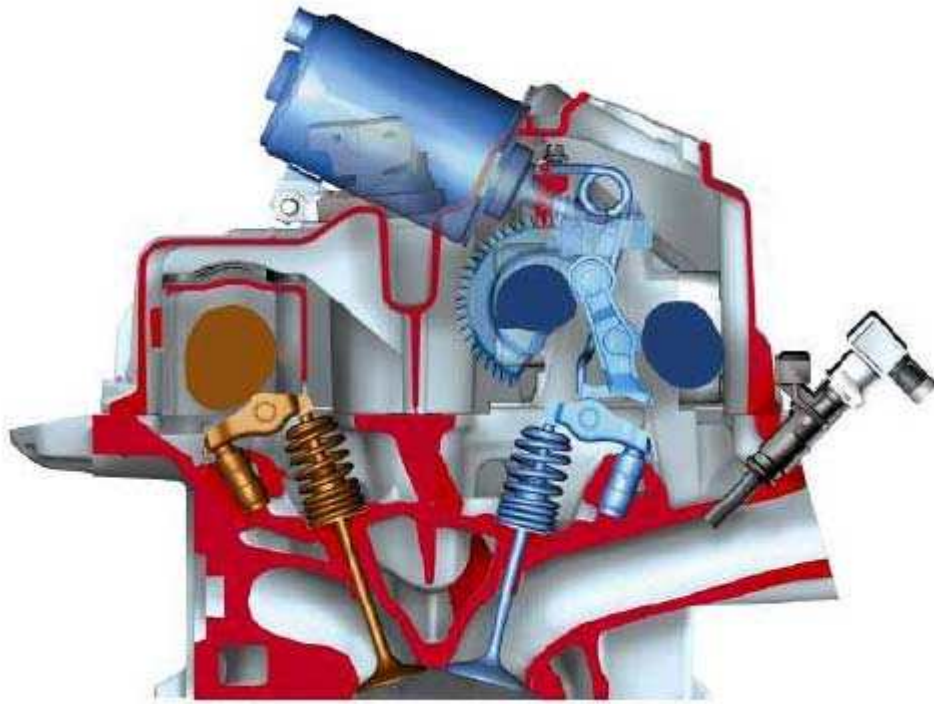


Fig. 50: Identifying Fuel Supply System
Courtesy of BMW OF NORTH AMERICA, INC.

N54 Engine

The N54 engine uses the new High Precision Injection (HPI) system. The HPI system is a "direct" fuel injection system which represents the second generation "DI" system from BMW. The first generation was on the N73 engine from 2003.

The N73 engine used a "wall guided" method of injection which used a recess in the piston to aid in mixture formation. The HPI system on the N54 uses a "spray guided" process which allows the mixture to form and ignite without the aid of any "walls" (i.e piston, cylinder wall etc.).

The spray guided system allows for more efficiency by cooling the cylinder charge without excessive cooling of the associated engine components. The wall guided system cools the piston crown which reduces thermal efficiency.

The HPI system also uses the new "piezo-electric" fuel injectors which are a vital components of the spray guided process. These new injectors open in an outward direction, which forms a precise tapered spray pattern.

With the aid of high system pressure (200 bar), the HPI system is now capable of providing new levels of efficiency which were not achievable with previous manifold injection systems.



Fig. 51: Identifying Manifold Injection Systems
Courtesy of BMW OF NORTH AMERICA, INC.



Index	Explanation	Index	Explanation
1	High-pressure line to injector (6)	6	Low-pressure sensor
2	Piezo injector	7	Fuel supply control valve
3	Fuel rail	8	Three plunger high pressure pump
4	High pressure sensor	9	High pressure line (pump to rail)
5	Feed line from in-tank pump		

Fig. 52: Identifying HPI Function Systems
 Courtesy of BMW OF NORTH AMERICA, INC.

HPI Function

The fuel is delivered from the fuel tank by the electric fuel pump via the feed line (5) at an "feed" pressure of 5 bar to the high pressure pump. The feed pressure is monitored by the low-pressure sensor (6). The fuel is delivered by the electric fuel pump in line with demand.

If this sensor fails, the electric fuel pump continues to run at 100% delivery with terminal 15 ON.

The high pressure pump is driven "in-tandem" with the vacuum pump which is driven by the oil pump chain drive assembly.

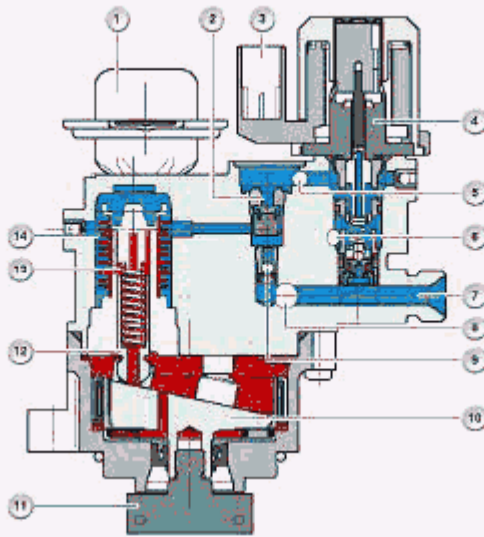
The fuel is compressed in the permanently driven three-plunger high-pressure pump (8) and delivery through the high-pressure line (9) to the rail (3). The fuel accumulated under pressure in the rail in this way is distributed via the high-pressure lines (1) to the piezo injectors (2).

The required fuel delivery pressure is determined by the engine-management system as a function of engine load and engine speed. The pressure level reached is recorded by the high-pressure sensor (4) and communicated to the engine control unit.

Control is effected by the fuel-supply control valve (7) by way of a setpoint/actual-value adjustment of the rail pressure. Configuration of the pressure is geared towards best possible consumption and smooth running of the N54 engine. 200 bar is required only at high load and low engine speed.

High Pressure Pump Function and Design

The fuel is delivered via the supply passage (6) at the admission pressure generated by the electric fuel pump to the high-pressure pump. From there, the fuel is directed via the fuel supply control valve (4) and the low-pressure non-return valve (2) into the fuel chamber (14) of the plunger-and-barrel assembly. The fuel is placed under pressure in this plunger-and-barrel assembly and delivered via the high pressure non-return valve (9) to the high pressure port (7).



Index	Explanation	Index	Explanation
1	Thermal compensator	8	Supply passage, pressure limiting valve
2	Low pressure non-return valve (check valve)	9	High pressure non-return valve (x 3)
3	Connection to engine management	10	Pendulum disc
4	Fuel supply control valve	11	Drive flange, high pressure pump
5	Return, pressure limiting valve	12	Plunger (x 3)
6	Supply from electric fuel pump (in-tank)	13	Oil filling, high pressure pump
7	High pressure port to fuel rail	14	Fuel chamber (x 3)

Fig. 53: Identifying High Pressure Pump Function & Design
 Courtesy of BMW OF NORTH AMERICA, INC.

The high-pressure pump is connected with the vacuum pump via the drive flange (11) and is thus also driven by the chain drive, i.e. as soon as the engine is running, the three plungers (12) are permanently set into up-and-down motion via the pendulum disc (10).

Fuel therefore continues to be pressurized for as long as new fuel is supplied to the high-pressure pump via the fuel-supply control valve (4). The fuel-supply control valve is activated by means of the engine management connection (3) and thereby admits the quantity of fuel required.

Pressure control is effected via the fuel-supply control valve by opening and closing of the fuel supply channel. The maximum pressure in the high-pressure area is limited to 245 bar.

If excessive pressure is encountered, the high-pressure circuit is relieved by a pressure-limiting valve via the ports (8 and 5) leading to the low-pressure area.

This is possible without any problems because of the non-compressibility of the fuel, i.e. the fuel does not change in volume in response to a change in pressure. The pressure peak created is compensated for by the

liquid volume in the low-pressure area.

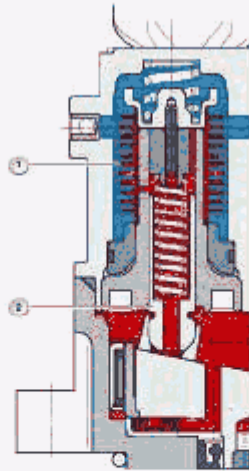
Volume changes caused by temperature changes are compensated for by the thermal compensator (1), which is connected with the pump oil filling.

Pressure Generation in High-pressure Pump

The plunger (2) driven by the pendulum disc presses oil (red) into the metal diaphragm (1) on its upward travel. The resulting change in volume of the metal diaphragm thereby reduces the available space in the fuel chamber. The fuel thereby placed under pressure (blue) is forced into the rail.

The fuel-supply control valve controls the fuel pressure in the rail. It is activated by the engine management system via a pulse-width modulated (PWM) signal.

Depending on the activation signal, a restrictor cross-section of varying size is opened and the fuel-mass flow required for the respective load point is set. There is also the possibility of reducing the pressure in the rail.



Index	Explanation
Red	Oil filling
Blue	Fuel
1	Metal diaphragm
2	Plunger

Fig. 54: Pressure Generation In High-Pressure Pump
Courtesy of BMW OF NORTH AMERICA, INC.



Fig. 55: Identifying High-Pressure Pump Location (HDP)
Courtesy of BMW OF NORTH AMERICA, INC.

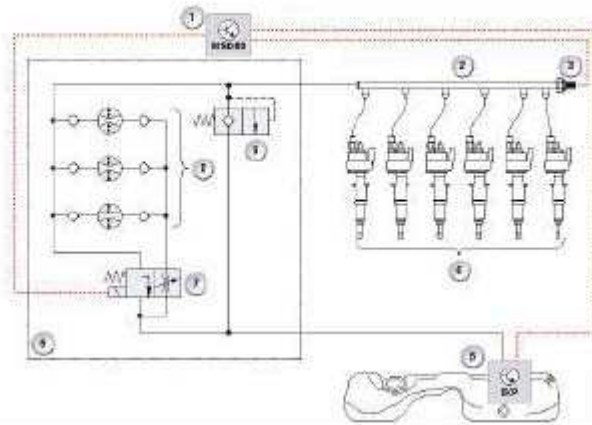
Limp-Home Mode

If a fault is diagnosed in the system, such as e.g. failure of the high-pressure sensor, the fuel-supply control valve is de-energized; the fuel then flows via a so-called bypass into the rail.

In the event of HPI limp-home mode, turbocharging is deactivated by an opening of the wastegate valves.

Causes of HPI limp-home mode can be:

- Implausible high-pressure sensor values
- Failure of the fuel-supply control valve
- Leakage in the high-pressure system
- Failure of the high-pressure pump
- Failure of the high-pressure sensor



Index	Explanation	Index	Explanation
1	Engine control module (MSD80)	6	High-pressure pump
2	Fuel rail	7	Fuel supply control valve
3	High pressure sensor	8	High pressure pump with non-return valves
4	Piezo injectors	9	Pressure limiting valve with bypass
5	Electric fuel pump		

Fig. 56: Identifying Limp-Home Mode Diagram
 Courtesy of BMW OF NORTH AMERICA, INC.

Fuel System Safety

Working on this fuel system is only permitted after the engine has cooled down. The coolant temperature must not exceed 40°C. This must be observed without fail because otherwise there is a danger of fuel sprayback on account of the residual pressure in the high-pressure system.

When working on the high-pressure fuel system, take particular care to ensure conditions of absolute cleanliness and follow the work sequences described in the repair instructions. Even the tiniest contaminant's and damage to the screw connections on the high-pressure lines can cause leaks.

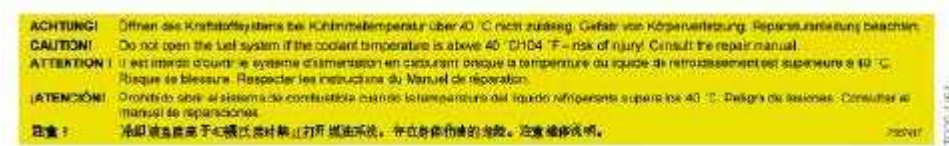


Fig. 57: Identifying Fuel System Safety Label
 Courtesy of BMW OF NORTH AMERICA, INC.



Fig. 58: Identifying High-Pressure Fuel Lines
Courtesy of BMW OF NORTH AMERICA, INC.

Piezo Fuel Injectors

It is the outward-opening piezo-injector that renders possible spray-directed direct injection and thus the overall innovations of the N54 engine. Due to the fact that only this component ensures that the injected fuel spray cone remains stable, even under the prevailing influences of pressure and temperature in the combustion chamber.

This piezo-injector permits injection pressures of up to 200 bar and extremely quick opening of the nozzle needle. In this way, it is possible to inject fuel into the combustion chamber under conditions released from the power cycles limited by the valve opening times.

The piezo-injector is integrated together with the spark plug centrally between the inlet and exhaust valves in the cylinder head. This installation position prevents the cylinder walls or the piston crown from being wetted with injected fuel. A uniform formation of the homogeneous air/fuel mixture is obtained with the aid of the gas movement in the combustion chamber and a stable fuel spray cone.



Fig. 59: Identifying Piezo Fuel Injectors
Courtesy of BMW OF NORTH AMERICA, INC.

The gas movement is influenced on the one hand by the geometry of the intake passages and on the other hand by the shape of the piston crown.

The injected fuel is swirled in the combustion chamber with the boost air until a homogeneous mixture is available throughout the compression space at the point of ignition.

NOTE: When working on the fuel system of the N54 engine, it is important to ensure that the ignition coils are not fouled by fuel. The resistance of the silicone material is significantly reduced by heavy fuel contact. This can cause secondary ignition misfires.

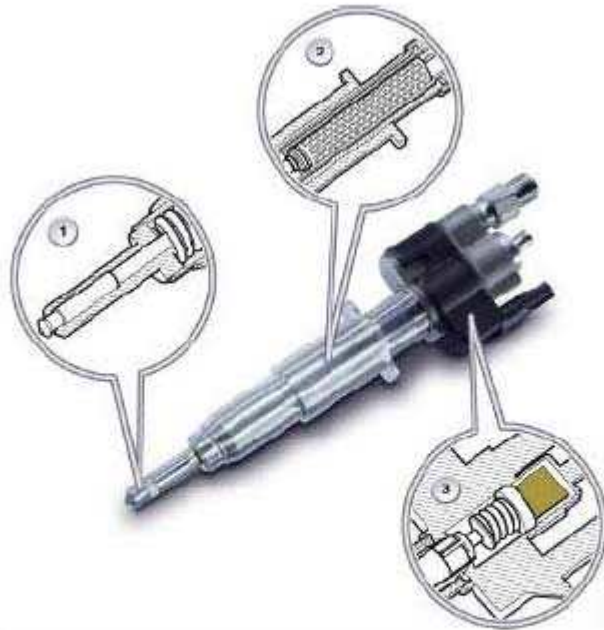
- Before performing any repairs to the fuel system, remove the ignition coils without fail and protect the spark-plug slot against the ingress of fuel with a cloth.
- Before refitting the piezo-injector, remove the ignition coils and ensure conditions of absolute cleanliness.
- Ignition coils heavily fouled by fuel must be replaced.

Injector Design and Function

The piezo-injector essentially consists of three sub-assemblies. The expansion of the energized piezo-element lifts the nozzle needle outwards from its valve seat. To be able to counter the different operating temperatures with comparable valve lifts, the injector has a thermal compensating element.

The nozzle needle is pressed outwards from its tapered valve seat. This opens up an annular orifice. The

pressurized fuel flows through this annular orifice and forms a hollow cone, the spray angle of which is not dependent on the backpressure in the combustion chamber.



Index	Explanation
1	Outward opening nozzle needle
2	Piezo-element
3	Thermal compensator

Fig. 60: Identifying Injector Design & Function
 Courtesy of BMW OF NORTH AMERICA, INC.

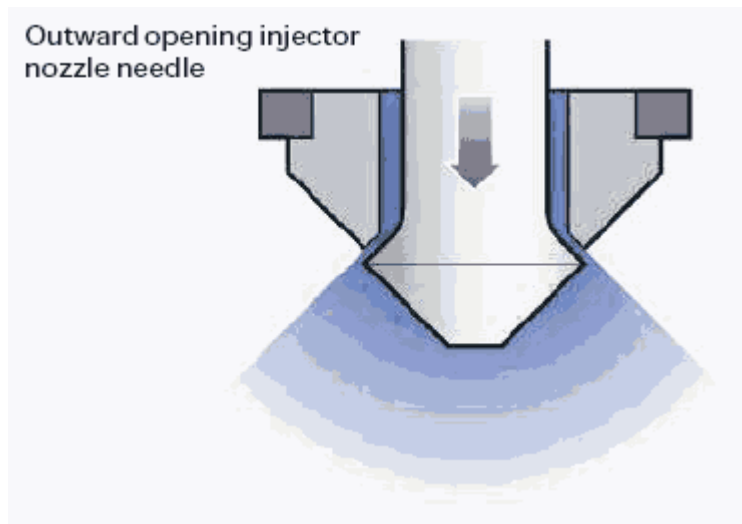
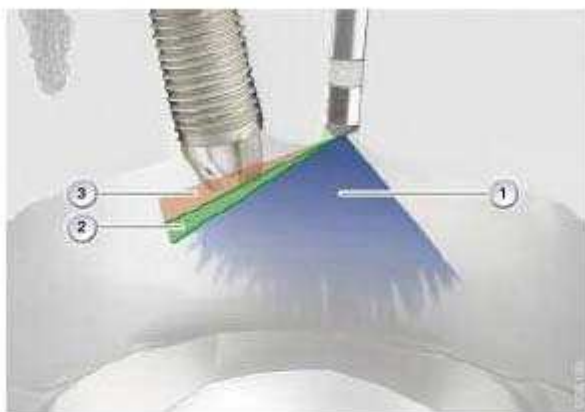


Fig. 61: Identifying Outward Opening Injector Nozzle Needle
 Courtesy of BMW OF NORTH AMERICA, INC.

The spray cone (1) of a piezo-injector can diverge during operation (2). Due to the formation of soot inside the engine, such divergence is perfectly normal and acceptable to a certain extent.

If, however, spray divergence reaches the stage where it begins to spray the spark plug wet, the spark plug may incur damage.



Index	Explanation
1	Ideal "spray" cone
2	Permitted divergence of spray cone
3	Non-permitted divergence of spray cone

Fig. 62: Identifying Spray Piezo-Injector Operation

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Do not attempt to clean the injectors in any way.

This may result in damage which can effect the spray pattern. Any divergence in the spray pattern can cause damage to the spark plug or the engine itself.

NOTE: Replace the Teflon sealing ring when fitting and removing the piezo-injector. This also applies when an injector that has just been fitted has to be removed again after an engine start. A piezo-injector provided with a new Teflon sealing ring should be fitted as quickly as possible because the Teflon sealing ring could swell up. Please observe the repair instructions and follow without fail.

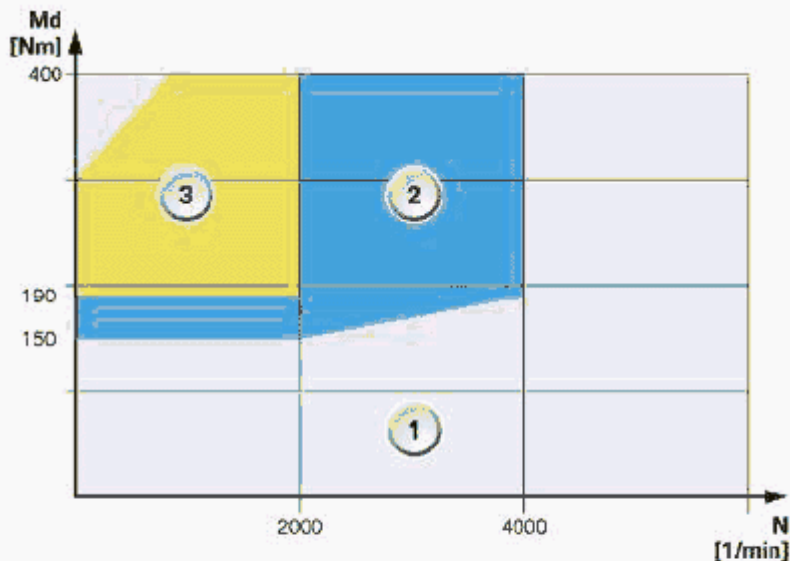
When fitting, make sure that the piezo injector is correctly seated. The hold-down element for securing the piezo-injectors must rest on both injector tabs, otherwise the necessary force is not applied to the piezo-injector.

Injection Strategy

Injection of the fuel mass required for the operating situation can take place in up to three individual injections. Which option is used in the relevant operating situation is dependent on engine load and speed. Here, the actual time resulting from the engine speed available for metering the fuel is an important framework quantity.

A special situation during the operation of any engine is the range in which a high load occurs at low engine speed, so-called "Low End Torque" operation. In this operating situation, the required fuel mass is metered to the engine in three individual injections.

This results in a highly effective mixture formation which in the final analysis has the effect of both increasing power output and saving fuel.



Index	Explanation
1	Single injection event
2	Double injection event
3	Triple injection event

Fig. 63: Identifying Injection Strategy
 Courtesy of BMW OF NORTH AMERICA, INC.

In order to bring the catalytic converters up to operating temperature as quickly as possible, the N54 engine has a catalyst-heating mode for when the engine is started from cold. In this mode, combustion heat is intentionally introduced into the exhaust train and not used first and foremost to develop power output.

The point of ignition is moved to 30° (crankshaft degrees) after TDC. The main quantity of the required fuel is injected before TDC and mixed with the boost air. The piston is situated after TDC in its downward travel such that the air/fuel mixture is already expanding again, which reduces the ignitability of the mixture.

In order to ignite the mixture reliably, a small residual quantity of fuel is injected 25° after TDC and this guarantees an ignitable mixture at the spark plug. This small fuel quantity therefore provides for ignition of the residual charge in the combustion chamber.

This operating mode is set by the engine-management system after a maximum period of 60 seconds from engine starting but is terminated if the catalytic-converter response temperature is reached earlier.

Piezo Element

The movement of the nozzle needle in the injector is generated no longer by a solenoid coil but rather by a piezo-element.

A piezo-element is an electromechanical converter, i.e. it consists of a ceramic material which converts electrical energy directly into mechanical energy (force/travel). A familiar application is the piezo cigarette lighter - when a piezo-crystal is pressed, voltage is generated until a spark flashes over and the gas ignites.

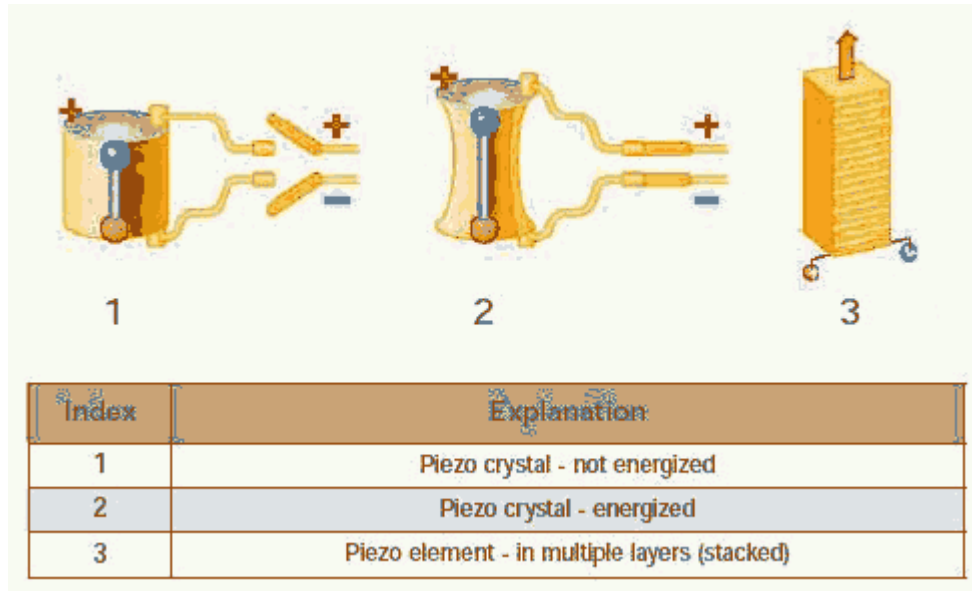


Fig. 64: Identifying Piezo Element
Courtesy of BMW OF NORTH AMERICA, INC.

In the case of the piezo-actuator, voltage is generated so that the crystal expands. In order to achieve greater travel, it is possible to design a piezo-element in several layers.

The actuator module consists of layers of the piezo-ceramic material connected mechanically in series and electrically in parallel. The deflection of a piezo-crystal is dependent on the applied voltage up to a maximum deflection; the higher the voltage, the greater the travel.

Injector Adjustment

When the injectors are manufactured, a multitude of measurement data is recorded at specific points in the factory. In this way, the tolerance ranges for injector-quantity adjustment are determined and specified in a six-digit number combination.

Information on the lift performance of the injector is also added for injector voltage adjustment. Injector adjustment is required because of the individual voltage demand of each piezo actuator. An allocation is made to a voltage demand category, which is included in the number combination on the injector.

These data items are transmitted to the ECM. During engine operation, these values are used to compensate for deviations in the metering and switching performance.

NOTE: When replacing an injector, it is absolutely essentially to carry out an injector adjustment.



Fig. 65: Identifying Tolerance Range Numbers
Courtesy of BMW OF NORTH AMERICA, INC.

Injector Control and Adaptation

The fuel mass required for the operating situation is injected by the piezo-injector into the combustion chamber. This mass can be influenced by three correcting variables:

- the rail pressure
- the injector opening time
- and the injector opening lift

The injector opening time and the injector opening lift are activated directly at the piezo injector. The opening time is controlled via the ti signal and the opening lift via the energy quantity in the activation of the piezo-injector.

Injector Adaptation

The fuel masses and injection cycles determined from the load/speed map are included in a pilot-control program map. Here, while further framework parameters are taken into consideration, the energy quantities and injector opening times required to activate the injectors are determined.

The N54 engine can be safely and reliably operated with these program-map values.

Optimization

For optimization of:

- Emission values

- Smooth running
- Fuel consumption
- Power output

The controlled variables of energy quantities and injector opening times are continuously monitored. This occurs on a bank-selective basis by way of lambda closed-loop control.

The residual oxygen in the exhaust gas is measured in each case for cylinder bank 1 and cylinder bank 2. This measurement result is compared with the values expected from the set correcting variables. The result of a deviation is that the injector opening signal is adapted. This adaptation is stored in the control unit and is therefore available for subsequent engine operation.

However, these stored values are lost when the system is flashed and must be relearned. A further adaptation of the injector activation takes place depending on time and use. This cylinder-selective adaptation involves a check of the residual-oxygen content with a conclusion as to the cylinder causing the situation. To this end, it is necessary for part of the exhaust-gas flow not to be swirled in the turbocharger. For this reason, the flap of the wastegate valve must be fully opened, i.e. swung out of the exhaust-gas flow.

This wastegate-flap position extends beyond its normal opening position in engine operation. Based on the result of this cylinder-selective monitoring, the energy quantity is adapted if necessary to activate the injectors.

Furthermore, the cylinder-selective adaptation includes if necessary an adaptation of the injector opening signal based on smooth running monitoring of the N54 engine. Overall adaptation of the injectors is limited to a 15% additional quantity.

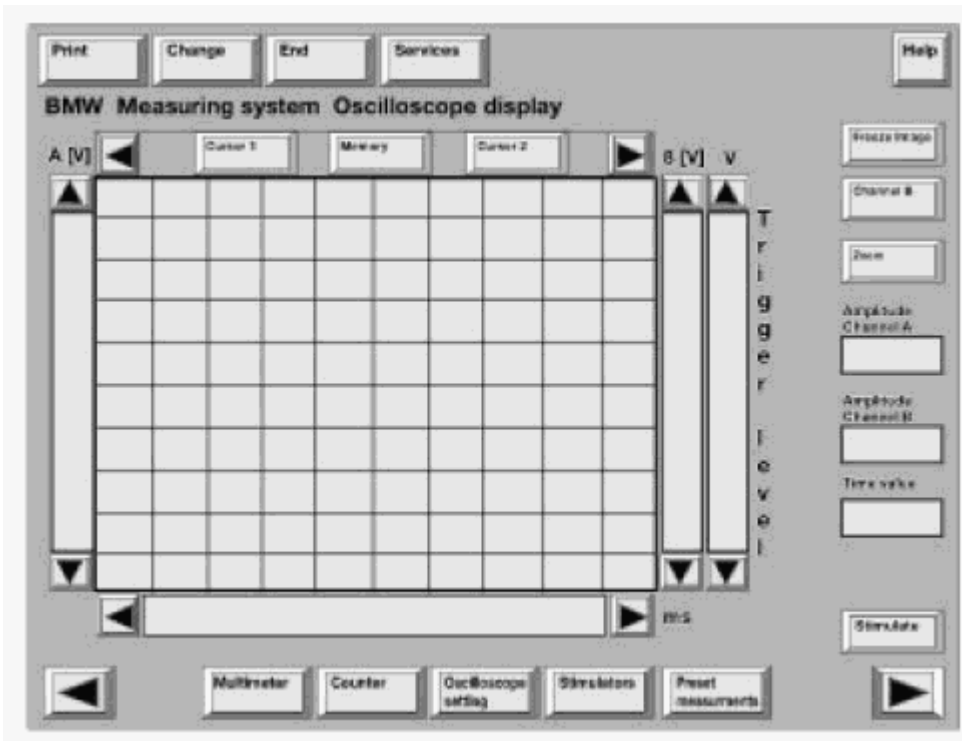


Fig. 66: Identifying BMW Measuring Oscilloscope Display Screen

Oscilloscope Settings						
	Channel A			Channel B		
Test Connection	MFK 1	MFK 2	KV	MFK 1	MFK 2	Trigger clip
Type of Measurement	AC	DC		AC	DC	
Frequency Range						
Trigger Source	Channel A	Channel B		Trigger Clip	KL1 (TD)	

Fig. 67: Identifying Oscilloscope Settings Table
 Courtesy of BMW OF NORTH AMERICA, INC.

Date:	Model:	Chassis:	Prod Date:	DISplus/GT-1 Software:			
Using the BMW diagnostic equipment, identify any available diagnostic options that can be used to troubleshoot the listed functions or components and mark each category accordingly.		Component Activation	Status Request	Test Plan	Signal Measurement	Notes/comments: (example: pin and connector assignments, "Function Selection" Path, Notes on Test Plans)	Service Function
Function/System/Component		Diagnosis Options			Additional Information		Purpose
Injection control/fuel injectors							
Low pressure fuel system/ In-tank fuel pump							
Low pressure fuel system/ Pressure sensor							
High pressure fuel system/Pressure control valve							
High pressure fuel system/Pressure sensor							

Can injectors be interchanged from one cylinder to another for testing purposes? _____
 What requirements would be necessary in order to accomplish this? _____
 or
 Why is this not recommended? _____

Component		Operating Condition			
		Start	Cold Idle	Warm Idle	High Load
High pressure control valve	Volts				
	Hz				
	Duty Cycle				
Rail pressure sensor	Volts				
	Hz				
	Cycle				
Inlet pressure sensor	Volts				
	Hz				
	Duty Cycle				

Fig. 68: Identifying HPI Injection Testing Table
 Courtesy of BMW OF NORTH AMERICA, INC.

IGNITION MANAGEMENT

Most of the ignition system components have remained the same for all NG6 engines for 2007. There are some minor changes to the ignition coils that apply to all versions. The coils have been optimized for more durability.

Spark Plugs

The spark plugs for the N51 and N52KP remain the same as N52. However, the N54 uses a completely new spark plug from Bosch. The spark plug design consists of a 12 mm thread which contrasts from the 14 mm design on the N52 which prevents any possibility of improper installation.

The hex on the spark plug is also a 12 point design which requires a special tool. The tool (socket) has a "thinwall" design to facilitate access in the confined area of the N54 cylinder head.



Fig. 69: Identifying Spark Plugs
Courtesy of BMW OF NORTH AMERICA, INC.

Spark Plug Diagnosis (N54)

Due to the proximity of the spark plug to the fuel injector nozzle, any divergence in the fuel spray may cause possible spark plug damage. This makes spark plug diagnosis an important part of N54 service concerns. Information gained by the spark plug diagnosis may indicate possible fuel injector faults. Spark plug replacement interval has been reduced to 45,000 miles for the N54.

The **Fig. 70** below can be used to assist in diagnosis:

Spark plug showing normal wear pattern for low mileage



Spark plug showing normal wear pattern for high mileage



Spark plug showing abnormal wear pattern - look for possible fuel spray diversion



Spark plug showing abnormal wear pattern - look for possible fuel spray diversion



Fig. 70: Identifying Spark Plug Wear Pattern
Courtesy of BMW OF NORTH AMERICA, INC.

EMISSIONS MANAGEMENT

The N54 and N52KP meet ULEV II requirements for 2007. There are not many changes to the emission systems on these engines. The N54 engine has 2 underbody catalysts in addition to the "near engine" catalysts already in use from the N52.

The N51 engine, however, is a SULEV II compliant engine which meets the 2007 requirements. In addition to the 5 existing SULEV states of California, New York, Maine, Massachusetts, and Vermont - four states have been added for 2007. These states include, Connecticut, Rhode Island, Oregon and Washington State.

The N51 emissions measures include:

- Secondary Air System with mini-HFM
- Radiator with "Prem-air" coating
- Lower compression ratio (10:1) via modified combustion chamber and pistons
- Underbody catalyst in addition to "near engine" catalyst
- Activated carbon air filter in air filter housing
- Steel fuel lines with threaded fittings and sealed fuel tank

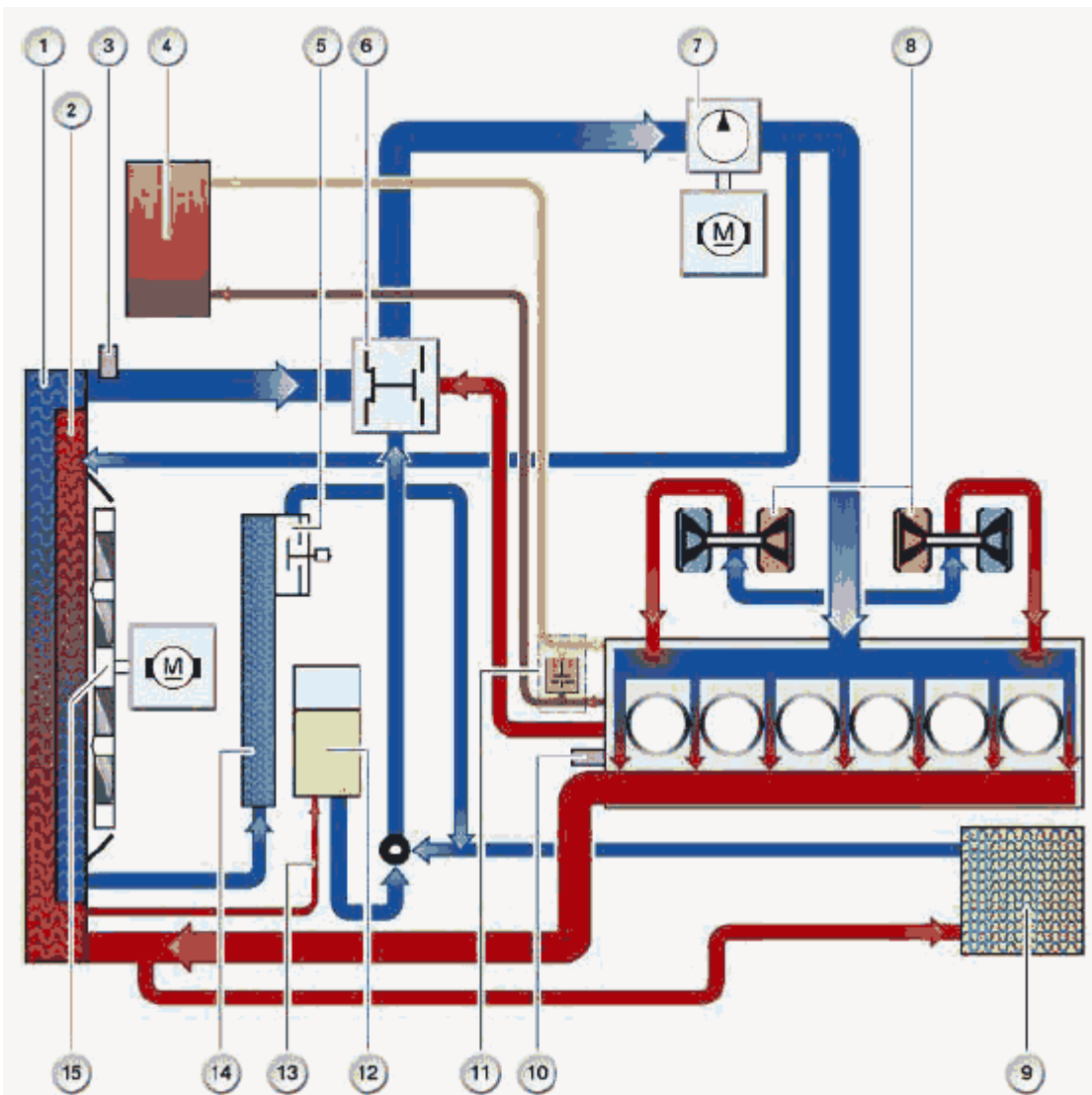
- Crankcase ventilation system integrated into cylinder head cover
- Purge system piping made from optimized plastic

NOTE: The SULEV II information above is only preliminary and is accurate as of 8/06. Additional information will be released as it becomes available.

PERFORMANCE CONTROLS

Cooling System

The cooling system of the N54 engine consists of a radiator circuit and an isolated oil cooling circuit. The fact that there is an isolated oil-cooling circuit ensures that heat is not introduced via the engine oil into the engine's coolant system.



Index	Explanation	Index	Explanation
1	Radiator	9	Heat exchanger
2	Gear-box oil cooler	10	Outlet temperature sensor, cylinder head
3	Outlet temperature sensor	11	Thermostat, engine oil cooler
4	Engine oil cooler	12	Coolant expansion tank
5	Thermostat for gearbox oil cooler	13	Vent line
6	Map thermostat	14	Gearbox oil cooler
7	Electric coolant pump	15	Fan

Fig. 71: Identifying Cooling System Diagram
Courtesy of BMW OF NORTH AMERICA, INC.

There is a significantly greater quantity of heat on account of this engine's increased power of 75.5 kW/l in comparison with other 3-liter spark-ignition engines.

This boundary condition is satisfied by the engine cooling system with its increased performance. This increase in power was to be realized in spite of some factors less advantageous to cooling.

Factors to be mentioned here are:

- Approximately 15% less flow area is available on account of the intercooler located below the radiator.
- The already small amount of space provided by the engine compartment is further limited by the accommodation of further components.
- Because the exhaust turbochargers are cooled by the coolant, an additional quantity of heat is introduced into the system via these turbochargers.

Measures for increasing cooling-system performance:

- Coolant pump with increased power - 400 W/9000 l/h
- Separation of water and engine-oil cooling
- Radiator with increased power
- Electric fan with increased power 600W for all gearbox variants

The structure of the coolant circuit is the same as that of the N52 engine. The engine is flushed through with coolant in accordance with the cross-flow concept. Cooling output can be influenced as a function of load by activating the following components:

- Electric fan
- Electric coolant pump
- Map thermostat

It is also possible that an N54 engine equipped with an automatic gearbox to utilize the lower area of the radiator to cool the gearbox by means of the gearbox oil cooler. This is achieved as in the N52 engine with control sleeves, which are introduced into the radiator tank.

Engine-oil Cooling

The N54 engine is equipped with a high-performance engine oil cooler. The pendulum slide pump delivers the oil from the oil sump to the oil filter. A thermostat flanged to the oil filter housing admits the oil to the engine-oil cooler. The engine oil cooler is located in the right wheel arch in the E92. The thermostat can reduce the resistance opposing the oil by opening the bypass line between the feed and return lines of the engine oil cooler. This ensures that the engine warms up safely and quickly.

Radiator

Design measures have been used to increase the performance of the radiator itself. The performance of a radiator is dependent on its radiation surface. However, the intercooler location had to be underneath the radiator, and this meant that it was necessary to compensate for the smaller flow area available.

Compared with the N52 engine, the radiator used in the N54 engine has a block depth which has been increased to 32 mm. In addition, the water pipes are situated closer together than in previously used radiators. The upshot of this is an increase in the utilizable radiation surface.

Electric Coolant Pump

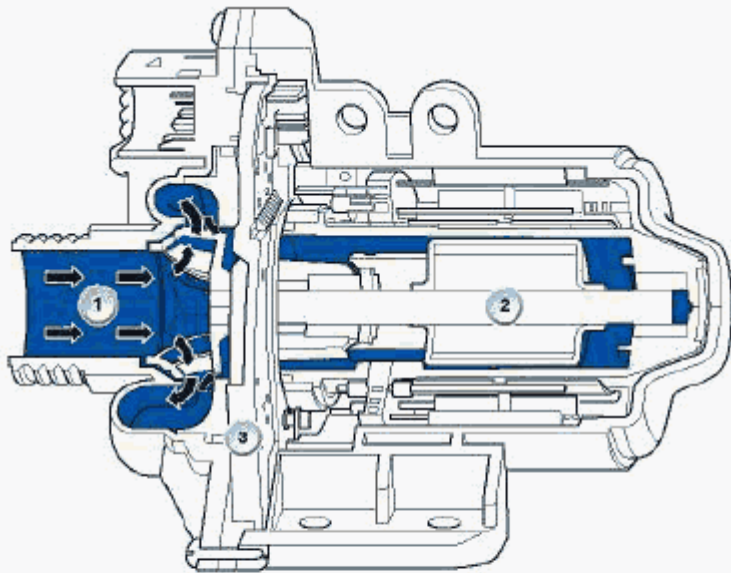
The coolant pump of the N54 engine is an electrically driven centrifugal pump with a power output of 400W and a maximum flow rate of 9000 l/h. This represents a significant increase in power of the electric coolant pump used in the N52 engine, which has a power output of 200 W and a maximum flow rate of 7000 l/h.

The power of the electric wet-rotor motor is electronically controlled by the electronic module (3) in the pump. The electronic module is connected via the bit-serial data interface (BSD) to the MSD80 engine control unit.

The engine control unit uses the engine load, the operating mode and the data from the temperature sensors to calculate the required cooling output.

Based on this data, the engine control unit issues the corresponding command to the electric coolant pump. The electric coolant pump regulates its speed in accordance with this command.

The system coolant flows through the motor of the coolant pump, thus cooling both the motor as well as the electronic module. The coolant lubricates the bearings of the electric coolant pump.



Index	Explanation
1	Pump
2	Pump motor
3	Electric Water Pump module

Fig. 72: Identifying Engine-Oil Cooling Diagram

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The same rules apply to all electric coolant pumps. The pump must be filled with coolant when removed for service to prevent any corrosion. Also, the pump impeller must be turned by hand before installation to ensure the pump is not seized.

GENERAL INFORMATION

New Engine Technology - Overview

BASIC MEASURING TECHNIQUES

Model: All

BASIC ENGINE MEASUREMENTS

During the course of engine repairs some basic engine measurements are required to verify engine diagnosis as well as to complete proper repairs. These measurements are made by precision measuring tools such as micrometers, Vernier calipers, cylinder bore gauges and dial indicators.

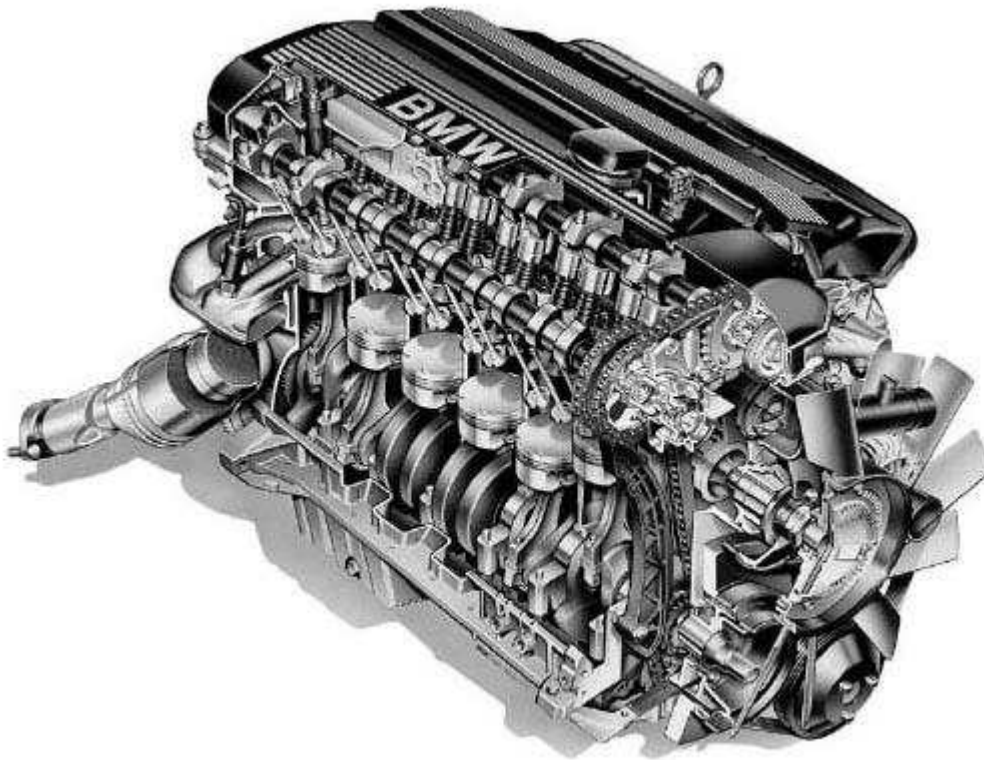


Fig. 1: Identifying Basic Engine Measurements
Courtesy of BMW OF NORTH AMERICA, INC.

Also, a working knowledge of the metric system is also a vital skill that is needed by the technician. All BMW engine measurements consist of metric specifications. Some of the routine engine measurements performed include:

- Valve Guide Wear (Tilt Angle K)
- Cylinder Bore Measurements (Taper and Out-of-Round)
- Cylinder Head Warpage and Thickness

- Axial and Radial Endplay Measurements (Crankshaft/Camshaft etc).

Among all of the skills possessed by a modern technician, basic measuring techniques are perhaps the most overlooked and least used. This is why it is important to review these skills from time to time as a refresher.

Also, it is necessary to access technical data to obtain the proper specifications for these measurements. This course is designed to review measuring techniques to assist in engine diagnosis.

Vernier Measurement

The Vernier scale is used on various measuring tools such as the Vernier caliper and the Depth Gauge. The Vernier scale can be used with Fractional (US) and Metric systems. For the purposes of this training module we will always refer to the Metric Vernier scale.

The Vernier scale consists of a fixed scale and a sliding scale. The fixed scale is divided with graduations in 1 millimeter increments. The sliding scale has 10 graduations in increments of .5.

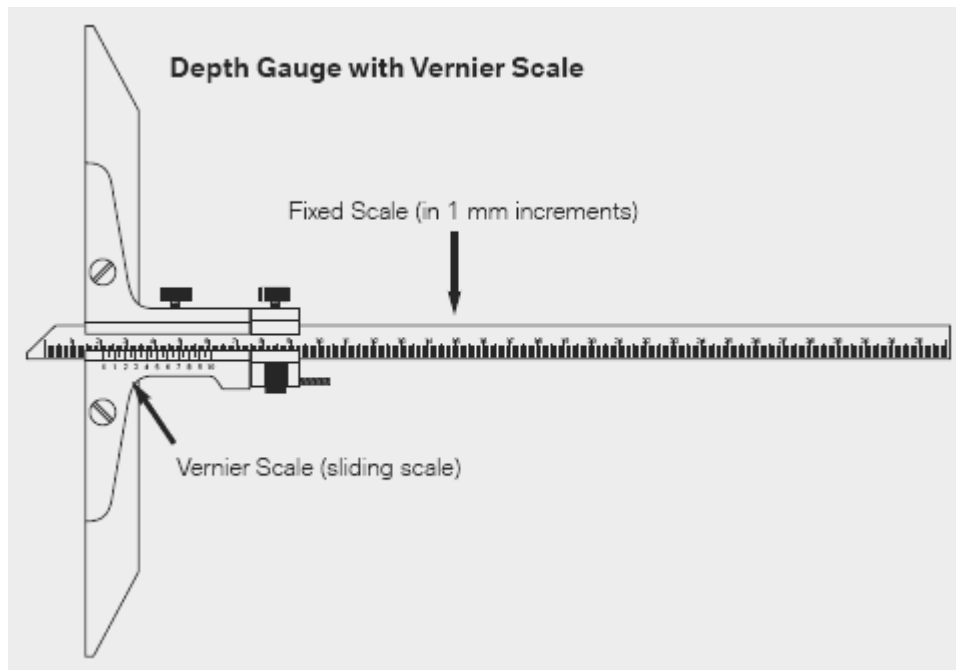


Fig. 2: Identifying Depth Gauge With Vernier Scale
Courtesy of BMW OF NORTH AMERICA, INC.

In order to read a measurement, use the zero mark on the left end of the vernier scale to use as a guide to read a measurement on the fixed scale.

In the example shown at the right, the zero mark is resting between 26 and 27 mm. Therefore the base measurement is 26 mm.

Next, the decimal measurement must be taken. For this, find a line on the Vernier that most closely matches any line on the fixed scale.

Using the example drawing, the "4" on the Vernier scale is lining up directly with a line on the fixed scale.

Combining the previous reading with this reading, the result would be 26.4 mm.

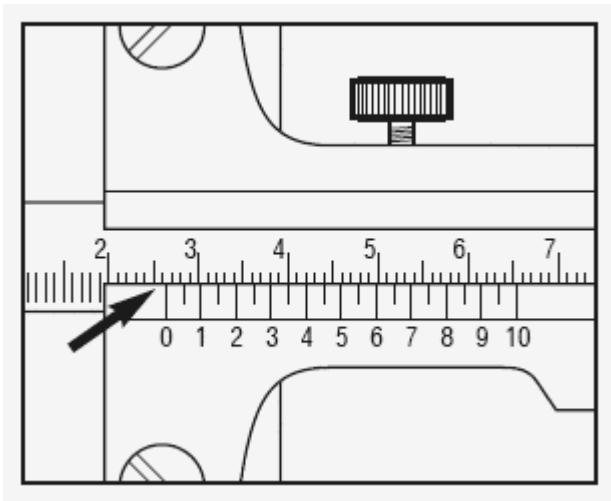


Fig. 3: Identifying Read Measurement, Zero Mark On Left End Of Vernier Scales
Courtesy of BMW OF NORTH AMERICA, INC.

The designations on the Vernier scale are in increments of .5. For example, if a reading on the Vernier scale falls on the .5 (i.e. 2.5, 3.5 etc) designation this would indicate 5/100th's of a millimeter.

Micrometer Measurements

Another valuable measuring tool is the micrometer, which can be used for measurements such as bearing journal diameter, cylinder head thickness, valve shim thickness and brake rotor thickness etc. Micrometers also come in configurations for inside measurements as well.

The micrometer scale comes in both fractional and metric varieties. We will cover only the metric micrometer scale in this course.

First you must familiarize yourself with the construction of the micrometer in order to understand how measurements are made.

Metric Micrometer Construction

The micrometer is constructed of a few basic parts. The actual item to be measured is placed between the anvil and the spindle. The micrometer can be adjusted to the approximate size using the thimble. The thimble should only be used for the coarse adjustment. In order to make the actual measurement, the micrometer should only be turned using the ratchet (a.k.a. the friction stop). Do not attempt to make a measurement using the thimble. This will give an inaccurate measurement and ultimately damage the micrometer.

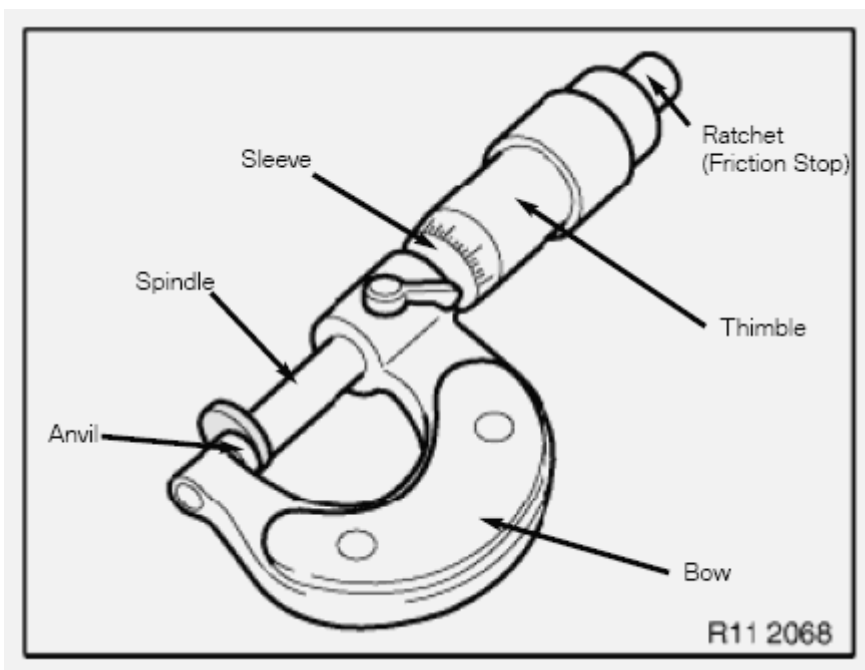


Fig. 4: Identifying Metric Micrometer Construction And Spindle
Courtesy of BMW OF NORTH AMERICA, INC.

Micrometers are available in various sizes for outside as well as inside measurements. The more common variation is the outside micrometer. They are usually available in 25 millimeter increments such as 0-25 mm, 25-50 mm, 50-75 mm etc.

The metric micrometer can measure in increments of one hundredth of a millimeter (.01mm). One hundredth of a millimeter is equal to 0.0003937 inch which is less than one thousandth of an inch.

The measurement area of the micrometer consists of the sleeve scale and the thimble scale. The sleeve scale is used to read whole and half millimeters. The thimble scale (which rotates) reads in hundredths (.01) of a millimeter from zero to fifty. Two complete revolutions of the thimble equals one millimeter.

On the sleeve scale, each scale mark above the center line indicates whole millimeters. Below the center line, half of a millimeter (or .5mm) increments are indicated.

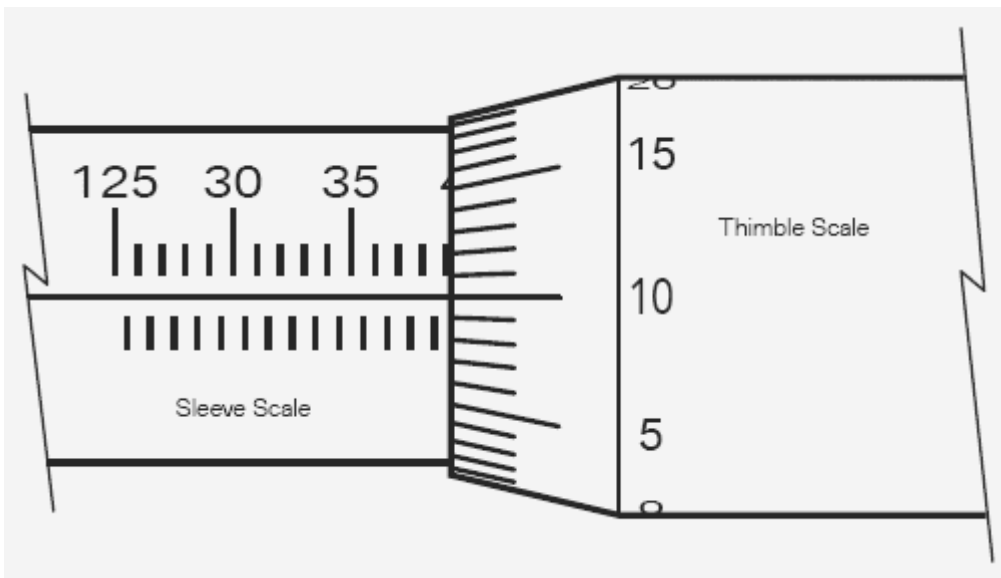


Fig. 5: Identifying Sleeve Scale

Courtesy of BMW OF NORTH AMERICA, INC.

Using the example shown above, the micrometer is a 125-150mm micrometer. To read this micrometer, first take the basic reading from the sleeve scale. The thimble is past the 139 mm mark. Therefore the reading is a least 139 mm. Next, look at the thimble scale and note the reading on the centerline. The "10" on the thimble scale is lined up with the centerline. This indicates a reading of .10 mm. If you add the two readings; $139 + .10 = 139.10$ mm.

Dial Indicator Measurements

The dial indicator is used to measure the travel or movement of a specific item. It can also be used to measure axial and radial runout. In engine measurement applications, the dial indicator can be used to measure valve guide wear, axial movement of the crankshaft (thrust), and runout of flywheels and harmonic balancers.

First, it is important to familiarize yourself with Dial Indicator construction. The face of the dial indicator consists of a moveable bezel which is also attached to the large measuring scale. This allows the tool be brought to the "zero point" when needed.

The main measuring device is the contact point. The contact point (1) is placed against the object to be measured. Usually, the contact point is rounded or has a ball bearing. This allows for a more accurate measurement.

The measuring face of the dial indicator consists of 2 scales. The smaller scale is for the "coarse" measurement which is in graduations of 1 millimeter. One revolution of the small scale is 10 millimeters.

The large scale is in graduations of .01 millimeter and the scale goes from zero to one hundred. Therefore, one revolution of the large scale is one millimeter.

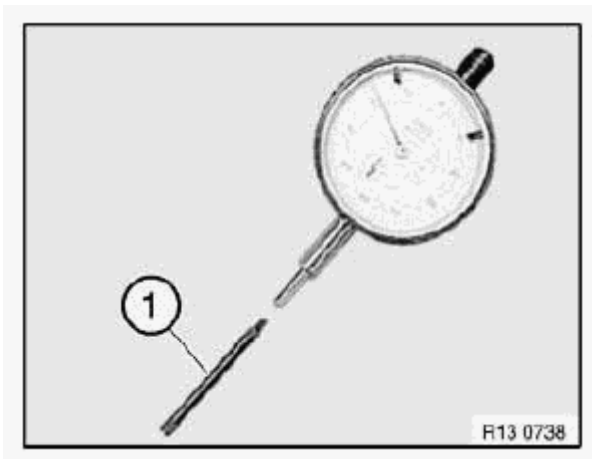


Fig. 6: Identifying Device Is Contact Point
Courtesy of BMW OF NORTH AMERICA, INC.

The dial indicator also needs to be held in place when taking a measurement. This requires a stand or base. Depending upon the application, these stands can be a clamp type, magnetic or a threaded base.

When taking a measurement, place the contact point on the object to be measured. The dial indicator must be pre-loaded slightly to prevent the measurement from bottoming out.

When reading the scale, be sure to "zero" the dial indicator first. If the readings to be taken are less than 1 millimeter, you do not need to use the small scale. If the readings are larger than 1 millimeter, be sure to factor the small scale into your measurement.



Fig. 7: Identifying Dial Indicator
Courtesy of BMW OF NORTH AMERICA, INC.

Examples of Dial Indicator Measurements

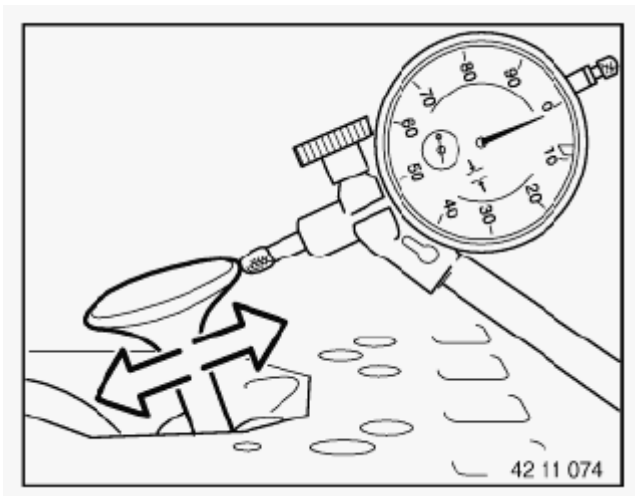


Fig. 8: Identifying Valve Guide Wear - Tilt Angle (K)
Courtesy of BMW OF NORTH AMERICA, INC.

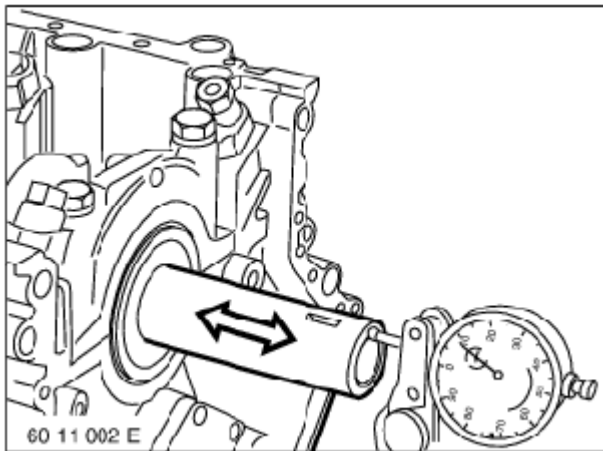


Fig. 9: Identifying Crankshaft Endplay - Axial
Courtesy of BMW OF NORTH AMERICA, INC.

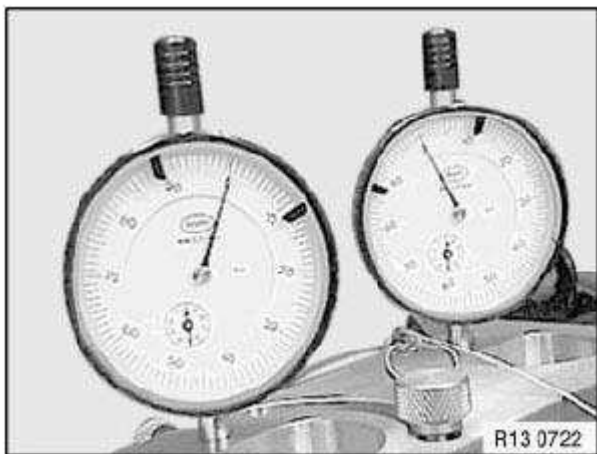


Fig. 10: Identifying S62 Engine - Basic Throttle Setting
Courtesy of BMW OF NORTH AMERICA, INC.

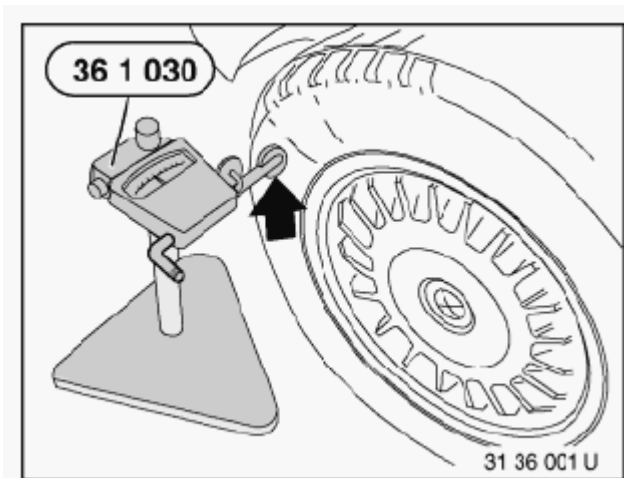


Fig. 11: Identifying Wheel Runout - Axial
Courtesy of BMW OF NORTH AMERICA, INC.

ADDITIONAL ENGINE MEASUREMENTS

During engine repair procedures it is sometimes necessary to assess engine wear to make determinations on parts replacement. Also, some engine measurements are needed to verify a previous diagnosis.

For example, a cylinder leakdown test could indicate a cylinder sealing concern. Once the engine is disassembled, it would be necessary to verify this condition by checking the piston and piston ring condition. If OK, the next step would be to determine the condition of the cylinder bore. At this point, the cylinders should be checked for taper (conicity) and for out-of-round. The correct measurements could mean the difference between just replacing the rings and/or pistons or replacing the engine block. This is why it is necessary to make accurate measurements when needed.

Some of the other routine engine measurements include:

- Cylinder head warpage
- Cylinder head thickness (on some applications)
- Piston rings - end gap and axial clearance

* Cylinder bore - including out-of-round and taper

Cylinder Head Measurement

If a repair requires removal of the cylinder head, a few basic measurements can be performed to save time and unnecessary machine shop costs. If an engine has been overheated or has an internal or external fluid leakage (coolant/oil), it is a good idea to check the cylinder head for warpage.

This can be done by using a commercially available machinists straight edge and a feeler gauge. by sliding the

feeler gauge under the straight edge in various locations, it can determine if there are any low spots or warpage. The specifications for warpage are found in WebTIS under Technical Data. Usually, the specification is about .05 mm.

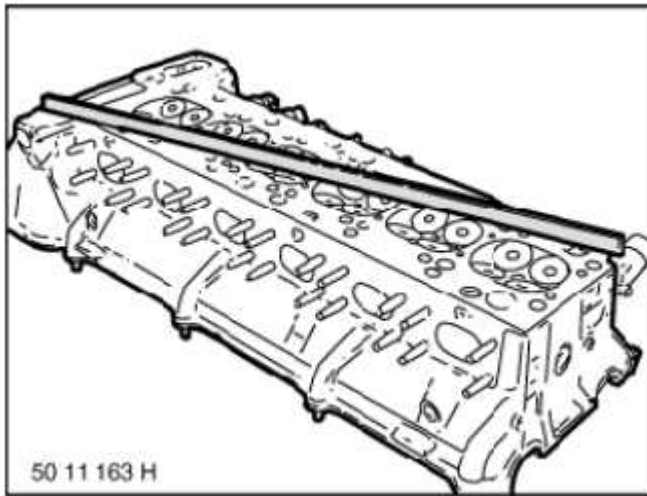
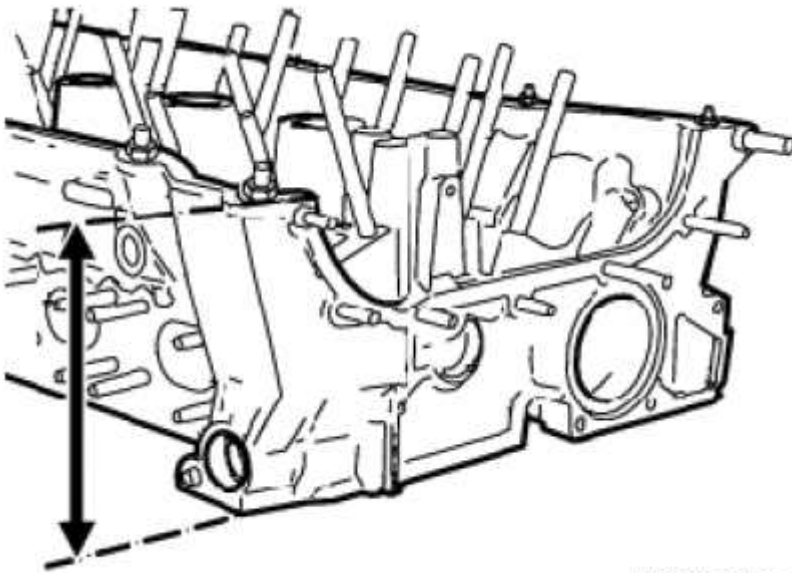


Fig. 12: Checking Cylinder Head Warpage
Courtesy of BMW OF NORTH AMERICA, INC.

Also, check to see if the cylinder head has a specification for machining limit. If so, it may be possible to have the cylinder head re-surfaced. Depending on the amount of material removed during the machining process, it may be necessary to install a thicker head gasket. There are some "service" head gaskets available through the parts department.

The cylinder head can be checked for minimum thickness. This is done using a micrometer or a vernier caliper. This is not possible on all engines, the example shown below is a 6-cylinder (M52TU/M54).

If the minimum thickness is not met, the head will need to be replaced.



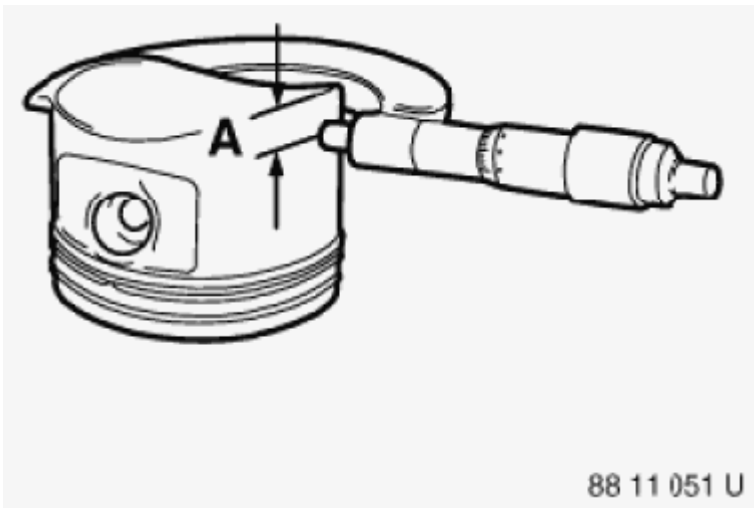
50 11 104 H

Fig. 13: Identifying Cylinder Head Minimum Thickness
Courtesy of BMW OF NORTH AMERICA, INC.

Piston Measurements

When replacing pistons and/or piston rings, there are some basic measurements that need to be made. When fitting a piston to a cylinder bore, the piston diameter should be checked to ensure a proper fit.

The piston diameter is measured using a micrometer. The measurement is taken at a specified point (A) which is 90 degrees from the piston pin axis. Each engine has a specific location to measure piston diameter. For example, the illustration below shows measuring Point A. The specification for this engine (N62) is 18 mm. So the piston diameter is measured 18 mm from the bottom of the piston skirt.



88 11 051 U

Fig. 14: Checking Piston Diameter Is Measured Using Micrometer
Courtesy of BMW OF NORTH AMERICA, INC.

The piston diameter, when subtracted from the cylinder bore equals the cylinder wall to piston clearance. If the clearance measurement obtained is not correct, re-check your readings.

Piston Ring Measurements

There are some important specifications to check when installing piston rings. One of the measurements is axial clearance. Axial clearance is the distance between the piston ring and ring land. This prevents the rings from binding in the ring land at operating temperature. Axial clearance is measured using a feeler gauge.

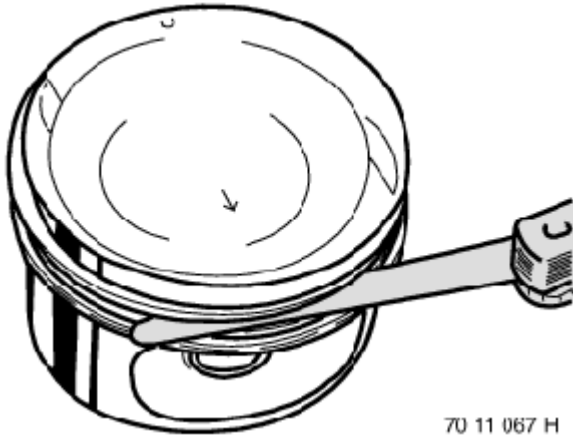


Fig. 15: Checking Piston Ring Of Feeler Gauge
Courtesy of BMW OF NORTH AMERICA, INC.

Also the piston ring end gap has to be checked. This measurement is checked using a feeler gauge.

This clearance is critical in order to prevent the end gaps from contacting each other when the engine is at operating temp.

When installing the piston rings, always stagger the end gaps as per the repair instructions.

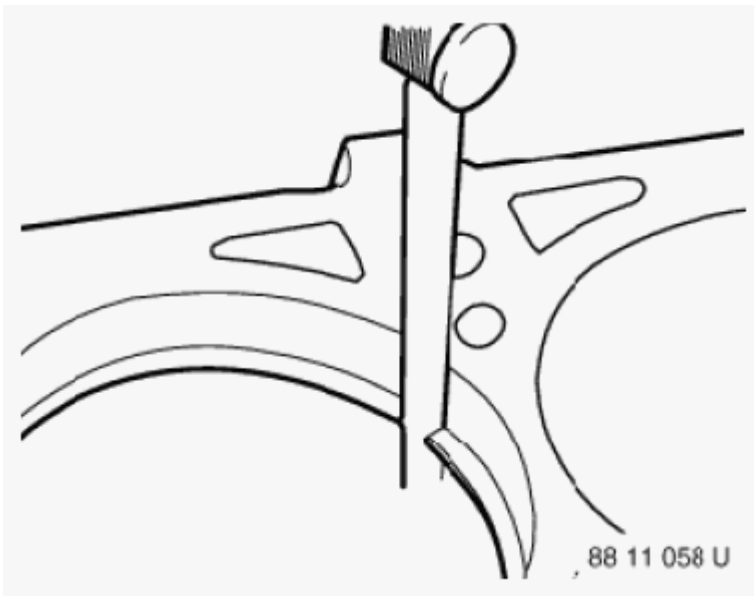


Fig. 16: Identifying Piston Ring End Gap
Courtesy of BMW OF NORTH AMERICA, INC.

Cylinder Bore

In order for the cylinder bore to be considered acceptable, it must not be excessively tapered or out-of-round. Once the cylinder has been checked for obvious damage and the surface finish is OK, the integrity of the bores must be verified. If cylinder wear is suspected, it must be checked using the proper cylinder bore gauge.

Each cylinder must be checked at three position in the bore - top, middle and bottom. Also there must be two opposing dimensions that should be checked. The difference between the top and bottom measurements will indicate the taper of the bore. The opposing dimensions will indicate the out-of-round specification.

If these measurements are out of specification, the cylinder bore must be re-finished or overbored. New pistons and rings must be fitted as well.

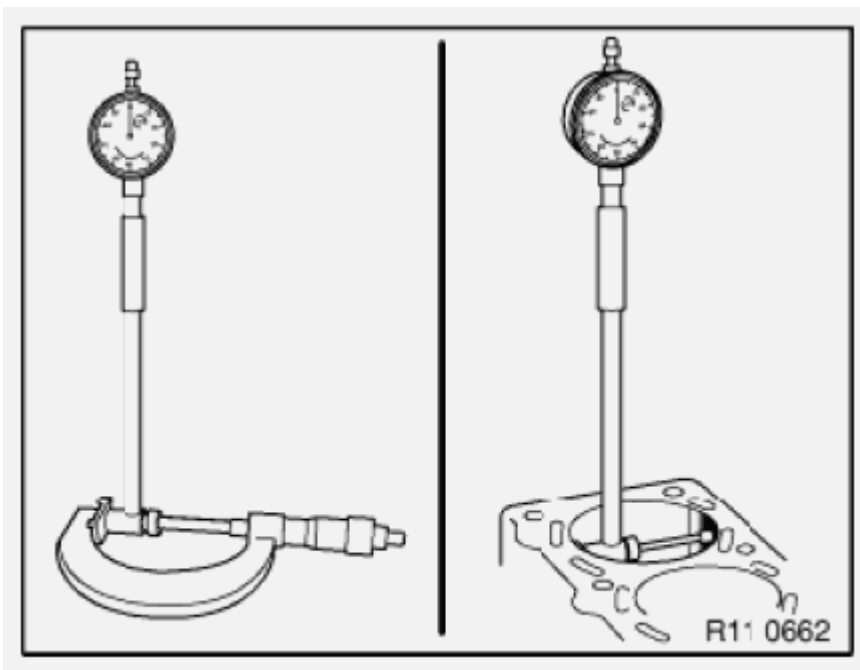


Fig. 17: Measuring Proper Cylinder Bore Gauge
Courtesy of BMW OF NORTH AMERICA, INC.

METRIC SYSTEM

All BMW specifications are metric. Therefore, a thorough knowledge of those areas on the metric system which apply to BMW vehicles is vital to a BMW Service Technician.

The unit of length, and the basis for all other metric units of measurement is the meter. The meter (1 meter), as a point of reference, is slightly longer than a yard (39.37 inches).

The divisions of a meter are hundredths and thousandths. One hundredth of a meter is called a centimeter, and is equal to .3937 inch or about half the diameter of a nickel.

One thousandth of a meter is called a millimeter. The small marks between the centimeter increments are each one millimeter, or one tenth of a centimeter. And as a point of reference, a standard paper clip is about one millimeter thick.

Metric System Denominations

Throughout the metric system, common to all units of measurement, are prefixes which designate multiples or fractions of the unit.

For automotive applications, the most common prefixes are centi; designating one-hundredth; milli; for one thousandth and kilo-for one thousand.

There are letters uniformly used throughout the system to label the divisions or multiples of each unit of measurement. The letter "m" represents milli, "c" is for centi and "k" is for kilo. These are then combined with the letter representing the unit of measurement.

For example, mm is millimeter, cm is centimeter and km is kilometer. The same applies to liter which is the unit of volume and gram which is the unit of weight.

One kilogram is equal to one thousand grams which is equal to 2.2 pounds.

All metric measurements are directly related. For example, one thousand cubic centimeters, or 10cm x 10cm x 10cm of water weighs one kilogram. The volume of those one thousand cc's is one liter.

Metric Reference Chart

METRIC REFERENCE CHART

Weight			
1 kilogram	= 1 kg	= 1000 grams	= 1000 g
1 hectogram	= 1 hg	= 100 grams	= 100 g
1 dekagram	= 1 dag	= 10 grams	= 10 g
1 gram	= 1 g		
1 decigram	= 1 dg	= .1 gram	= 0.1 g
1 centigram	= 1 cg	= 0.01 gram	= 0.01 g
1 milligram	= 1 mg	= 0.001 gram	= 0.001 g
Length			
1 kilometer	= 1 km	= 1000 meters	= 1000 m
1 hectometer	= 1 hm	= 100 meters	= 100 m
1 dekameter	= 1 dam	= 10 meters	= 10 m
1 meter	= 1m		
1 decimeter	= 1dm	= .1 meter	= .1 m
1 centimeter	= 1 cm	= 0.01 meter	= 0.01 m
1 millimeter	= 1 mm	= 0.001 meter	= 0.001 m
Volume			
1 kiloliter	= 1 kl	= 1000 liters	= 1000 l
1 hectoliter	= 1 hl	= 100 liters	= 100 l
1 dekaliter	= 1 dal	= 10 liters	= 10 l
1 liter	= 1l		
1 deciliter	= 1dl	= .1 liter	= .1 l
1 centiliter	= 1 cl	= 0.01 liter	= 0.01 l
1 milliliter	= 1 ml	= 0.001 liter	= 0.001 l

Metric System Conversion Charts

METRIC SYSTEM CONVERSION CHARTS

Linear Measure to Metric	Linear Measure (Metric) to English
1 inch = 2.54 cm	1 mm = 0.03937 inch
12 inches = 1 foot = 30.48 cm	1 cm = 0.39 inch
3 feet = 1 yard = 0.91 m	1 m = 39.37 inch

5.5 yards = 1 rod = 5.03 m	1 km = 0.62 miles
5280 feet = 1 mile = 1.61 km	
Square Measure to Metric	Square Measure (Metric) to English
1 in ² = 6.45 cm ²	1 mm ² = 0.002 in ²
144 in ² = 1 ft ² = 0.09 m ²	1 cm ² = 0.16 in ²
9 ft ² = 1 yd ² = 0.84 m ²	1 m ² = 1549 in ²
640 acres = 1mi ² = 2.59 km ²	1 km ² = 0.39 mi ² = 247.10 acres
Cubic Measure to Metric	Cubic Measure (Metric) to English
1 in ³ = 16.39 cm ³	1 mm ³ = 0.000061 in ³
1728 in ³ = 1 yd ³ = 0.76 m ³	1 cm ³ = 0.061 in ³
27ft ³ = 1 yd ³ = 0.76 m ³	1 m ³ = 35.32 ft ³
	1 km ³ = 0.24 mi ³
Liquid Measure to Metric	Liquid Measure (Metric) to English
1.81 in ³ = 1 fluid oz. = 30 ml	1 ml = 0.03 fluid oz = 0.061 in ³
1 pint = 0.47 l	1000 cm ³ = 1 l = 61.02 in ³ = 1.06 qt
57.75 in ³ = 1 quart = 0.95 l	1 ft ³ water = 62.5 lb
231 in ³ = 1 gal = 3.79 l = 0.0038 m ³	
1 ft ³ = 7.48 gal = 28.35 l	
Weights to Metric	Weight (Metric) to English
1 Oz = 28.35 g	1 g = 0.035 oz
1 lb = 453.59 g	1 kg = 2.20 lb
1 lb = 0.45 kg	1 metric ton = 1000 kg = 1.102 tons = 2205 lb
1 ton = .91 metric ton	
Temperature to Metric	Temperature to Fahrenheit
F = 9/5C +32	C = 5/9 (F-32)

Pressure Conversion Chart

PRESSURE CONVERSION CHART

Bar	kPa	psi	in.Hg.
6.0	600	87.0	
5.9	590	85.5	
5.8	580	84.0	
5.7	570	82.5	
5.6	560	81.0	
5.5	550	79.0	
5.4	540	78.5	
5.3	530	77.0	
5.2	520	75.5	

5.1	510	73.5	
5.0	500	72.5	
4.9	490	71.0	
4.8	480	69.5	
4.7	470	68.0	
4.6	460	66.5	
4.5	450	65.5	
4.4	440	64.0	
4.3	430	62.5	
4.2	420	61.0	
4.1	410	59.5	
4.0	400	58.0	
3.9	390	56.5	
3.8	380	55.0	
3.7	370	53.5	
3.6	360	52.0	
3.5	350	51.0	
3.4	340	49.5	
3.3	330	48.0	
3.2	320	46.5	
3.1	310	45.0	
3.0	300	43.5	
2.9	290	42.0	
2.8	280	40.5	
2.7	270	39.0	
2.6	260	37.5	
2.5	250	36.5	
2.4	240	35.0	
2.3	230	33.5	
2.2	220	32.0	
2.1	210	30.5	
2.0	200	29.0	
1.9	190	27.5	
1.8	180	26.0	
1.7	170	24.5	
1.6	160	23.0	
1.5	150	22.0	
1.4	140	20.5	
1.3	130	19.0	
1.2	120	17.5	35.90
1.1	110	16.0	32.91
1.0			

	100	14.5	29.92
0.9	90	13.0	26.93
0.8	80	11.5	23.94
0.7	70	10.0	20.94
0.6	60	9.0	17.95
0.5	50	7.5	14.96
0.4	40	6.0	11.97
0.3	30	4.5	8.98
0.2	20	3.0	5.98
0.1	10	1.5	2.99
0.0	0	0.0	0.0

GENERAL INFORMATION

Passive Safety System

INTRODUCTION TO PASSIVE SAFETY

Model: All with Passive Safety Systems

Production: All

INTRODUCTION

History of BMW Safety Systems

BMW has a long history of being at the forefront of passenger safety technology. Before the introduction of airbag systems, seatbelts provided the primary restraint for protection of the occupants during an impact. Three point seatbelts provided the greatest level of occupant safety at that time.

Many other safety innovations were already in use before airbag systems were introduced. Energy absorbing body structures with "crumple zones" uphold the integrity of the passenger safety cell. Some of the other features are "breakaway" engine and transmission mountings, collapsible steering column, door mounted impact beams and a hood that is designed to fold on impact rather than penetrate the windshield.

There are many other safety innovations which are transparent to the driver, but are crucial to providing a safe environment for the vehicle occupants.



Fig. 1: Identifying History Of BMW Safety Systems
Courtesy of BMW OF NORTH AMERICA, INC.

Since 1986, when BMW first introduced the Supplementary Restraint System (SRS) to their US model line, BMW has continuously improved the level of occupant protection.

The driver's side airbag was standard on all US production models from 1986. Later, the passenger side airbag became standard on the 1992 models.

These first systems were made by Cipro and Siemens and consisted of mechanical crash sensors located on the inner fenders. An airbag was mounted on the steering wheel and a control unit containing a mechanical safing sensor was located in the passenger compartment. The vehicle wiring harness was modified to accommodate these systems.

Later versions included a standard passenger side airbag from 9/91 production. These system were designated Siemens 2C. These systems were replaced by ZAE.

Beginning with the 1994 model year, the ZAE system was introduced on US models. The E31, E34, E36 and E38 all used the ZAE I system. ZAE I used crash sensors which were integral to the control unit and eliminated the mechanical fender mounted sensors on previous models. Also the passenger seat occupancy detection system (SBE) was introduced at this time. ZAE 2 was introduced later and now included the detection of rear impacts.

The Multiple Restraint System (MRS) addressed the need for side impact protection. Starting with the E39, door mounted side airbags were added on the front driver and passenger side. The MRS system also utilized side impact sensors which were externally mounted near the b-pillar. In combination with the MRS control unit, the side impact sensors allowed the MRS system to differentiate between front, rear and side impacts.



Fig. 2: Identifying Multiple Restraint (MRS) System
Courtesy of BMW OF NORTH AMERICA, INC.

Subsequent versions of MRS introduced new technology and enhancements to MRS I. MRSII utilized the new head protection system (HPS) and also the new Safety Battery Terminal.

MRS III has new features including the 2-stage airbag and the rear head protection system. Also, the MRS III control unit was now connected to the K-bus for diagnosis, improved crash signalling and for the fuel pump cut-off feature.

The only changes to MRS IV were improved software and triggering algorithms. It was introduced in 4/01 production on the E46 and E53 and later phased into E38 and E39.

The latest version of MRS is the MRS4RD system. The "RD" designation indicates a redesign over the previous MRSIV system. Numerous modifications include additional crash sensors mounted in the front of the vehicle and pressure sensors mounted in the front doors. Also, the new passenger seat occupancy detection system (OC-3) which is capable of determining the approximate size of the occupant based on weight distribution. To accommodate these changes, the MRS control unit was increased to 75 pins from the previous 50 pin control

unit.

E83 with MRS4RD



Fig. 3: Identifying Latest Version Of MRS MRS4RD System
Courtesy of BMW OF NORTH AMERICA, INC.

The introduction of the E65 brought about a new era in passive safety technology.

The new passive safety system on the E65 was a departure from the MRS philosophy. Instead of having the triggering electronics located centrally in the MRS module. The new method was to decentralize the triggering electronics by locating the trigger circuits in the satellite sensors which are closer to potential impact points.

The new system is referred to as the Intelligent Safety and Information System (ISIS). ISIS consists of a series of satellites connected by an optical bus network called *byte-flight*. The *byteflight* network was specifically designed a high speed network for use on safety related systems.

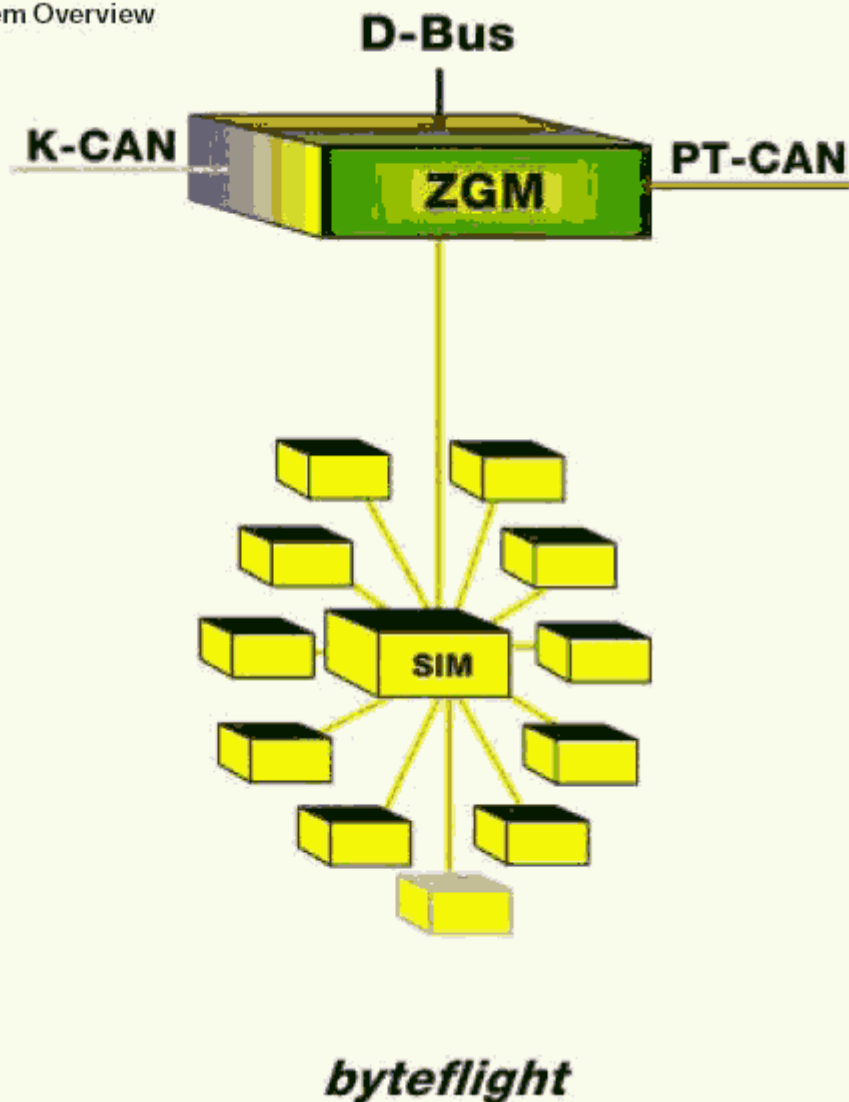
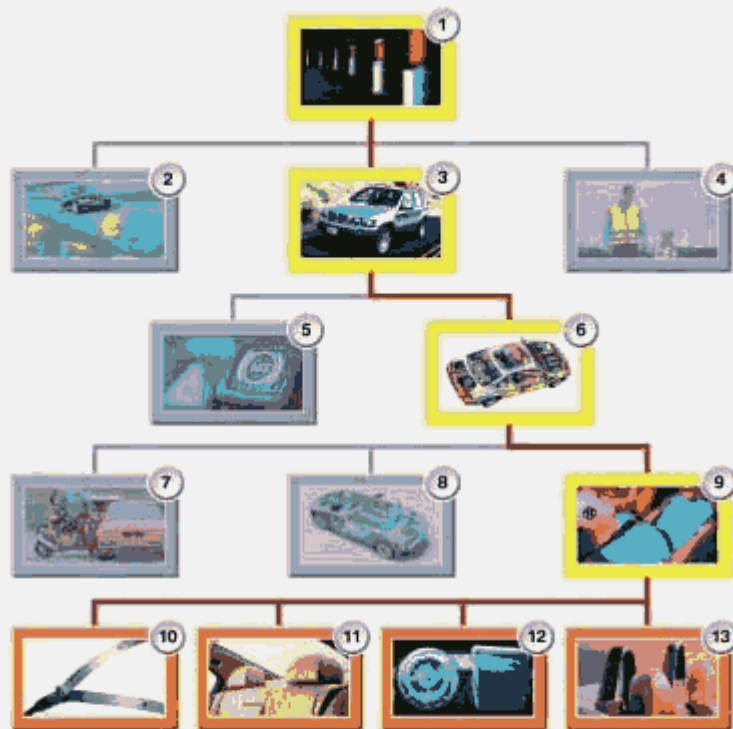


Fig. 4: Identifying E65 (ISIS) System Overview
Courtesy of BMW OF NORTH AMERICA, INC.

The ISIS concept was also adopted on the new Advanced Safety Electronic (ASE) systems which was introduced on the E85. The ASE system is also used on the new E60, E63 and E64 vehicles. ASE is similar in design to ISIS, and uses the bytelight fiber optic network. However the total number of satellites is reduced as compared to ISIS.

Fully Integrated Road Safety Technology (F.I.R.S.T.)

The BMW FIRST safety concept incorporates the environmental considerations (traffic, road conditions), the vehicle (active and passive safety), and the people involved. During the design process, all of these things are taken into to consideration to create a safe environment for the passengers as well as considering the durability of the vehicle during an impact to comply with federal law and insurance regulations.



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Index	Explanation	Index	Explanation
1	Traffic Conditions	8	Vehicle Protection
2	Environment	9	Occupant Protection
3	Vehicle	10	Seat Belt
4	People	11	Head Restraints
5	Active Safety	12	Airbag
6	Passive Safety	13	Rollover Protection
7	Partner Protection		

Fig. 5: Identifying Fully Integrated Road Safety Technology (F.I.R.S.T.) System
 Courtesy of BMW OF NORTH AMERICA, INC.

F.I.R.S.T. is the cornerstone behind BMW's safety philosophy. This technology consists of *active* and *passive* safety features designed to help the driver avoid accidents as well as protect the occupants in the event of an unavoidable accident.



Fig. 6: Identifying F.I.R.S.T. Cornerstone Behind BMW'S Safety Philosophy
Courtesy of BMW OF NORTH AMERICA, INC.

Active Safety features are designed to help the driver avoid accidents. In other words these features allow the driver to actively avoid potentially dangerous situations. These features consist of a responsive engine, stable suspension, precise steering and excellent all around vision. Systems such as Dynamic Stability Control (DSC) and ABS also help the driver retain precise control of the vehicle.

Traffic and adverse environmental conditions can be offset by systems such as RLS (rain sensing wiper control), X-Drive, climate control with mist sensor and driving lights etc.

Other features which are "transparent" to the driver include the multi-function steering wheel which allows the driver to control the cruise control and audio systems while still focusing on the road. The seating position and location of switches and controls are also taken into consideration during the design process. The new HUD also allows the driver to access important driving information while maintaining concentration.

Passive Safety features provide vehicle occupant protection when an accident cannot be avoided. Today's BMW Passive Safety systems consist of the following features:

- Energy absorbing body structures
- Seatbelts with Automatic tensioners and force limiters
- Dual front airbags with 2-stage deployment
- Head Protection Systems (front as well as rear on some models)
- Side Impact Airbags (standard) and Rear Side Airbags (optional)
- Active Knee Protection Airbags (On some models)
- Battery Safety Terminal
- Active Head Restraints (on some models)
- Rollover Protection on Convertibles (E36, E46 and E64) and fixed rollover bars on the Z3 and Z8 and Z4.

Energy Absorbing Body Structures

One of the first considerations in designing a safe vehicle is the body and chassis design. It is vital to protect the passenger in the event of an impact. This is accomplished by maintaining the integrity of the "passenger cell" during an accident.

The main consideration during an impact is to avoid transferring crash energy to the vehicle occupants. By adding energy absorbing crash elements to the vehicle, this energy transfer is reduced considerably.

Passenger Safety Cell E60



Fig. 7: Identifying Passenger Safety Cell E60 And Energy Absorbing Body Structures System
Courtesy of BMW OF NORTH AMERICA, INC.

In addition to having energy absorbing structures in the front and rear of the vehicle, there are also side impact protection structures in the doors. These structures not only help prevent impact intrusion into the safety cell, but also allow the door to be opened after most impacts.

Engine Support Arm showing "Crumple Zone"



Fig. 8: Identifying Engine Support Arm System (1 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.



Fig. 9: Identifying Engine Support Arm System (2 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

SMART Airbags

Front driver and passenger airbags have been in use with single stage activation since 1986. Once an impact is detected, the airbags are triggered with one specific level of deployment force.

From 1999, BMW developed the SMART airbag which is designed to deploy in 2 stages.

There are 4 triggering thresholds which are dependent upon the severity of impact detected, the status of the seatbelts and whether the passenger seat is occupied.

Driver's side SMART Airbag (Rear view)



Fig. 10: Identifying Driver Side SMART Airbag System
Courtesy of BMW OF NORTH AMERICA, INC.

Passenger side SMART Airbag (Rear view)



Fig. 11: Identifying Passenger Side SMART Airbag System
Courtesy of BMW OF NORTH AMERICA, INC.

The two stage airbags are used for both the front driver and front passenger which allows for a softer cushioning effect when the bags are triggered at lighter impacts.

The 2-stage airbags also employ the "cold-gas" inflation method which differs from the previous single stage airbags. The gas generators contain an inert gas mixture which is released when the airbags are triggered.

Also, the cold gas inflation method was incorporated into the side airbags and the ITS assemblies.

Side Airbags

Since the introduction of MRS, side airbags have been standard equipment. Rear airbags on some vehicles are part of an option package.

Side airbags are designed to prevent injury to the thorax (chest) region of the occupants.

Side Airbag with Inert Gas Inflation (Rear view)

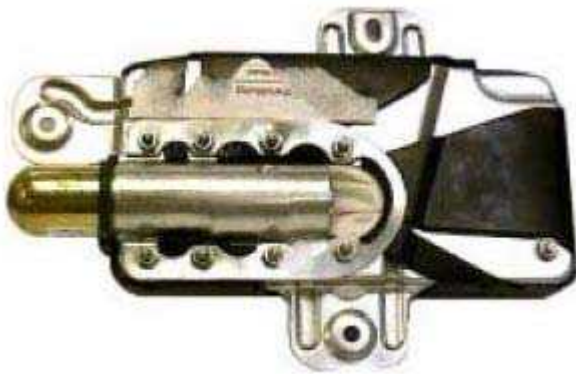


Fig. 12: Identifying Side Airbag With Inert Gas Inflation System
Courtesy of BMW OF NORTH AMERICA, INC.

Seatbelts

Of all of the safety innovations brought forth by the automotive industry, the safety belt is universally recognized as the single most effective safety device. Specifically, the 3-point safety belt provides passengers

with safety as well as comfort.

The effectiveness of the 3-point seat belt depends upon the correct positioning of the safety belt on the body.

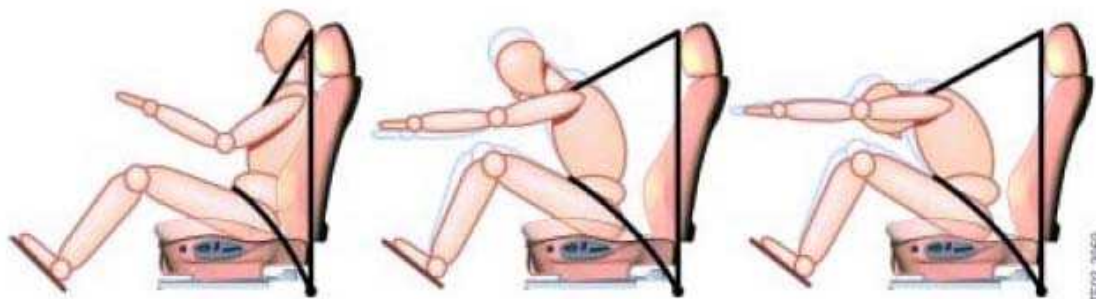


Fig. 13: Identifying Seat Belt Depends Correct Position Of Safety Belt On Body
Courtesy of BMW OF NORTH AMERICA, INC.

BMW safety belt systems use an upper anchor point which is height adjustable. In addition, the tensioning mechanisms allow the belt to remain relatively slack to increase comfort while driving.

The seat belt tensioning device is designed to remove slack in the seatbelt during an impact. This increases the effectiveness of the seatbelt and reduces the bio-mechanical load on the passenger.

There are 4 different belt tensioning systems which have been in use on BMW vehicles.

The 4 systems are as follows:

- Pyrotechnic automatic tensioners/end fitting tensioners
- Mechanical seat belt tensioners
- Pyrotechnic seat belt tensioners
- SGS (Seat Integrated Belt System)

More information on the seat belt tensioning systems will be covered in the forthcoming training modules.



Fig. 14: Identifying Mechanical Seat Belt Tensioners
Courtesy of BMW OF NORTH AMERICA, INC.

Battery Safety Terminal

The Battery Safety Terminal (BST) is designed to minimize the risk of short circuits in severe accidents. The BST protects the B+ cable from the battery to the starter and generator by disconnecting the main connections via a pyrotechnic device.

The rest of the power distribution circuits are protected by various fuses etc. This allows those circuits to remain available for SOS calls, power window and lock operation.

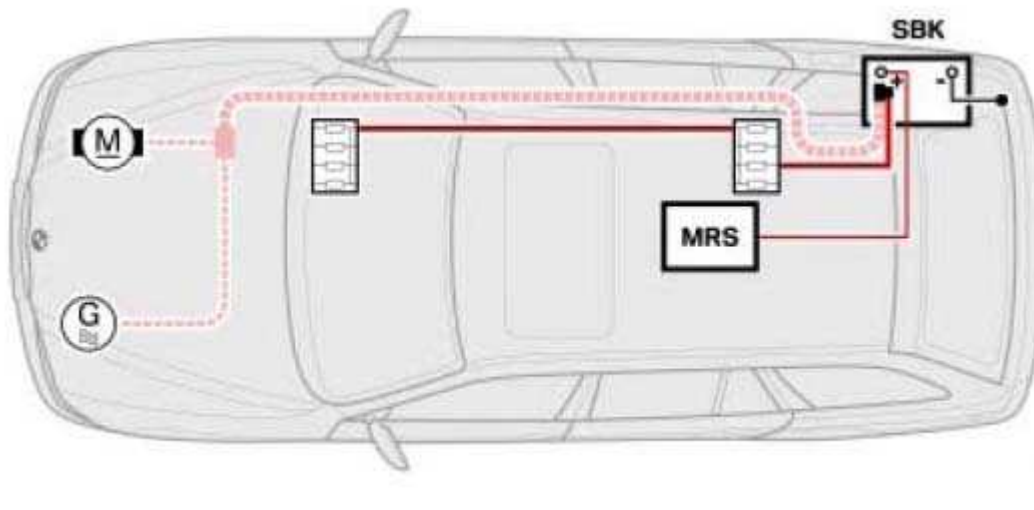


Fig. 15: Identifying Battery Safety Terminal
Courtesy of BMW OF NORTH AMERICA, INC.

The BST assembly is bolted to the positive battery terminal. It consists of a conventional battery terminal and a contact sleeve attached to the surface of the terminal. The sleeve houses an igniter pellet which contains a small amount of solid propellant.

Upon impact, the propellant is ignited which separates the battery cable from the positive terminal of the battery.

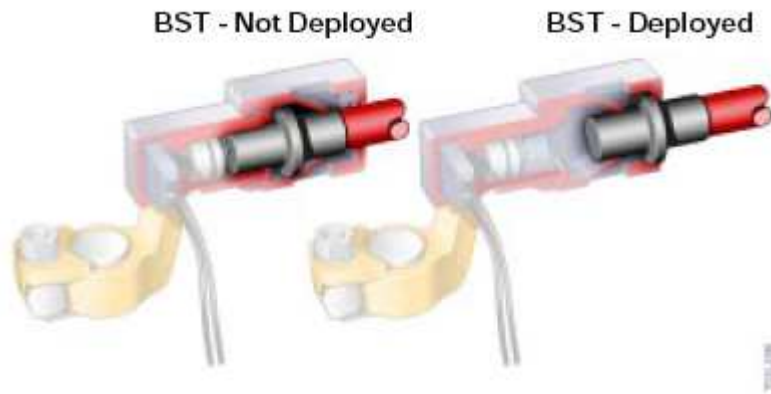


Fig. 16: Identifying BST - Not Deployed
Courtesy of BMW OF NORTH AMERICA, INC.

Once the BST is deployed, it must be replaced. Depending upon application, the entire B+ cable must be replaced or there are repair kits available on some models.

Head Protection System

Head injuries account for a large portion of overall accident statistics. To address this statistic BMW added the Head Protection System to complement the side airbags already in use. HPS was developed by BMW to offer increased occupant protection during a side impact and lower the instance of head injuries.

The original HPS, introduced on the E38, consisted of an Inflatable Tubular Structure (ITS) which was mounted in the headliner between the A and B pillars.

The ITS assembly consists of a woven fabric tube containing an inner tube of polyurethane. A gas generator is used to inflate the ITS assembly. When deployed, the ITS increases in diameter and overall length decreases by approximately 100mm. This causes the ITS assembly to emerge from the headliner trim.



Fig. 17: Identifying Head Protection System
Courtesy of BMW OF NORTH AMERICA, INC.

The ITS is designed as a sealed unit, unlike an airbag which deflates immediately. The ITS assembly deflates as the gas cools over a period of time, which allows the ITS to remain inflated in the event of secondary impacts.



Fig. 18: Identifying ITS Assembly Deflates Gas Cools
Courtesy of BMW OF NORTH AMERICA, INC.

Rear HPS was introduced later as part of a special rear side airbag option on the E38 and E39. The rear HPS does not use a conventional ITS assembly, but rather an "cushion" type airbag located in the C-pillar. A vehicle with rear HPS can be identified by observing "HPS" in the C-pillar cover.

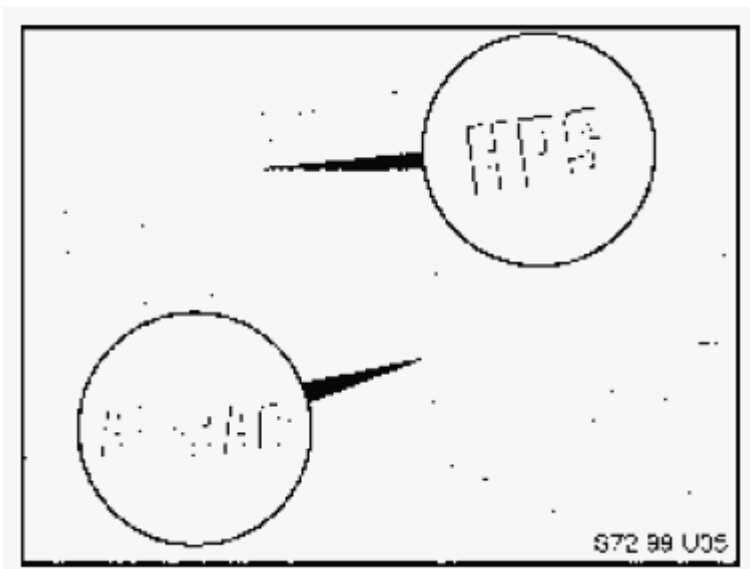


Fig. 19: Identifying Vehicle With Rear HPS Identified By Observing In C-Pillar Cover
 Courtesy of BMW OF NORTH AMERICA, INC.

The Head Protection System was further developed to increase the level of occupant protection. The Advanced Head Protection System was introduced on the E65. It consists of a modified ITS which is now extended by a curtain. There are 2 versions of AHPS available. The first, AHPS I, extends from the A-pillar to the B-pillar and protects the front passengers.

The second version, AHPS II, is part of an option for rear passenger head protection. The AHPS II extends for the A-pillar to the C-pillar to protect front and rear passengers simultaneously. The advantages of AHPS include protection from glass splinters and protruding objects as well as optimized coverage for occupants of all sizes.



Fig. 20: Identifying AHPS II And AHPS I Part
 Courtesy of BMW OF NORTH AMERICA, INC.

Active Knee Protection

The Active Knee Protection consists of a knee airbag located on the front driver and passenger sides of the vehicle. The knee airbag prevent the driver from sliding under the seat belt during an impact. This effect is

known as "submarining". This effect is counteracted by the knee airbag and initiates a controlled forward shift of the upper body.

This increases the effect of the seatbelt and the airbag.

The knee airbag is available on the E65, E85 and E63/64.

E65 Driver's Side Knee Airbag



Fig. 21: Identifying E65 Driver Side Knee Airbag System
Courtesy of BMW OF NORTH AMERICA, INC.

E65 Passenger Side Knee Airbag



Fig. 22: Identifying E65 Passenger Side Knee Airbag System
Courtesy of BMW OF NORTH AMERICA, INC.

Active Head Restraint System (AKS)

In a rear end collision, the risk for cervical vertebrae injuries (whiplash) is high. To prevent this, the objective would be to position the head as close as possible to the headrest. This prevents excessive rearward motion.

On the E65/E66 and E60, the basic seat option only allows for a fixed position between the backrest and head and eliminates the need for the AKS. However, on vehicles equipped with the multi-function seat option, the adjustability of the headrest and backrest allows for the possibility of a large gap between the headrest and the occupants head.

For this reason AKS was developed. The AKS is located in the backrest of the multifunction seat. It is deployed by a pyrotechnic device, similar to an airbag.

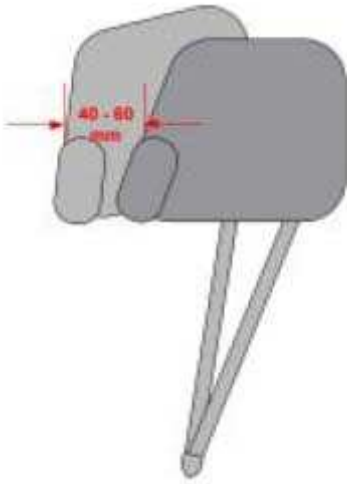


Fig. 23: Identifying Active Head Restraint (AKS) System
Courtesy of BMW OF NORTH AMERICA, INC.

Rollover Protection Systems

In order to protect the passengers of a convertible in the event of a rollover, BMW has developed the Rollover Protections System (RPS). Convertible models with RPS include the E36, E46 and E64. BMW roadsters use fixed steel rollover bars, these vehicle include the E52 (Z8), E36/7 (Z3), and the E85 (Z4).

The RPS consists of a set of automatically deployable rollbars which are triggered when the vehicle exceeds certain criteria. This criteria is based on the amount of tilt which is monitored by a rollover sensor.

When an impending rollover is detected, the rollover bars lock into place to provide the necessary head clearance to protect the occupants.



Fig. 24: Identifying Rollover Protection (RPS) Systems
Courtesy of BMW OF NORTH AMERICA, INC.

Also, the rollover bars can be deployed by the diagnostic equipment for testing. There is also a reset procedure for each model which is done manually. This allows the bars to be reset in the event of an erroneous deployment.



Fig. 25: Identifying Rollover Bars

Courtesy of BMW OF NORTH AMERICA, INC.

Summary of BMW Passive Safety Systems

	3 Series				Z4	5 Series				7 Series				6 Series		8 Series		SAV AWD	
	E30	E36	E46	E90/91	E85	E28	E34	E39	E60/E61	E23	E32	E38	E65/66	E24	E63/E64	E31	E52	E53	E83
Cipro	x					x				x				x					
Siemens 2A	x													x					
Siemens 2B		x					x				x					x			
Siemens 2C		x 9/93					x				x					x			
ZAE		x					x					x				x			
ZAE II		x					x					x				x			
MRS		x						x 3/96				x 3/96							
MRSII			x					x 9/97				x 5/97							
MRSIII			x 3/99					x 3/99				x 3/99					x	x	
MRSIV			x 4/01					x 8/01				x 8/01						x 4/01	
MRS 4RD																			x
MRS 5				x															
ISIS												x							
ASE					x				x						x				

Fig. 26: Identifying Summary Of BMW Passive Safety Systems
 Courtesy of BMW OF NORTH AMERICA, INC.

2004-05 GENERAL INFORMATION

Safety Systems - Overview - X3

SAFETY SYSTEMS

HISTORY OF MULTIPLE RESTRAINT SYSTEMS

Multiple restraint systems have a long history at BMW. The first multiple restraint system, the MRS 1, was introduced as long ago as 1996.

MRS 1

With the introduction of the side airbags in March 1996, the MRS 1 replaced the ZAE/BAE control unit used until then on the E38/E39. When the side airbags were introduced, two MRSA external sensors were also added for improved side-impact detection. Because of the required number of inputs/outputs, the number of pins had to be increased from 30 to 50.

MRS 2

The addition of the ITS head airbag and rear side airbags on the E38 in May 1997 saw the introduction of the MRS2. On the E39, the MRS2 was first used when the ITS head airbag was fitted in September 1997. September 1998 saw the introduction of the 2-stage front-passenger airbag (SMART airbag).

MRS 3

The MRS3 system was launched with the arrival of the 2-stage driver's airbag in March 1999. Another innovation on the MRS3 was its connection with the K-bus. The previous MRS systems had been hooked up to the diagnostic bus. The exception in that regard was the E36/7 (Z3). Since the Z3 has no K-bus, the MRS3 on the Z3 remained connected to the diagnostic bus.

MRS 4

The changes on the MRS4 as compared with the MRS3 consisted of a modified processor and new software for calculating the restraint system triggering algorithm. The MRS4 was first used in April 2001 with the launch of the MINI as well as on the E46 and E53. The E38 and E39 models were fitted with the MRS4 for the first time in August 2001.

MRS4RD

The multiple restraint system 4 redesign MRS4RD is a development of the MRS4 on the E46. The MRS4RD has had its interfaces expanded to 75 pins.

The job of the MRS4RD is to detect accident scenarios that are critical for the vehicle occupants and to selectively activate the necessary restraint systems according to the severity of the crash.

The MRS4RD has been further optimized and equipped with the following sensors:

- Up-front sensors
- Door-compression sensors
- B-pillar satellites

The job of the up-front sensors is to detect frontal impacts. This allows the restraint systems such as seatbelt tensioners and airbags to be activated.

The job of the door-compression sensors is to detect side impacts. The MRS4 satellites (MRSA) under the front seats have been moved to the B-pillars. The B-pillar satellites contain acceleration sensors for linear and lateral acceleration.

The MRS4RD performs a self-diagnosis and monitors all input and output signals. Any faults detected are stored in a non-volatile memory and indicated to the driver by the airbag warning lamp (AWL).

Communication with other control units in the vehicle's network of systems takes place via the K-bus.

The MRS4RD can be programmed/encoded via the K-bus.

MRS4RD Equipped E83

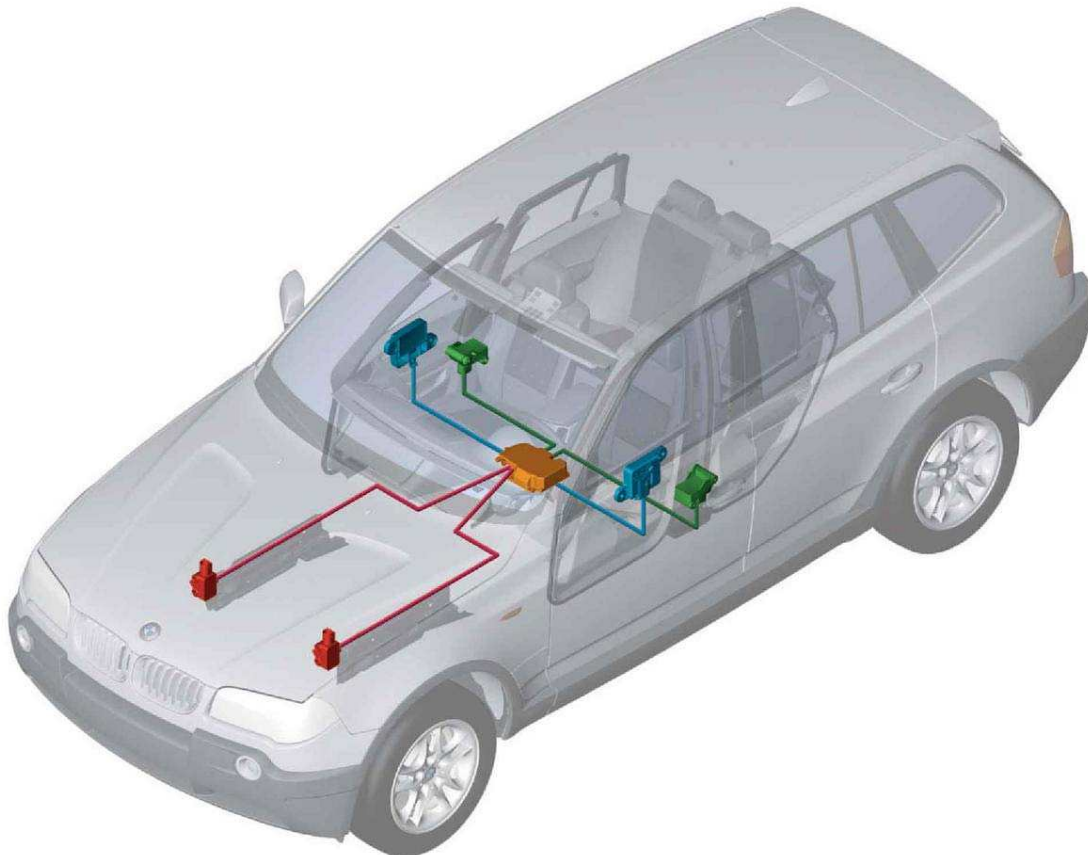
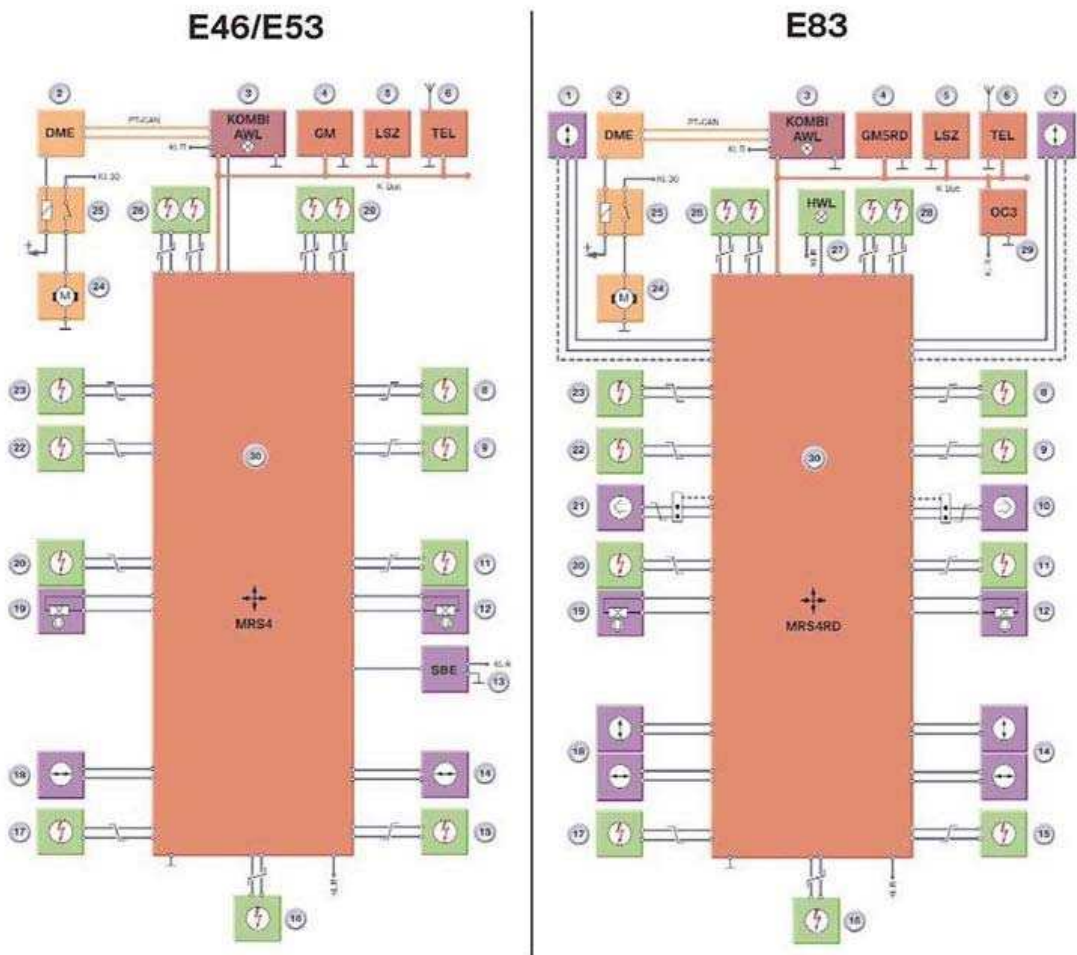


Fig. 1: Identifying MRS4RD Equipped E83
 Courtesy of BMW OF NORTH AMERICA, INC.

Comparison E46/E53 MRS W/E83 MRS4RD



1. Up-front Sensor, Left (E83)	11. Seat-belt tensioner, Right	21. Door Pressure Sensor, L (E83)
2. DME	12. Seat Belt Switch, Right	22. Side Airbag, LF
3. Instrument Cluster	13. Seat Occupation Sensor	23. ITS, Left (E83 Curtain Airbag)
4. GM5 (E83 GM5RD)	14. B-Pillar Satellite, Right (E83)	24. Electric Fuel Pump
5. LSZ	15. Side Airbag, RR	25. Fuel Pump Relay
6. Telephone	16. BST	26. Driver Airbag
7. Up-front Sensor, Right (E83)	17. Side Airbag, LR	27. Airbag Indicator Lamp (E83)
8. ITS, Right (E83 Curtain Airbag)	18. B-Pillar Satellite, Left (E83)	28. Passenger Airbag
9. Side Airbag, RF	19. Seat Belt Switch, Left	29. OC3 Mat (E83)
10. Door Pressure Sensor, R (E83)	20. Seat-belt Tensioner, Left	30. MRS Control Unit

Grayed Items X3 only

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Fig. 2: Comparison E46/E53 MRS W/E83 MRS4RD Circuit Diagram

Courtesy of BMW OF NORTH AMERICA, INC.

SYSTEM COMPONENTS

The MRS4RD multiple restraint system consists of the following components:

- MRS4RD control unit
- Sensors and switches
- Actuators

MRS4RD Control Unit

The number of pins on the MRS4RD control unit has been increased from 50 (MRS4) to 75 because of the greater number of interfaces.

The MRS4RD control unit is located centrally in the vehicle on the transmission tunnel. Integrated in the MRS4RD control unit are two acceleration sensors set right-angles to one another. The linear acceleration sensor (X-axis) is positioned at 0 degrees to the vehicle's longitudinal axis, and the lateral acceleration sensor (Y-axis) at 90 degrees to that axis.

All acceleration sensors sense acceleration in two directions, i.e. they register both positive and negative acceleration. The polarity of the acceleration signals depends on the direction of impact. That means it is possible to distinguish between a front or rear impact and between a left or right side impact.



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Fig. 3: Identifying MRS4RD Control Unit
Courtesy of BMW OF NORTH AMERICA, INC.

The MRS4RD multiple restraint system has more sensors than its predecessor system.

They include the following sensors:

- Up-front sensors
- Door-compression sensors
- B-pillar satellites with lateral and linear acceleration sensors

Up-Front Sensors

The job of the up-front sensors is to detect frontal impacts. The up-front sensors are located in the front end above the longitudinal subframe members. The up-front sensors provide the MRS control unit with the initial information on the progression and severity of the impact.

An up-front sensor consists of an acceleration sensor for detecting deceleration, a signal converter and a microprocessor for data transmission.

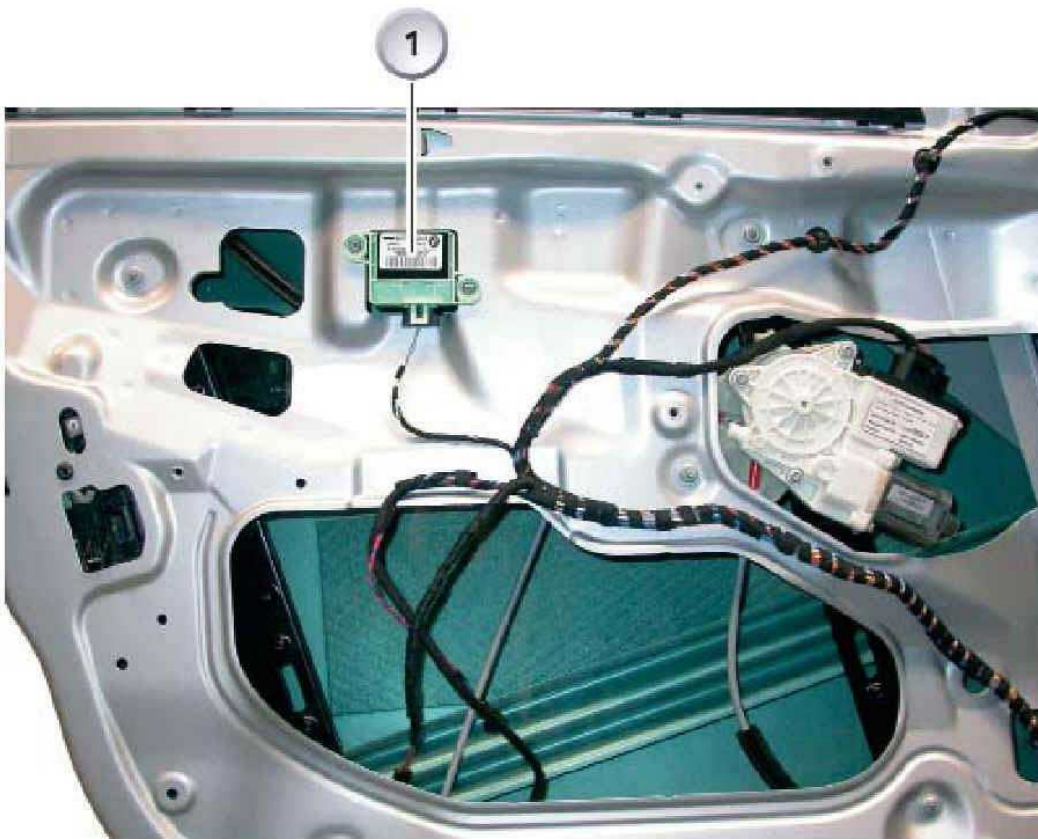
The up-front sensors are supplied with power via a current-signal interface. The up-front sensors are supplied with a current of 5 - 10 mA. When a data message is transmitted, the level jumps vertically by 20 mA.

The advantage of the current-signal interface is its constant supply of current which prevents corruption of the signal. A change of resistance in the lead does not affect the signal.

A power supply with a voltage signal would be corrupted by changes in resistance in the lead. The signal could equally be corrupted by EMC interference from other leads.

Door Pressure Sensors

The function of the door pressure sensors (1) is to provide supplementary detection of side impacts in addition to the information supplied by the lateral acceleration sensors in the B-pillar satellites and the MRS4RD control unit. The door pressure sensors are located on the inner door panel and measure the pressure inside the door.



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Fig. 4: Identifying Door Pressure Sensors
Courtesy of BMW OF NORTH AMERICA, INC.

In the event of a side impact, the outer door panel may be pushed inwards, thus compressing the space inside the door and increasing the pressure. That pressure increase is detected by the door pressure sensors. At the same time, the side impact is detected by the acceleration sensors in the B-pillar satellite. The B-pillar satellite then also transmits a data message. The MRS4RD control unit in the center of the vehicle processes the two signals and is able to trigger the restraint systems on the basis of the information provided.

B-Pillar Satellites

The two MRSA modules (multiple restraint system external satellites) which were previously positioned under the seats, have been replaced by B-pillar satellites. Each B-pillar satellite consists of a lateral acceleration sensor and a linear acceleration sensor.

As with the up-front sensors, signal transmission is cyclic. The B-pillar satellites detect side, front and rear impacts.

The left and right B-pillar satellites are identical.



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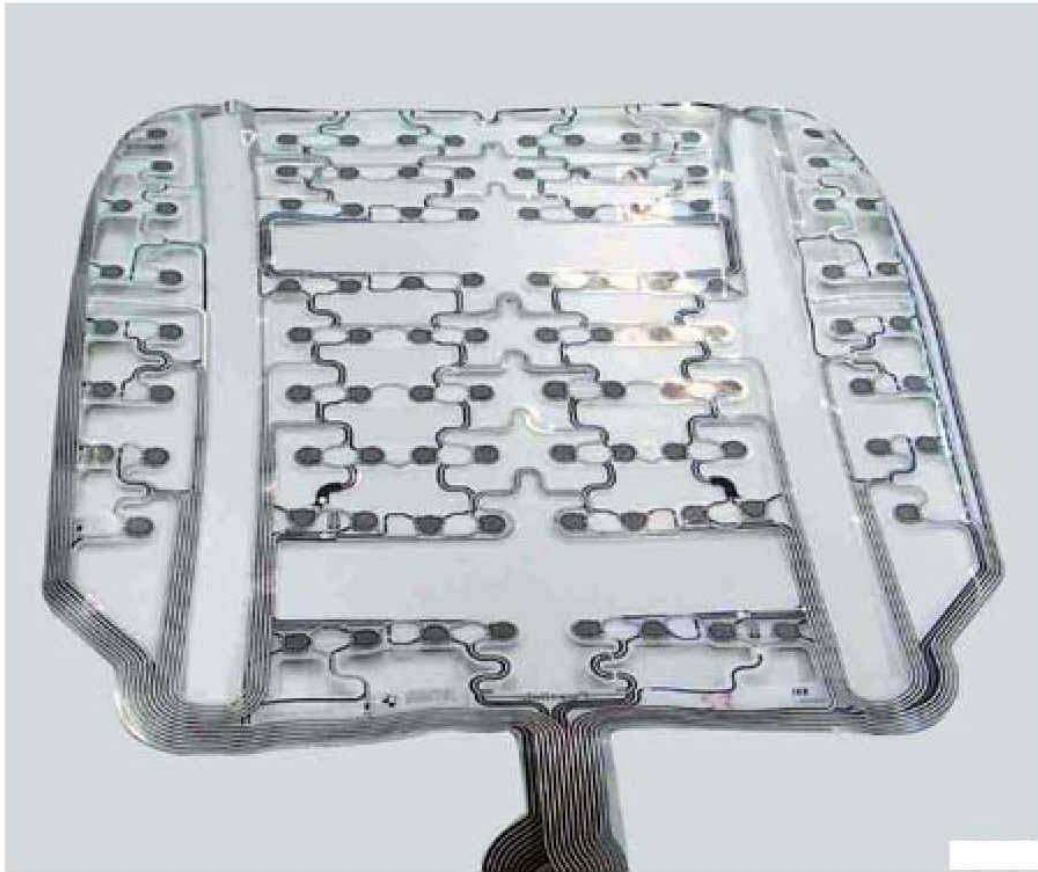
Fig. 5: Identifying B-Pillar Satellites
Courtesy of BMW OF NORTH AMERICA, INC.

Seat Occupancy Detector (OC-3 Mat)

Because of the legal situation in the USA, the presence of a child seat for a child up to one year old must be automatically detected and the passenger airbags then deactivated. The OC3 mat detects a child seat that conforms to the relevant standard (NHTSA FMVSS 208) by virtue of the pattern of the impression it makes on the seat and deactivates the passenger airbags.

A straightforward seat occupancy detector recognizes a certain weight as proof that the seat is occupied. In order to meet legislative requirements, the seat occupancy detector (SBE) has been developed into an intelligent occupant classifier (OC). This was achieved by means of the following measures:

- By a larger number of sensor elements
- By sensing a larger area of the seat
- By an intelligent electronic analyzer



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Fig. 6: Identifying OC3 Mat
Courtesy of BMW OF NORTH AMERICA, INC.

OC3 Mat



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Fig. 7: Identifying Convention Seat Occupancy Detector
Courtesy of BMW OF NORTH AMERICA, INC.

Convention Seat Occupancy Detector

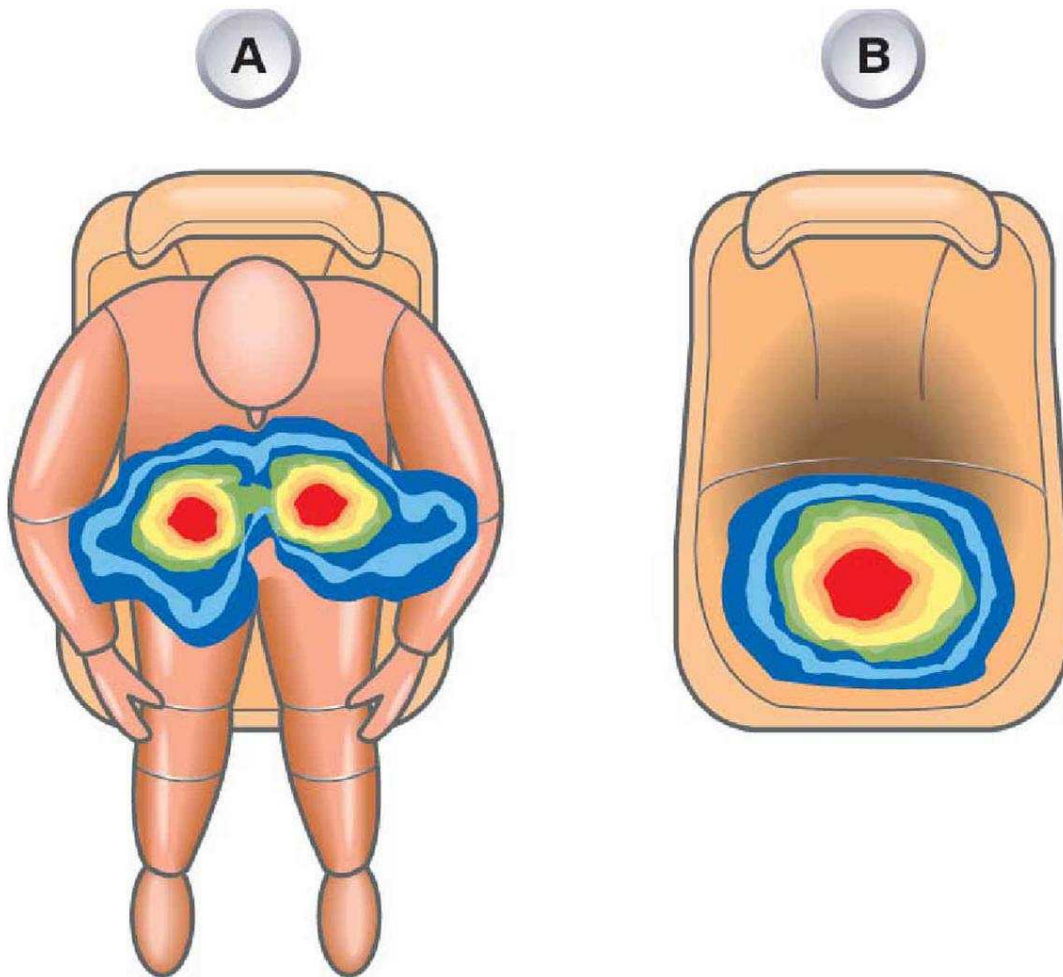
The OC-3 mat is capable of distinguishing between a one-year-old child in a child's seat and a light person.

The OC-3 mat is integrated into the seat area of the passenger seat. The OC-3 mat consists of conductors with pressure-dependent resistor elements (FSR, or Force Sensitive Resistance elements). The conductors are

connected to the electronic analyzer.

The FSR elements are wired in such a way that they can be sampled individually. When the mechanical load on a sensor element increases electrical resistance decreases and the measurement current changes accordingly.

By analyzing the signals from the individual sensors, the analyzer maps the occupancy of the seat surface and can identify the local concentrations of weight. The distances between the areas where pressure is applied and the concentrations of pressure reveal whether the seat is occupied by a person (A) or a child seat (B).



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Fig. 8: Identifying Local Concentrations Of Weight
Courtesy of BMW OF NORTH AMERICA, INC.

The analyzer of the OC3 mat sends a message to the MRS4RD control unit via the K-bus. If the system detects that the seat is unoccupied or that a child seat for a child up to one year old is fitted, the airbags on the passenger side are deactivated. The MRS4RD control unit switches on the airbag warning light. The airbag warning light indicates that the airbags on the passenger side are deactivated.

NOTE: The airbag warning light is switched on if the seat is unoccupied.

Belt Buckle Switch

The belt buckle switch is used to detect whether the seatbelt has been fastened or not. The detection signal is sent to the MRS4RD control unit. The signal is used as a criterion for selective triggering of the actuators in the event of a crash. The belt buckle switch is located in the seatbelt buckle on the driver and passenger seat.

The belt buckle switch is a two-wire Hall switch. The Hall switch is supplied by the MRS4RD control unit via a current-signal interface. The current draw of the switch is the signal for the switch position. The belt buckle switch is permanently diagnosed and monitored in all electrical system statuses from Terminal R "ON" onwards.

Actuators

The Multiple Restraint System 4 Redesign is responsible for activation of the following actuators:

- Front airbag, 2-stage, driver's side
- Front airbag, 2-stage, passenger side
- Head air bag (curtain airbag), left and right
- Side airbag, front door, left and right
- Side airbag, rear door, left and right
- Seatbelt tensioner, front, left and right
- Safety battery terminal
- Airbag warning lamp

Driver's Airbag

The purpose of the driver's front airbag in conjunction with the seatbelt is to reduce the risk of serious or fatal injury to the driver in the event of a head-on collision. The front airbag for the driver's side is located in the impact pad of the steering wheel. The front airbag for the driver is equipped with a 2-stage gas generator.

Depending on the crash severity, the two stages of the airbag are ignited with a delay. The two stages of the gas generator permit the airbag to perform its restraining function in a manner appropriate to the severity of the collision, thus avoiding additional trauma to the driver during the deployment stage. The gas flowing into the airbag inflates it, and in combination with the seat belt this reduces the risk of injury in an accident.

Passenger Airbag

The purpose of the passenger front airbag in conjunction with the seatbelt is to reduce the risk of serious or fatal injury to the front passenger in the event of a head-on collision. The 2-stage passenger front airbag is located underneath the dashboard.

In a crash and depending on crash severity, the two stages of the airbag are triggered with a delay. In this way the restraining effect is matched to the severity of the crash situation. Another effect is to reduce the strain on the occupant during the airbag-deployment phase.

When the passenger airbag inflates, a hinged flap that is attached to the dashboard opens. The passenger airbag inflates towards the windscreen. The front passenger's airbag emerges upwards and supports itself on the windscreen glass and the dashboard.

Head Airbag (Curtain Airbag)

On the E83, a new head protection system, the curtain airbag, is introduced as standard equipment for the first time. It differs from the head-protection system used on the E46/E53 as follows:

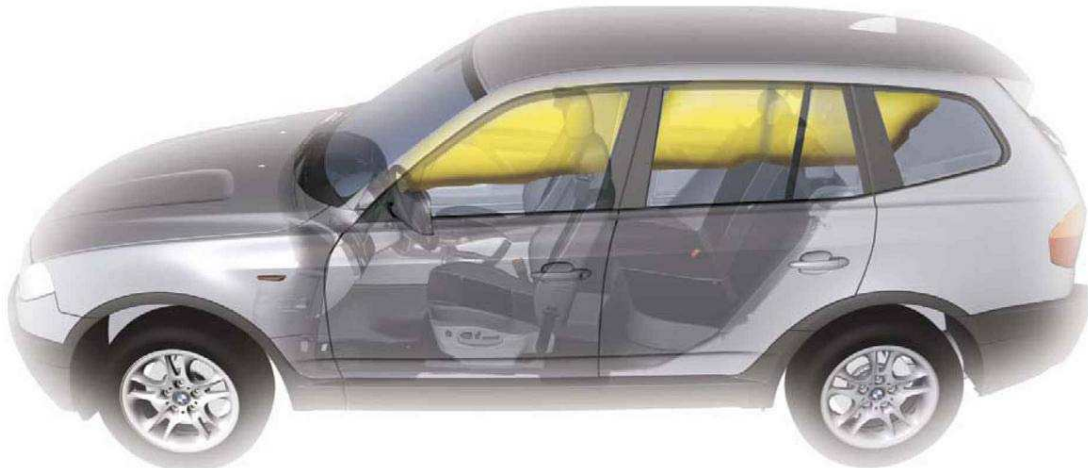
- Continuous head airbag extending all the way from the A-pillar to the C-pillar

The curtain airbag extends all the way from the A-pillar to the C-pillar, covering the entire side-window area. The curtain airbag inflates between the vehicle occupants and the side windows and pillar trims. In conjunction with the side airbags in the front and rear doors, it provides optimum protection for all passengers in the event of a side on impact.

The curtain airbag reduces the risk of occupants' heads or other extremities protruding through the windows in a sideways collision. This leads to less severe neck backlash forces and less severe head injuries.

Advantages of the system:

- Extended covered area for side windows front and rear.
- Protection against glass splinters and penetrating objects.
- Optimized protective area offering protection for occupants of differing sizes.



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Fig. 9: Identifying Head Airbag (Curtain Airbag)
Courtesy of BMW OF NORTH AMERICA, INC.

The curtain airbag is positioned along the line of roof side member, folded up. It consists of a gas generator, the two gas lances and the curtain.

In the event of a side-on collision, the generator is detonated and the gas flows through the two gas lances into the curtain. Simultaneous inflation of the curtain at the front and back achieves more even deployment.

The attachment of the curtain airbag to the A-pillar and the C-pillar pulls it into position. The curtain airbag inflates between the vehicle occupants and the side windows and pillar trims.

Being a sealed system, the curtain airbag retains its shape and strength for several seconds.

Curtain Airbag

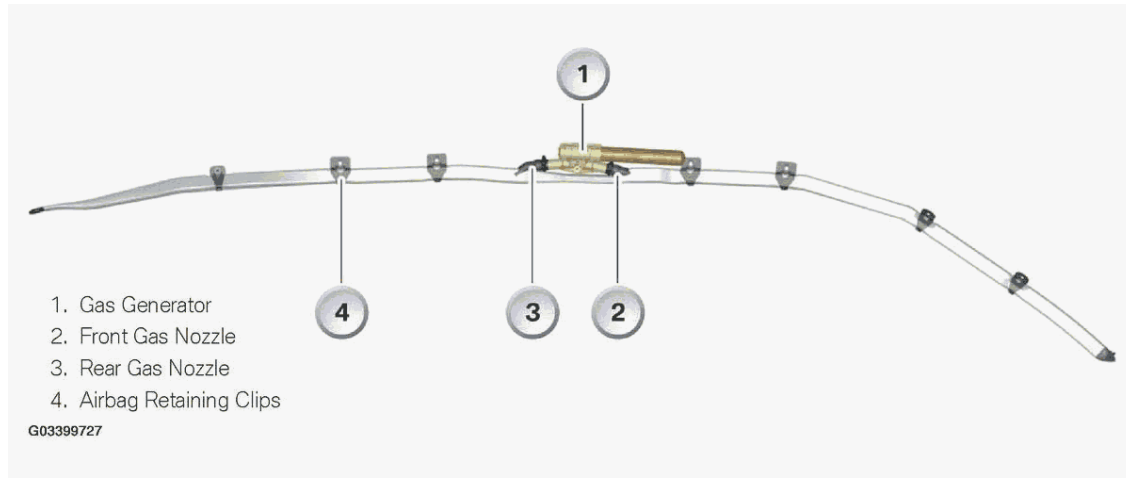


Fig. 10: Identifying Curtain Airbag
Courtesy of BMW OF NORTH AMERICA, INC.



Fig. 11: Identifying Gas Generator
Courtesy of BMW OF NORTH AMERICA, INC.

Side Airbag

The side airbags in the front and rear doors reduce the risk of occupant injury in the torso region of the body in the event of a side-on impact.

The side airbags are folded up inside an aluminum casing with a plastic cover behind the door trim panels. In the area of the side airbag in the door trim is a tear seam. The side airbags are fixed to the door trims as well as by a single screw to the inner door panel.

The plastic cover has defined breaking points. In a side impact of sufficient severity, the side airbag is triggered. The side airbag exits through the split line and deploys between the door and the rear occupants.

Seatbelt Tensioner

The pyrotechnic seatbelt tensioner has the task in the event of a crash to minimize any belt slack in the pelvic and shoulder region.

The seatbelt tensioner is located on the driver's and/or passenger seat. In combination with the mechanical force limiter in the inertia reel, this reduces the chest load for the seat occupants.

BST

If the MRS detects an impact of sufficient severity, the safety battery terminal is deployed. When this happens, the starter/alternator cable is electrically and mechanically disconnected. The alternator is deenergized. The safety battery terminal is located directly at the positive terminal of the battery.



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Fig. 12: Identifying BST

Courtesy of BMW OF NORTH AMERICA, INC.

SYSTEM FUNCTIONS

The MRS4RD control unit has to perform the following functions:

- Crash detection and calculation of deployment timing
- Activation of deployment output stages
- Documentation of time sequence of actuator deployment
- Pre-drive check
- Cyclic monitoring
- Indication of system readiness
- Indication and storage of faults
- Output of fault data (diagnosis)
- Output of crash signal for other members of the communication network
- Activation of the warning lamp if the passenger airbag is deactivated

Deployment

For the deployment output stages to be activated, the appropriate signals must be received from two different sensors, i.e. the B-pillar satellite and the MRS control-unit sensor.

In electrical-system statuses from Terminal R "ON" onwards, the MRS4RD control unit is supplied with power and is ready for operation on completion of the pre-drive check. The deployment capacitor, which acts as a power reserve, is charged to approx. 26 V via a switching regulator. The deployment capacitor provides the back-up power supply in the event of a crash in which the battery power supply is cut off.

The deployment capacitor, which provides the deployment power for the deployment output stages is controlled by a safety switch (trigger switch). The safety switch is operated by the microprocessor.

The deployment output stages consist of a high-side and a low-side power switch. The high-side power switch switches the deployment current and the low-side power switch switches the earth current. The high-side and low-side power switches are also used to check the deployment circuits as part of the pre-drive check.

The incoming sensor signals are analyzed by the analyzer module and passed on to the microprocessor. The microprocessor performs the deployment-algorithm calculations. The calculation results are compared with the event/deployment matrix and a decision reached as to the deployment of the various detonator pellets.

Pre-Drive Check

As of system status Terminal R "ON," the MRS4RD performs a pre-drive check (system test). While the pre-drive check is in progress, the airbag warning lamp is switched on for 3 - 5 seconds. Once the pre-drive check has been completed, and assuming no faults have been detected, the airbag warning lamp is switched off and the system is ready for operation.

The following tests are performed as part of the pre-drive check:

- Comparison of programmed equipment with actual equipment fitted
- Testing of deployment circuits
- Testing of resistance of deployment circuits
- Testing of internal components
- Testing of external components
- Checksum calculation for algorithm parameters

Cyclic Check

Once the pre-drive check has been successfully completed and the system is ready for operation, a cyclic check for the purposes of fault monitoring is performed. The cyclic check continues to be carried out as long as the system status is Terminal R "ON."

The following tests are performed as part of the cyclic check:

- Monitoring of resistance of deployment circuits
- Communication capability and status of components
- Power supply

System Readiness

The MRS4RD indicates that the system is ready for operation by extinguishing the airbag warning lamp (AWL).

Fault Storage

If there is a fault in the system, it is indicated by the airbag warning lamp.

If a fault occurs on the MRS4RD, it must be stored in a non-volatile memory (EEPROM). When faults are recorded, a distinction is made between internal and external faults.

If an internal fault has been detected, the record of the fault cannot be deleted, i.e. the control unit has to be replaced. The only exception in that regard is incorrect programming data.

External faults on system components are also recorded in the fault memory. Once such faults have been rectified, the record can be removed from the fault memory.

Crash Signal

In the event of a crash involving deployment of the restraint systems, the MRS4RD control unit sends a crash signal to the members of the bus network.

On receipt of that signal, the control units concerned perform the following functions according to the severity of the crash:

- Switch off electric fuel pump
- Switch off alternator
- Unlock central locking system
- Switch on hazard warning flashers
- Make emergency call (only if Professional phone option fitted)

EMERGENCY CALL (IF EQUIPPED W/TELEMATICS)

The E83 offers the customer a number of emergency call functions and a breakdown call function if the vehicle is equipped w/Telematics. The emergency call functions include a manual emergency call as well as the automatic emergency call activated as a result of a crash of appropriate severity.

Even if the vehicle is not equipped with the Motorola Everest telephone, every vehicle has a Telematic Control Unit TCU (if equipped w/Telematics), a telephone aerial, a hands-free unit as well as a GPS aerial for localization.

Manual Emergency Call

The emergency call switch (4) is connected directly to the telephone. Pressing the emergency call switch sets up a voice connection with the provider "Cross Country." The voice connection is indicated by a flashing LED in the switch.

Breakdown Call

The Breakdown call button in the Central Information Display can be activated by means of the controller. If the breakdown call button is activated, a connection to the BMW Emergency Service of the relevant country is set up.

Automatic Emergency Call

In the event of a crash of the appropriate severity, the MRS4RD control unit transmits a crash telegram to the TCU. The TCU places an emergency call, which at the same time contains the location of the vehicle.

If a navigation system is installed, the location of the vehicle is notified to the TCU. If no navigation system is installed, the location of the vehicle is determined by the internal GPS receiver of the TCU.

A voice connection is set up with the provider "Cross Country" to obtain more information on the accident (severity of the accident, number of injured) so that rescue operations can be initiated.

GENERAL INFORMATION

Starting Systems - Overview

STARTING SYSTEMS

Model: All

Production Date: All

PURPOSE OF STARTING SYSTEM

The purpose of the starting system is to convert chemical energy stored in the battery into electrical energy, then into mechanical energy in the starter motor. This mechanical energy is then transferred through gears and drives from the starter motor to the engine flywheel.

After the transfer and conversion of all this energy the engine flywheel begins to rotate.

The rotation must be of sufficient speed to allow the engine to form the combustible air-fuel mixture required for starting. It must be maintained during initial combustion long enough until the engine can sustain operation.

To accomplish this a starter or cranking motor is used.

The starting system consists of the following components:

- Battery.
- Ignition Switch.
- Starter Motor Assembly.
- EWS (if equipped).
- Starter Safety Switch.
- Cables and Wiring Harness.

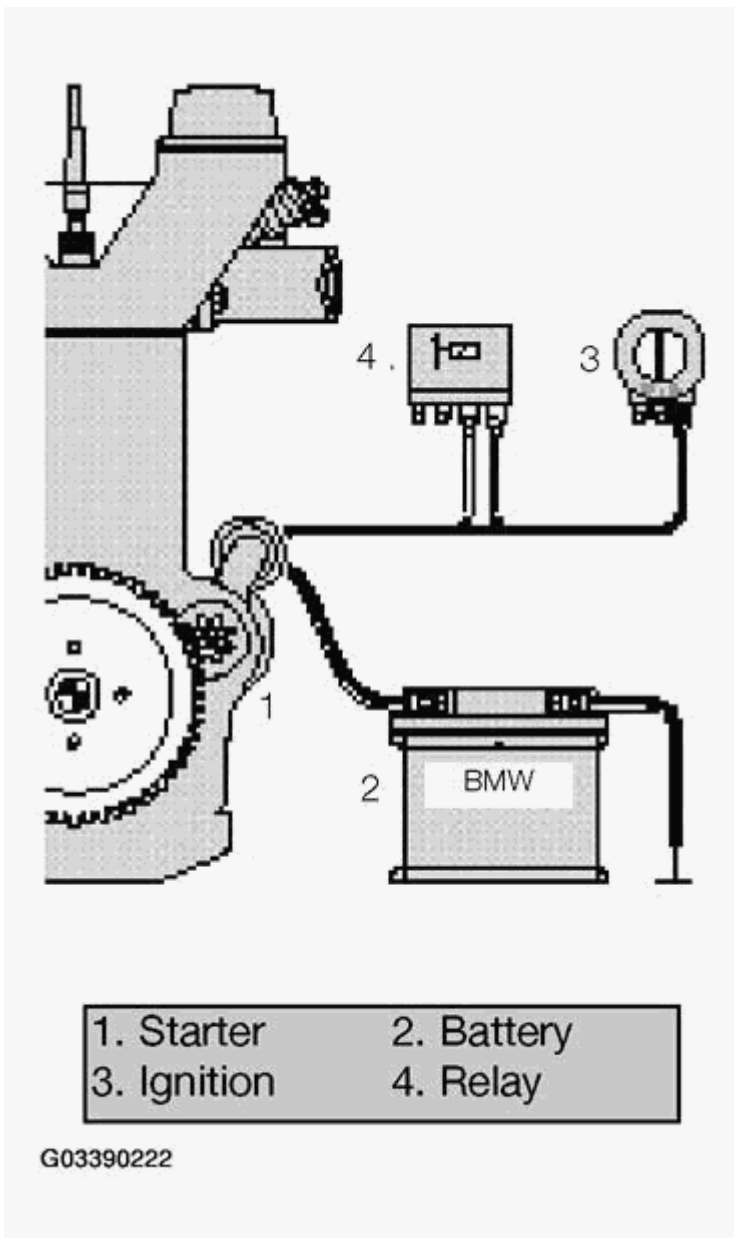


Fig. 1: Identifying Starting System

Courtesy of BMW OF NORTH AMERICA, INC.

SYSTEM COMPONENTS

Battery

The Battery is the primary EMF source in the automobile. The automotive battery is an electromechanical device that provides the potential difference (voltage). The battery does not store electrical energy. It stores chemical energy that is converted to electrical energy as it discharges.

All energy for starting the car is drawn from the battery. State-of-charge, and capacity of the battery are important factors in the ability of the engine to start, especially in cold and harsh conditions.

Ignition Switch

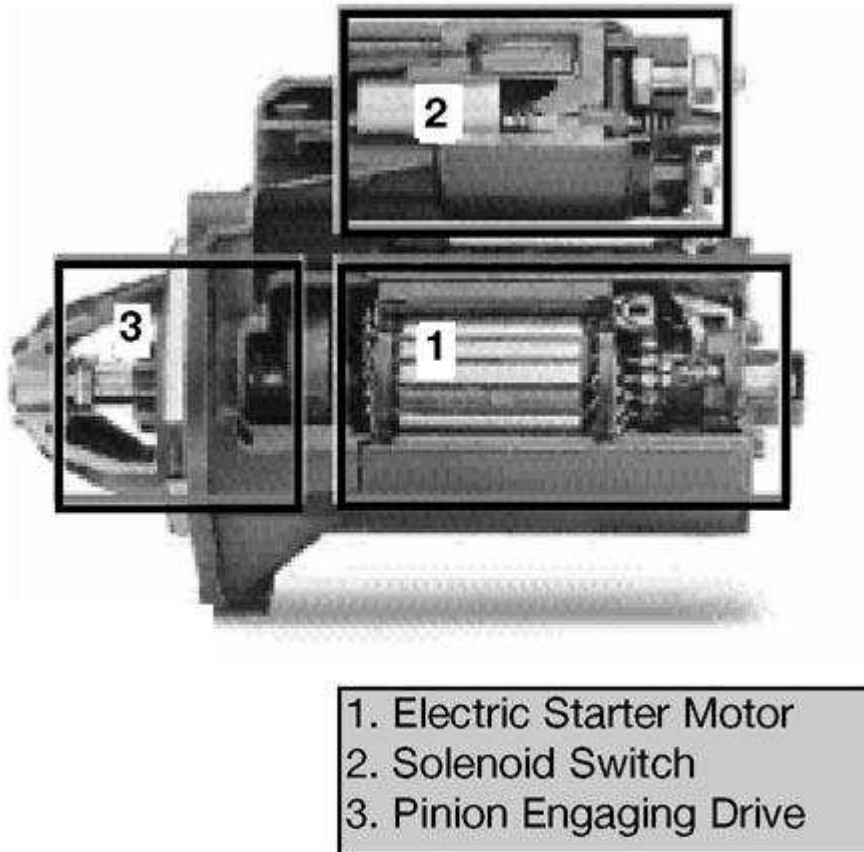
The Ignition Switch provides a request to the starting system to engage the starter motor. This request is handled differently depending on the year of the vehicle and particular systems the vehicle is fitted with.

In non EWS systems the ignition switch provided power directly to the starter solenoid or a starter relay. Beginning with EWS I the start request (KL50) is passed to an Immobilizer control module or an EWS module (EWS II/III).

On vehicles with one touch starting the KL50 signal is passed to the DME.

Starter Motor Assembly

The Starter Motor Assembly is a DC motor which uses the interaction of magnetic fields to convert electrical energy into mechanical energy.



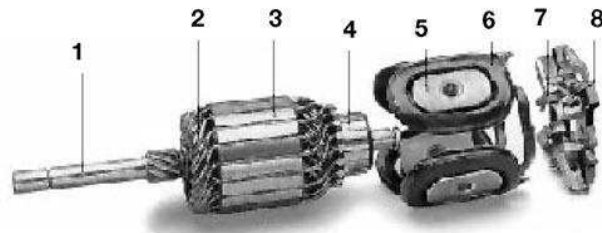
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Fig. 2: Identifying Starter Motor Assembly
Courtesy of BMW OF NORTH AMERICA, INC.

Electric Starter Motor

The Starter Motor provides the mechanical energy to rotate the engine through a direct or a gear reduction drive.

- Armature Shaft (1)
- Armature Winding (2)
- Armature Stack (3)
- Commutator (4)
- Poles Shoes (5)
- Field Coil (6)
- Carbon Brushes (7)
- Brush Holder (8)

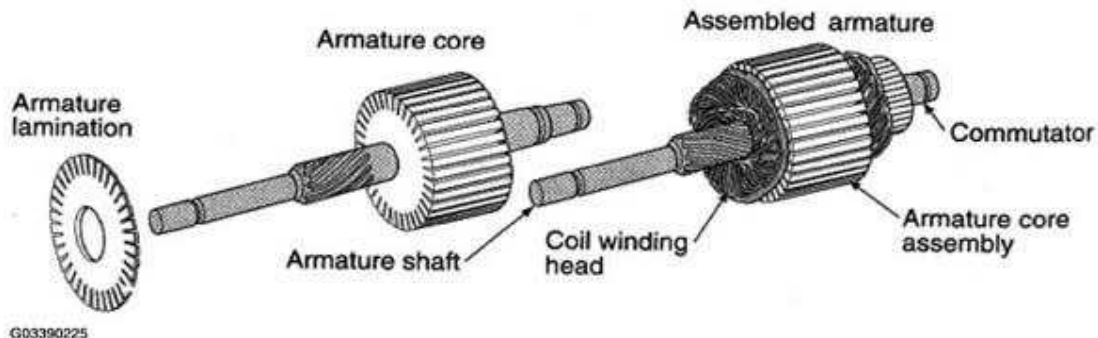


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Fig. 3: Identifying Major Components Of Starter Motor
Courtesy of BMW OF NORTH AMERICA, INC.

Armature

The Armature assembly is comprised of the armature shaft, armature winding, armature stack and commutator. Thin iron stampings are laminated together to form the stack or core. The slots on the outside of the laminations hold the armature windings. The windings loop around the core and are connected to the commutator. Each commutator segment is insulated from the adjacent segments. The commutator may have up to 30 segments. A steel shaft is insert in the center hole of the laminations with the commutator insulated from the shaft.



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Fig. 4: Expanded View Of Armature Assembly
Courtesy of BMW OF NORTH AMERICA, INC.

Field Coils

There are two types of field coils:

- Electromagnetic.
- Permanent magnet.

Electromagnetic

Wire ribbons or coils wrapped around a pole shoe, attached to the inside of the starter housing. The iron pole shoes and the iron starter housing work together to increase and concentrate the strength of the field coils. When current flows through the field coils strong electromagnetic fields with North and South poles are created.

Permanent

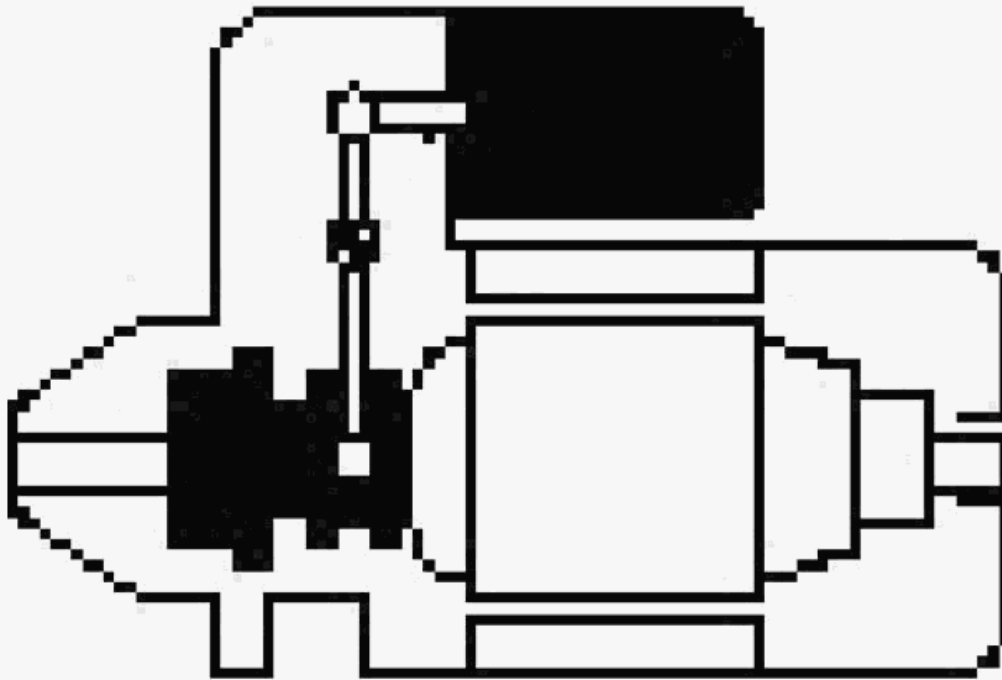
Multiple permanent magnets manufactured from an alloy of boron, neodymium and iron are positioned in the starter housing. Use of permanent magnets allow for the elimination of the field circuit and windings and realize a 50% weight savings.

Brushes

Brushes are electrically conductive sliding contacts, usually made of copper and carbon. The brushes make contact with the commutator and as the starter begins to rotate the brushes reverse the flow of current to the armature. Starter brushes carry the full flow of current through the motor.

Solenoid

The Solenoid assembly is an integral part of the starter and is actually a combined relay and engagement solenoid.



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Fig. 5: Identifying Solenoid Switch And Pinion Engaging Drive
Courtesy of BMW OF NORTH AMERICA, INC.

Solenoid switch and pinion engaging drive.

The solenoid has two functions:

- Pushing the pinion forward so that it engages in the ring gear of the engine.
- Closing the moving contact, providing the main current path for the starter.

The solenoid has two windings.

- Pull-in winding.
- Holding-in winding.

Both windings are used to draw in the plunger and engage the pinion, only the hold-in winding is used to hold the plunger in position.

Pinion Engaging Drive

The starter's end shield assembly contains the Pinion Engaging Drive with pinion, overrunning clutch, engagement lever and spring. The drive mechanism is responsible for coordinating the thrust motion of the solenoid switch and the rotary motion of the electric starter motor and transferring them to the pinion.

The starter engages the ring gear on the flywheel by means of the pinion. A high conversion ratio of pinion teeth to flywheel teeth (between 10:1 and 15:1) make it possible to overcome the high cranking resistance of the engine using a relatively small but high speed starter motor.

As soon as the engine starts and accelerates past cranking speed, the pinion must automatically demesh in order to protect the starter. For this reason, the starter incorporates an overrunning clutch.

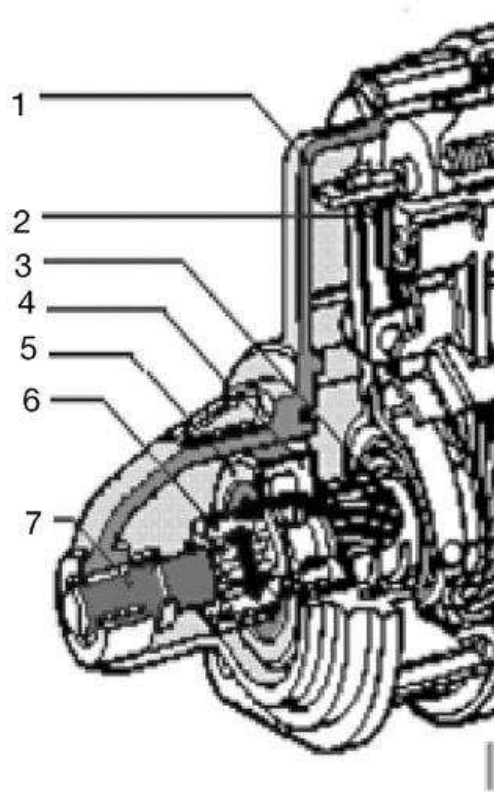
STARTER DRIVES

Conventional Drive

In a Conventional Drive starter the pinion gear is located directly on the armature shaft.

The pinion and overrunning clutch form the driver assembly.

The driver assembly rides on a helical spline on the armature shaft so that when the driver is thrust by the solenoid, a combined axial and rotary motion occurs which greatly facilitates the meshing of the pinion.



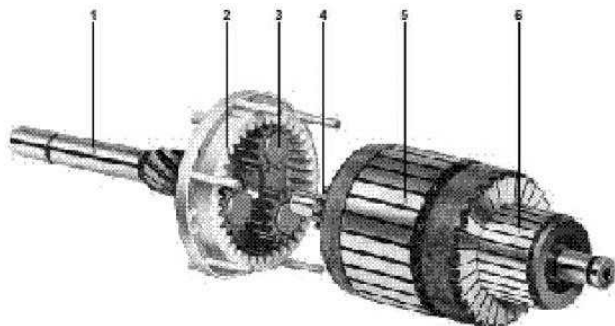
1. Drive End Shield
2. Engaging Lever
3. Meshing Spring
4. Driver
5. Roller Type Overrunning Clutch
6. Pinion
7. Armature Shaft

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Fig. 6: Identifying Conventional Drive Starter Pinion Gear
 Courtesy of BMW OF NORTH AMERICA, INC.

Gear Reduction Drive

In their design and function, Gear Reduction Drives are much the same as conventional drive starters. The main difference in the gear reduction drive starter is a planetary gear set added between the field frame and the drive end shield. This design allows for the use of smaller and lighter starters.



1. Planetary-Gear Carrier Shaft with Helical Spline.
2. Internal Gear (Ring Gear).
3. Planet Gears
4. Sun Gear on Armature Shaft
5. Armature
6. Commutator

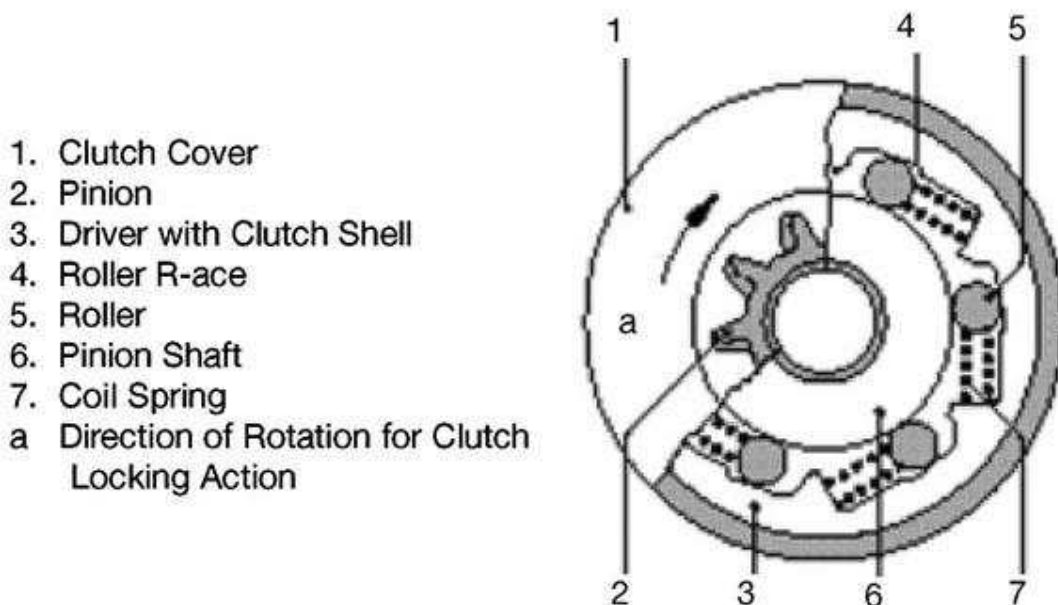
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Fig. 7: Identifying Gear Reduction Drive
Courtesy of BMW OF NORTH AMERICA, INC.

OVERRUNNING CLUTCH

In all starter designs the rotary motion is transmitted via an Overrunning Clutch. The overrunning clutch allows the pinion to be driven by the armature shaft (or planetary gear set), however it breaks the connection between the pinion and the armature shaft as soon as the accelerating engine spins the pinion faster than the starter.

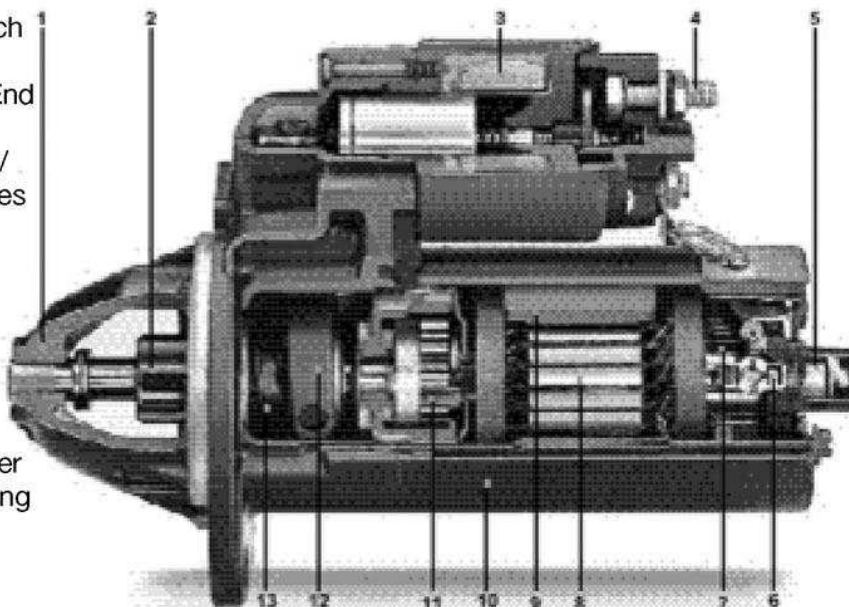
The overrunning clutch is located between the starter motor and the pinion and prevents the starter motor armature from being accelerated to an excessive speed when the engine starts.



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Fig. 8: Identifying Overrunning Clutch Components
Courtesy of BMW OF NORTH AMERICA, INC.

1. Drive End Shield.
2. Pinion
3. Solenoid Switch
4. Terminal
5. Commutator End Shield
6. Brush Plate W/
Carbon Brushes
7. Commutator
8. Armature
9. Permanent
Magnet
10. Field Frame
11. Planetary
Gear
12. Engaging Lever
13. Pinion Engaging
Drive



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Fig. 9: Cross Sectional View Of Starter Motor
Courtesy of BMW OF NORTH AMERICA, INC.

Fully assembled permanent magnet gear reduction starter.

EWS

The EWS system(s) is designed to provide electronic anti-theft protection for the vehicle through the use of coded keys and coded data communication between the EWS and the engine control module. The starter and engine control module are locked out until a properly coded key is recognized and the proper code is established between the EWS and the engine control modules.

Starter Safety Switch

The Starter Safety Switch is part of the transmission range switch on automatic transmission vehicles and a clutch switch on manual transmission vehicles (beginning MY 1997). The purpose of the switch is to prevent engine start-up with the vehicle in gear or the clutch not depressed. On vehicles with EWS, this signal is sent directly to the EWS module for processing.

Cable and Wiring Harness

Cables to the starter from the battery must carry large amounts of current. The wiring harness from the ignition switch and/or EWS carry little current as they are control signals to a relay or starter solenoid. Minimum voltage drop in starter cables is necessary to ensure sufficient starter speed and torque.

PRINCIPLE OF OPERATION

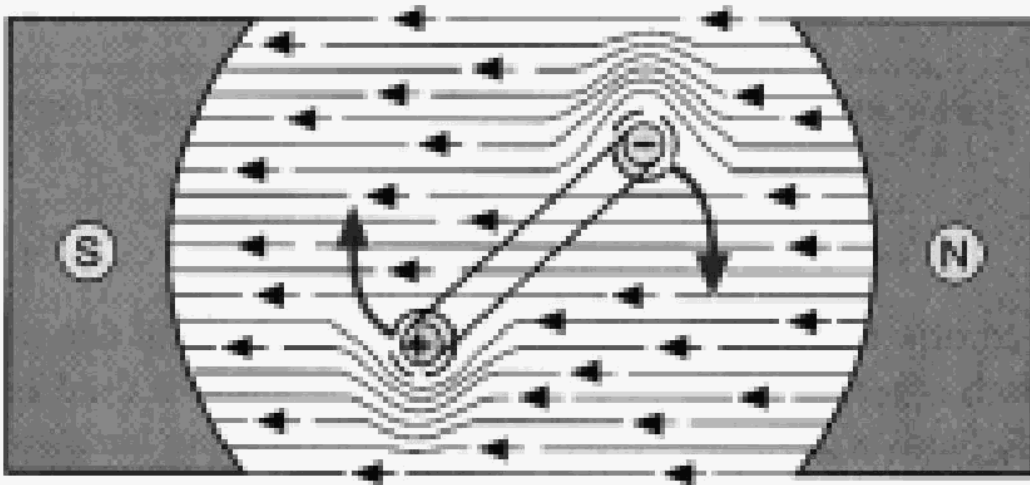
Electric Starter Motor

The Electric Starter Motor converts electrical current into rotary motion. In doing so it converts electrical energy into mechanical energy. The interaction of two magnetic fields produce this rotational force.

The field coils (either electromagnetic or permanent) located in the housing produce magnetic flux lines. Within the stationary field coils is the armature, a loop of wire (a conductor) with one end connected to B+, the other to B-. When current is applied to the armature flux lines circle the loop in one direction on one side and in the opposite direction on the other side. The interaction of the flux lines on the armature and the flux lines from the field coil cause the armature to rotate.

The armature will only rotate to the point where the magnetic force is equal on both sides. (Armature 90° to magnetic flux lines of field) For the armature to continue to rotate, the polarity or direction of current flow must be reversed.

Through the brushes and the commutator, the current flow is reversed as the magnetic forces become equal, causing the armature to continue to rotate.



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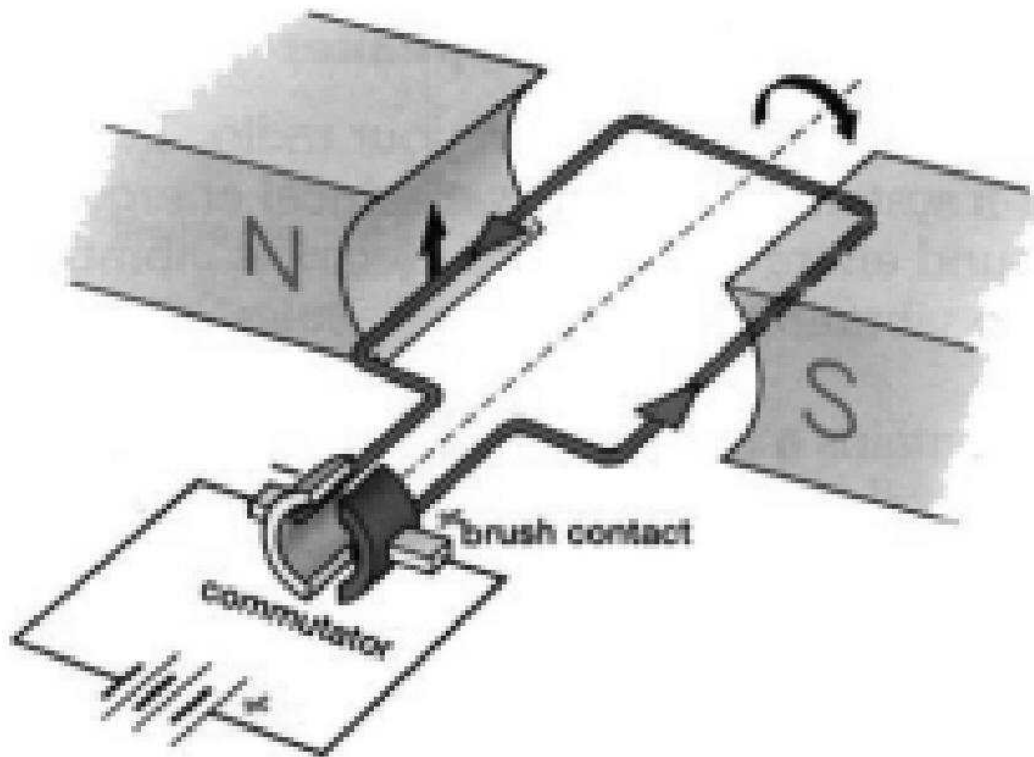
Fig. 10: Identifying Magnetic Flux Lines
Courtesy of BMW OF NORTH AMERICA, INC.

This constant reversal of current flow in the armature provides continual rotation.

Direction of rotation is determined using **Flemings Left Hand Rule**.

- Point your First finger in the direction of the magnetic Field (from N to S).
- Rotate your hand about that finger until your second finger points in the direction of the Current

(conventional current, from + to -).



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Fig. 11: Identifying Magnetic Field
Courtesy of BMW OF NORTH AMERICA, INC.

Loop symbolizes force out of magnetic field.

- Then your thumb points in the direction of the Movement of the wire.

To increase the force on the wire (armature) do one of the following:

- Use a larger current.
- Use a stronger magnetic field.
- Use a greater length of wire in the field.

To increase torque and speed in the starter motor, more windings in the armature are added, and the field has more pairs of magnets (either permanent or electromagnetic).

Flemings left hand rule:

The basic law of motors, the direction of force on a wire that is carrying current when it is in a magnetic field.

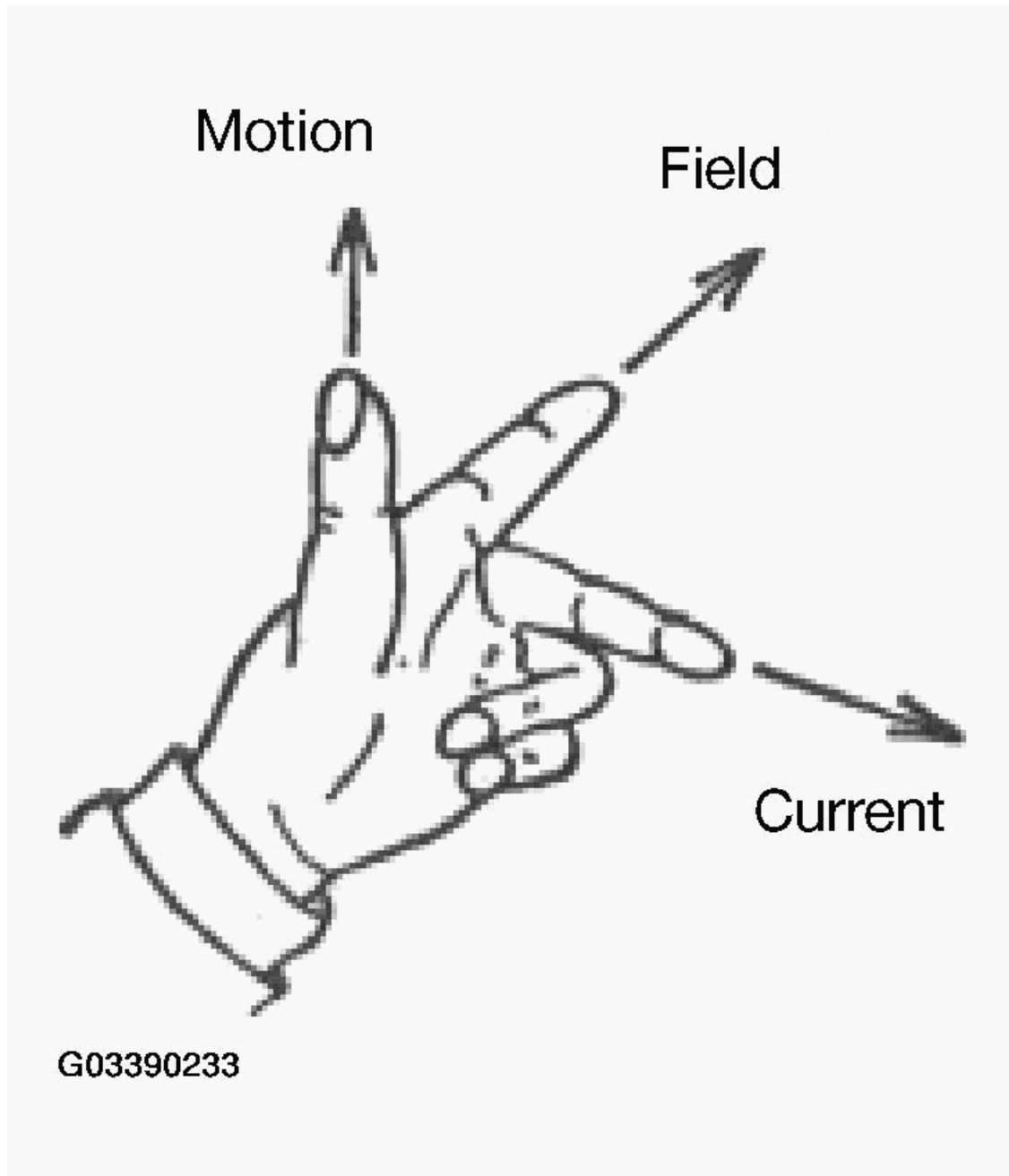


Fig. 12: Illustrating Fleming's Left Hand Rule
Courtesy of BMW OF NORTH AMERICA, INC.

MOTOR WINDINGS

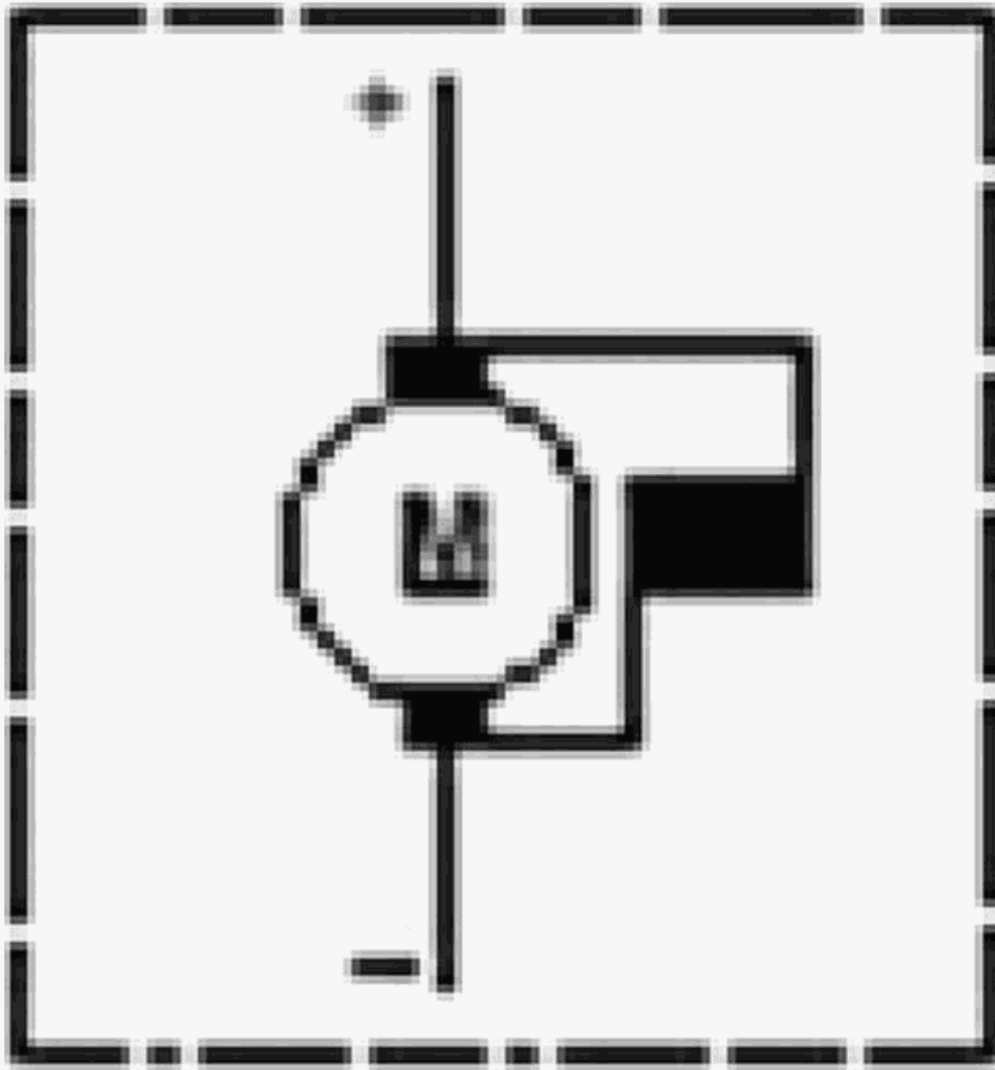
Torque and speed of the starter motor is dependent on the wiring of the field coils (electromagnetic coils).

There are three types of Motor Windings:

- Shunt Wound.
- Series Wound.
- Compound.

Shunt Wound Motors

In Shunt Wound Motors, the field coil is connected in parallel with the armature. The shunt motor does not decrease its torque as speed increases. Shunt motors do not produce high torque.



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Fig. 13: Identifying Shunt Wound Motors
Courtesy of BMW OF NORTH AMERICA, INC.

Series Wound Motors

In Series Wound Motors, the field coil is in series with the armature.

The current flows to the field windings, then to the brushes, commutator, and armature back again to the ground side brush. A series wound motor will develop maximum torque output at the time of initial start, then as motor

speed increases, torque falls off rapidly due to the CEMF.

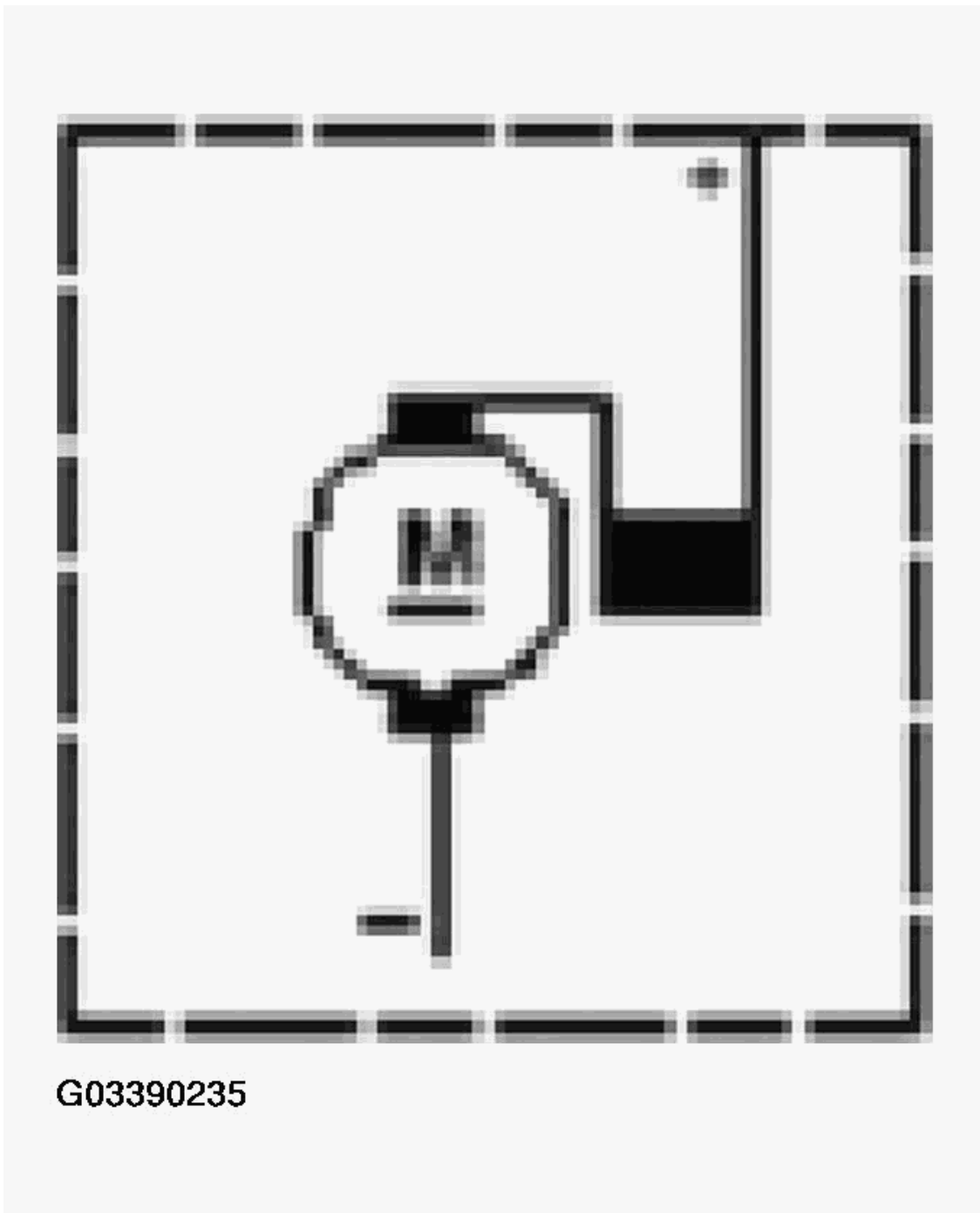


Fig. 14: Identifying Series Wound Motors
Courtesy of BMW OF NORTH AMERICA, INC.

Compound Wound Motors

Compound Wound Motors have some of the field coils wired in series to the armature and some in parallel. This configuration allows the compound motor to develop good starting torque and constant operating speed.

CEMF:

Counter Electromotive Force.

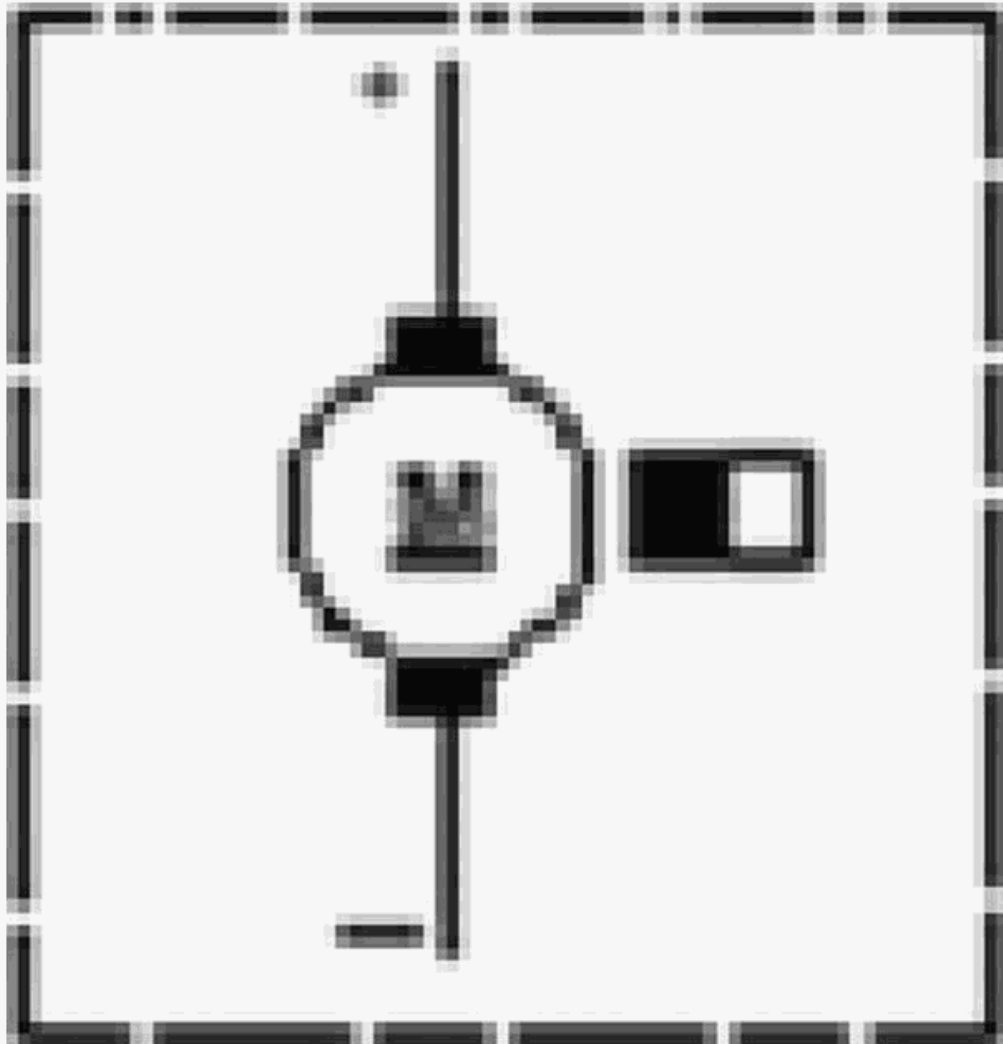
The voltage produced in the starter motor itself through electromagnetic induction.

This voltage acts against the supply voltage from the battery.

Motors must be designed to control the CEMF for optimum operation.

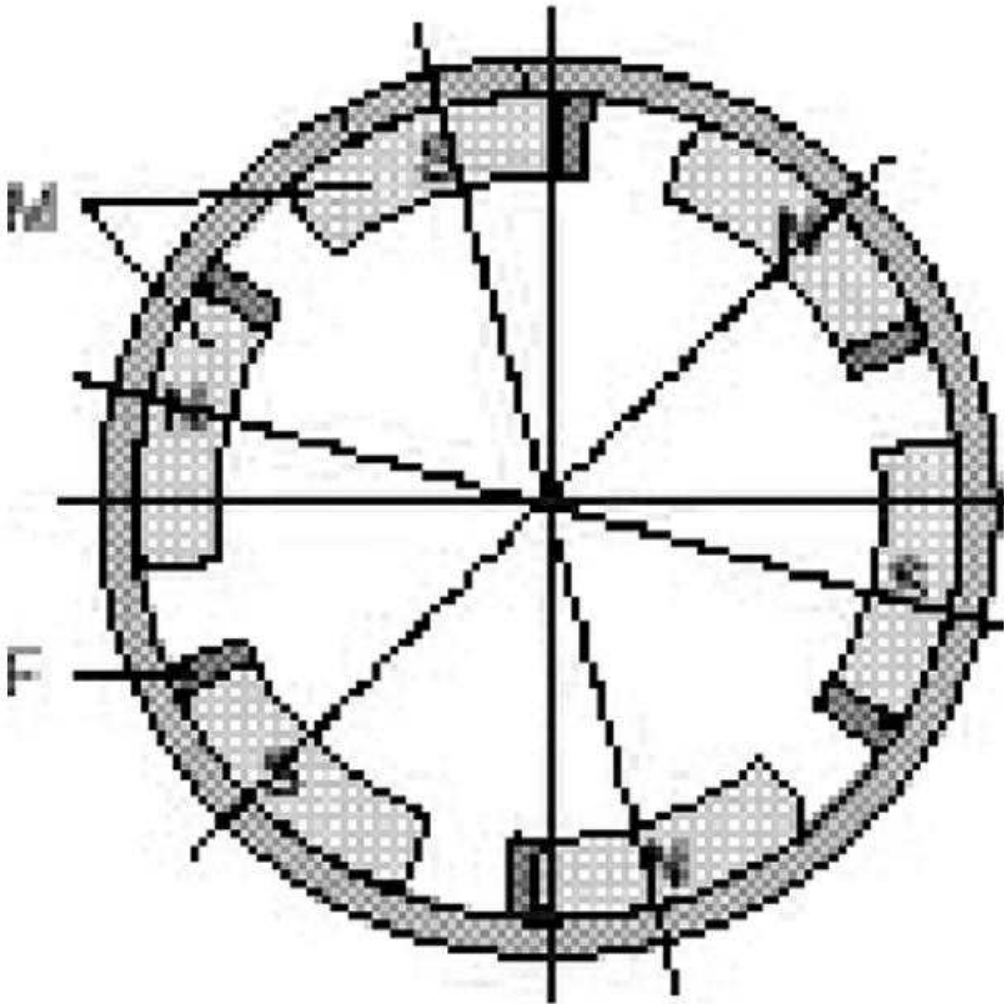
Permanent Magnet Motors

Permanent Magnet Motors eliminate all wiring to the field coils. The magnetic field is generated by the permanent magnet without the need for winding and pole shoes. The magnets use flux-concentrating pieces to direct the magnetic field.



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Fig. 15: Identifying Permanent Magnet Motors
Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 16: Identifying Permanent Magnets With Flux Concentrating Pieces
Courtesy of BMW OF NORTH AMERICA, INC.

Arrangement of permanent magnets (M) with flux concentrating pieces (F).

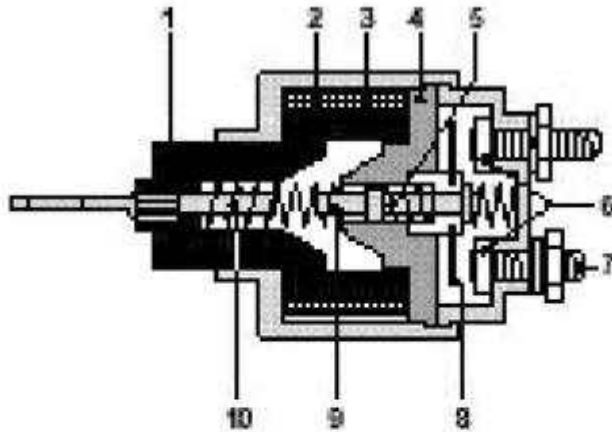
SOLENOID

The Solenoid performs the following functions:

- Pull the pinion to engage the flywheel.

- Hold the pinion engaged with the flywheel during starting rotation.
- Complete the electrical circuit from the battery to the brushes of the starter.
- Cause the pinion to retract from the flywheel.

Two windings are used to pull and hold the pinion engaged to the flywheel.



- | | |
|---------------------|----------------------|
| 1. Armature (relay) | 2. Pull-in winding |
| 3. Hold-in winding | 4. Solenoid armature |
| 5. Contact spring | 6. Contacts |
| 7. Terminal | 8. Moving contact |
| 9. Switching pin | 10. Return spring |

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Fig. 17: Identifying Solenoid Components

Courtesy of BMW OF NORTH AMERICA, INC.

Pull-In Winding- The stronger of the two windings, used to pull the pinion into engagement. This winding is released when the starter circuit is completed.

Hold-In Winding- Used to help the pull-in winding move the pinion initially, then holds the pinion engaged to the flywheel.

Signal 50 is received at the solenoid, energizing both windings. The windings cause the armature to be drawn into the coils, pressing on a spring, causing the moving contacts to close. The pull-in winding is released, the starter begins to turn. When signal 50 is released, the power is lost to the hold-in winding, spring pressure forces the armature out of the coil, the moving contacts are opened and the pinion returns to the rest position.

Workshop Hint:

The starter motor does not begin to spin until after the pinion is engaged in the flywheel.

This aids in the meshing of the pinion and flywheel

Workshop Hint:

Battery voltage is critical.

The combination of the pull-in winding and the hold-in winding may have sufficient power to engage the pinion. When the moving contacts are completed and the increased load of the starter motor is added to the system, low voltage will cause the hold-in winding to release the pinion. If signal 50 is still present the pull-in winding will again assist in pulling the pinion into engagement and the cycle starts over again. This gives the "clicking" noise from the starter.

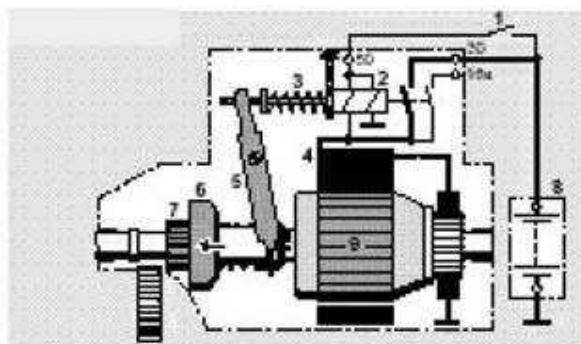
Pinion Drive

The Pinion Drive gear is attached to the roller-type overrunning clutch which is splined via a helical shaft to the starter armature. At rest the spring pressure in the overrunning clutch wedge rollers between the pinion shaft and the clutch hub race. This locks the pinion to the clutch. During start-up the clutch and pinion rotate as one.

As the engine speed exceeds starter speed, the pinion pushes the rollers, against the spring pressure, into a wider area. This movement of the rollers allow the pinion to turn independently of the starter armature, not causing the armature to overspeed.

When the solenoid windings are released the clutch assembly is pulled away from the flywheel through spring pressure.

Phases of Starter Operation



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1. Start Request Signal (KL50)
2. Solenoid Switch
3. Return Spring
4. Field Windings
5. Engaging Lever
6. Overrunning Clutch
7. Pinion
8. Battery
9. Armature

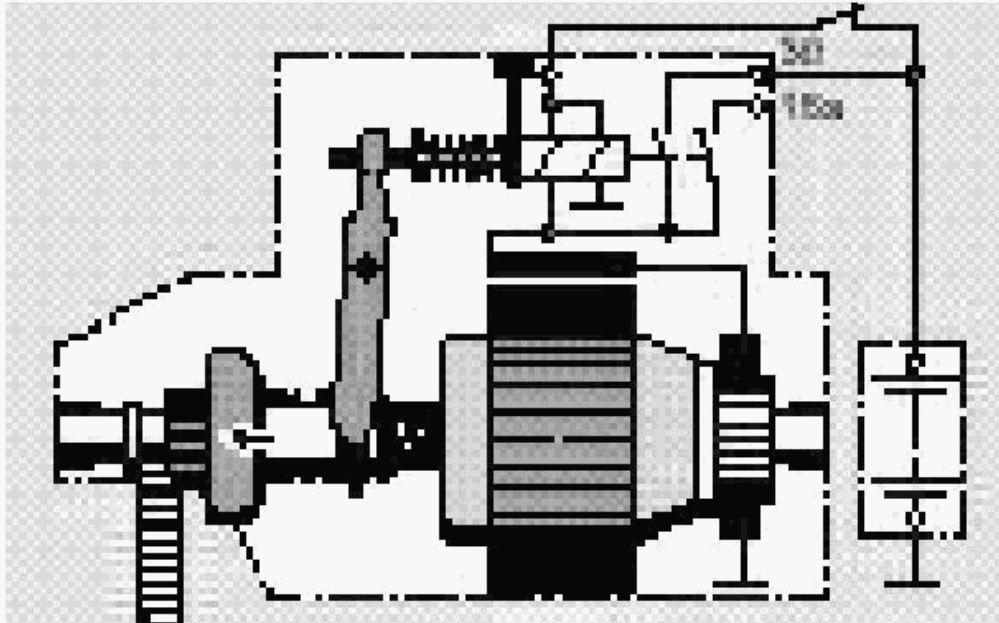
Fig. 18: View Of Starter At Rest

Courtesy of BMW OF NORTH AMERICA, INC.

Starter at rest, no current supplied.

Pull-in and hold-in winding energized.

Pinion tooth meets gap in ring gear and meshes.



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Fig. 19: Identifying First Phase Of Starter Operation
Courtesy of BMW OF NORTH AMERICA, INC.

Starter position just before Main current is switched on.

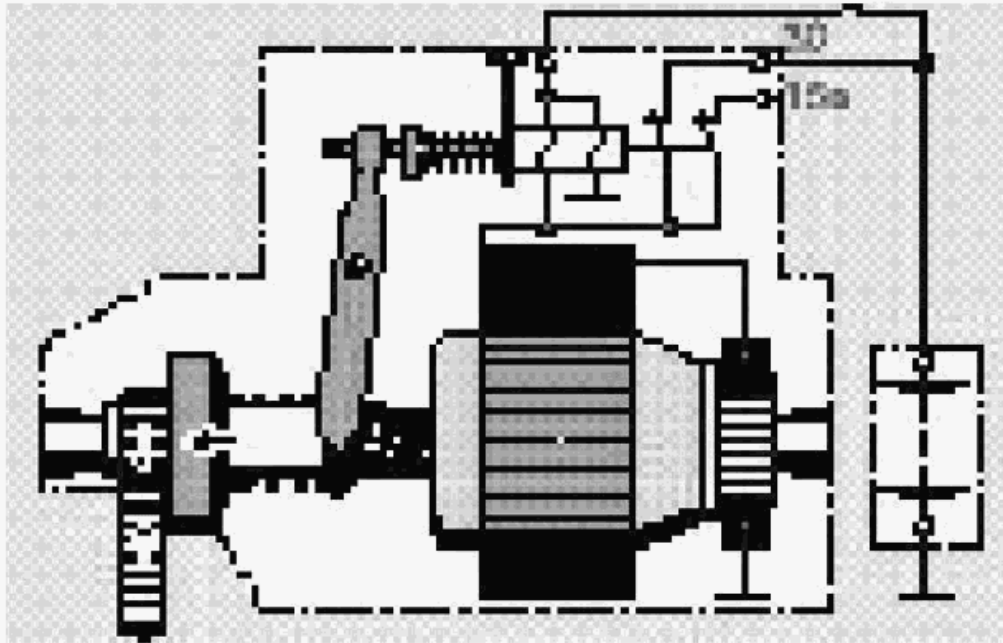
Engaging lever in end position.

Pull-in winding released.

Pinion meshed.

Main current flows.

Engine is rotated.



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Fig. 20: View Of Starter Operation

Courtesy of BMW OF NORTH AMERICA, INC.

Engine is cranked.

GENERAL INFORMATION

Telephone Diagnostics - Overview - All Models

TELEMATICS

FREQUENTLY ASKED QUESTIONS

1. What is telematics?

Telematics combines wireless voice and data to provide location-specific security, information, productivity, and in-vehicle entertainment services to drivers and their passengers.

2. How does a telematics system work?

The heart of a telematics system within the car is a telematics Communications Unit (TCU) that is connected (wirelessly) to a central service center. The TCU serves as the central platform of a telematics system, where all telematics-related technologies are deeply integrated. It communicates location-specific information to a central service center and in turn the center helps deliver telematics services to a driver via the cellular phone.

These services can include dispatching ambulance services to a driver in an emergency situation, or sending roadside assistance to a driver whose car has broken down. Other services include the ability of a central server to deliver navigation assistance and real-time traffic information, among others. What's more, the TCU is also connected to the engine control unit (or the onboard computer) which enables enhanced services such as remote engine diagnostics and automatic airbag notification.(01)

3. What is the difference between telematics and navigation systems?

A telematics system provides numerous services to drivers, and navigation is simply one of the services offered. Navigation systems that are starting to appear in highend cars today are referred to as autonomous navigation systems. Here, the navigation database resides in the car on a CD. These systems are relatively expensive. telematics systems provide navigation assistance "off-board". This means that the database resides outside the car, making the service far more affordable to a wider number of people.

4. Where does the word "telematics" come from?

The term originated in Europe and remains widely used in the European automotive industry to describe automotive communications technologies.

5. Can you explain a telematics system in technological detail? What are its components?

The main component in a telematics system is the telematics Communications Unit (TCU). In North America, a TCU contains a Motorola GPS receiver, cellular transceiver, and modem/transceiver control board. In Europe, a TCU contains a Motorola GPS receiver and GSM transceiver. Motorola's European telematics systems do not require a modem due to the already existing digital data transfer services, such as SMS (short message service) available with GSM.

Every telematics system developed by Motorola contains Motorola's automotive-grade telematics software, which is uniquely programmed to deeply integrate the components of a TCU, enabling simplified delivery of telematics services from one centralized area.

6. What services does a telematics system offer today?

Today, telematics systems offer drivers emergency and roadside assistance, air bag deployment notification, navigation, remote door unlock, vehicle security notification and stolen vehicle tracking services.(01) (02)

7. What services will telematics offer in the future?

Just as today's telematics safety and security features are a direct result of initial consumer demand, future telematics services will also be a direct result of what drivers want in their cars. These systems may provide customized services such as travel information (traffic updates, parking availability, airline status), messaging (voice mail and email retrieval), information (sports, weather, stock market updates and Internet access) and entertainment (audio games, books, magazines and newspapers). These are only a few of the applications which will evolve with telematics to keep drivers and their passengers in touch.

Eventually, telematics will even reach outside the car and communicate with the office and home, extending far beyond voice conversations. Drivers will be able to turn on home lights, start and stop the sprinkler system, set their office security system - all via their telematics systems.

8. How does a driver interact with a telematics system?

Drivers activate telematics systems via buttons located on the dashboard or the overhead console of the car. Motorola works with each automaker to help develop a purpose-built system for the projected ergonomic desires of drivers. The BMW Mayday telematics system has an emergency and roadside assistance button located on a cellular handset. The Mercedes TeleAid system has an S.O.S. button located behind the rear view mirror and "Information" and "Roadside Assistance" buttons located in the armrest.

9. Can a Global Positioning System (GPS) phone handle telematics services?

We have several concerns about integrating GPS functionality into a phone handset, instead of the vehicle itself.

Our first issue is the ability of a GPS phone to operate inside of the automobile without an external GPS or cellular antenna. GPS antennas must have an unrestricted view of the sky to track satellites. So the decision must be made whether it's more cost-effective to have the GPS in the phone or in the car.

Furthermore, integrating telematics into a portable phone may be very attractive from a cost and convenience perspective, but does not support the stolen vehicle alarm, door lock/unlock, and other features that require the device to remain in the car when the occupants have left.

Finally, GPS is only one part of the locating solution. In addition, cellular infrastructure positioning, such as cell tower triangulation, can help. Given current technology, GPS does not operate as effectively inside multiple story, concrete or metal buildings, where many emergency calls originate.

All of these issues, and many others, are taken into account when designing telematics systems and service.

10. How does the airbag deployment notification feature work?

The TCU is constantly "listening" or on the lookout for any sign of emergency. Because the TCU is connected to the engine control unit, when the airbag sensor sends a message to the engine controller to deploy the airbag, the controller alerts the TCU as well. Automotive-grade software that enables these functions and assures their reliability.

Once the TCU is alerted, it automatically makes a cellular call to the response center. The call gets priority call status and jumps ahead of other telematics calls, and the operator is alerted that a call has been received from an airbag deployment. That way, emergency crews can be sent immediately to the scene. (01)

11. What services do consumers really want in their cars?

Initially, autonomous navigation-only systems caught the fancy of drivers in Europe and Japan, while in North America, consumers were more interested in emergency response or emergency call systems. Increasingly, consumers are attracted to the broader spectrum of telematics services, such as the delivery of personalized information and entertainment.

12. Do Motorola's systems use digital cellular technology?

Yes. In Europe, Motorola's telematics systems use the European digital standard, GSM.

In North America, however, only AMPS offers the broad geographic coverage essential for reliable emergency response services. That's why it's the system being utilized in North American telematics right now.

13. What do telematics systems cost?

While each automotive company determines its own pricing, system prices currently range from \$500 to \$2000 in Europe and North America. Some GM vehicles include the OnStar system at no additional equipment charge, and require only a low monthly service fee. Monthly service costs vary, depending on the services offered. Like other new technologies, we anticipate that consumer demand will ultimately drive these costs down.

14. Do European and North American drivers expect different features?

It's clear that Europeans and Americans are all interested in navigation, safety and security services. But the degree to which they prioritize these services varies.

In Europe, there is a greater emphasis on navigation. At the same time, frequent cross-border travel creates language barriers, making familiar navigation and security services even more welcome. In the United States and Canada, safety and security are the most desired services. North Americans are also interested in navigation, but the need for it is not as great. All drivers are interested in getting real-time traffic information.

15. When will North American telematics make the shift to digital?

In North America, the growth of telematics depends on digital cellular standards providing service over a larger geographic area, especially in cities. Unlike the European-wide GSM standard, North America has multiple standards including AMPS, TDMA, CDMA, GSM and iDEN®.

Today, only AMPS offers wide enough geographic cellular coverage for emergency response services. That's why it is utilized in the Motorola telematics systems Motorola currently installed in North America. For data transmission on analog AMPS, modems can be added to the telematics hardware and central service center. In the future, systems will be based on digital wireless, to allow a richer array of features in metropolitan areas.

In addition, as the industry endeavors to deliver comprehensive data services such as Internet access and customized entertainment services, the migration to digital communications technology will be even more essential.

Companies such as Motorola, Nokia, Ericsson and Unwired Planet are addressing these issues for a wide variety of wireless devices. Through the Wireless Applications Protocol (WAP) consortium, we are working together to ensure a reliable and standard method of transferring data over wireless networks worldwide.

16. What new technologies will help deliver greater telematics services?

An important, ongoing initiative that will help drive telematics growth is the ITS Data Bus, or IDB. IDB is based on an open protocol for networking car audio, video, communication and computing devices. Led by the Society of Automotive Engineers (SAE) and supported by several corporations (including Motorola), IDB will allow seamless integration of multiple technologies inside the car.

IDB will allow simple plug-and-play use of any consumer electronics, regardless of the manufacturer. In addition, a firewall contained in the IDB will allow all electronics in the car to operate independently of each other, eliminating signal interference.

17. How will IDB specifically impact telematics?

Many companies are expected to integrate IDB into their telematics components and other electronics systems. Motorola, for example, plans to integrate IDBs into our telematics Communications Units, enabling the system to act as the central hub for all electronics interacting within the car. This will allow consumers to simply plug and play various electronics via their TCU, and take advantage of additional telematics services, without requiring multiple wires and cables overlapping in different areas of their vehicle. Not only will IDB allow easier installations, but it enable drivers to add new services without being concerned about propriety systems and wiring. With IDB, consumers will have greater choice, resulting in greater market growth.

Automatic airbag deployment notification, information services and other telematics services must be supported by your carrier's network, depend on service availability and coverage, and require a subscription. These services are not available in all areas. Check with your service provider for availability. All location based services are subject to the availability of GPS signal or alternative location tracking means. GPS coverage is not

available in all areas.

The use of wireless devices and their accessories may be prohibited or restricted in certain areas. Always obey the laws and regulations on the use of these products. All navigation systems select routes based on several criteria: geographic distance, type of route, and in some cases dynamic traffic information. While these systems usually opt for the shortest travel time to your destination, it is important that you take into account factors including road and driving conditions, terrain and local environments, some of which may contain hazards to you or your vehicle. Always use your best judgment when deciding on a route. As the driver of your vehicle, you are always the final decision-maker, and despite the many advantages of using any Telematics system, you are ultimately responsible for ensuring your safety.

GLOSSARY

AMPS Advanced Mobile Phone System

The first-generation analog cellular phone system that originated in the United States.

APCO

Association of Public Communications Officials

CDMA Code Division Multiple Access

An advanced digital cellular and PCS platform that converts audio signals into a stream of digital information (made up of 1s and 0s). This "digital speech packet" is transmitted via a wide-band channel consisting of several radio frequencies. CDMA differs from the other popular digital cellular platform, TDMA, in that it uses several frequencies instead of just one. These digital platforms ensure greater call clarity and security, prevent cloning fraud and allow a greater number of calls to be handled by a tower or response center at one time.

CDPD Cellular Digital Packet Data

Using the existing AMPS system to carry digital data, by transmitting dense packets of information across vacant analog channels.

CTIA

Cellular Telephone Industry Association

Data Bus

The central collection of wires that carry instructions to electronic components throughout the vehicle.

DCS-1800

The low-power variant of GSM (the European digital standard). Uses a 1.8 GHz carrier. Example: Mercury One-2-One.

DCS-1900

The proposed use of GSM (the European digital standard) with a 1.9 GHz carrier for PCS applications.

DCTU Digital Cordless Telephone U.S.

A standard based on a micro-cellular radio system that provides low-power cordless access between a subscriber and a base station up to a few hundred meters away. DCTU is a version of its European counterpart, DECT.

DECT Digital European Cordless Telephone

A standard based on a micro-cellular radio system that provides low-power cordless access between a subscriber and a base station up to a few hundred meters away.

ETACS Enhanced TACS (Total Access Communication System)

European analog cellular.

ETSI European Telecommunications Standards Institute

The standards body responsible for GSM.

FDMA Frequency Division Multiple Access

Used for AMPS and TACS, the two key analog systems and their variants, this system gives each conversation its own unique radio channel.

FLEX® Protocol

Created by Motorola, FLEX is the global de facto standard for high-speed, one-way alphanumeric paging. With its ability to handle more robust code transport messages effectively, Motorola's FLEX protocol is laying the foundation for graceful growth from 1600 to 6400 bits per second (bps) transmission rates.

Gateway

A device that allows consumer products to interface with the communication system in vehicles, while protecting the vehicle's system from defective devices or inappropriate messages.

GPS Global Positioning System

Also refers to Global Positioning Satellite. A system using satellites, receivers and software to allow users to determine their exact geographic position.

GSM Global System for Mobiles

A European digital standard.

Half-Rate

A variant of GSM, Half-Rate doubles system capacity by more efficient speech coding.

IDB ITS Data Bus

A medium-speed multiplexed bus intended for command and control of devices in vehicles. It has been proposed by Motorola and the Society of Automotive Engineers (SAE) as an industry standard. Should this happen, IDB will allow device manufacturers to create products that will be compatible with all vehicles - versus today's data bus systems which differ by automobile manufacturer. The IDB would interface with an existing vehicle bus through a gateway.

iDEN® Integrated Digital Enhanced Network

A new generation of digital wireless technology developed by Motorola to enable multiple services to be delivered from a single, integrated wireless communications system. iDEN is the backbone of the Nextel all-digital cellular service.

InFLEXion®

A Motorola protocol which enables transmission and storage of voice messages and offers enhanced privacy, channel efficiency and ease of use. What's more, InFLEXion allows greater detail and expression to come through.

IS-41

The protocol for "roaming" within the U.S., describing how services should "hand over" between operators.

IS-54

The TDMA standard for U.S. digital cellular.

IS-95

The CDMA standard for U.S. digital cellular.

ISO 9000

The International Organization for Standardization (ISO) published the ISO 9000 series of quality management and quality assurance standards in 1987 as a means to rationalize the many various national approaches to the subject of product quality. The ISO 9000 series has been widely recognized as an aid in developing manufacturing and service organizations' quality management as an additional assurance to product purchasers that the products and services they buy will consistently meet quality objectives.

ISO 9001

This standard is used when conformance with specific requirements is to be assured by the supplier during several product stages including design and development, production, testing, inspection and servicing.

ITS Intelligent Transportation Systems

A broad range of diverse technologies, including information processing, communications, control and electronics, which, when applied to our transportation system, can save time, money and lives.

ITS America Intelligent Transportation Systems of America

An organization mandated by the U.S. Congress in 1991 to foster public and private partnerships to increase the safety and efficiency of surface transportation through the application of advanced ITS technologies.

JDC Japanese Digital Cellular

Now renamed PDC.

JTAC Japanese Total Access Communication

Like the European TACS, JTAC is the Japanese analog cellular system.

LMR Land Mobile Radio

Wireless communication for specialized applications, such as taxis and emergency services.

MMI Man/Machine Interface

Also known as User Interface. The means by which the user interacts with a machine or device. In the past, knobs, dials and displays manipulated by a user's hand were common interfaces on technical devices. Today, MMI includes more advanced functions such as Voice Dialing, speech synthesis and touch screens.

NAMPS

Narrowband AMPS.

PCS Personal Communications Service

Service that bundles voice communications, numeric and text messaging, voice mail and other features into one device, service or bill.

PCS-1900

Like DCS-1900, this refers to the proposed use of a 1.9 GHz carrier for PCS applications.

PDC Personal Digital Cellular

The Japanese cellular standard.

PHS Personal Handy System

The Japanese cordless phone standard.

Protocol

A standard set of rules that governs how computers or other electronics communicate with one another. Protocols define a message's format as well as how they are exchanged. Agreeing to a standard protocol allows different types of computer systems to communicate with one another in spite of their differences.

PSAP Public Safety Answering Point

PSTN Public Switched Telephone Network

QS 9000

The quality system standard established by Chrysler, Ford, General Motors, truck manufacturers and other subscribing companies. This standard includes the ISO 9000 requirements, plus additional requirements for all aspects of the business. QS 9000 includes a detailed Advanced Product Quality Planning, Control Plan, Continuous Improvement, Production Part Approval Process, Manufacturing Capabilities methodologies and more.

ReFLEX®

The world's first two-way alphanumeric paging protocol, created by Motorola. ReFLEX enables pagers to confirm receipt, respond to and initiate messages.

SAE Society of Automotive Engineers

A one-stop resource for technical information and expertise used in designing, building, maintaining and operating self-propelled vehicles for use on land or sea, in air or space.

SIM Subscriber Identification Module

A card used in GSM to personalize a handset.

TACS Total Access Communication System

European analog cellular.

TCU Telematics Control Unit

The embedded vehicle control unit that communicates with the automobile controls, GPS satellite and customer service center to provide Telematics features to a driver.

TDMA Time Division Multiple Access

An advanced digital cellular platform that converts audio signals into a stream of digital information (made up of 1s and 0s) and divides it into "digital speech packets" according to time. The packets are then transmitted one a single radio frequency. TDMA differs from the other popular digital cellular platform, CDMA, in that it uses one channel instead of many. These digital platforms ensure greater call clarity and security, prevent cloning fraud and allow a greater number of calls to be handled by a tower or response center at one time.

TETRA TERrestrial Trunked RAdio

European digital cellular land mobile radio system.

TIA Telecommunications Industry Association

The United States' telecommunications standards making body.

User Interface

Also known as Man/Machine Interface (MMI). The means by which the user interacts with a machine or device. In the past, knobs, dials and displays manipulated by a user's hand were common interfaces on technical devices. Today, User Interfaces include more advanced functions such as Voice Dialing, speech synthesis and touch screens.

VR Virtual Reality

Used in a variety of Motorola products and services, it is a type of computer-generated environment in which the user interacts with the environment in three dimensions that provide sensory information to make an individual feel that they are in a different place.

WAP Wireless Application Protocol

A standard that aims to align industry efforts to bring advanced applications and Internet content to digital cellular phones.

GENERAL INFORMATION

The Battery - Overview - All Models

THE BATTERY

Model: All

Production Date: All

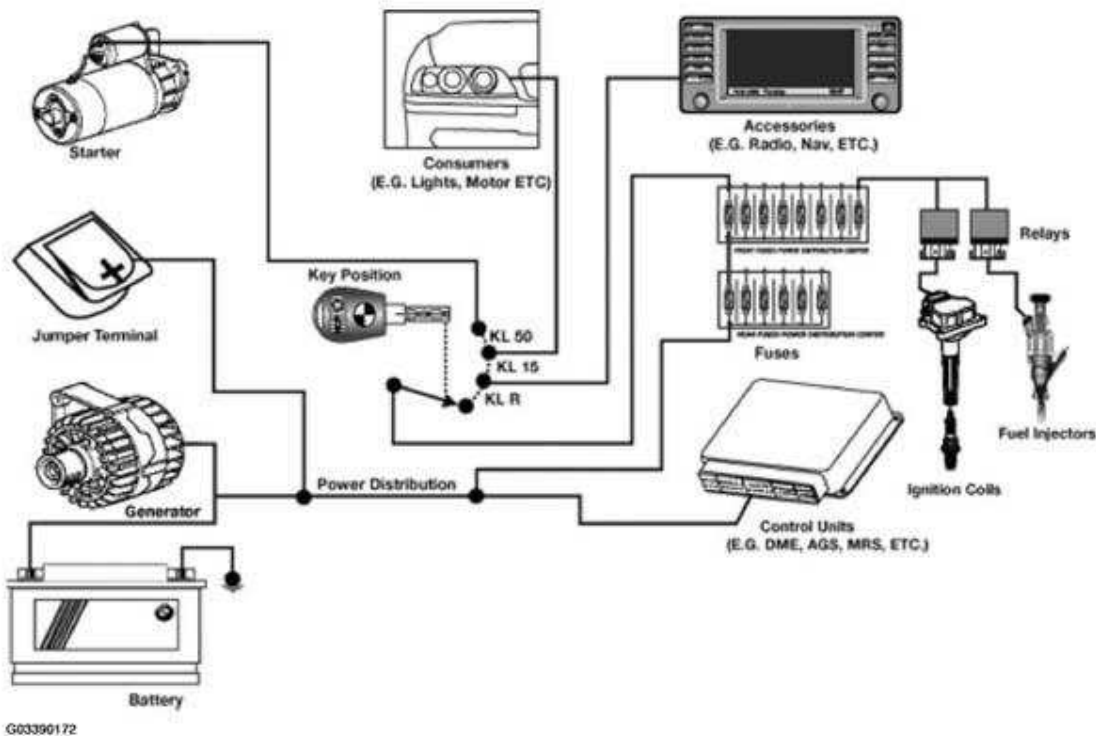


Fig. 1: View Of Electrical Components Connected To Battery
Courtesy of BMW OF NORTH AMERICA, INC.

Purpose of the Automotive Battery:

The battery is the primary EMF source in the automobile. In addition the battery performs the following functions:

- Provides voltage and current for the starter motor.
- Provides voltage and current for the ignition during cranking.
- Supplies all electrical power when the charging system is not operating.
- Supplies the extra power necessary when the vehicle's electrical load exceeds the supply from the charging system.
- Acts as a voltage stabilizer in the electrical system. The battery evens out voltage spikes and prevents

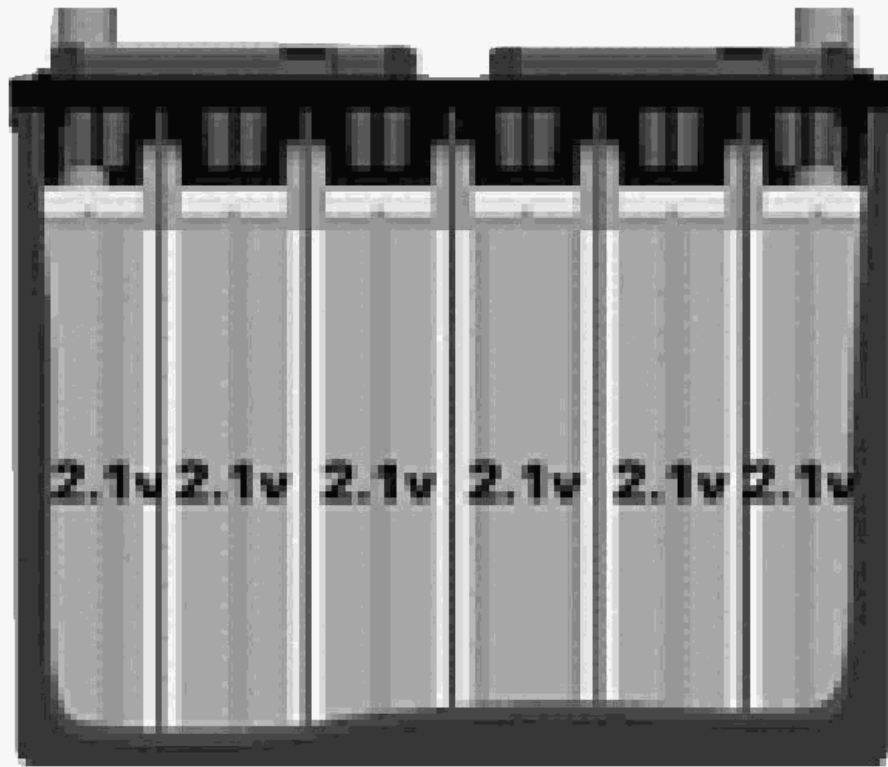
them from damaging other components in the electrical system.

- Provides power to KL30, KL15 and KLR.

The battery does not store electrical energy. It stores chemical energy that is converted to electrical energy as it discharges.

BATTERY CONSTRUCTION

Modern automotive batteries are made of cases (usually plastic) containing alternating plates of Lead and Lead Dioxide (or Lead Oxide) separated by insulators. These alternating plates are connected in series to produce a voltage of 12.6 volts, or about 2.1 volts for each set of Lead and Lead Dioxide plates. The negative terminal is connected to a Lead Dioxide plate and the positive terminal to a Lead plate.



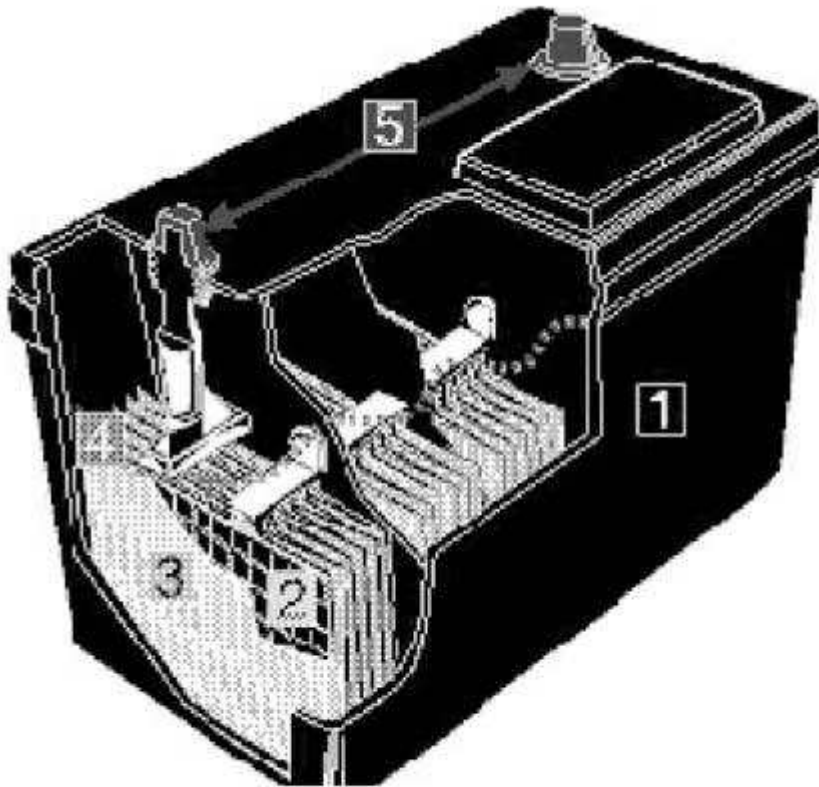
6 x 2.1 volts = 12.6 volts

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Fig. 2: Identifying Battery Plates

Courtesy of BMW OF NORTH AMERICA, INC.

The plates are covered with electrolyte which is a solution of 35% Sulfuric acid and 65% Water.



G03390174

Fig. 3: Cross Sectional View Of Battery
Courtesy of BMW OF NORTH AMERICA, INC.

1. Plastic container.
2. Positive and negative internal plates made of lead.
3. Plate separators made of porous synthetic material.
4. Electrolyte which is a dilute solution of Sulfuric acid and water better known as Battery Acid.
5. Lead terminals which are the connection point between the battery and whatever it powers.

Battery Case

Most battery cases and their covers are made of polypropylene. The case is divided into six sections or cells, shaped similar to an ice-cube tray.

The case is designed to:

- Withstand hot and cold temperature extremes.
- Resist damage caused by mechanical shock in automotive applications.

- Resist acid absorption and chemical damage.

The Grids

The grids are the supporting framework for the active material of the plates. They also conduct current to and from the active material plates.

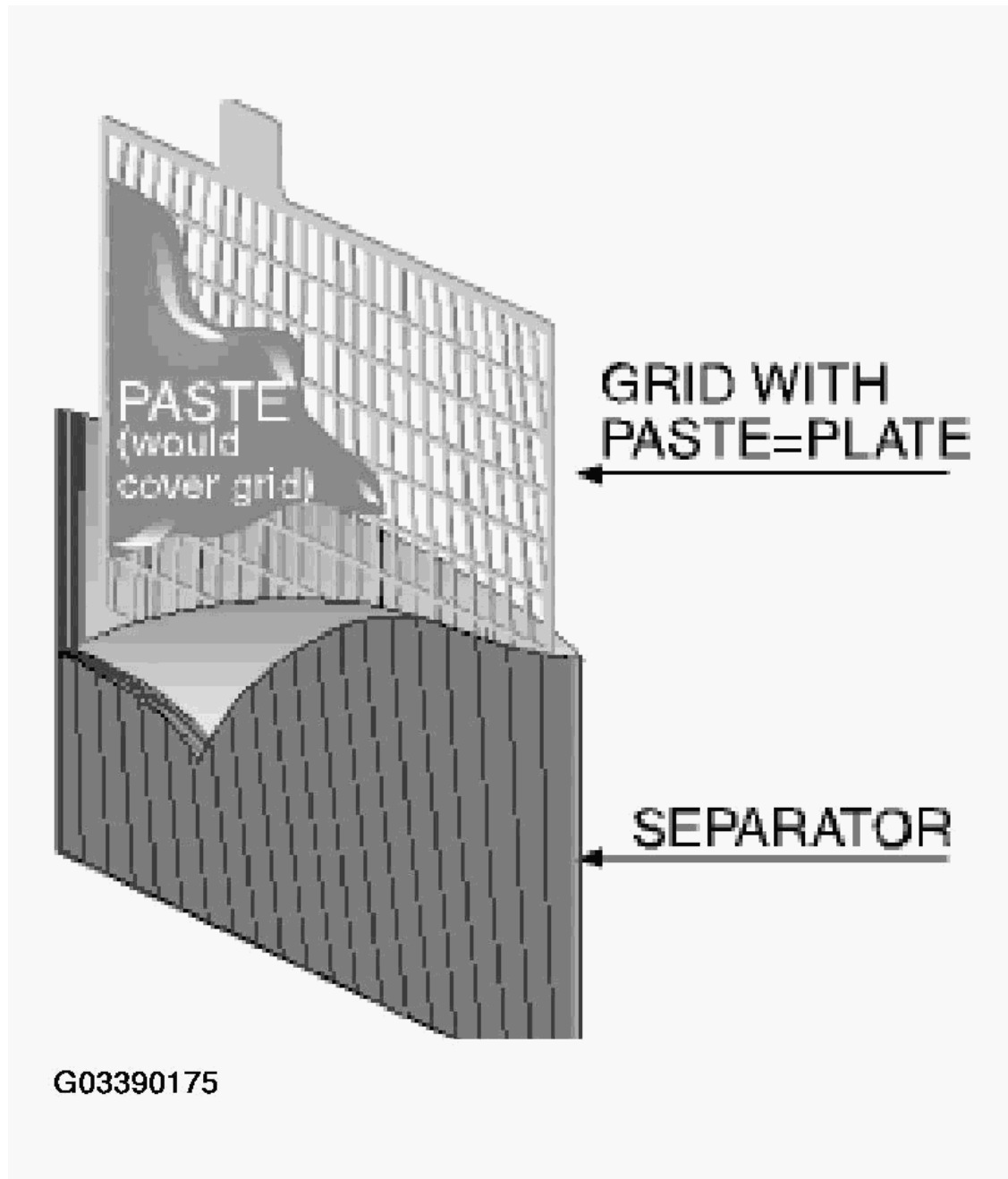


Fig. 4: Identifying Battery Grids
Courtesy of BMW OF NORTH AMERICA, INC.

The Plates

Plates are grids covered with a paste mixture of Lead Oxide and Sulfuric Acid and water. An expander material made of powdered sulfates is added to the paste to produce negative plates.

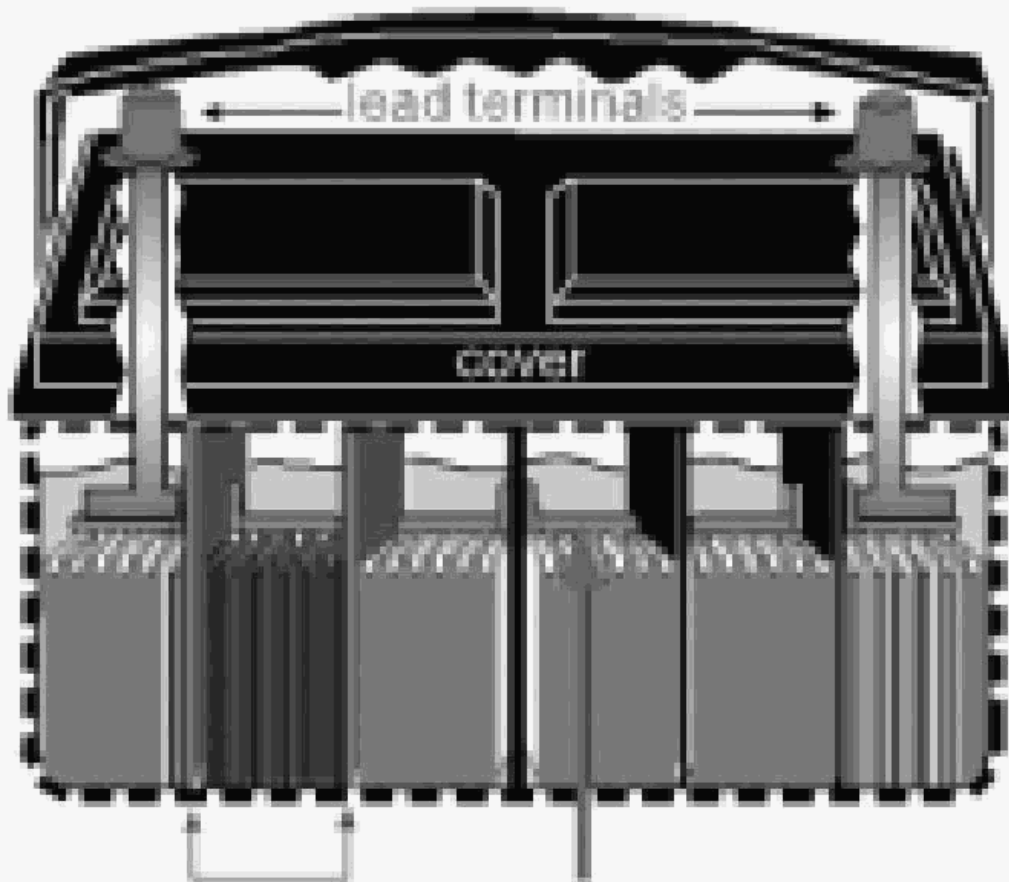
A forming charge is applied to the positive plates converting the Lead Oxide to Lead Dioxide, a highly porous material which allows the electrolyte to freely penetrate the plate.

A forming charge is also applied to the negative plates converting the Lead Oxide to Sponge Lead. The Sponge Lead allows the electrolyte to penetrate freely allowing the material beneath the plate surface to take part in the chemical reaction.

The Separators

Separators are thin sheets of electrically insulating porous material used as spacers between the plates to prevent short circuits within the cells.

Fine pores in the separators allow ionic current flow in the electrolyte between the positive and negative plates.



A cell:
positive and
negative plates
with separators

Cells are connected
with metal that
conducts electricity
from one cell to the
next.

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Fig. 5: Identifying Battery Separators

Courtesy of BMW OF NORTH AMERICA, INC.

Elements

In the most common method of construction, a stack of alternate positive and negative plates are formed with separators between each positive and negative plate. The lugs of the negative plates are welded together as are

those of the positive plates. The plate strap of each group of plates is used to connect them in series with the plate group of the next cell, or with a battery terminal.

The assembly resulting from placing one positive plate group and one negative plate group together, with separators is known as an element. There is one element per battery cell. More or larger plates per cell will increase plate surface area and increase capacity of the battery but will not affect the voltage output.

Electrolyte

The electrolyte is a mixture of Sulfuric Acid and Water. Electrolyte consists of 35% sulfuric acid and 65% water.

The electrolyte is the carrier for the electric current to move between the positive and negative plates through the separators.

The Lead Terminals

BMW's use a tapered top terminal. This design uses tapered terminal posts built to industry standards so that all cable clamps will fit any battery with these posts.

The positive terminal is slightly larger than the negative to minimize the danger of installing the battery in reverse. The positive terminal is 17.5mm in diameter at the top. The negative terminal is 15.9mm at the top.

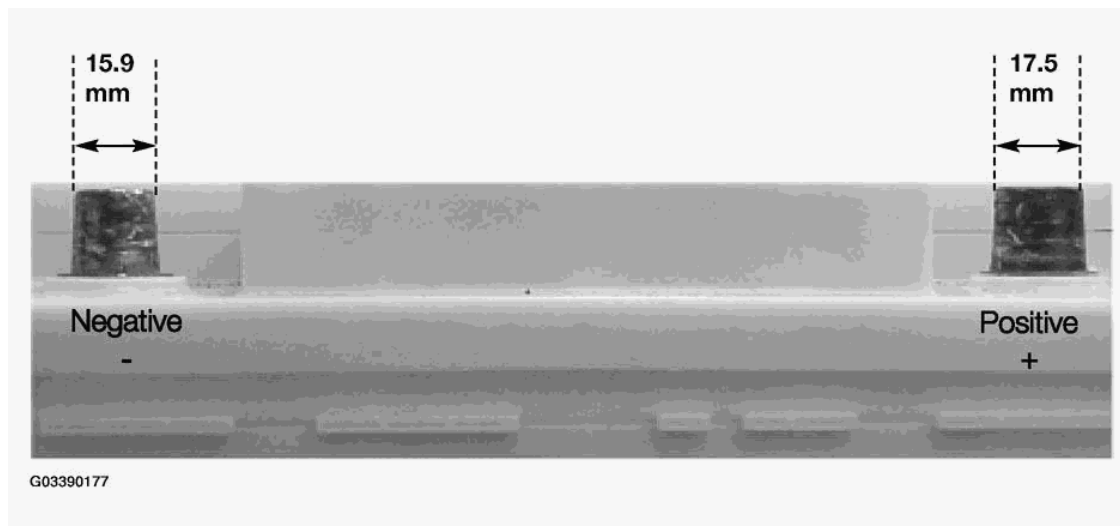


Fig. 6: Identifying Battery Terminals
Courtesy of BMW OF NORTH AMERICA, INC.

BATTERY TYPES

There are at least three types of the Lead-acid batteries that are currently used in the Automotive Industry.

Lead-Acid Battery

The three major contributors to battery chemistry are lead, lead dioxide and sulfuric acid. Pure lead is too soft to

withstand the physical abuse of mobile applications, so a strengthener is needed. About 6% antimony, a semi metallic element produced as a by-product to copper and lead ore refining, is added to strengthen the lead.

The antimony added to the grids acts as a catalyst and makes the loss of hydrogen and oxygen through outgassing worse. These batteries require frequent water replenishing.

Lead/Calcium Battery

Introduced in the 1970's Lead/Calcium batteries have Calcium added to the positive and negative grids to reduce the outgassing. These batteries were first referred to as "maintenance free". The Lead/Calcium batteries are not resistant to deep-cycling which occurs when a battery is drained to a very low voltage before being recharged. Frequent deep-cycling renders these batteries unable to sustain a charge. Lead/Calcium batteries need to be charged at higher voltage settings or they will not be recharged to full capacity.

Hybrid Battery

Hybrid batteries use a positive grid strengthened with antimony and a negative grid with calcium. The hybrid battery is more resistant to deep cycling than the lead/calcium, but still not as good as the original Lead-acid battery. Water usage is greatly reduced in the hybrid battery, although regular checking is advisable. Most cars supplied with hybrid batteries have their voltage regulators set to 14.3 volts.

Hybrid batteries were first installed in the E30 convertible during the 1991 Model Year.

HOW THE BATTERY WORKS

Discharging

Batteries don't store electrical energy, they store chemical energy and convert it to electrical energy during the discharging process.

Each cell of a battery contains positive and negative plates (grids). The positive plate is made of lead dioxide, the negative plate of a spongy lead. The negative plate combines with the sulfuric acid to create lead sulfate and one extra electron. The positive plate produces hydrogen ions and sulfuric acid ions (positive ions, atoms missing one electron).

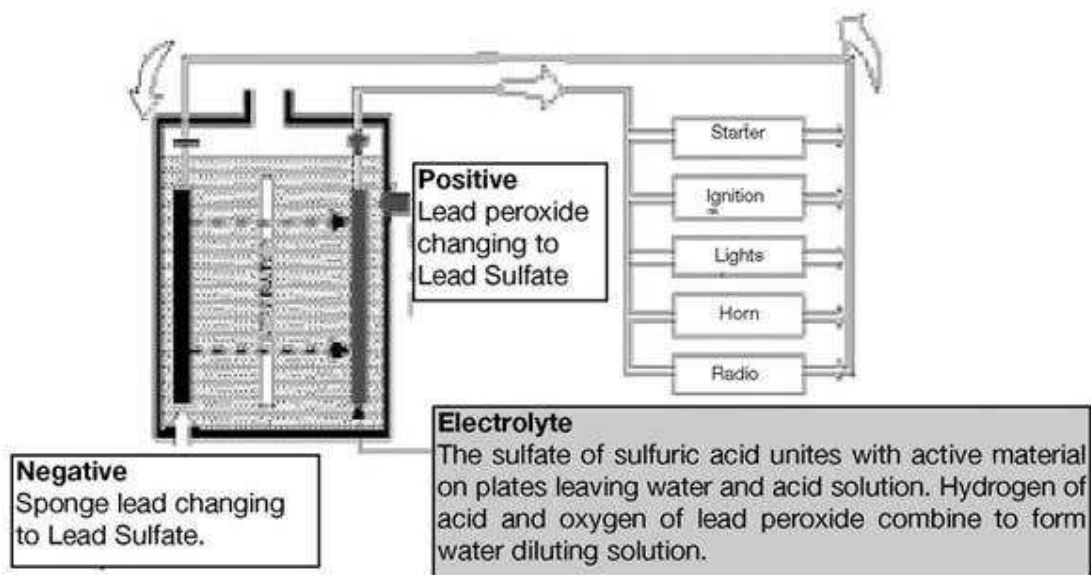
The extra electrons from the negative plate are passed from the negative battery terminal and through the electrical consumer, back to the positive battery terminal. Once back at the battery, the free electrons combine with the positive ions at the positive battery terminal producing lead sulfate and water.

It is important to remember that the system is closed. For every electron generated at the negative terminal, there is an electron consumed at the positive terminal.

As the process continues, the active materials (lead and lead dioxide plates and the electrolyte) become depleted and the reactions slow down until the battery is no longer capable of supplying electrons. At this point the battery is discharged.

The discharge process changes the ratio of sulfuric acid to water in the electrolyte, as more water is produced in the discharge process. By measuring the volume of acid in the water, the state of charge of the battery is

discovered.



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Fig. 7: Identifying Discharge Process

Courtesy of BMW OF NORTH AMERICA, INC.

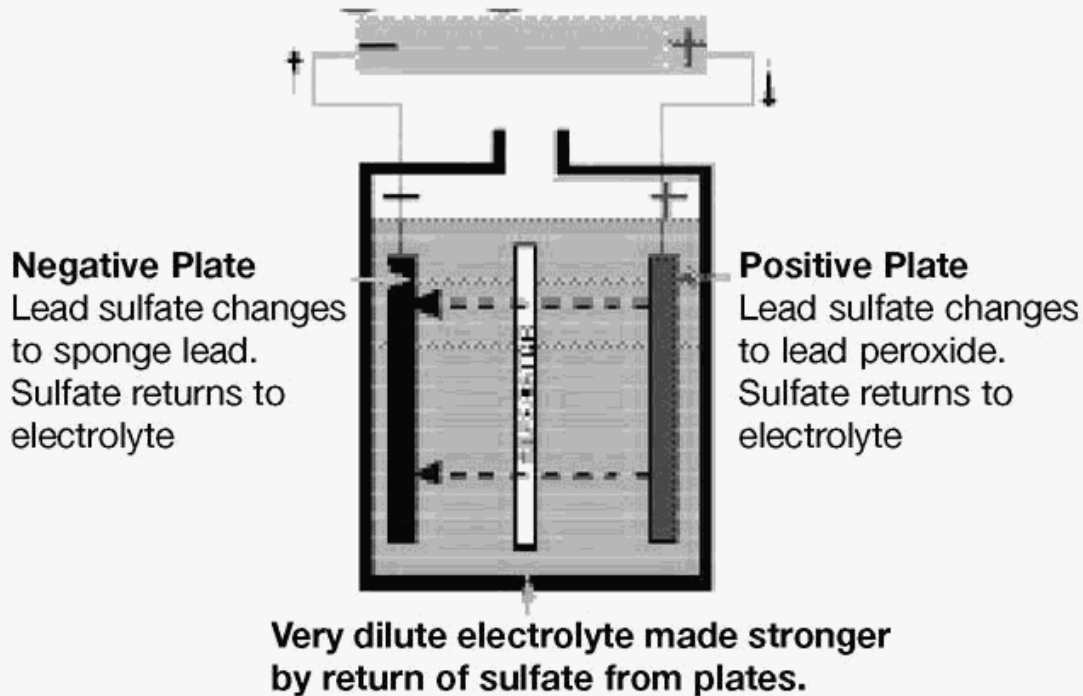
Charging

Applying voltage to the battery from an external source such as the generator or battery charger reverses the chemical action in the battery.

Reversing the chemical action in the battery, forces the free electrons at the negative terminal of the battery back into the electrolyte raising the sulfuric acid percentage. This chemical action removes the Lead sulfate that had formed on the negative plates leaving pure active material.

The electrons that were forced into the electrolyte are able to react with the lead sulfate on the positive terminal again raising the Sulfuric acid content and leaving pure active material on the positive plates.

This process enables the battery to be used over and over again.



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Fig. 8: Identifying Charging Process
Courtesy of BMW OF NORTH AMERICA, INC.

COMMON BATTERY TERMS



Teile-Nr. (Part No.) 61021 6 902 796

12V 55AH 480A	EN 55 080 048
12V 90RC 425CCA	SAE Group No . 47

fur Ersatz (for replacement):

Teile - Nr. 61 21 6 902 796 Nass (wet)

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Fig. 9: View Of Battery Label
Courtesy of BMW OF NORTH AMERICA, INC.

- **Ah - Amp Hour Capacity**

This rating is derived from discharging a fully charged battery at a constant amp draw for 20 hours @ 80°F, without the voltage of the battery falling below 10.5 volts. The constant amp draw is multiplied by the 20 hours to come up with the Amp Hour Rating.

- **CCA - Cold Cranking Performance**

Represents the amperage capacity a fully charged battery can deliver @ 0°F for 30 seconds before the voltage of the battery falls below 7.2 volts.

- **RC - Reserve Capacity**

Reserve capacity is expressed in minutes and relates to the amount of time a fully charged battery can maintain a constant draw of 25 amps @ 80°F before the voltage falls below 10.2 volts.

- **W - Watts**

The measurement of electrical power that the battery can deliver for a cold start. It is calculated by multiplying the starter amperage draw @ 0°F times 10 volts.

- **V - Volt**

Unit of measure of potential difference (Electrical pressure).

- **A - Amp**

The current flow in a circuit. Value is proportional to the number of electrons flowing past a point in one second.

- **ohms - Ohm**

The measurement of the resistance of a component or circuit to current flow.

- **Electrolyte**

The mixture of sulfuric acid and water. 35% sulfuric acid, 65% water.

- **Specific Gravity**

The measurement (by weight) of the volume of sulfuric acid in the electrolyte. A specific gravity of 1.275 (the specific gravity of a fully charged battery) means that the electrolyte is 1.275 times heavier than water. The specific gravity of water is 1.000.

- **Sulfate**

Deposits formed on the plates of the battery as the electrolyte gives up its sulfuric acid. Excessive deep

cycling of a battery can cause a hardening of this deposit and make it impossible to return sulfate to the electrolyte. A sulfated battery is one which has these hardened deposits on the plates and cannot be recharged to full capacity.

- **OCV Open Circuit Voltage**

The measurement of the voltage of a battery across the terminals.

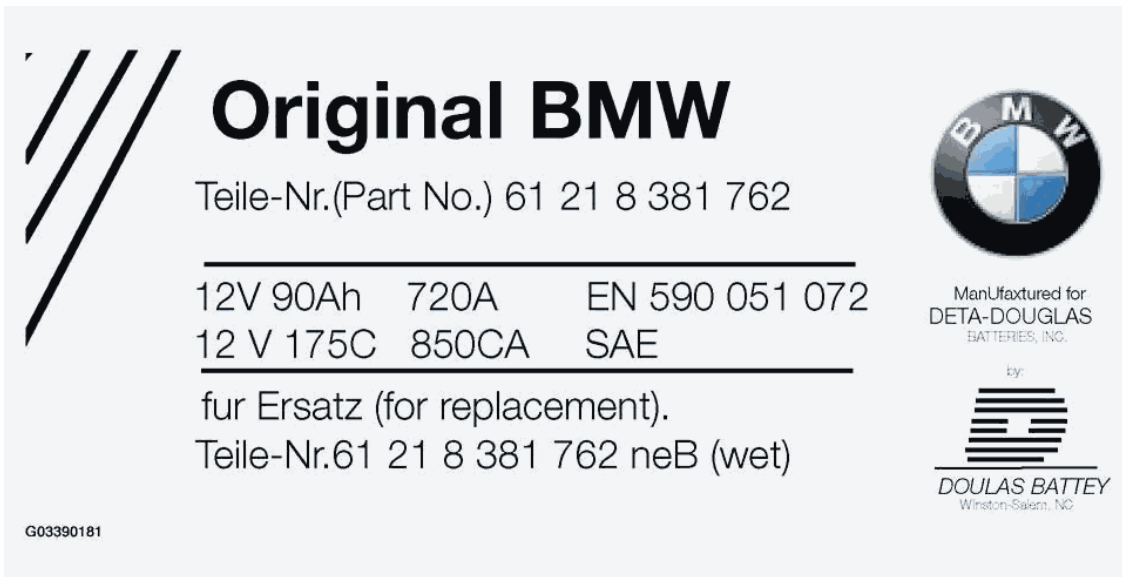


Fig. 10: View Of Battery Information Label
Courtesy of BMW OF NORTH AMERICA, INC.

BATTERY TESTING

There are four steps to follow in testing an automotive battery:

- Inspection.
- Removal of Surface Charge.
- State-of-Charge Test.
- Load Test.

Tools Needed

To test a battery following tools are needed:

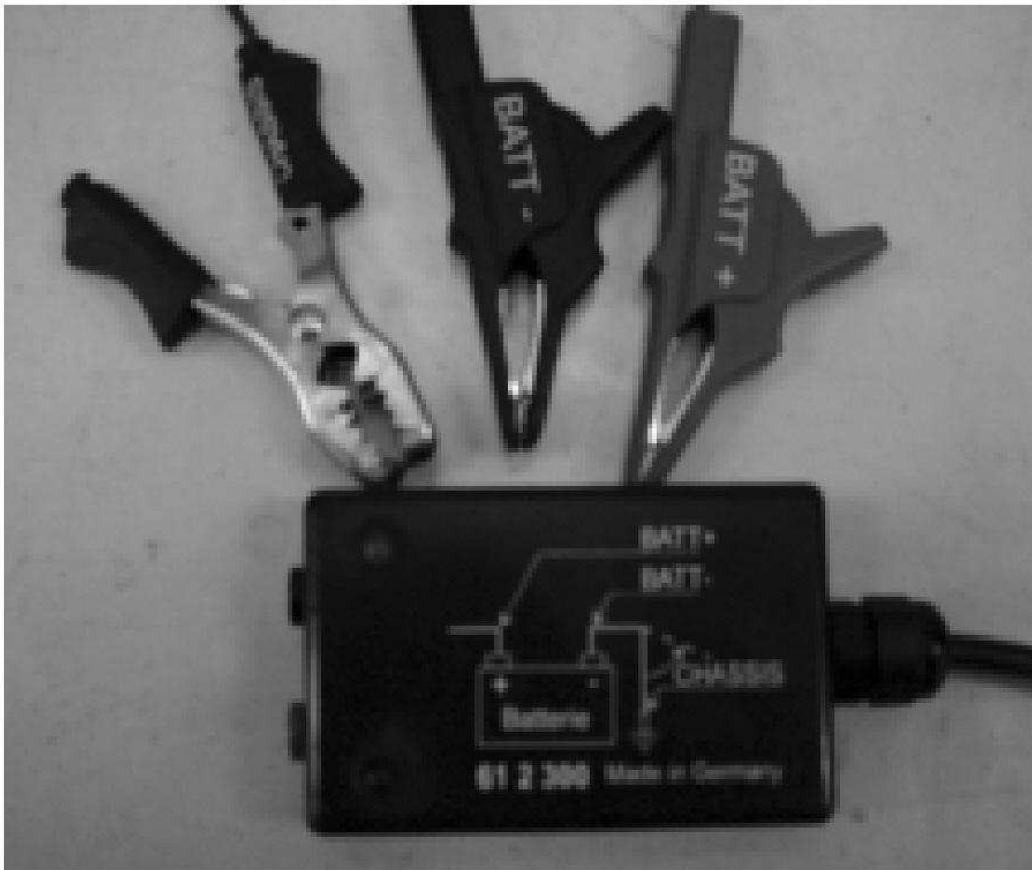
- DVOM Digital Volt Ohm Meter.
- Battery Load Tester (i.e. Snap On VAT 60).
- DISplus or MoDic.
- Battery Draw Test Special Tool PN 61 2 300.
- Closed Circuit Measurement Adapter PN 90 88 6 612 310.

- Temperature Compensating Hydrometer.



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Fig. 11: Identifying Battery Load Tester
Courtesy of BMW OF NORTH AMERICA, INC.



G03390183

Fig. 12: View Of Draw Test Tool
Courtesy of BMW OF NORTH AMERICA, INC.



G03390184

Fig. 13: Identifying Temperature Compensating Hydrometer
Courtesy of BMW OF NORTH AMERICA, INC.



G03390185

Fig. 14: View Of Closed Circuit Measurement Adapter
Courtesy of BMW OF NORTH AMERICA, INC.

Inspection

Visual inspection is important for the detection of obvious problems:

- Loose Generator Belt.
- Low Electrolyte Level.
- Corroded Cable or Terminal Clamps.
- Loose Hold-Down Camps or Cable Terminals.
- Damaged Battery Case.

NOTE: **The proper electrolyte level is just covering the plates, not all the way to the top of the battery inspection holes.**

Removal of Surface Charge

If the battery has just been recharged, or the car has been driven, eliminate any surface charge by one of the following methods:

- Allow the battery to sit for 2-3 hours.
- Turn the headlights on high beam for 5 minutes and wait 5 minutes after turning off.
- With battery load tester, apply a load of 1/2 the battery's CCA for 15 seconds, then wait 5 minutes.

State-of-Charge Test

OPEN CIRCUIT BATTERY VOLTAGE SPECIFICATIONS

Open Circuit Battery Voltage	Approximate State Of Charge	Average Cell SG
12.65 +	100%	1.265 +
12.45	75%	1.225
12.24	50%	1.190
12.06	25%	1.155
11.89	0%	1.120

Use the table to determine the battery's State-of-Charge.

Pay special attention if the DVOM measurement of OCV is equal to:

- 0 volts - Indicate an open cell.
- 10.45-10.65 volts - Indicates a shorted cell.

For non-sealed batteries, check both specific gravity (SG) in each cell with a temperature compensated hydrometer and battery OCV, without the engine running.

For sealed batteries, measuring the battery's OCV (without the engine running) with an accurate DVOM is the only way to determine the state-of-charge.

Batteries with a built-in hydrometer measure the state-of-charge in one cell only. If the indicator is clear or light yellow, the battery has a low electrolyte level and should be refilled before proceeding or replaced.

A state-of-charge reading **BELOW** 75% using SG, voltage measurement or dark indicator in batteries with built-in hydrometers, indicates the battery must be recharged before proceeding.

Replace the battery if one or more the following conditions are met:

- More than 0.050 difference in the specific gravity readings between the highest and lowest cell (There is a weak or dead cell).
- The battery will not recharge to 75% or greater state-of-charge or the built in hydrometer does not indicate good (green indicates 65% or better).
- DVOM reading indicates 0 volts (Open cell).
- DVOM reading indicates 10.45-10.65 volts (Shorted cell).

Load Test

A battery which has a state-of-charge of 75% or greater or has a "good" built-in hydrometer indication may be load tested.

With a battery load tester properly installed, load the battery for 15 seconds to one of the following:

- One-half (1/2) the CCA (Cold Cranking Amps).
- Three (3) times the AH Rating (Amp Hour Rating).

The voltage on a good battery will **NOT** drop below 9.7 volts during the battery load test. After the load is removed, wait 5 minutes, the battery should bounce back to 50% or greater state-of-charge. If a battery drops below 9.7 volts during the load test, does not bounce back or fails to start the engine, the battery should be replaced. Batteries which pass this test should be recharged to restore peak performance.

Load Test Conditions

Tests assume electrolyte temperature of 80° F, 26.7° C.

If the electrolyte temperature is above 80° F add .1 volt for every 10 degrees up to 100°.

If the temperature is below 80° F subtract .1 volt for every 10 degrees to 40°.

BATTERY MAINTENANCE

Electrolyte Level

If battery electrolyte level is allowed to drop substantially, the gas volume inside the battery grows proportionately resulting in an increased amount of flammable gas mixture. Any external or internal spark may result in an oxyhydrogen explosion. Additionally the plates are no longer covered by the electrolyte and may corrode.

The battery electrolyte level should be checked on every Inspection I and Inspection II.

Use only distilled water to top up the battery!

Tap water and electrolyte must never be used to refill or top off an automotive battery.

Workshop Hint:

Electrolyte levels may drop at a higher rate in the winter months, due to higher loads and increased utilization of electrical systems.

Battery Cable Connections

The top of the battery should be clean. Check for and correct corrosion on the top of the battery and the cable connections.

Workshop Hint

Many battery problems are caused by loose or corroded connections. Insure that cables are free from corrosion and tight before continuing diagnosis.

Battery Charging

The purpose of charging a battery is to put back the energy that has been removed. A battery that is not properly charged will deliver sub-standard performance and display a shorter life span.

A battery should be charged only after performing a visual inspection on the battery case and the electrolyte levels. Never attempt to charge a battery with a damaged case or low electrolyte levels.

A state-of-charge test should be performed before attempting to charge a battery.

Always connect the positive lead of the battery charger to the positive terminal of the battery and the negative lead of the battery charger to the negative terminal of the battery.

Unplug the charger or turn it off **BEFORE** disconnecting the leads at the battery.

Batteries that are fully discharged should be charged according to the following table.

BATTERIES SPECIFICATIONS

Reserve Capacity Rating (RC)	Slow Charge	Fast Charge
80 minutes or less	15 hours @ 3 amps	2.5 hours @ 20 amps
80 to 125 minutes	21 hours @ 4 amps	3.75 hours @ 20 amps
125 to 170 minutes	22 hours @ amps	5 hour @ 20 amps
170 to 250 minutes	23.hours @ 6 amps	7.5 hours @ 10 amps
Above 250 minutes	24 hours @ 10 amps	6 hours @ 40 amps

The best charging method is to **SLOWLY** recharge the battery using the BMW approved battery charger.

A slow charging rate allows more time for the electrolyte to penetrate the plates.

Sulfated Batteries

Continuous discharging of the battery or low electrolyte levels cause crystals to form on the plates. These crystals of lead sulphate occur when a battery is discharged. The deeper the discharge the more serious the sulphation. The sulphur molecules that form the sulphate are then absent from the electrolyte, causing the electrolyte to become inefficient.

A battery relies on clean plates and strong electrolyte to both receive charging current and offer strong current discharge. A sulphated battery can do neither. Proper recharging of the battery will remove some but not all of the sulphate. Eventually the battery plates are coated with enough sulphate that it is impossible to achieve an efficient recharge.

Testing A Battery for Sulphation

A battery which fails the load test should be tested for sulphation. To test a battery for sulphation, place it on a battery charger for three minutes with the charger set on 40 amps. After three minutes check the OCV, if the reading is greater than 15.0 volts the battery is sulphated. Batteries which indicate a sulphated condition should be recharged slowly and retested before being discarded.

Battery Freezing

A fully charged battery can be stored at sub-freezing temperatures with no damage. The battery is protected from freezing to a temperature of -75° F. A fully discharged battery however will freeze at +27° F.

Avoid freezing by keeping the battery fully charged.

Carefully inspect a battery which has frozen for a cracked case.

Battery Maintenance (Center Vehicles)

The battery charge is monitored while the vehicle is at the VPC and before it leaves on the transport. When the vehicle is having the QC I performed at the center the check list requires that the battery voltage be checked and maintained to 12.65V minimum.

In order to facilitate tracking vehicles in inventory, BMW has in place a Battery Maintenance Program. The program uses:

- Battery Log Forms.
- Battery Log Binder.
- Colored windshield stickers (red, green, yellow and white).

The Battery Maintenance Program has three possibilities:

- Vehicle in storage, battery disconnect switch removed.
- Vehicle in showroom or display.
- Vehicle in storage, Battery disconnect switch left in the vehicle.

Vehicle In Storage, Battery Disconnect Switch Removed

A four week charging cycle has been established for these cases. All vehicles arrive with a color coded sticker on the windshield. The color corresponds to the week that the battery must be charged. Also the vehicle will be provided with a Battery Log Form.

The "A" portion (Vehicle Receipt) of the Log Form must be completed during the QC I Display check and then has to be filed in the Battery Charge Log Book under the applicable color coded section. All the vehicles in that color section will have to be charged that week.

Vehicle In Showroom or Display

Because of the high consumer demand on vehicles that are being displayed and not driven, a four week charging cycle is not enough. For vehicles in the showroom the battery has to be charged as frequently as

necessary to ensure that the battery never drops below 12.5V. Use the "C" portion of the log form (Display Vehicle - Monitored Daily) to keep track of the charging and checking of the battery.

Vehicle In Storage, Battery Disconnect Switch Left In The Vehicle.

Since the battery disconnect switch is left installed and in the "OFF" position the 3 month charge cycle can be used. Use the "D" section of the Battery Log Form to document when the battery is charged.

Upon the sale of the vehicle, the Battery Log Form should be removed from the binder and placed in the vehicle file for future reference.

2000

Battery Log Form

Stock # _____

VPC USE: VIN: _____
Voltage: _____
Date: ____ / ____ / ____
Inspector: _____

This form should be filled out when the vehicle is received and updated according to the proper procedure (display vs. storage vehicle). It should be placed in the vehicle history file when sold.

Note: Failure to maintain batteries as recommended and documented with this form will be considered sufficient cause to reject warranty claims.

(A) Vehicle Receipt		Model	VIN	
Center #	Voltage as received	Inspected by	Date received	

(B) Vehicle In Storage - Charged Every 4 Weeks											
Color indicates battery is to be charged during the week of . . .											
Week Of	Voltage Before Charge	Charged By	Week Of	Voltage Before Charge	Charged By	Week Of	Voltage Before Charge	Charged By	Week Of	Voltage Before Charge	Charged By
Jan. 3			Jan. 10			Jan. 17			Jan. 24		
Jan. 31			Feb. 7			Feb. 14			Feb. 21		
Feb. 28			Mar. 6			Mar. 13			Mar. 20		
Mar. 27			April 3			April 10			April 17		
April 24			May 1			May 8			May 15		
May 22			May 29			June 5			June 12		
June 19			June 26			July 3			July 10		
July 17			July 24			July 31			Aug. 7		
Aug. 14			Aug. 21			Aug. 28			Sept. 4		
Sept. 11			Sept. 18			Sept. 25			Oct. 2		
Oct. 9			Oct. 16			Oct. 23			Oct. 30		
Nov. 6			Nov. 13			Nov. 20			Nov. 27		
Dec. 4			Dec. 11			Dec. 18			Dec. 25		

(C) Display Vehicle - Monitored Daily											
Date											
Voltage before charge											
Charged by											
Date											
Voltage before charge											
Charged by											

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Fig. 15: Battery Log Form (B Section)
Courtesy of BMW OF NORTH AMERICA, INC.

Battery Log Form Stock # _____

This form should be filled out when the vehicle is received and updated according to the proper procedure (display vs. storage vehicle). It should be placed in the vehicle history file when sold.

Note: Failure to maintain batteries as recommended and documented with this form will be considered sufficient cause to reject warranty claims.

(A) Vehicle Receipt		Model	VIN
Center #	Voltage as received	Inspected by	Date received

(D) Vehicle In Storage - Charged Every 3 Months					
January	Date	February	Date	March	Date
Voltage Before Charge	Charged By	Voltage Before Charge	Charged By	Voltage Before Charge	Charged By
April	Date	May	Date	June	Date
Voltage Before Charge	Charged By	Voltage Before Charge	Charged By	Voltage Before Charge	Charged By
July	Date	August	Date	September	Date
Voltage Before Charge	Charged By	Voltage Before Charge	Charged By	Voltage Before Charge	Charged By
October	Date	November	Date	December	Date
Voltage Before Charge	Charged By	Voltage Before Charge	Charged By	Voltage Before Charge	Charged By

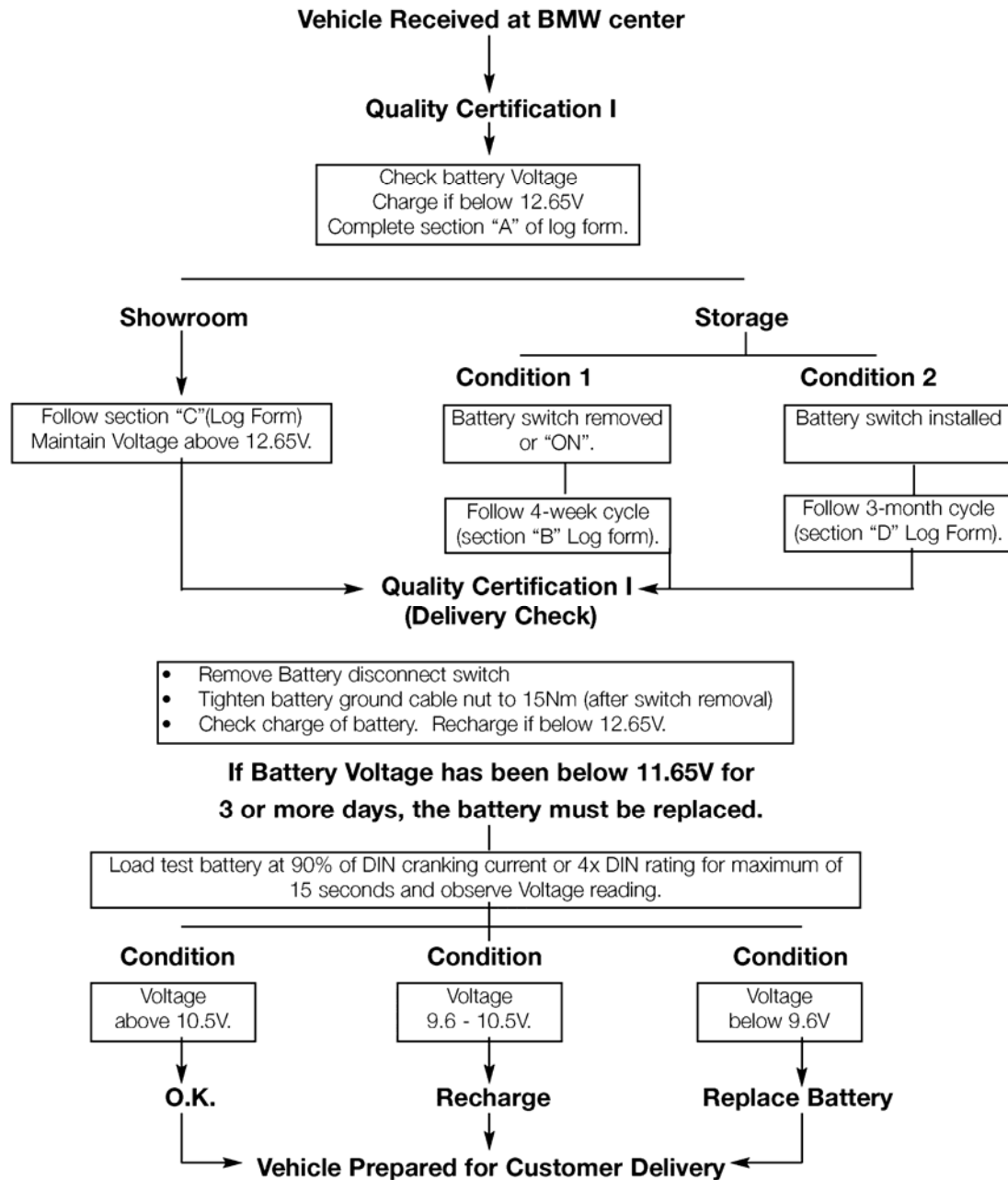
(C) Display Vehicle - Monitored Daily										
Date										
Voltage before charge										
Charged by										
Date										
Voltage before charge										
Charged by										

G03390187

Fig. 16: Battery Log Form (D Section)
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: If the battery voltage drops below 11.6v for three days or more the battery must be replaced before delivery to the customer

Battery Maintenance Flowchart



G03390188

Fig. 17: Battery Maintenance Flow Chart
 Courtesy of BMW OF NORTH AMERICA, INC.

BATTERY REPLACEMENT

Batteries determined to be defective through testing procedures should be replaced using the following guidelines.

- Reconfirm battery is actually defective and it does not need charging.
- Insure that ignition switch is in "Off" position and engine is not running.
- Disconnect negative battery terminal first.
- Place negative battery cable in a position so that it can not come in contact with battery during removal process.
- Reinstall battery hold down clamp.
- Install positive cable first.
- Recheck output of vehicle generator and balance of electrical system for other problems.
- Provide clear and concise description of the defect including cell readings, load test results and any other pertinent information which led to the battery replacement.
- Tag battery with VIN and repair order number.

Battery Failures

An analysis of batteries replaced under warranty shows that many claims could have been avoided had the batteries been maintained in a full state of charge.

Batteries must be maintained at all times when vehicles are at a retailer whether they are new cars, used cars, in storage (back lot), on display, or customer cars in for maintenance or repairs.

Batteries replaced due to lack of maintenance will not be covered by warranty.

Most Common Causes of Premature Battery Failures

- Failure to maintain proper state of charge.
- Loss of electrolyte due to overcharging or excessive heat.
- Deep discharging (Leaving lights on or other parasitic draws).
- Undercharging of battery.
- Vibration (Loose battery hold down clamp).
- Using tap water (instead of distilled water).
- Corrosion.
- Freezing.

Workshop Hints

Safety Tips

- Proper Clothing:
 - Always wear a face shield or safety goggles.
 - Plastic gloves can prevent acid burns to hands.
- Neutralizing Electrolyte:

Any leakage or spillage of battery electrolyte should be neutralized as soon as possible to prevent damage to

paint, body or trunk linings. Depending on the amount of spillage dilute some baking soda in water and apply to areas of the car that have been exposed to the battery electrolyte. The neutralizing action will create some foaming in the area where the chemical action takes place. Flush with ample amounts of water once the chemical reaction has subsided.

General Battery Hints

- Add only distilled water NEVER TOP OFF WITH ACID.
- Keep electrolyte level above plate separators.
- Keep battery top clean and dry.
- Keep open flame and metal objects away from battery top and terminals.
- Keep vent caps tightly in place (if applicable).
- Use proper charging equipment.

SPECIAL BATTERY SYSTEMS

Special battery systems are broken into two groups:

- Vibration Compensating Battery Systems.
- Dual Battery Systems.

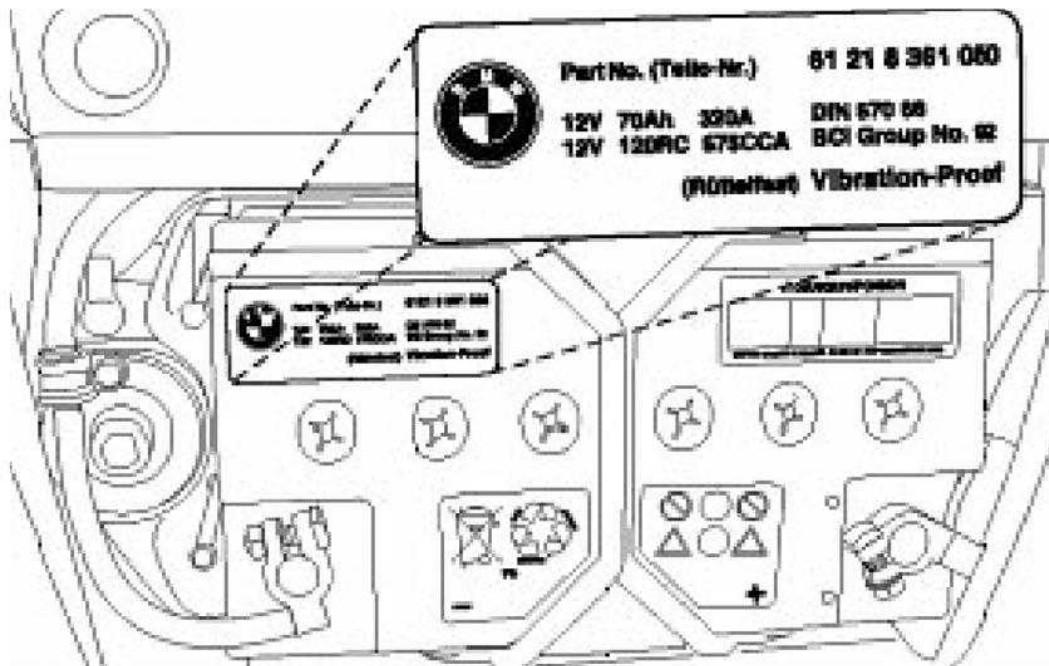
Vibration Compensating Battery Systems

Vibration Compensating Battery Systems act as vibration absorbers, smoothing out road vibrations in the E36 and E46 convertibles.

E36:

The E36 convertible is not only an energy source. The battery is designed as a vibration dampener. Due to this additional function the battery also has a special tray with an integrated vibration absorber.

NOTE: E36 convertible batteries are labeled "Vibration Proof". Replacement batteries must be of the same type.



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Fig. 18: View Of Battery Identification Label
 Courtesy of BMW OF NORTH AMERICA, INC.

E46:

The E46 convertible uses the same battery as the E46 sedan, coupe and touring. The battery box is specially designed to float on the vertical axis through three articulated rods.

This allows the battery to act as an inertia mass and dampen various vibrations while the vehicle is driven.



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Fig. 19: Identifying Dampening Rods
Courtesy of BMW OF NORTH AMERICA, INC.

Dual Battery Systems

E31 (850i):

The dual battery system on the 850i was introduced to handle the higher level of electronic technology with increased functions and safety features that were added to the vehicle, as well as the added diagnostic information.

Design considerations were made to minimize electrical loads during Key Off and periods of driving with low engine speeds while certain timed operations (e.g. Glove compartment light, courtesy lights and seat heating) were active.

Special testing and charging procedures exist for the dual battery system on the 850i, refer to appropriate article for specific information.

E38 750iL:

The dual battery system on the 750iL is necessary due to the addition of the E-CATs. If a single battery system was used, the E-CATs would be provided power from the single battery just after cold engine start-up when the battery is at its lowest capacity. This would increase engine loads due to charging of the single battery and cause an increase in injector "On" time during the cold engine warm-up period, which result in unnecessary tail pipe

emissions.

Providing separate battery systems for the starting circuit and the vehicle circuits also minimizes the possibility of a discharged starter battery ensuring reliable engine starting.

Components of E38 Dual Battery System

- **Starter Battery:** Located in the right rear trunk wheel, the starter battery is connected to the starter motor and to the heating coils of the E-CATs (via the E-CAT module).
- **Vehicle Circuit Battery:** Located above the starter battery on a swing out mount, the vehicle circuit battery provides operating power for the balance of the vehicles electrical requirements and is directly connected to the vehicle generator.
- **Battery Isolation Switch:** Located on the swing out mount of the vehicle circuit battery the battery isolation switch opens and closes the circuit between both batteries based on monitored conditions.

NOTE: The battery isolation switch is NOT used to boost a discharged starter battery with the voltage of the vehicle circuit battery to start the engine. The battery isolation switch can only withstand a maximum current flow of 60 amps.

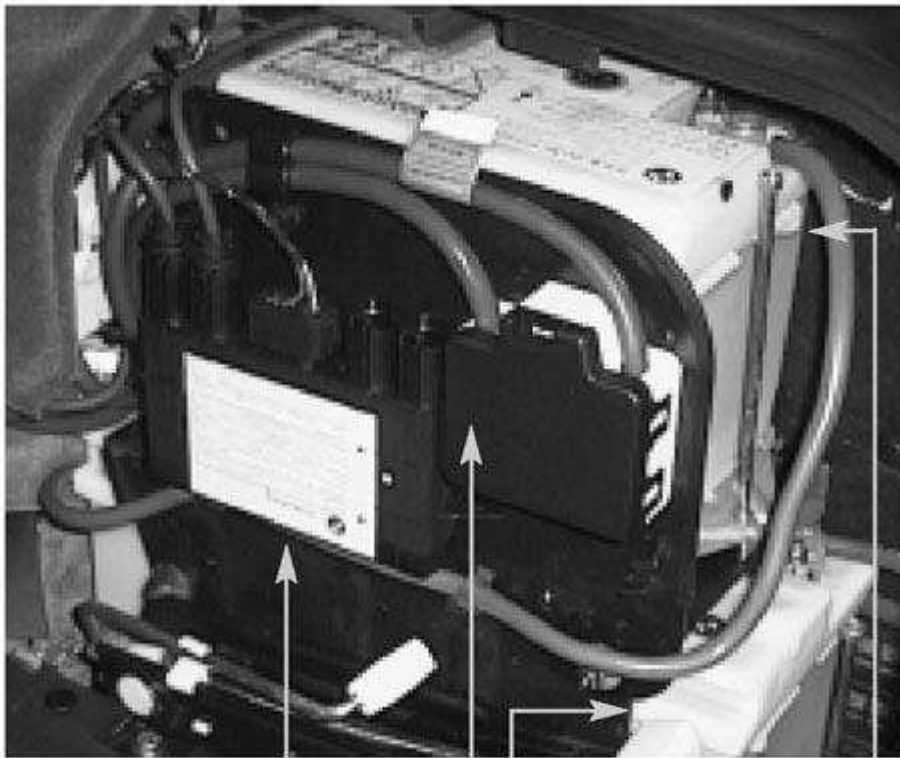
Battery Isolation Switch

The Battery Isolation Switch provides the vehicle with separate battery systems for the vehicle circuits and the starting circuit.

When the isolation switch is open, the vehicle circuit battery is the only power source connected to the power distribution center.

When the isolation switch is closed the starter battery is charged and the vehicle circuit battery is boosted by the starter battery.

Modes of the isolation switch:



Battery isolation switch

250 amp generator circuit fuse

Vehicle circuit battery

Starter/E CAT battery

G03390191

Fig. 20: Identifying Battery Isolation Switch
Courtesy of BMW OF NORTH AMERICA, INC.

- Starting Mode:
 - Normal Starting.
 - Safety Starting.
- Driving Mode.
- Charging Mode.
- Sleep Mode.

Starting Mode

When the isolation switch recognizes KL15 via the K Bus, it determines the voltage of the vehicle circuit battery.

- If the vehicle circuit battery **IS** sufficiently charged, it proceeds with **Normal Starting**.
- If the vehicle circuit battery **IS NOT** sufficiently charged, it proceeds with **Safety Starting**.

Normal Starting

- The isolation switch is open.
- Within 0.5 seconds of engine start-up the E-CAT module energizes the E-CAT heating coils (program dependent) and simultaneously signals the isolation switch that the ECATs are "On" via signal "KATON" (low signal).
- Upon completion of the heating period, the E-CAT module signals the isolation switch that the E-CATs are off (High Signal).
- Under normal conditions, the isolation switch is not closed before the heating procedure is finished.

Safety Starting:

- In response to a discharged condition of the vehicle circuit battery, the isolation switch closes to momentarily boost the vehicle circuit battery and supply all systems with starter battery voltage via the power distribution center.

This operation lasts for a maximum of 30 seconds or until confirmation of engine start up is received. (TD signal on the K Bus)

- Receiving the TD signals causes the isolation switch to immediately open for the duration of the E-CAT heating cycle.
- If the engine is not started within the 30 seconds, the isolation switch opens and remains open until KL 15 is recognized on the next start-up cycle.

Driving Mode

The vehicle circuit battery is permanently connected in parallel to the generator and is charged when the engine is running. When the isolation switch is closed, the generator simultaneously charges the starter battery.

As the vehicle is driven the isolation switch cycles between open and closed based on:

- Voltage values of both batteries.
- Current transfer between both batteries as monitored by the isolation switch.
- Internal temperature of isolation switch.

Conditions Causing Switch To Open While Driving:

- Sufficiently charged starter battery.
- Current flow through switch exceeding 0.5 amps.

The starter battery will supplement vehicle electrical needs during periods of high demand (e.g continuous wiper operation combined with lights and blower).

- The internal temperature of the isolation switch exceeds programmed maximum value.

Conditions Causing Switch To Close While Driving:

- Monitored voltage of vehicle circuit battery exceeds that of starter battery by 0.7 volts.
- The voltage of the vehicle circuit battery drops below 9 volts three times within one minute.

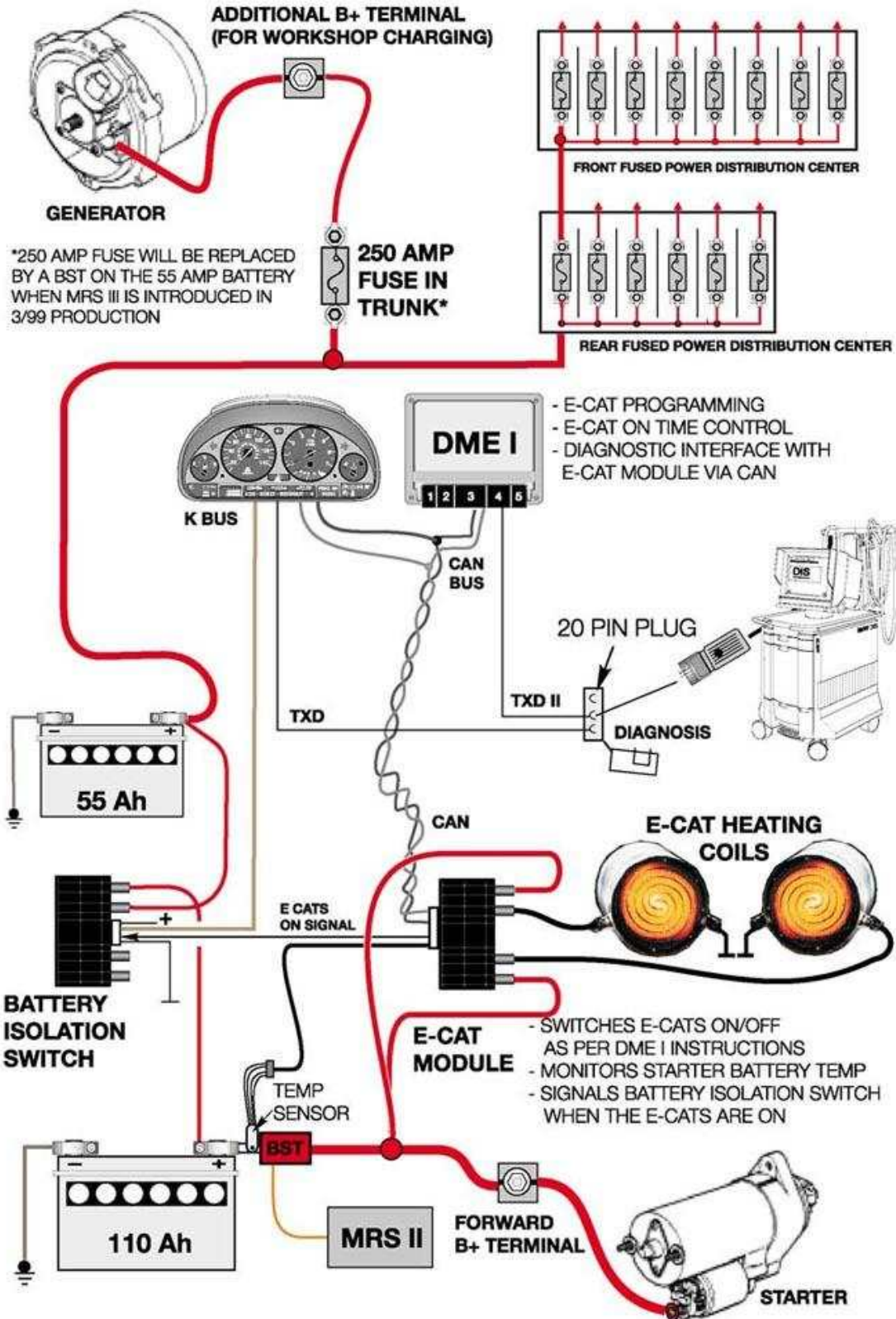


Fig. 21: Identifying Battery Charging System
Courtesy of BMW OF NORTH AMERICA, INC.

Charging Mode (in the workshop)

The isolation switch monitors starter battery voltage during key off conditions and continues monitoring after the vehicle and the isolation switch have entered sleep mode.

- If starter battery voltage exceeds 13.8 volts during charging in the workshop, the isolation switch comes out of sleep mode and closes.

This causes the starter battery voltage to bleed off to the vehicle circuit battery, charging the circuit battery and protecting the starter battery from overcharging.

The isolation switch remains closed until the next key on cycle.



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Fig. 22: Identifying Charging Mode (In Workshop)
Courtesy of BMW OF NORTH AMERICA, INC.

Sleep Mode

The isolation switch goes into sleep mode as soon as the engine is switched off. The current draw of the isolation switch drops below 1 mA. The isolation switch comes out of sleep mode if:

- KL15 is recognized.
- Starter battery voltage exceeds 13.8 volts (charging mode)

Failure of KATON signal:

If the **KATON** signal is not received due to:

- Open or short to B+ - isolation switch closes for 4 seconds after start-up, TD received.
- Short to B- - isolation switch opens 60 seconds after receiving TD.

CLOSED CIRCUIT CURRENT DRAW TESTING

Increased closed-circuit currents may occur permanently or intermittently and cause the battery to discharge prematurely. The increase in closed circuit current may be caused by a faulty control unit or by the installation of a non-approved accessory.

In a situation where a vehicle has broken down due to a discharged battery, for diagnostic purposes it is important not to disconnect the battery. The control unit may reset if the battery is disconnected. Following a reset, a faulty control unit may start functioning correctly again, making accurate diagnosis impossible.

Tools Needed:

- Closed Circuit Current Measurement Adapter.
- MoDic Adapter.
- DISplus, MoDic or DVOM.

To correctly measure closed-circuit current, measurement adapter **61 2 300** (P/N 90 88 6 612 300) should be used. This tool provides a bridge to ground, before the negative battery terminal is disconnected, and this prevents the control units from being reset.

The additional use of MoDiC adapter **61 2 310** (P/N 90 88 6 612 310) provides a method for current measurements over an extended period of time.

The measuring device needed depends on the situation.

The DISplus may be used in situations of suspected high current draw.

The 1000 amp probe measures AC and DC current from 0 to 1000 amps. It is a self calibrating inductive pick-up. (Use this pick-up with current draws over 10 amps) The DISplus, through MFK 1 is capable of measuring up to 2 amps.

The MoDic is particularly suitable for extended measurements and provides a graphical readout of recorded measurements over time. It is recommended for the situations where the use of a multimeter provided insufficient information for problem diagnosis.

The DVOM may be used for measurements up to 10 amps either with the measurement adapter or alone.

NOTE: **It is extremely important that the battery is NOT disconnected during the installation of test equipment. Disconnection of battery may cause faulty component to function normal.**

Performing Closed Current Draw Test

- Select proper measuring device (DISplus, MoDic or DVOM)
 - Remember amperage draw in excess of 10A will damage DVOM.
 - Use inductive amp probe of DISplus when amperage draw is high.
 - When using DISplus inductive probe, clamp on negative battery cable with:
 - Arrow pointing away from battery. Switch off all consumers.
 - (It is not necessary to disconnect B- from body when using inductive probe).
- Connect (-) test lead to negative battery terminal and (+) test lead to a known good ground.
- Ensure all systems are **OFF !**
- **Be sure DVOM is on and set in proper mode.**
- Disconnect battery ground lead from body.
- Observe meter reading, wait for vehicle to enter sleep mode.
- Identify faulty circuit by disconnecting fuses, relays, control modules or connectors, observing meter readings.
- Defective circuit is found when current is below maximum closed current for vehicle being tested.

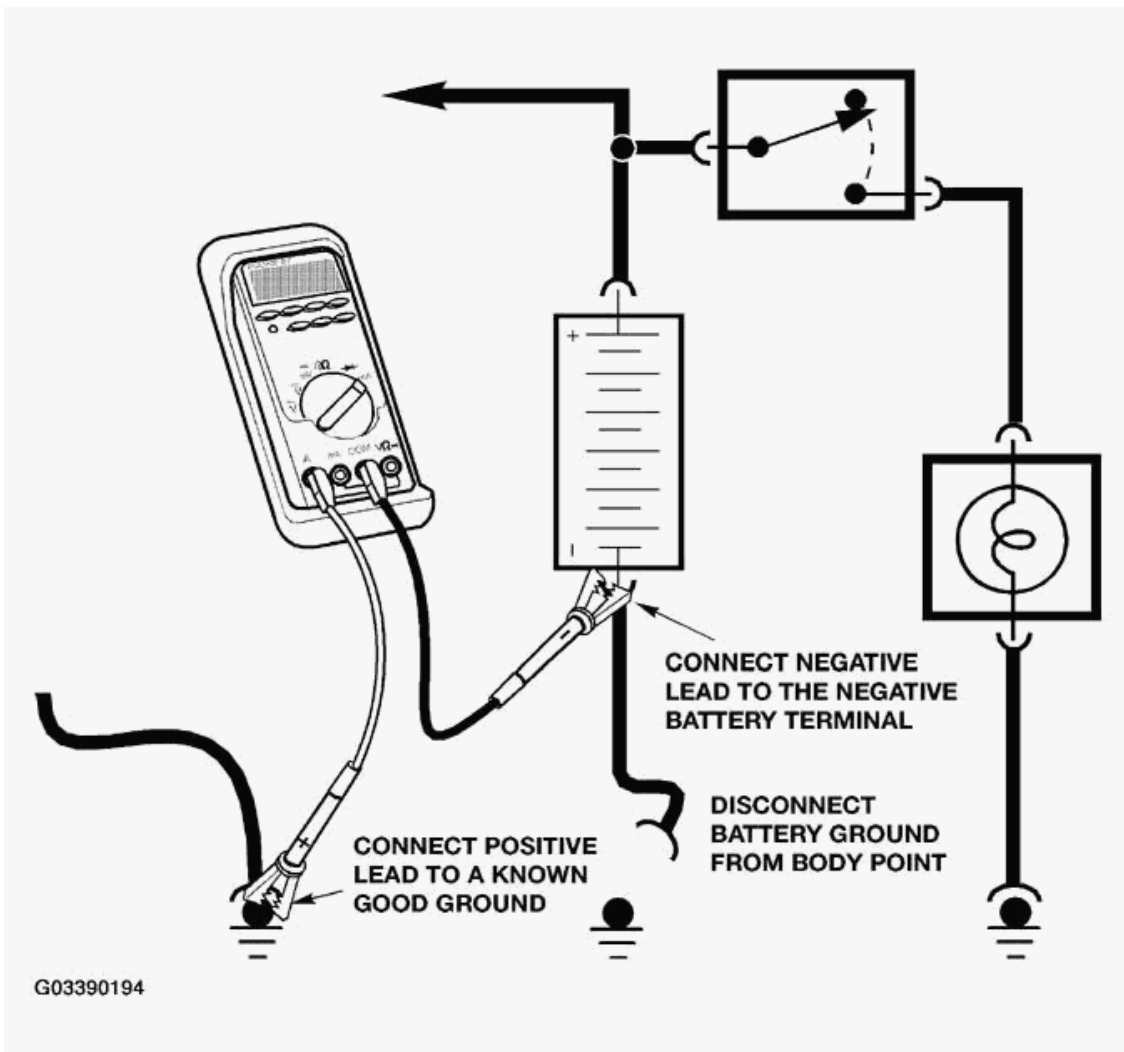


Fig. 23: Identifying Performing Closed Current Draw Test
 Courtesy of BMW OF NORTH AMERICA, INC.

MAXIMUM CLOSED CURRENT BY VEHICLE

E31	50mA
E32	50mA
E34	40mA
E36	30mA
E38	50mA
E39	40mA
E46	40mA
E52	50mA
E53	40mA
Z3	30mA

NOTE: Refer to appropriate article for complete instructions to perform closed circuit

current measurement using measurement adapter and MoDlc adapter.

GENERAL INFORMATION

Understanding Diagnostics - Overview - All Models

UNDERSTANDING DIAGNOSTICS

Model: All

Production Date: All

Trial and error creates inconvenience for the Customer and the Service Department when mis-diagnosis or longer waits occur as the technician tries different repair attempts. This is against BMW's promise to the customer to **"Fix it right the first time, on time, every time"**.

If the vehicle is not repaired efficiently the productivity of the technician suffers. Taking some time at the beginning to plan a diagnostic course of action can help give structure to what may appear in the beginning to be a chaotic situation.

As future systems increase in complexity so does their dependency on the Diagnosis Program as the principle tool for troubleshooting. However, the importance of understanding the calculated steps of a basic troubleshooting plan is just as important as before.

There will always be instances where the Test Modules provided by the DISplus need to be supplemented by a thoughtful diagnostic plan that is created by the skilled Technician. A parallel diagnostic plan that includes proper recording of test data along with the Diagnosis Program is a good habit to follow every time that troubleshooting is required.

A successful diagnostic plan will:

- Save repair time.
- Satisfy the customer by reducing vehicle down time.
- Increase Center profitability.
- Increase technician pride and earnings.

DIAGNOSTIC PLAN

The Diagnostic Plan consists of 5 steps:

- Verify the Customer Complaint - "Experience the Symptom!"
- Analyze the Problem.
- Isolate the Problem.
- Repair the Problem.
- Verify the Repair.

VERIFY THE COMPLAINT

Most troubleshooting starts the moment you receive a written description of the customer complaint. The complaint is the customer's description of a symptom that they are experiencing with the vehicle.

Symptom

A symptom is any circumstance, event or condition that accompanies something and indicates its existence or occurrence.

There may be multiple symptoms that are created with one problem.

An example is a defective thermostat: If the thermostat is stuck open the heater output will be insufficient, also, if the engine can never reach operating temperature then fuel mileage and performance will suffer. Which one of these complaints (symptoms) would lead you to the problem faster?

What is important to remember is that the customer may only complain about one symptom. It is the job of the technician to be a detective and carefully observe. There may be another symptom not complained of that directly points to the root cause of the problem.

Steps to Verify The Complaint

- Before getting in the vehicle, review the R.O., confirm this is the correct vehicle.
- Is any additional information needed about the complaint? Certain questions to the customer can help narrow this step.
- Is the problem intermittent? What are the conditions (roads, temp., speed, etc.)? What is the frequency of the occurrence?
- Test drive if driveability related or the conditions require, duplicate conditions as stated by customer.
- Was the complaint reproduced?
- Is knowledge of system or vehicle sufficient?
- Review Reference Training material and owner's handbook for a description of feature operation.
- Research complaint in SIB's.
- Research past repair history on vehicle.

ANALYZE THE PROBLEM

After verification of the complaint, analyze the problem. Use all resource available to aid in system diagnostics:

- Vehicle Fault Memory.
- ETM, RM, SIB.
- Vehicle Repair History.
- Training Handouts.
- Round Table Information.
- Hotline.
- Known Good Vehicle.

Analyzing the problem allows for the development of a repair plan.

Steps in Analyzing The Problem

- Perform a Short Test.
- Does an SIB pertain to this vehicle?
- Refer to the Function Description for additional system information.
- Is a test plan available for this system?
- Use fault symptom selection.
- Perform Diagnosis Request.

ISOLATE THE PROBLEM

To isolate the problem is "to place apart from others".

The object here is to zoom in on the problem area. It is easy to be overwhelmed by a problem, just reaching for an ETM can add to the confusion. The DISplus provides automatic tests in test modules to aid in the determination of the exact area or cause of the problem.

The elimination of components from the diagnostic trail, shortens the path. The first question asked should be:

- Is the problem Hydraulic, Mechanical or Electrical?

Save time by **NOT** testing components that could not create the problem.

Steps in Isolating The Problem

- Use Test Modules.
- Perform electrical tests with the DISplus Measurement System or a DVOM.
- Consult fault charts in Repair or Diagnostic Procedures Articles.
- Control Module Self Diagnosis.
- Use appropriate special tools (e.g. battery draw tester, tank leakage adapters, breakout boxes, etc.).
- Substitute a known good part.

Workshop Hints:

If a **TEST PLAN** is not available for a particular situation do the following:

- Think about the system in its entirety.
- Be sure the normal operation is understood.
- Develop a **PLAN**.
- Use all available resources.
- Don't try to diagnose the entire system at once, break it into manageable chunks.
- Check the easy things first. It would waste time to install the Breakout Boxes to find a bad bulb.

When following a TEST PLAN:

- **DON'T** Skip steps.
- **NEVER** assume results without doing a step.
- Recheck your work.

REPAIR THE PROBLEM

Repair the problem using approved repair techniques and parts. Having verified, isolated and analyzed the problem the last step is to repair or replace the component. Before installing that shiny new part, take one last step back from the vehicle to ask a final set of questions.

- Could another component have caused this part to fail?
- Were all the instructions in the Test Plan or Diagnostic Procedures followed?
- Is there *anything* that might have been overlooked?

Confident that the proper diagnosis has been made, complete the repairs.

Steps to Repairing The Problem:

- Follow the instructions in the repair article.
- Follow specific guidelines for wire harness repair or replacement.
- Make proper adjustments after installing the part.
- Perform Coding or Programming if required.
- Make sure another problem is not created in performing this repair.

VERIFY THE REPAIR

Always recheck for the complaint under the same conditions used to verify. The object is to prove the problem does not resurface.

- Clear the fault codes.
- Test drive the car.
- Check for re-occurring fault codes.
- Clear adaptations if necessary.
- Recheck the part installation for missing bolts or tie wraps.

Workshop Hints:

- Follow repair or replacement procedures as detailed in appropriate article.
- Use only genuine BMW parts.

THE I.P.O. PRINCIPLE

Control Modules receive information from sensors advising them of certain operating conditions. This information is identified as Input to the control modules. The Input continually informs the control modules of conditions that may be changing.

The control module then process the Input information comparing it to programmed responses or commands based on every possible operating condition. The control module decides based on the programming and the Input conditions which Output signal to operate.

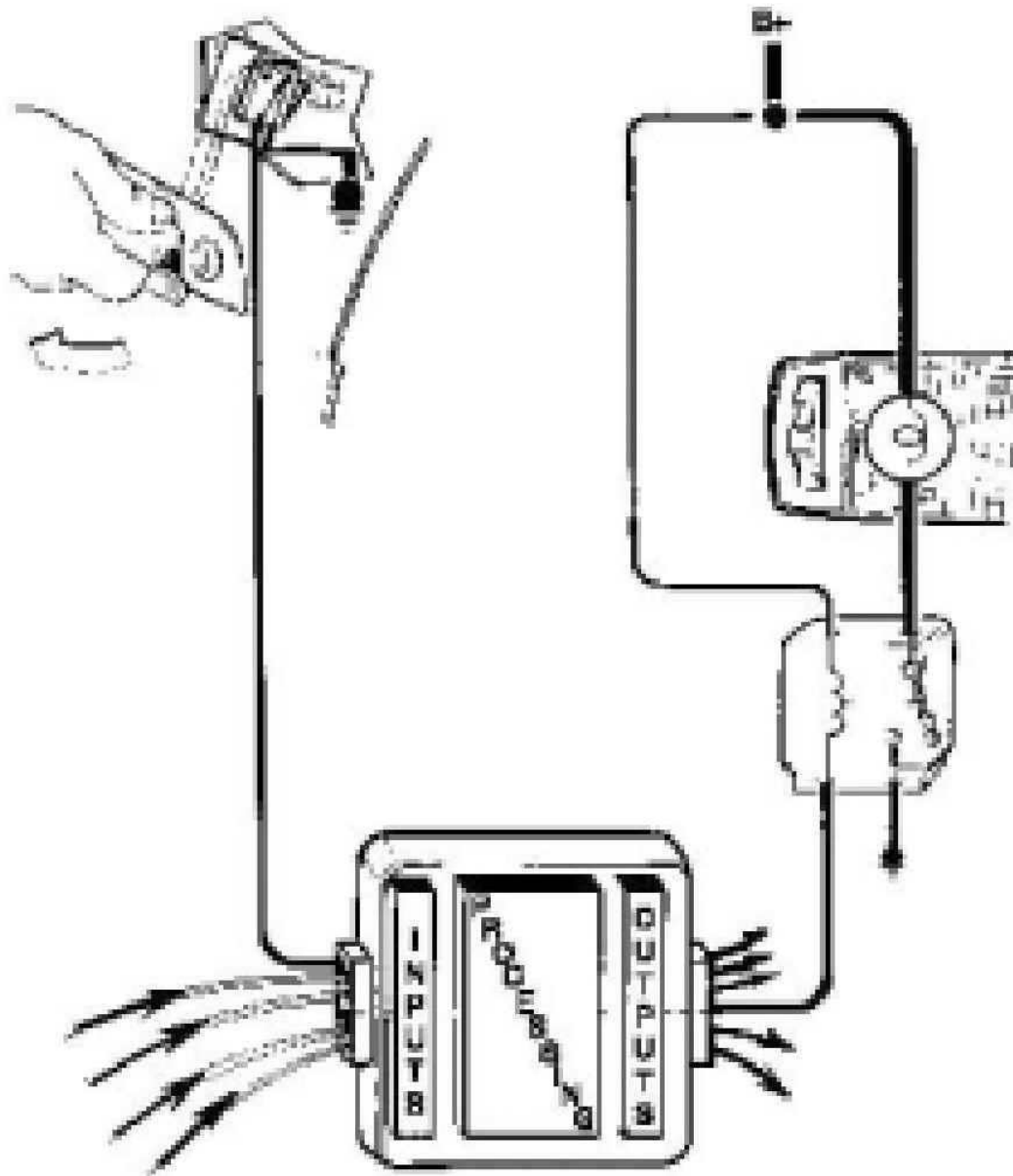
The control module, based on the processing that has occurred, then sends a signal to a component changing the status of that component. The components respond to the Output signal of the control module.

This is known as the I.P.O. Principle.

I.P.O.

- Status of switch is changed.
- Changing switch status is sent to processor.
- Processor looks at conditions which must be met.
- If the processor deems the conditions for switch status change are met, a relay is signaled via a ground signal.
- The relay is energized, the points are closed and the light bulb glows.

NOTE: The processor looked at other inputs before making the decision to activate the relay.



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Fig. 1: Identifying I.P.O. Principle

Courtesy of BMW OF NORTH AMERICA, INC.

Any device controlled by a processor requires input to alert the operating program of a condition. The program processes the input information and logically activates an output of a component.

All BMW control systems are explained by the IPO principle. It is the key to understanding all BMW control

system technologies.

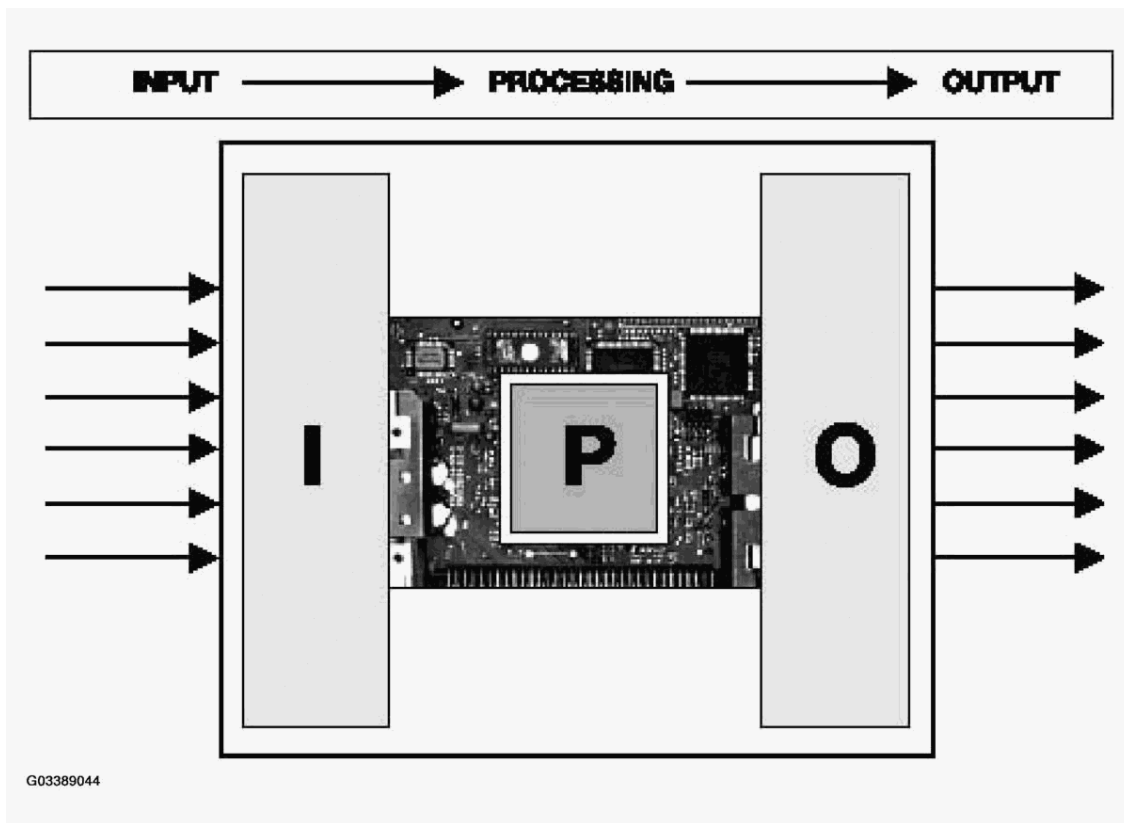


Fig. 2: I.P.O. Principle Display

Courtesy of BMW OF NORTH AMERICA, INC.

GENERAL INFORMATION

xDrive/DSC - Overview - X3

XDRIVE/DSC

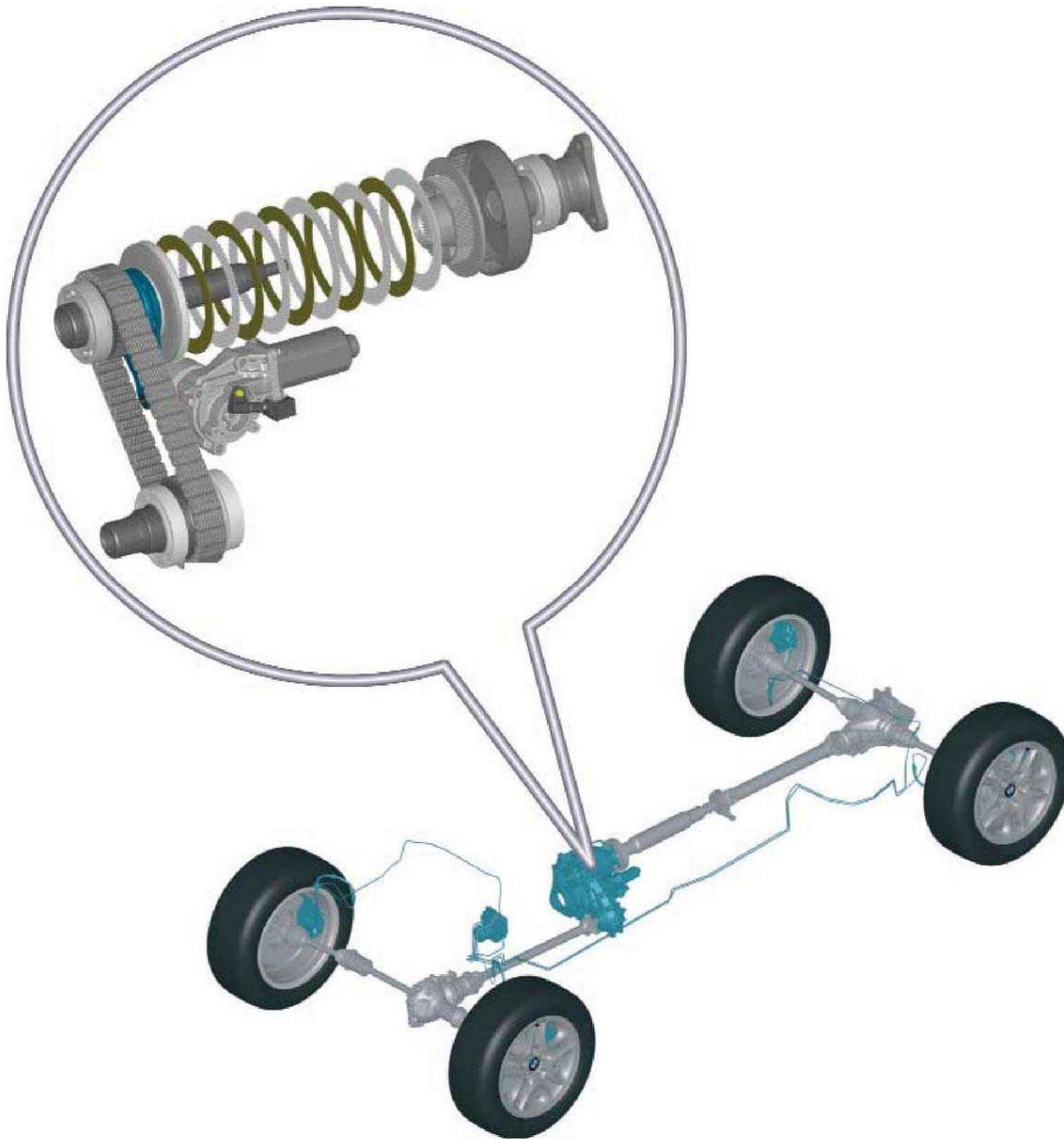
PURPOSE OF THE SYSTEM

xDrive

The innovative xDrive four-wheel drive is a system that controls and regulates the distribution of driving torque to the front and rear axles. The measured variables of DSC are used by xDrive but are also influenced by modified handling performance.

The multi-disc clutch is the heart of the xDrive. By using the controlled multi-disc clutch, it is possible to resolve the conflict between traction and handling performance.

This is achieved through the fact that torque distribution is not determined by a fixed gear ratio in the xDrive as was the case in the previous systems. Instead, the distribution of driving torque is dependent on the locking torque of the controlled multi-disc clutch in the transfer case and on the transferable torque to the front and rear axles.



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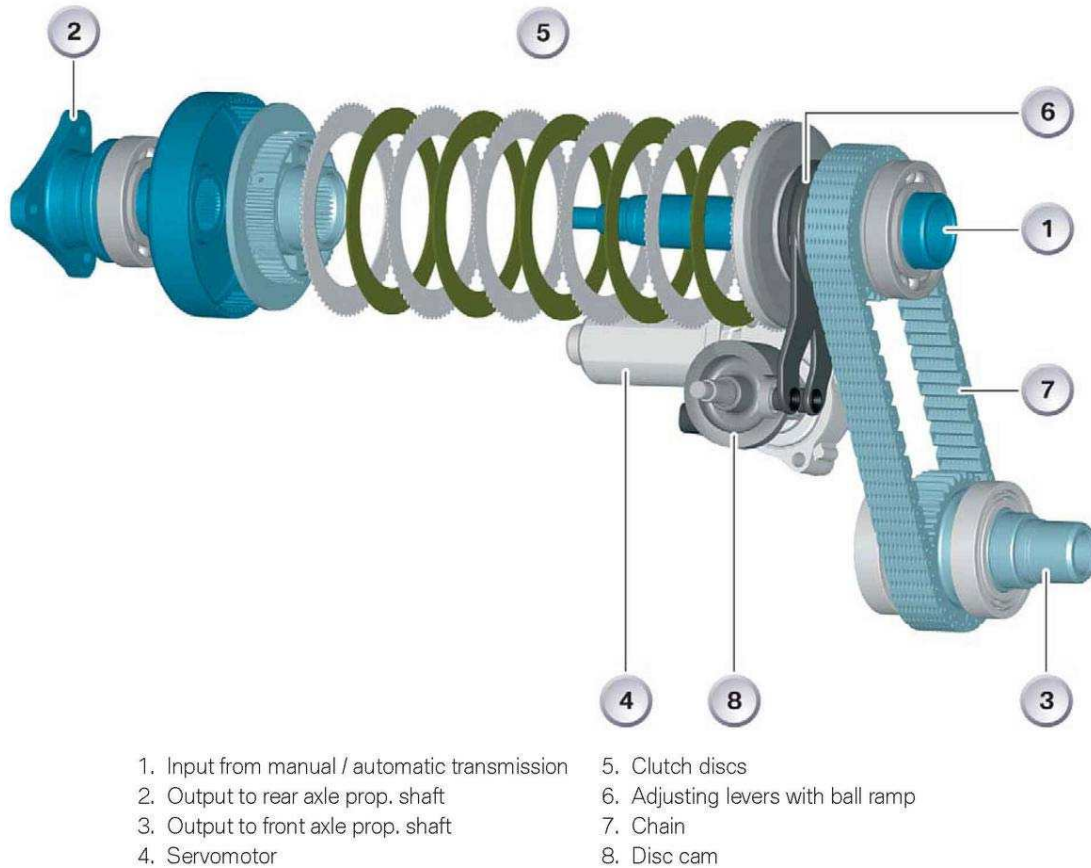
Fig. 1: Identifying xDrive

Courtesy of BMW OF NORTH AMERICA, INC.

XDRIVE - SYSTEM COMPONENTS

ATC 400 / ATC 500 Transfer Case

The ATC 400 is installed in the E83 and the ATC 500 in the E53 MU. They differ in that the ATC 500 is splined to the front propeller shaft and the ATC 400 uses a four bolt flange. In addition, there is one more disc in the multi-disc clutch of the ATC 500 and the distance between the input shaft and the output shaft to the front axle is 19 mm greater than in the ATC 400.



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Fig. 2: Identifying ATC 400 / ATC 500 Transfer Case Components
Courtesy of BMW OF NORTH AMERICA, INC.

The flange illustration of the ATC transfer case is the same for automatic and manual transmissions.

Power Flow

When the multi-disc clutch in the transfer case is disengaged, no driving torque is transmitted to the front axle. All of the driving torque is then distributed to the rear axle. This is because the input shaft (1) is splined providing a permanent connection to the rear axle propeller shaft output flange (2). The multi-disc clutch couples the rear axle propeller shaft output flange to the front propeller shaft output (3).

The driving torque on the front axle is increased or decreased by regulating the locking pressure of the multi-disc clutch, providing a stepless coupling of the front axle to the drivetrain. This depends on driving situations and road conditions. When the multi-disc clutch is fully engaged, the front and rear axles turn at the same speed.

Driving torque distribution (front/rear) is based on available traction at each axle. For example, when traction is identical on the front and rear axles and a driver accelerates from a stop in first gear at full throttle, the rear axle is capable of sustaining greater driving torque as the vehicle weight shifts from the front to the rear.

Another example is when the front axle is on a high traction surface and the rear axle is on ice. In this case,

virtually 100% of the available driving torque is transmitted to the front axle. Based on available traction, virtually no driving torque can be supported by the rear axle. Obviously, when more driving torque is transmitted to the front axle, driving torque on the rear axle is proportionally reduced due to lack of traction.

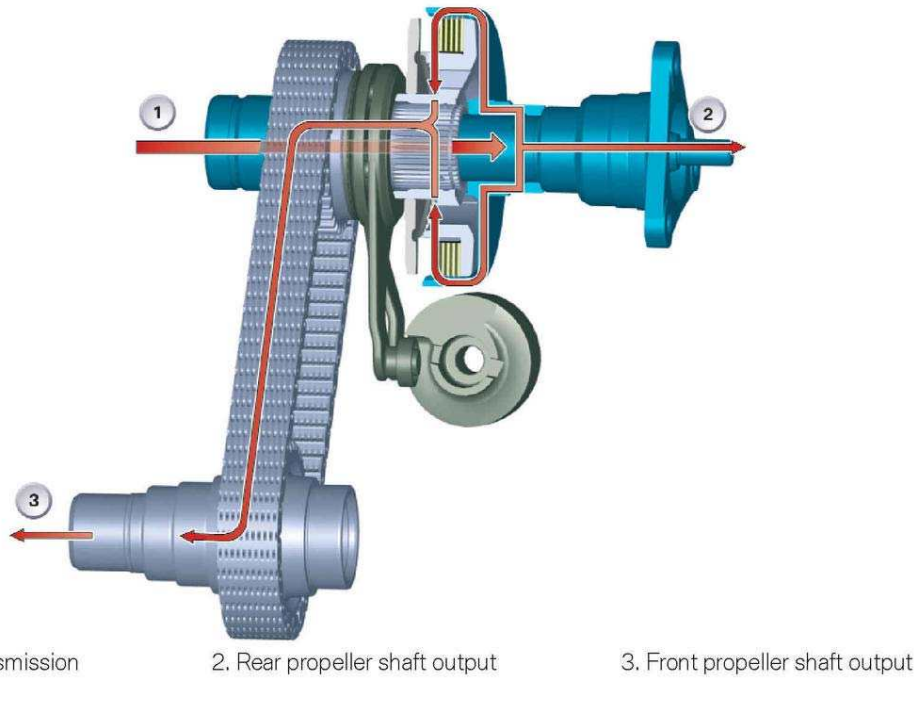


Fig. 3: Identifying Power Flow
Courtesy of BMW OF NORTH AMERICA, INC.

1. Input from transmission 2. Rear propeller shaft output 3. Front propeller shaft output

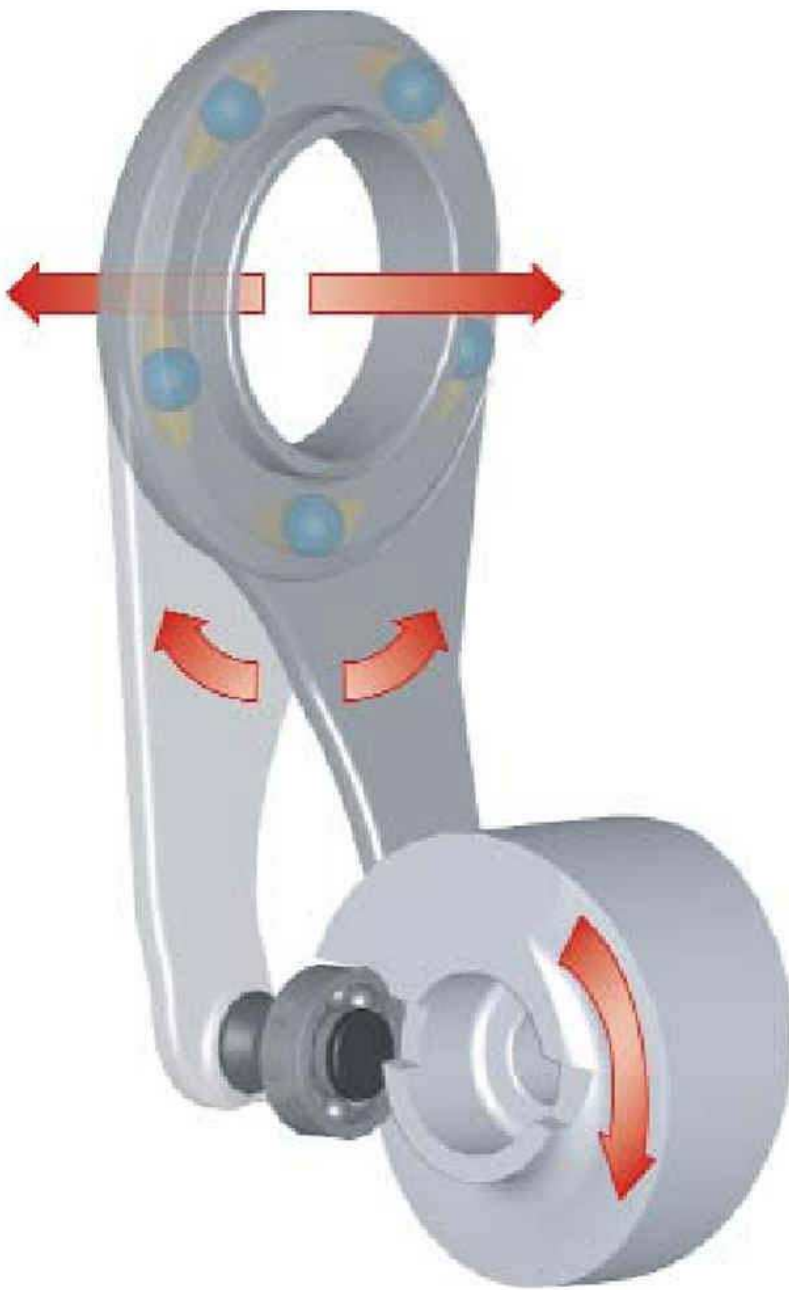
NOTE: On a vehicle equipped with an automatic transmission, when driving onto brake analyzers, move the selector lever to the "N" position. On a vehicle equipped with a manual transmission, do not press the accelerator pedal once on the brake analyzer. This keeps the transfer case clutch open and the vehicle cannot be pulled off the analyzer.

Adjusting Levers

When the disc cam is rotated, it forces the adjusting levers apart.

The ball ramps create a precision axial movement which compresses and increases pressure on the multi-disc clutch.

This is completely variable up to a full lock.



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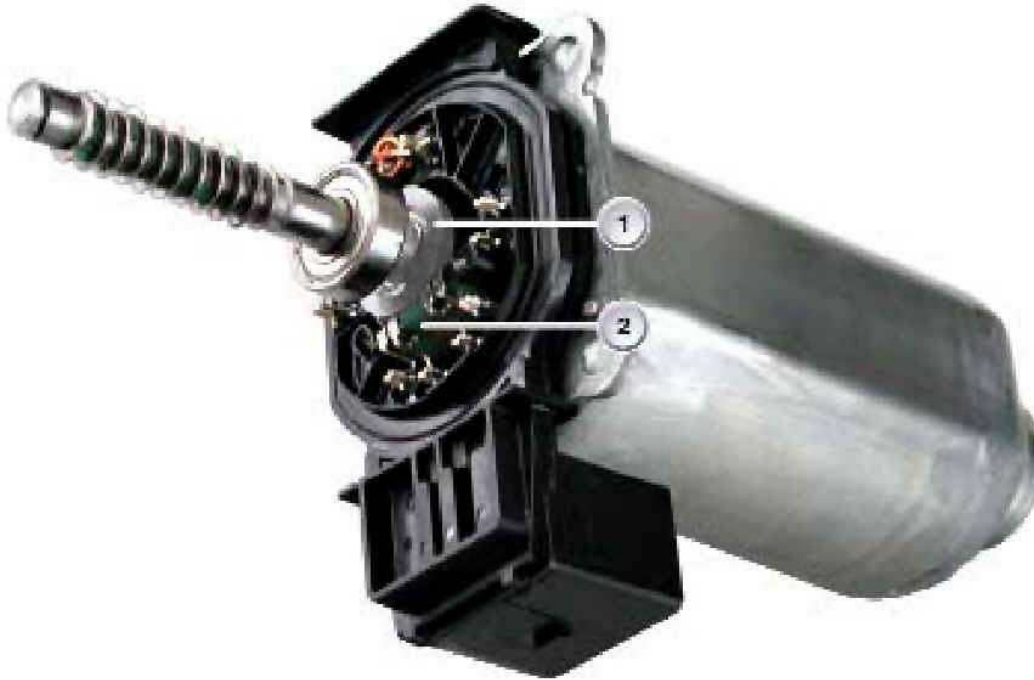
Fig. 4: Identifying Adjusting Levers
Courtesy of BMW OF NORTH AMERICA, INC.

Servomotor With Motor Position Sensor

The servomotor with worm gear are powered to rotate the disc cam.

The servomotor is a permanent magnet (1) DC motor which contains a Hall sensor (2) to detect the position and the adjusting speed of the motor shaft.

This is proportional to the degree of multi-disc clutch engagement.



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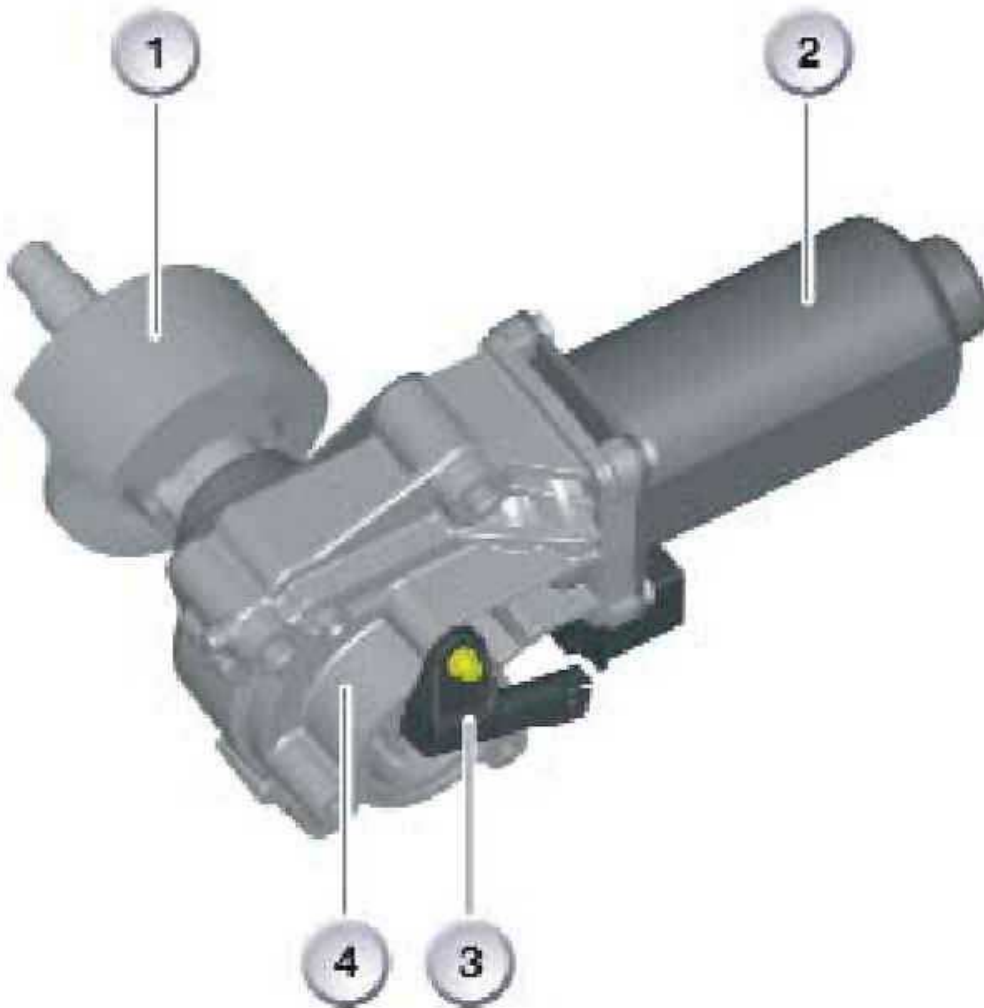
Fig. 5: Identifying Servomotor With Motor Position Sensor
Courtesy of BMW OF NORTH AMERICA, INC.

Coding Resistor

Because of mechanical tolerances in production, the characteristic curve of the multi-disc clutch locking torque varies slightly.

Once the actual locking torque has been measured on the clutch test bench, a resistor is attached to the servomotor; the resistor's value is a reference to the locking torque characteristic.

Each time the engine is started, the transfer case control unit measures the resistance value once and the optimum program map for the transfer case fitted is selected.



- | | |
|-------------------|--------------------|
| 1. Disc cam | 3. Coding resistor |
| 2. Electric motor | 4. Worm gear |

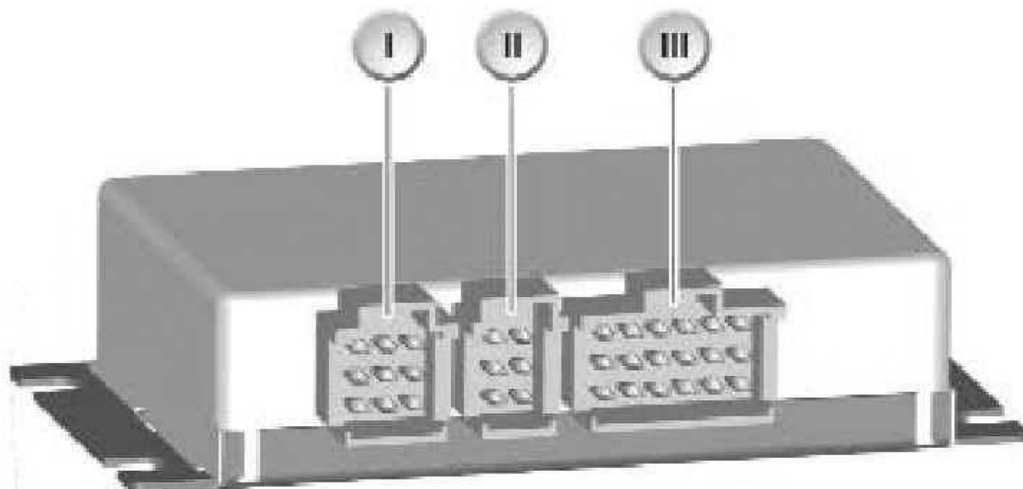
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Fig. 6: Identifying Coding Resistor
Courtesy of BMW OF NORTH AMERICA, INC.

Transfer Case Electronic Control Unit

The transfer case control unit (VGSG) is installed in the E83 on the rear floor panel under the luggage compartment trim.

In E53 MU, it is located underneath the rear bench seat on the left.



- I. 9-pin ELO connector (not used)
- II. 6-pin ELO connector
- III. 18-pin ELO connector

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Fig. 7: Identifying Transfer Case Electronic Control Unit
Courtesy of BMW OF NORTH AMERICA, INC.

Bus Overview

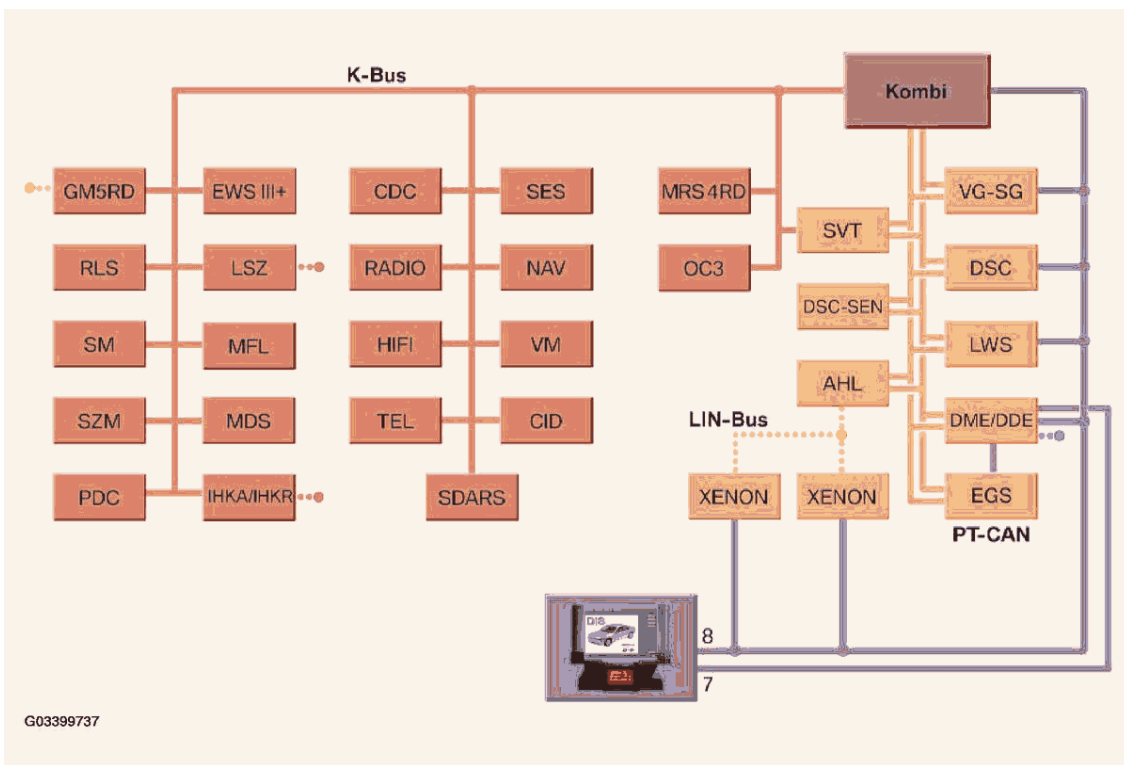


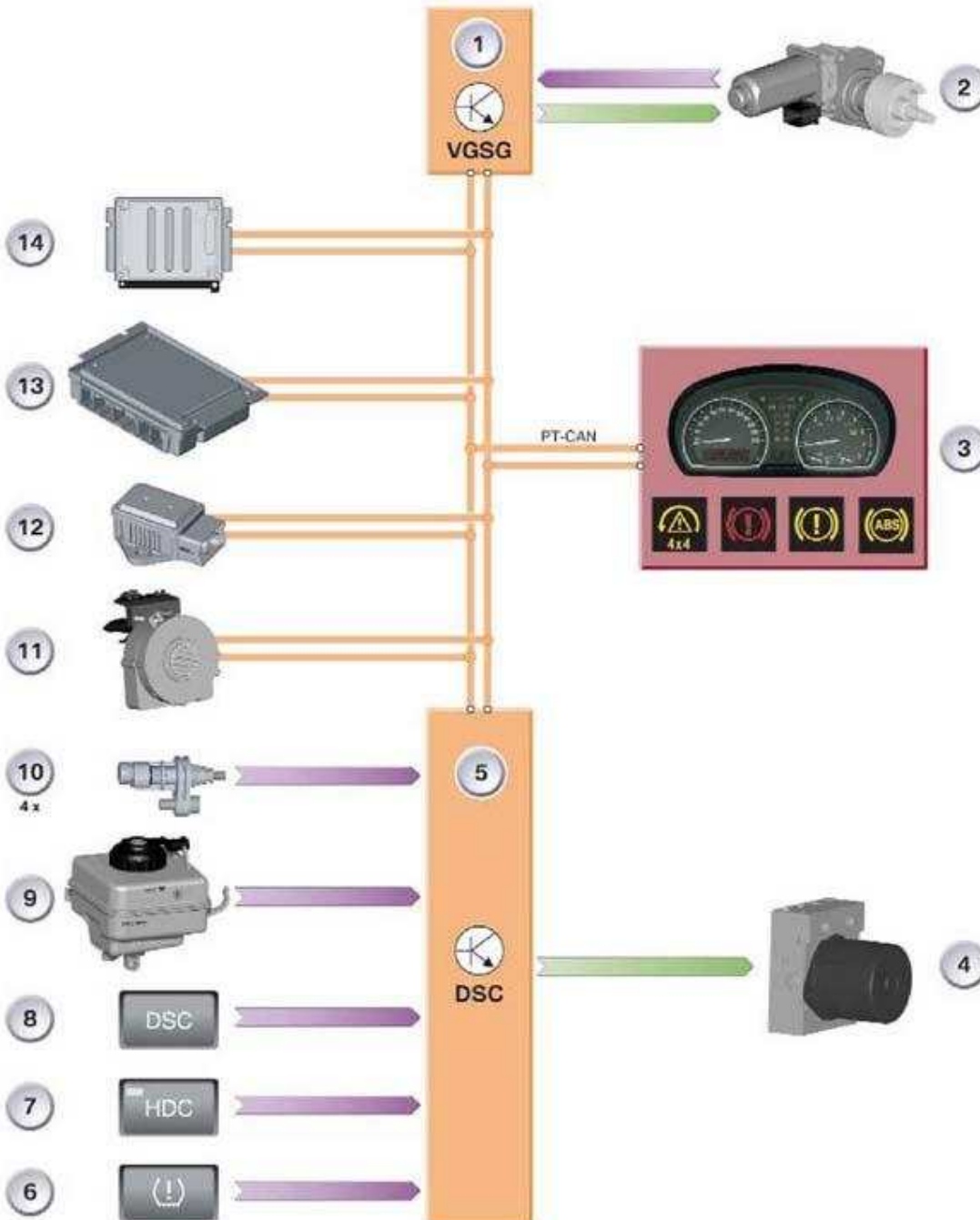
Fig. 8: Bus Overview
 Courtesy of BMW OF NORTH AMERICA, INC.

The transfer case control unit (VGSG) is on the PT-CAN Bus. VGSG shares information with DSC for overall xDrive control and has diagnostic communication via the OBD connector.

Inputs

Processing

Outputs



1. Transfer case control unit
2. Transfer case clutch servomotor
3. Instrument cluster
4. DSC hydraulic modulator
5. DSC control unit
6. RDW button
7. HDC button

8. DSC button
9. Brake fluid level
10. Wheel speed sensor
11. Steering angle sensor
12. Yaw/transverse acceleration sensors
13. EGS
14. ECM (DME)

Fig. 9: Identifying Inputs, Processing And Outputs
Courtesy of BMW OF NORTH AMERICA, INC.

XDRIVE - PRINCIPLE OF OPERATION

xDrive

The transfer case control unit (VGSG) regulates the locking pressure of the multi-disc clutch in the transfer case. The transfer case control unit receives information on the required clutch locking pressure from the DSC control unit. The processing, control and electronics required for this are integrated in the transfer case control unit. This information is converted and output as a corresponding rotary motion of the servomotor.

In order to position the servomotor and compensate for wear, a reference run is carried out each time the ignition is switched off. The servomotor position is determined by a Hall sensor integrated in the servomotor. During the reference run, the clutch is engaged and disengaged completely (once). While the clutch is actuated, the current consumption is measured for the servomotor position. This allows the VGSG to determine the beginning and end of the clutch actuating procedure.

A clutch and oil wear calculation is also processed and stored in the VGSG. It increases the locking pressure as necessary in order to reduce friction.

In the event of DSC failure, the VGSG incorporates a fallback level (strategy) for activating the transfer case clutch in order to maintain the four-wheel drive function.

TCC

Regulation of the transfer case clutch (TCC) locking pressure allows stepless coupling of the front axle to the drivetrain. The driving torque on the front axle can be increased or decreased depending on the driving situation and road conditions. Obviously, when more driving torque is transmitted to the front axle, driving torque on the rear axle is proportionally reduced due to lack of traction.

The advantages of variable distribution of driving torque to the front and rear axles are:

- Optimum utilization of the cornering and longitudinal wheel forces on the front and rear axles.
- DSC brake interventions only become necessary at a significantly later stage, an increase in comfort refinement.
- Compared with an "open" differential transfer case and DSC, xDrive significantly improves driving torque distribution when traction on the front and rear axles is notably different.

The DSC control unit influences control of the transfer case clutch. Even when DSC is deactivated, TCC remains active for the purpose of maximum traction and driving dynamics.

Permanent four-wheel drive is only completely deactivated in three control situations:

- During very tight cornering with low engine torque to allow speed compensation between the front and rear axles (e.g. parking)
- At speeds > 180 km/h

- When the vehicle dramatically understeers

The transfer case clutch control logic is described in three main modules:

- Pre-control
- Traction control / driving dynamics control
- Tire tolerance logic

Pre-Control

The pre-control logic (shared from DSC) reflects the driver's command and is calculated based on:

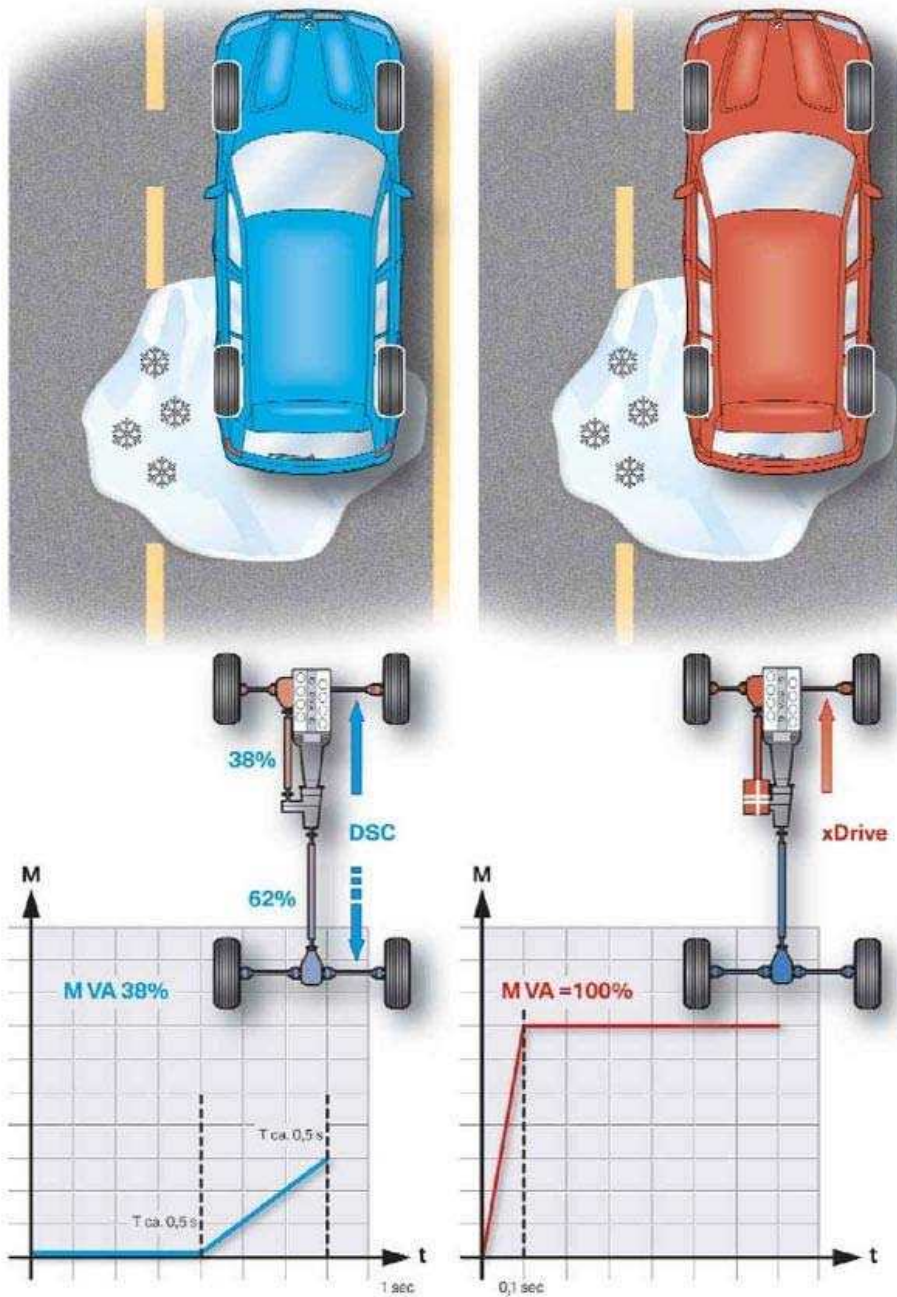
- Accelerator pedal value
- Engine torque
- Engine RPM
- Vehicle speed
- Gear
- Steering angle

In normal driving, the clutch is operated with minimum slip so that permanent four-wheel drive with a driving torque distribution of 40% on the front axle and 60% on the rear axle is available.

Even when the traction for the front and rear axles is dramatically different, the pre-control ensures that the system responds very quickly, as can be seen in graphic on the following page.

Notes:

"Open" Transfer Case VS xDrive



M = Driving torque

M VA = Driving torque on front axle

t = Time

G03399739

Fig. 10: Open Transfer Case Vs xDrive
 Courtesy of BMW OF NORTH AMERICA, INC.

In the case of the open transfer case, the brake is applied after slip is detected on the rear axle. This takes

approximately one half of a second in reaction time. 62% of the driving torque is supported on the two rear brake discs and only 38% of the driving torque can be transferred to the front axle. In other words, wheel slip must be sensed first before driving torque is transferred through the transfer case by applying the rear wheel brakes.

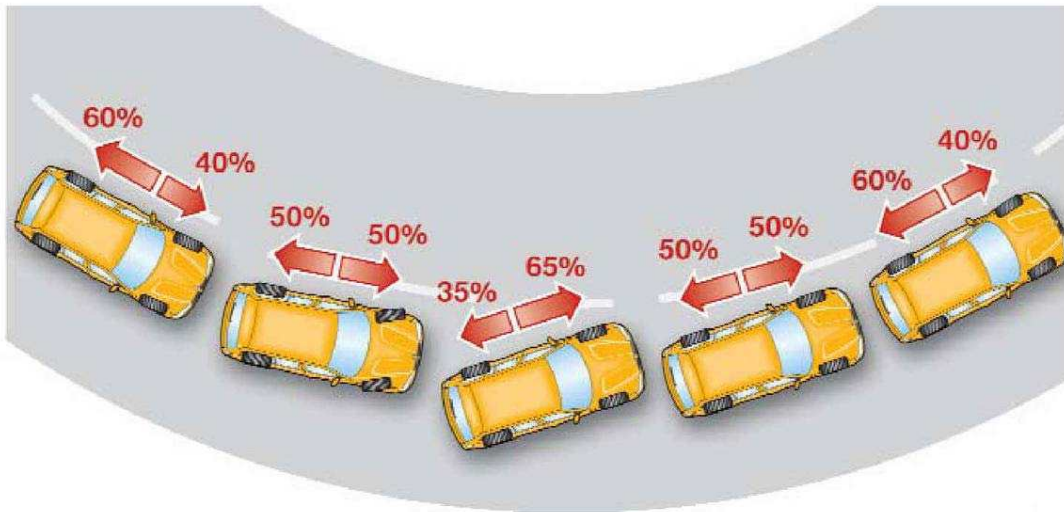
In contrast to an "open" transfer case (differential), the xDrive does not require brake intervention on the rear axle because no slip can occur (permanent through connection). The transfer case clutch is engaging the front axle as the vehicle is accelerating. This takes significantly less time (approx. one/tenth of a second).

Traction Control / Driving Dynamics Control

Traction control monitors the slip conditions on the front and rear axles. The wheel speeds, yaw rate and transversal acceleration serve as the input signals.

The function of traction control/driving dynamics control is to achieve optimum traction and to keep the vehicle stable.

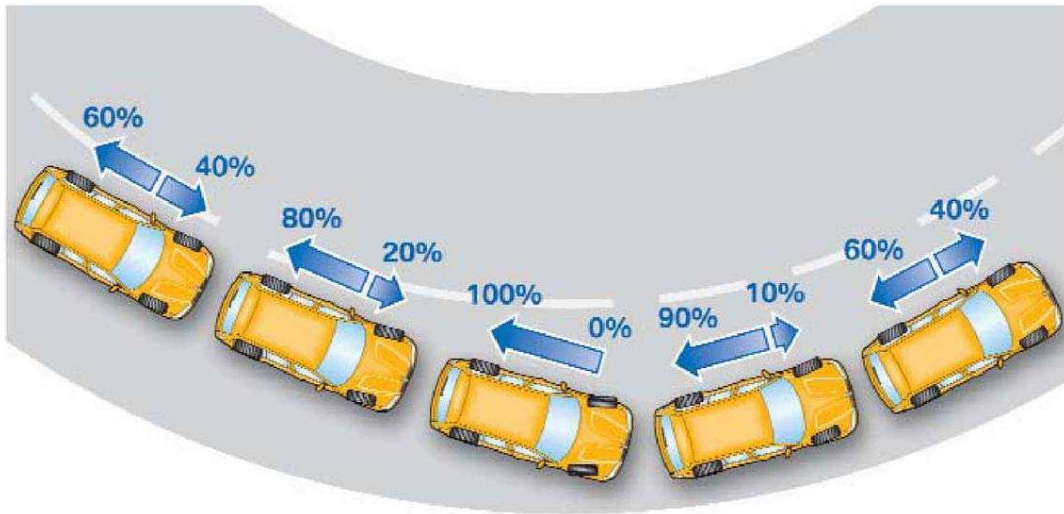
As seen in the following graphic, in the event of an oversteer tendency, the transfer case clutch is completely engaged and the maximum supportable driving torque on the front axle is transmitted. This helps to "pull" the front of the vehicle until stability is achieved.



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Fig. 11: Identifying Traction Control / Driving Dynamics Control (Oversteer Tendency)
Courtesy of BMW OF NORTH AMERICA, INC.

In the event of an understeer tendency, the clutch can be fully disengaged if necessary. In this example, the front axle is separated from the drivetrain and the driving torque can only be transmitted to the rear axle. This helps to "push" the rear of the vehicle until stability is achieved.



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Fig. 12: Identifying Traction Control / Driving Dynamics Control (Understeer Tendency)
 Courtesy of BMW OF NORTH AMERICA, INC.

Tire Tolerance Logic

The tire tolerance logic detects different tread circumferences on the front and rear axles. This occurs when:

- Mixed tires are used
- Space saving spare tire is installed
- Tires are used that have been worn down to different levels

Normally, tire circumference deviations result in drivetrain torque bias (unwanted variations).

The tire circumference can fluctuate up to 1% or more as a result of mixed tires or wear.

The tire tolerance logic decides depending on the driver's command and driving situation whether the slip is to occur in the transfer case clutch or at the contact area between tire and road.

If the slip is permitted in the transfer case clutch, the locking pressure set by the pre-control is reduced in order to keep the work loss low. In the driving dynamic control situation, the clutch is locked slightly more than normal, the four wheel drive is always guaranteed when required.

For maximum xDrive performance, tires (and wheels) of the same diameter should be installed on the vehicle.

Notes:

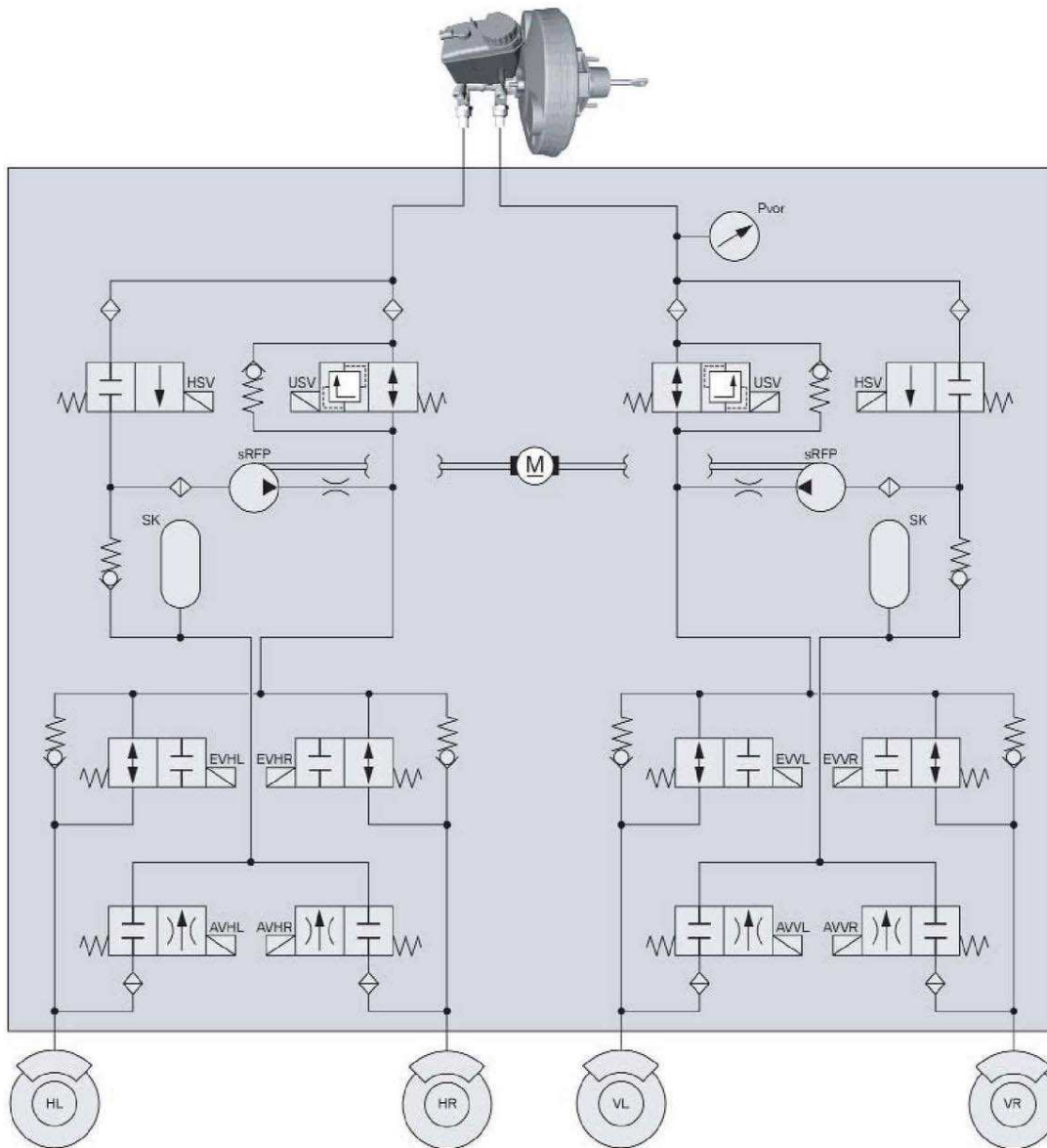
XDRIVE / DSC - SYSTEM COMPONENTS

The xDrive / DSC system consists essentially of those components from the familiar DSC8. The controllable

multi-disc clutch in the transfer case is a new feature.

- DSC8 module
- Transfer case electronic control unit (VGSG)
- Yaw and transversal acceleration sensors
- Wheel speed sensors
- Pressure sensor
- Steering angle sensor
- Brake fluid warning switch
- Brake light switch
- DSC button
- Transfer case motor position sensor
- Coding resistor
- Transfer case servomotor

Hydraulic Schematic



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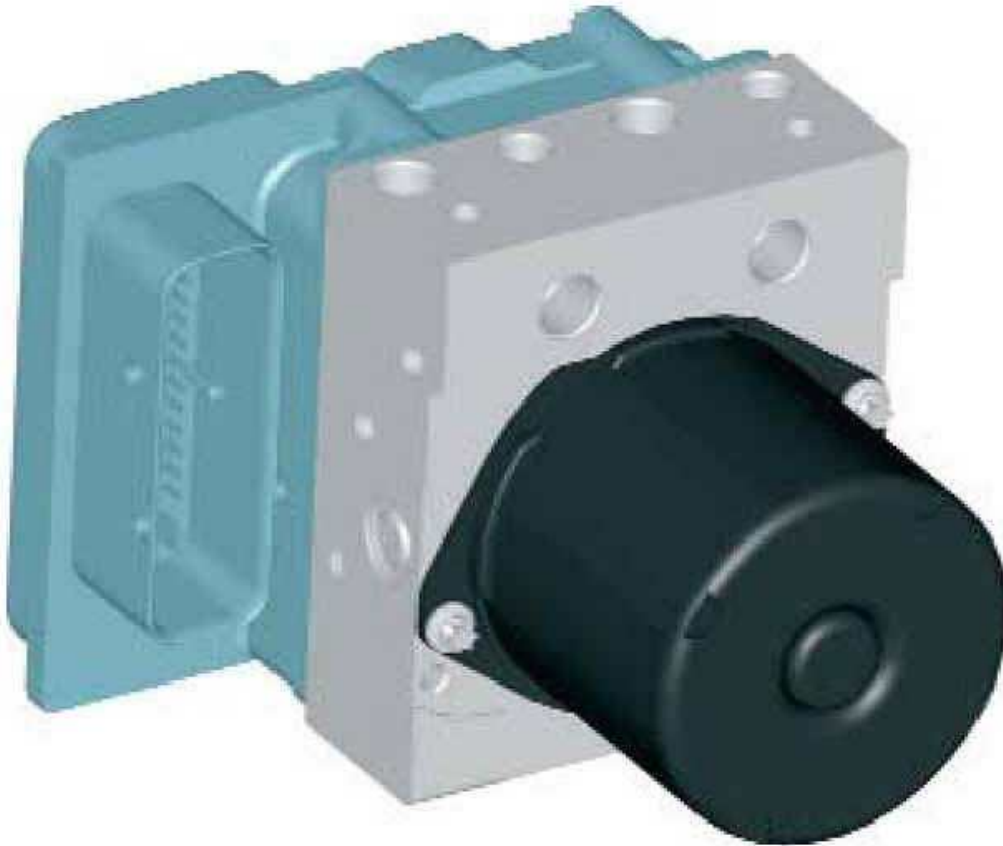
Fig. 13: Hydraulic Schematic
 Courtesy of BMW OF NORTH AMERICA, INC.

DSC Module

The DSC module located in the engine compartment consists primarily of the following three components:

- Surface mounted control unit
- Valve block with integrated pressure sensor
- Pump motor

It is the same design as the DSC8 module which was introduced at BMW with the E60.

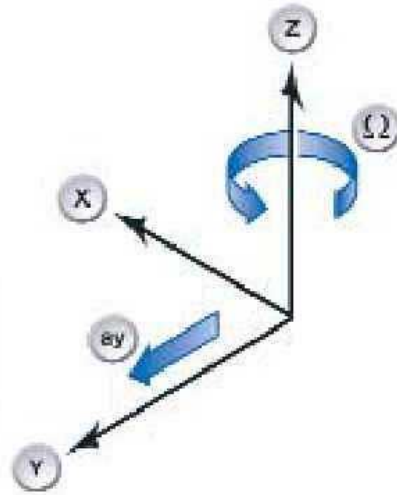
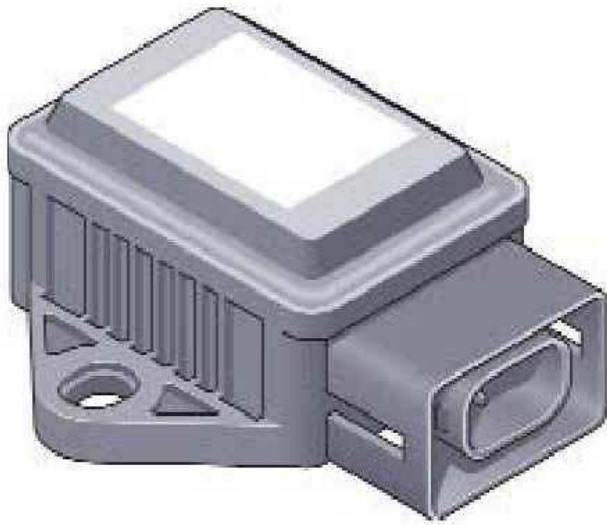


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Fig. 14: Identifying DSC Module
Courtesy of BMW OF NORTH AMERICA, INC.

Yaw And Transversal Acceleration Sensors

The sensor (assembly) in the E83 and the E53 MU is located on the transmission tunnel at the rear.



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Fig. 15: Identifying Yaw And Transversal Acceleration Sensors
Courtesy of BMW OF NORTH AMERICA, INC.

Wheel Speed Sensors

The active wheel speed sensors require a supply voltage for operation and output a signal of non speed dependent constant amplitude.



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Fig. 16: Identifying Wheel Speed Sensors
Courtesy of BMW OF NORTH AMERICA, INC.

The xDrive uses wheel speed sensors with an integrated evaluation circuit. The output signal is transmitted with the pulse width modulation (PWM).

The rising signal edge is used to determine road speed; the pulse width contains additional information on the direction of rotation, standstill detection, installation position detection and air gap reserve to the sensor ring. Direction of rotation detection is by the internal Hall sensor signals (like E65).

XDRIVE / DSC SYSTEM - PRINCIPLE OF OPERATION

As featured in earlier DSC modules, the DSC8 mounted control unit also features two microprocessors. The surface mounted control unit also incorporates two semiconductor relays:

- One for the pump motor
- One for the solenoid valves

When a speed of 6 km/h (4 mph) is exceeded, an electronic self-test is started which the pump motor and all the solenoid valves are briefly activated. When the brake light switch is activated simultaneously at that speed (for example: two footed drivers), the self-test is carried out at 15 km/h. Checking of the wheel speed signals is started at 2.75 km/h.

In the xDrive, the DSC also assumes the function of calculating the locking pressure for the multi-disc clutch in the transfer case. The locking pressure is set based on the driver's command and regulated as required depending on the driving situation.

The locking pressure produces the distribution of driving torque to the front and rear axles. The DSC sends the required locking pressure request to the VGSG via the PTCAN Bus.

In turn, the VGSG signals the locking pressure actually set depending on:

- Transfer case fluid temperature (calculation based on locking pressures)
- Electric motor loads
- Multi-disc clutch loads

System Functions

The xDrive / DSC system comprises the following functions (same as E60 or E53 except for *):

DSC:

- ABS Antilock Braking System
- ASC-X Automatic Stability Control X *
- DSC Dynamic Stability Control
- EBV Electronic brake-force distribution
- DBC Dynamic Brake Control
- CBC Cornering Brake Control

- MSR Engine drag-torque control
- HDC Hill Descent Control
- ADB-X Automatic Differential Brake *

xDrive:

- TCC Transfer Case Control (previously covered)

ASC-X / ADB-X

Unlike regular road vehicles, SAVs are also meant to demonstrate satisfactory handling characteristics and appropriate traction on unconventional roads. In order to provide optimum propulsion with sufficient cornering stability on both normal roads and other road surfaces, Automatic Stability Control X (ASC-X) contains a detection function to distinguish between them.

When off-road terrain is detected, wheel slip threshold is increased to provide sufficient traction force with the increased levels of traction loss.

ASC-X is supplemented by the Automatic Differential Brake (ADB-X) function, which applies the brakes to the wheels per axle, for side to side torque transfer. For example, when a wheel is spinning on one side (up to the slip setpoint), the brakes are applied to that wheel and the driving torque is transferred through the axle differential to the wheel with the higher traction. This provides superb capabilities when there are diagonal traction losses (ie. left front/right rear).

ADB-X remains active when DSC is deactivated. Furthermore, ADB-X can develop full capability because the engine power is not reduced, even during extreme four wheel drive operation. Only that wheel which has a low traction receives the brake application.

The brake disc can overheat with excessive ADB-X intervention with DSC deactivated. In this situation, the operation is discontinued at a disc temperature of approx. 700 °C and is resumed when this temperature drops below approx. 400 °C. This is a calculation performed by the DSC control unit based on brake application time, pressure, wheel speed, etc.

Limp Home Operation

In order to maintain the four wheel drive function for as long as possible even in the event of important sensor signal failures or failure of the DSC control unit, a limp home control is integrated in the transfer case control unit. This control operates in redundancy to the transfer case clutch control in the DSC control unit. The limp home control contains only two control functions, precontrol and traction-slip control.

The wheel speed signals are very important to traction/slip control. Engine signals, steering angle and yaw are used predominantly for precontrol. If individual sensor signals fail, substitute values are calculated and the relevant functions operated with extended control thresholds.

This strategy is continued until useful four wheel drive control is no longer possible. In this event, the driver is alerted by the DSC/xDrive lamp coming on in the instrument cluster and also by an acoustic warning signal (gong).

Faulted wheel speed signals on the rear axle are calculated by driving or engine speed (remember, the rear wheels are always driven). If the front wheel speed signals fail, the values of the rear axle are adopted. Wheel speeds also substitute for a faulty steering angle signal.

Warning Indicator Lamps




The warning indicator lamps for the xDrive / DSC are found in the instrument cluster as shown on the right.

The warning indicator lamps and acoustic signals (gong) are assigned to the xDrive / DSC system states of malfunction described below.



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Fig. 17: Identifying Warning Indicator Lamps For xDrive / DSC
Courtesy of BMW OF NORTH AMERICA, INC.

DSC deactivated	no gong	
DSC faulty (ABS only) or VGSG faulty	with gong	
Complete DSC failure or Complete DSC failure and VGSG failure	with gong	

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Fig. 18: Identifying Warning Indicator Lamps And Acoustic Signals (Gong)
 Courtesy of BMW OF NORTH AMERICA, INC.

WORKSHOP HINTS

CAUTION: On a vehicle equipped with an automatic transmission, when driving onto brake analyzers, move the selector lever to the "N" position. On a vehicle equipped with a manual transmission, do not press the accelerator pedal once on the brake analyzer. This keeps the transfer case clutch open and the vehicle cannot be pulled off the analyzer.

Towing: Use only a flatbed carrier!

Transfer Case Oil And Monitoring

Please refer to Operating Fluids for the required transfer case oil and specifications for the correct amount.

Oil Monitoring is performed by the VTG control module to determine when a service (change) is due. The VTG calculates transfer case and clutch wear based on the amount of slip, engagement pressure (torque), speed and mileage.

This calculation accounts for normal "dry" road driving, "adverse" road driving and "other" road extreme driving. Depending on individual vehicle use - driving styles and driving conditions, the transfer case oil service interval will vary.

When a service is due, this will be indicated by a Fault Code and additional details are available using the DISplus/ GT1. Service functions provide directions on changing the transfer case oil and updating the VTG control module with the necessary reset and adaption procedure. This is extremely important for CBS.

Diagnosis

Diagnosis is available for fault repairs and service procedures using the DSIplus/GT1. When the tire tolerance logic is active, it can be read out in the fault memory.

Programming (Flashing)

Both the transfer case control unit (VTG) and the DSC control unit are programmable and the new control unit (s) must be programmed when replaced. The wear values stored in the VTG control module (to be replaced) must be transferred to the replacement VTG.

DTC INDEX - THEORY & OPERATION

Theory & Operation - 328i, 328xi, X3

DIAGNOSTIC TROUBLE CODE INDEX

DIAGNOSTIC TROUBLE CODE INDEX - THEORY & OPERATION

DTC	Definition
<u>P0420/0430</u>	Catalyst Monitoring
<u>P0300, P0301, P0302, P0303, P0304, P0305, P0306</u>	Misfire Monitoring
<u>P0442/P0456, P1434, P1447, P1448, P1449</u>	Evaporative system leak measurement
<u>P0440, P0441</u>	EVAP (Functional check canister purge solenoid)
<u>P0461, P0462, P0463, P2067, P2068</u>	Fuel Level Sensor
<u>P0072, P0073</u>	CAN based Ambient Temperature - signal diagnosis
<u>P0071</u>	Ambient Temperature Signal Plausibility Check
<u>P0171, P0172, P0174, P0175</u>	Fuel System Monitoring Lambda Adaptation
<u>P2096/P2098, P2097/P2099</u>	Fuel System Monitoring Trim Control Plausibility Monitoring
<u>P0131/P0151, P0132/P0152</u>	Upstream Oxygen Sensor - Short Circuit Monitoring
<u>P112C/P112D, P2243/P2247, P2626/P2629</u>	Upstream Oxygen Sensor - Open Circuit Monitoring
<u>P3022/P3023, P3024/P3025</u>	Upstream Oxygen Sensor - Signal Controller Monitoring
<u>P2414/P2415</u>	Upstream Oxygen Sensor - Signal Activity Check
<u>P0040</u>	Upstream Oxygen Sensor - Swapped Sensors Check
<u>P2195, P2196, P2197, P2198</u>	Upstream Oxygen Sensor - Active Signal Check (Shift to lean / rich)
<u>P0133/P0153</u>	Upstream Oxygen Sensor - Signal Dynamic Monitoring (Slow Response)
<u>P2297/P2298</u>	Upstream Oxygen Sensor - Signal Monitoring During Fuel Cut-off
<u>P3026/P3027</u>	Upstream Oxygen Sensor - Heater Monitoring

<u>P0030, P0031, P0032, P0050, P0051, P0052</u>	Upstream Oxygen Sensor - Heater Circuit Monitoring
<u>P0137, P0138, P0140, P0157, P0158, P0160</u>	Downstream Oxygen Sensor - Circuit Monitoring
<u>P0139/P0159</u>	Downstream Oxygen Sensor - Signal Dynamic / Plausibility Check During Fuel Cutoff
<u>P1130/P1131</u>	Downstream Oxygen Sensor - Dynamic / Transition Time in Sensor Midpoint Range Monitoring
<u>P114A, P114B, P114C, P114D, P2279, P2271, P2271, P2273</u>	Downstream Oxygen Sensor - Active Signal Check (Stuck lean / rich)
<u>P0141, P0161, P0036, P0037, P0038, P0056, P0057, P0058</u>	Downstream Oxygen Sensor - Heater Circuit Monitoring
<u>P0017, P0018</u>	Electrical Coolant Temperature Diagnosis
<u>P3198</u>	Coolant Temperature Gradient Diagnosis
<u>P3199</u>	Coolant Temperature Stuck Diagnosis
<u>P316A</u>	Coolant Temperature Sensor stuck in a range Diagnosis with Engine off timer
<u>P1515, P1551</u>	Engine off timer Monitoring
<u>P0128, P0597, P0598, P0599</u>	Thermostat
<u>P0112, P0113</u>	Electrical Intake Air Temperature Diagnosis
<u>P0111, P111E, P111F</u>	Intake Air Plausibility Check
<u>P0012/P0015</u>	Variable Camshaft Timing (Vanos) (detection of mechanical IVVT error)
<u>P0340/P0365/P1300/P130A/P0344/P0369/P1554/P1553/P0016/P0017</u>	Camshaft position sensor (CMP)
<u>P0341</u>	Camshaft Crankshaft synchronization
<u>P0335/P0370/P0373</u>	Crankshaft position sensor (CRK)
<u>P1047, P1048, P1049, P1076, P1075, P103A, P1078, P107A, P107B, P107C, P105B, P105A, P1055, P1056, P1019, P1020, P1057, P1017, P1030, P1064, P101A, P1023, P1024, P1041</u>	Variable Valve Lift - Electrical Diagnosis
<u>P169A, P1694</u>	ETC spring check (start routine)
<u>P1632, P1633, P1634, P1635</u>	ETC adaptation diagnosis
<u>P1637, P1639</u>	Electronic Throttle Control

	(ETC) Motor Control Performance
<u>P0506, P0507</u>	ISC (Idle Speed Control) Actuator
<u>P1415, P1424</u>	Air Mass Flow Meter - Rationality check
<u>P1124, P1104, P1105</u>	Manifold Differential Pressure Sensor - Rationality check

DTC INDEX

128i, 328i, 328xi, 525i, 528i, 528xi, 530i, 530xi, X3, X5, Z4

SELF-DIAGNOSTICS DTCS

SELF-DIAGNOSTICS DIAGNOSTIC TROUBLE CODE (DTC) LIST

DTC	Description
<u>DTC P0010</u>	'A' Camshaft Position - Actuator Circuit/Open (Bank 1) (SIG)
<u>DTC P0012</u>	'A' Camshaft Position - Timing Over-Retarded (Bank 1) (PLAUS)
<u>DTC P0013</u>	'B' Camshaft Position - Actuator Circuit/Open (Bank 1) (SIG)
<u>DTC P0015</u>	'B' Camshaft Position - Timing Over-Retarded (Bank 1) (PLAUS)
<u>DTC P0016</u>	Crankshaft Position - Camshaft Position Correlation (Bank 1 Sensor A) (MAX)
<u>DTC P0017</u>	Crankshaft Position - Camshaft Position Correlation (Bank 1 Sensor B) (MAX)
<u>DTC P0030</u>	HO2S Heater Control Circuit (Bank 1 Sensor 1) (SIG)
<u>DTC P0031</u>	HO2S Heater Control Circuit Low (Bank 1 Sensor 1) (MIN)
<u>DTC P0032</u>	HO2S Heater Control Circuit High (Bank 1 Sensor 1) (MAX)
<u>DTC P0036</u>	HO2S Heater Control Circuit (Bank 1 Sensor 2) (SIG)
<u>DTC P0037</u>	HO2S Heater Control Circuit Low (Bank 1 Sensor 2) (MIN)
<u>DTC P0038</u>	HO2S Heater Control Circuit High (Bank 1 Sensor 2) (MAX)
<u>DTC P0040</u>	O2 Sensor Signals Swapped Bank 1 Sensor 1/Bank 2 Sensor 1 (PLAUS)
<u>DTC P0041</u>	O2 Sensor Signals Swapped Bank 1 Sensor 2 / Bank 2 Sensor 2 (PLAUS)
<u>DTC P0050</u>	HO2S Heater Control Circuit (Bank 2 Sensor 1) (SIG)
<u>DTC P0051</u>	HO2S Heater Control Circuit Low (Bank 2 Sensor 1) (MIN)
<u>DTC P0052</u>	HO2S Heater Control Circuit High (Bank 2 Sensor 1) (MAX)
<u>DTC P0056</u>	HO2S Heater Control Circuit (Bank 2 Sensor 2) (SIG)
<u>DTC P0057</u>	HO2S Heater Control Circuit Low (Bank 2 Sensor 2) (MIN)
<u>DTC P0058</u>	HO2S Heater Control Circuit High (Bank 2 Sensor 2) (MAX)
<u>DTC P0070</u>	Ambient Air Temperature Sensor Circuit (SIG)
<u>DTC P0071</u>	Ambient Air Temperature Sensor Range/Performance (PLAUS)
<u>DTC P0072</u>	Ambient Air Temperature Sensor Circuit Low (MIN)
<u>DTC P0073</u>	Ambient Air Temperature Sensor Circuit High (MAX)
<u>DTC P00B2</u>	Radiator Coolant Temperature Sensor Circuit Range/Performance (PLAUS)
<u>DTC P00B3</u>	Radiator Coolant Temperature Sensor Circuit Low (MIN)
<u>DTC P00B4</u>	Radiator Coolant Temperature Sensor Circuit High (MAX)
<u>DTC P0100</u>	Mass or Volume Air Flow 'A' Circuit (MAX)
<u>DTC P0111</u>	Intake Air Temperature Sensor 1 Circuit Range/Performance (Bank 1) (PLAUS)
<u>DTC P0112</u>	Intake Air Temperature Sensor 1 Circuit Low (Bank 1) (MIN)
<u>DTC P0113</u>	Intake Air Temperature Sensor 1 Circuit High (Bank 1) (MAX)
<u>DTC P0117</u>	Engine Coolant Temperature Sensor 1 Circuit Low (MIN)
<u>DTC P0118</u>	Engine Coolant Temperature Sensor 1 Circuit High (MAX)
<u>DTC P0121</u>	Throttle/Pedal Position Sensor/Switch 'A' Circuit Range/Performance (PLAUS)

<u>DTC P0122</u>	Throttle/Pedal Position Sensor/Switch 'A' Circuit Low (MIN)
<u>DTC P0123</u>	Throttle/Pedal Position Sensor/Switch 'A' Circuit High (MAX)
<u>DTC P0128</u>	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature) (PLAUS)
<u>DTC P0131</u>	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 1) (MIN)
<u>DTC P0132</u>	O2 Sensor Circuit High Voltage (Bank 1 Sensor 1) (MAX)
<u>DTC P0133</u>	O2 Sensor Circuit Slow Response (Bank 1 Sensor 1) (MAX)
<u>DTC P0135</u>	O2 Sensor Heater Circuit (Bank 1 Sensor 1) (MAX)
<u>DTC P0135</u>	O2 Sensor Heater Circuit (Bank 1 Sensor 1) (MIN)
<u>DTC P0137</u>	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 2) (MIN)
<u>DTC P0138</u>	O2 Sensor Circuit High Voltage (Bank 1 Sensor 2) (MAX)
<u>DTC P0139</u>	O2 Sensor Circuit Slow Response (Bank 1 Sensor 2) (PLAUS)
<u>DTC P0140</u>	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 2) (SIG)
<u>DTC P0141</u>	O2 Sensor Heater Circuit (Bank 1 Sensor 2) (MAX)
<u>DTC P0151</u>	O2 Sensor Circuit Low Voltage (Bank 2 Sensor 1) (MIN)
<u>DTC P0152</u>	O2 Sensor Circuit High Voltage (Bank 2 Sensor 1) (MAX)
<u>DTC P0153</u>	O2 Sensor Circuit Slow Response (Bank 2 Sensor 1) (MAX)
<u>DTC P0155</u>	O2 Sensor Heater Circuit (Bank 2 Sensor 1) (MAX)
<u>DTC P0155</u>	O2 Sensor Heater Circuit (Bank 2 Sensor 1) (MIN)
<u>DTC P0157</u>	O2 Sensor Circuit Low Voltage (Bank 2 Sensor 2) (MIN)
<u>DTC P0158</u>	O2 Sensor Circuit High Voltage (Bank 2 Sensor 2) (MAX)
<u>DTC P0159</u>	O2 Sensor Circuit Slow Response (Bank 2 Sensor 2) (PLAUS)
<u>DTC P0160</u>	O2 Sensor Circuit No Activity Detected (Bank 2 Sensor 2) (SIG)
<u>DTC P0161</u>	O2 Sensor Heater Circuit (Bank 2 Sensor 2) (MAX)
<u>DTC P0171</u>	System Too Lean (Bank 1) (MAX)
<u>DTC P0172</u>	System Too Rich (Bank 1) (MIN)
<u>DTC P0174</u>	System Too Lean (Bank 2) (MAX)
<u>DTC P0175</u>	System Too Rich (Bank 2) (MIN)
<u>DTC P0201</u>	Injector Circuit/Open - Cylinder 1 (SIG)
<u>DTC P0202</u>	Injector Circuit/Open - Cylinder 2 (SIG)
<u>DTC P0203</u>	Injector Circuit/Open - Cylinder 3 (SIG)
<u>DTC P0204</u>	Injector Circuit/Open - Cylinder 4 (SIG)
<u>DTC P0205</u>	Injector Circuit/Open - Cylinder 5 (SIG)
<u>DTC P0206</u>	Injector Circuit/Open - Cylinder 6 (SIG)
<u>DTC P0221</u>	Throttle/Pedal Position Sensor/Switch 'B' Circuit Range/Performance (PLAUS)
<u>DTC P0222</u>	Throttle/Pedal Position Sensor/Switch 'B' Circuit Low (MIN)
<u>DTC P0223</u>	Throttle/Pedal Position Sensor/Switch 'B' Circuit High (MAX)
<u>DTC P0261</u>	Cylinder 1 Injector Circuit Low (MIN)
<u>DTC P0262</u>	Cylinder 1 Injector Circuit High (MAX)
<u>DTC P0264</u>	Cylinder 2 Injector Circuit Low (MIN)
<u>DTC P0265</u>	Cylinder 2 Injector Circuit High (MAX)

<u>DTC P0267</u>	Cylinder 3 Injector Circuit Low (MIN)
<u>DTC P0268</u>	Cylinder 3 Injector Circuit High (MAX)
<u>DTC P0270</u>	Cylinder 4 Injector Circuit Low (MIN)
<u>DTC P0271</u>	Cylinder 4 Injector Circuit High (MAX)
<u>DTC P0273</u>	Cylinder 5 Injector Circuit Low (MIN)
<u>DTC P0274</u>	Cylinder 5 Injector Circuit High (MAX)
<u>DTC P0276</u>	Cylinder 6 Injector Circuit Low (MIN)
<u>DTC P0277</u>	Cylinder 6 Injector Circuit High (MAX)
<u>DTC P0300</u>	Random/Multiple Cylinder Misfire Detected (MAX)
<u>DTC P0300</u>	Random/Multiple Cylinder Misfire Detected (MIN)
<u>DTC P0300</u>	Random/Multiple Cylinder Misfire Detected (PLAUS)
<u>DTC P0300</u>	Random/Multiple Cylinder Misfire Detected (SIG)
<u>DTC P0301</u>	Cylinder 1 Misfire Detected (MAX)
<u>DTC P0301</u>	Cylinder 1 Misfire Detected (MIN)
<u>DTC P0301</u>	Cylinder 1 Misfire Detected (SIG)
<u>DTC P0302</u>	Cylinder 2 Misfire Detected (MAX)
<u>DTC P0302</u>	Cylinder 2 Misfire Detected (MIN)
<u>DTC P0302</u>	Cylinder 2 Misfire Detected (SIG)
<u>DTC P0303</u>	Cylinder 3 Misfire Detected (MAX)
<u>DTC P0303</u>	Cylinder 3 Misfire Detected (MIN)
<u>DTC P0303</u>	Cylinder 3 Misfire Detected (SIG)
<u>DTC P0304</u>	Cylinder 4 Misfire Detected (MAX)
<u>DTC P0304</u>	Cylinder 4 Misfire Detected (MIN)
<u>DTC P0304</u>	Cylinder 4 Misfire Detected (SIG)
<u>DTC P0305</u>	Cylinder 5 Misfire Detected (MAX)
<u>DTC P0305</u>	Cylinder 5 Misfire Detected (MIN)
<u>DTC P0305</u>	Cylinder 5 Misfire Detected (SIG)
<u>DTC P0306</u>	Cylinder 6 Misfire Detected (MAX)
<u>DTC P0306</u>	Cylinder 6 Misfire Detected (MIN)
<u>DTC P0306</u>	Cylinder 6 Misfire Detected (SIG)
<u>DTC P0313</u>	Misfire Detected With Low Fuel (MIN)
<u>DTC P0326</u>	Knock Sensor 1 Circuit Range/Performance (Bank 1 or Single Sensor) (PLAUS)
<u>DTC P0327</u>	Knock Sensor 1 Circuit Low (Bank 1 or Single Sensor) (MIN)
<u>DTC P0328</u>	Knock Sensor 1 Circuit High (Bank 1 or Single Sensor) (MAX)
<u>DTC P0335</u>	Crankshaft Position Sensor 'A' Circuit (MAX)
<u>DTC P0335</u>	Crankshaft Position Sensor 'A' Circuit (MIN)
<u>DTC P0340</u>	Camshaft Position Sensor 'A' Circuit (Bank 1 or Single Sensor) (MAX)
<u>DTC P0341</u>	Camshaft Position Sensor 'A' Circuit Range/Performance (Bank 1 or Single Sensor) (MAX)
<u>DTC P0344</u>	Camshaft Position Sensor 'A' Circuit Intermittent (Bank 1 or Single Sensor) (MAX)

<u>DTC P0351</u>	Ignition Coil 'A' Primary/Secondary Circuit (MAX)
<u>DTC P0352</u>	Ignition Coil 'B' Primary/Secondary Circuit (MAX)
<u>DTC P0353</u>	Ignition Coil 'C' Primary/Secondary Circuit (MAX)
<u>DTC P0354</u>	Ignition Coil 'D' Primary/Secondary Circuit (MAX)
<u>DTC P0355</u>	Ignition Coil 'E' Primary/Secondary Circuit (MAX)
<u>DTC P0356</u>	Ignition Coil 'F' Primary/Secondary Circuit (MAX)
<u>DTC P0365</u>	Camshaft Position Sensor 'B' Circuit (Bank 1) (MAX)
<u>DTC P0366</u>	Camshaft Position Sensor 'B' Circuit Range/Performance (Bank 1) (MAX)
<u>DTC P0369</u>	Camshaft Position Sensor 'B' Circuit Intermittent (Bank 1) (MAX)
<u>DTC P0370</u>	Timing Reference High Resolution Signal 'A' (MAX)
<u>DTC P0370</u>	Timing Reference High Resolution Signal 'A' (MAX)
<u>DTC P0370</u>	Timing Reference High Resolution Signal 'A' (MIN)
<u>DTC P0373</u>	Timing Reference High Resolution Signal 'A' Intermittent/Erratic Pulses (MAX)
<u>DTC P0420</u>	Catalyst System Efficiency Below Threshold (Bank 1) (MAX)
<u>DTC P0420</u>	Catalyst System Efficiency Below Threshold (Bank 1) (MIN)
<u>DTC P0430</u>	Catalyst System Efficiency Below Threshold (Bank 2) (MAX)
<u>DTC P0430</u>	Catalyst System Efficiency Below Threshold (Bank 2) (MIN)
<u>DTC P0440</u>	Evaporative Emission System (PLAUS)
<u>DTC P0441</u>	Evaporative Emission System Incorrect Purge Flow (SIG)
<u>DTC P0442</u>	Evaporative Emission System Leak Detected (Small Leak) (MAX)
<u>DTC P0444</u>	Evaporative Emission System Purge Control Valve Circuit Open (SIG)
<u>DTC P0456</u>	Evaporative Emission System Leak Detected (Very Small Leak) (MIN)
<u>DTC P0458</u>	Evaporative Emission System Purge Control Valve Circuit Low (MIN)
<u>DTC P0459</u>	Evaporative Emission System Purge Control Valve Circuit High (MAX)
<u>DTC P0461</u>	Fuel Level Sensor 'A' Circuit Range/Performance (PLAUS)
<u>DTC P0462</u>	Fuel Level Sensor 'A' Circuit Low (MIN)
<u>DTC P0463</u>	Fuel Level Sensor 'A' Circuit High (MAX)
<u>DTC P0475</u>	Exhaust Pressure Control Valve (SIG)
<u>DTC P0477</u>	Exhaust Pressure Control Valve Low (MIN)
<u>DTC P0478</u>	Exhaust Pressure Control Valve High (MAX)
<u>DTC P0480</u>	Fan 1 Control Circuit (SIG)
<u>DTC P0491</u>	Secondary Air Injection System Insufficient Flow (Bank 1) (MAX)
<u>DTC P0492</u>	Secondary Air Injection System Insufficient Flow (Bank 2) (MIN)
<u>DTC P0500</u>	Vehicle Speed Sensor 'A' (SIG)
<u>DTC P0503</u>	Vehicle Speed Sensor 'A' Intermittent/Erratic/High (PLAUS)
<u>DTC P0506</u>	Idle Air Control System RPM Lower Than Expected (MIN)
<u>DTC P0507</u>	Idle Air Control System RPM Higher Than Expected (MAX)
<u>DTC P0512</u>	Starter Request Circuit (MAX)
<u>DTC P0512</u>	Starter Request Circuit (MIN)
<u>DTC P0512</u>	Starter Request Circuit (SIG)
<u>DTC P0520</u>	Engine Oil Pressure Sensor/Switch Circuit (SIG)
<u>DTC P0521</u>	

	Engine Oil Pressure Sensor/Switch Range/ Performance (PLAUS)
<u>DTC P0522</u>	Engine Oil Pressure Sensor/Switch Low (MIN)
<u>DTC P0523</u>	Engine Oil Pressure Sensor/Switch High (MAX)
<u>DTC P0524</u>	Engine Oil Pressure Too Low (MIN)
<u>DTC P0571</u>	Brake Switch 'A' Circuit (PLAUS)
<u>DTC P0597</u>	Thermostat Heater Control Circuit/Open (SIG)
<u>DTC P0598</u>	Thermostat Heater Control Circuit Low (MIN)
<u>DTC P0599</u>	Thermostat Heater Control Circuit High (MAX)
<u>DTC P0604</u>	Internal Control Module Random Access Memory (RAM) Error (MAX)
<u>DTC P0604</u>	Internal Control Module Random Access Memory (RAM) Error (MIN)
<u>DTC P0604</u>	Internal Control Module Random Access Memory (RAM) Error (MIN)
<u>DTC P0605</u>	Internal Control Module Read Only Memory (ROM) Error (MAX)
<u>DTC P0606</u>	ECM/PCM Processor (SIG)
<u>DTC P060C</u>	Internal Control Module Main Processor Performance (PLAUS)
<u>DTC P0620</u>	Generator Control Circuit (MAX)
<u>DTC P0620</u>	Generator Control Circuit (SIG)
<u>DTC P062F</u>	Internal Control Module EEPROM Error (PLAUS)
<u>DTC P062F</u>	Internal Control Module EEPROM Error (SIG)
<u>DTC P062F</u>	Internal Control Module EEPROM Error (SIG)
<u>DTC P0645</u>	A/C Clutch Relay Control Circuit (SIG)
<u>DTC P0646</u>	A/C Clutch Relay Control Circuit Low (MIN)
<u>DTC P0647</u>	A/C Clutch Relay Control Circuit High (MAX)
<u>DTC P0668</u>	PCM/ECM/TCM Internal Temperature Sensor Circuit Low (MIN)
<u>DTC P0669</u>	PCM/ECM/TCM Internal Temperature Sensor Circuit High (MAX)
<u>DTC P0686</u>	ECM/PCM Power Relay Control Circuit Low (MIN)
<u>DTC P0687</u>	ECM/PCM Power Relay Control Circuit High (MAX)
<u>DTC P0691</u>	Fan 1 Control Circuit Low (MIN)
<u>DTC P0692</u>	Fan 1 Control Circuit High (MAX)
<u>DTC P0703</u>	Brake Switch 'B' Circuit (PLAUS)
<u>DTC P0831</u>	Clutch Pedal Switch 'A' Circuit Low (MIN)
<u>DTC P0832</u>	Clutch Pedal Switch 'A' Circuit High (MAX)
<u>DTC P0A14</u>	Engine Mount 'A' Control Circuit/Open (MAX)
<u>DTC P0A14</u>	Engine Mount 'A' Control Circuit/Open (MIN)
<u>DTC P0A14</u>	Engine Mount 'A' Control Circuit/Open (SIG)
<u>DTC P0A14</u>	Engine Mount 'A' Control Circuit/Open (SIG)
<u>DTC P0A15</u>	Engine Mount 'A' Control Circuit Low (MIN)
<u>DTC P0A16</u>	Engine Mount 'A' Control Circuit High (MAX)
<u>DTC P0A3B</u>	Generator Over Temperature (MAX)
<u>DTC P0A3B</u>	Generator Over Temperature (MAX)
<u>DTC P1004</u>	VVT-Guiding Sensor Solenoid Loss (Bank 1) (MAX)
<u>DTC P1006</u>	VVT-Guiding Sensor Parity Error (Bank 1) (SIG)
<u>DTC P1012</u>	

	VVT-Reference Sensor Solenoid Loss (Bank 1) (MAX)
<u>DTC P1014</u>	VVT-Reference Sensor Parity Error (Bank 1) (SIG)
<u>DTC P1017</u>	VVT-Sensors Plausibility (Bank 1) (PLAUS)
<u>DTC P1017</u>	VVT-Sensors Plausibility (Bank 1) (PLAUS)
<u>DTC P1019</u>	VVT-Supply Voltage Sensors High Input (Bank 1) (MAX)
<u>DTC P101A</u>	VVT-Self-Learning Function, Stops Not Learned (MAX)
<u>DTC P101A</u>	VVT-Self-Learning Function, Stops Not Learned (MIN)
<u>DTC P101A</u>	VVT-Self-Learning Function, Stops Not Learned (SIG)
<u>DTC P1020</u>	VVT-Supply Voltage Sensors Low Input (Bank 1) (MIN)
<u>DTC P1023</u>	VVT-Self-Learning Function Faulty Adjustment Range (Bank 1) (MAX)
<u>DTC P1024</u>	VVT-Self-Learning Function Faulty Lower Learning Range (Bank 1) (MIN)
<u>DTC P102B</u>	VVT-Guiding Sensor Diagnostic Error (Bank 1) (MIN)
<u>DTC P102C</u>	VVT-Reference Sensor Diagnostic Error (Bank 1) (MIN)
<u>DTC P1030</u>	VVT-Actuator Monitoring Position Control, Control Deviation (Bank 1) (PLAUS)
<u>DTC P1030</u>	VVT-Actuator Monitoring Position Control, Control Deviation (Bank 1) (SIG)
<u>DTC P103A</u>	VVT-System Current Too High (MAX)
<u>DTC P1041</u>	Internal VVT-Control Module EEPROM Error (Bank 1) (PLAUS)
<u>DTC P1047</u>	VVT-Control Circuit High Input (Bank 1) (MAX)
<u>DTC P1048</u>	VVT-Control Circuit Low Input (Bank 1) (MIN)
<u>DTC P1049</u>	VVT-Control Circuit Engine Cables Short Circuit (Bank 1) (SIG)
<u>DTC P1055</u>	VVT-Supply Voltage Control Motor High Input (Bank 1) (MAX)
<u>DTC P1056</u>	VVT-Supply Voltage Control Motor Low Input (Bank 1) (MIN)
<u>DTC P1057</u>	VVT-Supply Voltage Control Motor Electrical (Bank 1) (PLAUS)
<u>DTC P105A</u>	Internal Control Module VVT Error, Current Too High (MAX)
<u>DTC P105B</u>	Internal Control Module VVT Error, Voltage Too Low (MIN)
<u>DTC P1062</u>	VVT-Limp Home Request Full Stroke Position Not Reached (Bank 1) (SIG)
<u>DTC P1064</u>	VVT-Value Comparison Starting Position/Parking Position Plausibility (Bank 1) (MAX)
<u>DTC P1075</u>	VVT-Overload Protection (Bank 1) (MAX)
<u>DTC P1076</u>	VVT-Overload Protection ECU-Temperature High Input (Bank 1) (SIG)
<u>DTC P1078</u>	VVT-Overload Protection Control Motor Current High Input (Bank 1) (MIN)
<u>DTC P107A</u>	VVT-Overload Protection Control Motor Current Too High (MAX)
<u>DTC P107B</u>	VVT-Overload Protection Control Motor Temperature Too High (MIN)
<u>DTC P107C</u>	VVT-Overload Protection Temperature Too High (MIN)
<u>DTC P107C</u>	VVT-Overload Protection Temperature Too High (SIG)
<u>DTC P1104</u>	Differential Pressure Sensor Intake Manifold Pressure Too Low (Bank 1) (MIN)
<u>DTC P1105</u>	Differential Pressure Sensor Intake Manifold Pressure Too High (Bank 1) (MAX)
<u>DTC P110D</u>	Throttle Position Sensor A and B Range/Performance (PLAUS)
<u>DTC P111E</u>	Intake Air Temperature Sensor 1 Maximum Temperature Implausible (Bank 1) (MAX)
<u>DTC P111F</u>	Intake Air Temperature Sensor 1 Minimum Temperature Implausible (Bank 1)

	(MIN)
<u>DTC P1124</u>	Differential Pressure Sensor Intake Manifold Offset (Bank 1) (PLAUS)
<u>DTC P112C</u>	O2 Sensor Negative Current or Positive Current Control Circuit/Open (Bank 1 Sensor 1) (MIN)
<u>DTC P112C</u>	O2 Sensor Negative Current or Positive Current Control Circuit/Open (Bank 1 Sensor 1) (SIG)
<u>DTC P112D</u>	O2 Sensor Negative Current or Positive Current Control Circuit/Open (Bank 2 Sensor 1) (MIN)
<u>DTC P112D</u>	O2 Sensor Negative Current or Positive Current Control Circuit/Open (Bank 2 Sensor 1) (SIG)
<u>DTC P1130</u>	O2 Sensor Circuit Dynamic Test (Bank 1 Sensor 2) (PLAUS)
<u>DTC P1131</u>	O2 Sensor Circuit Dynamic Test (Bank 2 Sensor 2) (PLAUS)
<u>DTC P114A</u>	Post Catalyst Fuel Trim Via Oxygen Sensor System Too Rich (Bank 1) (MAX)
<u>DTC P114B</u>	Post Catalyst Fuel Trim Via Oxygen Sensor System Too Lean (Bank 1) (MIN)
<u>DTC P114C</u>	Post Catalyst Fuel Trim Via Oxygen Sensor System Too Rich (Bank 2) (MAX)
<u>DTC P114D</u>	Post Catalyst Fuel Trim Via Oxygen Sensor System Too Lean (Bank 2) (MIN)
<u>DTC P114F</u>	Air Mass Flow Sensor Defective (MIN)
<u>DTC P115A</u>	Mass or Volume Air Flow 'A' Maximum Exceeded (MAX)
<u>DTC P116C</u>	Air Mass Flow Sensor Signal Range (MAX)
<u>DTC P116D</u>	Air Mass Flow Sensor Signal Gradient Error (MIN)
<u>DTC P116E</u>	Air Mass Flow Sensor Signal Electrical (SIG)
<u>DTC P1197</u>	Differential Pressure Sensor Intake Manifold High Input (Bank 1) (MAX)
<u>DTC P1198</u>	Differential Pressure Sensor Intake Manifold Low Input (Bank 1) (MIN)
<u>DTC P1214</u>	Fuel Pump Speed Too High (MAX)
<u>DTC P1215</u>	Fuel Pump Speed Too Low (MIN)
<u>DTC P1216</u>	Fuel Pump Emergency Operation (SIG)
<u>DTC P1217</u>	Fuel Pump Overtemperature Condition (PLAUS)
<u>DTC P1230</u>	Fuel Pump Relay Primary Circuit (SIG)
<u>DTC P1234</u>	Fuel Pump Relay Primary Circuit Low (MIN)
<u>DTC P1236</u>	Fuel Pump Relay Primary Circuit High (MAX)
<u>DTC P1244</u>	Fuel Pump Emergency Cut-Off (SIG)
<u>DTC P1300</u>	Camshaft Position Sensor 'A' Segment Timing Error (Bank 1) (MAX)
<u>DTC P1301</u>	Ignition Monitoring Cylinder 1 Spark Duration Too Short (MIN)
<u>DTC P1302</u>	Ignition Monitoring Cylinder 2 Spark Duration Too Short (MIN)
<u>DTC P1303</u>	Ignition Monitoring Cylinder 3 Spark Duration Too Short (MIN)
<u>DTC P1304</u>	Ignition Monitoring Cylinder 4 Spark Duration Too Short (MIN)
<u>DTC P1305</u>	Ignition Monitoring Cylinder 5 Spark Duration Too Short (MIN)
<u>DTC P1306</u>	Ignition Monitoring Cylinder 6 Spark Duration Too Short (MIN)
<u>DTC P130A</u>	Camshaft Position Sensor 'B' Segment Timing Error (Bank 1) (MAX)
<u>DTC P1327</u>	Knock Sensor 2 Circuit Low Input (Bank 1) (MIN)
<u>DTC P1328</u>	Knock Sensor 2 Circuit High Input (Bank 1) (MAX)
<u>DTC P135B</u>	Knock Sensor 2 Circuit Range/Performance (Bank 1) (PLAUS)

<u>DTC P1383</u>	Ignition Monitoring Malfunction (SIG)
<u>DTC P1396</u>	Crankshaft Position Sensor Segment Timing Plausibility (MIN)
<u>DTC P1407</u>	Fuel Level Signal 1 (PLAUS)
<u>DTC P1408</u>	Fuel Level Signal 2 (PLAUS)
<u>DTC P140A</u>	Secondary Air Injection System Insufficient Total Flow (Bank 1 and Bank 2) (SIG)
<u>DTC P140E</u>	Cylinder Injection Cut-Off, Fuel Level Too Low (PLAUS)
<u>DTC P1413</u>	Secondary Air Injection Pump Relay Control Circuit Signal Low (MIN)
<u>DTC P1414</u>	Secondary Air Injection Pump Relay Control Circuit Signal High (MAX)
<u>DTC P1415</u>	Mass or Volume Air Flow Too Low (MIN)
<u>DTC P1417</u>	Throttle Control Incorrect Air Supply (SIG)
<u>DTC P1424</u>	Mass or Volume Air Flow Too High (MAX)
<u>DTC P1434</u>	Diagnostic Module Tank Leakage (DM-TL) (SIG)
<u>DTC P143B</u>	Direct Ozone Reduction Catalyst Temperature Sensor Wrong Code (PLAUS)
<u>DTC P143C</u>	Direct Ozone Reduction Catalyst Temperature/Radiator Coolant Temperature Correlation (SIG)
<u>DTC P143E</u>	Direct Ozone Reduction Catalyst Temperature Sensor Gradient Too Low (PLAUS)
<u>DTC P1447</u>	Diagnostic Module Tank Leakage (DM-TL) Pump Current Too High during Switching Solenoid Test (PLAUS)
<u>DTC P1448</u>	Diagnostic Module Tank Leakage (DM-TL) Pump Current Too Low (MIN)
<u>DTC P1449</u>	Diagnostic Module Tank Leakage (DM-TL) Pump Current Too High (MAX)
<u>DTC P1453</u>	Secondary Air Injection Pump Relay Control Circuit Electrical (SIG)
<u>DTC P14C0</u>	Fan Mechanical or Hardware Defect (PLAUS)
<u>DTC P14C1</u>	Radiator Shutter Mechanical or Hardware Defect (PLAUS)
<u>DTC P14C2</u>	DISA (Differentiated Intake Manifold) Actuator 1 Mechanical or Hardware Defect (PLAUS)
<u>DTC P14C3</u>	DISA (Differentiated Intake Manifold) Actuator 2 Mechanical or Hardware Defect (PLAUS)
<u>DTC P14C4</u>	Radiator Shutter (Upper) Mechanical (MIN)
<u>DTC P14C5</u>	Radiator Shutter (Upper) Hardware Defect (MAX)
<u>DTC P14C6</u>	Radiator Shutter (Lower) Electrical (MAX)
<u>DTC P150A</u>	Battery Sensor BSD (Bit Serial Data Interface) Extended Communication Circuit (MAX)
<u>DTC P150B</u>	Battery Sensor BSD (Bit Serial Data Interface) Communication Circuit (SIG)
<u>DTC P150B</u>	Battery Sensor BSD (Bit Serial Data Interface) Communication Circuit (SIG)
<u>DTC P150C</u>	Battery Sensor Firmware Implausible (PLAUS)
<u>DTC P150D</u>	Battery Sensor Temperature Error (MAX)
<u>DTC P150E</u>	Battery Sensor Voltage Error (SIG)
<u>DTC P150F</u>	Battery Sensor Current Error (PLAUS)
<u>DTC P1511</u>	DISA (Differentiated Intake Manifold) Control Circuit Electrical (MAX)
<u>DTC P1511</u>	DISA (Differentiated Intake Manifold) Control Circuit Electrical (MIN)

<u>DTC P1511</u>	DISA (Differentiated Intake Manifold) Control Circuit Electrical (SIG)
<u>DTC P1511</u>	DISA (Differentiated Intake Manifold) Control Circuit Electrical (SIG)
<u>DTC P1512</u>	DISA (Differentiated Intake Manifold) Control Circuit Signal Low (MIN)
<u>DTC P1512</u>	DISA (Differentiated Intake Manifold) Control Circuit Signal Low (MIN)
<u>DTC P1513</u>	DISA (Differentiated Intake Manifold) Control Circuit Signal High (MAX)
<u>DTC P1513</u>	DISA (Differentiated Intake Manifold) Control Circuit Signal High (MAX)
<u>DTC P1515</u>	Engine Off Timer Plausibility (PLAUS)
<u>DTC P151A</u>	Battery Sensor Terminal 15/30 Wakeup Circuit (MAX)
<u>DTC P151B</u>	Battery Sensor Wakeup Circuit (PLAUS)
<u>DTC P151C</u>	Battery Sensor System Error (SIG)
<u>DTC P1521</u>	Engine Oil Quality Sensor Communication Error (SIG)
<u>DTC P1540</u>	Driving Dynamics Control Switch High Input (MAX)
<u>DTC P1541</u>	Driving Dynamics Control Switch Low Input (MIN)
<u>DTC P1551</u>	Engine Off Timer Timeout (SIG)
<u>DTC P1553</u>	Engine Position System 'B' Performance (Bank 1) (MAX)
<u>DTC P1554</u>	Engine Position System 'A' Performance (Bank 1) (MAX)
<u>DTC P155A</u>	Multifunction Steering Wheel (MFL) Interface, Toggle-Bit Fault (MAX)
<u>DTC P155A</u>	Multifunction Steering Wheel (MFL) Interface, Toggle-Bit Fault (MIN)
<u>DTC P155A</u>	Multifunction Steering Wheel (MFL) Interface, Toggle-Bit Fault (PLAUS)
<u>DTC P1561</u>	Cold Start Idle Air Control System RPM Lower Than Expected (Bank 1) (MIN)
<u>DTC P1562</u>	Cold Start Idle Air Control System RPM Higher Than Expected (Bank 1) (MAX)
<u>DTC P1563</u>	Multifunction Steering Wheel (MFL) Rocker Switch Defective (PLAUS)
<u>DTC P1576</u>	Multifunction Steering Wheel (MFL) Interface, Bit Error (PLAUS)
<u>DTC P1582</u>	Oil Pump Circuit High (MAX)
<u>DTC P1583</u>	Oil Pump Circuit Low (MIN)
<u>DTC P1584</u>	Oil Pump Circuit Open (SIG)
<u>DTC P1586</u>	Engine Oil Quality Sensor Temperature Measurement (MAX)
<u>DTC P1587</u>	Engine Oil Quality Sensor Level Measurement (MIN)
<u>DTC P1588</u>	Engine Oil Quality Sensor Permeability Measurement (PLAUS)
<u>DTC P15A1</u>	Engine Oil Pressure Control, Mechanical, Solenoid Valve Sticking In Fully Energized Position (Minimum Oil Pressure) (MAX)
<u>DTC P15A2</u>	Engine Oil Pressure Control, Mechanical, Solenoid Valve Sticking In De-Energized Position (Maximum Oil Pressure) (MIN)
<u>DTC P15A3</u>	Engine Oil Pressure Too High (MAX)
<u>DTC P15A6</u>	Engine Oil Pressure Too High Before Start (MAX)
<u>DTC P15A7</u>	Engine Oil Pressure Too Low Before Start (MIN)
<u>DTC P15B0</u>	Terminal 15 Sense Circuit Input High (MAX)
<u>DTC P15B1</u>	Terminal 15 Sense Circuit Input Low (MIN)
<u>DTC P15B2</u>	Terminal 15 Sense Circuit CAS Error (SIG)
<u>DTC P15B3</u>	Terminal 15 Sense Circuit Range/Performance (PLAUS)
<u>DTC P160A</u>	Powermanagement Exhaustive Discharge (MIN)

<u>DTC P160B</u>	Powermanagement Defective (PLAUS)
<u>DTC P160C</u>	Powermanagement Overvoltage (MAX)
<u>DTC P160D</u>	Powermanagement Undervoltage (MIN)
<u>DTC P160E</u>	Powermanagement Operation Without Battery (SIG)
<u>DTC P160F</u>	Powermanagement No-Load Current Error (PLAUS)
<u>DTC P1618</u>	Control Module Self-Test, AD-Converter Monitoring (PLAUS)
<u>DTC P1625</u>	Pedal Position Sensor Potentiometer Supply Channel 2 Electrical (PLAUS)
<u>DTC P1632</u>	Throttle Valve Adaptation Conditions Not Met (Bank 1) (MAX)
<u>DTC P1633</u>	Throttle Valve Adaptation Limp-Home Position Unknown (Bank 1) (MIN)
<u>DTC P1634</u>	Throttle Valve Adaptation Spring Test Failed (Bank 1) (MAX)
<u>DTC P1635</u>	Throttle Valve Adaptation Lower Mechanical Stop Not Adapted (Bank 1) (MAX)
<u>DTC P1636</u>	Throttle Valve Control Circuit (Bank 1) (SIG)
<u>DTC P1637</u>	Throttle Valve Position Control, Control Deviation (Bank 1) (MAX)
<u>DTC P1638</u>	Throttle Valve Position Control Throttle Stuck Temporarily (Bank 1) (MAX)
<u>DTC P1639</u>	Throttle Valve Position Control Throttle Stuck Permanently (Bank 1) (MAX)
<u>DTC P1644</u>	Throttle Valve Adaptation Stop Relearning Lower Mechanical Stop (Bank 1) (PLAUS)
<u>DTC P164C</u>	Pedal Position Sensor Potentiometer Supply Channel 1 Electrical (PLAUS)
<u>DTC P165A</u>	EWS (Electronic Immobilizer) Interface to ECM, Hardware Error (MAX)
<u>DTC P165B</u>	EWS (Electronic Immobilizer) Interface to ECM, Checksum Error (PLAUS)
<u>DTC P165C</u>	EWS (Electronic Immobilizer) Data, No Available Storage Possibility (MAX)
<u>DTC P165D</u>	EWS (Electronic Immobilizer) Data, Faulty Release Code Storage (MIN)
<u>DTC P165E</u>	EWS (Electronic Immobilizer) Data, Checksum Error (PLAUS)
<u>DTC P165F</u>	Internal Control Module Measurement Error Oxygen Sensor Heating (Bank 1, Sensor 1) (SIG)
<u>DTC P1660</u>	EWS (Electronic Immobilizer) Telegram Error (MIN)
<u>DTC P1661</u>	Timeout EWS (Electronic Immobilizer) - Telegram (SIG)
<u>DTC P1667</u>	EWS (Electronic Immobilizer) Start Value Not Yet Programmed (MIN)
<u>DTC P1667</u>	EWS (Electronic Immobilizer) Start Value Not Yet Programmed (PLAUS)
<u>DTC P1668</u>	EWS (Electronic Immobilizer) Start Value Destroyed (SIG)
<u>DTC P166A</u>	Control Module Self-Test, LDM (Longitudinal Dynamics Management) Monitoring (SIG)
<u>DTC P166B</u>	LDM (Longitudinal Dynamics Management) Torque Request inspite of Brake Signal (MAX)
<u>DTC P166C</u>	LDM (Longitudinal Dynamics Management) Torque Request Implausible (PLAUS)
<u>DTC P166F</u>	Internal Control Module Measurement Error Oxygen Sensor Heating (Bank 2, Sensor 1) (SIG)
<u>DTC P1675</u>	Throttle Valve Actuator Start Test Re-Adaptation Required (MAX)
<u>DTC P1694</u>	Throttle Valve Actuator Start Test Spring Test and Limp-Home Position Failed (SIG)
<u>DTC P169A</u>	Throttle Valve Actuator Start Test Limp-Home Position Failed (MIN)

<u>DTC P16A0</u>	Internal Control Module Memory Check Sum Error in Boot Software (MAX)
<u>DTC P16A1</u>	Internal Control Module Memory Check Sum Error in Application Software (MIN)
<u>DTC P16A2</u>	Internal Control Module Memory Check Sum Error in Data (SIG)
<u>DTC P16A3</u>	Internal Control Module Non-Volatile Memory (NVMY) Error (MAX)
<u>DTC P16A4</u>	Timeout Control Module Knock Sensor SPI-Bus (SIG)
<u>DTC P16A5</u>	Timeout Control Module Multiple Output Stage SPI-Bus (SIG)
<u>DTC P16A6</u>	Control Module Self-Test, Cruise Control Monitoring (MAX)
<u>DTC P16A7</u>	Control Module Self-Test, Hot Film Air Mass Meter Monitoring (MAX)
<u>DTC P16A8</u>	Control Module Self-Test, Throttle Position Monitoring (MIN)
<u>DTC P16A9</u>	Control Module Self-Test, Speed Monitoring Reset (PLAUS)
<u>DTC P16B0</u>	Control Module Self-Test, Pedal Position Sensor Monitoring (PLAUS)
<u>DTC P16B1</u>	Control Module Self-Test, Idle Air Control System Integrated Component Plausibility (MAX)
<u>DTC P16B2</u>	Control Module Self-Test, Idle Air Control System PD-Component Plausibility (MIN)
<u>DTC P16B3</u>	Control Module Self-Test, MSR (Engine-Drag-Torque Control) Monitoring (MAX)
<u>DTC P16B4</u>	Control Module Self-Test, DCC (Dynamic Cruise Control) Monitoring (MIN)
<u>DTC P16B5</u>	Control Module Self-Test, AMT (Automatic Manual Transmission) Monitoring (SIG)
<u>DTC P16B6</u>	Control Module Self-Test, ETC Monitoring (PLAUS)
<u>DTC P16B7</u>	Control Module Self-Test, Clutch Torque Monitoring Maximum Value Plausibility (MAX)
<u>DTC P16B8</u>	Control Module Self-Test, Clutch Torque Monitoring Minimum Value Plausibility (MIN)
<u>DTC P16B9</u>	Control Module Self-Test, Torque Loss Monitoring (SIG)
<u>DTC P16C0</u>	Control Module Self-Test, Driving Dynamics Control Switch Monitoring (PLAUS)
<u>DTC P16C1</u>	Control Module Self-Test, Torque Monitoring Current Indicated Value Plausibility (PLAUS)
<u>DTC P16C1</u>	Control Module Self-Test, Torque Monitoring Current Indicated Value Plausibility (PLAUS)
<u>DTC P16C2</u>	Control Module Self-Test, Speed Limitation Monitoring (PLAUS)
<u>DTC P16C5</u>	Main Relay Switching Delay (MIN)
<u>DTC P16C6</u>	CAN Timeout BSD (Bit Serial Data Interface) (MAX)
<u>DTC P16C6</u>	CAN Timeout BSD (Bit Serial Data Interface) (MAX)
<u>DTC P16C6</u>	CAN Timeout BSD (Bit Serial Data Interface) (MAX)
<u>DTC P16C6</u>	CAN Timeout BSD (Bit Serial Data Interface) (MIN)
<u>DTC P16C6</u>	CAN Timeout BSD (Bit Serial Data Interface) (MIN)
<u>DTC P16C6</u>	CAN Timeout BSD (Bit Serial Data Interface) (PLAUS)
<u>DTC P16C6</u>	CAN Timeout BSD (Bit Serial Data Interface) (PLAUS)
<u>DTC P16C6</u>	CAN Timeout BSD (Bit Serial Data Interface) (SIG)

<u>DTC P16C6</u>	CAN Timeout BSD (Bit Serial Data Interface) (SIG)
<u>DTC P16C6</u>	CAN Timeout BSD (Bit Serial Data Interface) (SIG)
<u>DTC P16C6</u>	CAN Timeout BSD (Bit Serial Data Interface) (SIG)
<u>DTC P16C8</u>	Serial Communication Link EKP (Electrical Fuel Pump) (SIG)
<u>DTC P2067</u>	Fuel Level Sensor 'B' Circuit Low (MIN)
<u>DTC P2068</u>	Fuel Level Sensor 'B' Circuit High (MAX)
<u>DTC P2088</u>	'A' Camshaft Position Actuator Control Circuit Low (Bank 1) (MIN)
<u>DTC P2089</u>	'A' Camshaft Position Actuator Control Circuit High (Bank 1) (MAX)
<u>DTC P2090</u>	'B' Camshaft Position Actuator Control Circuit Low (Bank 1) (MIN)
<u>DTC P2091</u>	'B' Camshaft Position Actuator Control Circuit High (Bank 1) (MAX)
<u>DTC P2096</u>	Post Catalyst Fuel Trim System Too Lean (Bank 1) (MIN)
<u>DTC P2097</u>	Post Catalyst Fuel Trim System Too Rich (Bank 1) (MAX)
<u>DTC P2098</u>	Post Catalyst Fuel Trim System Too Lean (Bank 2) (MIN)
<u>DTC P2099</u>	Post Catalyst Fuel Trim System Too Rich (Bank 2) (MAX)
<u>DTC P2120</u>	Throttle/Pedal Position Sensor/Switch 'D' Circuit (PLAUS)
<u>DTC P2122</u>	Throttle/Pedal Position Sensor/Switch 'D' Circuit Low (MIN)
<u>DTC P2123</u>	Throttle/Pedal Position Sensor/Switch 'D' Circuit High (MAX)
<u>DTC P2127</u>	Throttle/Pedal Position Sensor/Switch 'E' Circuit Low (MIN)
<u>DTC P2128</u>	Throttle/Pedal Position Sensor/Switch 'E' Circuit High (MAX)
<u>DTC P2138</u>	Throttle/Pedal Position Sensor/Switch 'D'/'E' Voltage Correlation (PLAUS)
<u>DTC P213F</u>	Fuel Pump System Fault - Forced Engine Shutdown (SIG)
<u>DTC P2183</u>	Engine Coolant Temperature Sensor 2 Circuit Range/Performance (PLAUS)
<u>DTC P2184</u>	Engine Coolant Temperature Sensor 2 Circuit Low (MIN)
<u>DTC P2185</u>	Engine Coolant Temperature Sensor 2 Circuit High (MAX)
<u>DTC P2195</u>	O2 Sensor Signal Biased/Stuck Lean (Bank 1 Sensor 1) (MAX)
<u>DTC P2196</u>	O2 Sensor Signal Biased/Stuck Rich (Bank 1 Sensor 1) (MAX)
<u>DTC P2197</u>	O2 Sensor Signal Biased/Stuck Lean (Bank 2 Sensor 1) (MAX)
<u>DTC P2198</u>	O2 Sensor Signal Biased/Stuck Rich (Bank 2 Sensor 1) (MAX)
<u>DTC P2228</u>	Barometric Pressure Circuit Low (MIN)
<u>DTC P2229</u>	Barometric Pressure Circuit High (MAX)
<u>DTC P2243</u>	O2 Sensor Reference Voltage Circuit/Open (Bank 1 Sensor 1) (MAX)
<u>DTC P2247</u>	O2 Sensor Reference Voltage Circuit/Open (Bank 2 Sensor 1) (MAX)
<u>DTC P2270</u>	O2 Sensor Signal Biased/Stuck Lean (Bank 1 Sensor 2) (MIN)
<u>DTC P2271</u>	O2 Sensor Signal Biased/Stuck Rich (Bank 1 Sensor 2) (MAX)
<u>DTC P2272</u>	O2 Sensor Signal Biased/Stuck Lean (Bank 2 Sensor 2) (MIN)
<u>DTC P2273</u>	O2 Sensor Signal Biased/Stuck Rich (Bank 2 Sensor 2) (MAX)
<u>DTC P2297</u>	O2 Sensor Out of Range During Deceleration (Bank 1 Sensor 1) (MAX)
<u>DTC P2298</u>	O2 Sensor Out of Range During Deceleration (Bank 2 Sensor 1) (MAX)
<u>DTC P2299</u>	Brake Pedal Position/Accelerator Pedal Position Incompatible (PLAUS)
<u>DTC P2400</u>	Evaporative Emission System Leak Detection Pump Control Circuit/Open (SIG)
<u>DTC P2401</u>	Evaporative Emission System Leak Detection Pump Control Circuit Low (MIN)
<u>DTC P2402</u>	

	Evaporative Emission System Leak Detection Pump Control Circuit High (MAX)
<u>DTC P240A</u>	Evaporative Emission System Leak Detection Pump Heater Control Circuit/Open (SIG)
<u>DTC P240B</u>	Evaporative Emission System Leak Detection Pump Heater Control Circuit Low (MIN)
<u>DTC P240C</u>	Evaporative Emission System Leak Detection Pump Heater Control Circuit High (MAX)
<u>DTC P2414</u>	O2 Sensor Exhaust Sample Error (Bank 1 Sensor 1) (MAX)
<u>DTC P2415</u>	O2 Sensor Exhaust Sample Error (Bank 2 Sensor 1) (MAX)
<u>DTC P2418</u>	Evaporative Emission System Switching Valve Control Circuit/Open (SIG)
<u>DTC P2419</u>	Evaporative Emission System Switching Valve Control Circuit Low (MIN)
<u>DTC P2420</u>	Evaporative Emission System Switching Valve Control Circuit High (MAX)
<u>DTC P250A</u>	Engine Oil Level Sensor Circuit (SIG)
<u>DTC P250B</u>	Engine Oil Level Sensor Circuit Range/Performance (PLAUS)
<u>DTC P250F</u>	Engine Oil Level Too Low (MIN)
<u>DTC P252A</u>	Engine Oil Quality Sensor Circuit (MIN)
<u>DTC P252A</u>	Engine Oil Quality Sensor Circuit (PLAUS)
<u>DTC P252A</u>	Engine Oil Quality Sensor Circuit (SIG)
<u>DTC P252A</u>	Engine Oil Quality Sensor Circuit (SIG)
<u>DTC P2568</u>	Direct Ozone Reduction Catalyst Temperature Sensor Circuit Range/Performance (PLAUS)
<u>DTC P2569</u>	Direct Ozone Reduction Catalyst Temperature Sensor Circuit Low (MIN)
<u>DTC P2570</u>	Direct Ozone Reduction Catalyst Temperature Sensor Circuit High (MAX)
<u>DTC P2626</u>	O2 Sensor Pumping Current Trim Circuit/Open (Bank 1 Sensor 1) (PLAUS)
<u>DTC P2629</u>	O2 Sensor Pumping Current Trim Circuit/Open (Bank 2 Sensor 1) (PLAUS)
<u>DTC P300A</u>	Controlled Air Guiding Circuit High (MAX)
<u>DTC P300B</u>	Controlled Air Guiding Circuit Low (MIN)
<u>DTC P300C</u>	Controlled Air Guiding Circuit (SIG)
<u>DTC P3022</u>	O2 Sensor Disturbed SPI Communication To WRAF-IC (Bank 1 Sensor 1) (MIN)
<u>DTC P3023</u>	O2 Sensor Disturbed SPI Communication to WRAF-IC (Bank 2 Sensor 1) (MIN)
<u>DTC P3024</u>	O2 Sensor Initialization Error WRAF-IC (Bank 1 Sensor 1) (MAX)
<u>DTC P3025</u>	O2 Sensor Initialization Error WRAF-IC (Bank 2 Sensor 1) (MAX)
<u>DTC P316A</u>	Engine Coolant Temperature Signal Stuck High (PLAUS)
<u>DTC P3196</u>	Cold Start Radiator Coolant Temperature Sensor Signal High (MAX)
<u>DTC P3197</u>	Radiator Coolant Temperature Gradient Too High (PLAUS)
<u>DTC P3198</u>	Engine Coolant Temperature 1 Gradient Too High (PLAUS)
<u>DTC P3199</u>	Engine Coolant Temperature Signal Stuck (PLAUS)
<u>DTC P3202</u>	Powertrain CAN, CAN Chip Cut-Off (SIG)
<u>DTC P3205</u>	Local CAN, CAN Chip CutOff (SIG)
<u>DTC P321E</u>	Ambient Pressure Sensor Maximum Pressure Implausible (MAX)
<u>DTC P321F</u>	Ambient Pressure Sensor Minimum Pressure Implausible (MIN)

<u>DTC P3223</u>	Generator Mechanical (PLAUS)
<u>DTC P3226</u>	E-Box Control Circuit Fan High Input (MAX)
<u>DTC P3227</u>	E-Box Control Circuit Fan Low Input (MIN)
<u>DTC P3228</u>	E-Box Control Circuit Fan Open Circuit (SIG)
<u>DTC P3235</u>	Control Module Monitoring Version Coding Plausibility (PLAUS)
<u>DTC P324A</u>	Generator Type Implausible (MAX)
<u>DTC P324A</u>	Generator Type Implausible (MIN)
<u>DTC P324C</u>	Generator Over Temperature Calculated (MAX)
<u>DTC P324C</u>	Generator Over Temperature Calculated (MAX)
<u>DTC P324E</u>	Generator Regulator Type Implausible (MAX)
<u>DTC P3255</u>	Generator Voltage in Starting Phase above Threshold (MAX)
<u>DTC P325A</u>	Generator Electrical Error Calculated (MAX)
<u>DTC U0101</u>	Lost Communication With TCM (SIG)
<u>DTC U0126</u>	Lost Communication With Steering Angle Sensor Module (SIG)
<u>DTC U0137</u>	Lost Communication With Trailer Brake Control Module (SIG)
<u>DTC U0155</u>	Lost Communication With Instrument Panel Cluster (IPC) Control Module (SIG)
<u>DTC U0167</u>	Lost Communication With Vehicle Immobilizer Control Module (SIG)
<u>DTC U1100</u>	Lost Communication With ASC/DSC (SIG)
<u>DTC U1100</u>	Lost Communication With ASC/DSC (SIG)
<u>DTC U1100</u>	Lost Communication With ASC/DSC (SIG)
<u>DTC U1101</u>	Lost Communication With Ambient Temperatur/Relative Time (SIG)
<u>DTC U1102</u>	Message Monitoring Actuation Cruise Control/ACC Alive Check (MIN)
<u>DTC U1103</u>	Lost Communication With Actuation Cruise Control/ACC (SIG)
<u>DTC U1104</u>	Message Monitoring Actuation Cruise Control/ACC Check Sum Error (PLAUS)
<u>DTC U1105</u>	Message Monitoring Torque Request ACC Alive Check (MIN)
<u>DTC U1106</u>	Lost Communication With Torque Request ACC (SIG)
<u>DTC U1107</u>	Message Monitoring Torque Request ACC Check Sum Error (PLAUS)
<u>DTC U1108</u>	Message Monitoring Torque Request Steering Alive Check (MIN)
<u>DTC U1108</u>	Message Monitoring Torque Request Steering Alive Check (MIN)
<u>DTC U1109</u>	Lost Communication With Torque Request Steering (SIG)
<u>DTC U1109</u>	Lost Communication With Torque Request Steering (SIG)
<u>DTC U110A</u>	Message Monitoring Torque Request Steering Check Sum Error (PLAUS)
<u>DTC U110A</u>	Message Monitoring Torque Request Steering Check Sum Error (PLAUS)
<u>DTC U110B</u>	Message Monitoring Torque Request DSC Alive Check (MIN)
<u>DTC U110C</u>	Lost Communication With Torque Request DSC (SIG)
<u>DTC U110D</u>	Message Monitoring Torque Request DSC Check Sum Error (PLAUS)
<u>DTC U110E</u>	Message Monitoring Torque Request ETC Alive Check (MIN)
<u>DTC U110E</u>	Message Monitoring Torque Request ETC Alive Check (MIN)
<u>DTC U110F</u>	Lost Communication With Torque Request ETC (SIG)
<u>DTC U110F</u>	Lost Communication With Torque Request ETC (SIG)
<u>DTC U1110</u>	Message Monitoring Torque Request ETC Check Sum Error (MIN)
<u>DTC U1110</u>	

	Message Monitoring Torque Request ETC Check Sum Error (MIN)
<u>DTC U1110</u>	Message Monitoring Torque Request ETC Check Sum Error (PLAUS)
<u>DTC U1110</u>	Message Monitoring Torque Request ETC Check Sum Error (PLAUS)
<u>DTC U1110</u>	Message Monitoring Torque Request ETC Check Sum Error (PLAUS)
<u>DTC U1110</u>	Message Monitoring Torque Request ETC Check Sum Error (PLAUS)
<u>DTC U1110</u>	Message Monitoring Torque Request ETC Check Sum Error (SIG)
<u>DTC U1110</u>	Message Monitoring Torque Request ETC Check Sum Error (SIG)
<u>DTC U1110</u>	Message Monitoring Torque Request ETC Check Sum Error (SIG)
<u>DTC U1114</u>	Message Monitoring Vehicle Mode Status Alive Check (MIN)
<u>DTC U1115</u>	Lost Communication With Vehicle Mode Status (SIG)
<u>DTC U1116</u>	Message Monitoring Vehicle Mode Status Check Sum Error (PLAUS)
<u>DTC U1118</u>	Lost Communication With Speed (SIG)
<u>DTC U111A</u>	Lost Communication With Transmission Data (SIG)
<u>DTC U111B</u>	Lost Communication With Transmission Data2 (SIG)
<u>DTC U111C</u>	Lost Communication With Mileage/Range (SIG)
<u>DTC U111D</u>	Message Monitoring Terminal Status Alive Check (MIN)
<u>DTC U111E</u>	Lost Communication With Terminal Status (SIG)
<u>DTC U111F</u>	Message Monitoring Terminal Status Check Sum Error (PLAUS)
<u>DTC U1120</u>	Lost Communication With Steering Wheel Angle (SIG)
<u>DTC U1121</u>	Lost Communication With Power Management Battery Voltage (SIG)
<u>DTC U1122</u>	Lost Communication With Power Management Charge Voltage (SIG)
<u>DTC U1123</u>	Message Monitoring ARS-Module Status Alive Check (MIN)
<u>DTC U1124</u>	Lost Communication With ARS-Module Status (SIG)
<u>DTC U1126</u>	Lost Communication With DSC Status (SIG)
<u>DTC U1128</u>	Lost Communication With EKP (Electrical Fuel Pump) Status (SIG)
<u>DTC U1129</u>	Lost Communication With Reverse Status (SIG)
<u>DTC U112A</u>	Message Monitoring Instrument Pack Status Alive Check (MIN)
<u>DTC U112B</u>	Lost Communication With Instrument Pack Status (SIG)
<u>DTC U112B</u>	Lost Communication With Instrument Pack Status (SIG)
<u>DTC U112B</u>	Lost Communication With Instrument Pack Status (SIG)
<u>DTC U112C</u>	Lost Communication With Heat Flow/Load Moment A/C (SIG)
<u>DTC U112D</u>	Lost Communication With Control Crash Cut-Off EKP (Electrical Fuel Pump) (SIG)
<u>DTC U1130</u>	Lost Communication With Radiator Shutter (Upper) (PLAUS)
<u>DTC U1132</u>	Lost Communication With Generator via BSD (Bit Serial Data Interface) (MAX)
<u>DTC U1132</u>	Lost Communication With Generator via BSD (Bit Serial Data Interface) (SIG)
<u>DTC U1134</u>	Lost Communication With Lamp Status (SIG)
<u>DTC U1135</u>	Lost Communication With Status Water Valve (SIG)
<u>DTC U113A</u>	Lost Communication With Central Locking System Status (SIG)
<u>DTC U113C</u>	Lost Communication With Time/Date (SIG)
<u>DTC U113D</u>	Lost Communication With Wheel Torque Management Request/Driveline (SIG)

<u>DTC U113E</u>	Lost Communication With Display Transmission Data (SIG)
<u>DTC U1154</u>	Lost Communication With Message 2 TCM (SIG)
<u>DTC U1155</u>	Message Monitoring 2 TCM Check Sum Error (PLAUS)
<u>DTC U1156</u>	Message Monitoring 2 TCM Alive Check (MIN)
<u>DTC U1160</u>	Lost Communication With Message 2 TCM (SIG)
<u>DTC U1161</u>	Message Monitoring 3 TCM Alive Check (MIN)
<u>DTC U1162</u>	Message Monitoring 3 TCM Check Sum Error (PLAUS)
<u>DTC U1166</u>	Message Monitoring EWS (Electronic Immobilizer) - Frame Error (MIN)
<u>DTC U1167</u>	Message Monitoring Direct Ozone Reduction Catalyst Temperature Sensor Frame Error (SIG)
<u>DTC U1168</u>	Message Monitoring Direct Ozone Reduction Catalyst Temperature Sensor Check Sum Error (PLAUS)

GENERAL INFORMATION

Diagnostic Connector (DLC) Locations

DOMESTIC CARS

CHRYSLER GROUP LLC

NOTE: This table provides a quick reference for self-diagnostic connector locations, when available from manufacturer, that ARE NOT located at the lower left side of the dash, as mandated in 1996 by the Federal government.

CHRYSLER GROUP LLC - DOMESTIC CARS

Application	Connector Location
Acclaim	
1989-90	Under Left Side Of Dash
1991-92	On Left Front Fender Panel, Near Shock Tower
1993-94	Near Battery
1995	Behind Left Side Of Dash, Near Fuse Block
Aries, Caravelle, Dynasty, E Class, Executive Sedan, LeBaron Sedan, New Yorker, Reliant, Town & Country, 400 & 600	
1984-85	On Left Fender Apron, Behind Battery (2.2L Only)
1986-87	On Front Of Right Shock Tower (2.2L & 2.5L Only)
1988-89	On Left Fenderwell
1990	Under Left Side Of Dash
1991-92	On Left Front Fender Panel, Near Shock Tower
1993 (Except New Yorker)	Near Battery
1993 (New Yorker)	On Left Fender Panel Near PCM
Avenger (1995-00)	Under Center Of Dash, Near Center Console
Breeze, Cirrus & Stratus (1995)	Left Of Steering Column, On BCM
Charger, Horizon, Omni, Rampage, Scamp & Turismo	
1985-89	
2.2L Carbureted	On Left Fender Apron
2.2L Turbo	On Front Of Right Shock Tower
Concorde, Intrepid, LHS, New Yorker, Vision & 300M	
1993-95	Behind Left Side Of Dash
1996-97	Under Left Side Of Dash, Near Center

	Console
Daytona	
1984-87	On Front Of Right Shock Tower
1988-89	On Left Fenderwell
1990-92	On Left Front Fender Panel, Near Shock Tower
1993	On Left Front Inner Fender Or Under Steering Column
Dynasty	
1990	Under Left Side Of Dash
1991-93	On Left Fender Panel, Near SBEC/PCM
Fifth Avenue	
1990	Under Left Side Of Dash
1991-93	On Left Fender Panel Near SBEC/PCM
Horizon & Omni (1989-90)	
	Under Left Side Of Dash
Imperial	
1981-83	CCC Connector Left Of Air Cleaner
1990	Under Left Side Of Dash
1991-93	On Left Fender Panel Near SBEC/PCM
LeBaron Coupe & Convertible	
1985-87	On Right Front Shock Tower
1988-89	On Left Fenderwell
1990-92	On Left Front Fender Panel, Near Shock Tower
1993	On Left Front Inner Fender Or Under Steering Column
1994	Near Battery
1995	Behind Left Side Of Dash, Near Fuse Block
Lancer	
1985-87	On Right Front Shock Tower
1988-89	On Left Fenderwell
Laser	
1990-94	Above Left Kick Panel, Near Fuse Block
1995	Under Left Side Of Dash, Near Center Console
Monaco & Premier	
1990	On Right Front Fender Panel
1991-92	On Left Fender Panel, Next To SBEC
	Under Headlight Switch, Under Left Side

Neon (1995)	Of Dash
Shadow	
1985-87	On Right Front Shock Tower
1988	On Left Fenderwell
1989	Under Dash, To Right Of Steering Column
1990	On Left Fender Front Panel, Near SBEC
1991-92	On Left Front Fender Panel, Near Shock Tower
1993-94	Near Battery
Spirit & Sundance	
1985-87	On Right Front Shock Tower
1989-90	Under Left Side Of Dash
1991-92	On Left Front Fender Panel, Near Shock Tower
1993-94	Near Battery
1995	Behind Left Side Of Dash, Near Fuse Block
Talon	
1990-94	Above Left Kick Panel, Near Fuse Block
1995-98	Under Left Side Of Dash, Near Center Console

FORD MOTOR CO.

NOTE: This table provides a quick reference for self-diagnostic connector locations, when available from manufacturer, that **ARE NOT** located at the lower left side of the dash, as mandated in 1996 by the Federal government.

FORD MOTOR CO. - DOMESTIC CARS

Application	Connector Location
Bobcat & Pinto	On Center Of Right Fender Apron
Capri	
1980-85	On Center Of Left Front Fender Apron
1986	On Left Rear Corner Of Engine Compartment
Continental	
1984-89	On Right Rear Corner Of Engine Compartment
1990-91	On Right Rear Corner Of Firewall, On Electronic Assembly Cover

1992	On Right Fender Apron
1993-94	VIP Connectors (2) On Right Rear Of Engine Compartment, On PCM Cover
Contour & Mystique	
1995	On Left Rear Corner Of Engine Compartment
Cougar & Thunderbird	
1982-90	On Left Fender Apron
1991	On Rear Of Right Front Fender Panel
1992	Front Of Right Shock Tower
1993	2 Connectors In Right Rear Corner Of Engine Compartment
1994	On Right Side Of Engine Compartment & Below Glove Box
1995	
3.8L	On Right Side Of Engine Compartment & Below Glove Box
4.6L	Behind Right Side Of Dash, Below Glove Box
1996	Lower Right Side Of Dash, Below Glove Box
Crown Victoria, Grand Marquis & Lincoln Town Car	
1983 & 1987	On Right Fender Apron
1985-86 & 1988-90	On Left Fender Apron
1992	On Left Front Fender Panel
1993-94	On Top Of Left Front Wheelwell
Escort, EXP, Lynx & Tracer	
1985-90	On Right Fender Apron Near Firewall
1991	On Left Rear Of Engine Compartment
1992	On Right Rear Of Engine Compartment, Near Cowl
1993-95	On Left Side Of Firewall
LTD & Marquis	
1983	On Left Fender Apron
1984-86	On Left Rear Corner Of Engine Compartment
Mark VII	
1984-87	On Right Rear Corner Of Engine Compartment
1988-90	Front Of Right Fender Apron
1991	On Right Side Of Engine Compartment, Near Thermactor Solenoids

Mark VIII	
1993-96	On Top Of Left Wheelwell
Mustang	
1980-85	On Center Of Left Front Fender Apron
1986-91	On Left Rear Corner Of Engine Compartment
1992	On Left Shock Tower, Near Ignition Coil
1993	2 Connectors On Right Front Strut Tower
1994-95	Behind Right Front Strut Tower & Right Of Steering Column
Probe	
1991-92	On Left Rear Corner Of Engine Compartment
1993	DLC - Behind Left Side Of Dash; STI Connector - On Left Inner Fender Panel
1994-95	On Left Front Inner Fender Panel
Sable & Taurus	
1986-87 (3.0L Only)	Near Alternator
1988-90	
2.5L	On Engine Harness Near PCV Hose
3.0L	On Right Rear Corner Of Engine Compartment
1991	On Right Rear Corner Of Engine Compartment, On ECA Cover
1992	On Right Rear Corner Of Engine Compartment, Below MAP Sensor
1993-95	Right Rear Of Engine Compartment
Tempo & Topaz	
1984-92	On Right Rear Corner Of Engine Compartment
1993-94	In Engine Compartment, On Left Strut Tower

GENERAL MOTORS

NOTE: This table provides a quick reference for self-diagnostic connector locations, when available from manufacturer, that ARE NOT located at the lower left side of the dash, as mandated in 1996 by the Federal government.

GENERAL MOTORS - DOMESTIC CARS

Application	Connector Location

Allante	Enter Diagnostic Mode By Pressing OFF & WARM Buttons On Instrument Panel
Bonneville (1980-81)	ECU Connector On Upper Right Kick Panel
Brougham (1987-92)	Bottom Center Of Instrument Panel
Camaro & Firebird (1980)	Diagnostic Ground Lead Connector On Right Shroud Above ECM
Caprice Classic	
1980-81	ECU Connector On Upper Right Kick Panel
1982-88	Under Center Of Instrument Panel
Catalina	ECU Connector On Upper Right Kick Panel
Cavalier (1982-88)	On Side Of Fuse Block
Cimarron	On Side Of Fuse Block
Century	Under Left Of Dash Ashtray
Corvette (1980-83)	In Center Console, Under Ashtray
Custom Cruiser	
1980-81	ECU Connector On Upper Right Kick Panel
1982-88	Under Center Of Instrument Panel
DeVille (1981-88)	Enter Diagnostic Mode By Pressing OFF & WARMER Buttons On Instrument Panel
Delta 88	ECU Connector On Upper Right Kick Panel
Eldorado (1981-88)	Enter Diagnostic Mode By Pressing OFF & WARMER Buttons On Instrument Panel
Electra (1980-81)	ECU Connector On Upper Right Kick Panel
Estate Wagon	ECU Connector On Upper Right Kick Panel
Fiero	Under Ashtray Or Cigar Lighter Panel Within Center Console
Firenza	On Side Of Fuse Block
Fleetwood (1981-88)	Enter Diagnostic Mode By Pressing OFF & WARMER Buttons On Instrument Panel
Fleetwood Brougham	On Bottom Center Of Dash, Near Ashtray
Impala (1982-88)	Under Center Of Instrument Panel
LeMans	ECM Connector On Right Kick Panel

	Or Under Left Side Of Dash
LeSabre (1980-81)	ECU Connector On Upper Right Kick Panel
LeSabre Wagon (1982-88)	Under Center Of Instrument Panel
Monza	Under Right Side Of Dash
Ninety-Eight (1980-81)	ECU Connector On Upper Right Kick Panel
Nova	Behind Right Strut Tower
Parisienne	Under Center Of Instrument Panel
Reatta	
1988-92 (MFI)	Enter Diagnostic Mode By Pressing OFF & WARM Buttons On Instrument Panel
1991-93	Above Parking Brake Pedal
Riviera	
1980-85 (Carbureted)	Under Left Or Center Of Dash
1986-92 (MFI)	Enter Diagnostic Mode By Pressing OFF & WARM Buttons On Instrument Panel
Safari	Under Center Of Instrument Panel
Seville (1981-88)	Enter Diagnostic Mode By Pressing OFF & WARMER Buttons On Instrument Panel
Skyhawk	Under Right Side Of Dash
Starfire	Under Right Side Of Dash
Sunbird	On Side Of Fuse Block, Under Right Side Of Dash
Toronado	
1980-85 (Carbureted)	Under Left Or Center Of Dash
1986-92 (MFI)	Enter Diagnostic Mode By Pressing OFF & WARM Buttons On Instrument Panel
Trofeo	
1988-92 (MFI)	Enter Diagnostic Mode By Pressing OFF & WARM Buttons On Instrument Panel
1991-93	Above Parking Brake Pedal
2000	On Side Of Fuse Block

DOMESTIC LIGHT TRUCKS & VANS

CHRYSLER GROUP LLC

NOTE: This table provides a quick reference for self-diagnostic connector locations, when available from manufacturer, that ARE NOT located at the lower left side of the dash, as mandated in 1996 by the Federal government.

CHRYSLER GROUP LLC - DOMESTIC LIGHT TRUCKS & VANS

Application	Connector Location
Caravan, Grand Caravan, Grand Voyager, Mini Ram Van, Town & Country, & Voyager	
1984-92	On Left Side Fender Apron
1993	On Left Fender Front Fender Panel, Near SBEC
1994-95	On Wiring Harness, On Center Of Firewall
Dakota	
1987-88	On Right Side Fender Apron
1989	On Left Side Of Firewall
1990-92	On Right Side Of Firewall
1993-95	On Right Rear Corner Of Engine Compartment
Jeep	
Cherokee (1992-95)	On Left Front Fender Apron, Behind Air Cleaner
Comanche	On Left Front Fender Apron, Behind Air Cleaner
Grand Cherokee & Wagoneer	
1993-95	
PCM	On Right Rear Of Engine Compartment, Near PCM
TCM	Behind Left Side Of Instrument Panel
Wrangler (1992-95)	On Left Side Of Firewall, Near PCM
Pickup & Ramcharger	
1985-90	On Left Side Of Firewall
1991-93	On Left Front Fender Panel, Next To SBEC/PCM
1995 Pickup	On Right Side Of Firewall
Ram Wagon & Van	
1985-90	On Left Side Of Firewall
1991-95	On Center Of Firewall, Near SBEC/PCM

FORD MOTOR CO.

NOTE: This table provides a quick reference for self-diagnostic connector locations, when available from manufacturer, that ARE NOT located at the lower left side

of the dash, as mandated in 1996 by the Federal government.

FORD MOTOR CO. - DOMESTIC LIGHT TRUCKS & VANS

Application	Connector Location
Aerostar	
1986-90	On Left Front Fender
1991	Near Starter Relay
1992	On Left Front Inner Fender Panel
1993-95	On Left Side Of Firewall
Bronco	
1982-85	
6-Cylinder	On Left Front Fender
V8	On Right Inner Fender Panel
1986-87	On Right Front Fender, Near Starter Relay
1988-92	On Left Fender Apron
1993-95	2 Connectors In Left Rear Of Engine Compartment, On Bracket
1996-	Below Glove Box
Bronco II	
1983-85	On Right Front Inner Fender Panel (2.3L Only)
1986-90	On Right Front Fender Apron
Excursion	
Behind Center Of Dash	
Explorer & Mountaineer (1991-94)	
On Right Rear Of Engine Compartment, Near A/C-Heater Blower	
Pickup	
1982-85	
6-Cylinder	On Left Front Fender
V8	On Right Inner Fender Panel
1986-87	On Right Front Fender, Near Starter Relay
1988-92	On Left Fender Apron
1993-95	2 Connectors In Left Rear Of Engine Compartment, On Bracket
1996-	Below Center Of Instrument Panel
Pickup (F250 Heavy Duty & F350)	
Under Right Side Of Dash	
Ranger	
1983-85	On Right Front Inner Fender Panel (2.3L Only)
1986-90	On Right Front Fender Apron
1991	Behind Engine Compartment

	Fuse/Relay Block
1992	On Left Front Inner Fender Panel
1993-95	On Rear Of Engine Compartment Fuse/Relay Block
Van	
1986-92	On Right Fender Apron
1993-95	On Left Front Corner Of Engine Compartment
1996	
5.8L (49 State, Over 8600 GVW) & 7.5L (Except Calif.)	On Left Front Corner Of Engine Compartment
All Others	Under Left Side Of Dash
1997-98	
Diesel	Under Left Side Of Dash
All Others	Left Front Corner Of Engine Compartment
Villager (1993)	On Left Side Of Engine Compartment, Below Coolant Reservoir

GENERAL MOTORS

NOTE: This table provides a quick reference for self-diagnostic connector locations, when available from manufacturer, that ARE NOT located at the lower left side of the dash, as mandated in 1996 by the Federal government.

GENERAL MOTORS - DOMESTIC LIGHT TRUCKS & VANS

Application	Connector Location
Astro & Safari Van (1986-87)	Under Left Corner Of Cowl
"S" & "T" Series Blazer, Bravada, Envoy, Jimmy, Pickup & Sonoma	
1982-85	
1.9L	Under Left Side Of Dash, Behind ECM
2.0L & 2.8L	Under Ashtray
2.5L	Under Left Side Of Dash
1986-87	Under Ashtray
Van ("G" Series) (1982-87)	Under Driver's Seat

IMPORTED CARS & TRUCKS

ACURA

NOTE: This table provides a quick reference for self-diagnostic connector locations, when available from manufacturer, that ARE NOT located at the lower left side

of the dash, as mandated in 1996 by the Federal government.

ACURA - IMPORTED CARS & TRUCKS

Application	Connector Location
Integra	
1991-93	Behind Right Kick Panel
1994-97	Behind Glove Compartment
1998-02	Behind Right Side Of Center Console
Legend	
1991-93	Under Right Side Of Dash, Above PGM-FI ECU/PCM
1994-95	Behind Glove Compartment
NSX (1997-01)	Under Glove Compartment
SLX	Behind Lower Left Corner Of Dash, Behind Cover
Vigor	
1992-93	Under Right Side Of Dash, Near Center Console
1994	Behind Glove Compartment
2.2CL & 2.3CL	In Front Of Shift Lever, Behind Ashtray
2.5TL	In Front Of Shift Lever, Behind Ashtray
3.0CL	In Front Of Shift Lever, Behind Ashtray
3.2TL & 3.5RL	In Front Of Shift Lever, Behind Ashtray

AUDI

NOTE: This table provides a quick reference for self-diagnostic connector locations, when available from manufacturer, that ARE NOT located at the lower left side of the dash, as mandated in 1996 by the Federal government.

AUDI - IMPORTED CARS & TRUCKS

Application	Connector Location
A4	
1996	Next To Rear Ashtray
1997-01 (1.8L Turbo)	Behind Cover, Under Left Side Of Steering Column
1997-99 (2.8L V6)	Under Cover, Next To Rear Ashtray
1997-	Under Left Side Of Dash, Behind Cover
A6	
1995	Under Ashtray, In Front Storage Compartment Of Center Console

1996-97	Under Cover, Next To Parking Brake Handle
Cabriolet	
1994-96	In Fuse/Relay Block, On Left Side Of Dash
1997-98	Under Ashtray, At Rear Of Center Console
Coupe GT, 4000S & 4000S Quattro	In Fuse Socket, On Fuel Pump Relay
80	In Fuse Socket, On Fuel Pump Relay
90	
1988-92	In Fuse Socket, On Fuel Pump Relay
1993	In Main Fuse/Relay Block, On Plenum Tray
1994-95	In Fuse/Relay Block, On Left Side Of Dash
100	
1989-91	Under Left Side Of Dash
1992-94	In Auxiliary Relay Station No. 1, On Left Rear Of Engine Compartment
5000CS Quattro, 5000CS Turbo & 5000S	In Fuse Socket, On Fuel Pump Relay

BENTLEY

NOTE: This table provides a quick reference for self-diagnostic connector locations, when available from manufacturer, that ARE NOT located at the lower left side of the dash, as mandated in 1996 by the Federal government.

BENTLEY - IMPORTED CARS & TRUCKS

Application	Connector Location
1996-00	
All Models	In Glove Compartment
2001-04	
Arnage	Below Left Side Of Dash
2001-	
Azure Convertible	In Glove Compartment
Continental	In Glove Compartment

BMW

NOTE: This table provides a quick reference for self-diagnostic connector locations, when available from manufacturer, that ARE NOT located at the lower left side of the dash, as mandated in 1996 by the Federal government.

BMW - IMPORTED CARS & TRUCKS

Application	Connector Location
Z3	Behind Cover, On Right Side Of Center Console
Z4 & Z8	Under Left Side Of Dash, Left Of Steering Column, Behind Cover
318 & 325	
1991	On Bracket, Above Thermostat Housing
1992-95	On Right Rear Of Engine Compartment
1996	Under Left Side Of Dash, Behind Panel Labeled OBD
330	Behind Cover, Under Left Side of Dash Above Hood & Trunk Releases
524t	On Top Rear Of Engine
525i & 535i	
1990-91 (Black 20-Pin Connector)	Left Rear Corner Of Engine Compartment
1992-95	Outside Of Engine Compartment Fuse/Relay Block
528e	On Intake Manifold Bracket, Behind Thermostat Housing
635CSi	On Bracket, Next To Fuse/Relay Block
735i	
1986-87	On Bracket, On Top Of Engine
1988-92	On Right Side Of Engine Compartment, On Shock Tower
740 & 750	Under Left Side Of Dash, Behind Panel Labeled OBD
740i & 740iL (1993-01)	Behind Cover On Lower Left Corner Of A/C Control Panel
745Li	In Left Side Kickpanel, Behind Cover Labeled OBD
750iL	Behind Cover On Lower Left Corner Of A/C Control Panel

DAIHATSU

NOTE: This table provides a quick reference for self-diagnostic connector locations, when available from manufacturer, that ARE NOT located at the lower left side of the dash, as mandated in 1996 by the Federal government.

DAIHATSU - IMPORTED CARS & TRUCKS

Application	Connector Location
Charade	At Upper Section Of Transmission

CHRYSLER GROUP LLC

NOTE: This table provides a quick reference for self-diagnostic connector locations, when available from manufacturer, that ARE NOT located at the lower left side of the dash, as mandated in 1996 by the Federal government.

CHRYSLER GROUP LLC - IMPORTED CARS & TRUCKS

Application	Connector Location
Colt & Summit	
1986-87	Above Inside Of Glove Compartment
1988	On Left Rear Corner Of Engine Compartment
1989-98	Under Left Side Of Dash, Near Fuse/Relay Block
Colt Vista	
1987	Behind Glove Compartment
1988-89	Under Left Side Of Dash, Near Hood Release Handle
1990-96	Under Right Side Of Dash
Conquest & Starion	
Behind Glove Compartment	
Expo	
Under Left Side Of Dash, Near Fuse/Relay Block	
Medallion	
On Left Side Of Firewall	
Pickup	
Under Left Side Of Dash, Near Fuse/Relay Block	
Ram-50	
Under Left Side Of Dash, Near Fuse/Relay Block	
Sigma	
In Glove Compartment	
Stealth	
1991-98	Under Left Side Of Dash, On Fuse/Relay Block
1999	Under Left Side Of Dash, Left Of Center Console
Summit Wagon	
Under Right Side Of Dash	
Vista Wagon	
Under Right Side Of Dash	

FERRARI**FERRARI - IMPORTED CARS & TRUCKS**

Application	Connector Location

All Models	
1996-	Behind Left Side Of Dash

FORD MOTOR CO.

NOTE: This table provides a quick reference for self-diagnostic connector locations, when available from manufacturer, that ARE NOT located at the lower left side of the dash, as mandated in 1996 by the Federal government.

FORD MOTOR CO. - IMPORTED CARS & TRUCKS

Application	Connector Location
Aspire	
1994-95	On Left Rear Corner Of Engine Compartment
1996-97	Under Left Side Of Dash
Capri	
1991	Behind Right Side Of Dash, Behind Glove Compartment
1992	
1.3L	On Left Rear Corner Of Engine Compartment
1.6L	On Right Rear Corner Of Engine Compartment
1993-94	On Right Rear Corner Of Engine Compartment
Festiva	
1992-93	
1.3L	On Left Rear Corner Of Engine Compartment
1.6L	On Right Rear Corner Of Engine Compartment
Merkur XR4Ti	On Right Front Fender Apron, Near Battery
Scorpio	On Right Rear Corner Of Engine Compartment
Tracer	On Left Rear Corner Of Engine Compartment

GENERAL MOTORS

NOTE: This table provides a quick reference for self-diagnostic connector locations, when available from manufacturer, that ARE NOT located at the lower left side of the dash, as mandated in 1996 by the Federal government.

GENERAL MOTORS & GEO - IMPORTED CARS & TRUCKS

Application	Connector Location
LeMans	Behind Right Kick Panel, Above ECM
Metro	
1989-95	Under Left Side Of Dash, Near Fuse Block
1996	Under Right Side Of Dash, Near Center Console
1997-01	Under Left Side Of Dash
Prizm & Prizm LSi	
1989-95	On Left Front Strut Tower
1996-02	Under Left Side Of Dash
Spectrum	Under Right Side Of Dash, Above A/C-Heater Blower Motor
Sprint	On Left Front Shock Tower, Near Battery
Storm	
1990-91	Behind Right Side Of Dash, Above A/C-Heater Blower Motor
1992-93	Behind Right Kick Panel
Tracker	
1989-95	Under Left Side Of Dash, Near Fuse Block
1996	In Engine Compartment, Near MAP Sensor
1997-	Under Left Side Of Dash

HONDA

NOTE: This table provides a quick reference for self-diagnostic connector locations, when available from manufacturer, that ARE NOT located at the lower left side of the dash, as mandated in 1996 by the Federal government.

HONDA - IMPORTED CARS & TRUCKS

Application	Connector Location
Accord	
1990-95	Behind Right Side Of Dash, Above Kick Panel
1996-97	Behind Ashtray In Center Console
Civic (1992-95)	Behind Right Side Of Dash, Near PGM-FI ECM
Civic Del Sol	
1992-95	Behind Right Side Of Dash, Near

	PGM-FI ECM
1996-97	Under Removable Cover On Right Side Of Center Console
CR-V	Behind Passenger Side Of Center Console
Element	
2003-11	Above Gas Pedal, Below Fuse Block
Insight (2010-11)	Below Left-of-Center Of Dash
Odyssey	
1995	Behind Right Side Of Dash, Above Kick Panel
1996-98	Behind Passenger Side Of Center Console
Passport (1995)	Behind Left Kick Panel
Prelude	
1992-95	Behind Center Console
1996	Under Beverage Holder In Center Console
1997-02	Under Removable Cover On Right Side Of Center Console
S2000	Behind Right Side Of Center Console

HYUNDAI

NOTE: This table provides a quick reference for self-diagnostic connector locations, when available from manufacturer, that ARE NOT located at the lower left side of the dash, as mandated in 1996 by the Federal government.

HYUNDAI - IMPORTED CARS & TRUCKS

Application	Connector Location
Accent (1995)	In Coin Box
Sonata	
1989	Under Left Side Of Dash, In Fuse Block
1990	
W/Passive Seat Belt Restraints	In Fuse Block
W/O Passive Seat Belt Restraints	On Lower Left Of Steering Column

INFINITI

NOTE: This table provides a quick reference for self-diagnostic connector locations, when available from manufacturer, that ARE NOT located at the lower left side

of the dash, as mandated in 1996 by the Federal government.

INFINITI - IMPORTED CARS & TRUCKS

Application	Connector Location
G20 (1993-95)	In ECCS Control Unit, Behind Center Console
I30 (1995)	Beside Fuse Box
J30	
1993	Under Left Side Of Dash
1994-95	In ECM, Behind Right Kick Panel
1996-98	Under Left Side Of Dash
M30	Under Left Side Of Dash, Near Fuse Block
Q45	
1990-93	Under Left Side Of Dash, Near Fuse Block
1994-95	In ECM, Behind Right Kick Panel

ISUZU

NOTE: This table provides a quick reference for self-diagnostic connector locations, when available from manufacturer, that ARE NOT located at the lower left side of the dash, as mandated in 1996 by the Federal government.

ISUZU - IMPORTED CARS & TRUCKS

Application	Connector Location
Amigo & Pickup	
1986-89	Under Left Side Of Dash
1990-95	Behind Left Kick Panel, Near ECM
1998-00	Lower Left Corner Of Dash, Behind Small Cover
Hombre	Under Lower Left Side Of Dash, Behind Cover
Impulse	
1986-89	Under Left Side Of Dash, Above ECU
1990-92	Behind Right Kick Panel
1993-95	Behind Left Kick Panel, Near ECM
I-Mark	Behind Right Side Of Dash, Above A/C-Heater Blower Motor
Oasis	Behind Right Side Of Center Console
Rodeo	
1991-95	Behind Left Kick Panel
1996-	Lower Left Side Of Dash, Behind

	Small Cover
Stylus	Behind Right Kick Panel
Trooper & Trooper II	
1986	Under Left Side Of Dash
1987-91	Under Center Console
1992	
DOHC	Behind Center Of Dash, Right Of Steering Column
SOHC	Under Left Side Of Dash
1993-95	Under Left Side Of Dash, Right Of Steering Column
1996-02	Lower Left Side Of Dash, Behind Small Cover
VehiCROSS	Under Left Side Of Dash

JAGUAR

NOTE: This table provides a quick reference for self-diagnostic connector locations, when available from manufacturer, that ARE NOT located at the lower left side of the dash, as mandated in 1996 by the Federal government.

JAGUAR - IMPORTED CARS & TRUCKS

Application	Connector Location
XJR (1995-97)	Near Center Console
XJS	
1992	On Left Rear Trunk Wheel Arch, Behind Trim Panel
1993-94	Under Battery Tray, On Right Front Of Luggage Compartment
1995-96	Near Center Console
XJ6	
1992	On Left Rear Of Engine Compartment
1993-94	Under Battery Tray, On Right Front Of Luggage Compartment
1995-97	Under Left Side Of Dash, Near Center Console
XJ12	Near Center Console

KIA

NOTE: This table provides a quick reference for self-diagnostic connector locations, when available from manufacturer, that ARE NOT located at the lower left side

of the dash, as mandated in 1996 by the Federal government.

KIA - IMPORTED CARS & TRUCKS

Application	Connector Location
Sephia	
1994	On Center Of Firewall
1995 & 1996	
1.6L	Under Center Of Dash, Mounted On Floorboard
2.0L	Under Right Side Of Dash, Near Kick Panel
Sportage	
1994	On Center Of Firewall
1995 & 1996	
1.6L	Under Center Of Dash, Mounted On Floorboard
2.0L	Under Right Side Of Dash, Near Kick Panel

LAND ROVER

NOTE: This table provides a quick reference for self-diagnostic connector locations, when available from manufacturer, that ARE NOT located at the lower left side of the dash, as mandated in 1996 by the Federal government.

LAND ROVER - IMPORTED CARS & TRUCKS

Application	Connector Location
Defender 90	Behind Fuse Cover, In Center Of Console
Range Rover	Under Right Side Of Dash, In Footwell

LEXUS

NOTE: This table provides a quick reference for self-diagnostic connector locations, when available from manufacturer, that ARE NOT located at the lower left side of the dash, as mandated in 1996 by the Federal government.

LEXUS - IMPORTED CARS & TRUCKS

Application	Connector Location
ES Series	
1990-91	
DLC	Near Left Shock Tower
Total Diagnostic Communication Link Connector	Under Left Side Of Dash
1992-94	

DLC No. 1	On Bracket, Behind Right Front Strut Tower
DLC No. 2 & 3	Under Left Side Of Dash
1995-97	In Fuse Box At Lower Left Of Dash
GS Series	
1990-95	
DLC No. 1	On Bracket, On Top Of Engine
DLC No. 2	Under Left Side Of Dash
1996-00	In Fuse Box At Lower Left Of Dash
LS Series	
1990-94	
DLC No. 1	On Bracket, On Top Of Engine
DLC No. 2	Under Left Side Of Dash
1995-00	In Fuse Box At Lower Left Of Dash
SC Series	
1992-95	
DLC No. 1	On Bracket, Behind Right Front Strut Tower
DLC No. 2 & 3	Under Left Side Of Dash
1996-00	In Fuse Box At Lower Left Of Dash

MAZDA

NOTE: This table provides a quick reference for self-diagnostic connector locations, when available from manufacturer, that ARE NOT located at the lower left side of the dash, as mandated in 1996 by the Federal government.

MAZDA - IMPORTED CARS & TRUCKS

Application	Connector Location
B-Series	
1987-88	On Right Front Fender Apron
1989-93	
Engine Control Check Connector (Black 6-Pin)	Near Windshield Washer Motor
Trouble Codes Connector (Green 1-Pin)	Near Black 6-Pin Connector (Engine Control)
1994-95	On Right Front Fender Panel
Miata (1990-95)	On Left Rear Of Engine Compartment, Near Master Cylinder
MPV (1989-95)	
Engine Control Unit (Green 6-Pin & 1-Pin Connectors)	On Left Side Of Engine Compartment, Near Inner Fender Panel
MX-3	Mounted On Bracket, On Left Front Strut Tower

MX-6 & 626	
1988	Behind Left Front Shock Tower
1989	On Left Front Corner Of Engine Compartment
1990-91	At ECU Connector Terminal
1992	On Left Rear Corner Of Engine Compartment
1993	On Side Of Fuse/Relay Block, Near Battery
1994-95	On Left Front Fender Apron
Navajo	
1991-93	On Right Rear Corner Of Engine Compartment
1994-95	On Right Front Fender Panel
Protege	
1987-89	On Passenger's Footwell (Left Foot Area)
1990-95	On Left Side Of Firewall, Near Wiper Motor
RX7	
1986-88 (3 Check Connectors)	At Left & Right Corners Of Engine Compartment
1989-91 (Green 6-Pin Connector)	Behind Ignition Coil
1993-95	On Bracket, On Left Front Strut Tower
323	
1986-88	Front Left Of Engine Compartment, Near Ignition Coil
1989 (Green 6-Pin & Green 1-Pin Connectors)	On Left Side Of Firewall
1990-95	On Left Side Of Firewall, Near Wiper Motor
929	
1989	Near Air Cleaner
1990-91 (Green 6-Pin Connector)	In Left Front Corner Of Engine Compartment
1992-93	Mounted On Air Cleaner Housing
1994-95	On Left Front Strut Tower

MERCEDES-BENZ

NOTE: This table provides a quick reference for self-diagnostic connector locations, when available from manufacturer, that ARE NOT located at the lower left side of the dash, as mandated in 1996 by the Federal government.

MERCEDES-BENZ - IMPORTED CARS & TRUCKS

Application	Connector Location
C-Class (1994)	On Right Rear Of Engine Compartment
E-Class	
1994-97	On Right Rear Of Engine Compartment
G-Class	Under Left Side Of Dash, Behind Cover
ML-Class	Under Left Side Of Dash, Behind Cover
S-Class	
140 Platform (1994-99)	On Right Rear Of Engine Compartment
190 Series	
1986-87	On Left Rear Of Engine Compartment
1988-93	
All Models	In Engine Compartment, On Left Front Fender
California (OBD)	On Right Side Of Firewall, Near Battery
1994	On Right Rear Of Engine Compartment
260E	
1987	On Left Front Fender Apron, Next To Ignition Control Module
1988-89	
All Models	In Engine Compartment, On Left Front Fender
California (OBD)	On Right Side Of Firewall, Near Battery
300 Series	
1986-87	On Left Front Fender Apron, Next To Ignition Control Module
1988-92	
All Models	In Engine Compartment, On Left Front Fender
California (OBD)	On Right Side Of Firewall, Near Battery
1993	
Except 300E	Left Fender Apron
300E	Right Rear Corner Of Engine Compartment
1994-95 (All Models)	On Right Rear Of Engine Compartment
400 & 500 Series	

1993	
12-Pin Connector	On Rear Of Left Front Inner Fender Panel
38-Pin (Impulse Readout)	In Module Box, On Right Rear Of Engine Compartment
1994-95	On Right Rear Of Engine Compartment
420SEL & 560 Series (Except 2.2L)	
1986-89	
All Models	In Engine Compartment, On Left Front Fender
California (OBD)	On Right Side Of Firewall, Near Battery
1990-91	In Engine Compartment, On Left Front Fender
560 Series (2.2L)	On Lower Left Side Of Engine Connector

MITSUBISHI

NOTE: This table provides a quick reference for self-diagnostic connector locations, when available from manufacturer, that ARE NOT located at the lower left side of the dash, as mandated in 1996 by the Federal government.

MITSUBISHI - IMPORTED CARS & TRUCKS

Application	Connector Location
Diamante (1992-98)	Under Left Side Of Dash, Near Fuse/Relay Block
Expo	Under Left Side Of Dash, Near Fuse/Relay Block
Montero	
1986-88	Left Rear Corner Of Engine Compartment
1989-91	Behind Glove Compartment
Pickup	Under Left Side Of Dash, Near Fuse/Relay Block
Raider	
1987-88	Left Rear Corner Of Engine Compartment
1989	Behind Glove Compartment
3000GT	
1991-98	Under Left Side Of Dash, On Fuse/Relay Block
1999	Under Left Side Of Dash, Left Of Center Console

NISSAN

NOTE: This table provides a quick reference for self-diagnostic connector locations, when available from manufacturer, that ARE NOT located at the lower left side of the dash, as mandated in 1996 by the Federal government.

NISSAN - IMPORTED CARS & TRUCKS

Application	Connector Location
Altima	
1993-94	On Driver-Side Of Center Console, Above Accelerator Pedal
1995-96	Below Fuse Box
Maxima	
1989-94	Under Left Side Of Dash
1995-96	Below Fuse Box
NX & Sentra	Under Left Side Of Dash, Near Fuse Block
Pulsar NX	
1986	Above Right Side Of Dash, Below Wiper Motor
1987	Above Steering Column
Quest (1993-95)	
CONSULT Tester Connector	On Driver-Side Of Center Console, Above Accelerator Pedal
Self-Test Connector	Located Near Starter
Stanza	Below Center Of Dash, Near Center Console
Van	On Right Side Of Engine Compartment, Behind Fuel Filter
200SX (1995-96)	Below Fuse Box
240SX	
1991-94	Under Left Side Of Dash, Below Fuse Block
1995-96	In Glove Box
300ZX (1990)	Near Parking Brake

PEUGEOT

NOTE: This table provides a quick reference for self-diagnostic connector locations, when available from manufacturer, that ARE NOT located at the lower left side of the dash, as mandated in 1996 by the Federal government.

PEUGEOT - IMPORTED CARS & TRUCKS

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Application	Connector Location
505 Series	On Lower Left Side Of Engine Connector

PORSCHE

NOTE: This table provides a quick reference for self-diagnostic connector locations, when available from manufacturer, that **ARE NOT** located at the lower left side of the dash, as mandated in 1996 by the Federal government.

PORSCHE - IMPORTED CARS & TRUCKS

Application	Connector Location
911 Series	
1992-95	In Passenger's Footwell
1996	Left Side Of Center Console
928S	Top Front Of Engine
944 Series	On Left Side Of Engine Compartment

RENAULT

NOTE: This table provides a quick reference for self-diagnostic connector locations, when available from manufacturer, that **ARE NOT** located at the lower left side of the dash, as mandated in 1996 by the Federal government.

RENAULT - IMPORTED CARS & TRUCKS

Application	Connector Location
Sportwagon	
Engine Diagnostic	On Center Of Firewall
Fuel Injection Diagnostic	Right Rear Of Engine Compartment, Behind Airflow Meter

ROLLS-ROYCE

NOTE: This table provides a quick reference for self-diagnostic connector locations, when available from manufacturer, that **ARE NOT** located at the lower left side of the dash, as mandated in 1996 by the Federal government.

ROLLS-ROYCE - IMPORTED CARS & TRUCKS

Application	Connector Location
All Models	
1996-00	In Glove Compartment
2001-	Under Left Side Of Dash

SAAB

NOTE: This table provides a quick reference for self-diagnostic connector locations, when available from manufacturer, that ARE NOT located at the lower left side of the dash, as mandated in 1996 by the Federal government.

SAAB - IMPORTED CARS & TRUCKS

Application	Connector Location
900 Series	
1986-90	In Front Of Fuse/Relay Panel
1991-93	Under Back Seat, On Right Side
1994	
Convertible	Under Rear Seat
Hatchback	Under Steering Column
All Others	Under Right Front Seat
9000 Series	
1990	On Left Side Of Engine Compartment
1991-92	Under Passenger's Seat
1993	On Left Of Firewall
1994-95	Under Right Front Seat

SUBARU

NOTE: This table provides a quick reference for self-diagnostic connector locations, when available from manufacturer, that ARE NOT located at the lower left side of the dash, as mandated in 1996 by the Federal government.

SUBARU - IMPORTED CARS & TRUCKS

Application	Connector Location
Brat, Coupe, Hatchback, Sedan & Wagon	
1987	
Read Memory Connector	Under Left Side Of Dash, Next To MFI/SMFI Control Unit
Test Mode Connector	
MFI	On Left Side Of Dash, Next To MFI Control Unit
Sequential MFI	On Left Side Of Firewall
1988-89	On Left Side Of Dash, Next To ECU
Forester	Under Left Side of Dash, Behind Cover
Justy	
1987-88	
Read Memory Connector (Factory)	On Right Front Fender, Near Strut Tower
Test Mode Connector	On Driver-Side Kick Panel Or ECU

1989-95	
Read Memory Connector (Factory)	Under Left Side Of Dash
Test Mode Connector	On Driver-Side Kick Panel Or ECU
Legacy	
1990-94	
Check Connector (Black Connector)	Behind Right Side Of Steering Column, Near Heater Case
Diagnostic Connector (Black 4-Pin Connector)	Behind Right Side Of Steering Column, Near Heater Case
Read Memory Connector (Black Connector)	Behind Knee Panel, Right Of Steering Column
Select Monitor Connector (Yellow Connector)	Behind Right Side Of Steering Column, Near Heater Case
Test Mode Connector (Green Connector)	Behind Knee Panel, Right Of Steering Column
1995-	Under Left Side Of Dash, Behind Cover
Loyale	
1990-91	
MFI (5-Pin Connector)	In Front Of ECU
SMFI (Yellow 9-Pin & Black 13-Pin Connectors)	Near Brake Booster
1992-95	
Diagnostic Check Connector (Yellow 9-Pin & Black 13-Pin Connectors)	Behind Brake Booster
Diagnostic Read-Memory Connector (2-Single Wire Connectors)	Behind Left Front Strut Tower
Outback & Outback Sport	Under Center Of Dash
SVX	
1992-96	Under Left Side Of Dash
1997	Right Of Steering Column, On Center Console

SUZUKI

NOTE: This table provides a quick reference for self-diagnostic connector locations, when available from manufacturer, that ARE NOT located at the lower left side of the dash, as mandated in 1996 by the Federal government.

SUZUKI - IMPORTED CARS & TRUCKS

Application	Connector Location
Esteem (1995)	Near Battery
Samurai	
1986-90	Under Right Side Of Dash, Behind Glove Compartment

1991-92	On Right Side Of Firewall
1993-95	Under Left Side Of Dash, In Fuse Block
Sidekick & X90	
1989-91	Under Left Side Of Dash, In Fuse Block
1992-93	
ALDL Connector	Under Left Side Of Dash
Engine Connector	Under Left Side Of Dash, Near Fuse Block
1994-96	In Engine Compartment, Near Battery
Swift	
1989-91	Under Left Side Of Dash, In Fuse Block
1992	
ALDL Connector	Under Left Side Of Dash
Diagnostic Test Terminal	In Fuse Block
1993-95	Under Left Side Of Dash, In Fuse Block

TOYOTA

NOTE: This table provides a quick reference for self-diagnostic connector locations, when available from manufacturer, that ARE NOT located at the lower left side of the dash, as mandated in 1996 by the Federal government.

TOYOTA - IMPORTED CARS & TRUCKS

Application	Connector Location
Camry	
1983-90	Next To Brake Master Cylinder
1991	Near Left Front Shock Tower
1992-95	
4-Cylinder	Near Wiper Motor
V6	Under Left Side Of Dash
Celica	
1983-84	Next To Battery
1985-95	Behind Left Front Shock Tower
Celica Supra	Rear Of Battery, Near Relay Panel (2-Pin Connector)
Corolla	
Front Wheel Drive	
1987	Side Of Left Front Shock Tower (2-

	Pin Connector)
1988-94	Behind Left Front Shock Tower
Rear Wheel Drive	
1985-86	Side Of Right Front Shock Tower (2-Pin Connector)
1987	Right Rear Corner Of Engine Compartment
Cressida	
1988-93	
Check Connector	On Left Front Shock Tower
Total Diagnostic Communication Link Connector	Under Left Side Of Dash
Land Cruiser (1988-94)	Near Wiper Motor
MR2	
1986-90	Near Airflow Meter
1992-95	On Right Rear Of Engine Compartment, Near MAP Sensor
Paseo (1992-95)	On Side Of Engine Compartment Fuse/Relay Block No. 2, Near Battery
Pickup	
1984-86	Near Ignition Coil, Near Master Cylinder (2-Pin Connector)
1987-90	Right Front Inner Fender Panel, Near Relay Block
1992-94	On Side Of Engine Compartment Fuse/Relay Block No. 2, Near Battery
Previa	
1992-93	Under Front Of Driver's Seat
1994	
Except Supercharged	Under Center Console, Near Parking Brake Lever
Supercharged	Under Cover, On Top Center Of Instrument Panel
1995-97	On Top Center Of Instrument Panel
RAV4	Under Dash, Near Center Console
Starlet	
1981-82	On Instrument Panel Fuse Block, On Top Of Dash
1983-84	Right Rear Of Engine Compartment
Supra	
1986-90	Rear Of Battery, Near Relay Panel
1991-92	On Left Front Shock Tower
1993-94	
DLC No. 1	On Right Side Of Firewall

DLC No. 2	Under Left Side Of Dash, Near Kick Panel
Tacoma & T100	
1993	On Side Of Engine Compartment Fuse/Relay Block No. 2, Near Battery
1994-95	
Except OBD-II DLC	On Side Of Engine Compartment Fuse/Relay Block No. 2, Near Battery
OBD-II DLC	Under Left Side Of Dash
Tercel	
1987-90	In Engine Compartment, Next To Master Cylinder
1991-94	On Side Of Engine Compartment Fuse/Relay Block No. 2, Near Battery
1995-98	Near Steering Column
Van	Near Airflow Meter
4Runner	
1985-86	Near Ignition Coil, Next To Master Cylinder (2-Pin Connector)
1987-95	On Side Of Engine Compartment Fuse/Relay Block No. 2, Near Battery

VOLKSWAGEN

NOTE: This table provides a quick reference for self-diagnostic connector locations, when available from manufacturer, that ARE NOT located at the lower left side of the dash, as mandated in 1996 by the Federal government.

VOLKSWAGEN - IMPORTED CARS & TRUCKS

Application	Connector Location
Cabrio	
1996	In Center Console, Below Tachometer
1997-02	On Center Dash, Behind Panel Near Ashtray
Corrado	Under Center Console Trim Plate
Fox	Under Center Console, Near Shift Lever
Golf	
1993	On Center Of Dash, Below A/C-Heater Control Knobs
1994	Under Center Console
1998-03	In Center Console

Golf III 2.0L	
1995-96	Below A/C-Heater Control Panel
1997-98	On Center Dash, Behind Panel Adjacent To Ashtray
GTI	
1993	On Center Of Dash, Below A/C- Heater Control Knobs
1994	Under Center Console
GTI 2.8L	On Center Dash, Behind Panel Adjacent To Ashtray
Jetta	
1993	On Center Of Dash, Below A/C- Heater Control Knobs
1994	Under Center Console
Jetta III 2.0L	
1995-96	Below A/C-Heater Control Panel
1997-98	On Center Dash, Behind Panel Adjacent To Ashtray
Jetta/Jetta III 2.8L	On Center Dash, Behind Panel Adjacent To Ashtray
New Beetle	Lower Part of Dash, In Front Of Shift Lever
Passat	
1992-94	Under Center Console, Forward Of Shift Lever
1995-97	On Center Dash, Behind Panel Near Ashtray
Toureg	
2004-2007	In the cover of the drivers side footwell, to right of engine hood release lever

VOLVO

NOTE: This table provides a quick reference for self-diagnostic connector locations, when available from manufacturer, that ARE NOT located at the lower left side of the dash, as mandated in 1996 by the Federal government.

VOLVO - IMPORTED CARS & TRUCKS

Application	Connector Location
C30	Under Left Center Of Dash
C70	Behind Cover, Below Parking Brake Lever

S40	Under Left Center Of Dash
S70	Behind Cover, Below Parking Brake Lever
S90	Behind Cover, Below Parking Brake Lever
V40	Under Left Center Of Dash
V70 (1997-00)	Behind Cover Below Parking Brake Lever
V90	Behind Cover, Below Parking Brake Lever
240	
1986-92	Left Rear Corner Of Engine Compartment
1993	Behind Left Front Strut Tower
740 & 760	
1986-92	
Ignition System	On Left Front Fender Apron
Fuel Injection (1990-92 Only)	Left Rear Corner Of Engine Compartment
780	On Left Front Fender, Behind Air Cleaner Housing
850	
1993	On Center Console, Forward Of Shift Lever & Near ECM
1994-95	
Non-Turbo	On Right Front Strut Tower
Turbo	Behind Cover, Forward Of Shift Lever
1996-97	Behind Cover, Forward Of Shift Lever
940	
1991-93	
Ignition System	On Left Front Fender Apron
Fuel Injection	Left Rear Corner Of Engine Compartment
1994-95	Behind Left Front Strut Tower
960	
1992-95	On Left Front Strut Tower
1996	In Center Console, To Right Of Parking Brake Lever
1997	Behind Cover, Forward Of Shift Lever

2007 BMW

X3

BUZZERS, RELAYS & TIMERS

BUZZERS, RELAYS & TIMERS LOCATION

Component	Location
A/C Compressor Relay (K19)	Right side of dash. See Fig. 31 .
DME Relay (K6300)	Left rear engine compartment. See Fig. 33 .
Fog Light Relay (K47)	Right side of dash. See Fig. 31 .
Fuel Injectors Relay (K6327)	Left rear engine compartment. See Fig. 33 .
Fuel Pump Relay (K6301)	Under right side of dash. See Fig. 40 .
Headlight Washer Relay (K6)	Under right side of dash. See Fig. 41 .
Horn Relay (K2)	Right side of dash. See Fig. 31 .
Rear Window Defroster Relay (K13)	Right rear quarterpanel. See Fig. 32 .
Reversing Light Relay (K6325)	Left rear of engine compartment. See Fig. 46 .
Secondary Air Pump Relay (K6304)	Under right side of dash. See Fig. 41 .
Variable Valve Timing Gear Relay (K6316)	Left rear of engine compartment. See Fig. 45 .
Windshield Wiper Relay (K11)	Left rear engine compartment. See Fig. 42 .

CIRCUIT PROTECTION DEVICES

CIRCUIT PROTECTION DEVICES LOCATION

Component	Location
E Box	Left rear of engine compartment.
Fuse Box (A400)	In right side of rear compartment floor board. See Fig. 50 .
Power Distribution (A41)	Right side of dash. See Fig. 22 .
Rear Fuse Holder (A49)	Center of rear compartment floor board. See Fig. 47 .

CONTROL UNITS

CONTROL UNITS LOCATION

Component	Location
Adaptive Directional Headlight (A214)	Under right side of dash. See Fig. 20 .
Digital Motor Electronics (DME) Control Module (A6000)	Left rear engine compartment. See Fig. 24 .
Dynamic Stability Control (A65a)	Left rear engine compartment. See Fig. 23 .
General Module Control Unit (A1)	Right side of dash. See Fig. 18 .
Heating/Air Conditioning System (A11a)	Center of dash. See Fig. 48 .
Intermittent Wipe/Wash Control Module (Rear) (A36)	In liftgate. See Fig. 21 .
Multiple Restraint System Control Module (A12)	In center console. See Fig. 19 .

Navigation System (A112a)	Left side of rear compartment. See Fig. 49 .
Panorama Glass Sunroof Module (A336)	In overhead console. See Fig. 52 .
Park Distance Control (PDC) (A81a)	Center of rear compartment floor board. See Fig. 54 .
Servotronic (A17)	Right side of dash. See Fig. 20 .
Trailer Module (A6)	Center of rear compartment floor board. See Fig. 47 .
Transfer Box Control Module (A70006)	Center of rear compartment floor board. See Fig. 54 .
Transmission Control (A7000a)	Left rear of engine compartment. See Fig. 44 .
Video Module (A197)	Left side of rear compartment. See Fig. 64 .
Voice Control System (U6a)	Left side of rear compartment. See Fig. 114 .

MOTORS

MOTORS LOCATION

Component	Location
Auxiliary Water Pump (M37)	Left side of engine compartment. See Fig. 105 .
Driver's Door System Lock (S47)	In driver's door. See Fig. 60 .
Driver's Seat Angle Adjustment Drive (M50a)	Under driver's seat. See Fig. 106 .
Driver's Seat Backrest Angle Adjustment Drive (M53a)	Under driver's seat. See Fig. 107 .
Driver's Seat Forward/Backward Adjustment Drive (M51a)	Under driver's seat. See Fig. 107 .
Driver's Seat Height Adjustment Drive (M52a)	Under driver's seat. See Fig. 107 .
Driver's Seat Lumbar Support Drive (M55a)	Under driver's seat. See Fig. 108 .
Driver's Window Motor (M21)	In driver's door. See Fig. 61 .
Electric Fan (M9)	Front of engine compartment. See Fig. 83 .
Electric Fuel Pump (M2)	Below right rear seat. See Fig. 34 .
Fuel Filler Flap Central Locking Drive (M16)	Above right rear wheel. See Fig. 32 .
Glass Roof Motor (M14105)	In overhead console. See Fig. 113 .
Headlight Washer Pump (M7)	Right front of engine compartment. See Fig. 36 .
Hydraulic Selector Unit (Y8505)	Under center of vehicle. See Fig. 121 .
Left Headlight Beam Height Control Stepper Motor (M80)	Left front of engine compartment. See Fig. 17 .
Left Rear Door Power Window (M20a)	In left rear door. See Fig. 104 .
Left Rear Door System Lock (M15)	In left rear door. See Fig. 104 .
Passenger's Backrest Angle Adjustment Drive (M58a)	Under front passenger's seat. See Fig. 110 .
Passenger's Door System Lock (S49)	In front passenger's door. See Fig. 63 .
Passenger's Seat Angle Adjustment Drive (M61a)	Under front passenger's seat. See Fig. 111 .
Passenger's Seat Forward/Backward Adjustment Drive (M60a)	Under front passenger's seat. See Fig. 111 .

Passenger's Seat Height Adjustment Drive (M59a)	Under front passenger's seat. See Fig. 111.
Passenger's Seat Lumbar Support Drive (M56a)	Under front passenger's seat. See Fig. 109.
Passenger's Window Motor (M23)	In front passenger's door. See Fig. 62.
Rear Window Washer Pump (M95)	Right front engine compartment. See Fig. 36.
Right Headlight Beam Height Control Stepper Motor (M81)	Right front of engine compartment. See Fig. 95.
Right Rear Door Power Window (M22a)	In right rear door. See Fig. 103.
Right Rear Door System Lock (M14)	In right rear door. See Fig. 103.
Secondary Air Injection Pump (M63)	Right side of engine compartment. See Fig. 35.
VTG Actuator (M8533)	Under left side of vehicle. See Fig. 112.
Windshield Washer Pump (M4)	Right side of engine compartment. See Fig. 35.
Wiper Motor (M3a)	Left rear of engine compartment. See Fig. 102.

SENDING UNITS & SENSORS

SENDING UNITS & SENSORS LOCATION

Component	Location
Automatic Air Recirculation Sensor (B414)	Left front of engine compartment. See Fig. 82.
Brake Pad Wear Sensor (Left Front) (B16a)	Left front wheel. See Fig. 27.
Brake Pad Wear Sensor (Right Rear) (B17a)	Right rear wheel. See Fig. 28.
Coolant Pressure Sensor (B8)	Right front wheelwell. See Fig. 25.
Driver's Side Front Airbag Sensor (B10508a)	Left front of engine compartment. See Fig. 84.
DSC Sensor (B75)	Center console. See Fig. 19.
DSC Steering Angle Sensor (A68)	Under left side of dash. See Fig. 53.
Headlight Beam Height Control Load Sensor (B42a)	Behind right front wheel. See Fig. 76.
Interior Movement Detector (A121b)	In overhead console. See Fig. 57.
Left Front Airbag Sensor (S71)	Left front of engine compartment. See Fig. 17.
Left Front Center Ultrasonic Sensor (B31a)	Front bumper. See Fig. 74.
Left Front Ultrasonic Sensor (B30a)	Front bumper. See Fig. 74.
Left Front Wheel Speed Sensor (B2)	Front of left front wheel. See Fig. 69.
Left Rear Center Ultrasonic Sensor (B35a)	Rear bumper. See Fig. 75.
Left Rear Ultrasonic Sensor (B34a)	Rear bumper. See Fig. 75.
Left Rear Wheel Speed Sensor (B4)	Right side of left rear wheel. See Fig. 72.
Outside Temperature Sensor (B21a)	Left front wheelwell. See Fig. 29.
Passenger's Side Front Airbag Sensor (B10509a)	Right front of engine compartment. See Fig. 85.
Pedal Position Sensor (R10)	Under left side of dash. See Fig. 37.
Rain/Headlight Sensor (B57b)	Top center of windshield. See Fig. 79.
Right Front Airbag Sensor (S72)	Right front of engine compartment. See Fig. 95.

Right Front Center Ultrasonic Sensor (B32a)	Front bumper. See Fig. 74 .
Right Front Ultrasonic Sensor (B33a)	Front bumper. See Fig. 74 .
Right Front Wheel Speed Sensor (B1)	Top of right front wheel. See Fig. 68 .
Right Rear Center Ultrasonic Sensor (B36a)	Rear bumper. See Fig. 75 .
Right Rear Ultrasonic Sensor (B37a)	Rear bumper. See Fig. 75 .
Right Rear Wheel Speed Sensor (B3)	Left side of right rear wheel. See Fig. 71 .
Seat Occupancy Recognition (A113)	Under front passenger's seat. See Fig. 56 .
Tilt Sensor (B28)	Center of rear compartment floor board. See Fig. 47 .

SOLENOIDS & SOLENOID VALVES

SOLENOIDS & SOLENOID VALVES LOCATION

Component	Location
Driver Lumbar Support Valve Block (Y193)	Under driver's seat. See Fig. 108 .
Exhaust Flap (Y198)	Left side of rear compartment. See Fig. 120 .
Passenger's Lumbar Support Valve Block (Y194)	Under front passenger's seat. See Fig. 109 .
Refrigerant Compressor Control Valve (Y2a)	Right front of engine compartment. See Fig. 119 .
Servotronic Valve (B15a)	Under left front of vehicle. See Fig. 26 .
Water Valve (Y4a)	Left side of engine compartment. See Fig. 105 .

SWITCHES

SWITCHES LOCATION

Component	Location
Backup Light Switch (S8511)	Right rear side of transmission. See Fig. 39 .
Brake Fluid Level Switch (B18a)	Left rear engine compartment. See Fig. 23 .
Brake Light Switch (S29)	Under left side of dash. See Fig. 37 .
Clutch Switch (S805)	Under left side of dash. See Fig. 37 .
Coolant Level Switch (S63b)	Left front engine compartment. See Fig. 38 .
Heated Spray Nozzles Thermal Switch (S198)	Under right front side of vehicle. See Fig. 73 .
Hood Contact Switch (S19a)	Right rear of engine compartment. See Fig. 101 .
Park Brake Switch (S31)	Rear center console. See Fig. 19 .
Park/Neutral Position Switch (Y19)	Bottom of center dash. See Fig. 117 .
Wash Water Level Switch (S136)	Right front of engine compartment. See Fig. 36 .

MISCELLANEOUS

MISCELLANEOUS LOCATION

Component	Location
Amplifier (A18)	Left side of rear compartment. See Fig. 49 .
Antenna Diversity (A421)	Top center of rear compartment door. See Fig. 65 .

Antitheft Horn (H1a)	Rear of engine compartment. See Fig. 93 .
Basic Interference Telephone (U407a)	Left side of rear compartment. See Fig. 116 .
Bluetooth Antenna (W18)	Top of left "C" pillar. See Fig. 118 .
Chime Module (H10)	Left side of dash. See Fig. 30 .
Classification Resistor (R8554)	Under vehicle. See Fig. 112 .
Compensator (N27a)	Left side of rear compartment. See Fig. 114 .
Driver's Airbag Inflator Assemblies (G5)	Part of steering wheel. See Fig. 48 .
Driver's Seat Belt Tensioner Generator (G12)	Part of seat belt buckle assembly. See Fig. 87 .
Driver's Side Airbag Inflator Assembly (G14b)	In driver's door. See Fig. 60 .
Electric Auxiliary Heater (I01062)	Left side of engine compartment. See Fig. 96 .
Electronic Immobilizer (EWS) (A836)	Under left side of dash. See Fig. 53 .
Horn (Left) (H2a)	Left front wheelwell. See Fig. 29 .
Interference Suppression Capacitor (L400)	Top left of rear compartment. See Fig. 100 .
Left "B" Pillar Satellite (A157)	Bottom of left "B" pillar. See Fig. 58 .
Left Condenser (I01140)	Left side of rear compartment. See Fig. 99 .
Left Front Door Satellite (A162)	In driver's door. See Fig. 60 .
Left Front RDS Transmitter (B43a)	Behind left front wheel. See Fig. 77 .
Left Head Airbag Inflator Assembly (G37)	Top left of rear compartment. See Fig. 91 .
Left Heated Washer Nozzle (E51a)	Bottom left of windshield. See Fig. 86 .
Left Rear Side Airbag Inflator Assembly (G20a)	In left rear door. See Fig. 89 .
Left TV Amplifier (A453)	Left side of rear compartment. See Fig. 66 .
Microphone (H65)	In overhead console. See Fig. 80 .
OBDII (X19527)	Left side of left footwell. See Fig. 30 .
Passenger's Airbag Inflator Assemblies (G6)	Top right side of dash. See Fig. 48 .
Passenger's Seat Belt Tensioner Generator (G13)	Part of seat belt buckle assembly. See Fig. 88 .
Passenger's Side Airbag Inflator Assembly (G15b)	In front passenger's door. See Fig. 63 .
Ride Height Sensor (B64)	Under vehicle. See Fig. 81 .
Right "B" Pillar Satellite (A158)	Bottom of right "B" pillar. See Fig. 59 .
Right Condenser (I01141)	Left side of rear compartment. See Fig. 99 .
Right Front Door Satellite (A163)	In front passenger's door. See Fig. 63 .
Right Front RDC Transmitter (B47a)	Behind right front wheel. See Fig. 78 .
Right Head Airbag Inflator Assembly (G38)	Top right of rear compartment. See Fig. 92 .
Right Heated Washer Nozzle (E52a)	Bottom right of windshield. See Fig. 86 .
Right Horn (H3a)	Under right front of vehicle. See Fig. 94 .
Right Rear Side Airbag Inflator Assembly (G21a)	In right rear door. See Fig. 90 .
Right Side TV Amplifier (A453a)	Right side of rear compartment. See Fig. 67 .
Satellite Receiver (A20)	Left side of rear compartment. See Fig. 51 .
Telephone Transceiver (U400a)	Left side of rear compartment. See Fig. 115 .
Wave Trap 1 (I01101)	Bottom right side of rear compartment door. See Fig. 97 .

CONNECTORS

CONNECTORS LOCATION

Component	Location
X256 (37 Pin)	Right front door. See Fig. 12 .
X257 (37 Pin)	Left front door. See Fig. 13 .
X273 (27 Pin)	Bottom of left "B" pillar. See Fig. 58 .
X274 (27 Pin)	In right rear door. See Fig. 70 .
X275 (25 Pin)	Under seat. See Fig. 123 .
X279 (25 Pin)	Under front passenger's seat. See Fig. 56 .
X322 (8 Pin)	Center console. See Fig. 55 .
X13318 (10 Pin)	Left side of rear compartment. See Fig. 120 .
X14087 (26 Pin)	Right "A" pillar. See Fig. 10 .

GROUNDS

GROUNDS LOCATION

Component	Location
X46	Center console. See Fig. 19 .
X165	Left front of engine compartment. See Fig. 122 .
X166	Right front engine compartment. See Fig. 2 .
X167	Right front wheelwell. See Fig. 1 .
X170	Left rear engine compartment. See Fig. 3 .
X173	Below driver's seat. See Fig. 4 .
X490	Right door sill. See Fig. 14 .
X494	Right side of rear seat. See Fig. 15 .
X498	Right side of luggage compartment. See Fig. 16 .
X0861	Right front wheelwell. See Fig. 1 .
X861	Left front of engine compartment. See Fig. 17 .
X1105	Left side of dash. See Fig. 5 .
X1108	Left kick panel. See Fig. 6 .
X2184	Center of rear compartment floor board. See Fig. 54 .
X10012	Center of dash. See Fig. 7 .
X13016	Right side of luggage compartment. See Fig. 9 .

SPLICES

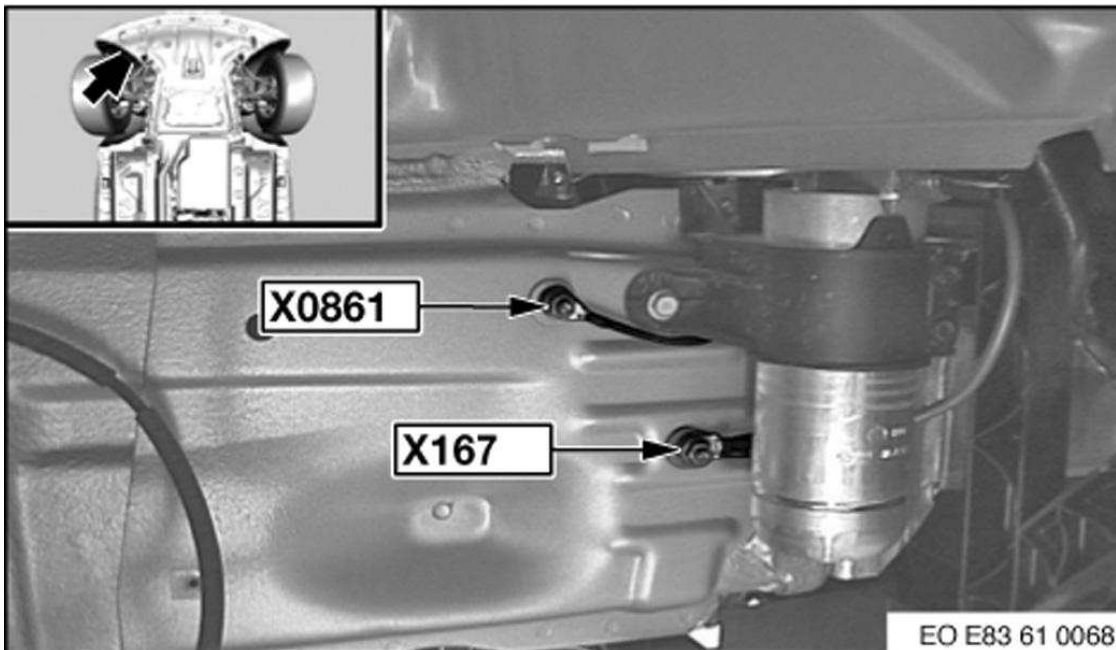
SPLICES LOCATION

Component	Location

X181	Right side of dash. See Fig. 22 .
X183	Right side of dash. See Fig. 22 .
X217	Left side of dash. See Fig. 11 .
X218	Right side of right footwell. See Fig. 7 .
X219	Right side of dash. See Fig. 22 .
X428	Right side of dash. See Fig. 22 .
X461	Bottom right of rear compartment door. See Fig. 97 .
X595	Center of rear compartment floor board. See Fig. 46 .
X834	In left rear door. See Fig. 89 .
X835	In right rear door. See Fig. 103 .
X891	In front passenger's door. See Fig. 62 .
X10116	Right side of dash. See Fig. 22 .
X10148	Right side of dash. See Fig. 43 .
X10189	Right side of dash. See Fig. 22 .
X10237	Center of dash. See Fig. 8 .
X18826	Right side of right footwell. See Fig. 7 .
X18827	Right side of right footwell. See Fig. 7 .

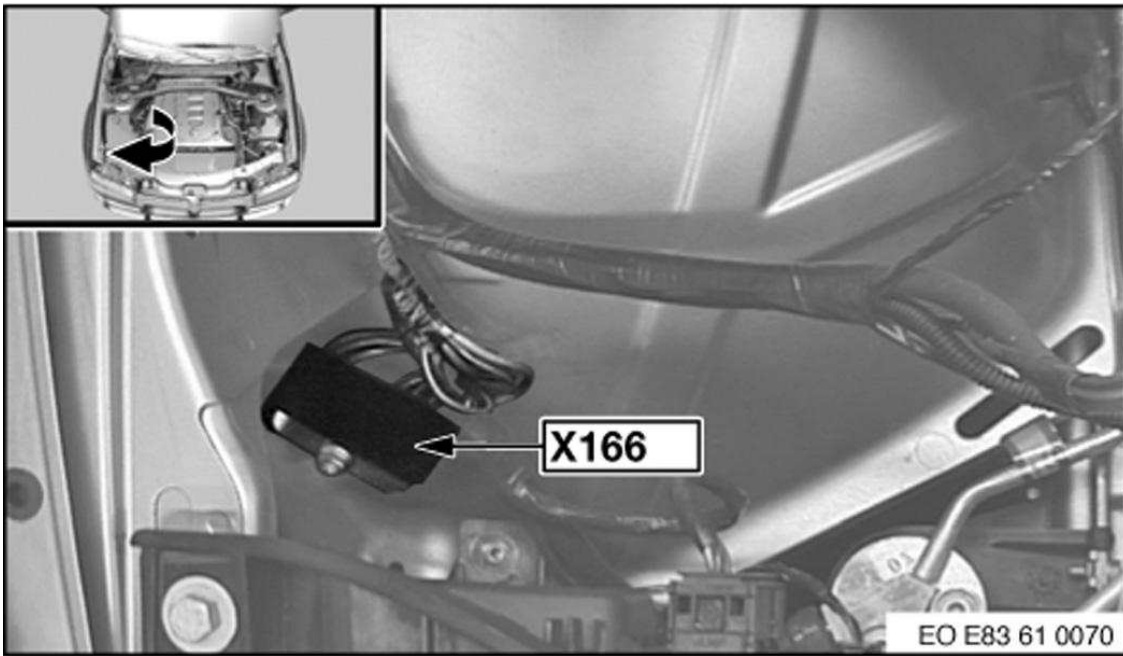
COMPONENT LOCATION GRAPHICS

NOTE: Figures may show multiple component locations. Refer to appropriate table for proper figure references.



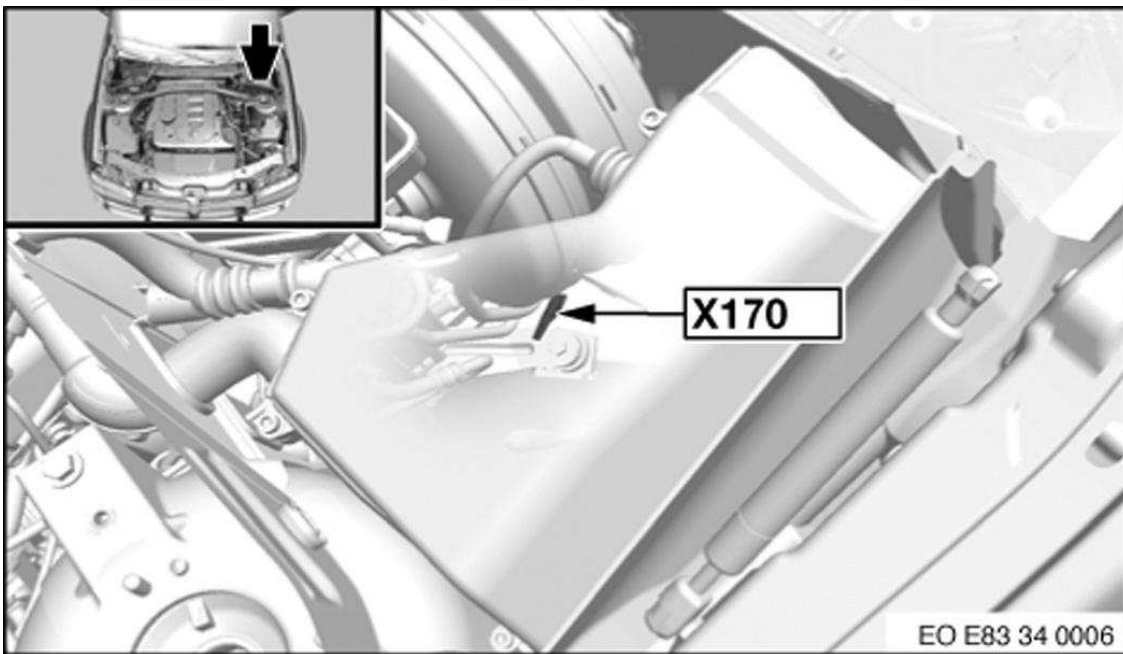
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Fig. 1: Right Front Wheelwell
 Courtesy of BMW OF NORTH AMERICA, INC.



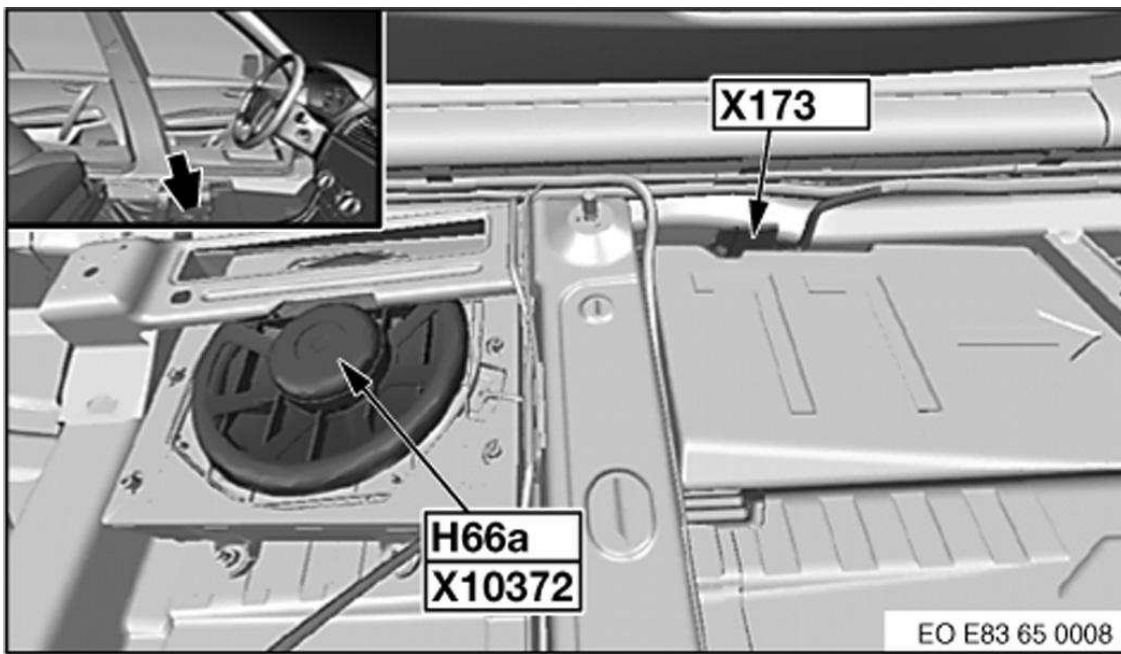
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Fig. 2: Right Front Of Engine Compartment
Courtesy of BMW OF NORTH AMERICA, INC.



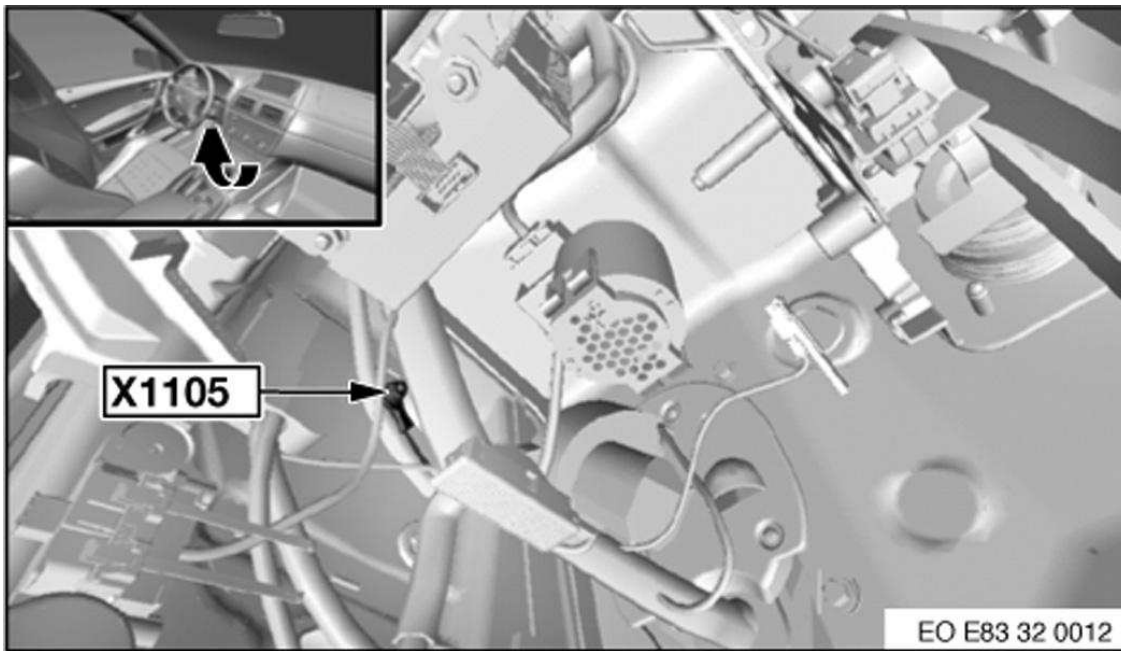
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Fig. 3: Left Rear Of Engine Compartment
Courtesy of BMW OF NORTH AMERICA, INC.



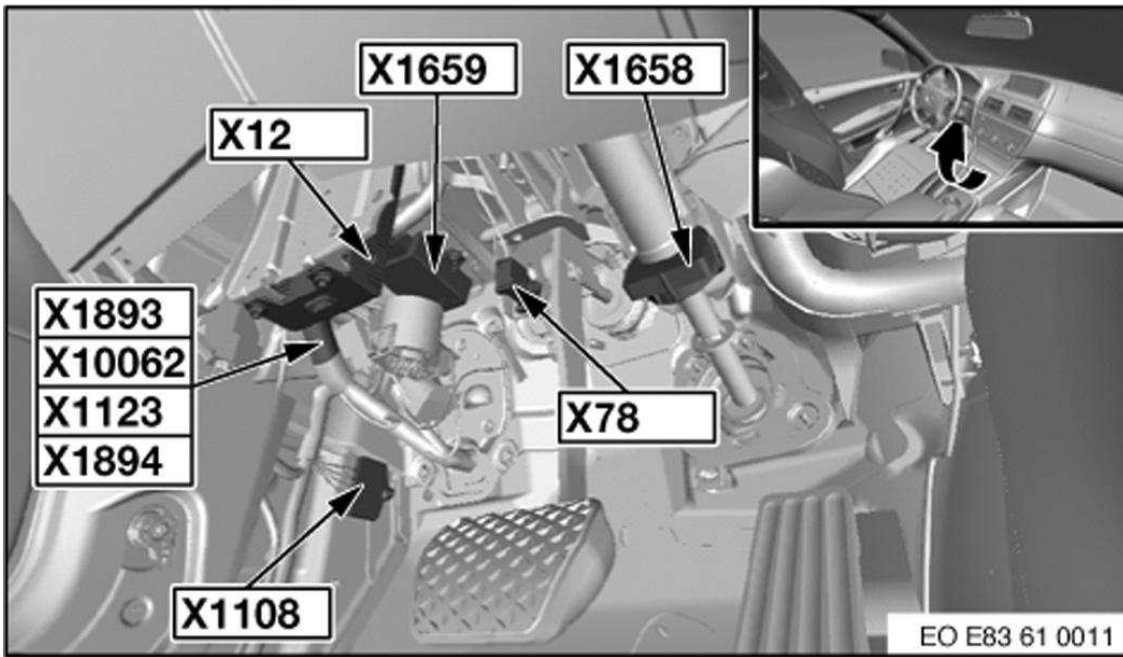
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Fig. 4: Below Driver's Seat
Courtesy of BMW OF NORTH AMERICA, INC.



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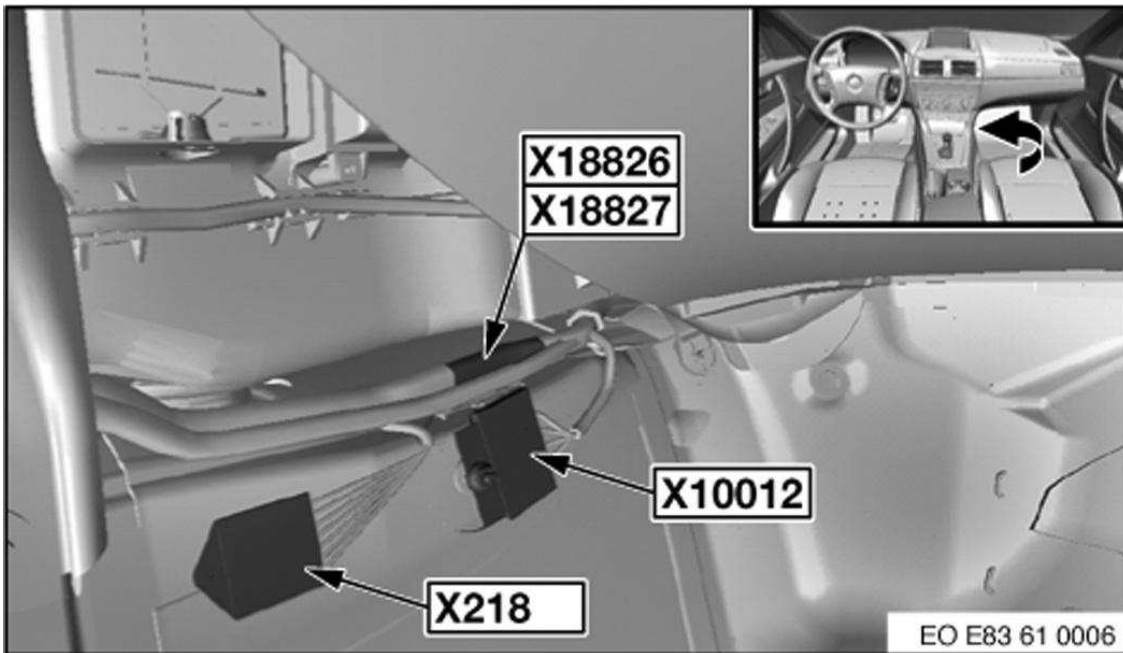
Fig. 5: Left Side Of Dash
Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 6: Left Kick Panel

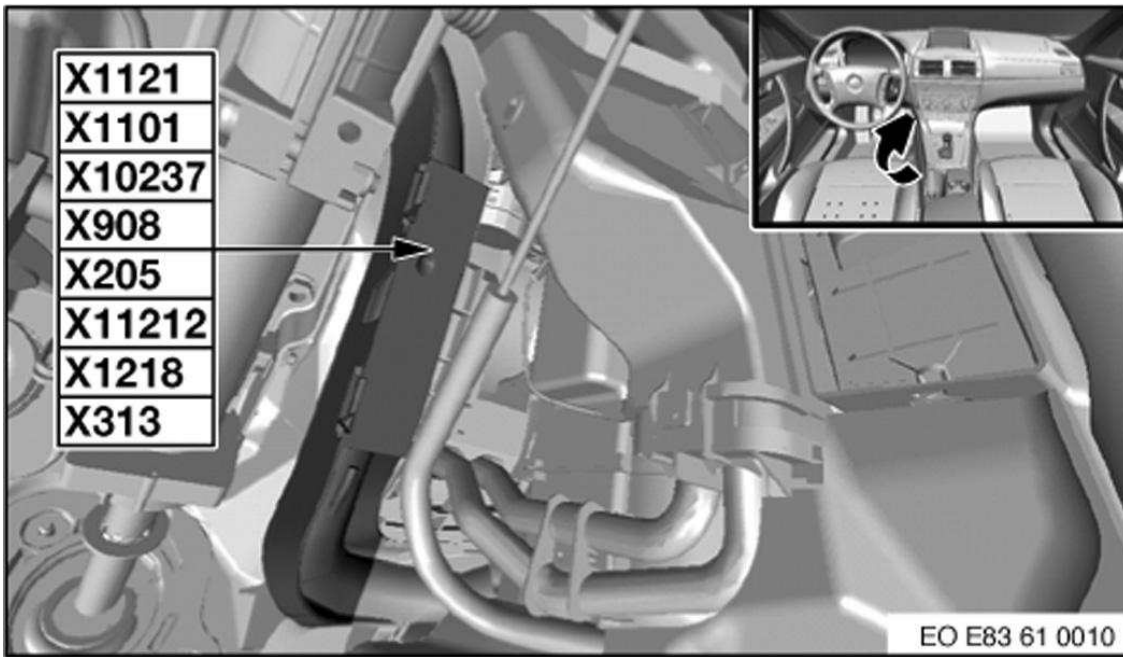
Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 7: Center Of Dash

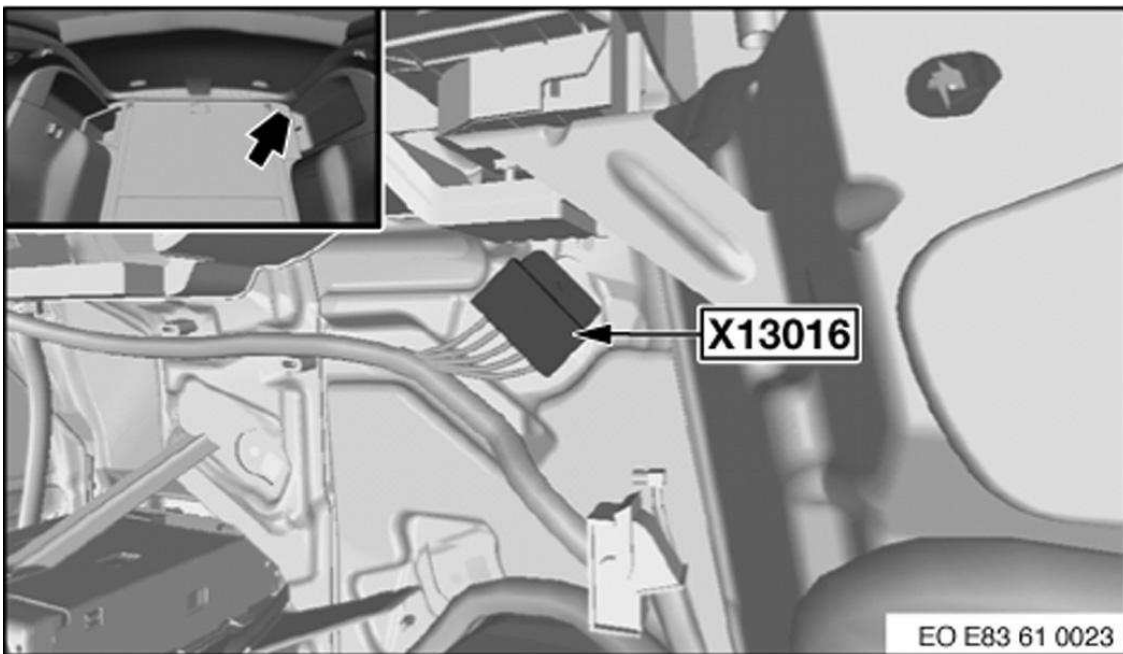
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Fig. 8: Center Of Dash

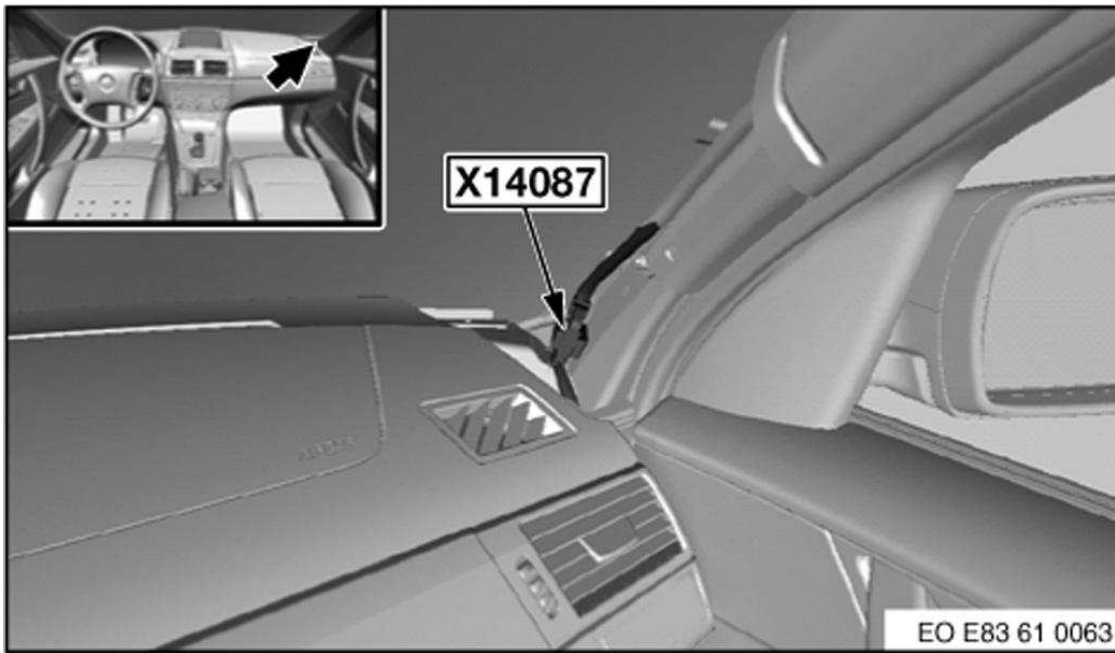
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Fig. 9: Right Side Of Luggage Compartment

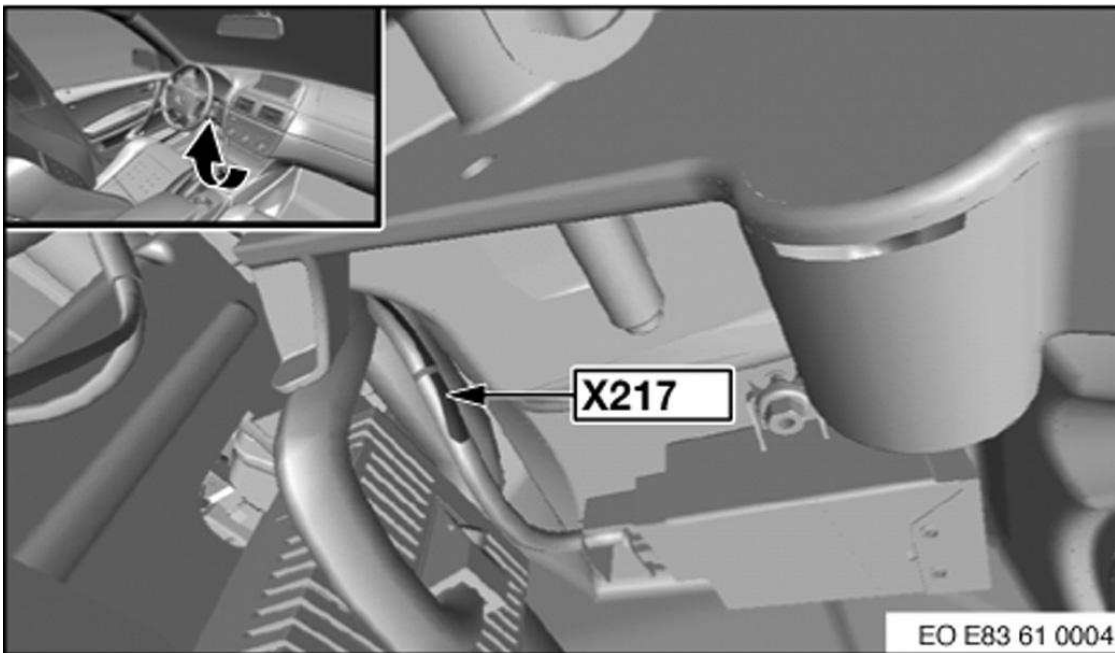
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Fig. 10: Right "A" Pillar

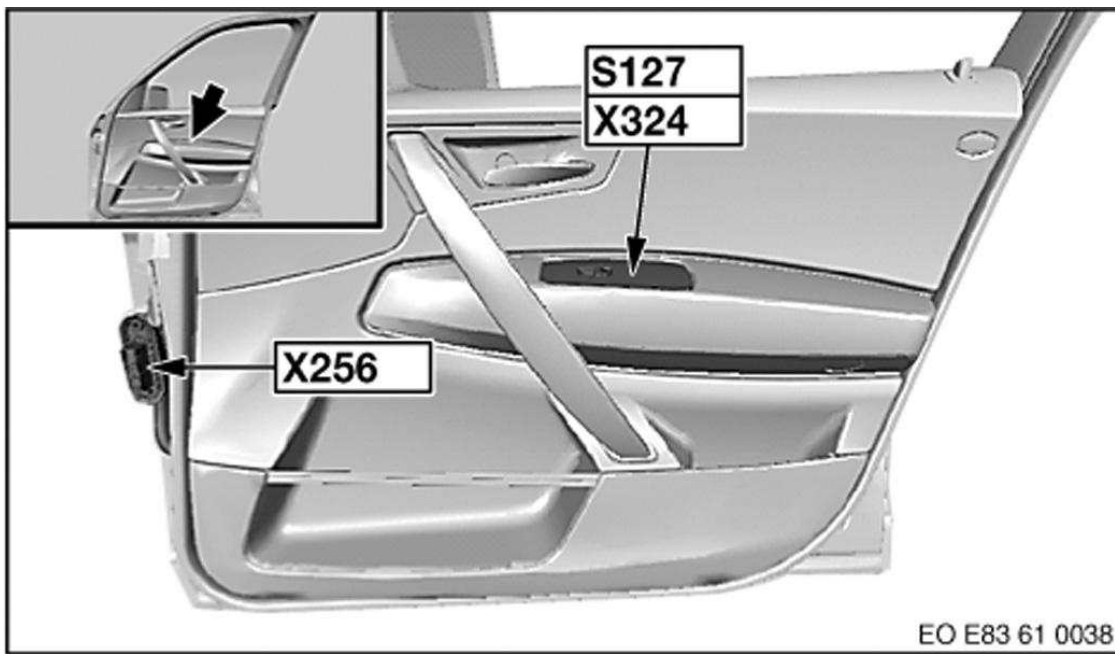
Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 11: Left Side Of Dash

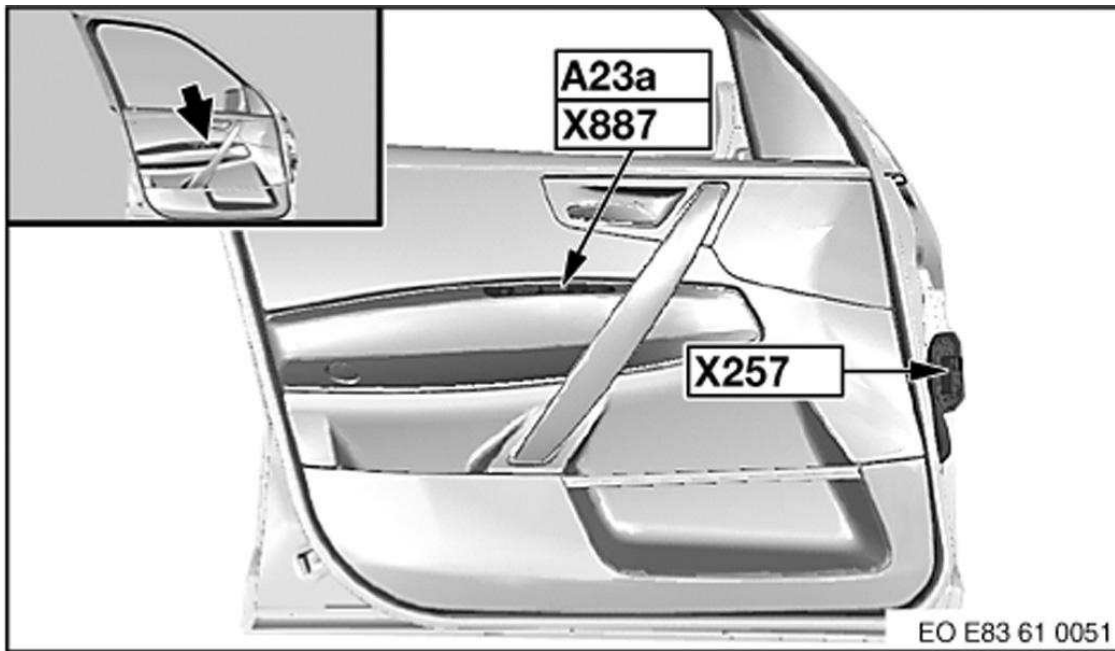
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Fig. 12: Right Front Door

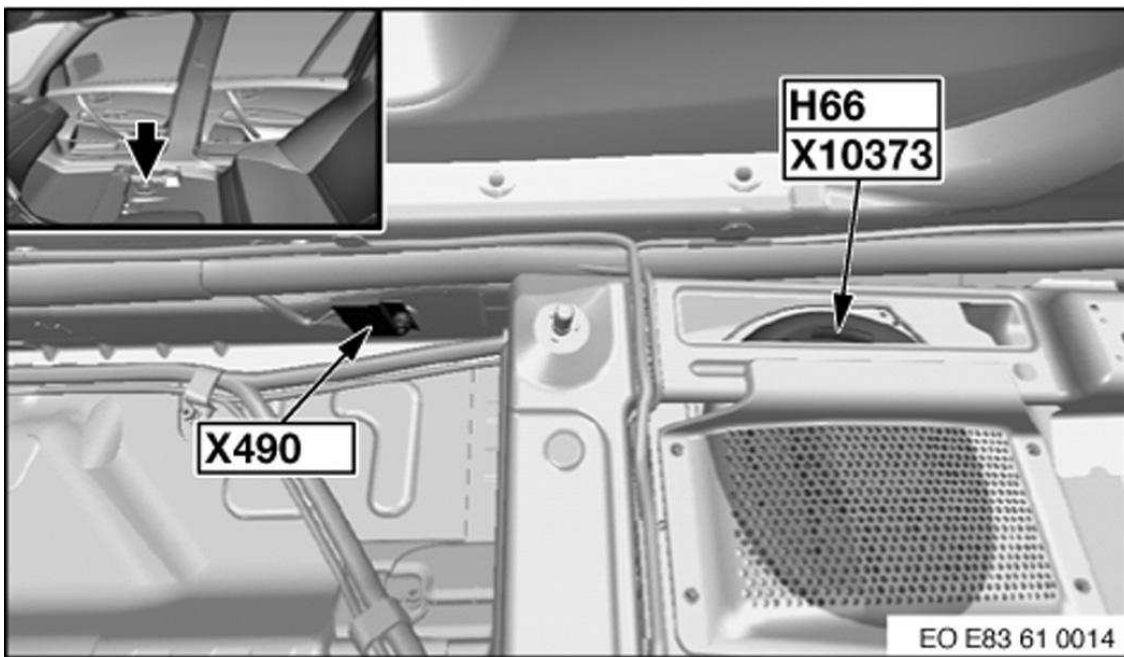
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Fig. 13: Left Front Door

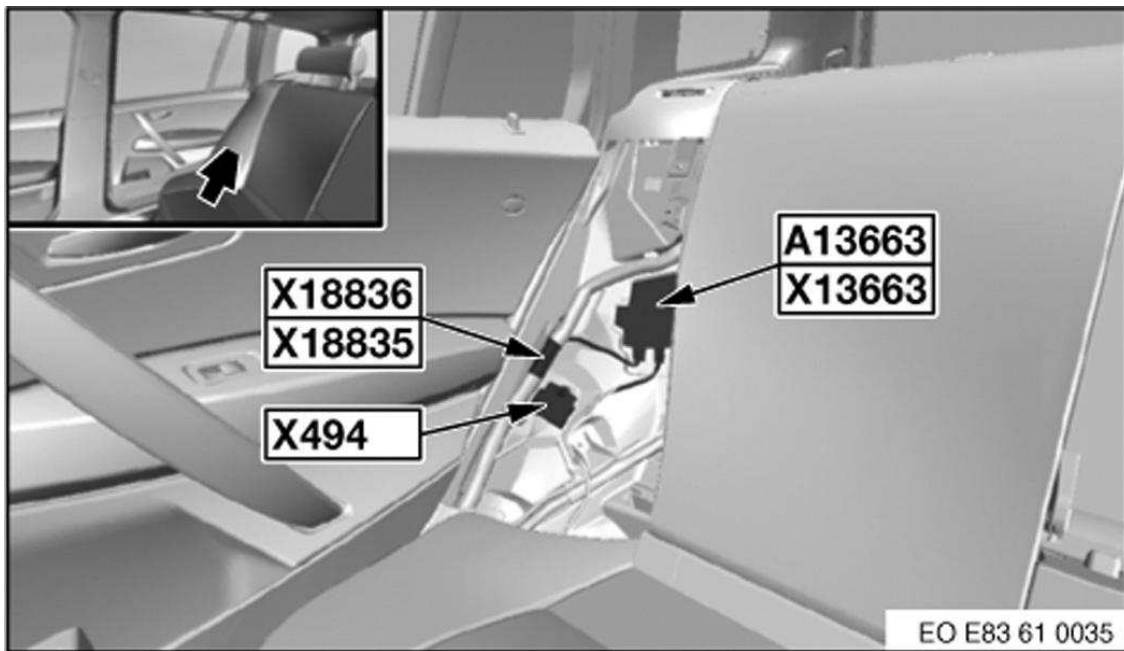
Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 14: Right Door Sill

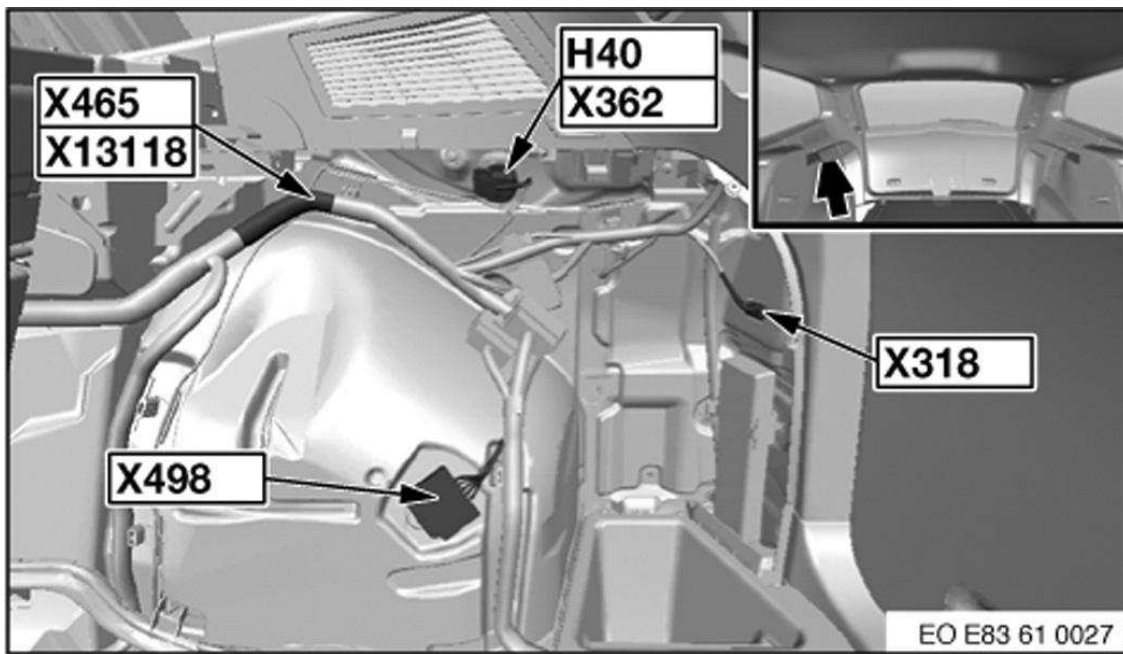
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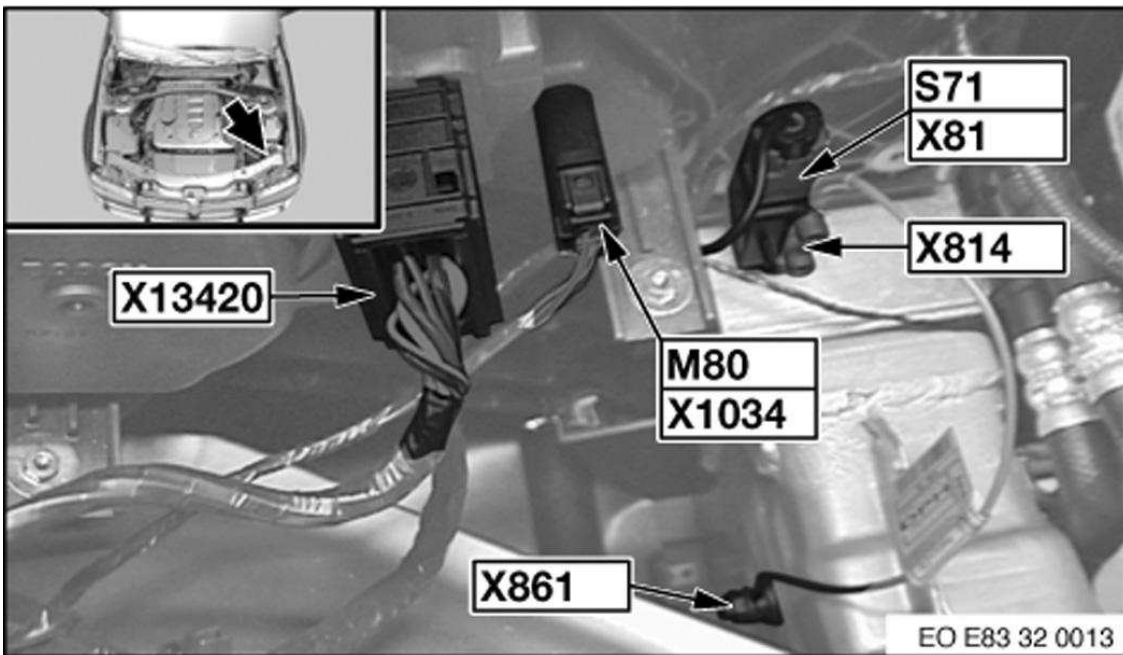
Fig. 15: Right Side Of Rear Seat

Courtesy of BMW OF NORTH AMERICA, INC.



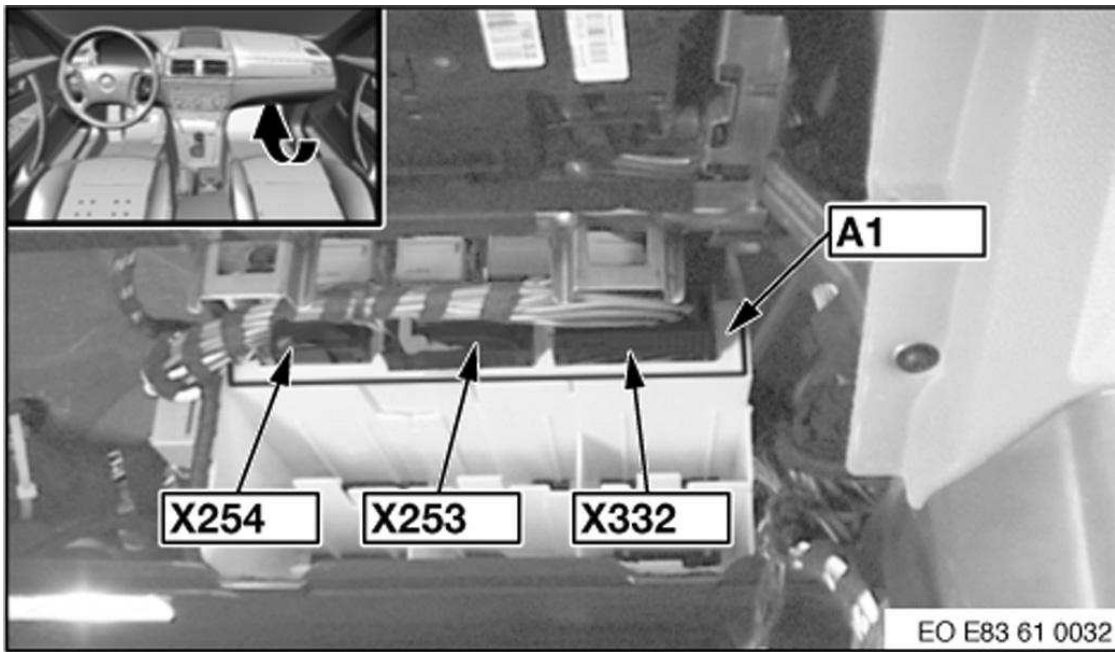
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Fig. 16: Right Side Of Luggage Compartment
 Courtesy of BMW OF NORTH AMERICA, INC.



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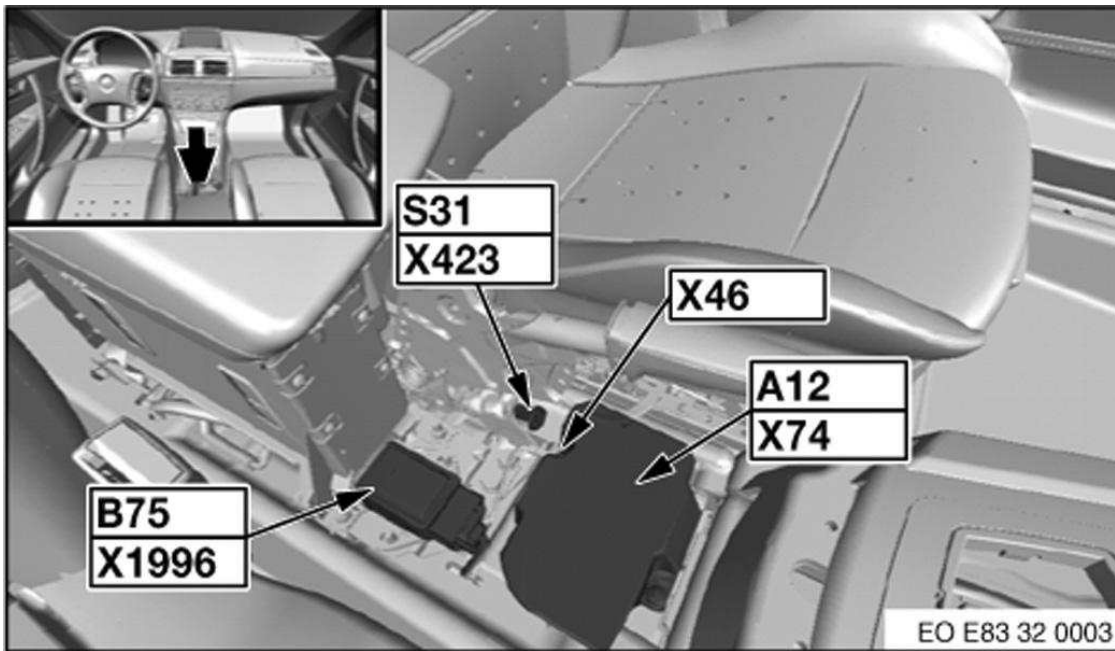
Fig. 17: Left Front Of Engine Compartment
 Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 18: Right Side Of Dash

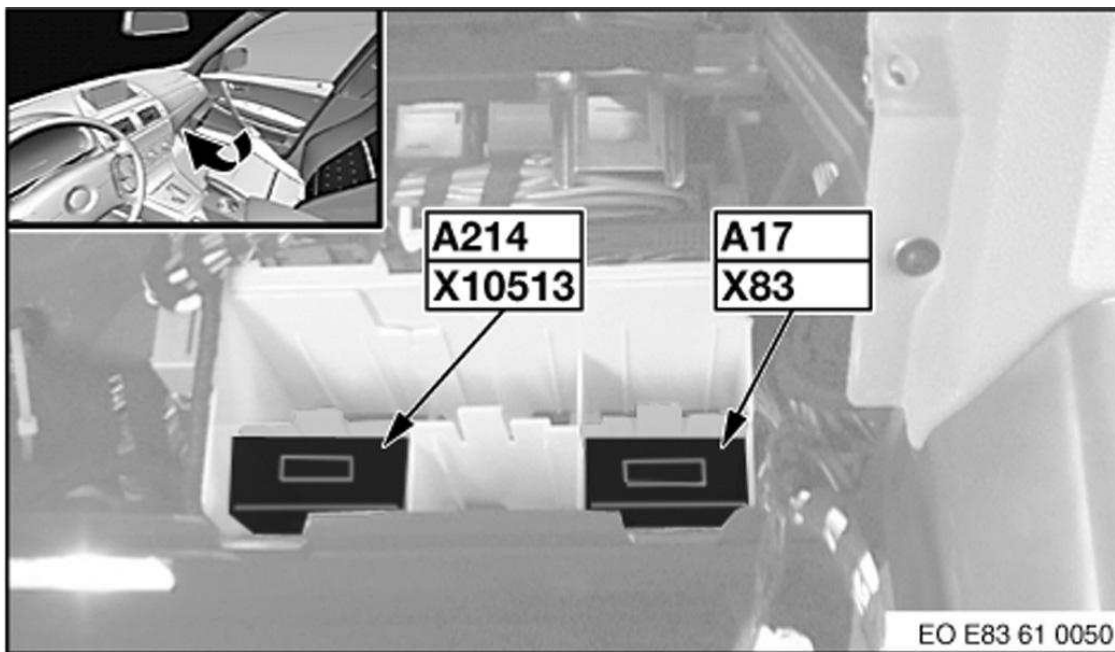
Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 19: Center Console

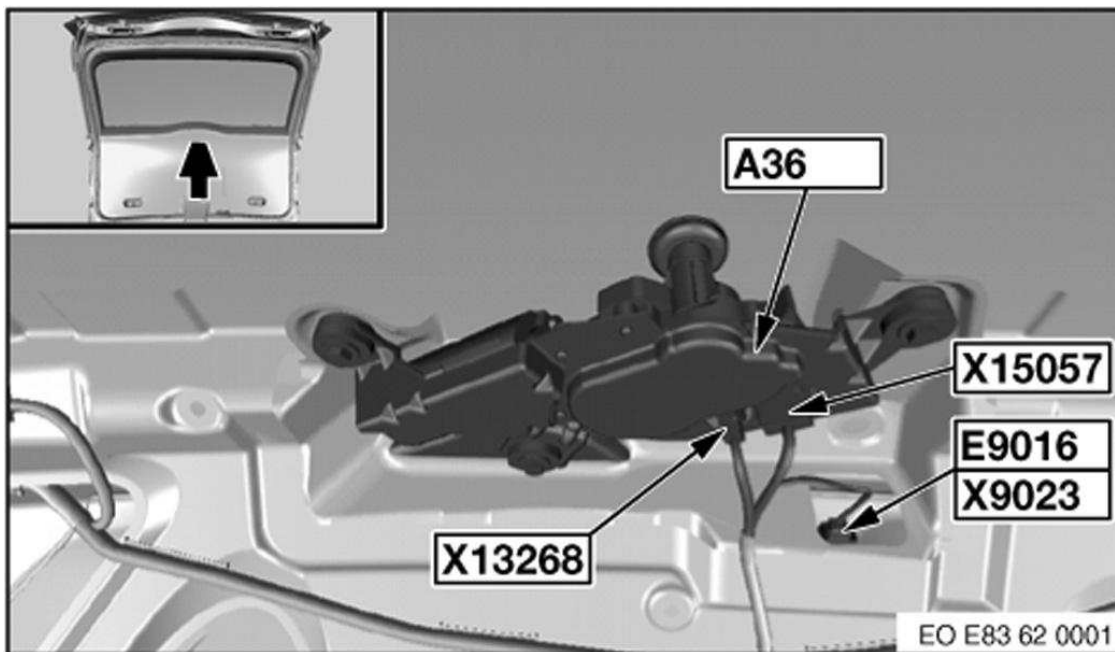
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Fig. 20: Right Side Of Dash

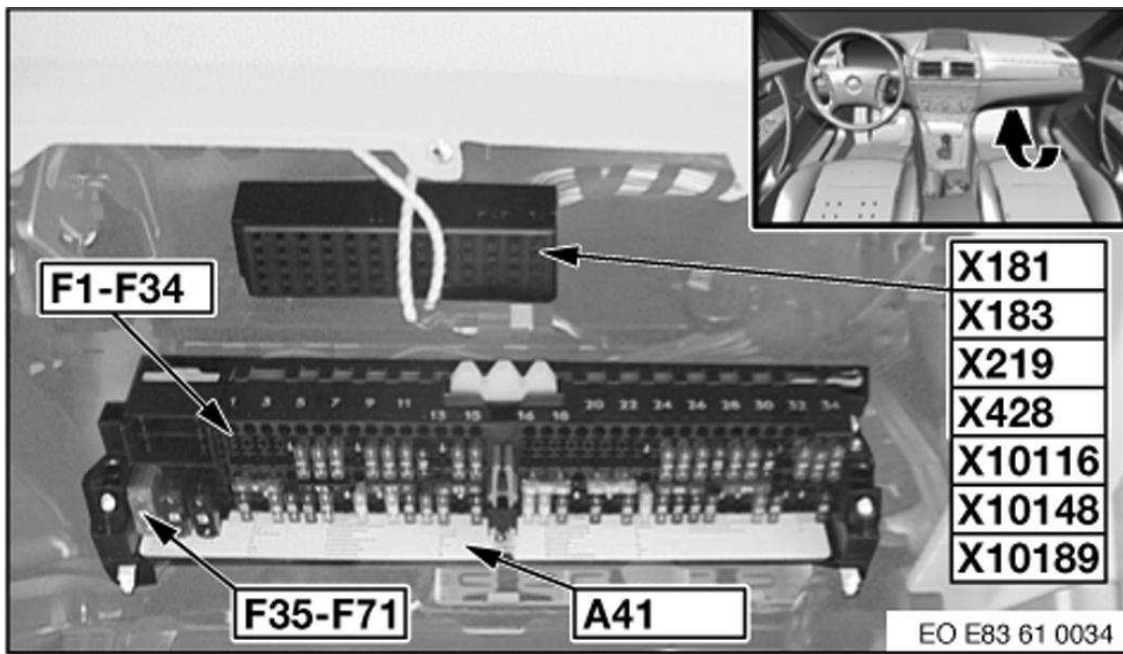
Courtesy of BMW OF NORTH AMERICA, INC.



G00365172

Fig. 21: Liftgate

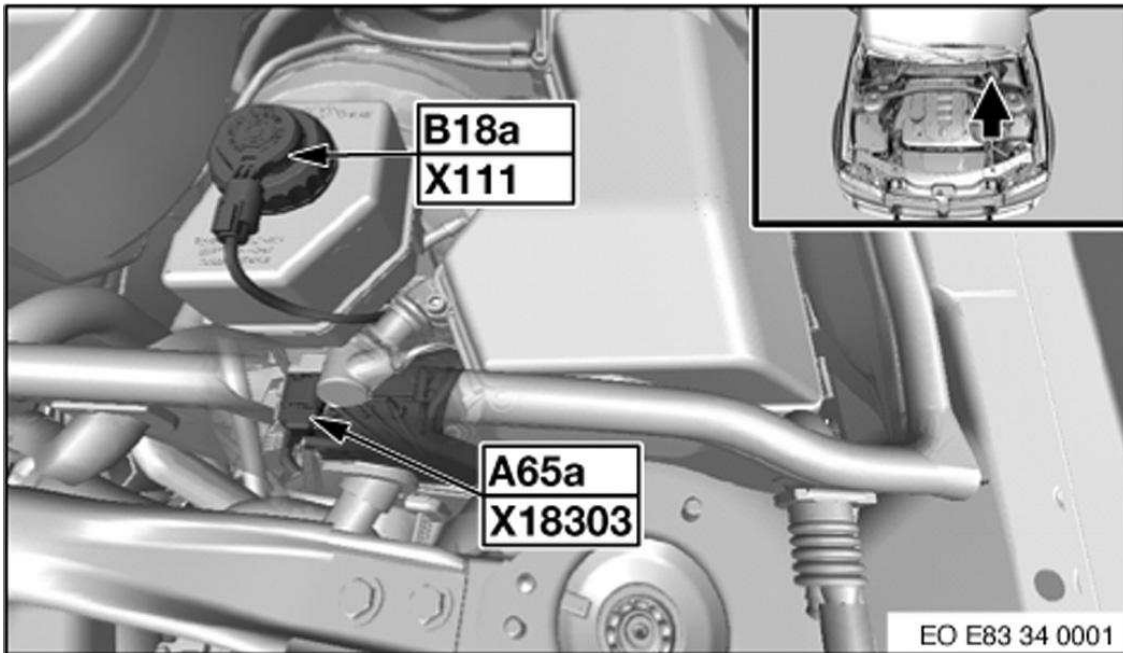
Courtesy of BMW OF NORTH AMERICA, INC.



G00365173

Fig. 22: Right Side Of Dash

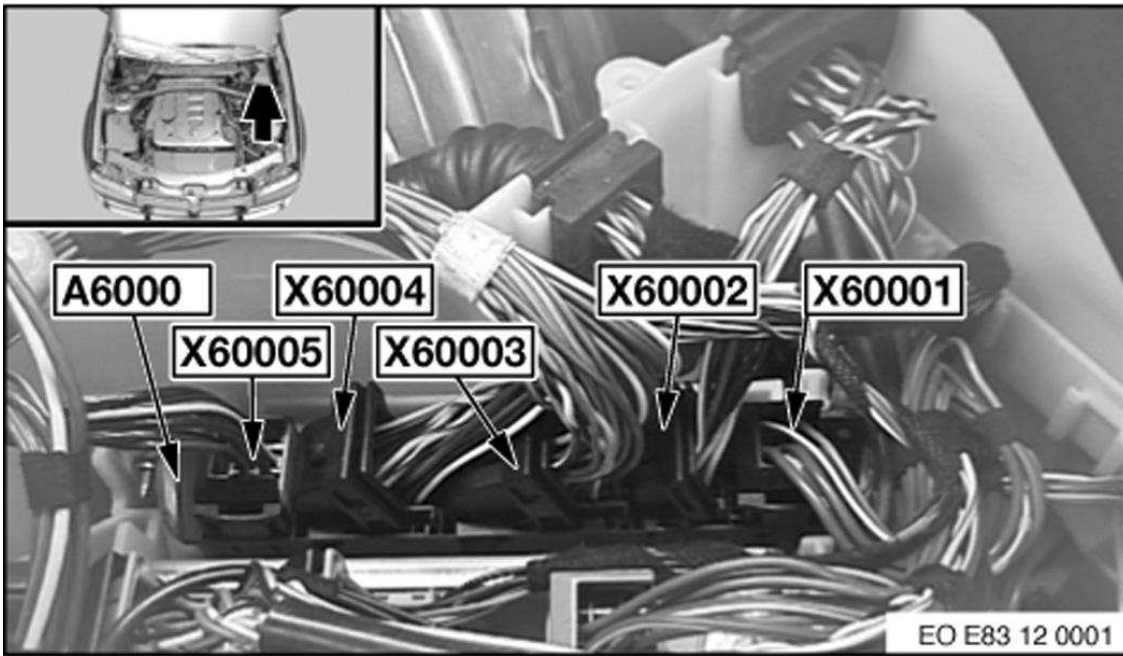
Courtesy of BMW OF NORTH AMERICA, INC.



G00365174

Fig. 23: Left Rear Of Engine Compartment

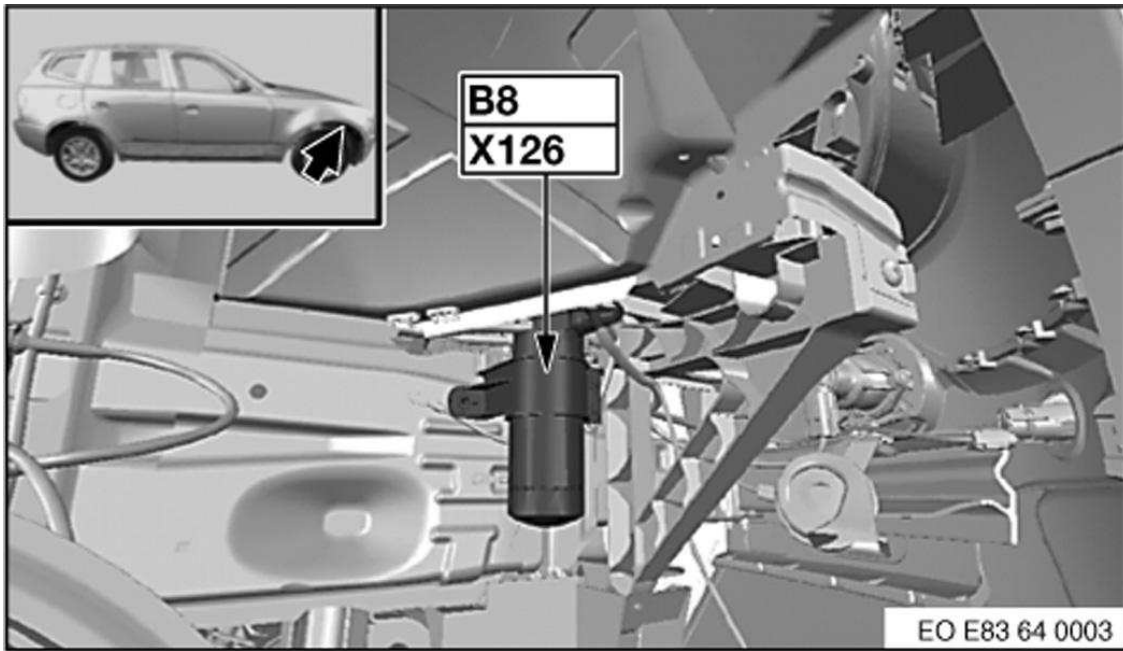
Courtesy of BMW OF NORTH AMERICA, INC.



G00365175

Fig. 24: Left Rear Of Engine Compartment

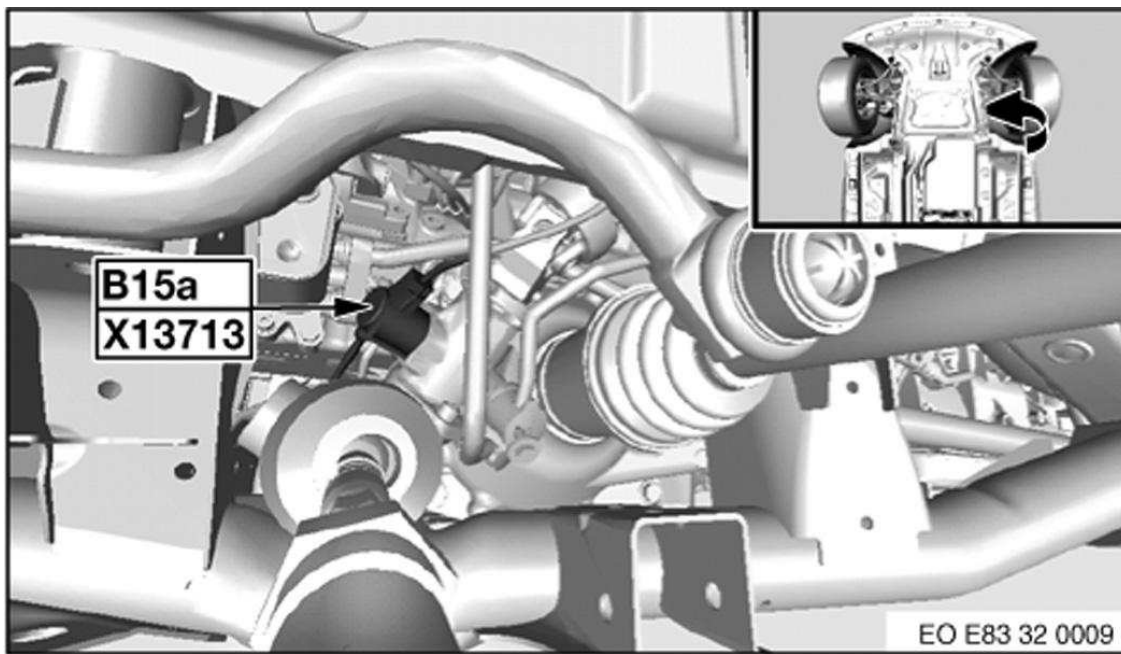
Courtesy of BMW OF NORTH AMERICA, INC.



G00365176

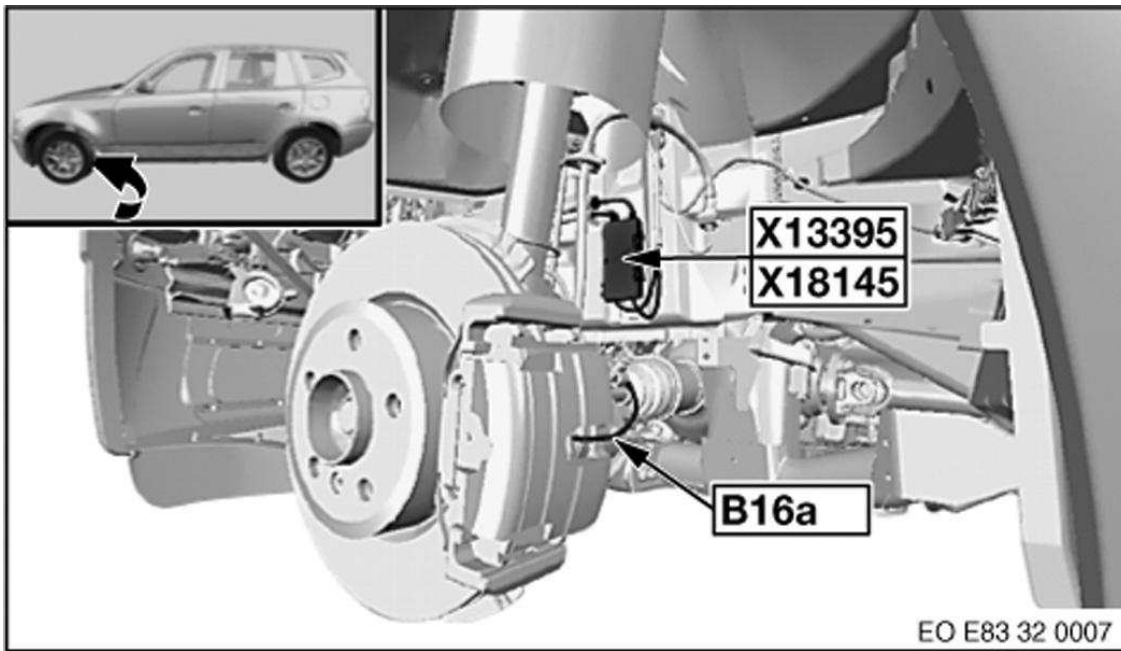
Fig. 25: Right Front Wheelwell

Courtesy of BMW OF NORTH AMERICA, INC.



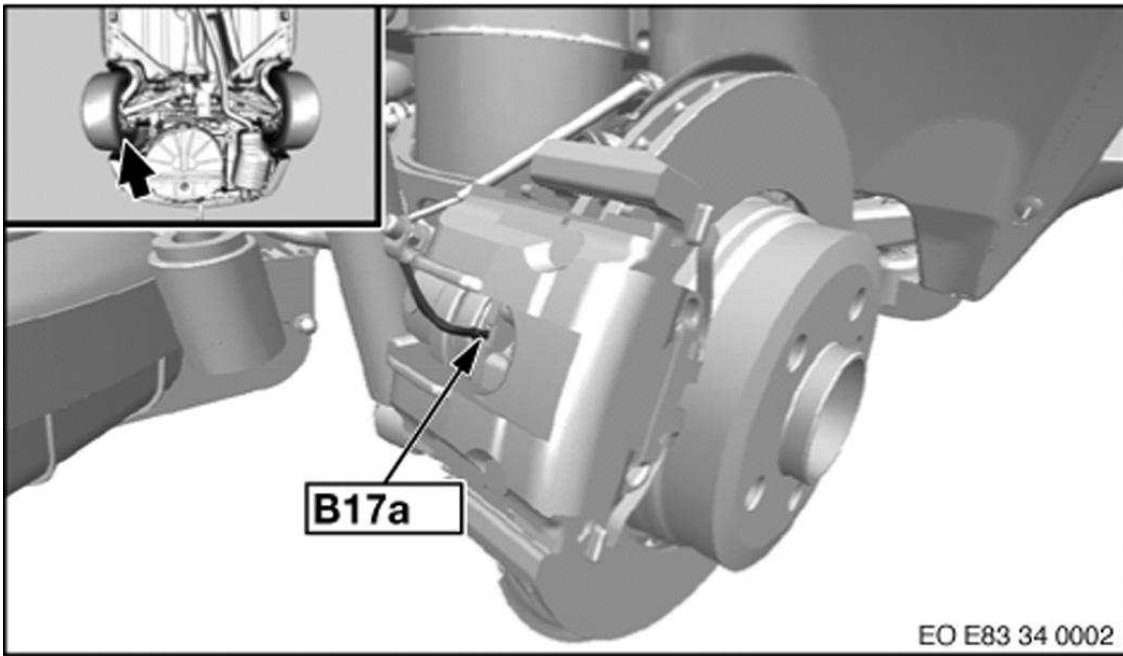
G00365177

Fig. 26: Under Left Front Of Vehicle
Courtesy of BMW OF NORTH AMERICA, INC.



G00365178

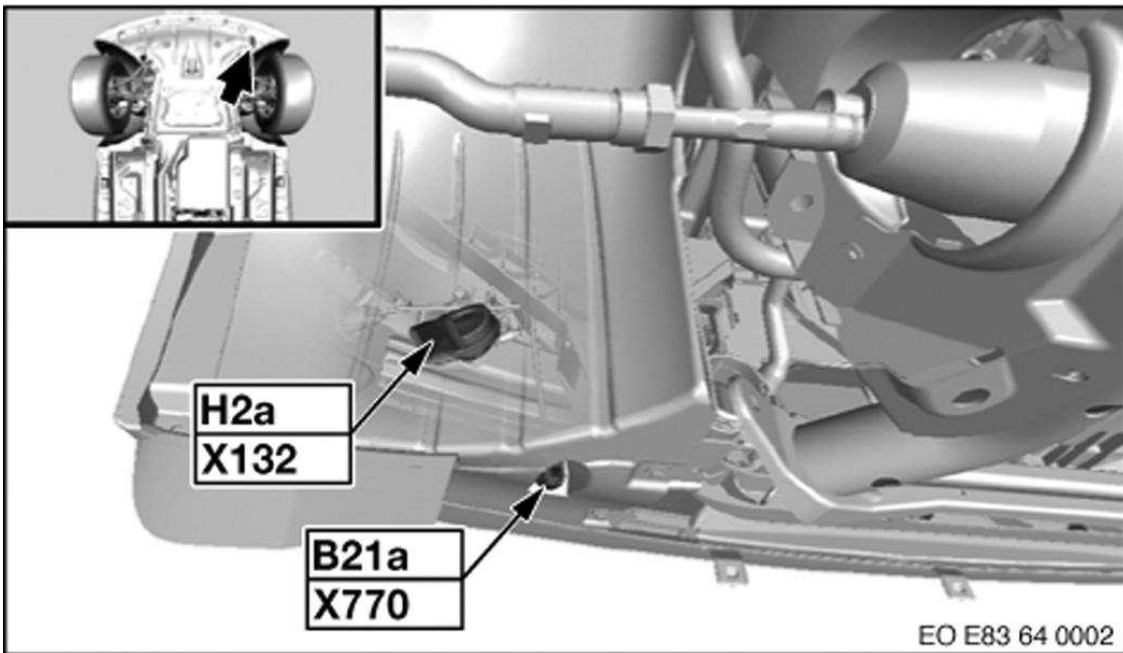
Fig. 27: Left Front Wheel
Courtesy of BMW OF NORTH AMERICA, INC.



G00365179

Fig. 28: Right Rear Wheel

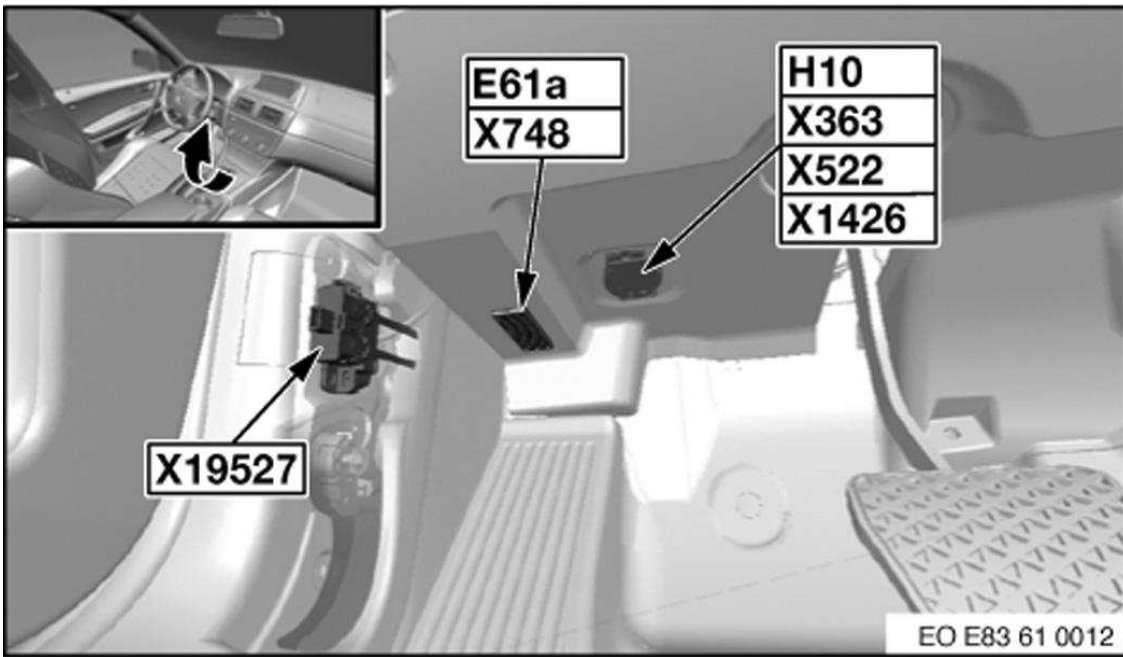
Courtesy of BMW OF NORTH AMERICA, INC.



G00365181

Fig. 29: Left Front Wheelwell

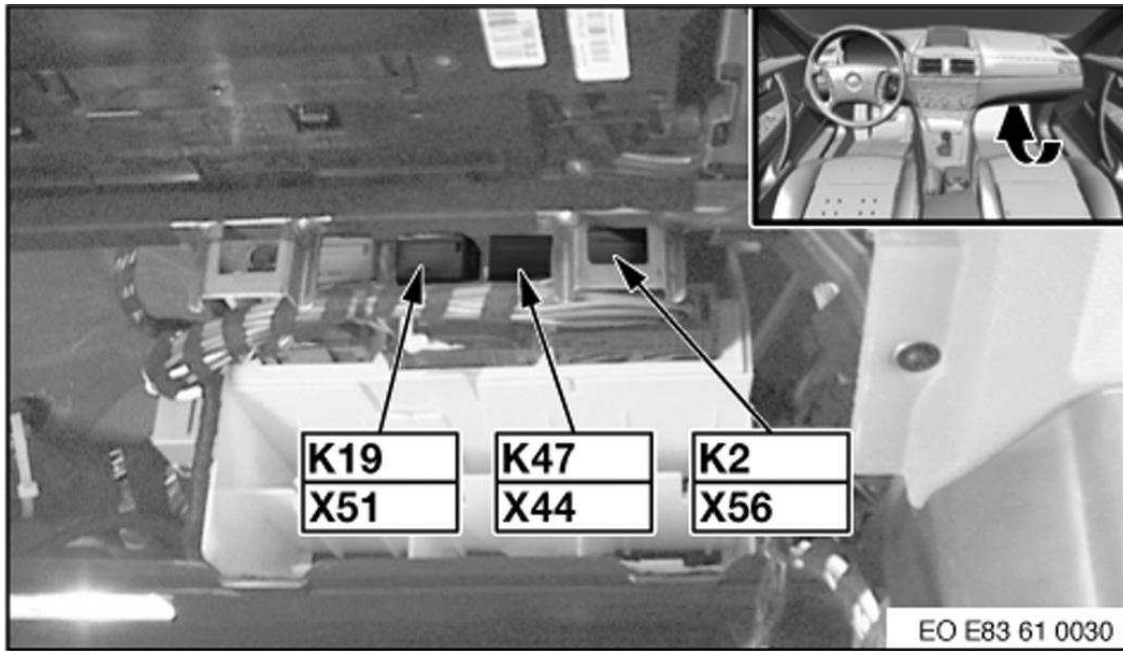
Courtesy of BMW OF NORTH AMERICA, INC.



G00365183

Fig. 30: Left Side Of Dash

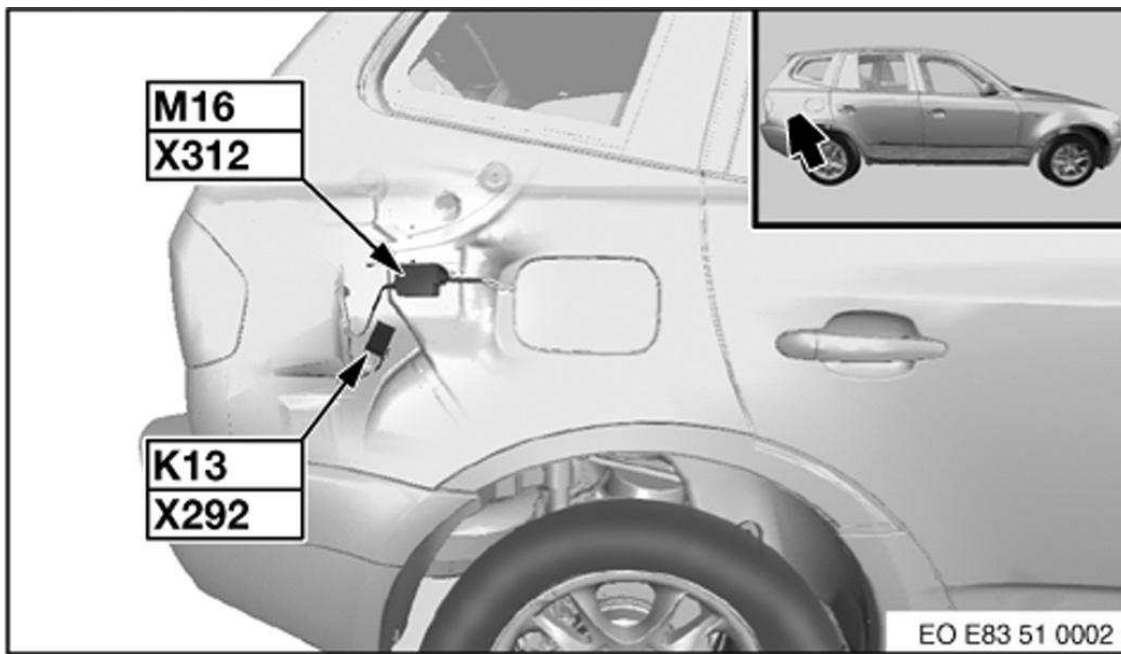
Courtesy of BMW OF NORTH AMERICA, INC.



G00365184

Fig. 31: Right Side Of Dash

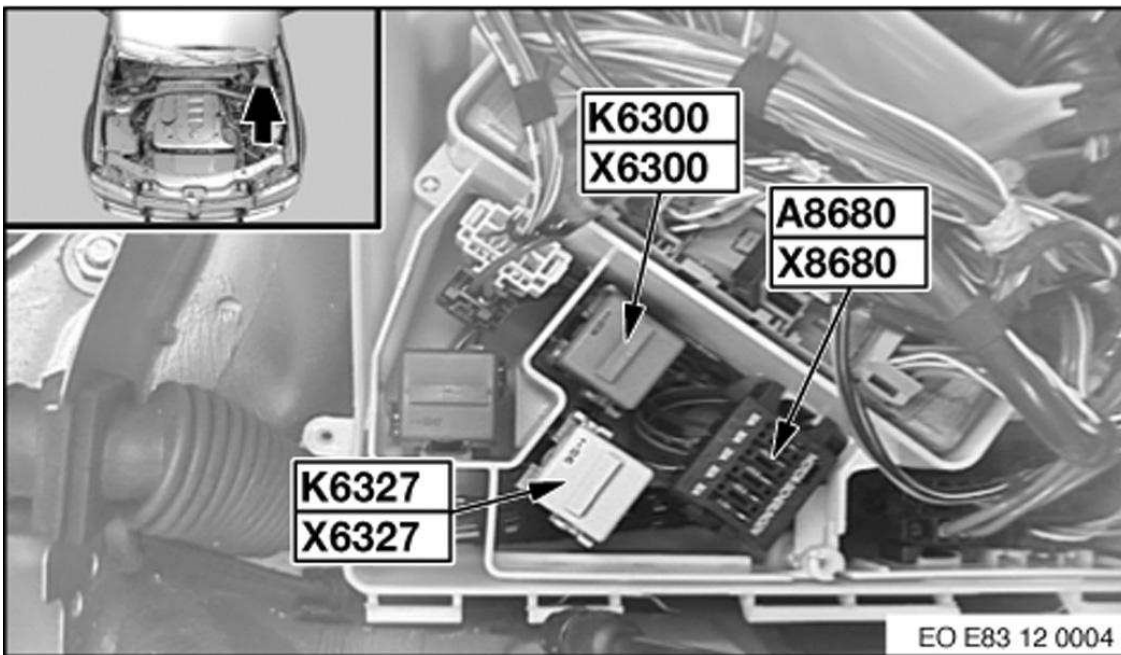
Courtesy of BMW OF NORTH AMERICA, INC.



G00365186

Fig. 32: Right Rear Quarterpanel

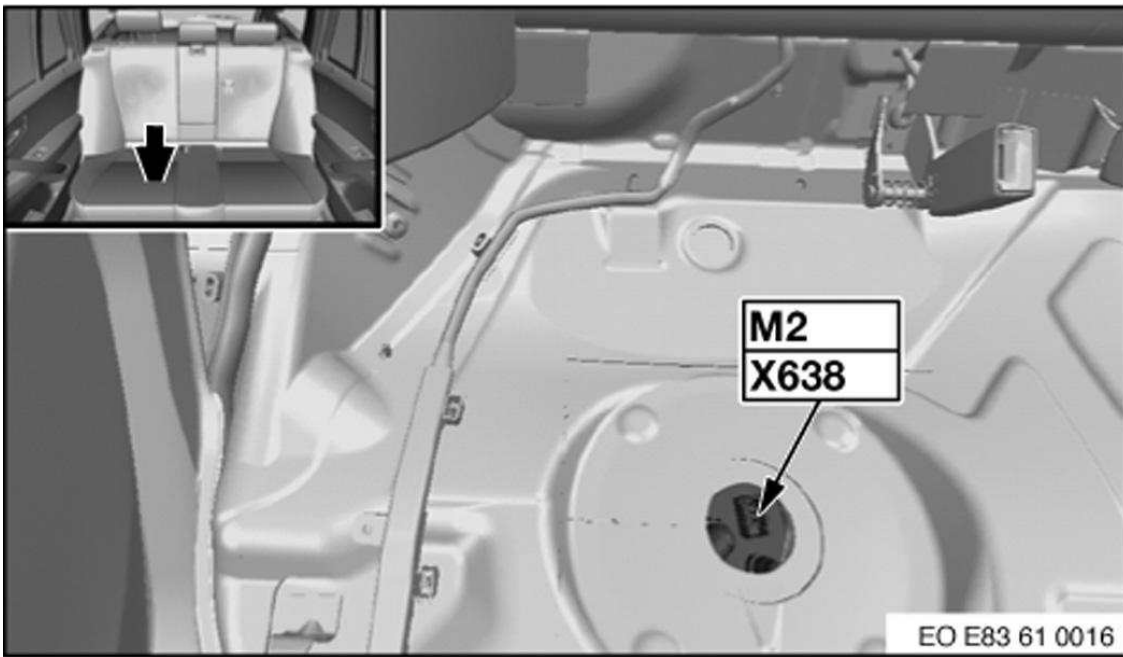
Courtesy of BMW OF NORTH AMERICA, INC.



G00365187

Fig. 33: Left Rear Of Engine Compartment

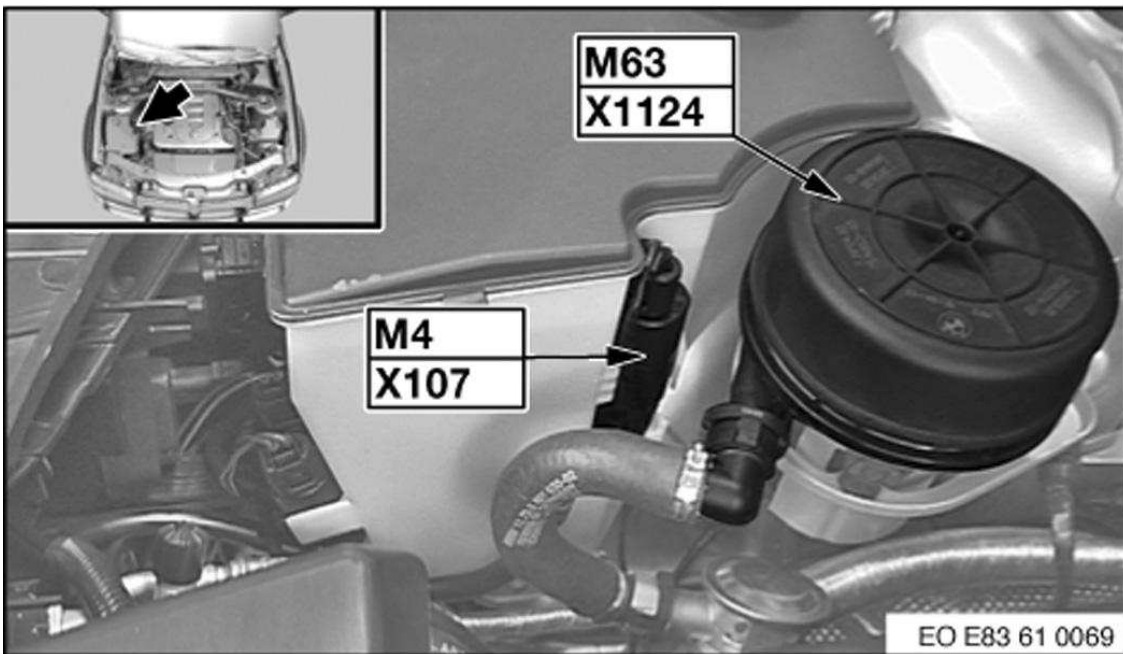
Courtesy of BMW OF NORTH AMERICA, INC.



G00365188

Fig. 34: Below Right Rear Seat

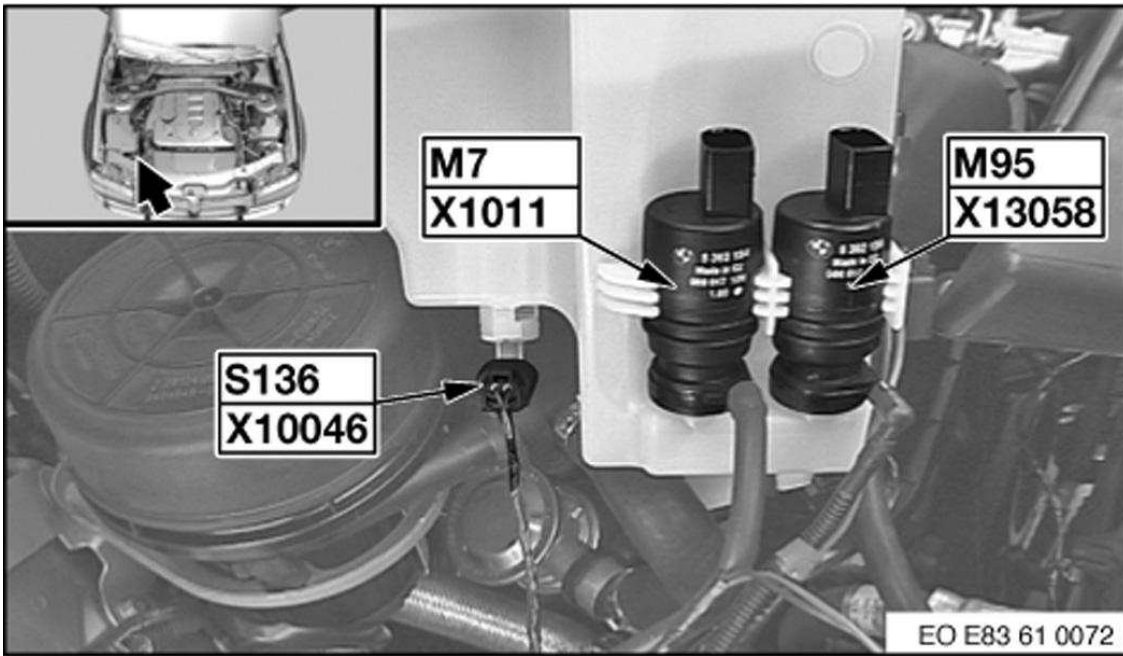
Courtesy of BMW OF NORTH AMERICA, INC.



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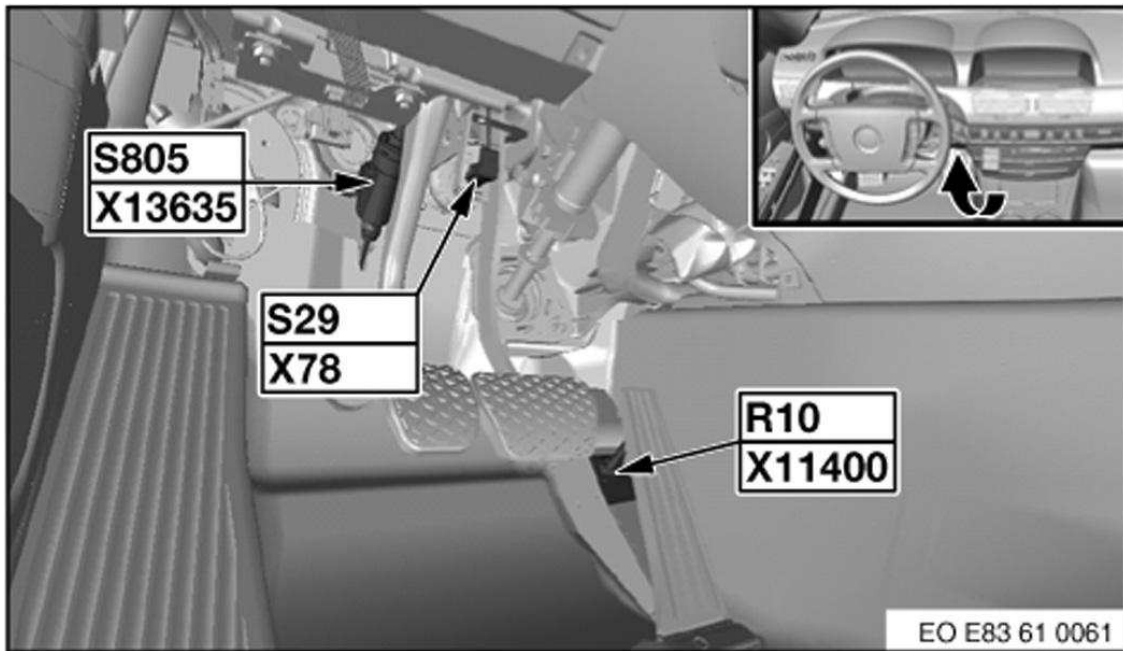
Fig. 35: Right Side Of Engine Compartment

Courtesy of BMW OF NORTH AMERICA, INC.



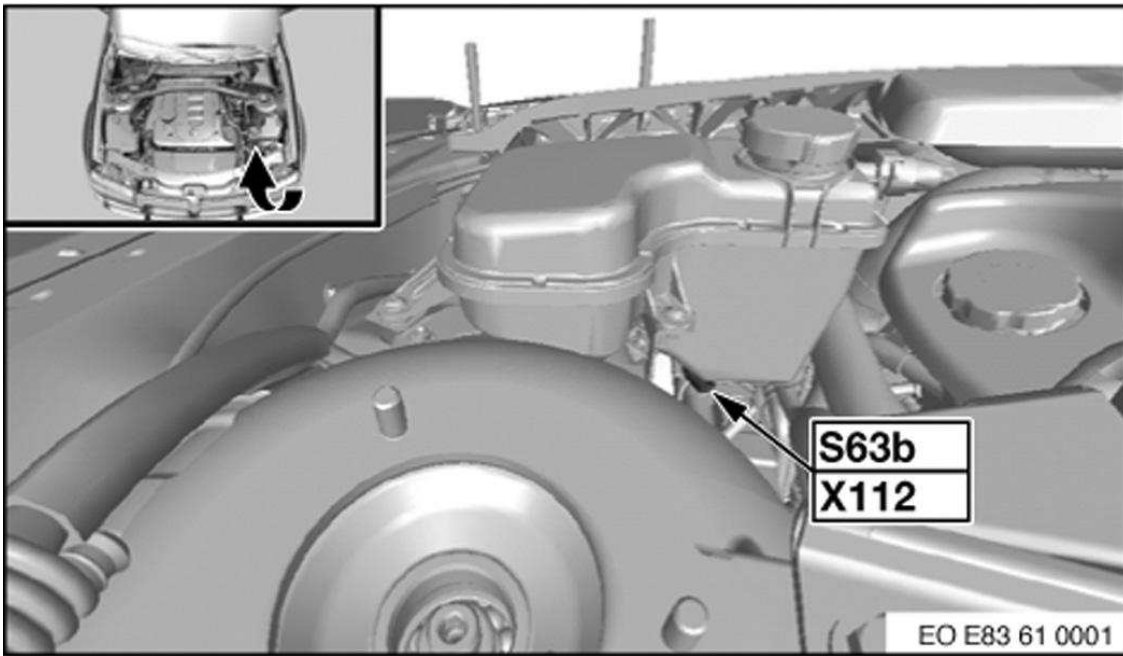
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Fig. 36: Right Front Of Engine Compartment
 Courtesy of BMW OF NORTH AMERICA, INC.



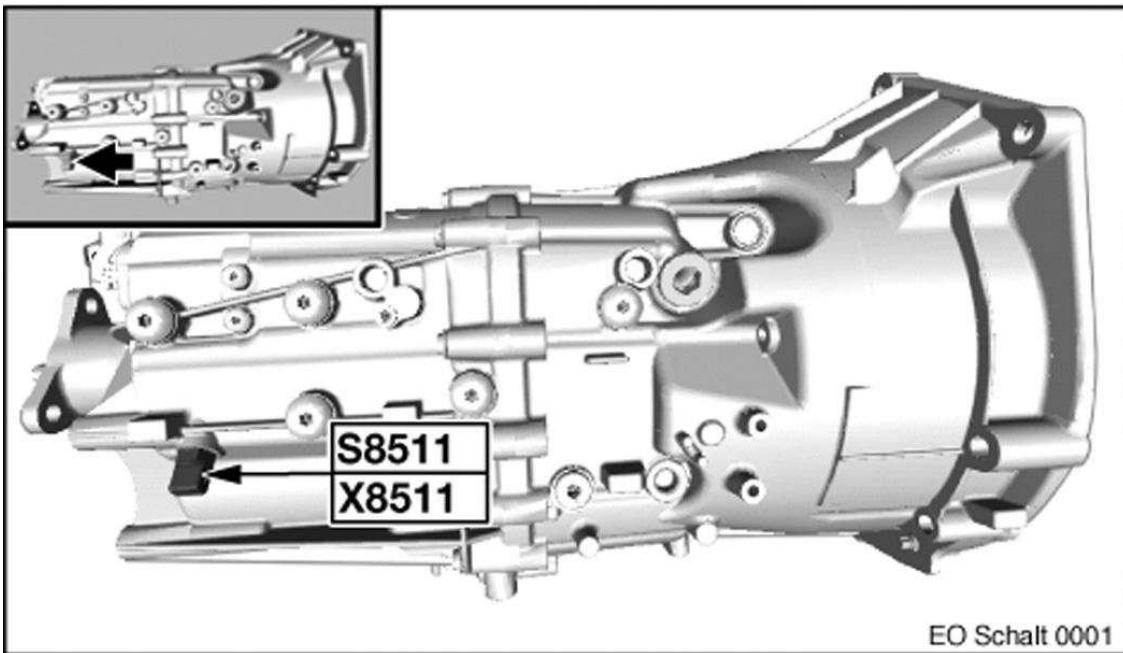
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Fig. 37: Under Left Side Of Dash
 Courtesy of BMW OF NORTH AMERICA, INC.



G00365193

Fig. 38: Left Front Of Engine Compartment
Courtesy of BMW OF NORTH AMERICA, INC.



G00365195

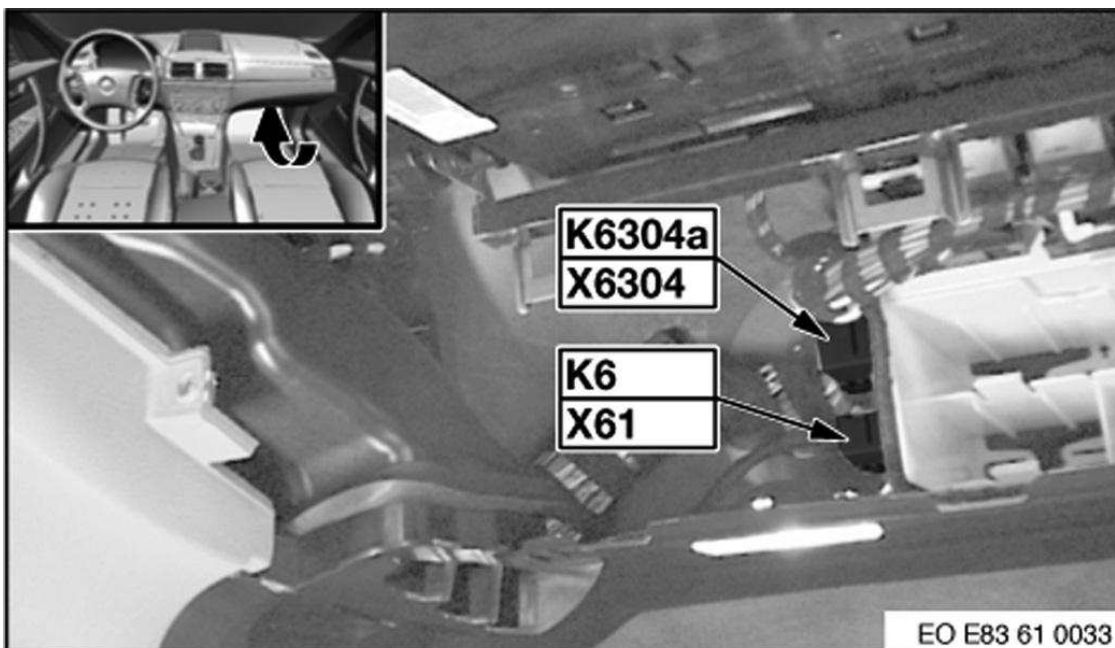
Fig. 39: Right Rear Side Of Transmission
Courtesy of BMW OF NORTH AMERICA, INC.



G00444404

Fig. 40: Under Right Side Of Dash

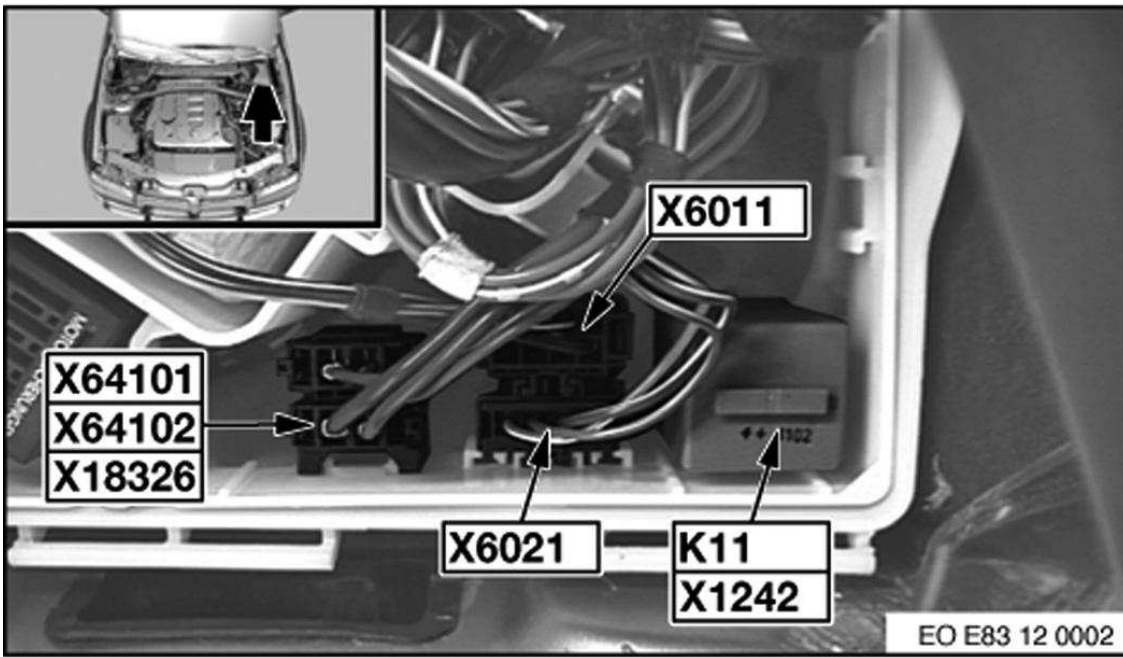
Courtesy of BMW OF NORTH AMERICA, INC.



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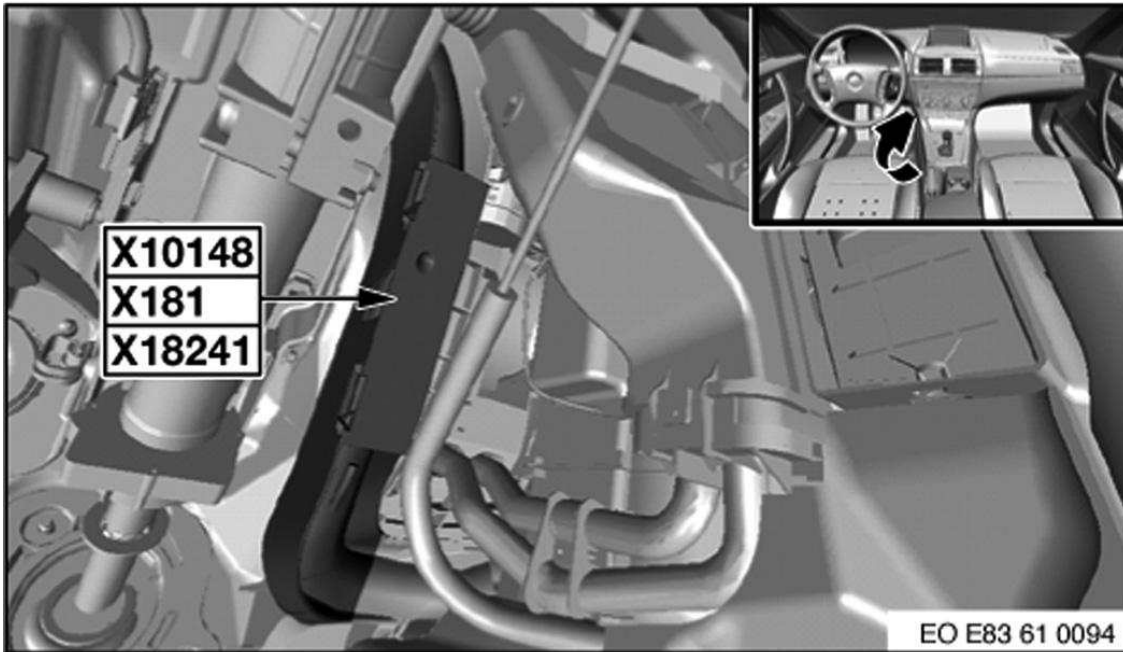
Fig. 41: Under Right Side Of Dash

Courtesy of BMW OF NORTH AMERICA, INC.



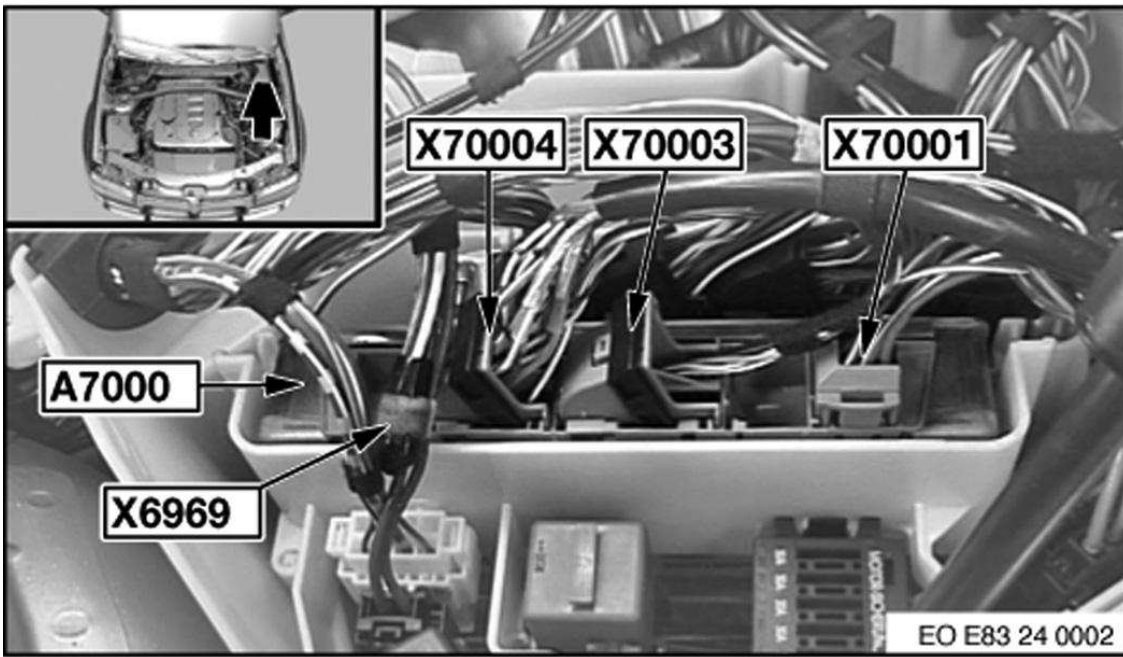
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Fig. 42: Left Rear Of Engine Compartment
 Courtesy of BMW OF NORTH AMERICA, INC.



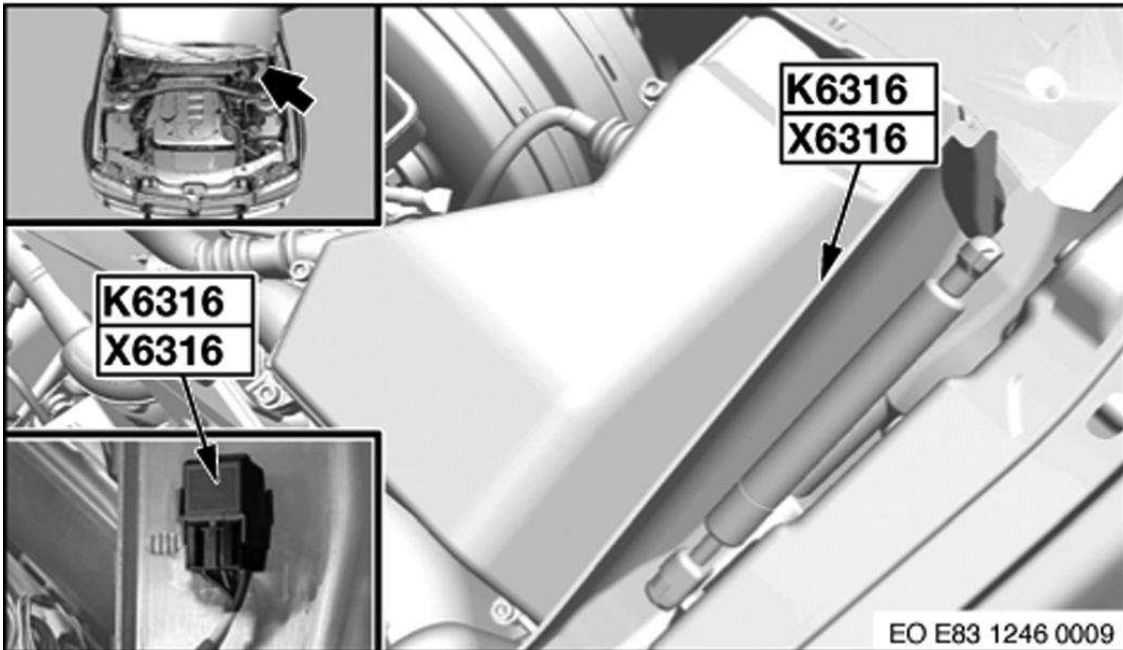
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Fig. 43: Under Left Side Of Dash
 Courtesy of BMW OF NORTH AMERICA, INC.



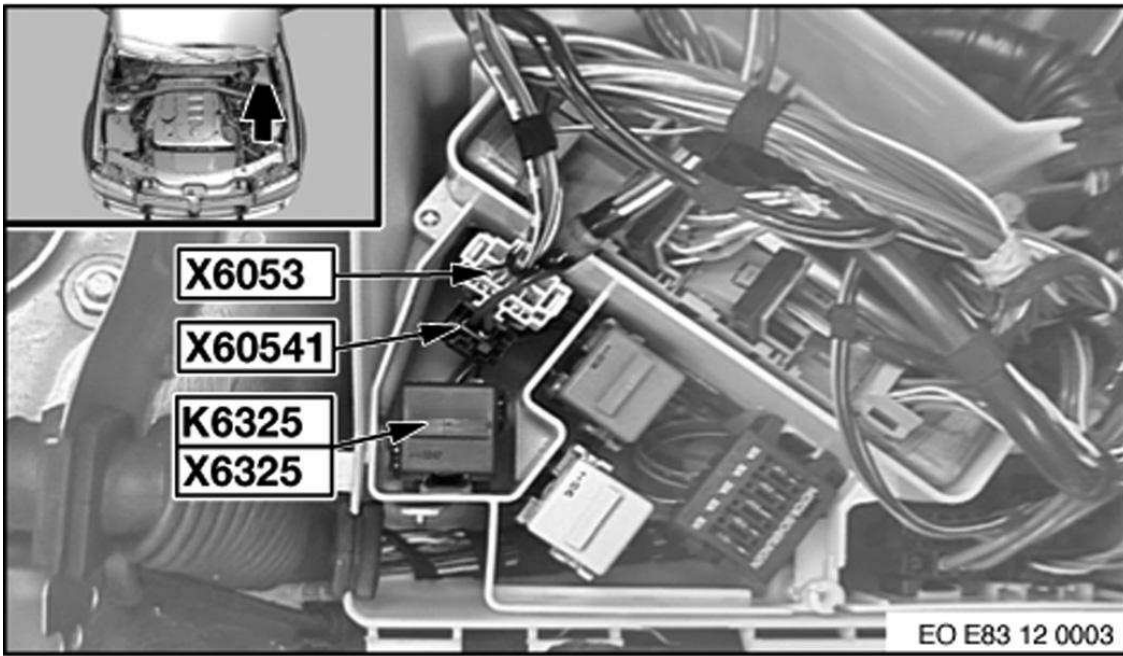
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Fig. 44: Left Rear Of Engine Compartment
 Courtesy of BMW OF NORTH AMERICA, INC.



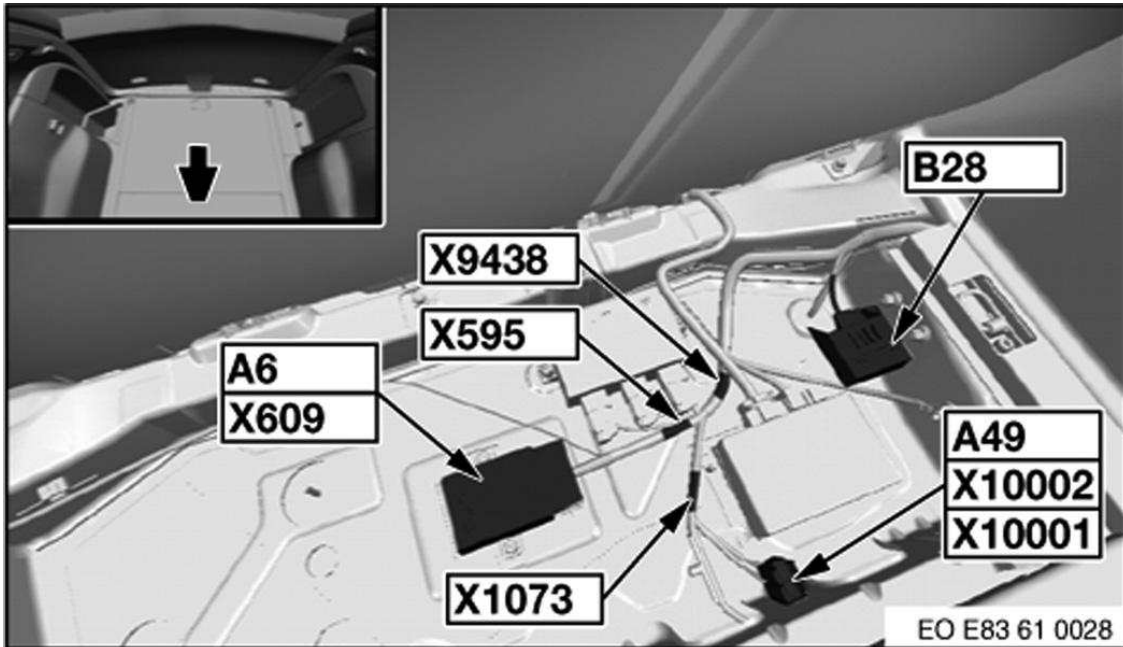
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Fig. 45: Left Rear Of Engine Compartment
 Courtesy of BMW OF NORTH AMERICA, INC.



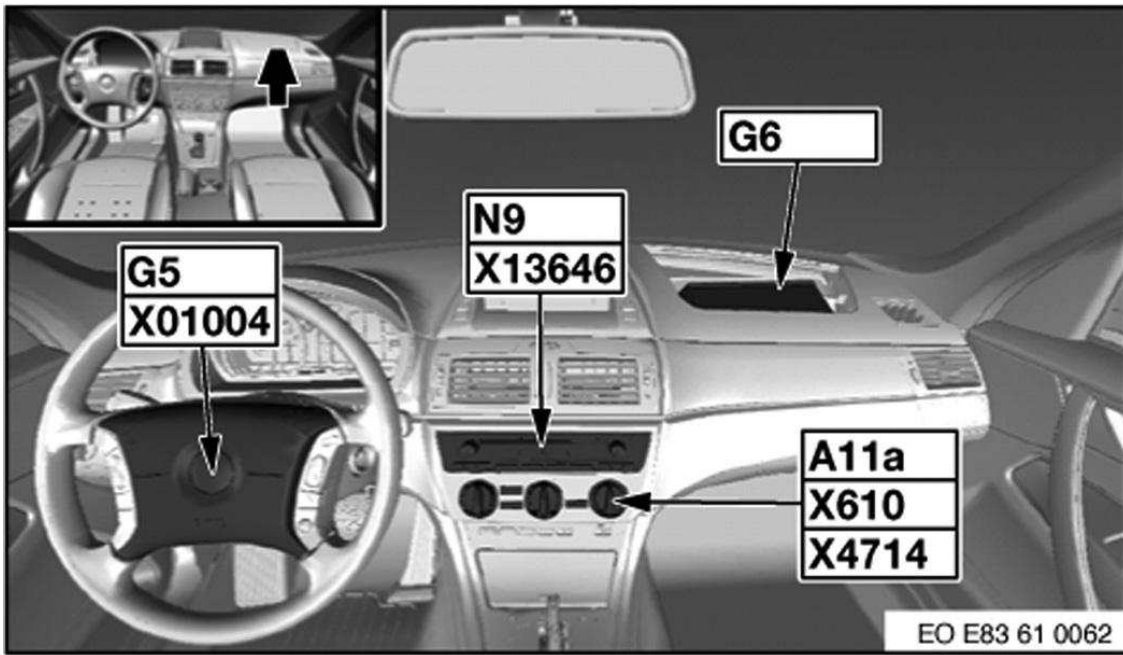
G0044410

Fig. 46: Left Rear Of Engine Compartment
 Courtesy of BMW OF NORTH AMERICA, INC.



G0044411

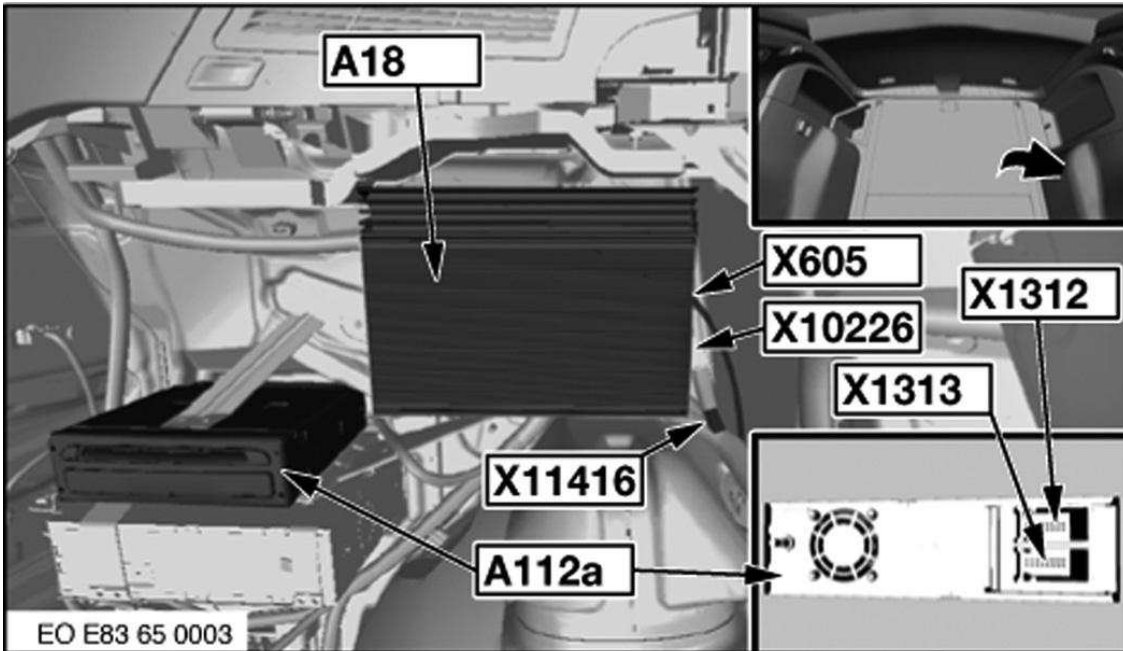
Fig. 47: Rear Compartment
 Courtesy of BMW OF NORTH AMERICA, INC.



G0044412

Fig. 48: Top Right Side Of Dash

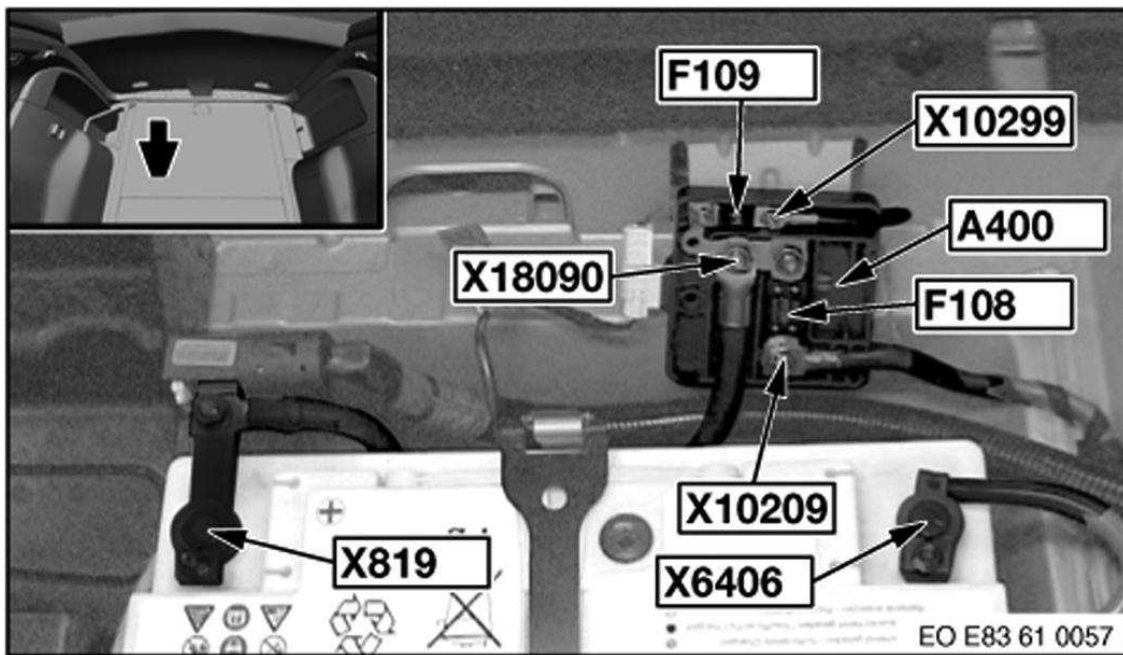
Courtesy of BMW OF NORTH AMERICA, INC.



G0044413

Fig. 49: Left Side Of Rear Compartment

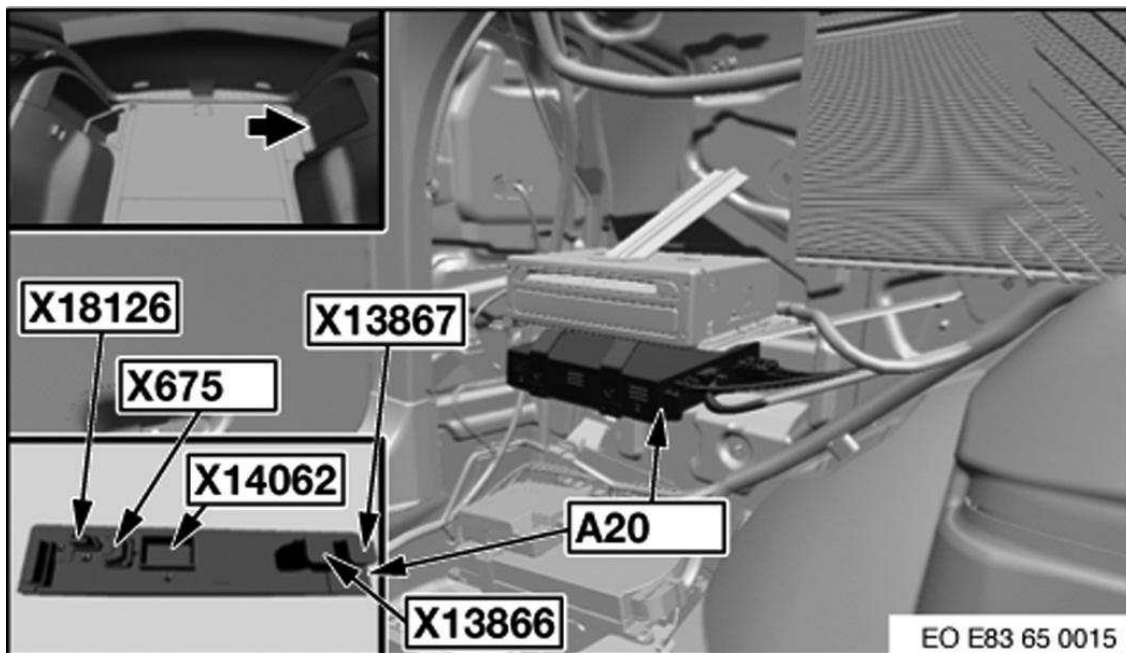
Courtesy of BMW OF NORTH AMERICA, INC.



G00444414

Fig. 50: Rear Compartment

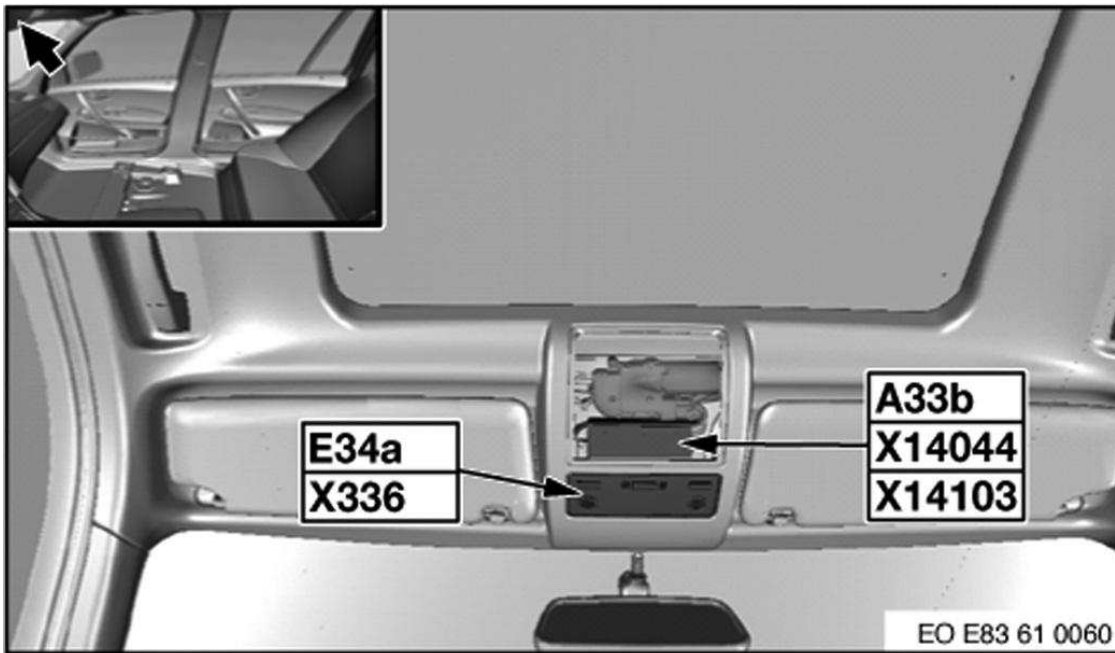
Courtesy of BMW OF NORTH AMERICA, INC.



G00444415

Fig. 51: Left Side Of Rear Compartment

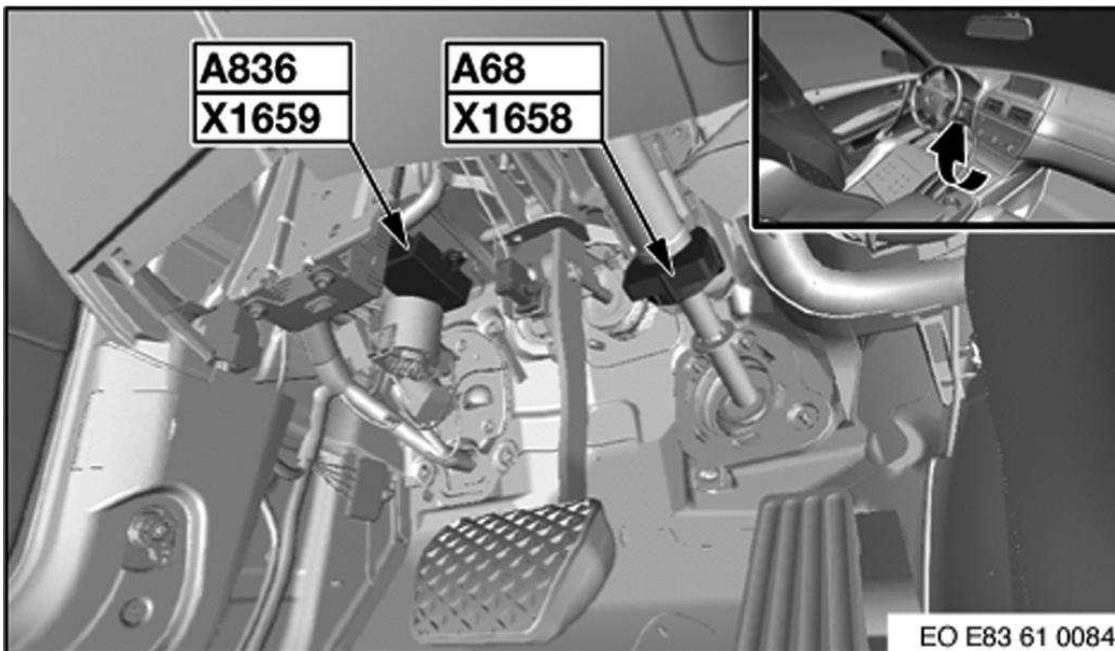
Courtesy of BMW OF NORTH AMERICA, INC.



G00444416

Fig. 52: Top Center Of Windshield

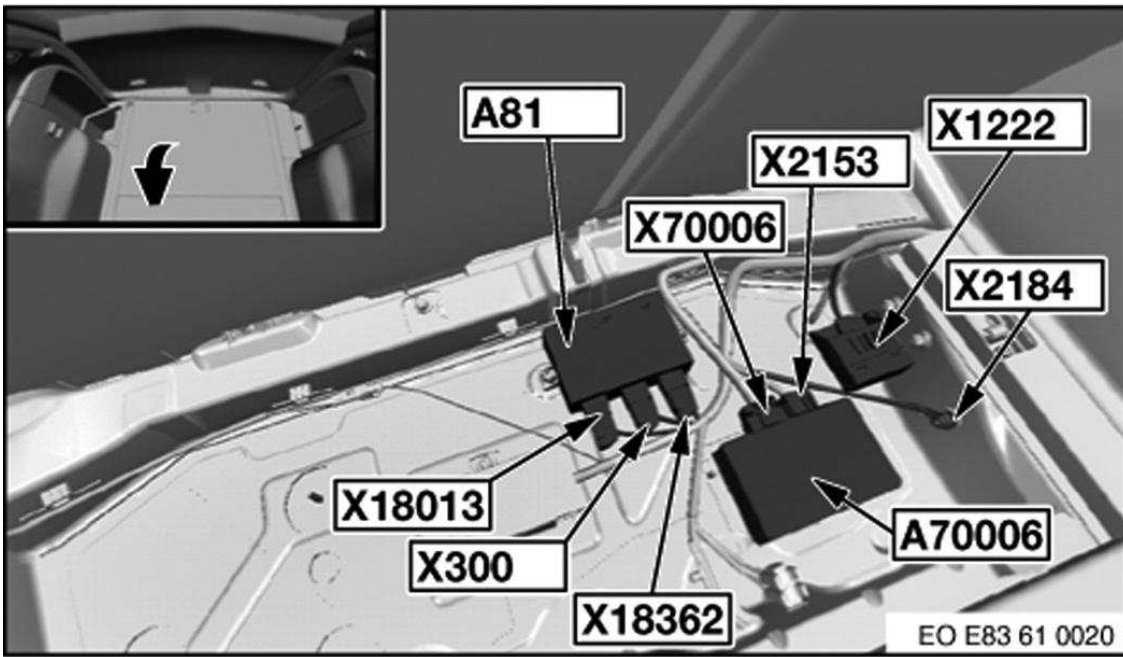
Courtesy of BMW OF NORTH AMERICA, INC.



G00444417

Fig. 53: Under Left Side Of Dash

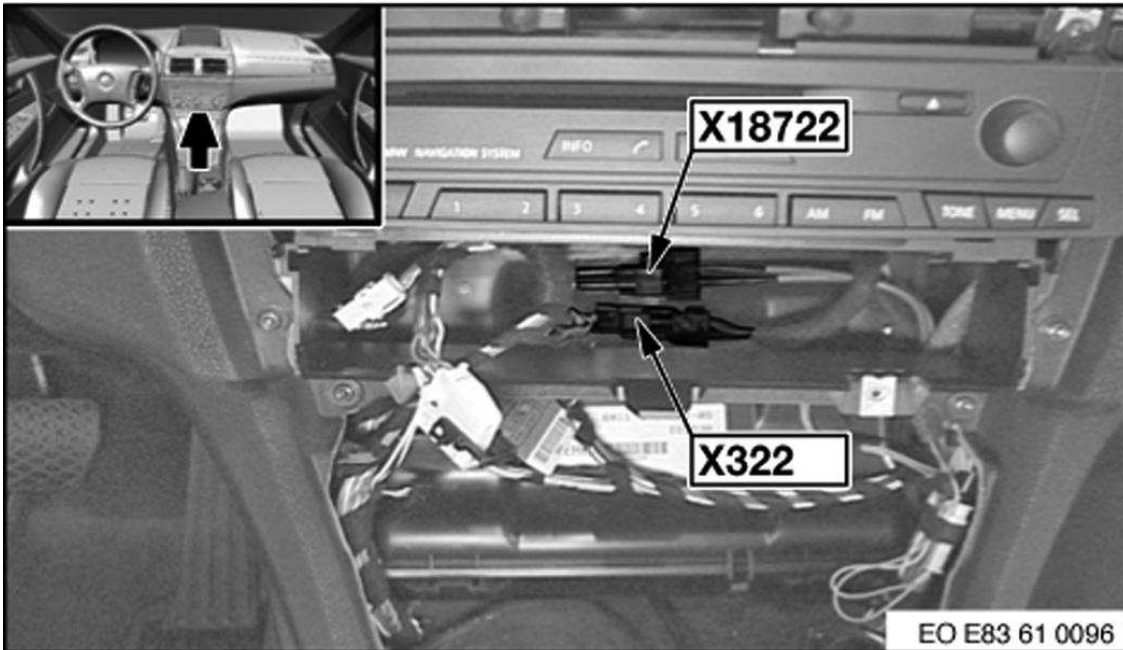
Courtesy of BMW OF NORTH AMERICA, INC.



G00444418

Fig. 54: Rear Compartment

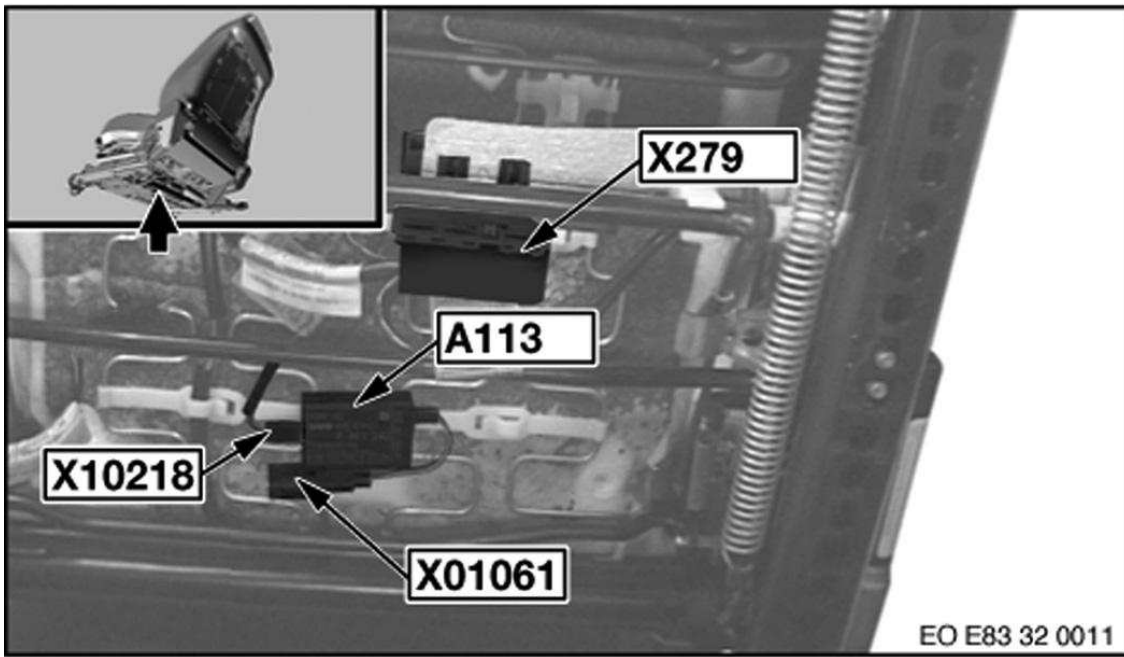
Courtesy of BMW OF NORTH AMERICA, INC.



G00444419

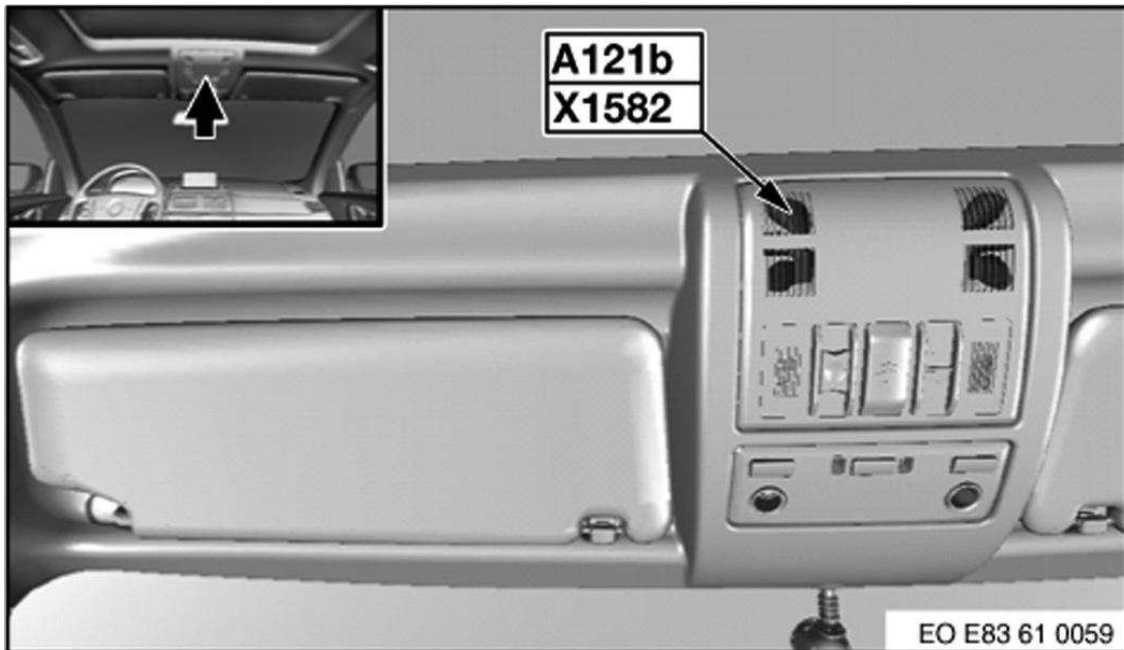
Fig. 55: Center Console

Courtesy of BMW OF NORTH AMERICA, INC.



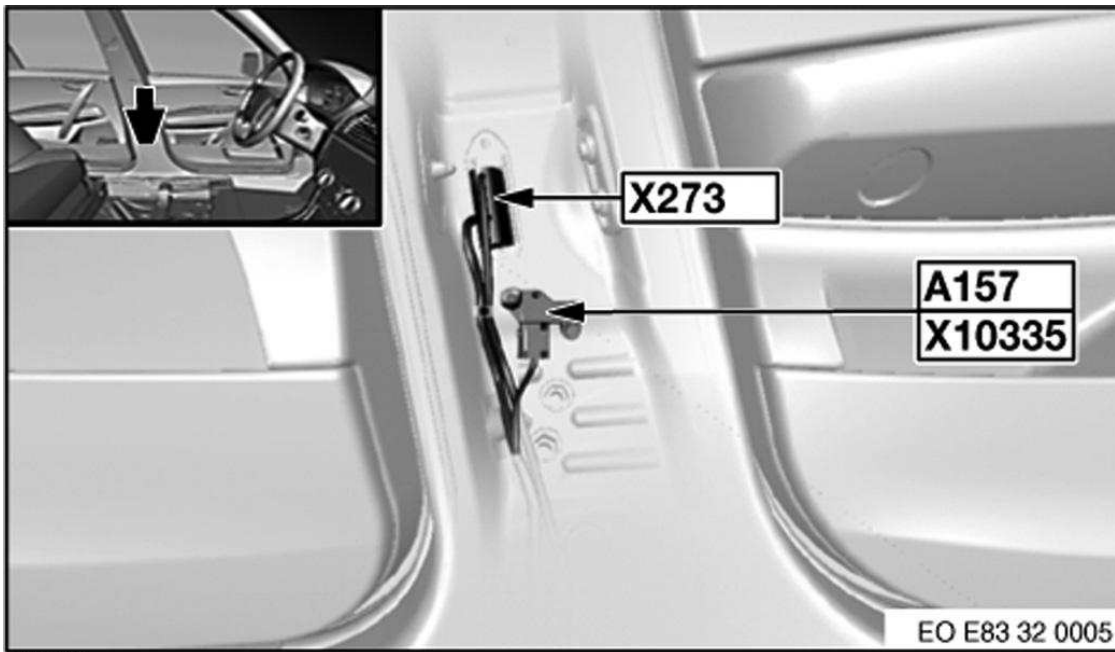
G00444420

Fig. 56: Under Front Passenger's Seat
Courtesy of BMW OF NORTH AMERICA, INC.



G00444421

Fig. 57: Overhead Console
Courtesy of BMW OF NORTH AMERICA, INC.



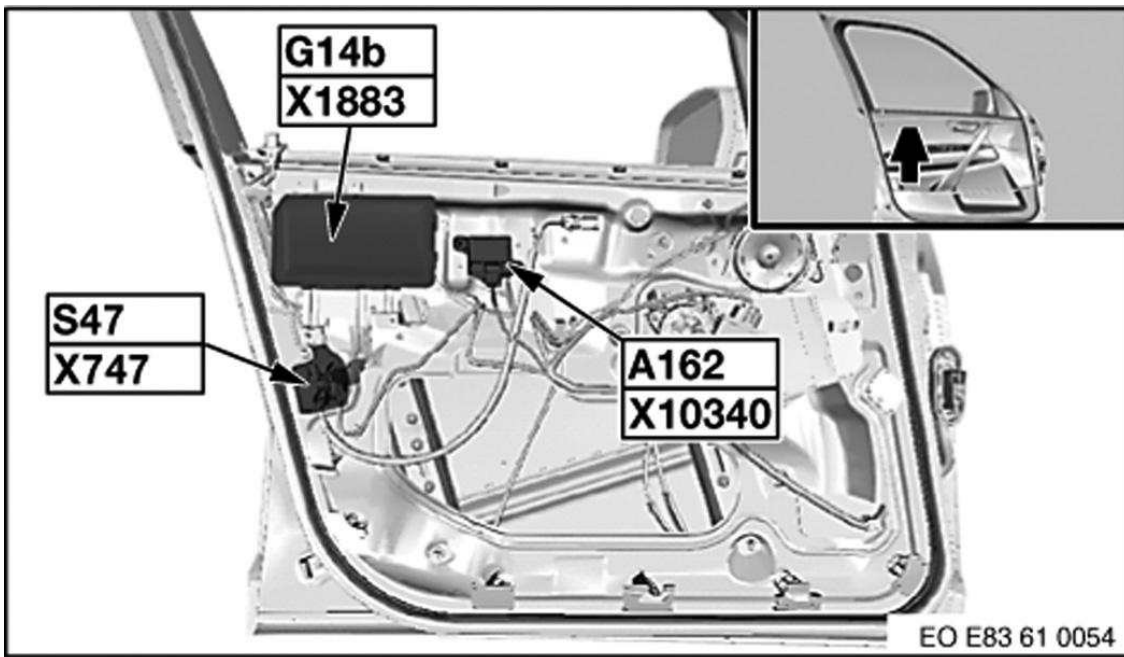
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Fig. 58: Bottom Of Left "B" Pillar
Courtesy of BMW OF NORTH AMERICA, INC.



G00444423

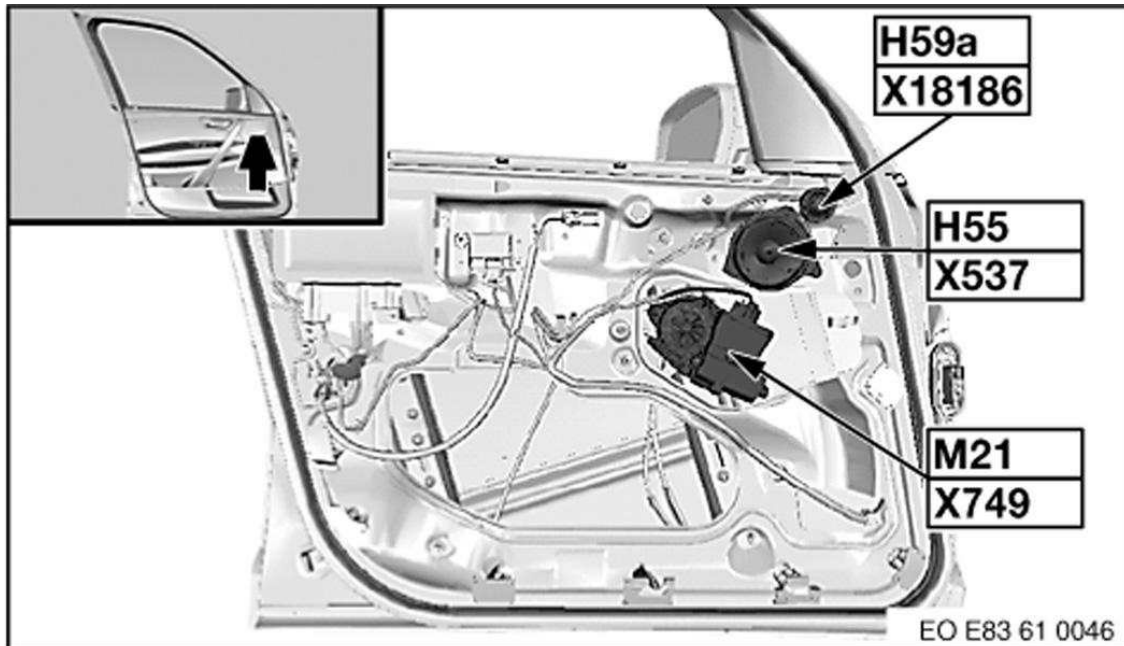
Fig. 59: Bottom Of Right "B" Pillar
Courtesy of BMW OF NORTH AMERICA, INC.



G00444424

Fig. 60: Driver's Door

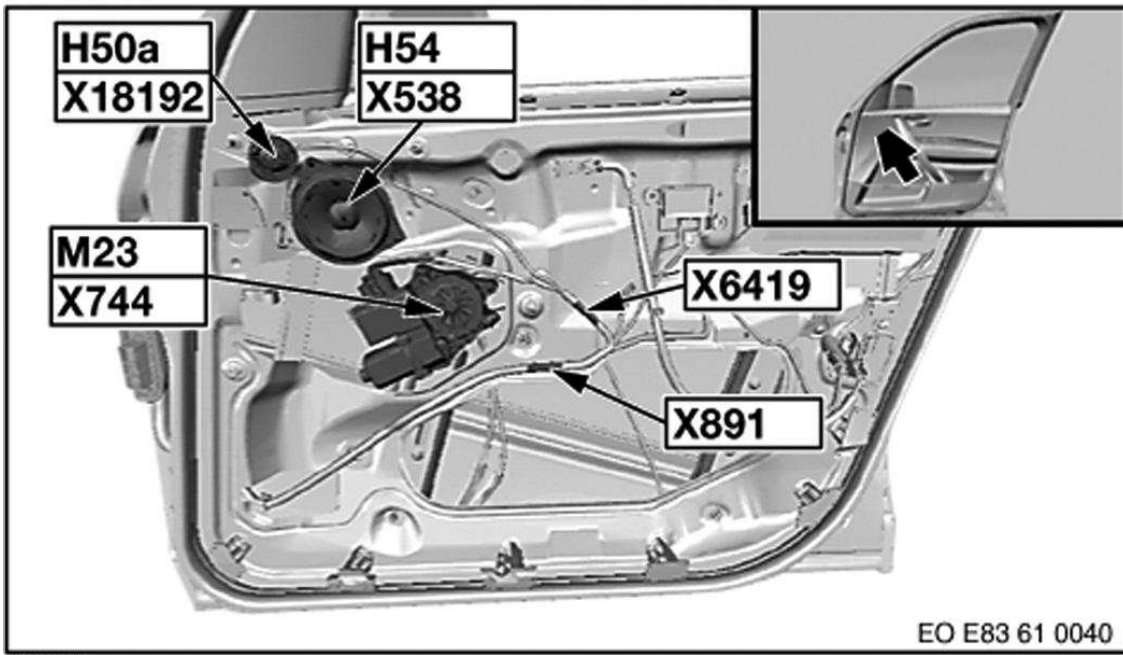
Courtesy of BMW OF NORTH AMERICA, INC.



G00444425

Fig. 61: Driver's Door

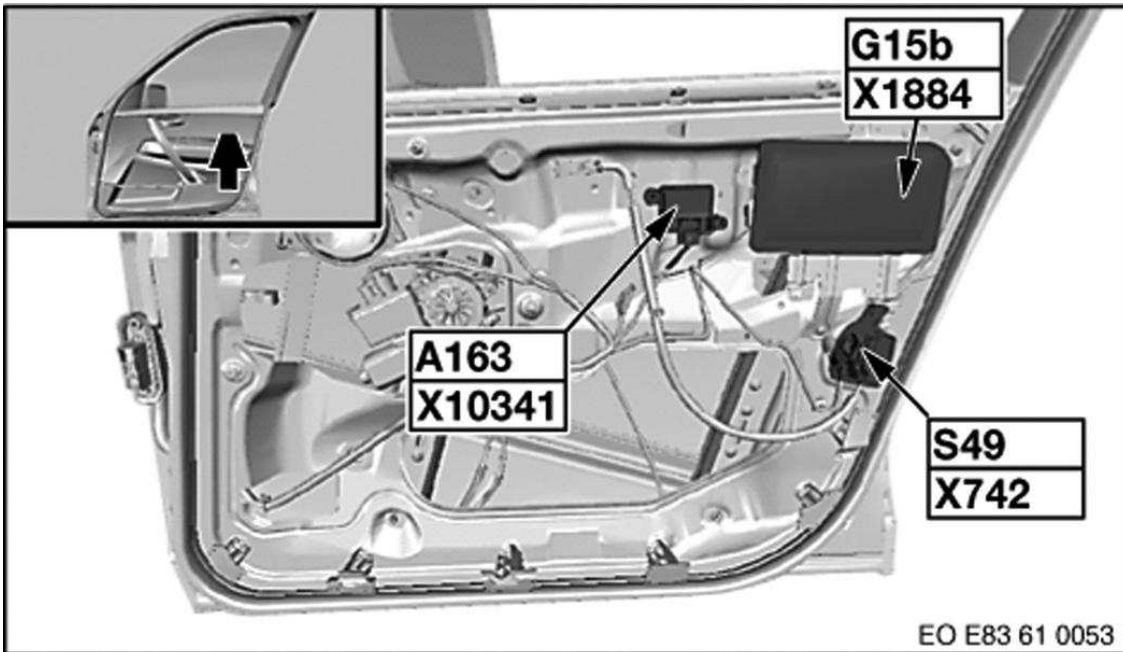
Courtesy of BMW OF NORTH AMERICA, INC.



G00444426

Fig. 62: Front Passenger's Door

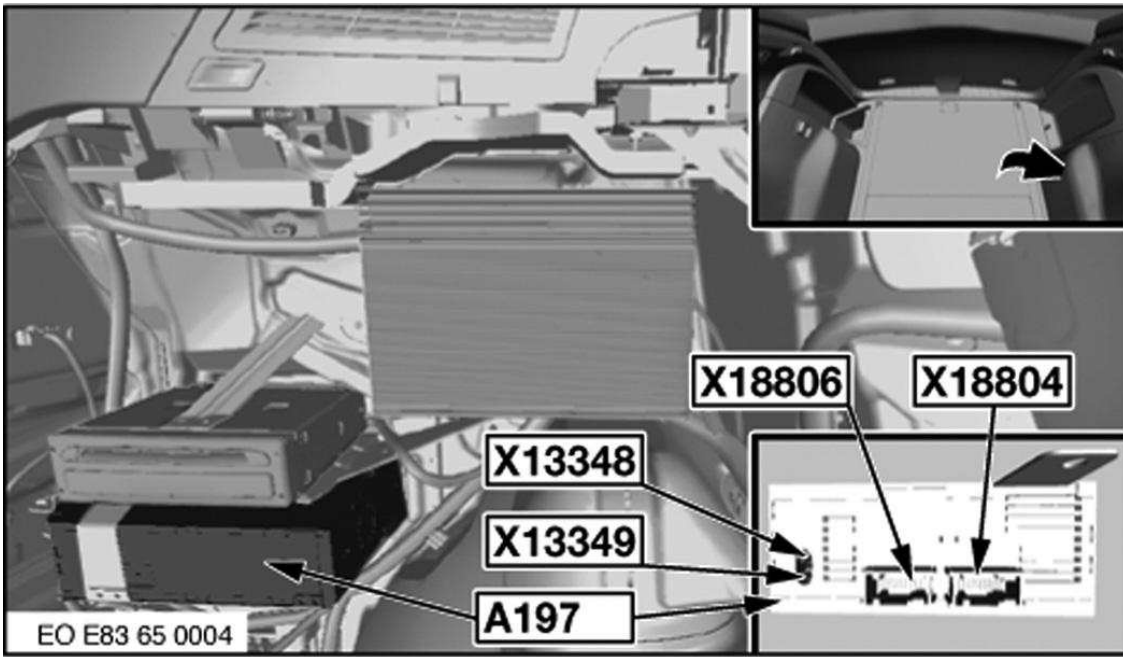
Courtesy of BMW OF NORTH AMERICA, INC.



G00444427

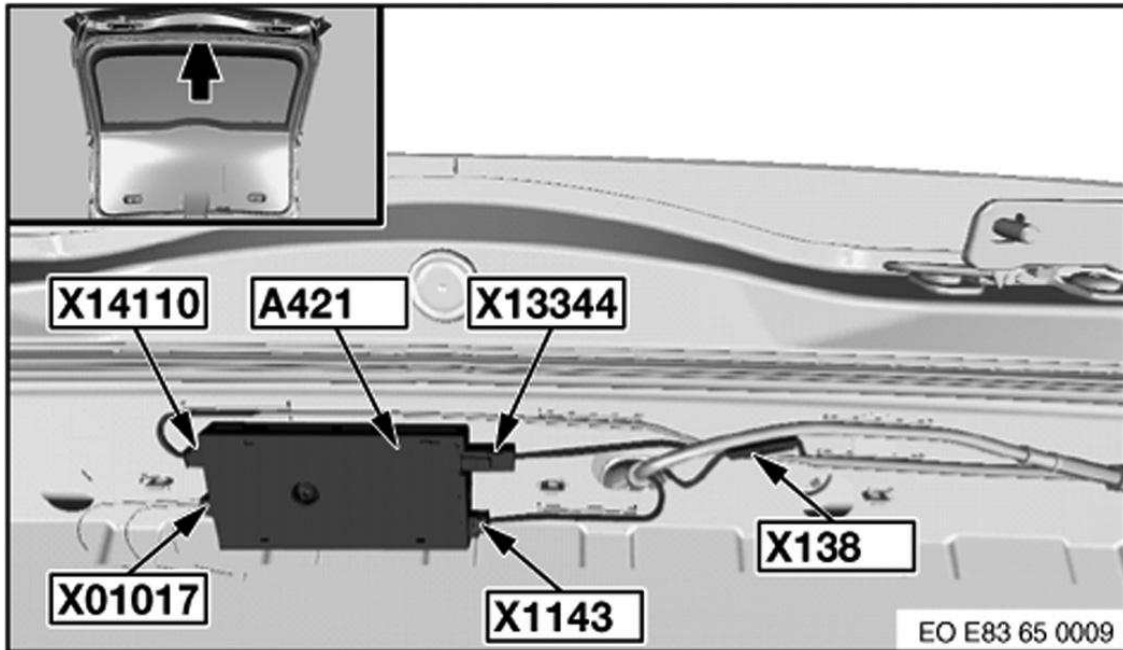
Fig. 63: Front Passenger's Door

Courtesy of BMW OF NORTH AMERICA, INC.



G00444428

Fig. 64: Left Side Of Rear Compartment
 Courtesy of BMW OF NORTH AMERICA, INC.



G00444429

Fig. 65: Rear Compartment Door
 Courtesy of BMW OF NORTH AMERICA, INC.

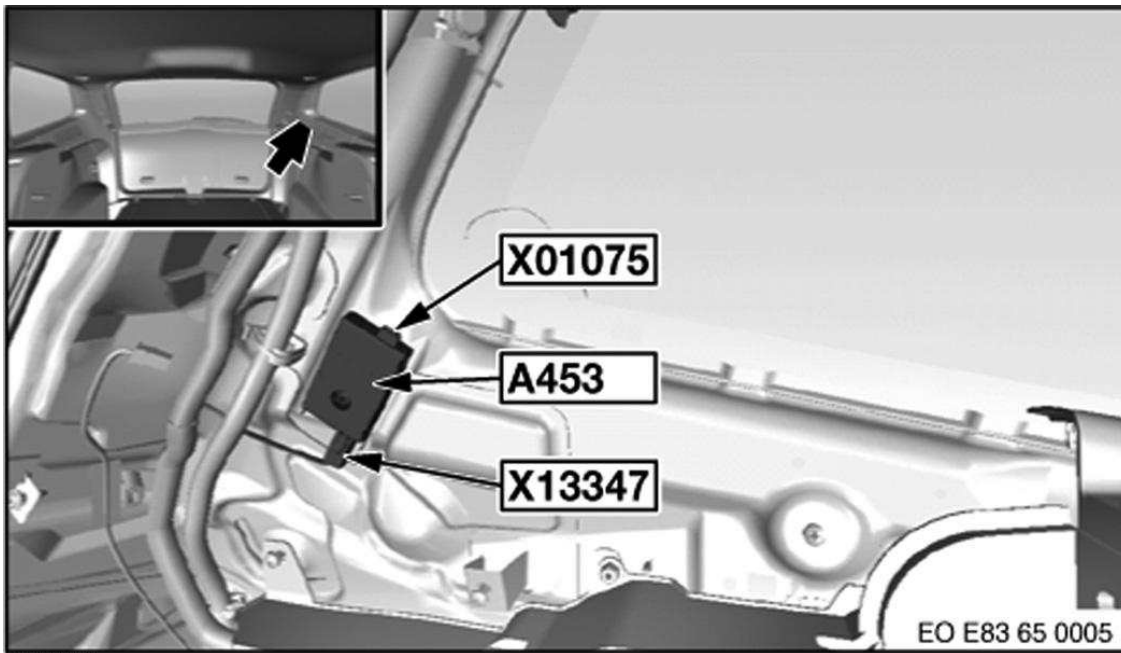


Fig. 66: Bottom Of Left "C" Pillar
Courtesy of BMW OF NORTH AMERICA, INC.

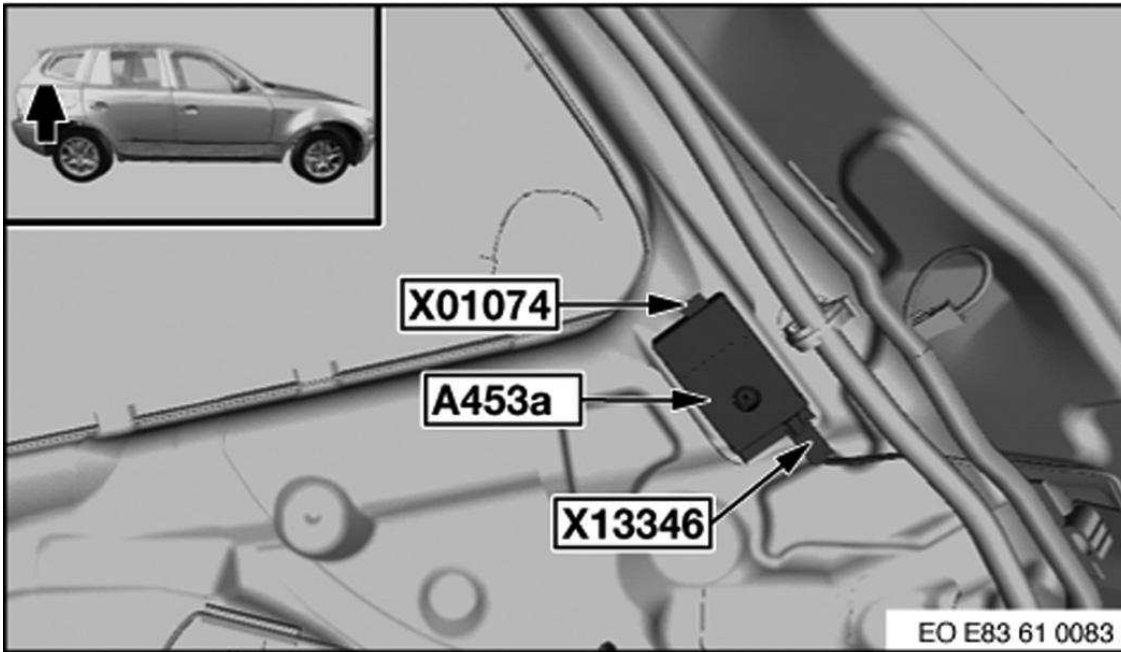
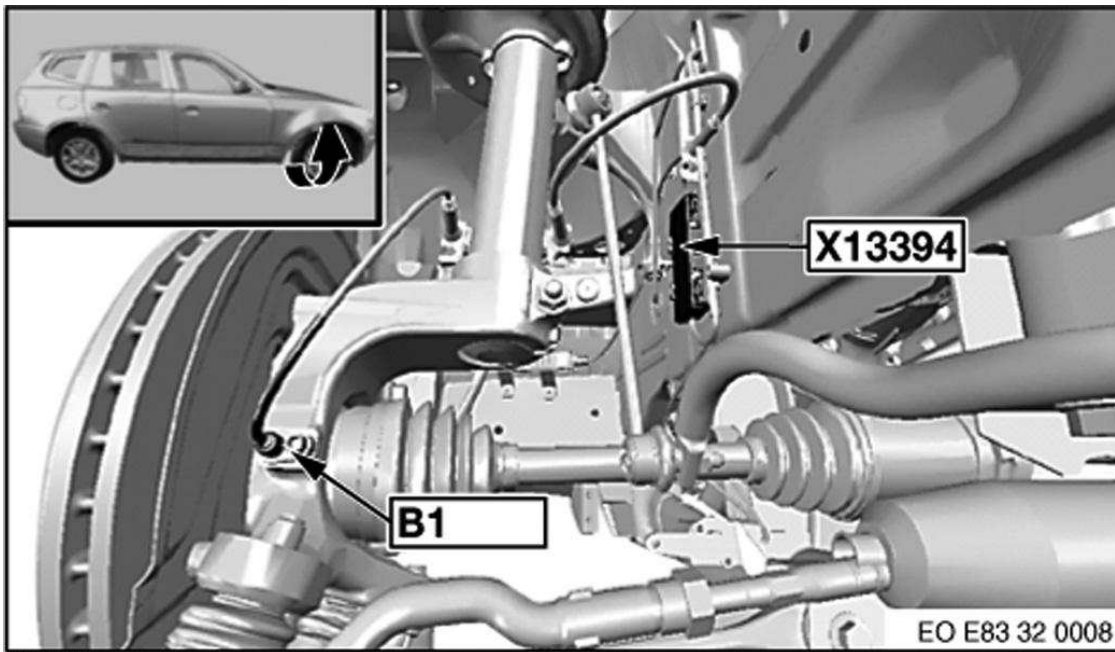


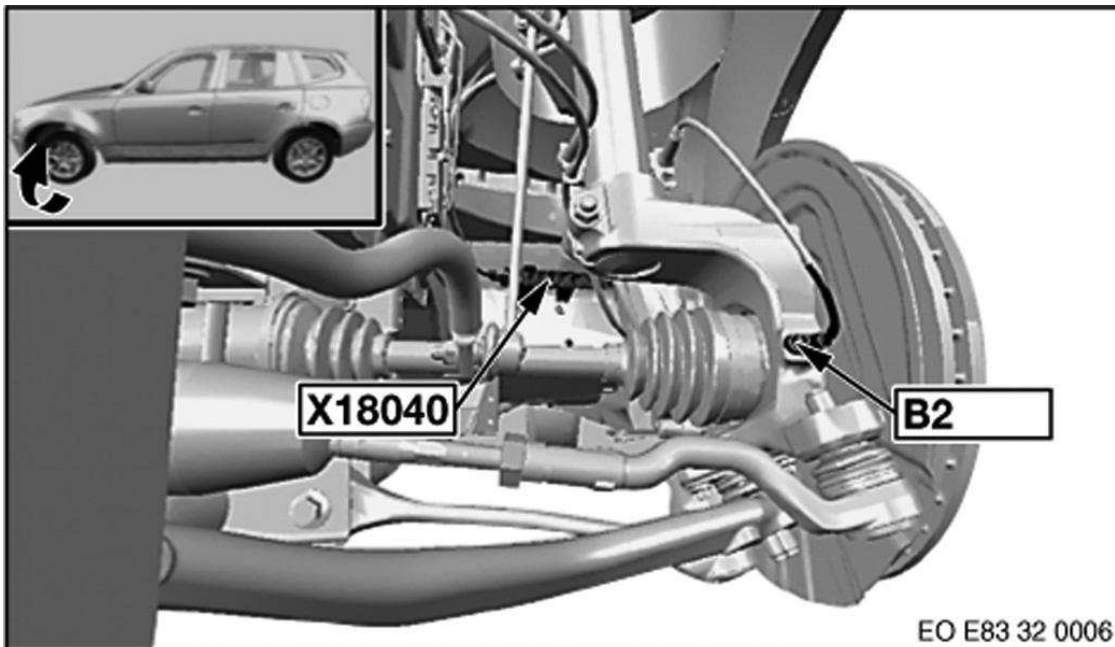
Fig. 67: Right Side Of Rear Compartment
Courtesy of BMW OF NORTH AMERICA, INC.



G0044432

Fig. 68: Top Of Right Front Wheel

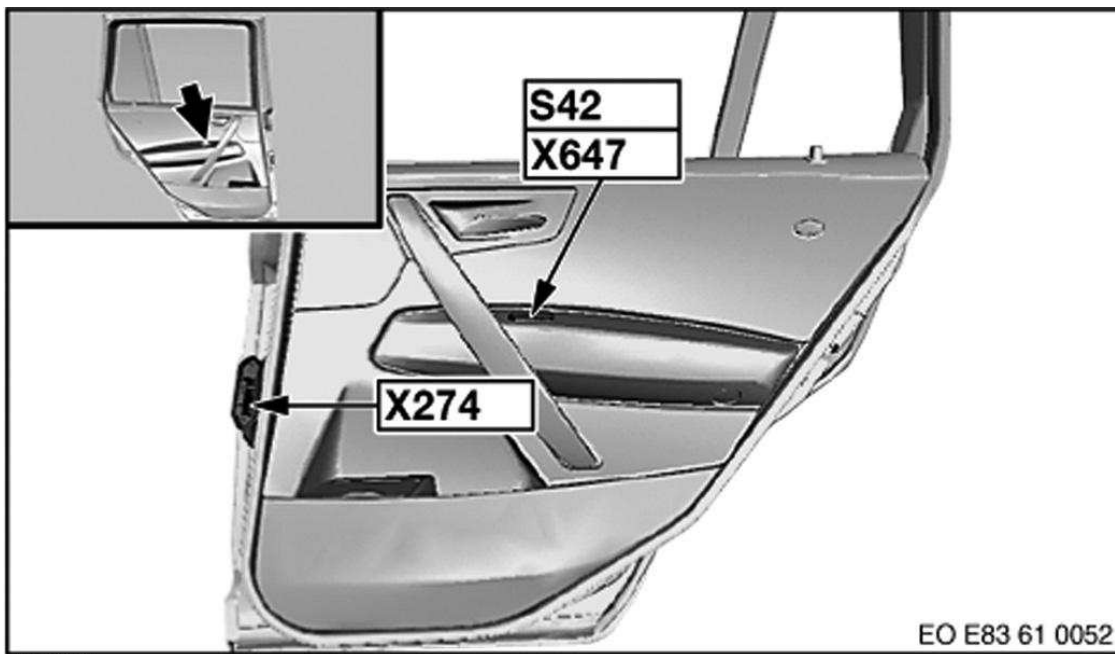
Courtesy of BMW OF NORTH AMERICA, INC.



G0044433

Fig. 69: Front Of Left Front Wheel

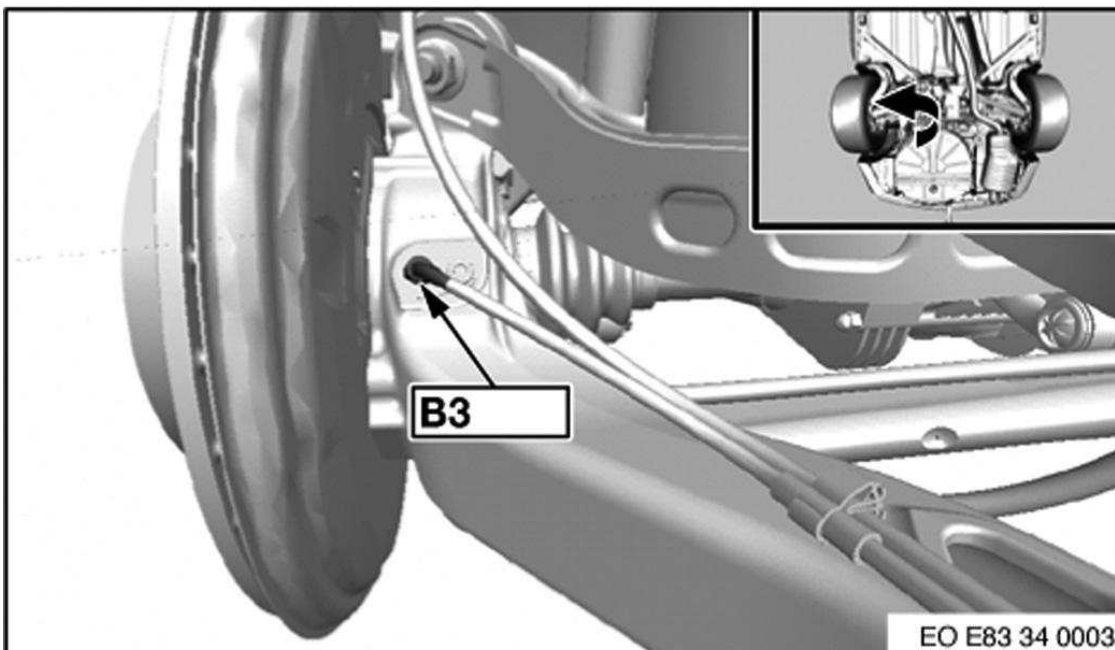
Courtesy of BMW OF NORTH AMERICA, INC.



G0044434

Fig. 70: Right Rear Door

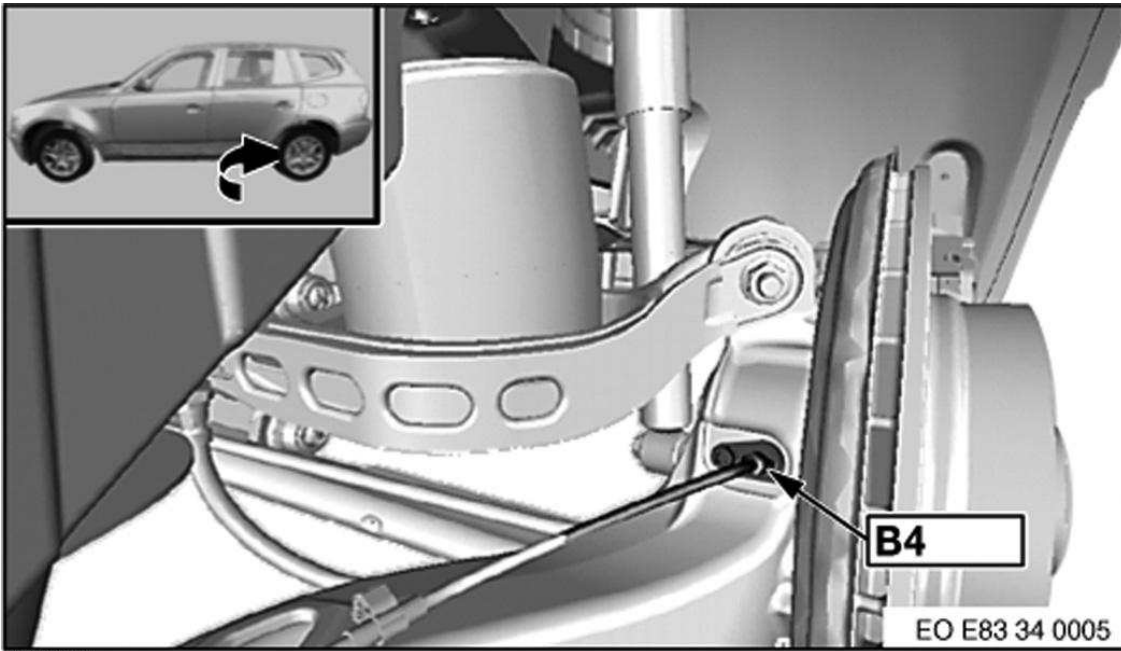
Courtesy of BMW OF NORTH AMERICA, INC.



G0044435

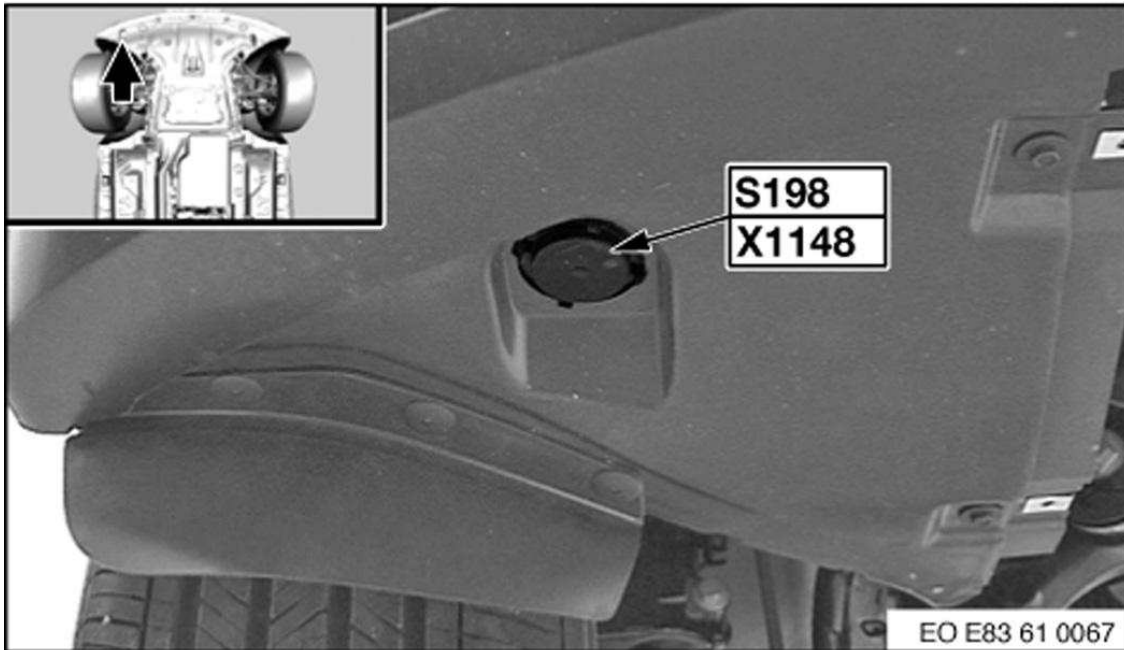
Fig. 71: Left Side Of Right Rear Wheel

Courtesy of BMW OF NORTH AMERICA, INC.



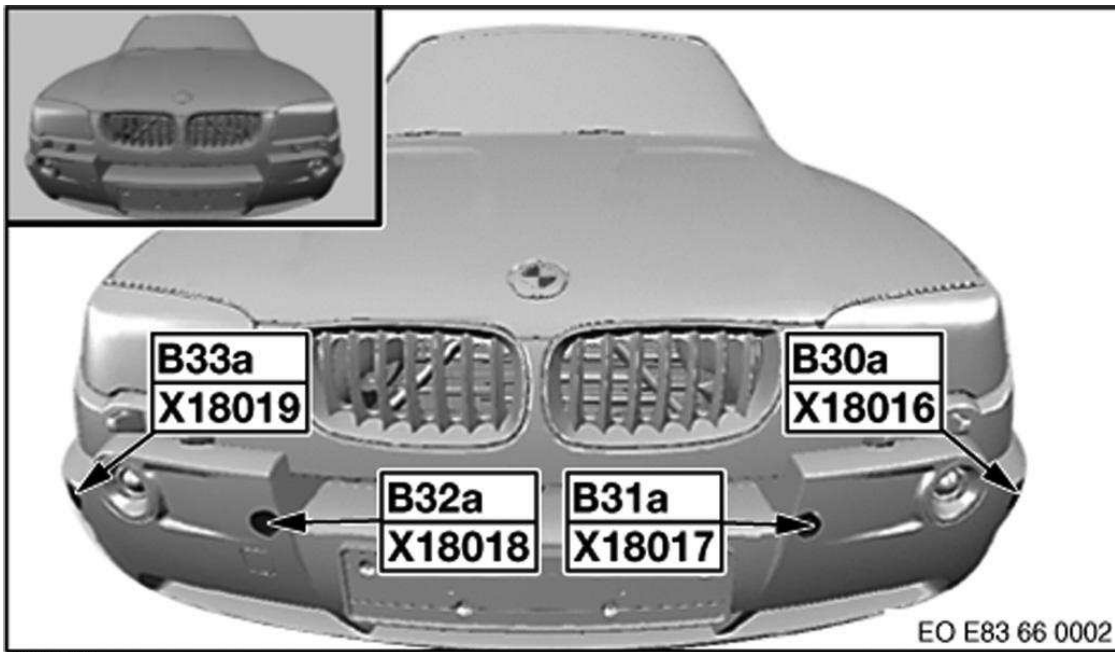
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Fig. 72: Right Side Of Left Rear Wheel
Courtesy of BMW OF NORTH AMERICA, INC.



G0044438

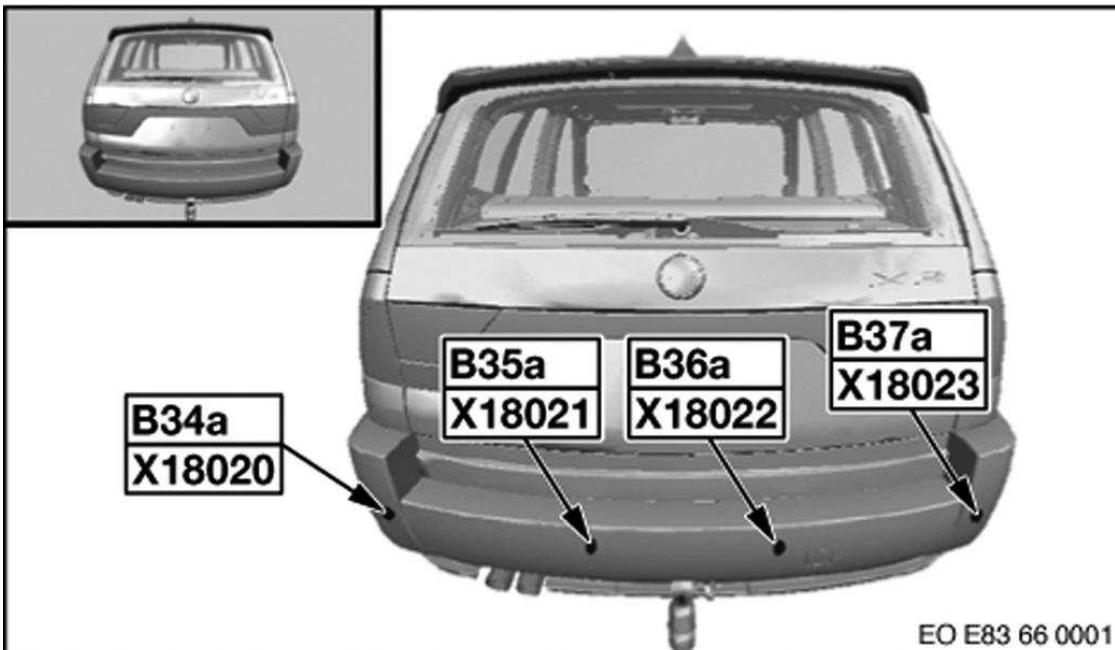
Fig. 73: Under Vehicle
Courtesy of BMW OF NORTH AMERICA, INC.



G00444439

Fig. 74: Front Bumper

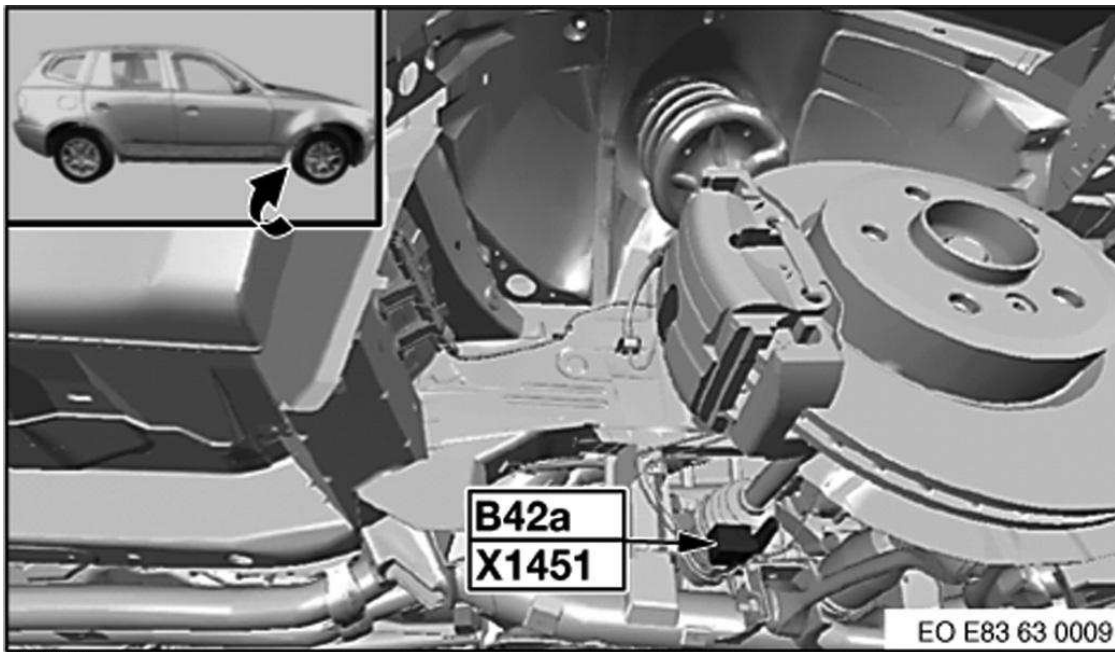
Courtesy of BMW OF NORTH AMERICA, INC.



G00444440

Fig. 75: Rear Bumper

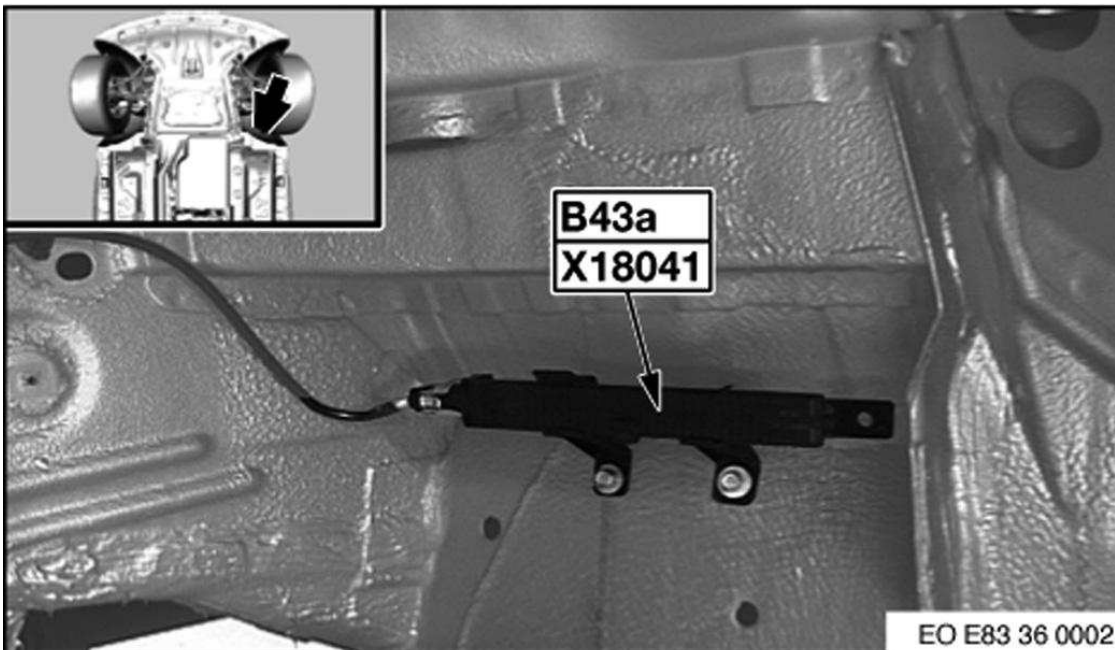
Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 76: Behind Right Front Wheel

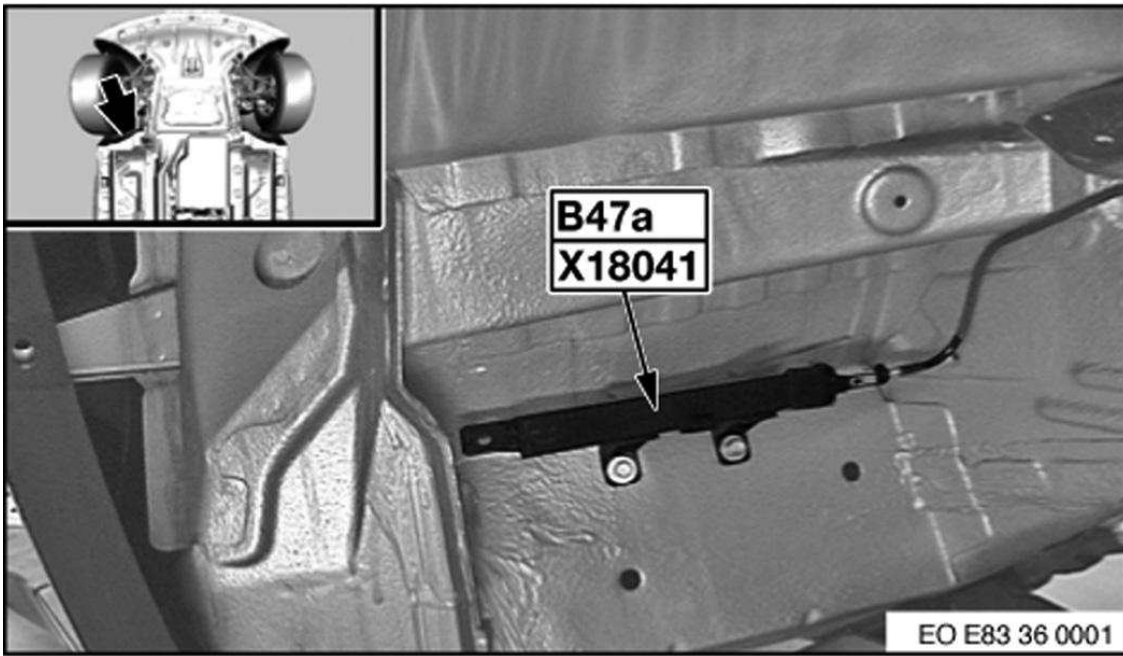
Courtesy of BMW OF NORTH AMERICA, INC.



G0044442

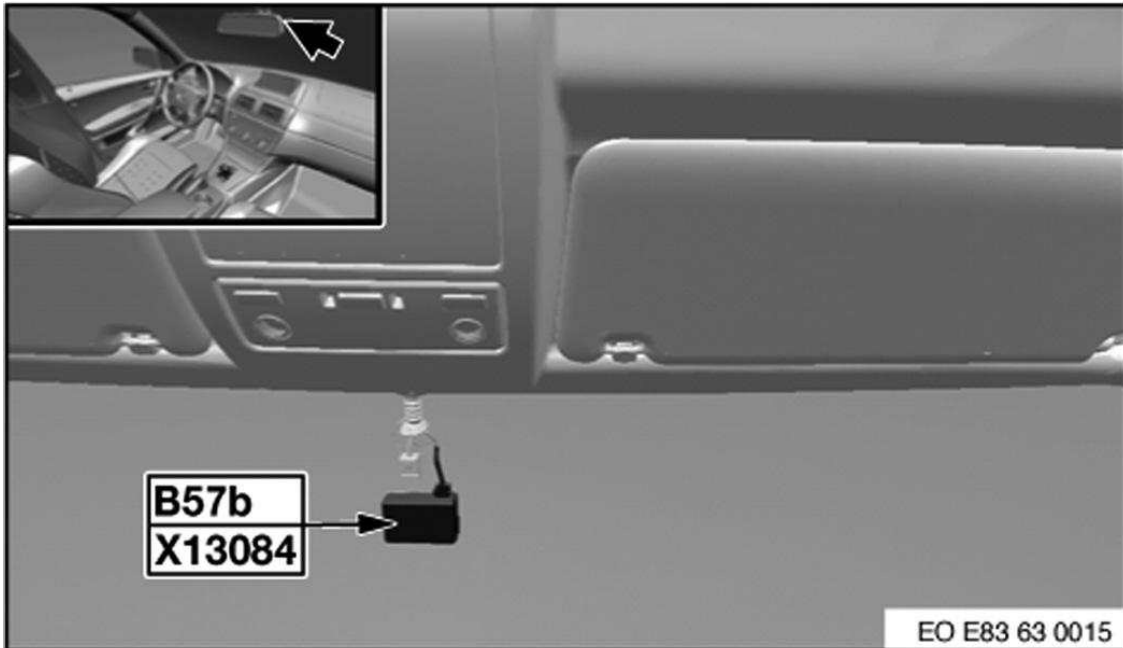
Fig. 77: Behind Left Front Wheel

Courtesy of BMW OF NORTH AMERICA, INC.



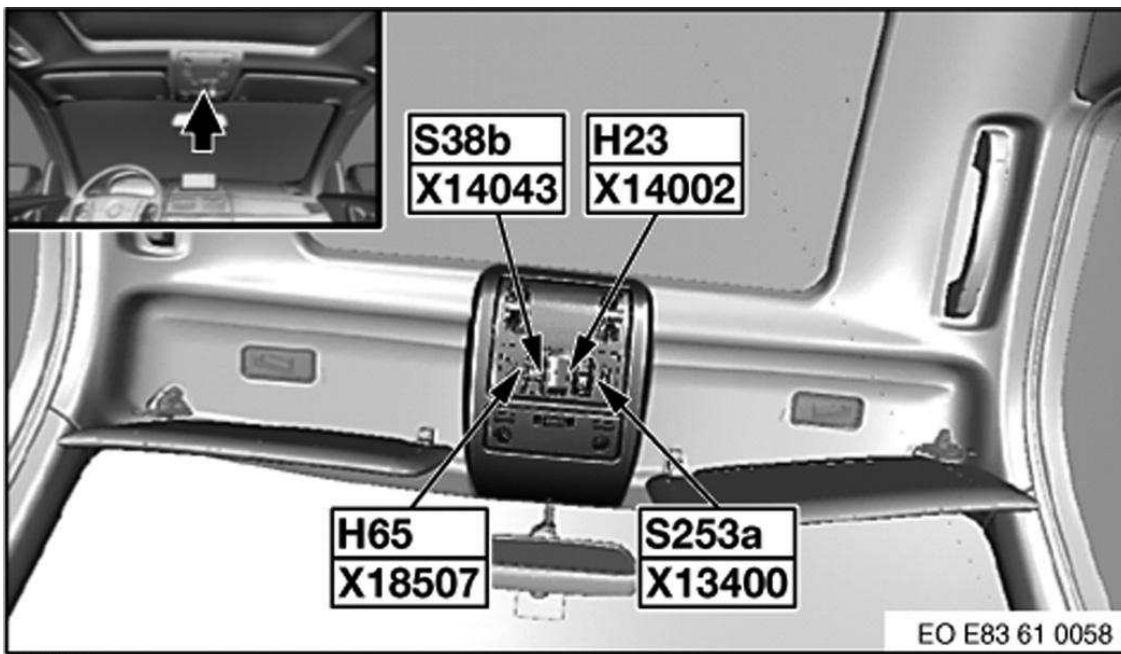
G00444443

Fig. 78: Behind Right Front Wheel
Courtesy of BMW OF NORTH AMERICA, INC.



G00444444

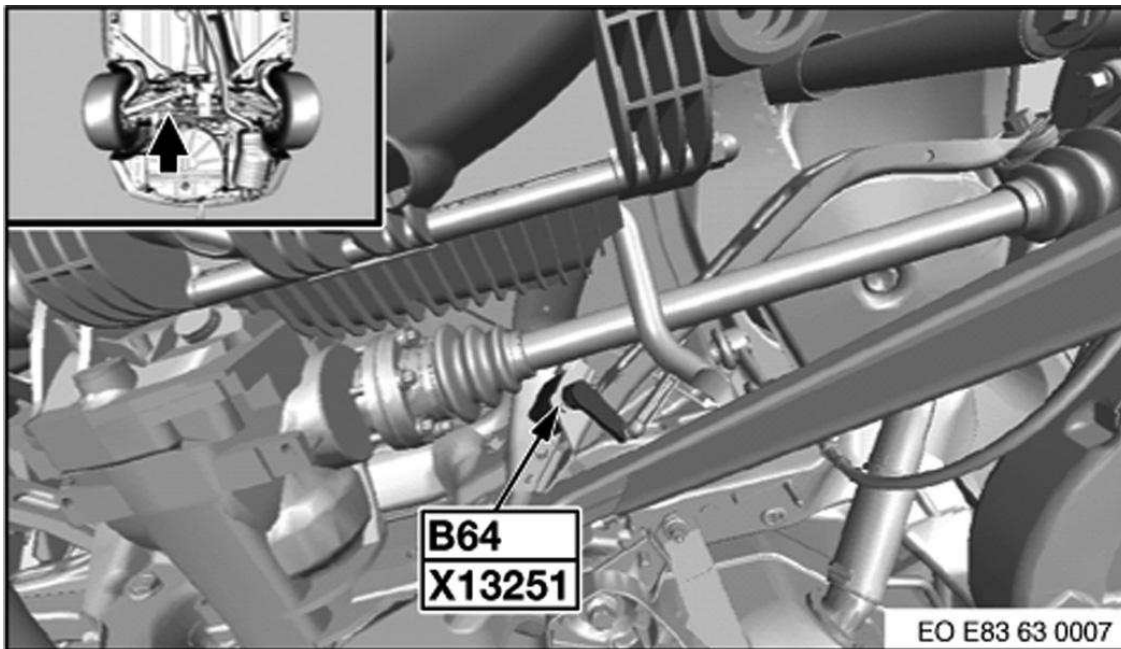
Fig. 79: Top Center Of Windshield
Courtesy of BMW OF NORTH AMERICA, INC.



G00444445

Fig. 80: Overhead Console

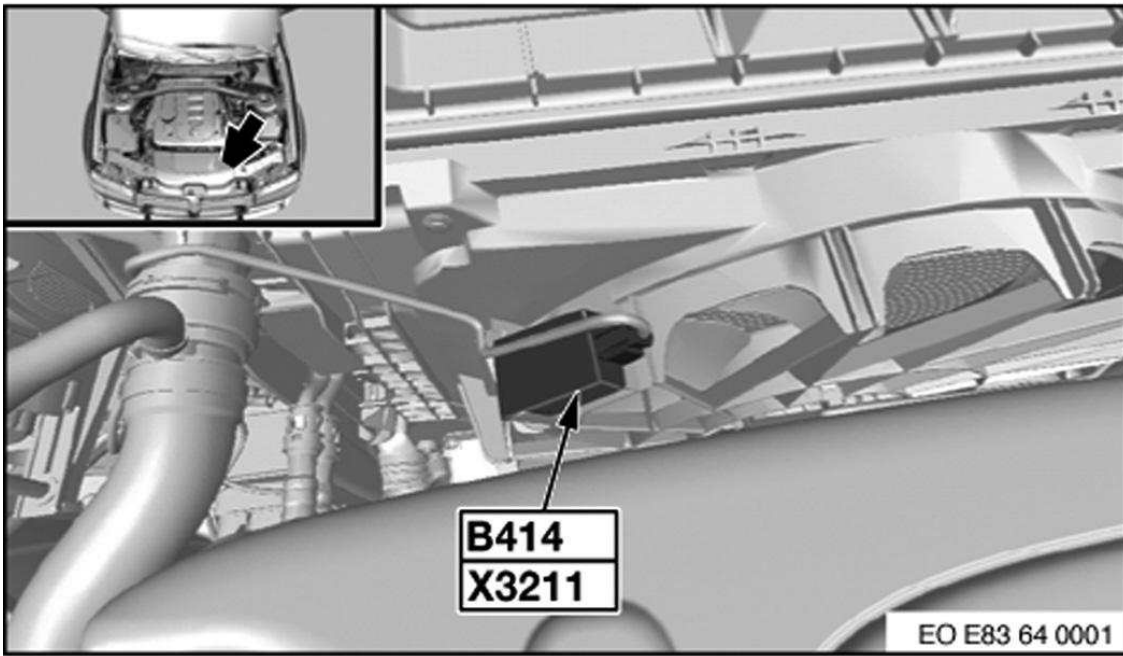
Courtesy of BMW OF NORTH AMERICA, INC.



G00444446

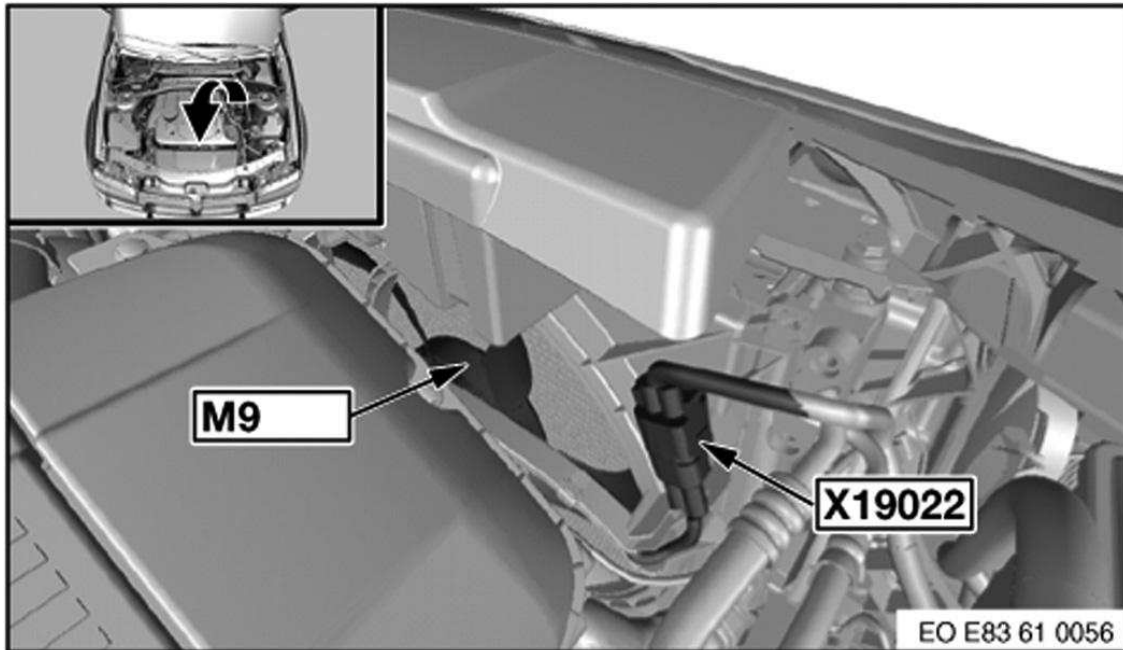
Fig. 81: Under Vehicle

Courtesy of BMW OF NORTH AMERICA, INC.



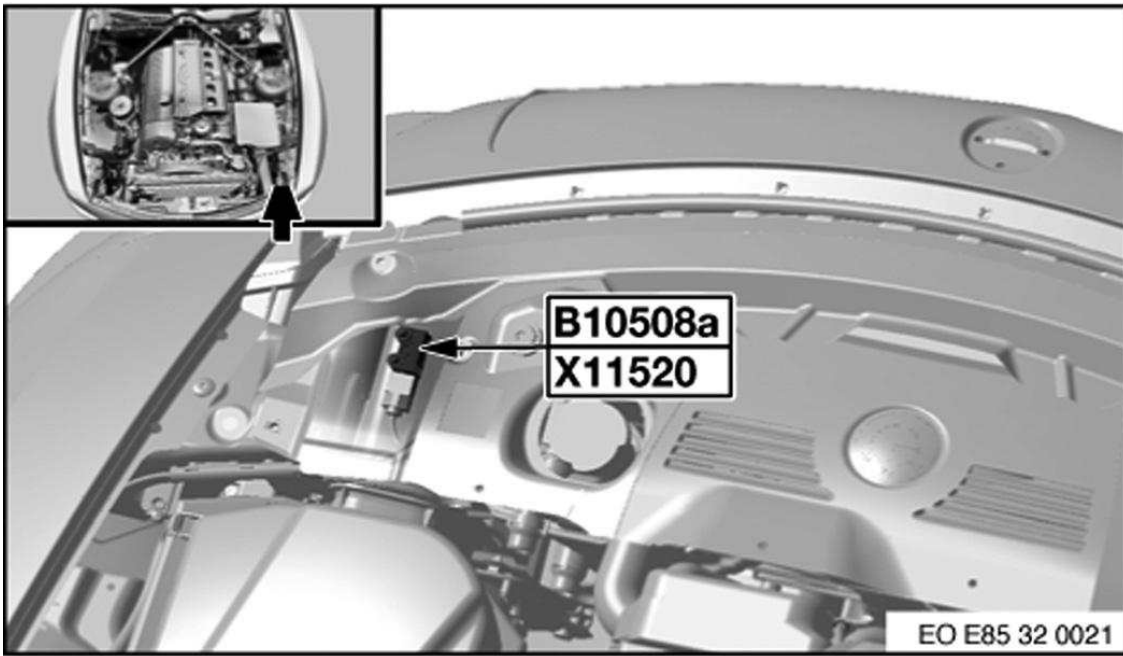
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Fig. 82: Left Front Of Engine Compartment
Courtesy of BMW OF NORTH AMERICA, INC.



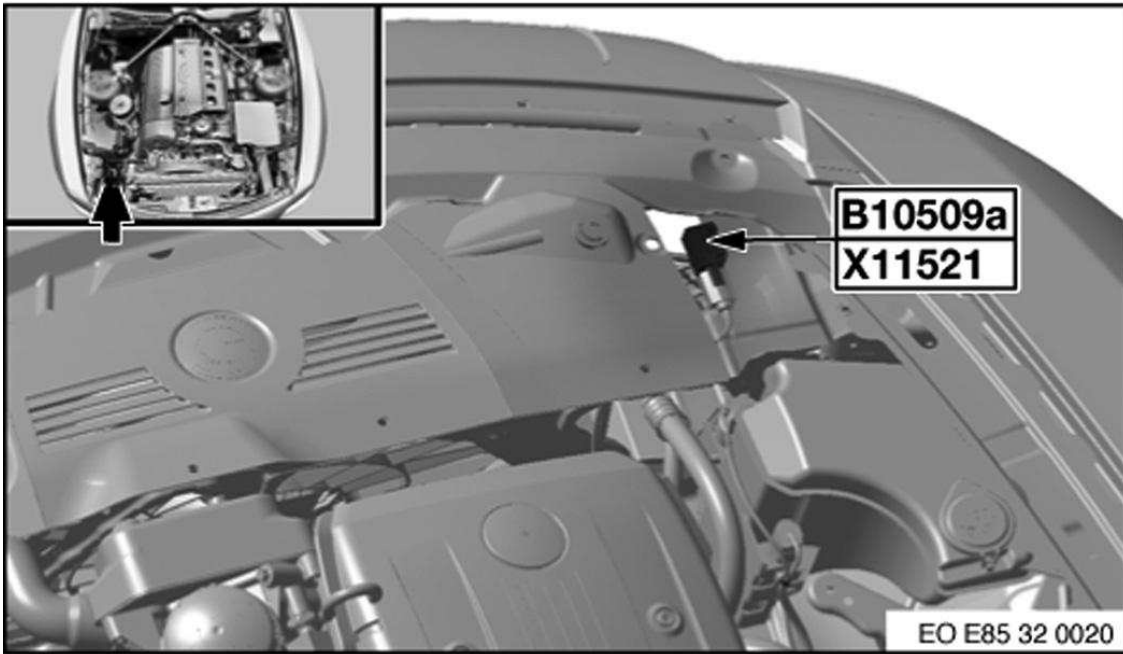
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Fig. 83: Front Of Engine Compartment
Courtesy of BMW OF NORTH AMERICA, INC.



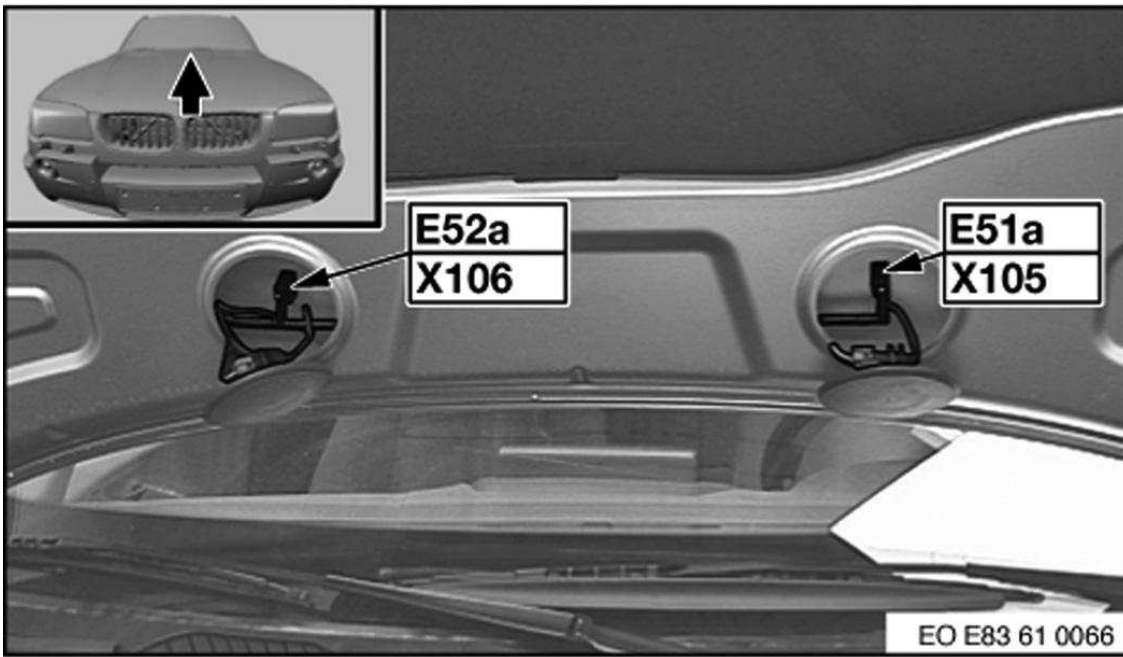
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Fig. 84: Left Front Of Engine Compartment
Courtesy of BMW OF NORTH AMERICA, INC.



G00444450

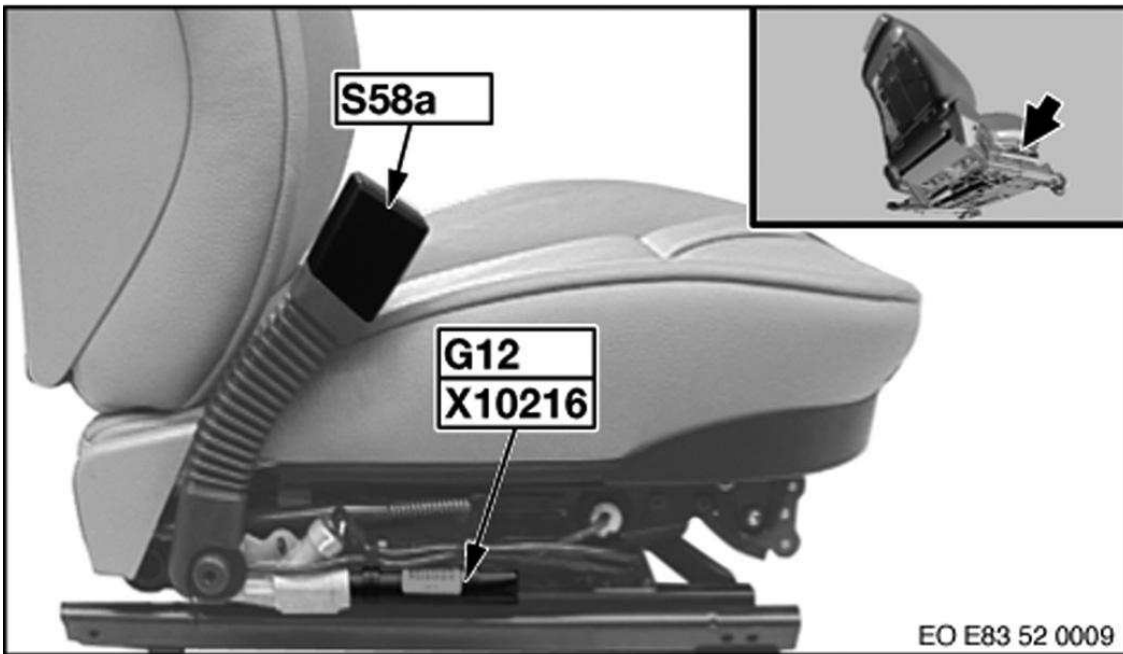
Fig. 85: Right Front Of Engine Compartment
Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 86: Rear Of Hood

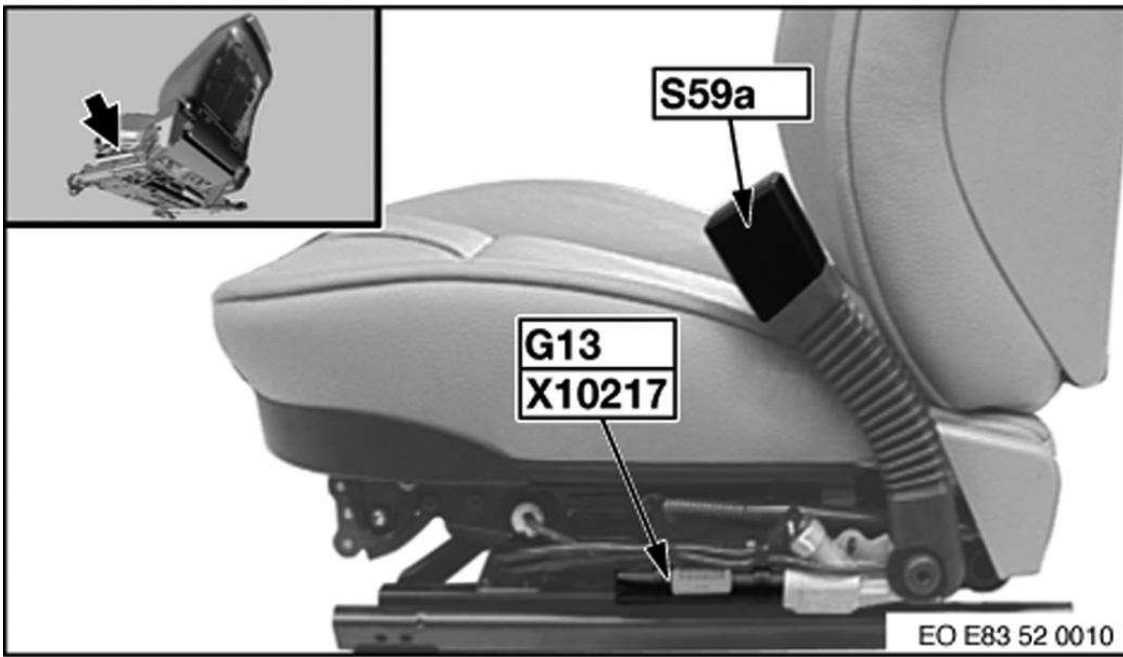
Courtesy of BMW OF NORTH AMERICA, INC.



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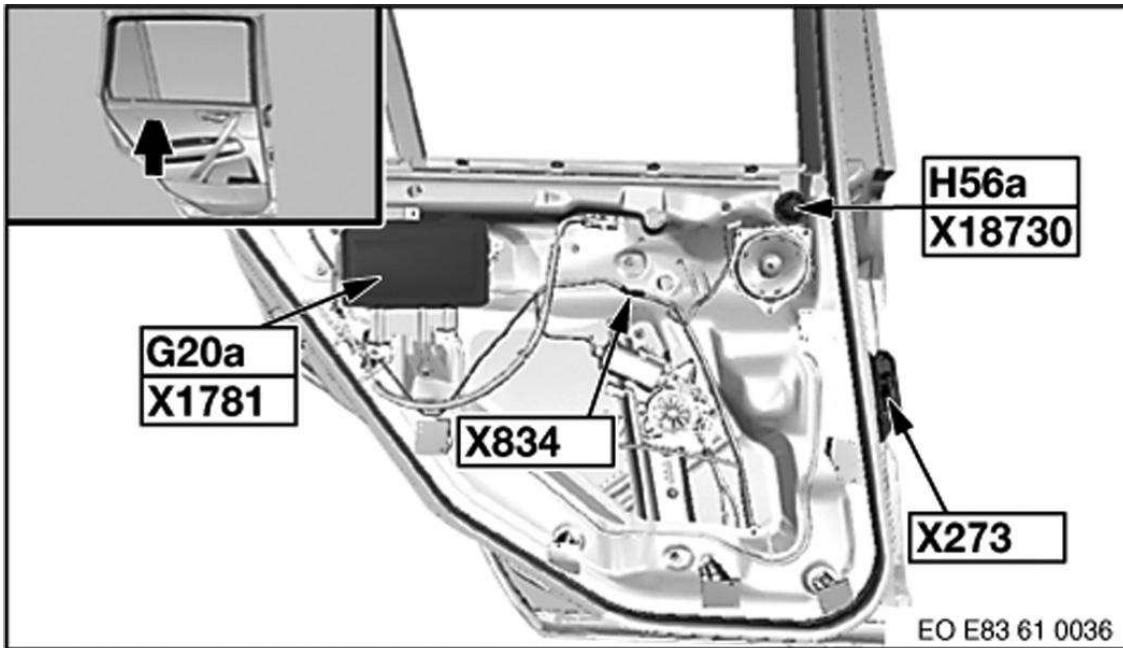
Fig. 87: Part Of Seat Belt Buckle Assembly

Courtesy of BMW OF NORTH AMERICA, INC.



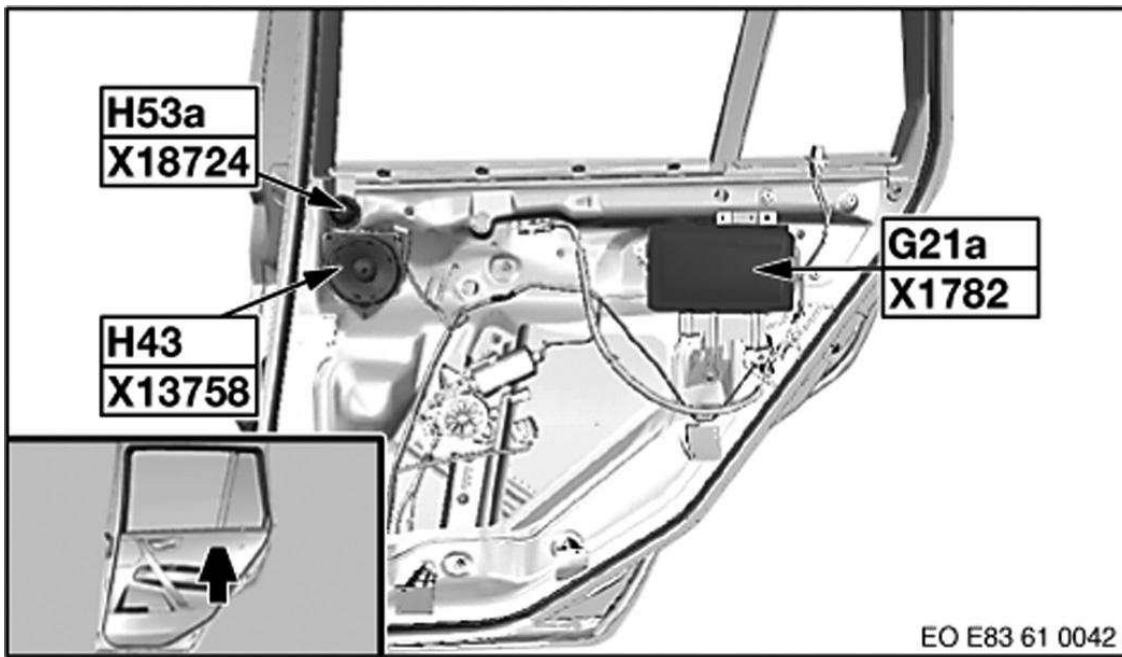
G0044453

Fig. 88: Part Of Seat Belt Buckle Assembly
 Courtesy of BMW OF NORTH AMERICA, INC.



G0044454

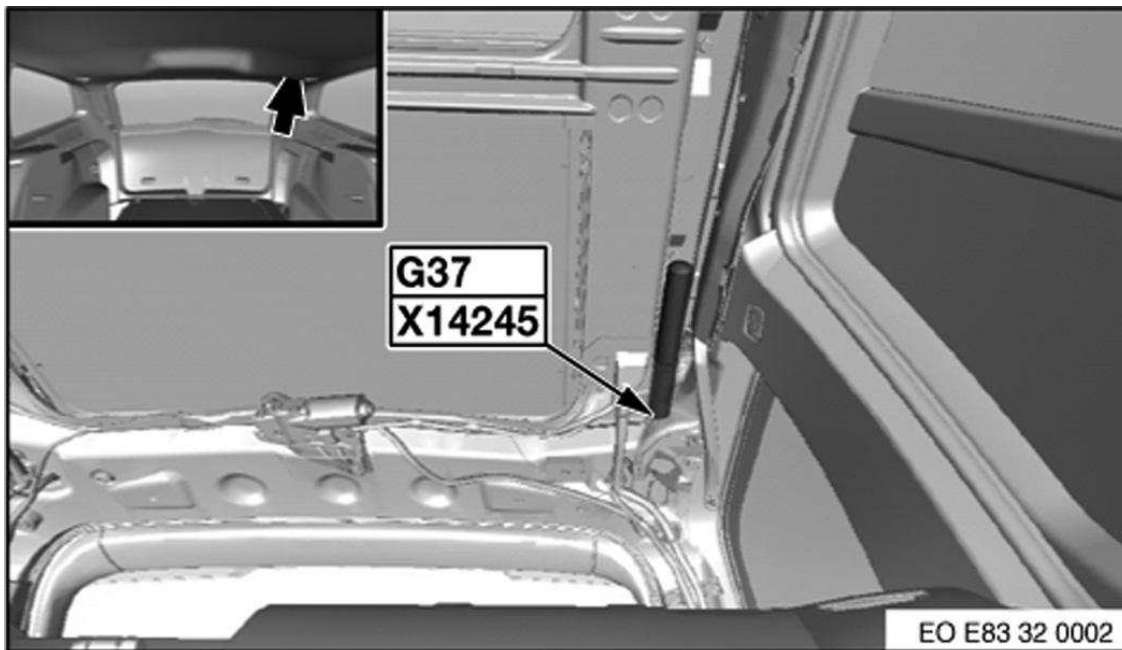
Fig. 89: Left Rear Door
 Courtesy of BMW OF NORTH AMERICA, INC.



G00444455

Fig. 90: Right Rear Door

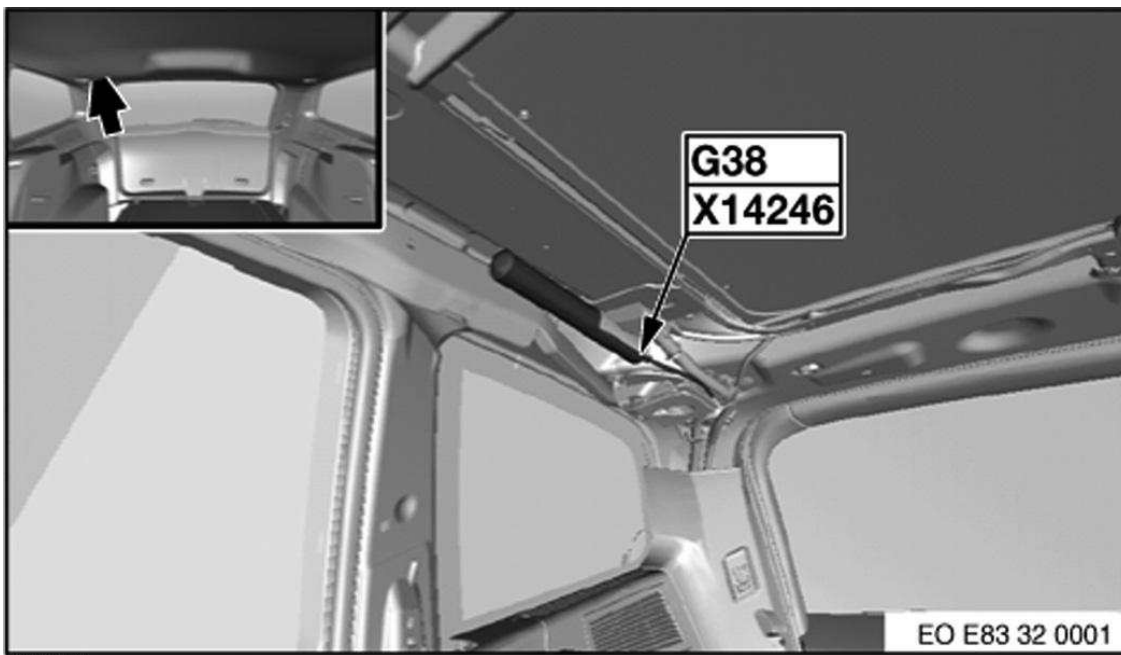
Courtesy of BMW OF NORTH AMERICA, INC.



G00444456

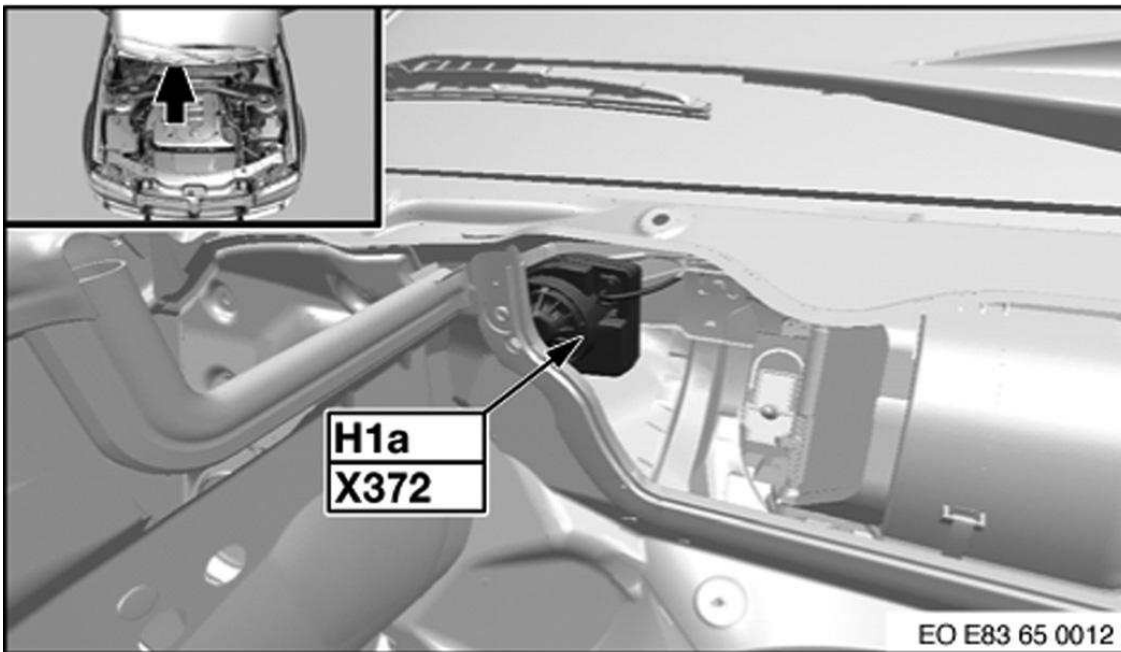
Fig. 91: Top Left Of Rear Compartment

Courtesy of BMW OF NORTH AMERICA, INC.



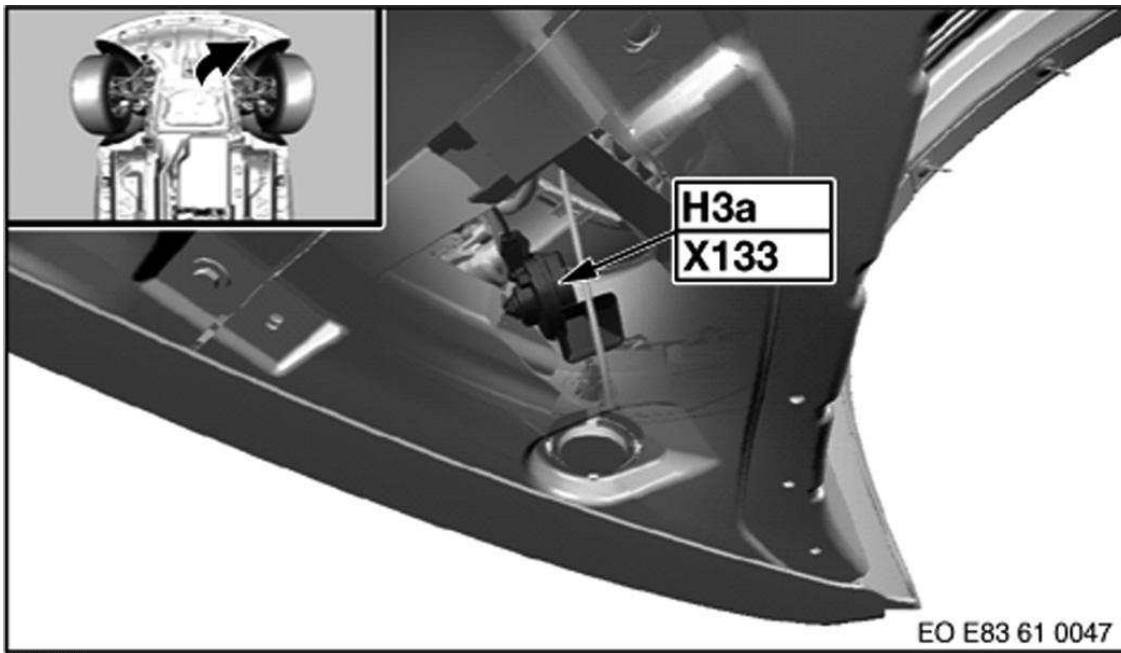
G00444457

Fig. 92: Top Right Of Rear Compartment
Courtesy of BMW OF NORTH AMERICA, INC.



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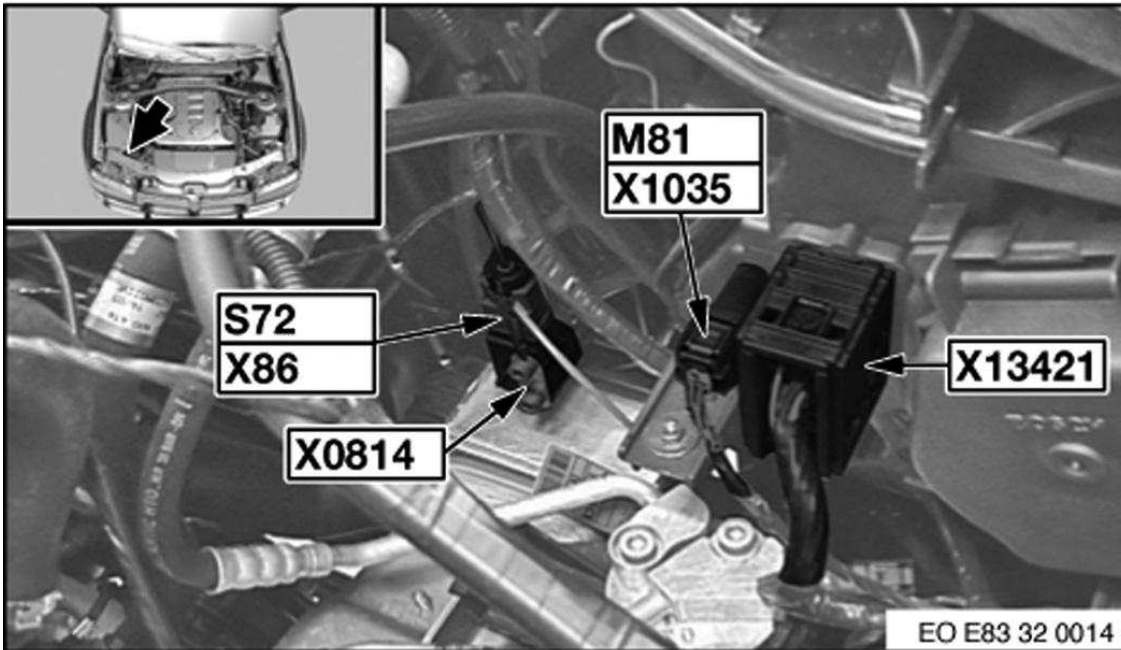
Fig. 93: Rear Of Engine Compartment
Courtesy of BMW OF NORTH AMERICA, INC.



G00444459

Fig. 94: Under Vehicle

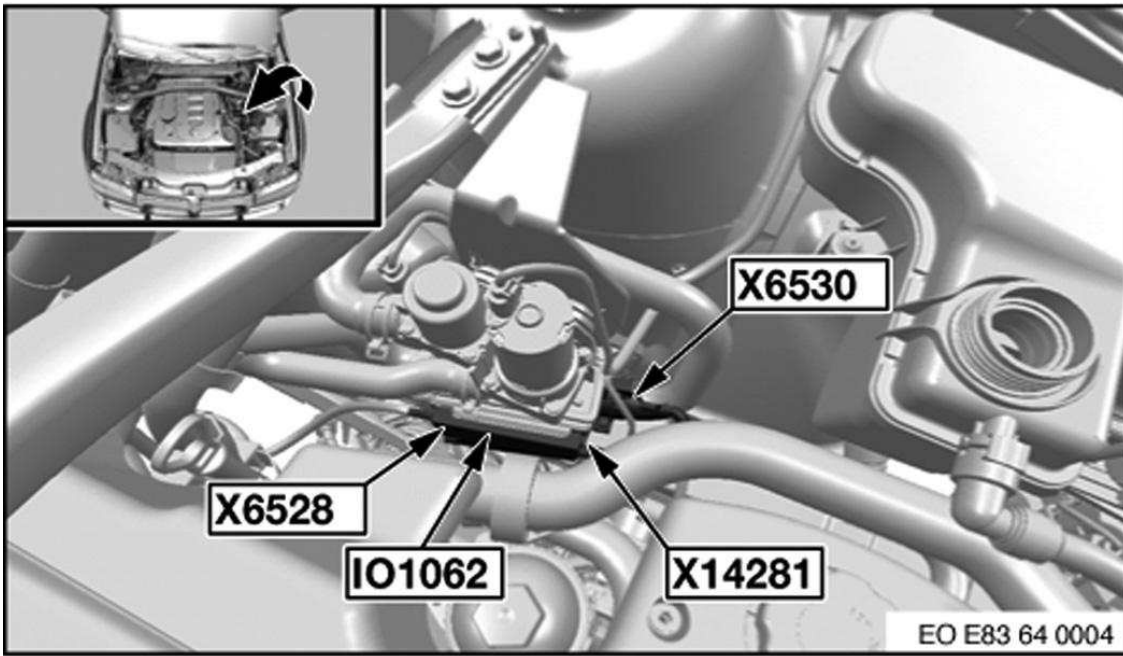
Courtesy of BMW OF NORTH AMERICA, INC.



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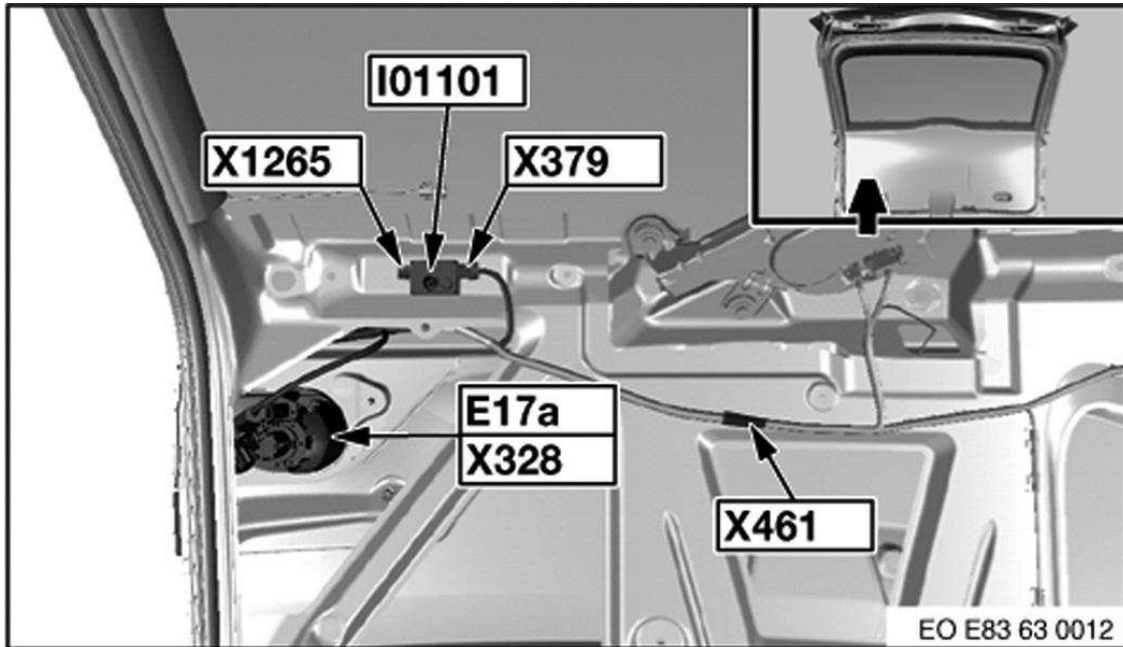
Fig. 95: Right Side Of Engine Compartment

Courtesy of BMW OF NORTH AMERICA, INC.



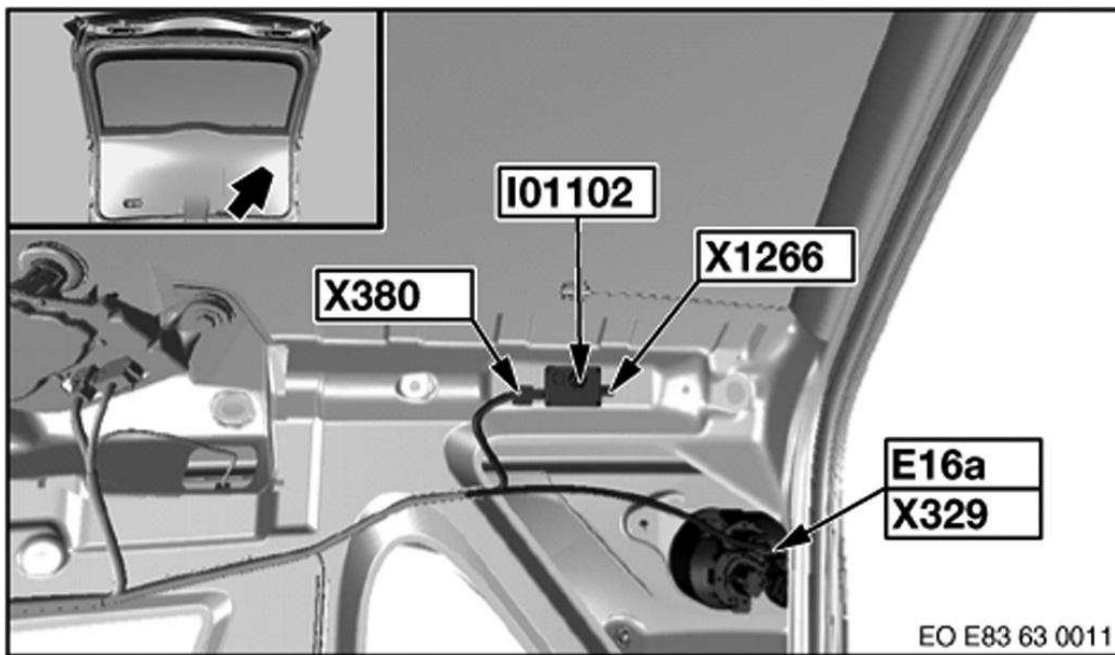
G00444461

Fig. 96: Left Side Of Engine Compartment
 Courtesy of BMW OF NORTH AMERICA, INC.



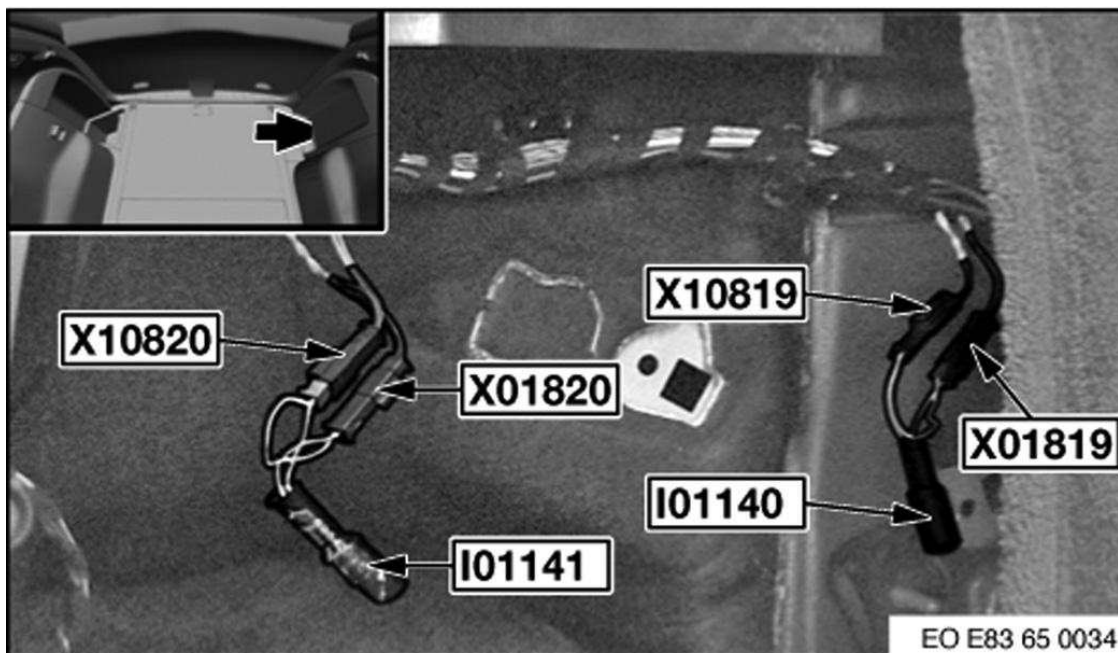
G00444462

Fig. 97: Rear Compartment Door
 Courtesy of BMW OF NORTH AMERICA, INC.



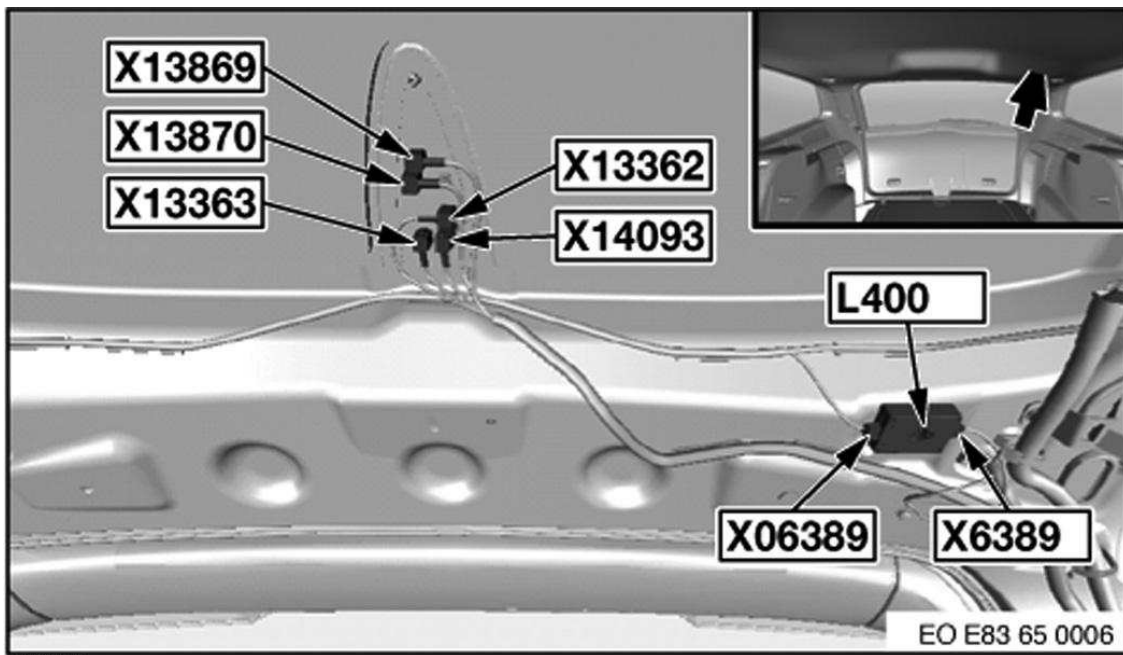
G00444463

Fig. 98: Rear Compartment Door
 Courtesy of BMW OF NORTH AMERICA, INC.



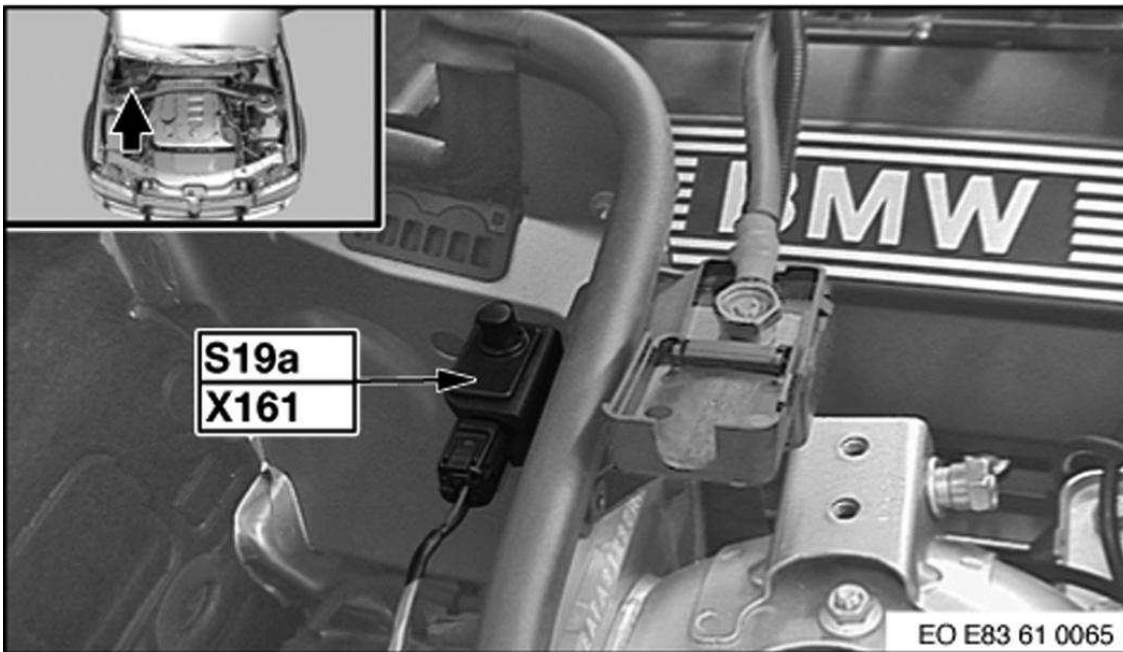
G00444464

Fig. 99: Left Side Of Rear Compartment
 Courtesy of BMW OF NORTH AMERICA, INC.



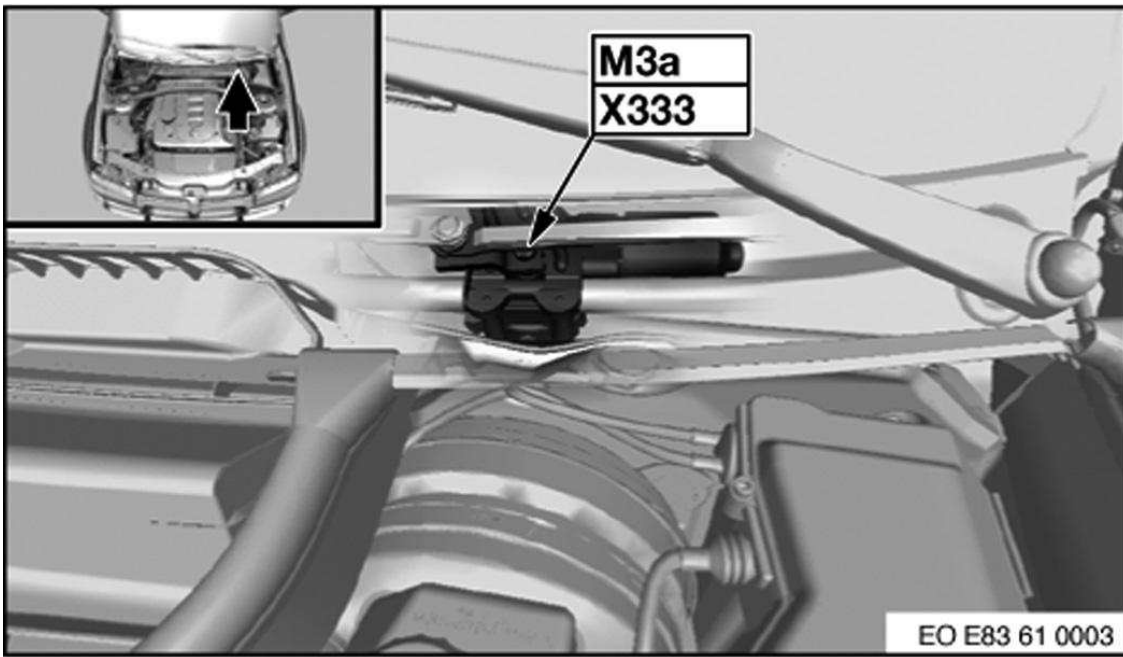
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Fig. 100: Top Left Of Rear Compartment
 Courtesy of BMW OF NORTH AMERICA, INC.



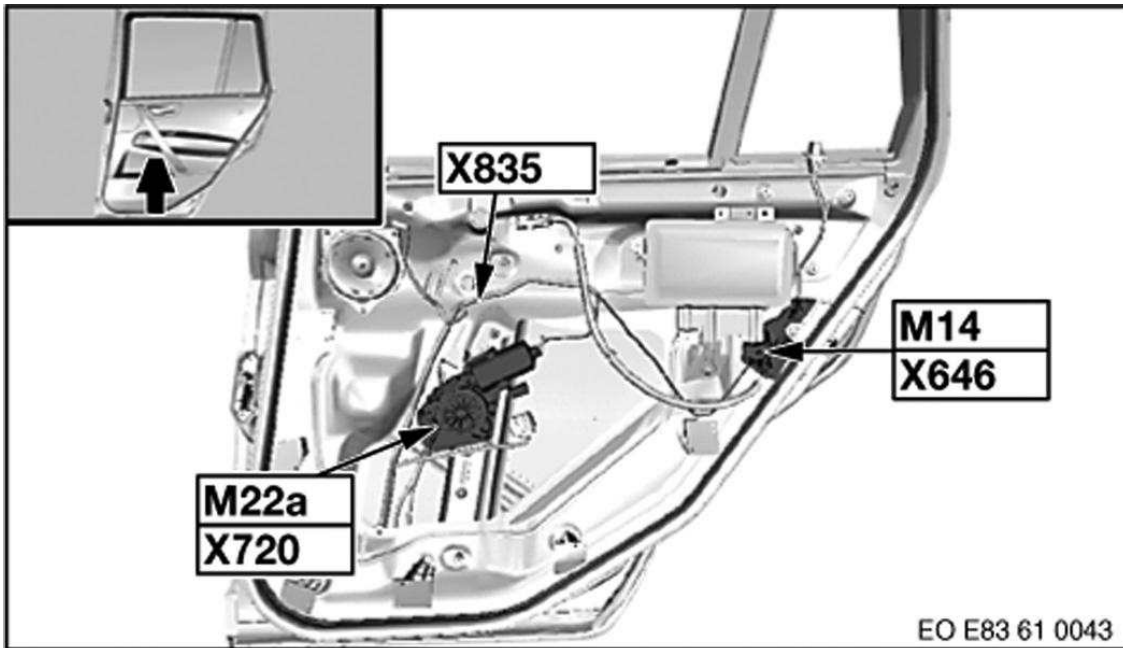
G00444466

Fig. 101: Right Rear Of Engine Compartment
 Courtesy of BMW OF NORTH AMERICA, INC.



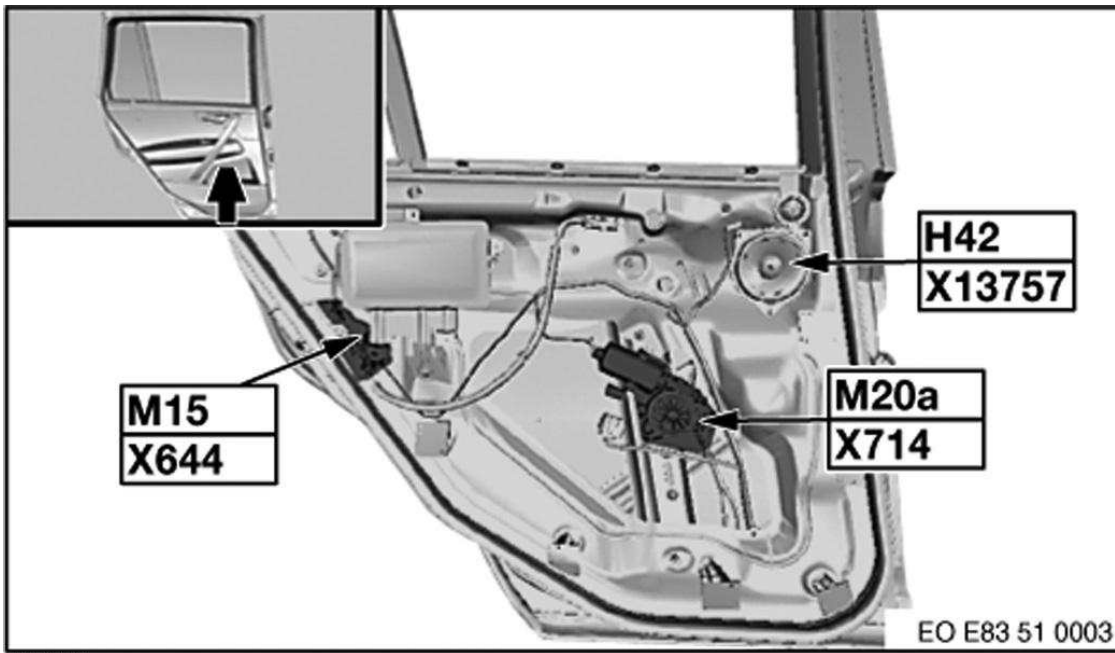
G00444467

Fig. 102: Left Rear Of Engine Compartment
 Courtesy of BMW OF NORTH AMERICA, INC.



G00444468

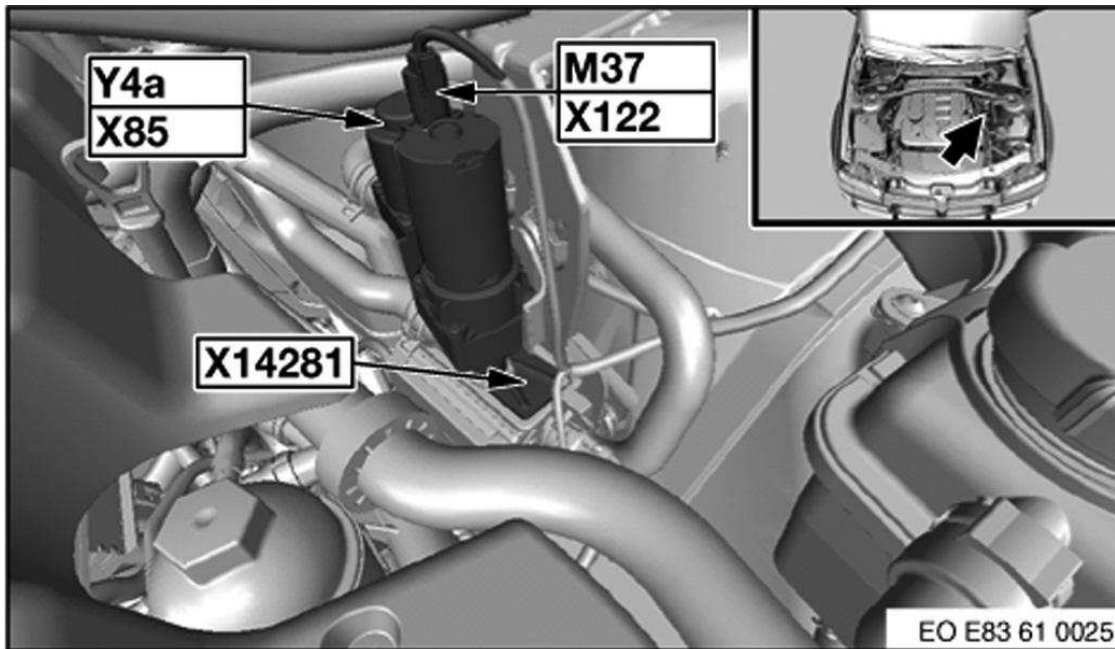
Fig. 103: Right Rear Door
 Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 104: Left Rear Door

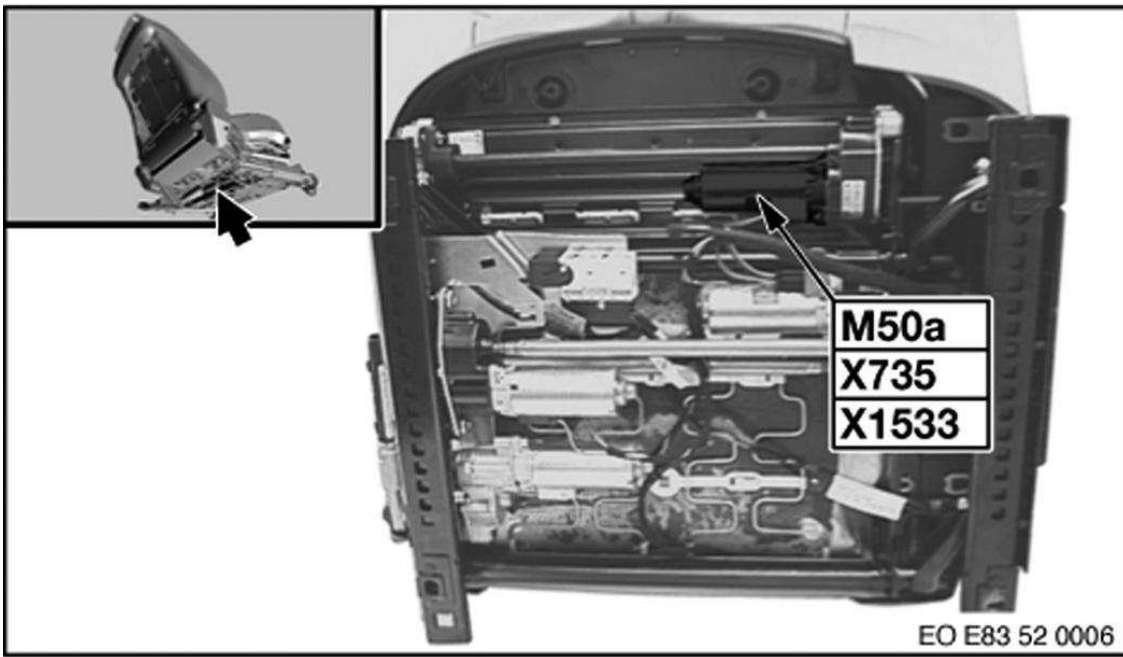
Courtesy of BMW OF NORTH AMERICA, INC.



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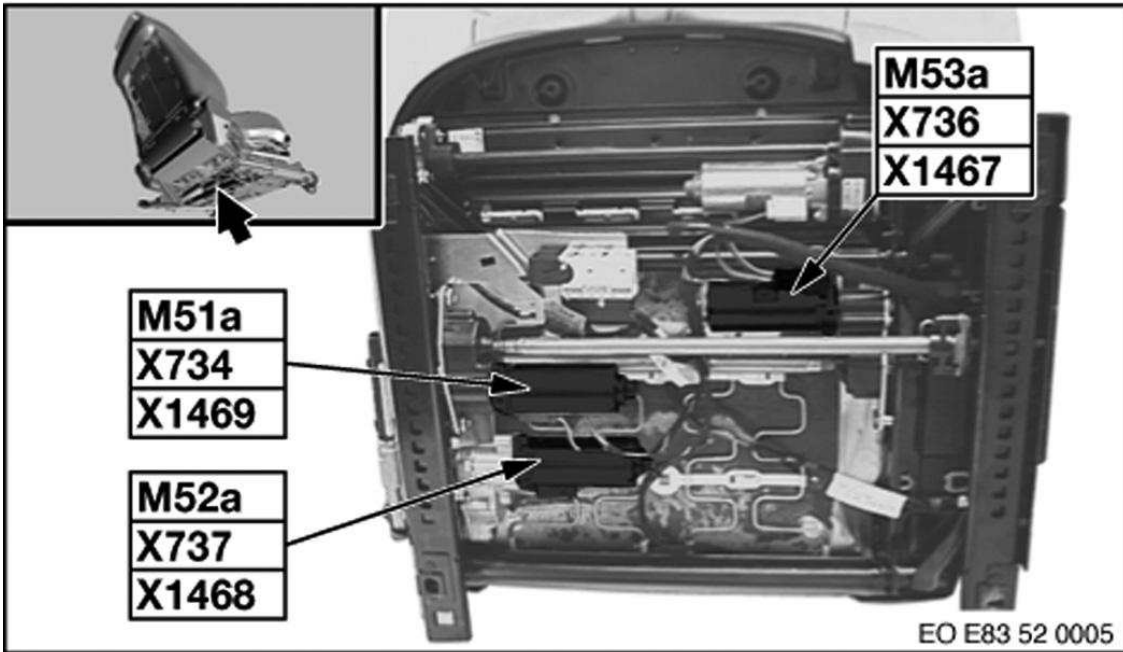
Fig. 105: Left Side Of Engine Compartment

Courtesy of BMW OF NORTH AMERICA, INC.



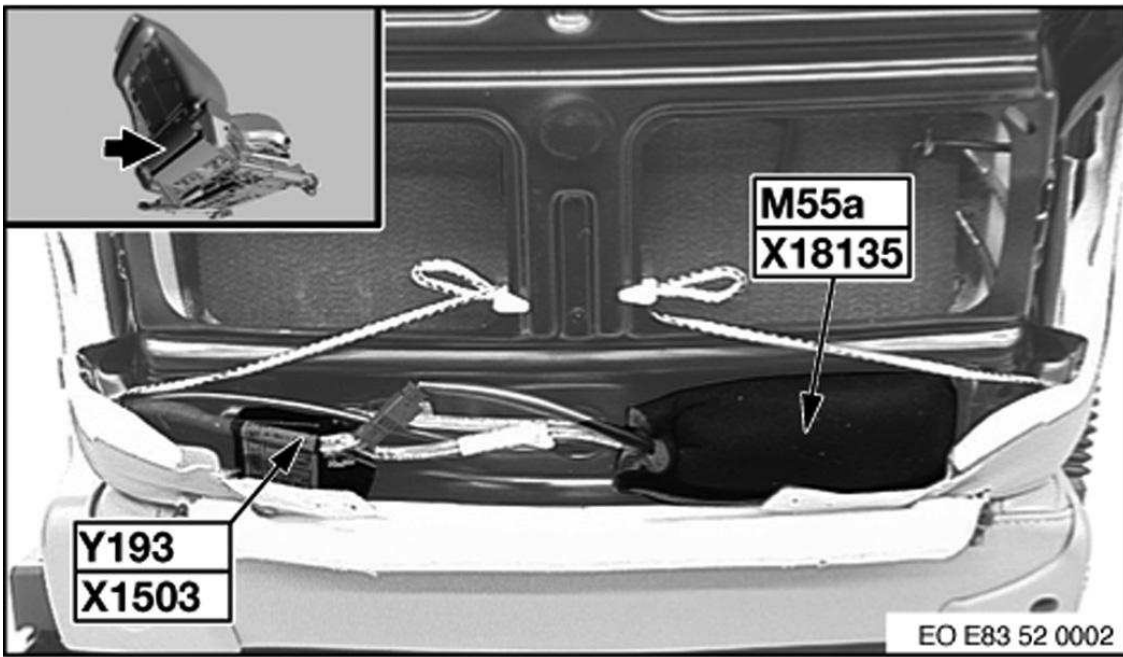
G0044471

Fig. 106: Under Driver's Seat
 Courtesy of BMW OF NORTH AMERICA, INC.



G0044472

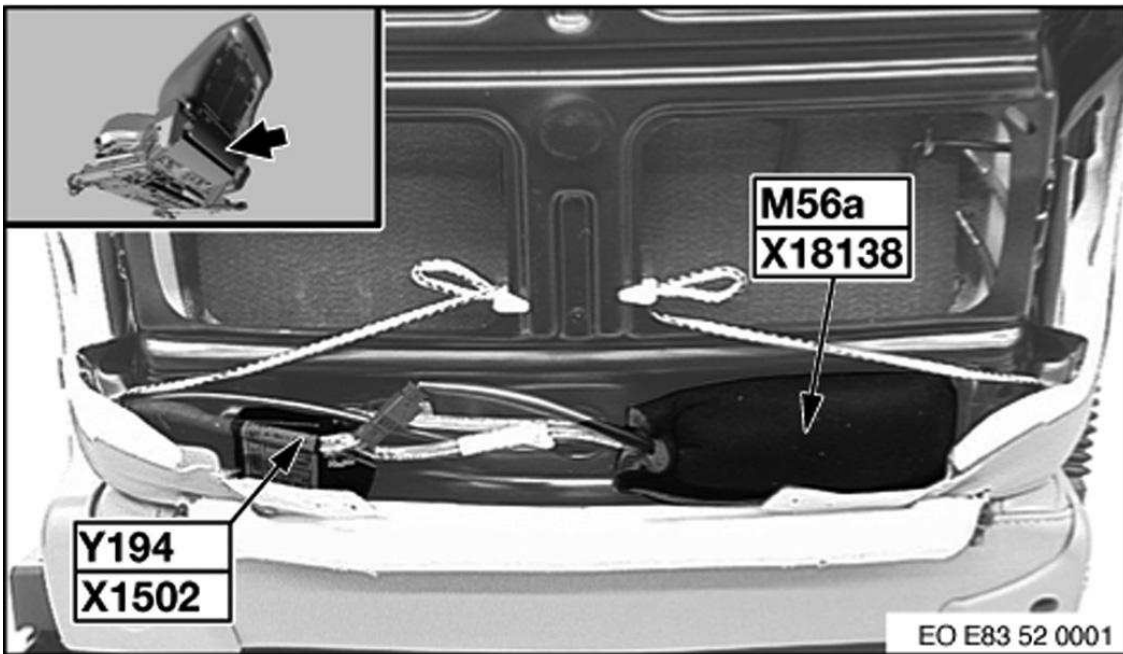
Fig. 107: Under Driver's Seat
 Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 108: Under Driver's Seat

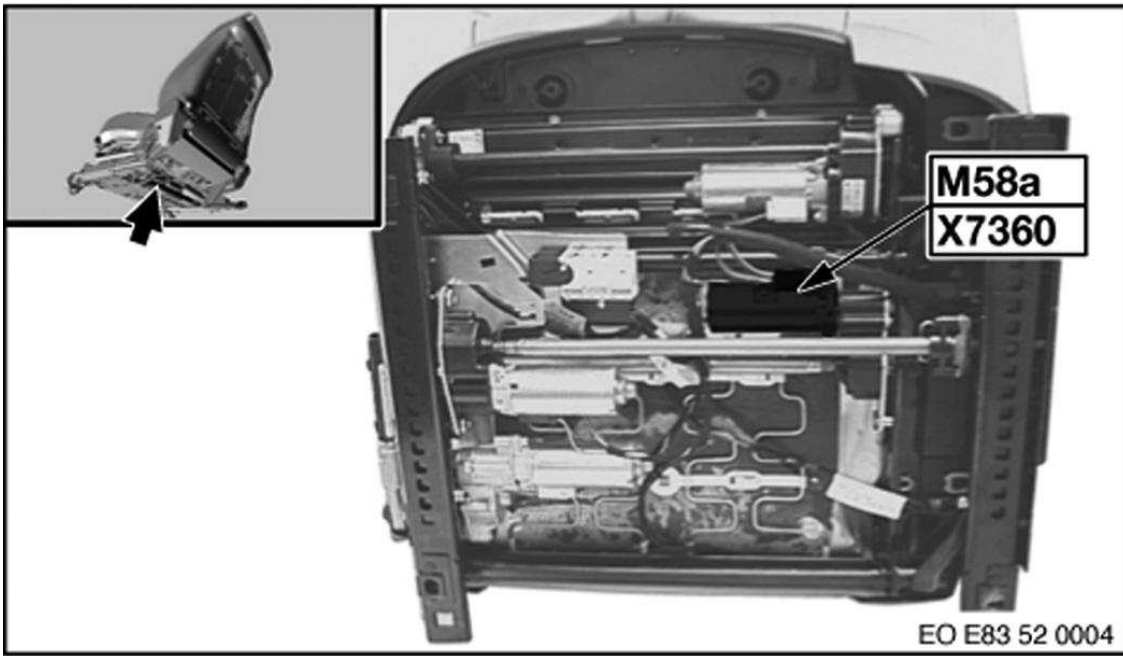
Courtesy of BMW OF NORTH AMERICA, INC.



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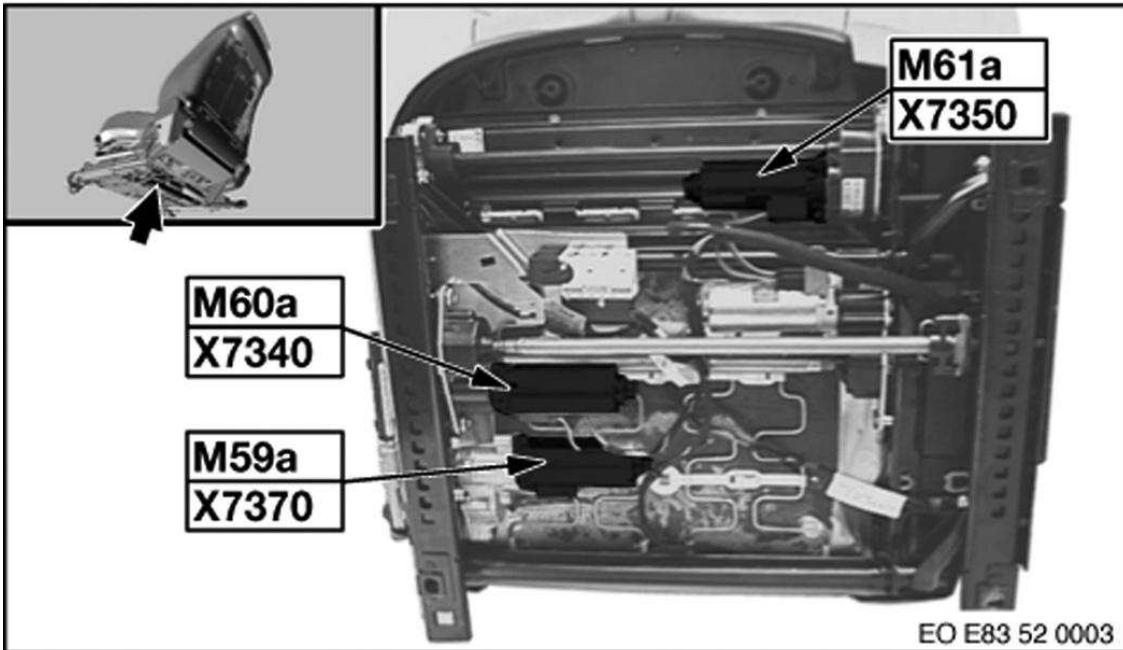
Fig. 109: Under Front Passenger's Seat

Courtesy of BMW OF NORTH AMERICA, INC.



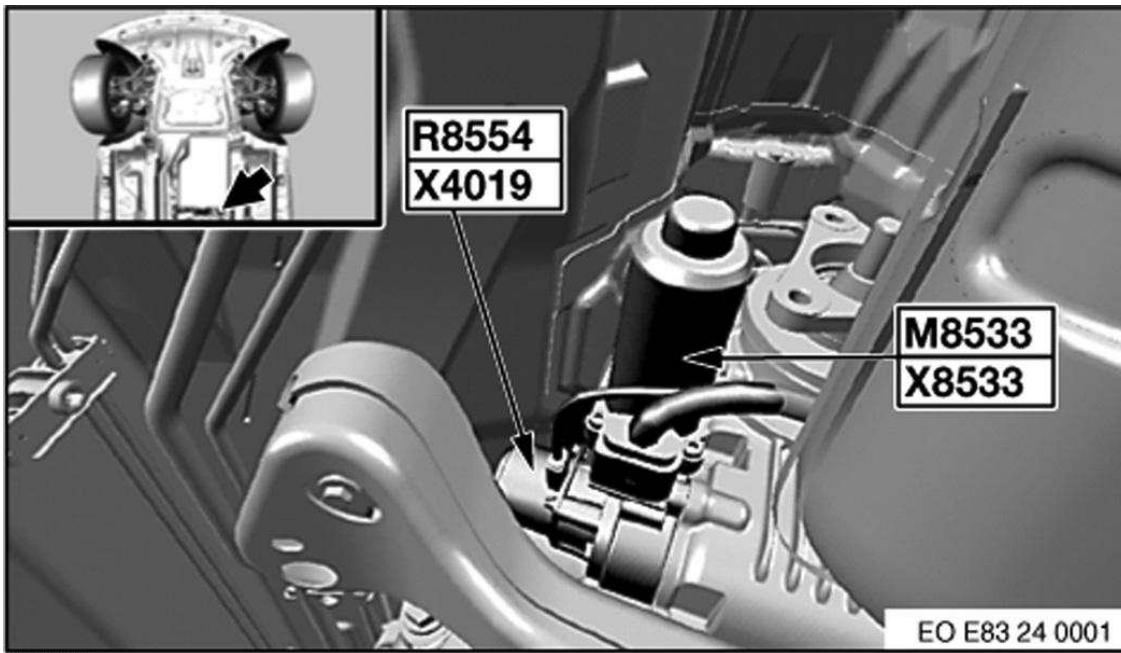
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Fig. 110: Under Front Passenger's Seat
Courtesy of BMW OF NORTH AMERICA, INC.



G00444476

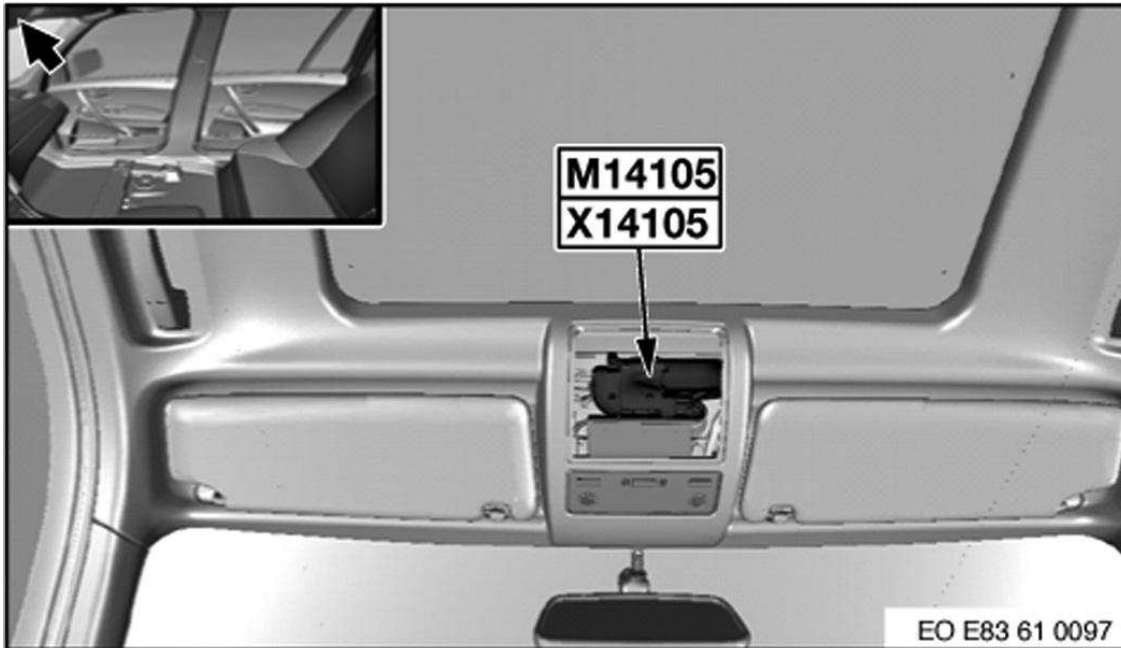
Fig. 111: Under Front Passenger's Seat
Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 112: Under Vehicle

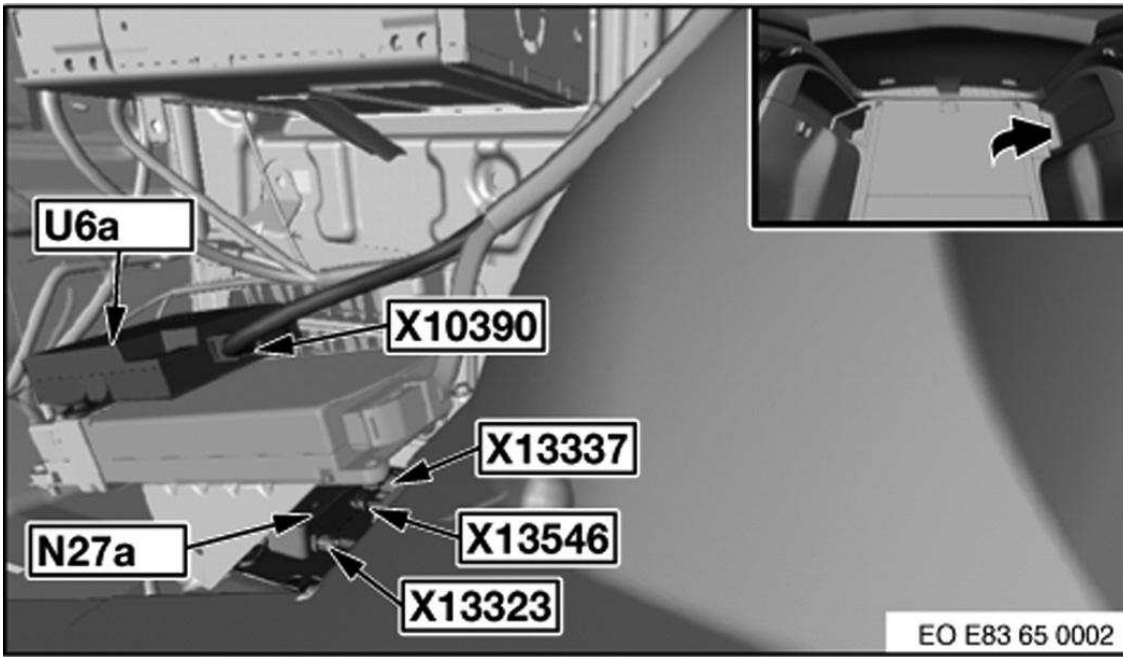
Courtesy of BMW OF NORTH AMERICA, INC.



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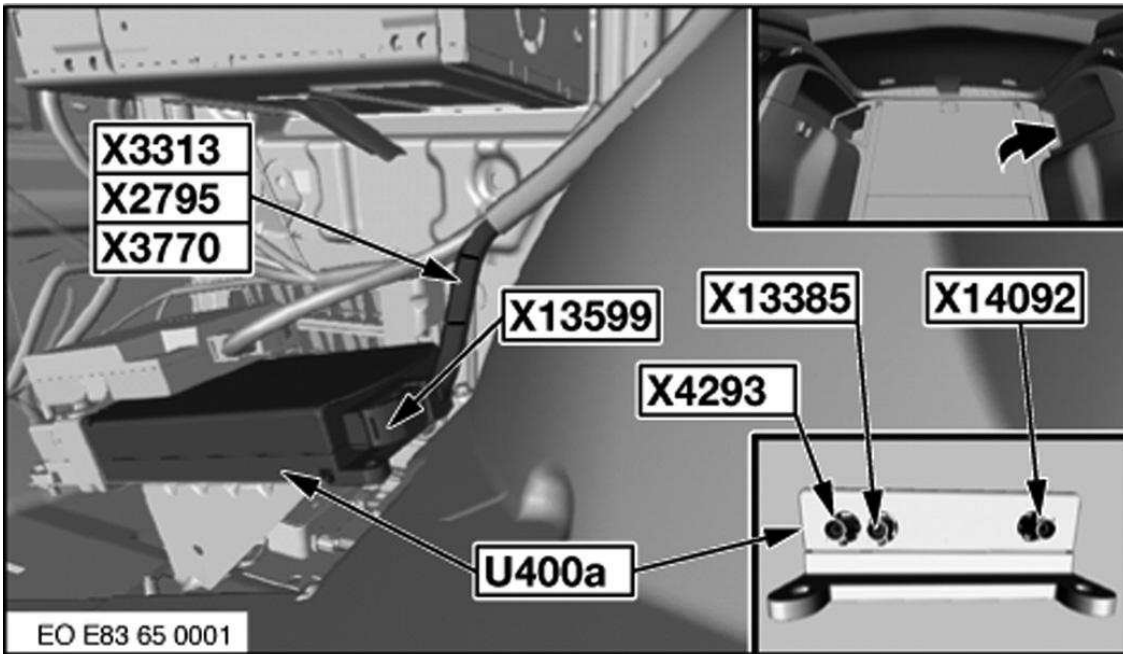
Fig. 113: Overhead Console

Courtesy of BMW OF NORTH AMERICA, INC.



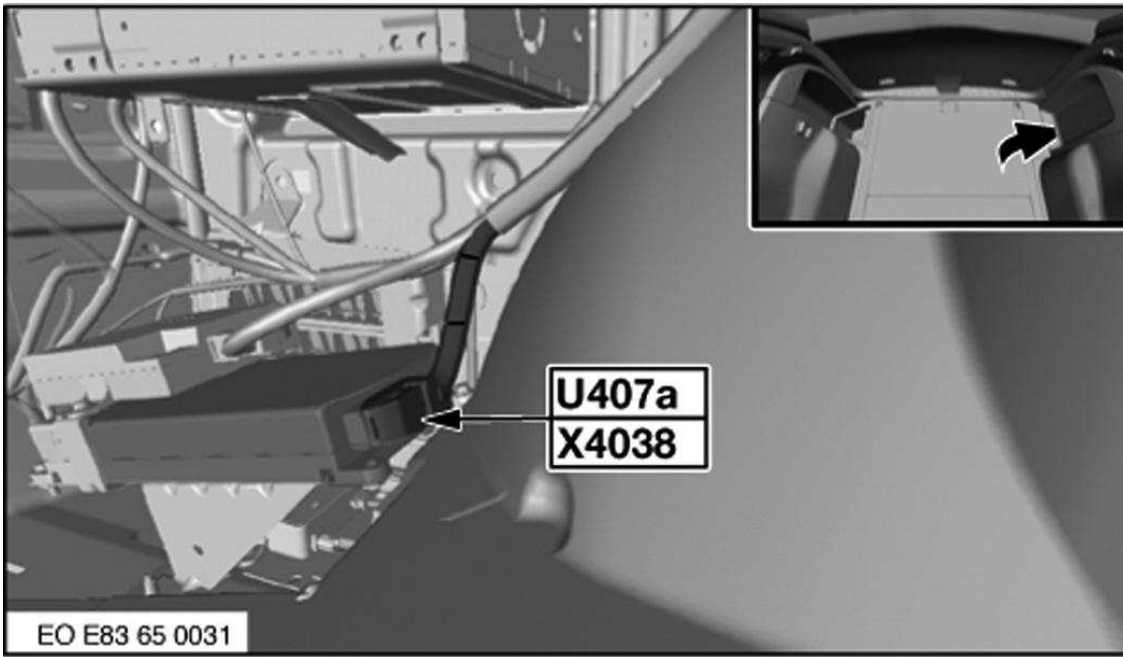
G00444479

Fig. 114: Left Side Of Rear Compartment
 Courtesy of BMW OF NORTH AMERICA, INC.



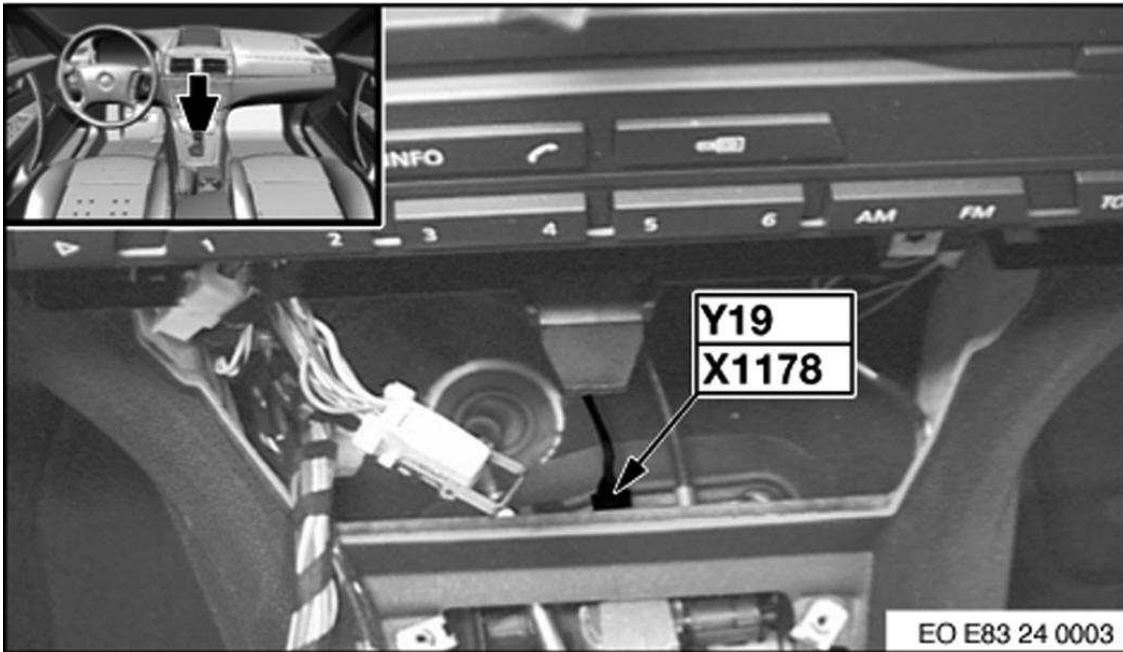
G00444480

Fig. 115: Left Side Of Rear Compartment
 Courtesy of BMW OF NORTH AMERICA, INC.



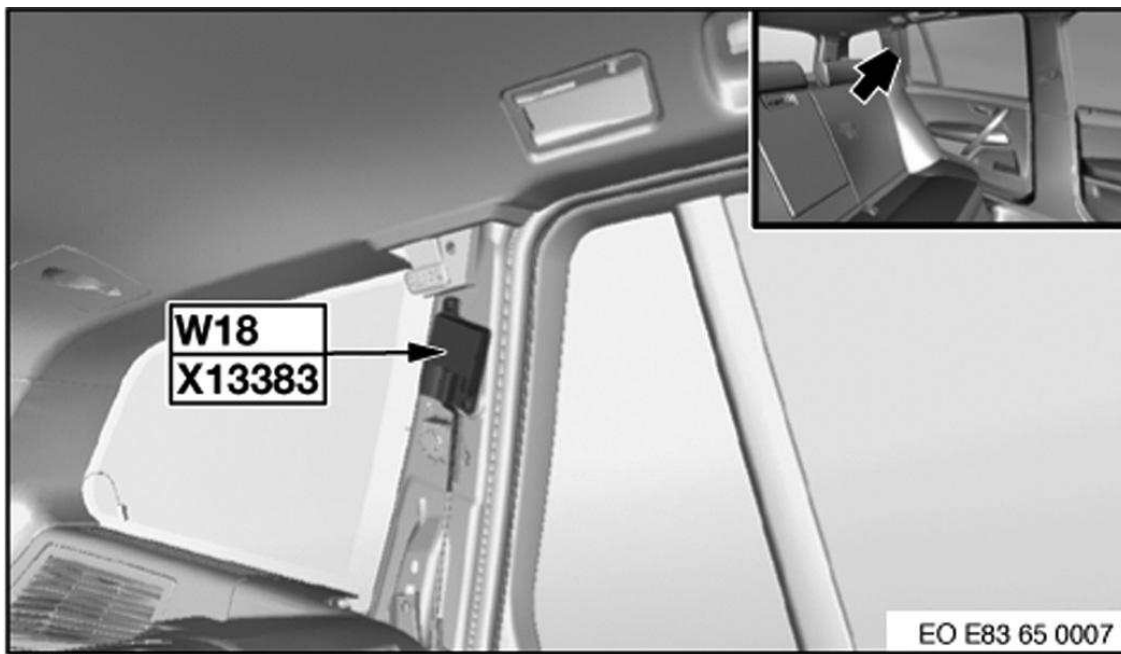
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Fig. 116: Left Side Of Rear Compartment
Courtesy of BMW OF NORTH AMERICA, INC.



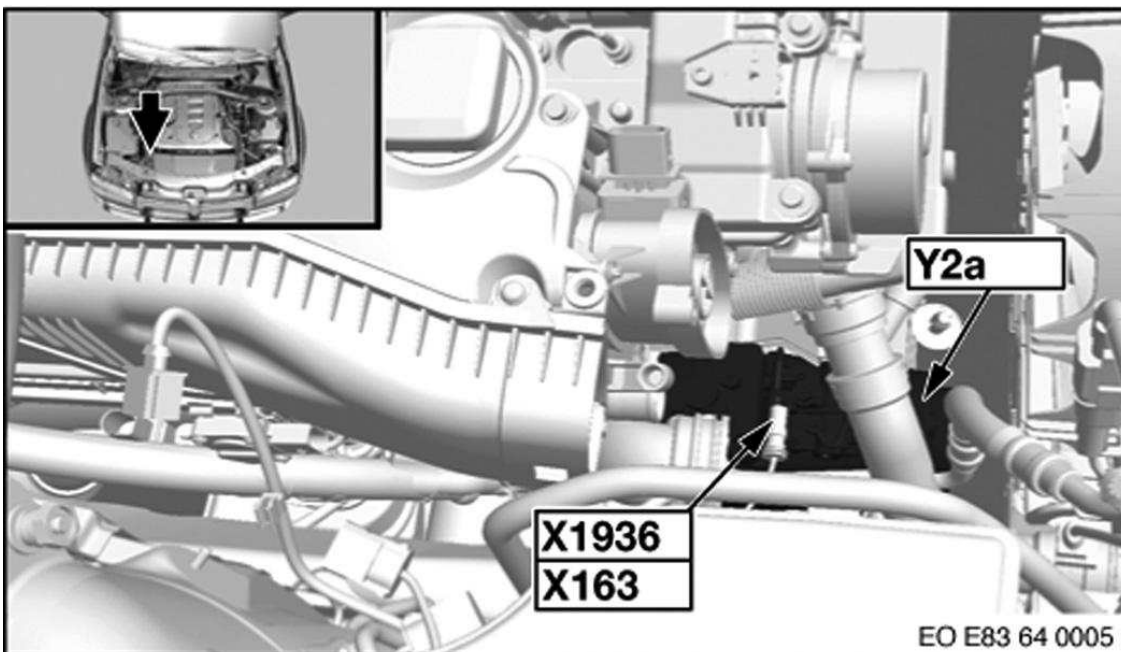
G00444482

Fig. 117: Center Console
Courtesy of BMW OF NORTH AMERICA, INC.



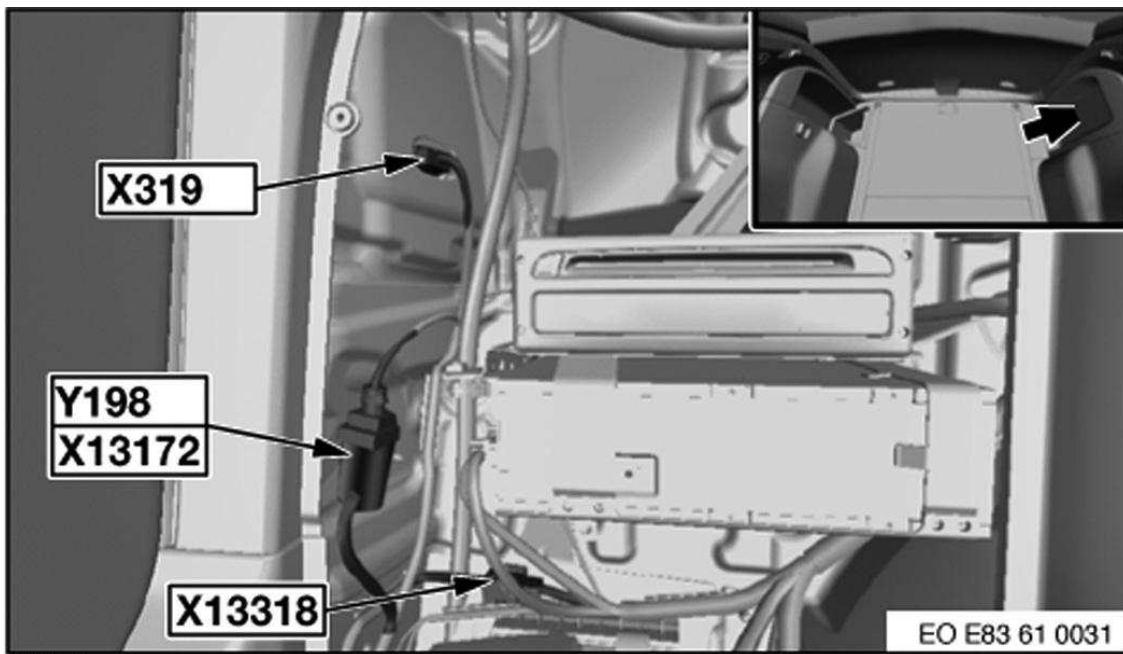
G00444483

Fig. 118: Top Of Left "C" Pillar
Courtesy of BMW OF NORTH AMERICA, INC.



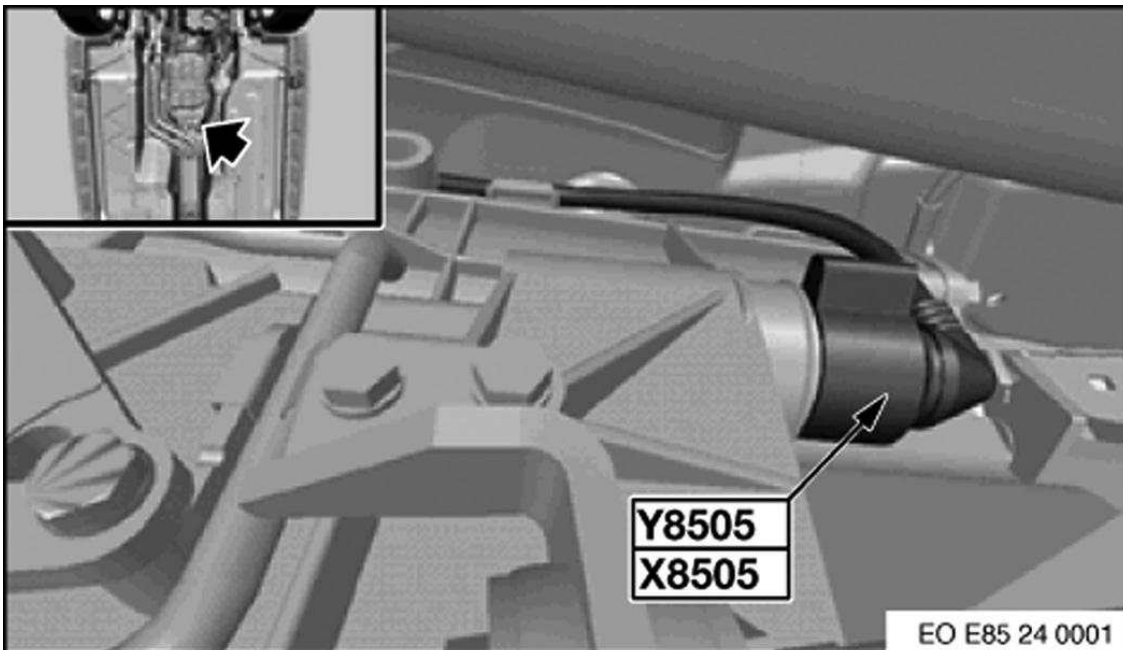
G00444484

Fig. 119: Right Side Of Engine Compartment
Courtesy of BMW OF NORTH AMERICA, INC.



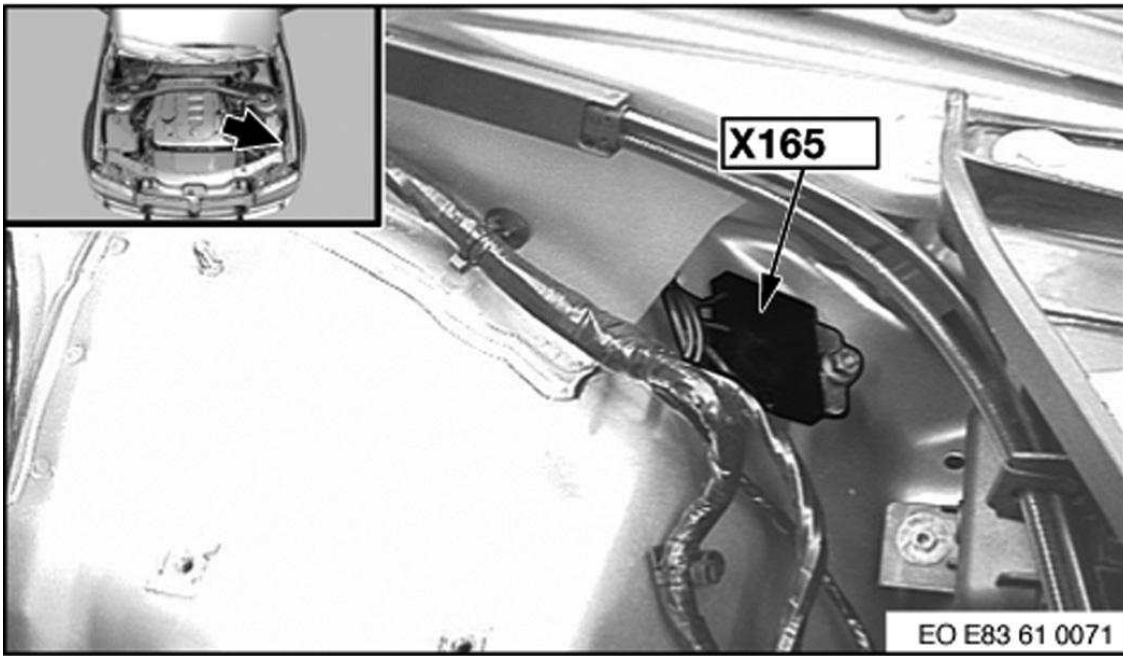
G00444485

Fig. 120: Left Side Of Rear Compartment
Courtesy of BMW OF NORTH AMERICA, INC.



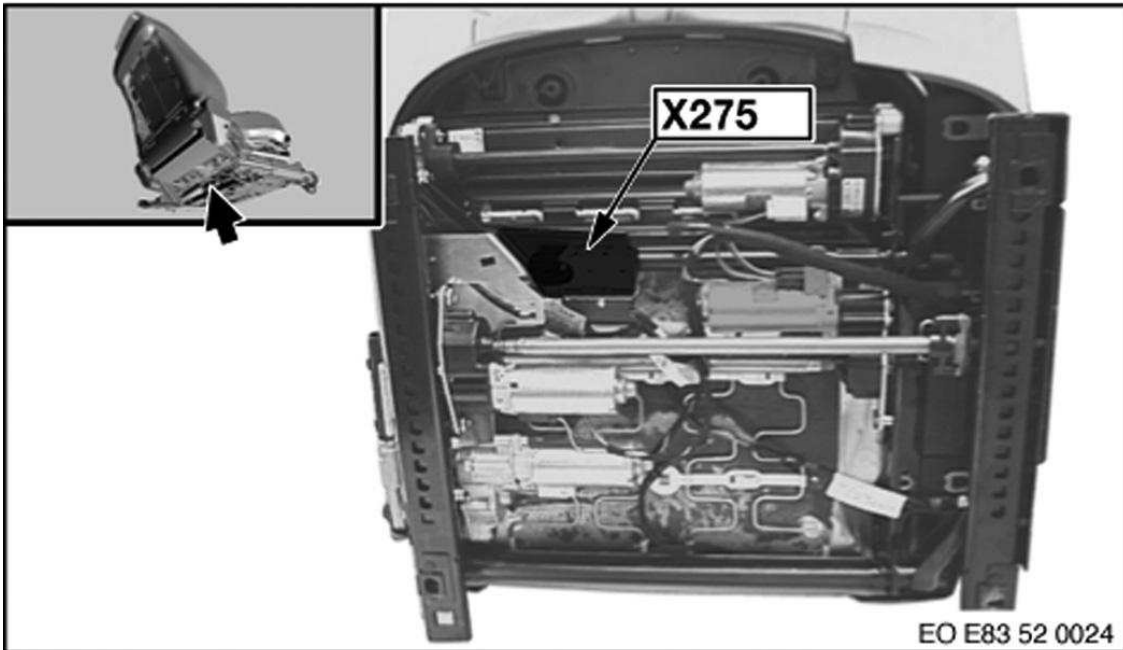
G00444486

Fig. 121: Under Vehicle
Courtesy of BMW OF NORTH AMERICA, INC.



G00444487

Fig. 122: Left Side Of Engine Compartment
Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 123: Under Seat
Courtesy of BMW OF NORTH AMERICA, INC.

2003-06 ACCESSORIES & BODY, CAB

Audio - SI Techniques - E60, E61, E63, E64, E65, E66

FUNCTIONS CHANGED AFTER VEHICLE PROGRAMMING E60, E61, E63, E64, E65, E66, E87, E90, E91

NOTE: Refer to FUNCTIONS CHANGED AFTER VEHICLE PROGRAMMING E60, E61, E63, E64, E65, E66, E87, E90, E91 .

FUNCTIONS CHANGED AFTER VEHICLE PROGRAMMING E60, E61, E63, E64

NOTE: Refer to FUNCTIONS CHANGED AFTER VEHICLE PROGRAMMING E60, E61, E63, E64 .

SATELLITE DIGITAL AUDIO RADIO SERVICE E60, E61, E63, E64, E90, E91



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Fig. 1: Identifying Satellite Digital Audio Radio Service
Courtesy of BMW OF NORTH AMERICA, INC.

INTRODUCTION

In the USA, BMW supports the digital radio reception system SDARS (Satellite Digital Audio Radio Service). The following providers offer SDARS:

- "Sirius Satellite Radio Inc."
- "XM Satellite Radio Inc."

BMW uses the SDARS system of "Sirius Satellite Radio Inc.". For system overview, refer to **SDARS SYSTEM OVERVIEW: E60, E61, E63, E64, E90, E91**.

The installation of special equipment creates the prerequisites in the car for using SDARS. These items of special equipment include the hardware and software for digital radio reception.

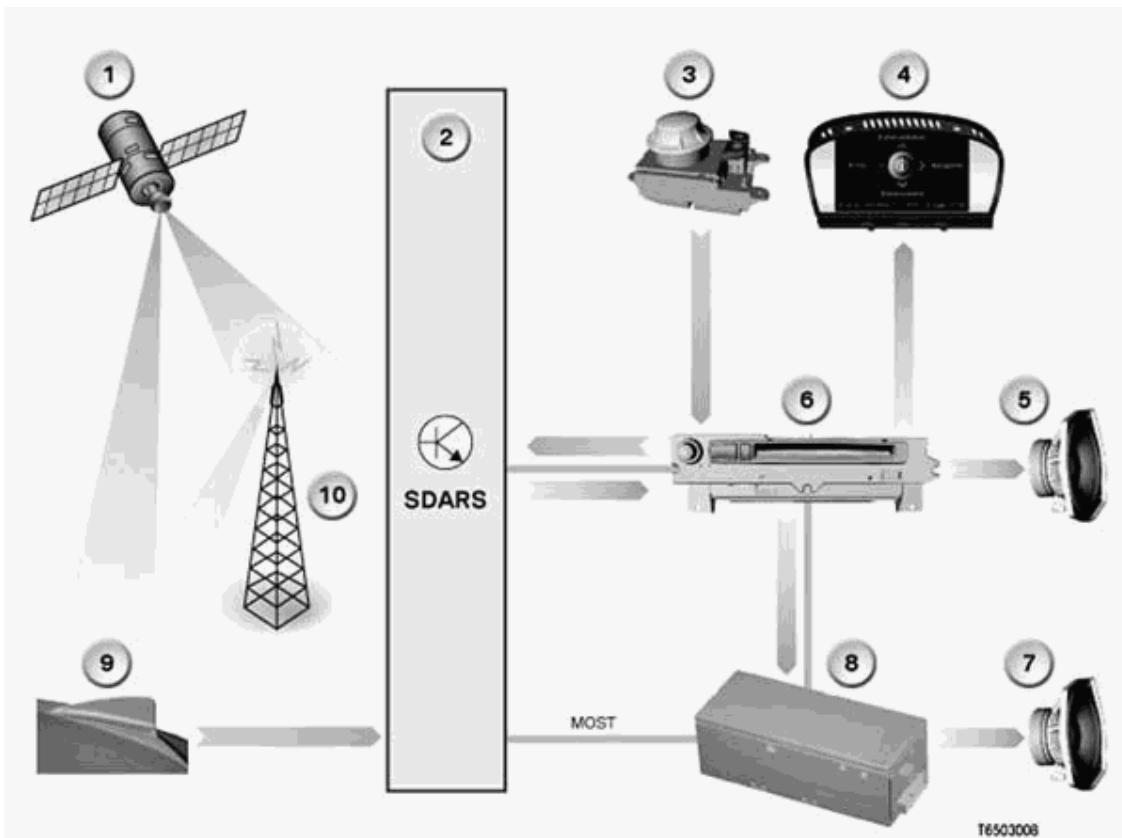
- Option 655 "BMW satellite tuner" together with
- Option 645 "Radio Control US"

SDARS System Overview: E60, E61, E63, E64, E90, E91

This system overview contains the following overviews:

- Input/output
- System circuit diagram
- Overview of control units and busses
 - > E60, E61, E63, E64 up to 09/2005
 - > E60, E61, E63, E64 from 09/2005
 - > E90, E91

Inputs/Outputs



Item	Description	Item	Description
1	Sirius satellite 1	2	Satellite tuner (SDARS: Satellite Digital Audio Radio Service)
3	Controller (CON)	4	Central Information Display (CID)
5	Loudspeaker	6	Multi-audio system controller (M-ASK)
7	Loudspeakers (TOP-HiFi system)	8	TOP-HiFi amplifier (optional) "Logic 7"
9	Telephone and GPS antenna on vehicle (includes SDARS antennas)	10	Stationary antennae for terrestrial reception
MOST	Media Oriented System Transport		

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Fig. 2: SDARS Inputs/Outputs Component Block Diagram
 Courtesy of BMW OF NORTH AMERICA, INC.

System Circuit Diagram

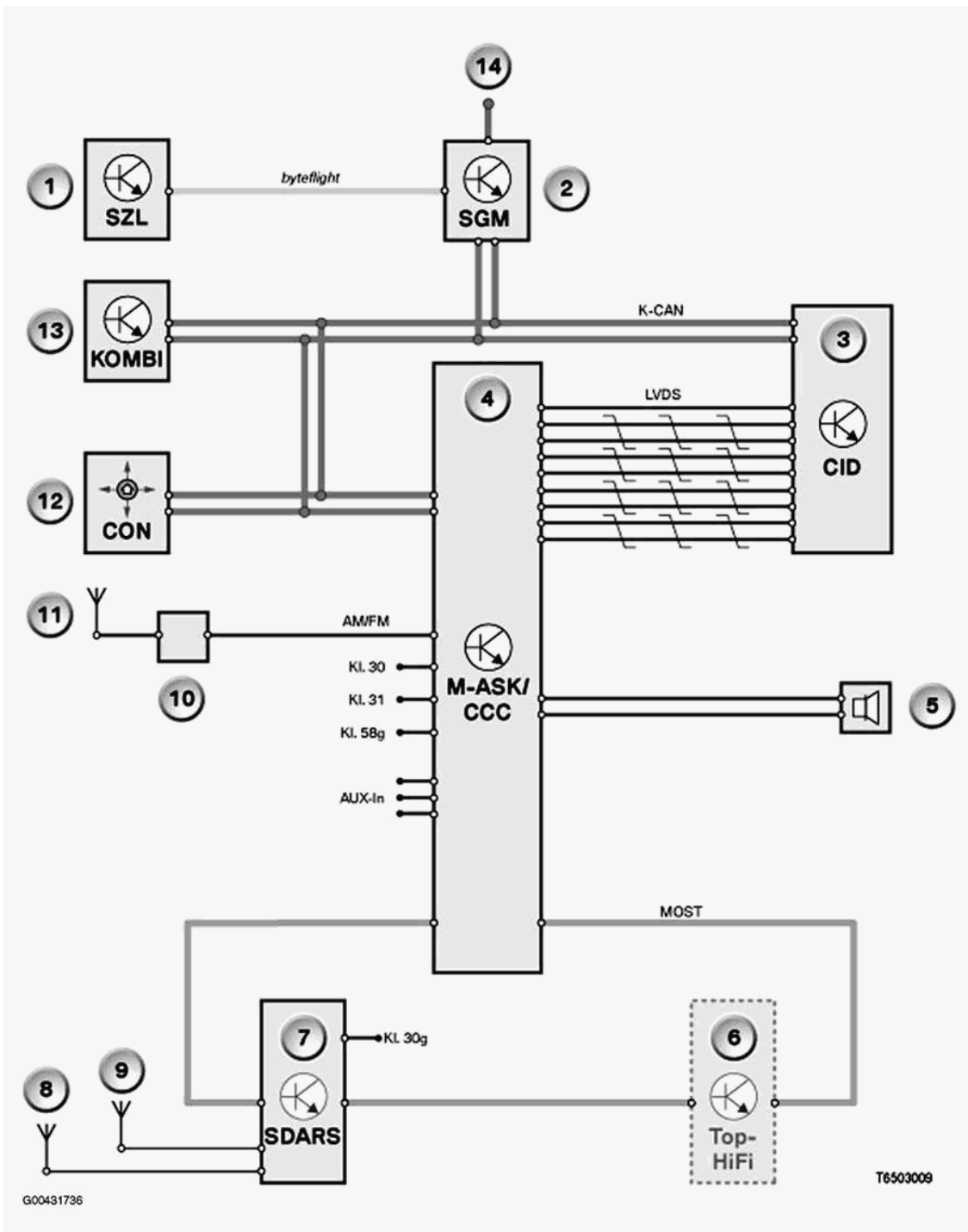


Fig. 3: SDARS System Circuit Diagram

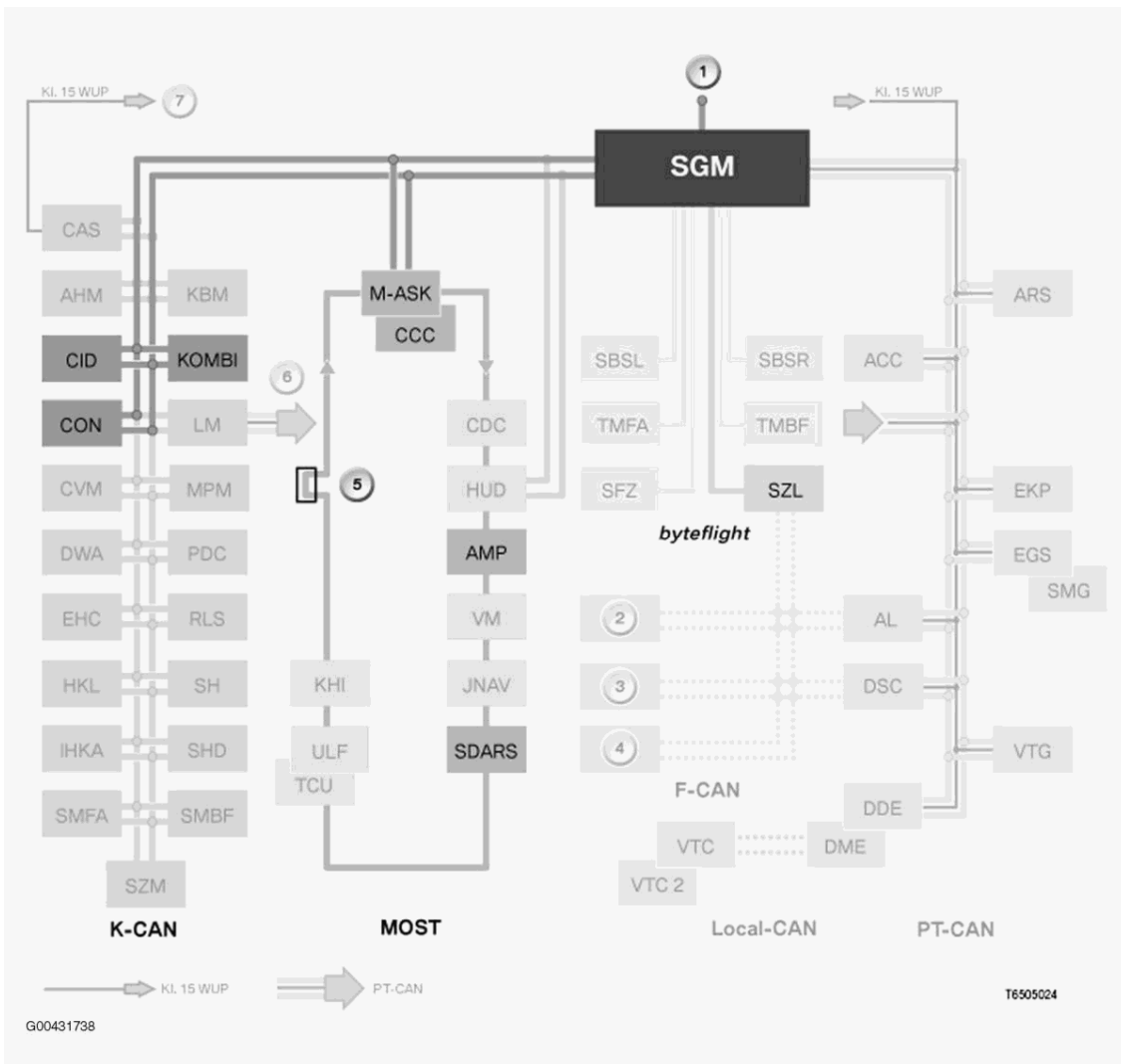
Courtesy of BMW OF NORTH AMERICA, INC.

Item	Description	Item	Description
1	Steering column switch cluster (SZL) with buttons for volume control and station selection	2	Safety and gateway module (SGM)
3	Central Information Display (CID)	4	M-ASK or CCC (M-ASK = "multi-audio system controller"; CCC = "Car Communication Computer")
5	Loudspeaker	6	TOP-HiFi amplifier (optional) "Logic 7"
7	Satellite tuner (SDARS)	8	Antenna connector for SDARS antenna for terrestrial reception
9	Antenna connector for SDARS antenna for satellite reception	10	Antenna diversity
11	Radio antennas (AM/FM)	12	Controller (CON)
13	Instrument cluster (KOMBI)	14	Diagnostic wire
K-CAN	Body CAN	LVDS	LVDS (Low Voltage Differential Signalling) data line
MOST	Media Oriented System Transport	AUX-In	Input for AUX-In connection
Kl. 58 g	Terminal 58g	Kl. 31	Terminal 31, earth
Kl. 30	Terminal 30, battery plus	AM/FM	AM and FM signal input (AM: amplitude modulation; FM: frequency modulation)
byteflight	byteflight fibre optics		

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Fig. 4: Legend For SDARS System circuit diagram
Courtesy of BMW OF NORTH AMERICA, INC.

Overview Of Control Units And Buses Involved In SDARS (E60, E61, E63, E64 up to 09/2005)



**Fig. 5: Overview Of Control Units And Buses Involved In SDARS (E60, E61, E63, E64 up to 09/2005)
 Courtesy of BMW OF NORTH AMERICA, INC.**

Control units on the K-CAN data bus	
Item	Description
CID	Central Information Display
CON	Controller
KOMBI	Instrument cluster
SGM	Safety and gateway module

Control units on the MOST data bus	
Item	Description
AMP	Amplifier
CCC	Car Communication Computer
M-ASK	Multi-audio system controller (with navigation system)
SDARS	Satellite tuner (SDARS = "Satellite Digital Audio Radio Service")
The arrows show the direction of the light waves in the MOST bus.	

Control units on the byteflight data bus	
Item	Description
SGM	Safety and gateway module
SZL	Steering column switch centre (with steering-angle sensor)

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Fig. 6: Legend For Overview Of Control Units And Buses Involved In SDARS (E60, E61, E63, E64 up to 09/2005)
Courtesy of BMW OF NORTH AMERICA, INC.

Overview Of Control Units And Buses Involved In SDARS (E60, E61, E63, E64 from 09/2005)

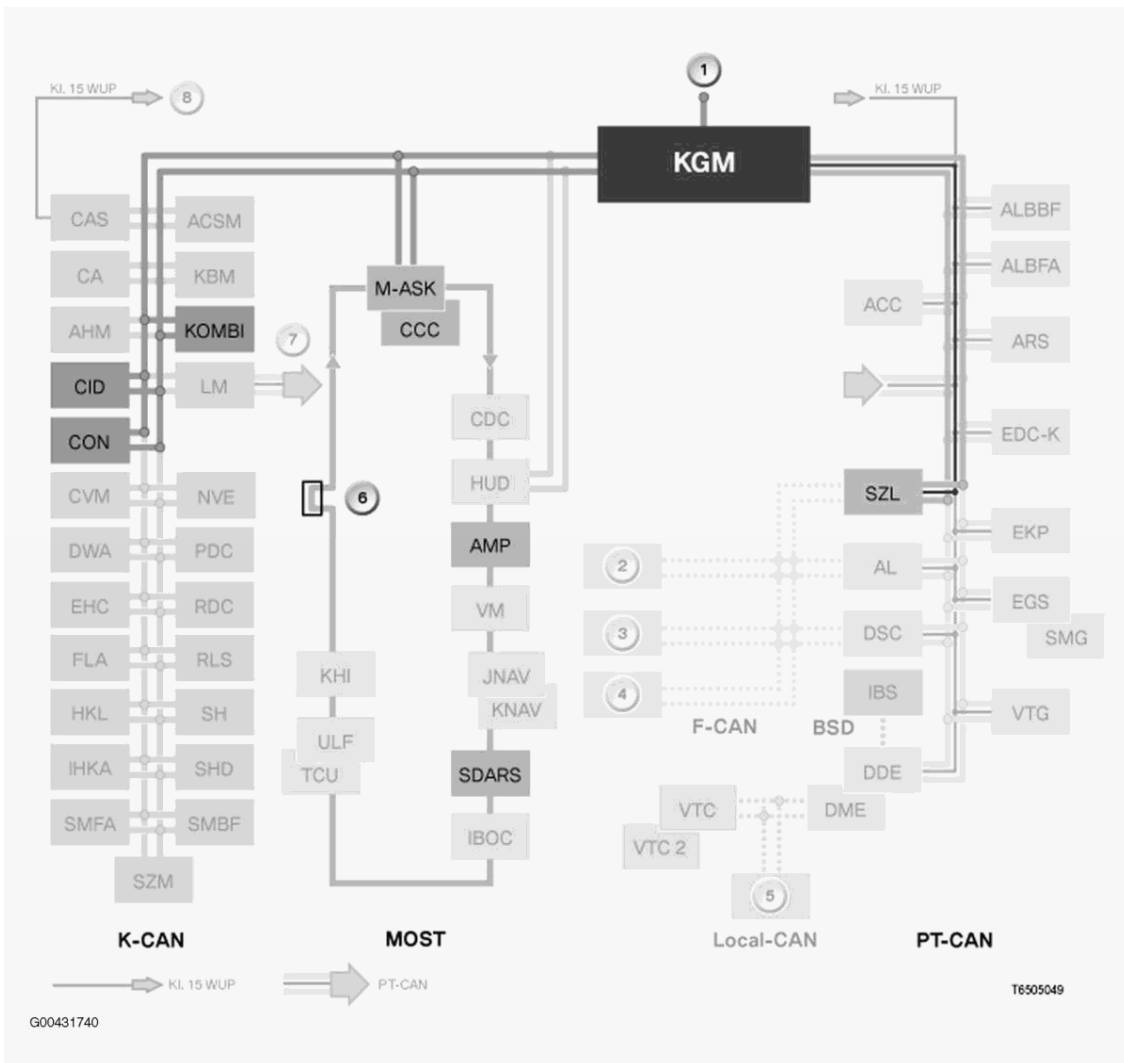


Fig. 7: Overview Of Control Units And Buses Involved In SDARS (E60, E61, E63, E64 from 09/2005)
 Courtesy of BMW OF NORTH AMERICA, INC.

Control units on the K-CAN data bus	
Item	Description
CID	Central Information Display
CON	Controller
KGM	Body-gateway module
KOMBI	Instrument cluster

Control units on the MOST data bus	
Item	Description
AMP	Amplifier
CCC	Car Communication Computer
M-ASK	Multi-audio system controller (with navigation system)
SDARS	Satellite tuner (SDARS: Satellite Digital Audio Radio Service)
The arrows show the direction of the light waves in the MOST bus.	

Control units on the PT-CAN data bus	
Item	Description
KGM	Body-gateway module
SZL	Steering column switch centre (with steering-angle sensor)

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Fig. 8: Legend For Overview Of Control Units And Buses Involved In SDARS (E60, E61, E63, E64 from 09/2005)

Courtesy of BMW OF NORTH AMERICA, INC.

Overview Of Control Units And Buses Involved In SDARS (E90, E91)

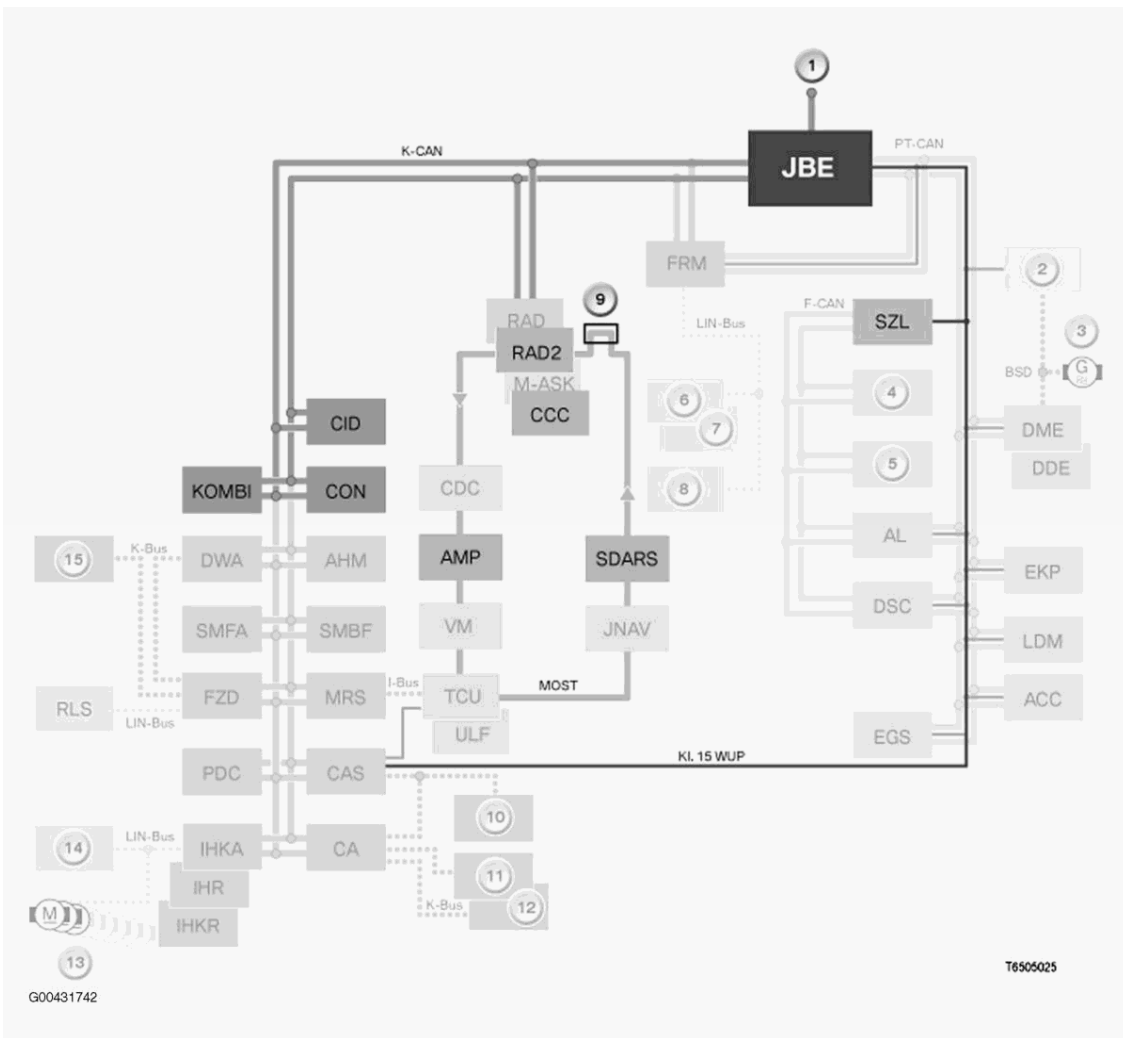


Fig. 9: Overview Of Control Units And Buses Involved In SDARS (E90, E91)
 Courtesy of BMW OF NORTH AMERICA, INC.

Control units on the K-CAN data bus	
Item	Description
CID	Central Information Display
CON	Controller
JBE	Junction box electronics
KOMBI	Instrument cluster

Control units on the MOST data bus	
Item	Description
AMP	Amplifier
CCC	Car Communication Computer
RAD2	Radio 2 (BMW "Professional" radio)
SDARS	Satellite tuner (SDARS = "Satellite Digital Audio Radio Service", US version only)
The arrows show the direction of the light waves in the MOST bus.	

Control units on F-CAN and PT-CAN data bus	
Item	Description
JBE	Junction box electronics
SZL	Steering column switch cluster

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Fig. 10: Legend For Overview Of Control Units And Buses Involved In SDARS (E90, E91)
Courtesy of BMW OF NORTH AMERICA, INC.

NEW FEATURES:

- Digital radio reception from satellites and stationary antennae for terrestrial reception. For more information, refer to **SDARS TECHNOLOGY: E60, E61, E63, E64, E90, E91** .
- Radio text: Information concerning radio programs are displayed.

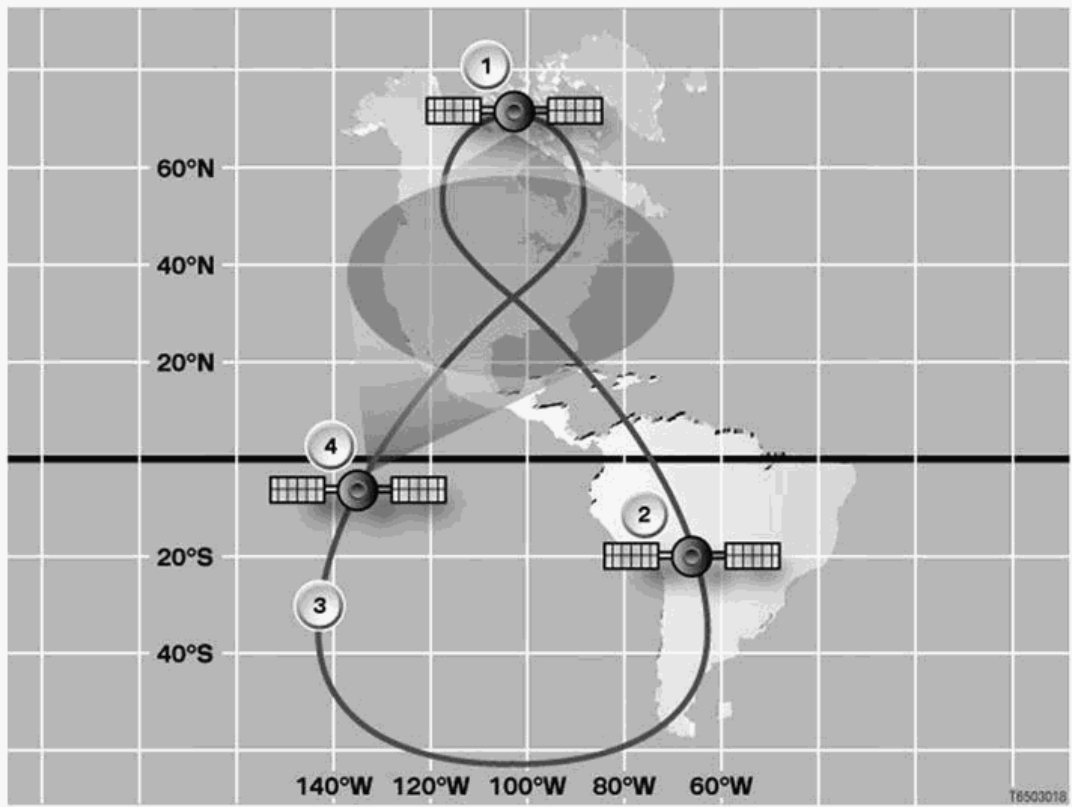
SDARS Technology: E60, E61, E63, E64, E90, E91

Satellite Technology

The following firms in the USA supply the Satellite Digital Audio Radio Service (SDARS):

- "Sirius Satellite Radio Inc."
- "XM Satellite Radio Inc."

BMW uses "Sirius Satellite Radio Inc.". With "Sirius Satellite Radio Inc." 3 Sirius satellites circle the earth on an elliptical orbit. The orbit around the earth and the positions of the Sirius satellites were deliberately selected so that 2 Sirius satellites always transmit to the reception area. The illustration below shows the orbit and satellites.



Item	Description	Item	Description
1	Sirius satellite 1	2	Sirius satellite 2
3	Elliptical orbit	4	Sirius satellite 3

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Fig. 11: Identifying Satellite Orbit Of SDARS System
Courtesy of BMW OF NORTH AMERICA, INC.

The advantages of "Sirius Satellite Radio Inc." (as compared to "XM Satellite Radio Inc.") are:

- Higher orbit, eliminating screening from mountains and buildings.
- Fewer stationary antennae for terrestrial reception are required.

Sirius needs approx. 105 stationary antennae for terrestrial reception. "XM Satellite Radio Inc." requires 1500 stationary antennae for terrestrial reception.

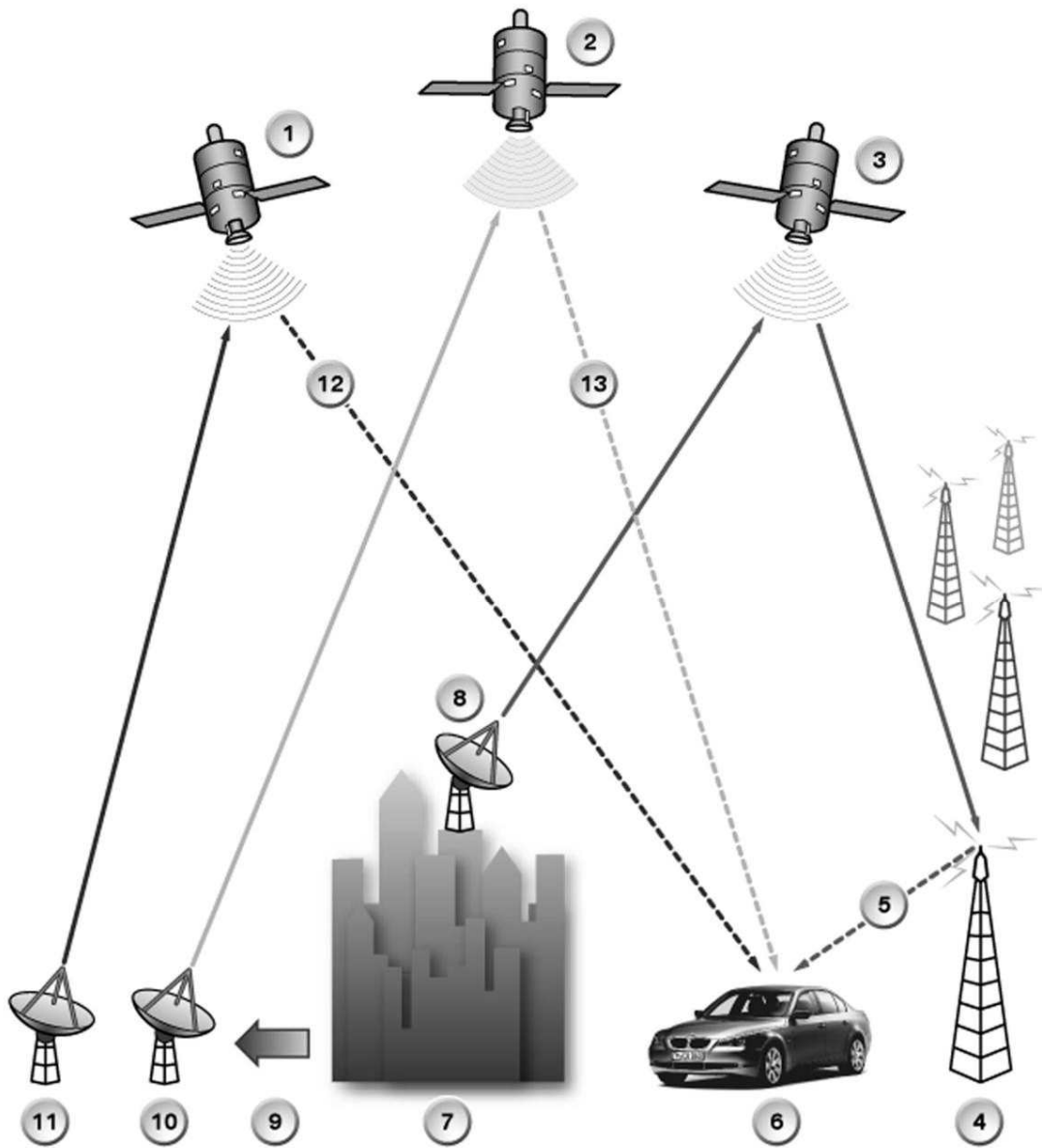
"Sirius Satellite Radio Inc." System

Generates and distributes the radio program through:

- National "Sirius Satellite Radio Inc." station
- Transmitting antennae (parabolic antennae)
- Satellites
- Satellite control centre
- Stationary antennae for terrestrial reception

The vehicle needs:

- SDARS antenna for satellite reception
- SDARS antenna for terrestrial reception
- Satellite tuner (SDARS)
- Audio system (HiFi system or TOP-HIFI system)



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Fig. 12: SDARS Signal Diagram

Courtesy of BMW OF NORTH AMERICA, INC.

Item	Description	Item	Description
1	Sirius satellite 1	2	Sirius satellite 2
3	Sirius satellite 3	4	Terrestrial (stationary) antennae
5	Signal path: Stationary antenna for terrestrial reception ->Satellite tuner (in luggage compartment)	6	Satellite tuner (in luggage compartment)
7	Radio station	8	Transmitter antenna (parabolic antenna)
9	Data transmission: "Sirius Satellite Radio Inc." national radio station studio -> other transmitting antennae	10	Transmitting antenna for Sirius satellite 2
11	Transmitting antenna for Sirius satellite 1	12	Signal path: Sirius satellite 1 ->Satellite tuner (in the luggage compartment)
13	Signal path: Sirius satellite 2 ->Satellite tuner (in the luggage compartment)		

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Fig. 13: Legend For SDARS Signal Diagram
Courtesy of BMW OF NORTH AMERICA, INC.

National Radio Station "Sirius Satellite Radio Inc." is located in the Rockefeller Center, New York City. The radio programs are transmitted by cable from the studios to the transmitting antennae.

Transmitting Antennae The transmitting antennae are parabolic antennae to focus the antenna beam onto the satellites. The transmitting antennae are connected by cable to the national radio station in New York. Digital signals are transmitted to the 3 Sirius satellites from the transmitting antennae.



Fig. 14: Identifying SDARS Ground Transmitting Antenna
Courtesy of BMW OF NORTH AMERICA, INC.

The digital signals are transmitted to the 3 Sirius satellites from the transmitting antennae as follows:

- 2 antennae in New Jersey transmit to 2 satellites.
- 1 antenna at the radio station in New York transmits to 1 satellite.

Satellite Control Station The satellite control station continually monitors the 3 Sirius satellites of the "Sirius Satellite Radio Inc.".

Stationary Antennae For Terrestrial Reception The stationary antennae disperse the signals from the satellites into reception areas where there is no satellite reception.



Fig. 15: Identifying SDARS System Stationary Antenna Signal
Courtesy of BMW OF NORTH AMERICA, INC.

Frequency Range The SDARS systems work in the frequency range 2320 MHz to 2345 MHz. The SDARS system used by BMW uses the frequency range 2320 MHz to 2332.5 MHz.

NOTE: ***SDARS can only be received by digital tuners. Radios for AM (Amplitude Modulation: medium waves, long waves, short waves) or FM (Frequency Modulation: VHF) are not able to pick up digital signals.***

BENEFITS:

- Low degree of interference from outside sources (no noise) because signals are transmitted digitally.
- Reception of the national radio station is possible over the whole of mainland USA.
- Sound quality is nearly as good as from Compact Disk or MiniDisk.
- Radio program not interrupted for commercials.
- At present, some 100 radio programs can be received digitally.
- Approximately 20 current affairs and "talk" radio programs can be received digitally.
- Dividing the stations into groups allows a particular musical style or information station to be found quickly.
 - The selection "Preset" creates and stores a list of favourite stations.

- Additional information is available with radio text: Station name, artist, song title.

BRIEF DESCRIPTION OF COMPONENTS

The components involved can be split into the following functional areas:

- Master control unit and aerials
- Central display and control
- Audio

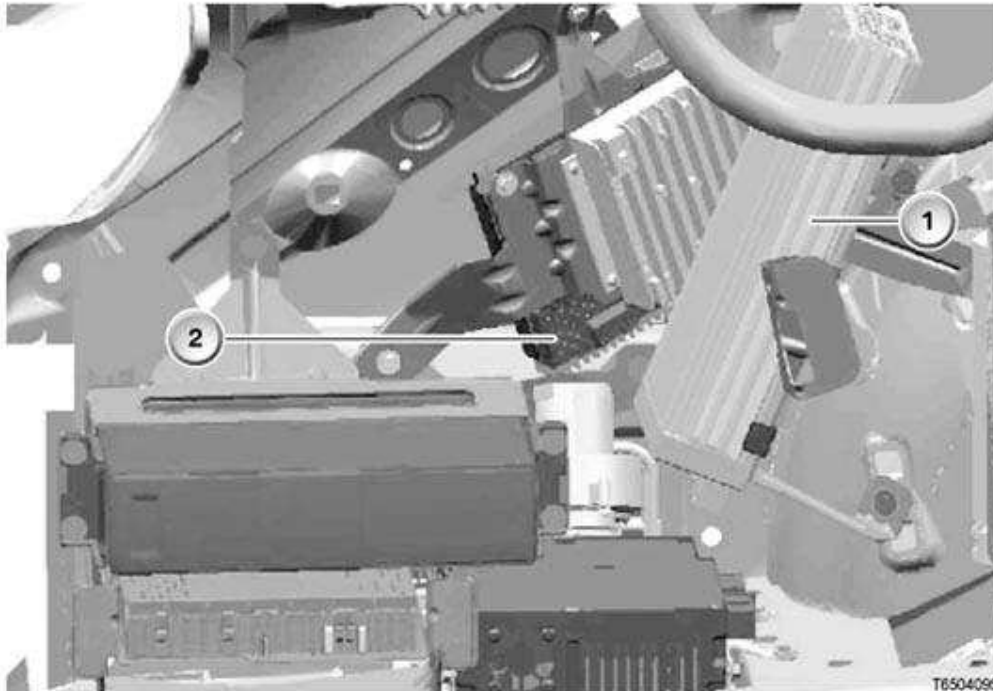
Master Control Unit And Aerials

Satellite Tuner: Tuner For Satellite Digital Audio Radio Service

The satellite tuner converts the digital signals from the SDARS aerials into optical signals (light signals). The satellite tuner transmits these optical signals onto the MOST bus (Media-Oriented System Transport).

Installation Location

On E60, E61, E63, E64 the satellite tuner is located on the side panel on the left-hand side of the luggage compartment.

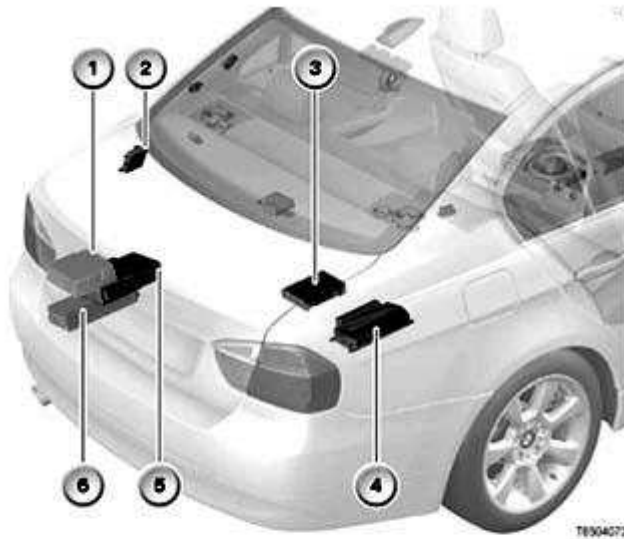


Item	Description	Item	Description
1	Top-HiFi amplifier (AMP) (optional)	2	Satellite tuner (SDARS)

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Fig. 16: Locating Satellite Tuner (E60, E61, E63, E64)
Courtesy of BMW OF NORTH AMERICA, INC.

On E90, E91 the satellite tuner is located on the base plate in the luggage compartment.



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Item	Description	Item	Description
1	Video module (EUROPE version only)	2	Line compensator for telephone antenna
3	Satellite tuner (SDARS)	4	Telematics control unit (TCU)
5	CD changer (CDC)	6	Audio amplifier (HiFi amplifier or TOP-HiFi amplifier)

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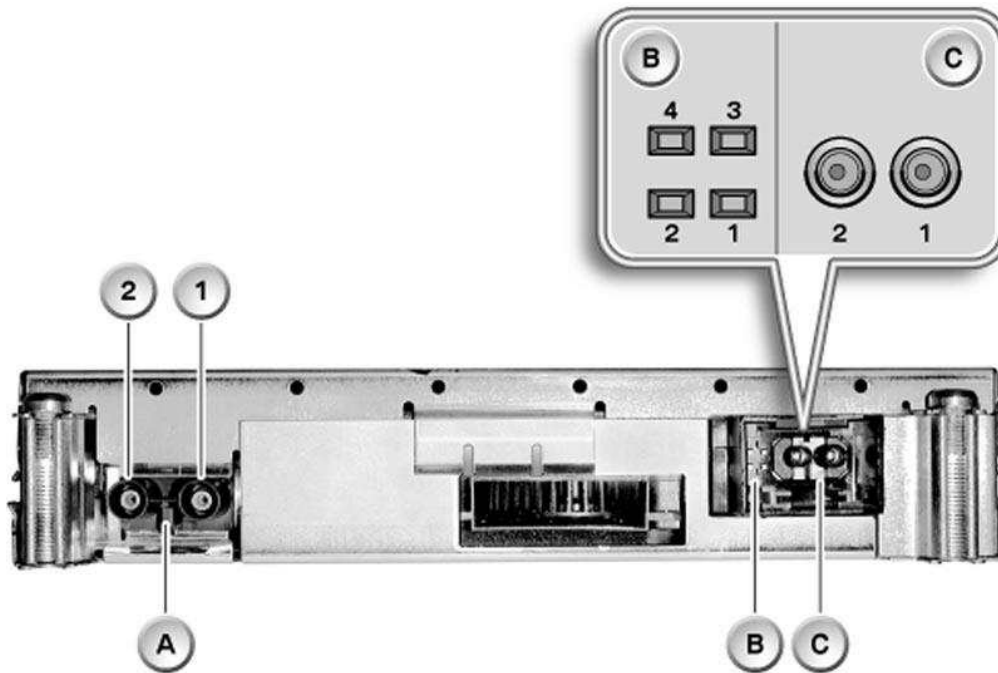
Fig. 17: Locating Satellite Tuner (E90, E91)
 Courtesy of BMW OF NORTH AMERICA, INC.

Design

The satellite tuner has connections for 2 SDARS antennas:

- 1 antenna connector for SDARS antenna for satellite reception
- 1 antenna connector for SDARS antenna for terrestrial reception

The satellite tuner is connected to the MOST bus via an internal interface. The same plug is also used for the power supply.



T6505026

Item	Description	Item	Description
A	Connection for SDARS antennas, connector X14066		
1	Connection for antennas for satellite reception	2	Connection for antennas for terrestrial reception
B	Power supply for satellite tuner with 4-pin connector, X14062		
C	MOST interface > E60, E61, E63, E64: Connector X14063 > E90, E91: Connector X10636		
1	Output from MOST bus	2	Input to MOST bus

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Fig. 18: Rear View Of Satellite Tuner & Connections
 Courtesy of BMW OF NORTH AMERICA, INC.

Pin Assignment

PIN ASSIGNMENTS FOR SATELLITE TUNER CONNECTOR X14062, 4-PIN

Pin	Type	Description
1	V	Terminal 30g (= terminal 30 active), activation of the Car Access System (CAS)
2	-	-
3	M	Terminal 31, earth
4	-	-

M = Ground

V = Supply

For current specifications regarding pin assignments, please refer to BMW diagnosis system.

How It Works

The digital signals (high-frequency signals) are fed to the satellite tuner from the following 2 SDARS antennas:

- SDARS antenna for terrestrial reception
- SDARS antenna for satellite reception The digital signals have a varying modulation (frequency or time modulation) but carry the same information. They are first processed separately and then evaluated to ensure the best possible quality of data transmission.

After they have been amplified, the digital signals are routed to an intermediate-frequency amplifier and converted into intermediate-frequency signals (ZF signals).

The ZF signals are then sent separately to two analogue/digital converters and converted into digital signals.

The separate processing and evaluation of the signals ensures that the best possible combination of signals from the 3 separate sources (Sirius satellite 1, Sirius satellite 2 and stationary antennae for terrestrial reception) is always used.

The processed signals are converted into optical signals (light signals) in an integrated MOST transmitter/receiver. The optical signal generated in the MOST transmitter/receiver is emitted on the MOST bus.

SDARS Antennas

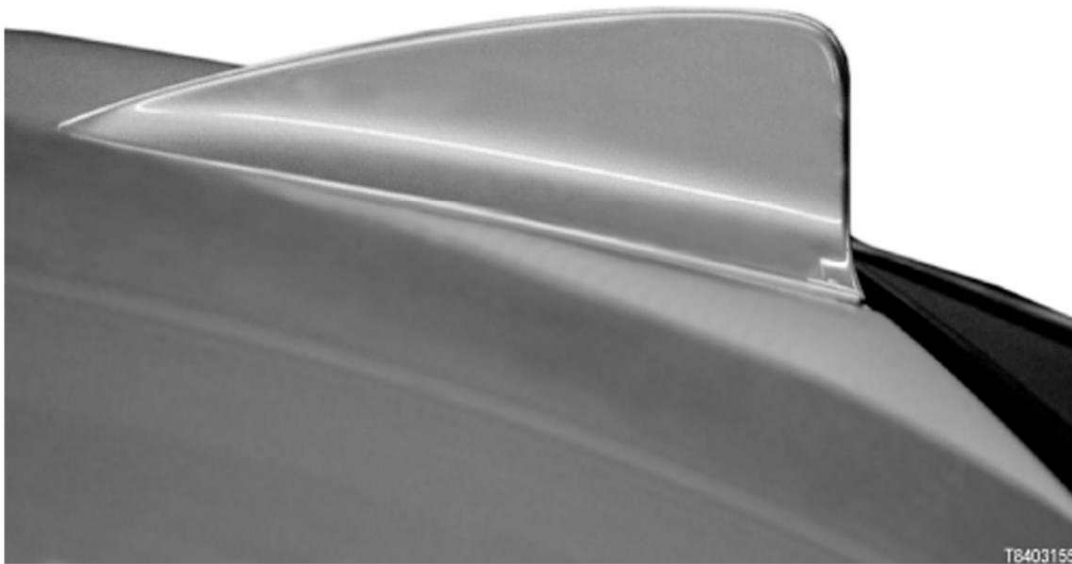
High-frequency signals (digital signals) from satellites and stationary aerials for terrestrial reception are picked up by 2 SDARS aerials on the vehicle. Separate aerial cables route the signals to the satellite tuner.

SDARS aerials:

- 1 SDARS aerial for terrestrial reception from stationary aerials
- 1 SDARS aerial for satellite reception

Installation Location

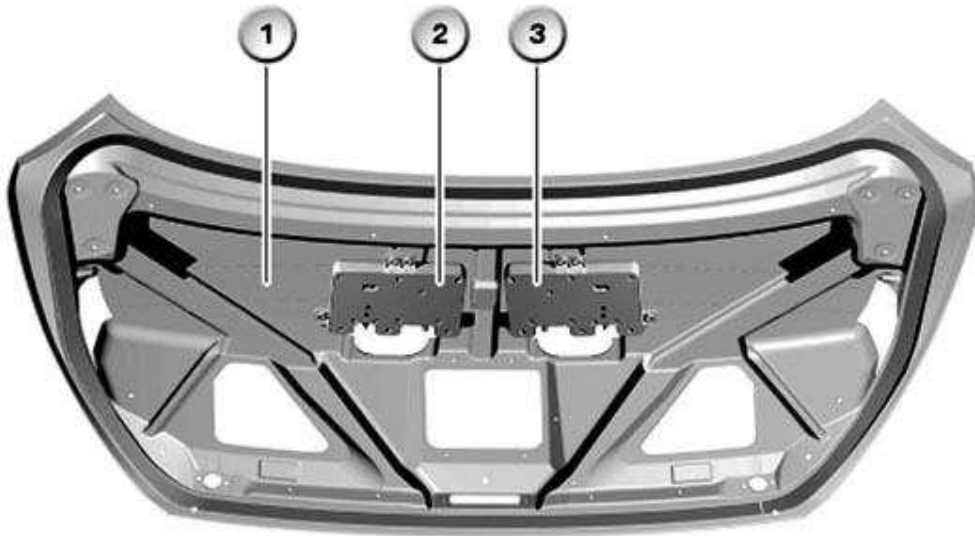
On E60, E61, E90, E91, the antennas are located in the fin on the rear edge of the roof.



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Fig. 19: Locating SDARS Antennas (E60, E61, E90, E90)
Courtesy of BMW OF NORTH AMERICA, INC.

On E63, E64, the antennas are located under the interior trim of the tailgate. As the tailgate is made of plastic, there is no interference with reception.



T6504075

Item	Description	Item	Description
1	Rear lid	2	Telephone and GPS antenna
3	SDARS antenna		

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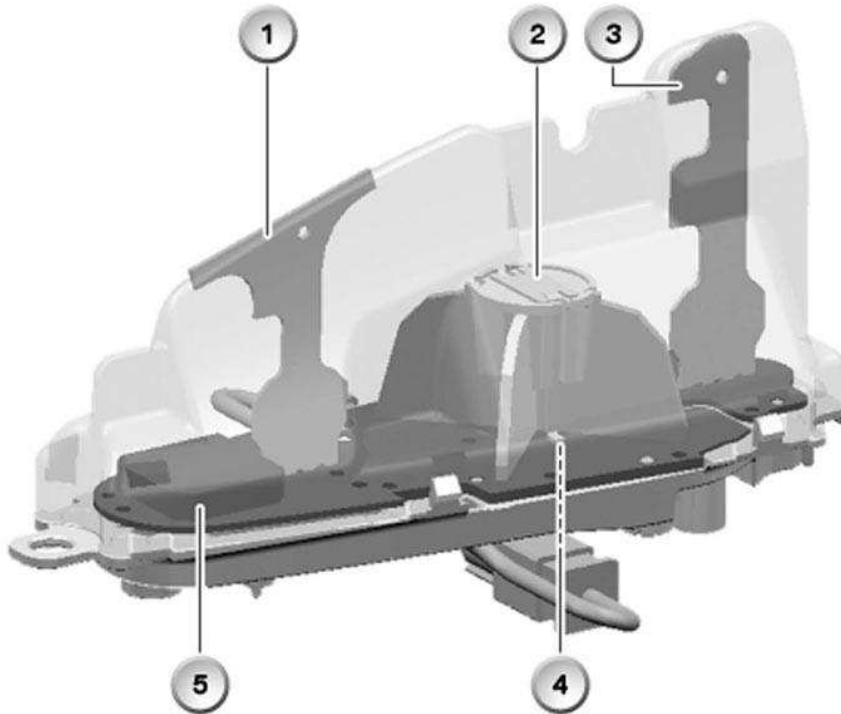
Fig. 20: Locating SDARS antennas (E63, E64)
 Courtesy of BMW OF NORTH AMERICA, INC.

Design

The fin can house the following antennas:

- Telephone antenna 1
- Telephone antenna 2
- SDARS antenna for terrestrial reception
- SDARS antenna for satellite reception
- GPS antenna for navigation systems (GPS: Global Positioning System).

The individual antennas are combined as a single casing as follows.



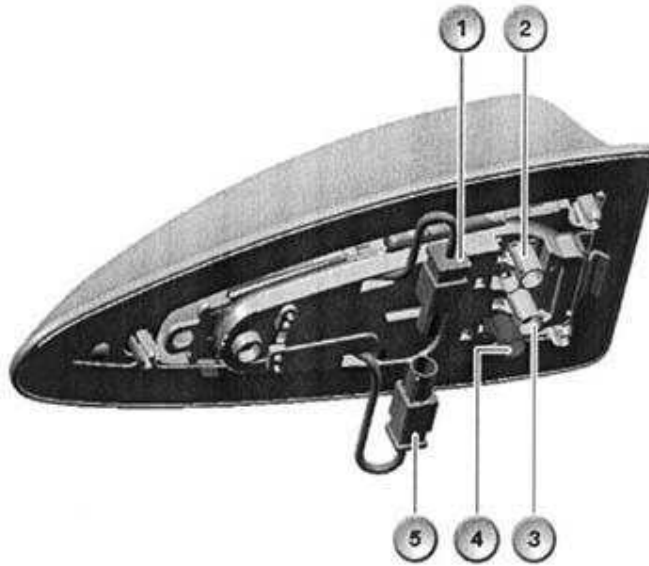
T6503012

Item	Description	Item	Description
1	Telephone antenna 1	2	SDARS antenna for terrestrial reception
3	Telephone antenna 2	4	SDARS antenna for satellite reception (below the SDARS antenna for terrestrial reception)
5	GPS antenna for navigation systems		

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Fig. 21: Sectional View Of "Fin" Type Antenna
Courtesy of BMW OF NORTH AMERICA, INC.

The antenna connectors for the individual antennas are shown in the following illustration.



7800013

Item	Description	Item	Description
1	Antenna connector for the GPS antenna	2	Antenna connector for the SDARS antenna for terrestrial reception
3	Antenna connector for telephone antenna 2	4	Antenna connector for the SDARS antenna for satellite reception
5	Antenna connector for telephone antenna 1		

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Fig. 22: Identifying Connectors For "Fin" Type Antenna
 Courtesy of BMW OF NORTH AMERICA, INC.

How It Works

The SDARS antennas are receiving antennas.

- **SDARS Antenna For Terrestrial Reception** The SDARS antenna for terrestrial reception picks up the signals from the terrestrial antennae. Terrestrial antennae are stationary antennae located, for example on masts or in tunnels. The stationary antennae for terrestrial reception are needed as satellite signals cannot be received everywhere.
- **SDARS Antenna For Satellite Reception** The SDARS antenna for the satellite reception picks up the signals direct from the 3 Sirius satellites.

Central Display And Operation

RAD2: BMW "Professional" Radio

> E90, E91

The BMW "Professional" radio is an item of special equipment.

The radio serves as the gateway (data interface) between the MOST bus and the K-CAN.

SDARS is controlled on the radio.

SDARS is only available in conjunction with the following equipment:

- BMW "Professional" radio (RAD2)
- Car Communication Computer (CCC)

M-ASK: Multi-audio system controller

> E60, E61, E64, E65

M-ASK is an item of special equipment.

M-ASK is the interface for operating the satellite tuner. The radio stations and other SDARS information are displayed on the Central Information Display (CID).

CCC: Car Communication Computer

The CCC is installed in connection with one of the following options:

- Navigation system "Professional"
- "Voice recognition system"
- "TV function" (not US version)

On the CCC, several control units and the CD-ROM/MD/DVD drives are integrated into a single housing. The CCC is used to control all information and communication systems, including SDARS.

CID: Central Information Display

The menus for the M-ASK and CCC are displayed on the CID.

CON: Controller

The menus on the CID are selected with the controller.

Audio

AMP: TOP-HiFi Amplifier (Optional)

Option 677 "HiFi system Professional LOGIC7" guarantees the best possible interior sound. The TOP-HiFi amplifier is connected to the MOST-bus.

Loudspeaker

Tweeters, mid-range loudspeakers and woofers are arranged to give the best possible interior sound.

SYSTEM FUNCTIONS

The following SDARS system functions are described:

- Digital radio reception
- Optimised radio reception
- Wide selection of radio programs, grouped according to musical style

Digital Radio Reception

The "Sirius Satellite Radio Inc." radio station records the radio programs in digital form. Parabolic antennae transmit the signals to the 3 Sirius satellites.

The digital signals are transmitted back to Earth as follows:

- 2 satellites transmit to all parts of the Earth. The signals are received by the car's SDARS aerial for satellite reception.
- 1 satellite transmits the digital signals to stationary antennae for terrestrial reception. The aerials transmit digital signals in all directions. The vehicle's SDARS aerial for terrestrial reception receives these digital signals.

Different reception paths for digital signals ensure that reception is good even if there is no direct visual contact between the vehicle and the Sirius satellites.

If there is not direct visual contact, the signal will be received via the stationary antennae for terrestrial reception.

Satellite reception can be prevented by topographical and constructional features (e.g. valleys, skyscrapers, tunnels).

Very good reception across the entire region covered is achieved through the following measures:

- Satellites positioned in a high elliptical orbit
- Use of additional stationary antennae for terrestrial reception

Optimised Radio Reception

The quality of the signal is further improved by a special process for evaluating the signal.

Wide Selection Of Radio Programs, Grouped According To Musical Style

- A wide selection of musical styles can be grouped together in the following categories:
 - "Rock"

- "Hip-Hop"
- "Country"
- "Dance"
- "Jazz/Standards"
- "Popular"
- "Rhythm and Blues"
- "Variety"
- "Classical"
- "News"
- "Sports"
- "Entertainment"

OPERATION

NOTE: ***"Sirius Satellite Radio Inc." may only be used with a valid contractual agreement.***

- **A contract must be signed with the company before the "Sirius Satellite Radio Inc." service can be used.**
- **"Sirius Satellite Radio Inc." may block the service through the satellite contact: e.g. if payment obligations are not met.**

NOTE: ***SDARS must be enabled.***
After enablement, perform initial operation of SDARS as described in the operating instructions. How to use the satellite tuner is described in detail in the operating instructions.

Depending on the vehicle's equipment, the SDARS will be operated as follows:

- On the BMW "Professional" radio (RAD2)
- On the M-ASK or CCC: with the Central Information Display (CID) and Controller (CON)
- With the multi-function steering wheel (buttons for station-search: upwards/downwards)
- With voice input (only if Car Communication Computer (CCC) is fitted)
- With buttons in the centre console (selection of radio station: upwards/downwards)

NOTES FOR SERVICE STAFF

Service staff should note the following points:

- General information: refer to **SDARS, GENERAL INFORMATION FOR SERVICE STAFF (E60, E61, E63, E64, E90, E91)** .
- Diagnosis: refer to **SDARS DIAGNOSIS (E60, E61, E63, E64, E90, E91)** .

- Encoding/programming: refer to **ENCODING/PROGRAMMING SDARS (E60, E61, E63, E64, E90, E91)** .
- Car and Key Memory: refer to **CAR & KEY MEMORY FOR SDARS (E60, E61, E63, E64, E90, E91)** .

E90, E91: Almost all Car & Key Memory functions are programmed inside the vehicle itself. (See "Personal Profile" in the Owner's Handbook: Individual settings for a maximum of 3 remote control units via the display in the instrument cluster or via the Central Information Display)

Subject to change.

SDARS, General Information For Service Staff (E60, E61, E63, E64, E90, E91)

IMPORTANT: Do not subject fibre-optic cables to mechanical loads during assembly work.

When performing assembly work on the satellite tuner and on the M-ASK or CCC, make sure the fibre-optic cables (for the MOST bus) are handled correctly:

- **Do not pull on the fibre-optic cable.**
- **Do not crush the fibre-optic cable.**
- **Do not kink the fibre-optic cable.**

Incorrect handling could affect the function of the fibre-optic cables. A total failure of the SDARS system is the result of a broken fibre-optic cable.

Using A Satellite Tuner For The First Time

The first time a satellite tuner decodes a signal from a satellite, the so-called "Preview Channel" can be heard for a period of 6 months without a contract. ("Preview Channel: selected station for trials purposes) Once this period has been exceeded, the radio station will block sound output. (The list of stations will still be displayed.) Continued use of the radio station requires enablement. To this end, a contract must be concluded with "Sirius Satellite Radio Inc."

For reasons of quality assurance, some satellite tuners are tested by the manufacturer. These satellite tuners are marked with a blue label. The date of manufacture is shown on the white label. That means: The trials period with the "Preview Channel" has been running since the date of manufacture. For this reason, it may occasionally happen that the trials period has expired before the satellite tuner is first used in the vehicle.



T6505028

- 1) Satellite tuner
- 2) Date of manufacture on white label
- 3) Blue label
(indicates a satellite tuner that has been tested by the manufacturer)

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Fig. 23: Identifying Satellite Tuner & Label
Courtesy of BMW OF NORTH AMERICA, INC.

SDARS Diagnosis (E60, E61, E63, E64, E90, E91)

Option 645 "Radio Control US" together with option 655 "BMW satellite tuner" can be diagnosed with the BMW diagnosis system over the vehicle's diagnosis interface. The BMW diagnosis system displays the necessary operations as it guides the user through the menus.

Software update, maintenance and troubleshooting: Like all other subscribing control units the satellite tuner has read and write access to the diagnosis operations. In the CAS control unit, the saved profile can be actively

changed via the diagnosis log.

Encoding/Programming SDARS (E60, E61, E63, E64, E90, E91)

Programming/Replacing Control Unit

Most of the selected settings for SDARS are retained even if the relevant control units are reprogrammed. The following procedure is executed:

- Before programming or encoding starts, the data is automatically read off by CIP (Encoding, Individualisation, Programming) into the intermediate memory.
- After programming, the data is stored again in the respective control units.

Car & Key Memory For SDARS (E60, E61, E63, E64, E90, E91)

With the Car & Key Memory, 12 channels can be stored as individual default settings ("Presets"). The presets are stored in the satellite tuner (SDARS). The presets are specified for a specific ignition key by means of a code. When the car is started the satellite tuner finds the last radio station that was being listened to prior to switching off.

NOTE: ***Personal Profile on the E90, E91.*** Please refer to the **Personal Profile** section in the **Owner's Handbook: Individual default settings are stored for p to 3 remote controls.**

DIGITAL AND ANALOGUE TELEVISION E60, E61, E63, E64, E65, E66

NOTE: **Television in front is inactive while the vehicle is being driven. For safety reasons television is forbidden in the front when the vehicle is in motion. For this reason the television is switched off in the front when the vehicle is in motion. The sound is not switched off.**



Fig. 24: Identifying Digital And Analogue Television System
Courtesy of BMW OF NORTH AMERICA, INC.

INTRODUCTION

The television can be ordered as special equipment (option 601). The Control Display or Central Information Display in the instrument panel act as a monitor for the television (control display in the E65, E66; Central Information Display in the E60, E61, E63, E64).

With option 603, "Rear monitor", it is possible to use the television in the rear seat area too. Option 603 is not available for the E65 or E66.

New feature: The newly developed video modules receive both analogue and digital television in accordance with the international standard DVB-T. The abbreviation "DVB-T" stands for "Digital Video Broadcasting - Terrestrial".

Depending on the series there are the following equipment versions for analogue and digital television:

1. Front television:

Viewing television in the front is only possible when the vehicle is stationary.

- E60, E61, E63, E64 - Television in front without amplifier (AMP)

For System Overview, refer to **E60, E61, E63, E64 - SYSTEM OVERVIEW OF TV IN FRONT WITHOUT AMPLIFIER** .

- E60, E61, E63, E64 - Television in front with amplifier (AMP)

For System Overview, refer to **E60, E61, E63, E64 - SYSTEM OVERVIEW OF TV IN FRONT WITH AMPLIFIER** .

- E65, E66: Television in front without navigation system

For System Overview, refer to **E65, E66: SYSTEM OVERVIEW OF TV IN FRONT WITHOUT NAVIGATION SYSTEM** .

- E65, E66: Television in front with navigation system

For System Overview, refer to **E65, E66 - SYSTEM OVERVIEW OF TV IN FRONT WITH NAVIGATION SYSTEM** .

2. Television in front and rear is only available with E65, E66.

When the vehicle is in motion it is only possible to watch television in the rear seat area. It is only possible to watch television in the front when the vehicle is stationary.

- E65, E66: television in front and rear, with or without navigation system

For System Overview, refer to **E65, E66: SYSTEM OVERVIEW OF TELEVISION IN FRONT AND REAR** .

NOTE: **The Japan national version has its own system overview.
There is a separate television system overview for the Japan national version.
Please refer to the NATIONAL VERSION section.**

E60, E61, E63, E64 - System Overview Of TV In Front Without Amplifier

NOTE: ***The overviews also include the Japan version of the television with navigation system. On the Japan version, the navigation system has its own control unit: JNAV (Japan navigation system) The RGB wire for this navigation system (JNAV) is controlled by the video module.***

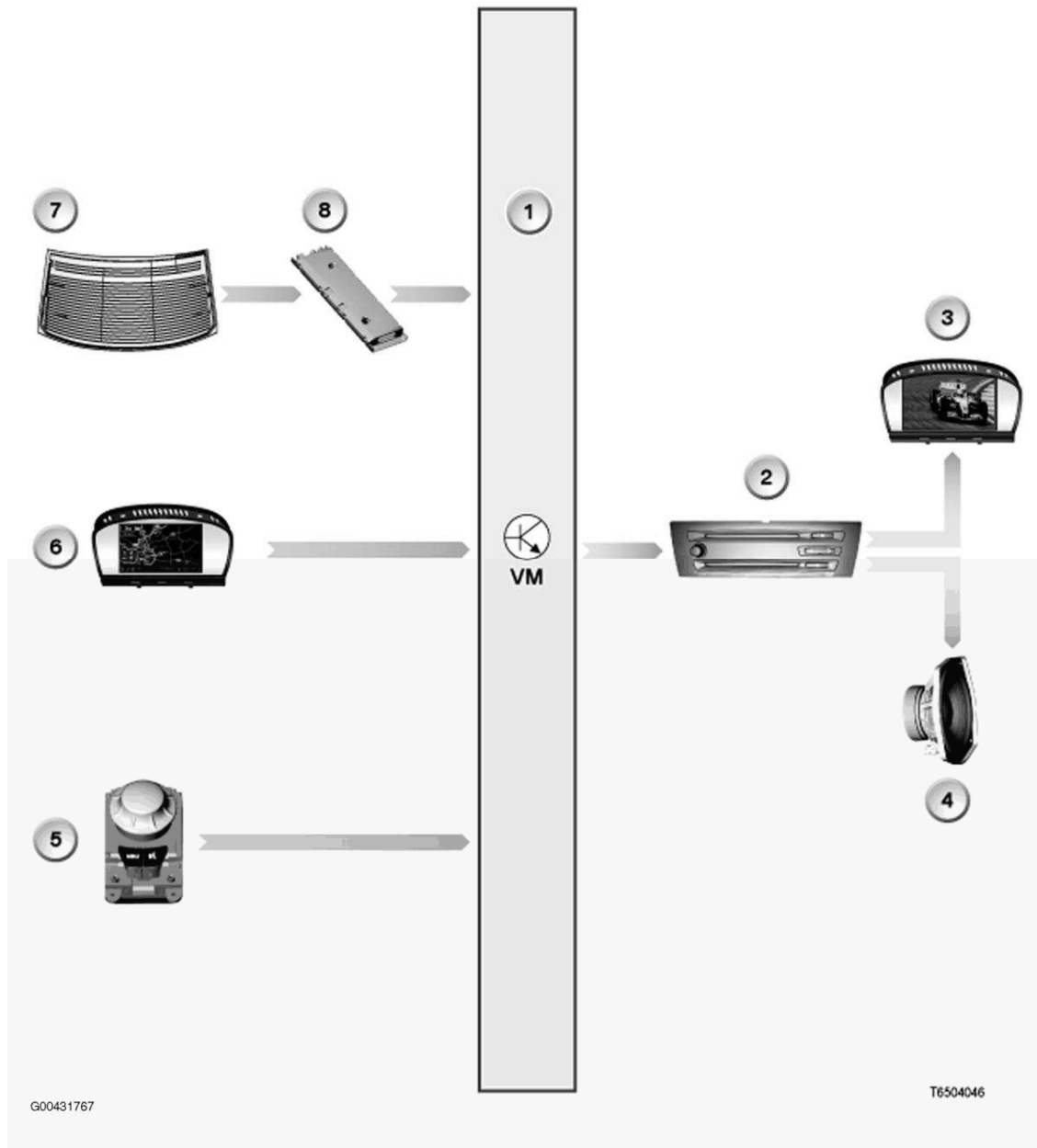


Fig. 25: Inputs/Outputs Block Diagram - E60, E61, E63, E64 (Television In Front Without Amplifier)
 Courtesy of BMW OF NORTH AMERICA, INC.

Key	Explanation	Key	Explanation
1	Video module (VM)	2	Car Communication Computer (CCC)
3	Central Information Display (CID)	4	Loudspeaker
5	Controller (CON)	6	Japan navigation system (JNAV, only on Japan version)
7	TV aerial in heated rear window (TV 1, TV 2)	8	Aerial amplifier (TV tuner, 2 pcs)

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Fig. 26: Legend For Inputs/Outputs Block Diagram - E60, E61, E63, E64 (Television In Front Without Amplifier)

Courtesy of BMW OF NORTH AMERICA, INC.

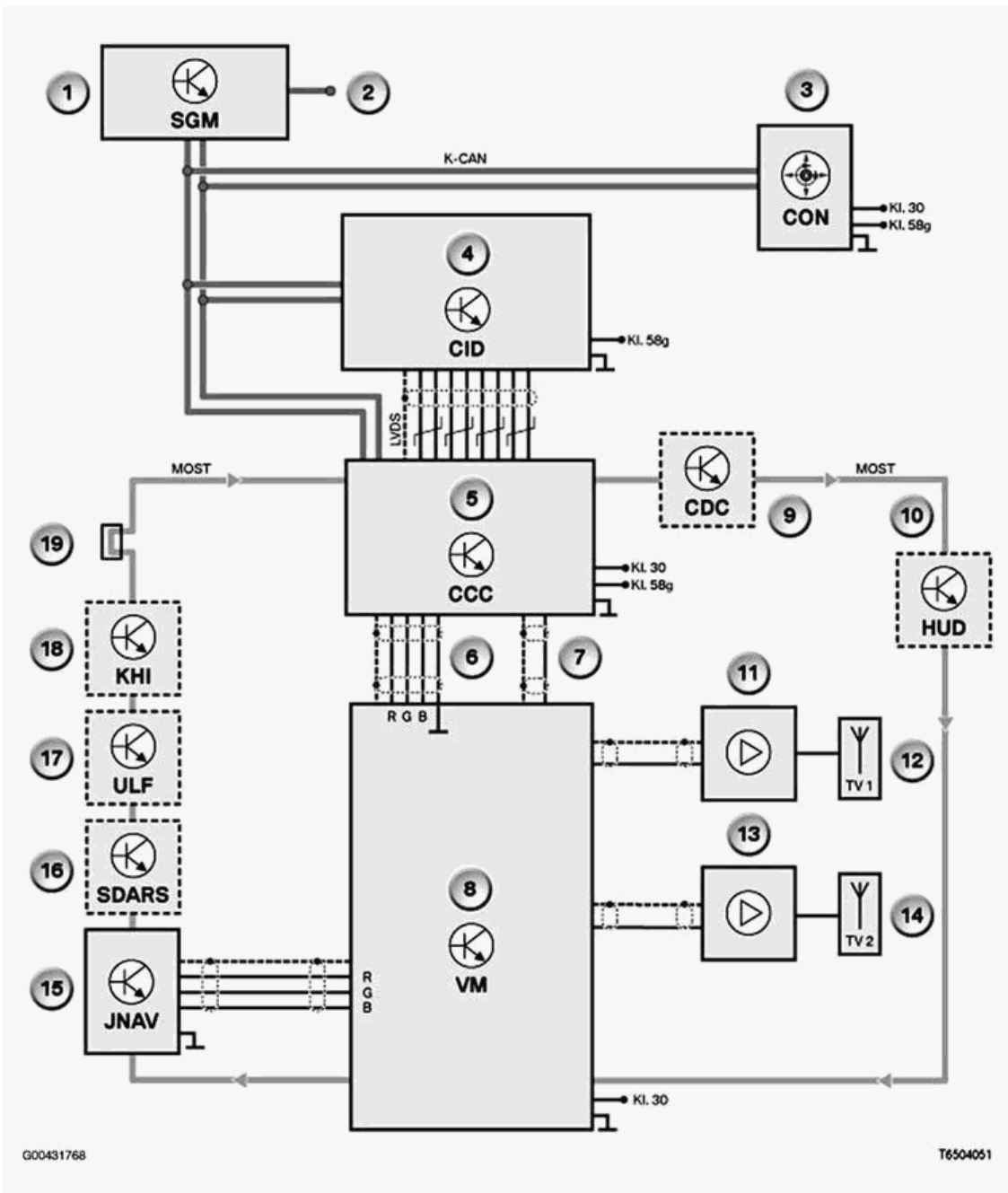


Fig. 27: System Circuit Diagram - E60, E61, E63, E64 (Television In Front Without Amplifier)
 Courtesy of BMW OF NORTH AMERICA, INC.

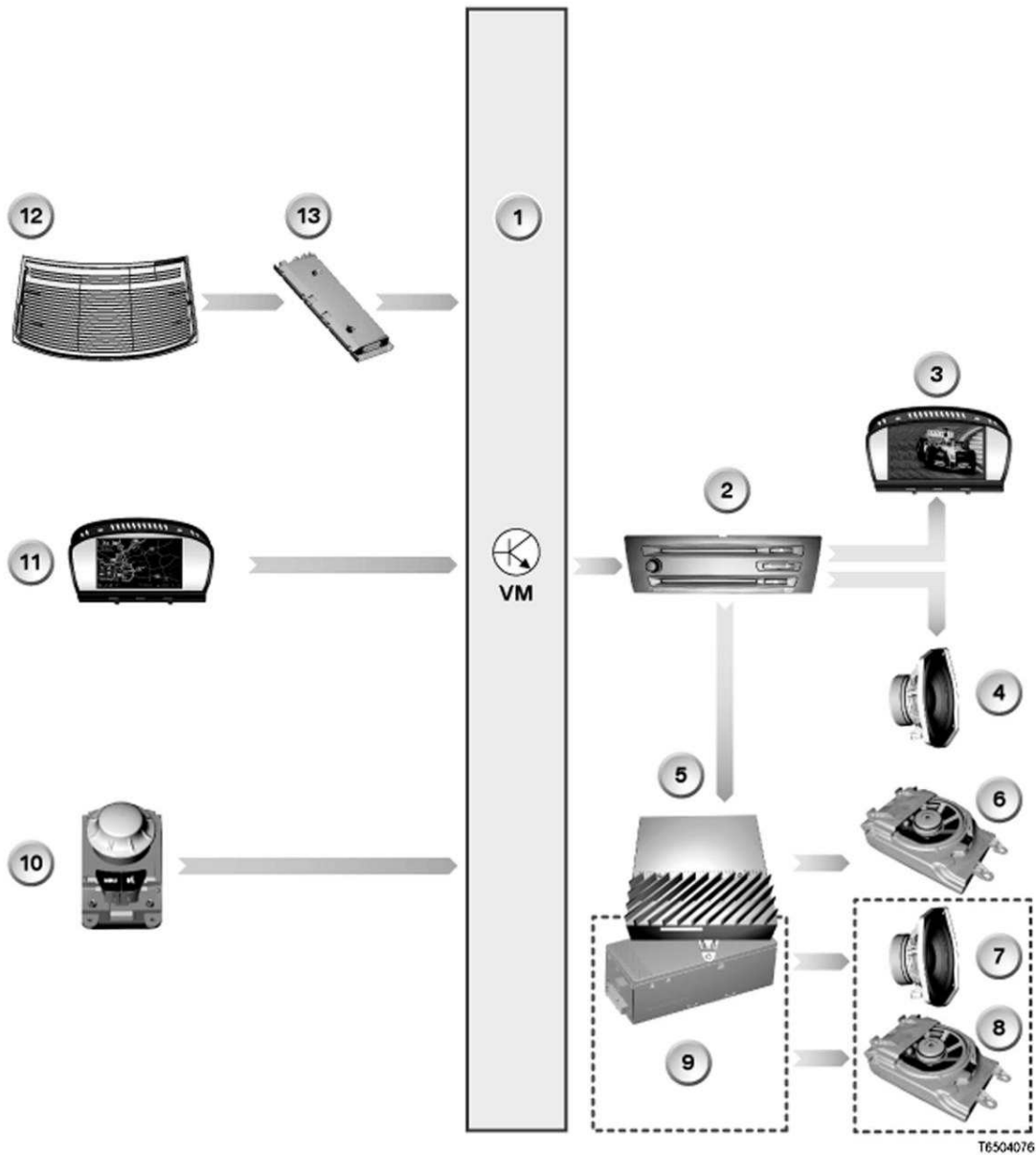
Key	Explanation	Key	Explanation
1	Controller (CON)	2	Safety and gateway module (SGM)
3	Diagnosis lead	4	Loudspeaker
5	Aerial amplifier (TV tuner)	6	TV aerial (TV 1)
7	Aerial amplifier (TV tuner)	8	TV aerial (TV 2)
9	Video module (VM)	10	FBAS wire (FBAS: Composite Video Burst Synchronisation; only on vehicles without Japan navigation system)
11	RGB wire with earth wire and screening (only on Japan version with Japan navigation system)	12	Japan navigation system (JNAV, only on Japan version)
13	MOST port	14	Car Communication Computer (CCC)
15	Central Information Display (CID)		
K-CAN	Body controller area network	Kl. 30	Terminal 30 (power supply)
Kl. 58g	Terminal 58g (locating light)	LVDS	Low Voltage Differential Signalling
MOST	Media-Oriented Systems Transport (arrow indicates direction of light in MOST)	RGB	Red-green-blue (RGB wire)

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Fig. 28: Legend For System Circuit Diagram - E60, E61, E63, E64 (Television In Front Without Amplifier)

Courtesy of BMW OF NORTH AMERICA, INC.

E60, E61, E63, E64 - System Overview Of TV In Front With Amplifier



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Fig. 29: Inputs/Outputs Block Diagram - E60, E61, E63, E64 (Television In Front With Amplifier)
 Courtesy of BMW OF NORTH AMERICA, INC.

Key	Explanation	Key	Explanation
1	Video module (VM)	2	Car Communication Computer (CCC)
3	Central Information Display (CID)	4	Mid-range loudspeakers and tweeters:
5	Amplifier (AMP) (HiFi amplifier)	6	Woofers
7	Mid-range loudspeakers and tweeters: (dotted line: Mid-range loudspeakers and tweeters are actuated by TOP-HiFi amplifier)	8	Woofers (dotted line: The woofer is actuated by the TOP-HiFi amplifier.)
9	Amplifier (AMP): Alternatively also TOP-HiFi amplifier (dotted line means "alternative" to HiFi amplifier)	10	Video module (VM)
10	Controller (CON)	11	Japan navigation system (JNAV, only on Japan version)
12	TV aerial in heated rear window (TV 1, TV 2)	13	Aerial amplifier (TV tuner, 2 pcs)

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Fig. 30: Legend For Block Diagram - E60, E61, E63, E64 (Television In Front With Amplifier)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: ***The overviews also include the Japan version of the television with navigation system. On the Japan version, the navigation system has its own control unit: JNAV: Japan navigation system. The RGB wire for the navigation system is controlled by the video module.***

The illustration shows the television in the front with HiFi amplifier. On the television with HiFi amplifier, the amplifier (AMP) only actuates the woofer. The mid-range loudspeakers and tweeters are actuated by the Car Communication Computer (CCC). On vehicles with TOP-HiFi amplifier ("LOGIC 7"), the TOP-HiFi amplifier actuates all loudspeakers.

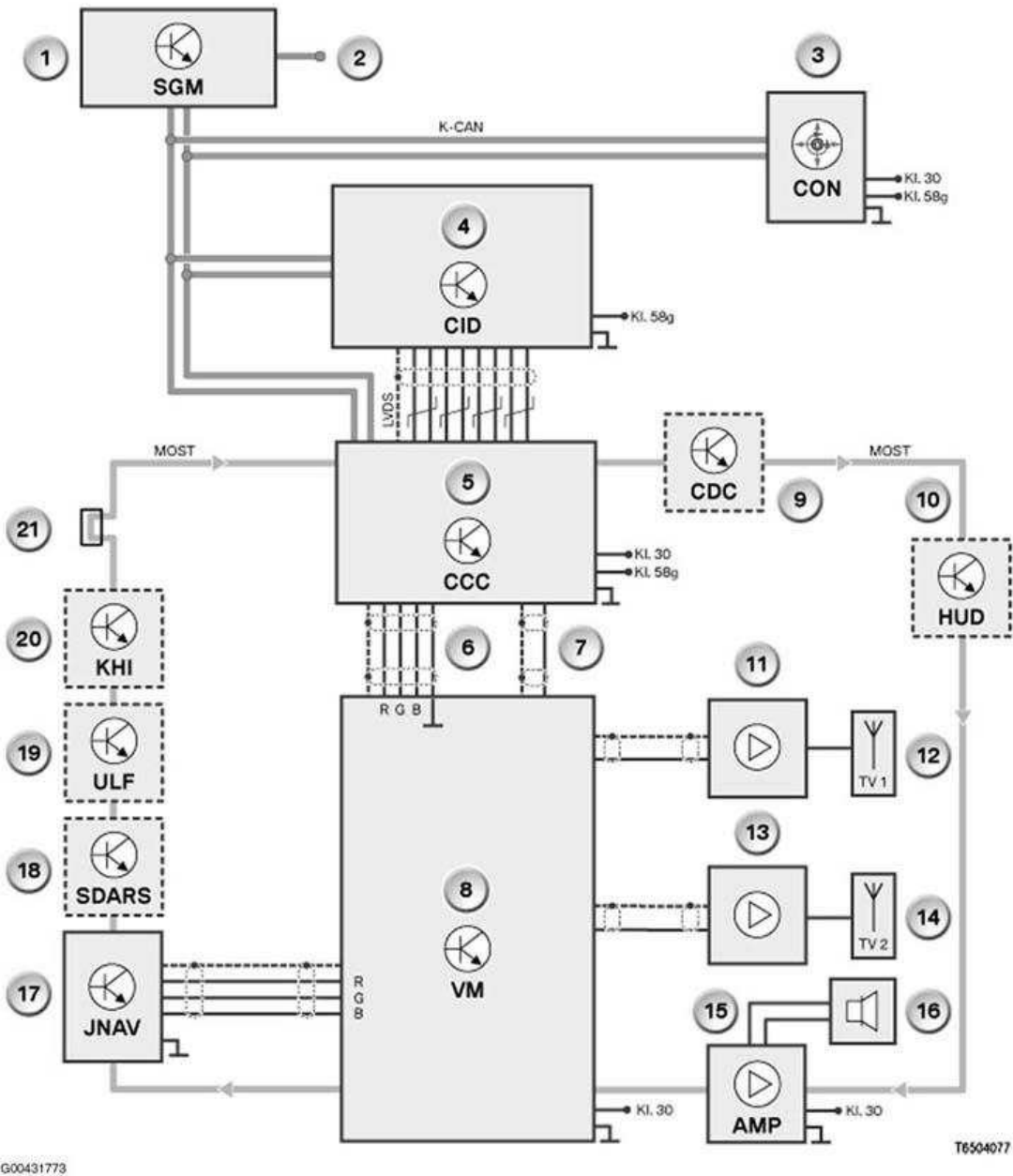


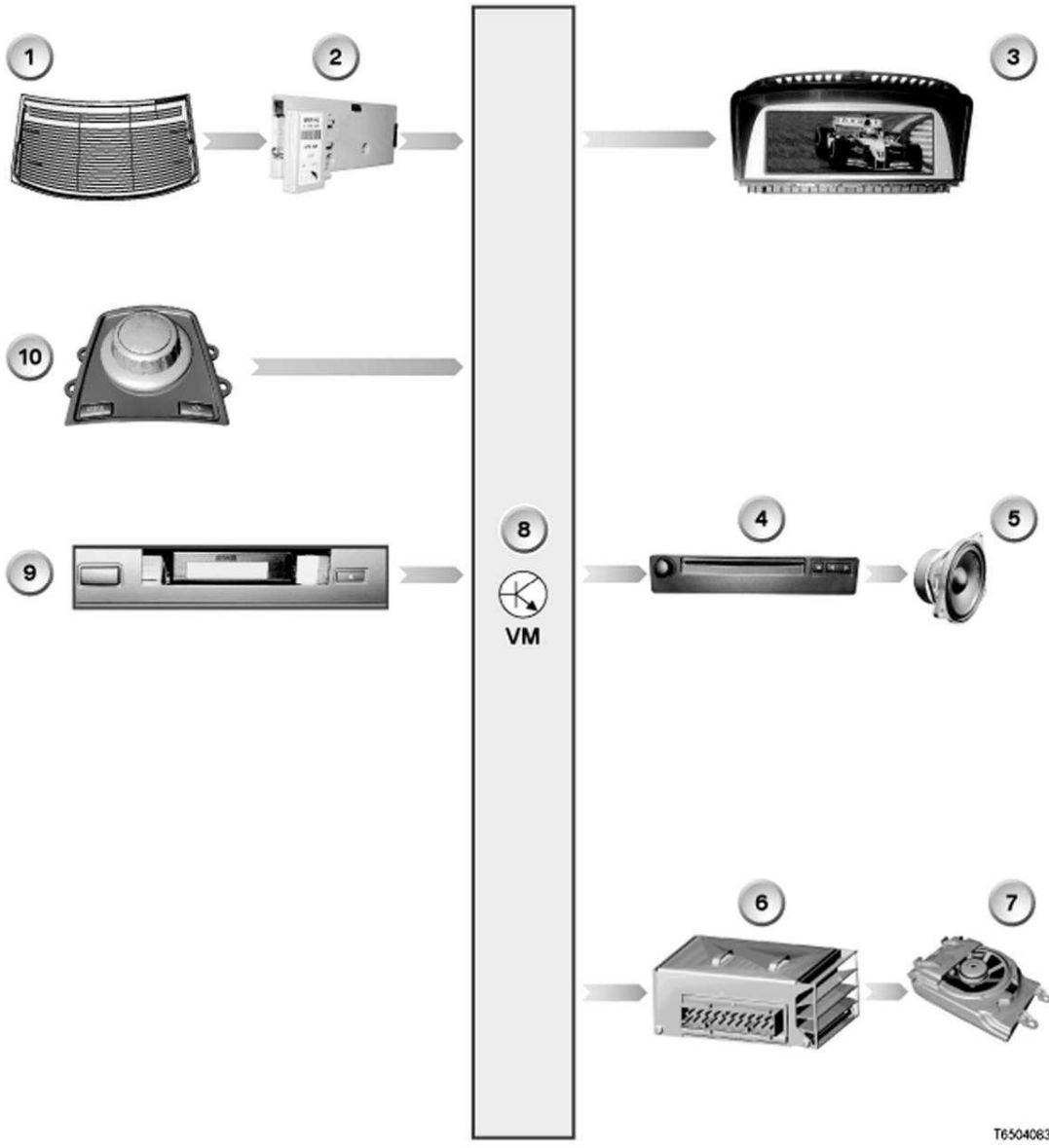
Fig. 31: System Circuit Diagram - E60, E61, E63, E64 (Television In Front With Amplifier)
 Courtesy of BMW OF NORTH AMERICA, INC.

Key	Explanation	Key	Explanation
1	Controller (CON)	2	Safety and gateway module (SGM)
3	Diagnosis lead	4	Mid-range loudspeakers and tweeters:
5	Aerial amplifier (TV tuner)	6	TV aerial (TV 1)
7	Aerial amplifier (TV tuner)	8	TV aerial (TV 2)
9	Woofers	10	Amplifier (AMP): Alternatively HiFi amplifier or TOP-HiFi amplifier The illustration shows the HiFi amplifier
11	Video module (VM)	12	FBAS wire (Composite Video Burst Synchronisation): Only on vehicles without Japan navigation system (JNAV)
13	RGB wire with earth wire and screening: only on Japan version	14	Japan navigation system (JNAV)
15	MOST port	16	Car Communication Computer (CCC)
17	Central Information Display (CID)		
K-CAN	Body controller area network	Kl. 30	Terminal 30 (power supply)
Kl. 58g	Terminal 58g (locating light)	LVDS	Low Voltage Differential Signalling
MOST	Media-Oriented Systems Transport (arrow indicates direction of light in MOST)	RGB	Red-green-blue (RGB wire)

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Fig. 32: Legend For System Circuit Diagram - E60, E61, E63, E64 (Television In Front With Amplifier)
Courtesy of BMW OF NORTH AMERICA, INC.

E65, E66: System Overview Of TV In Front Without Navigation System



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Fig. 33: Inputs/Outputs Block Diagram - E65, E66 (Television In Front Without Navigation System)
 Courtesy of BMW OF NORTH AMERICA, INC.

Key	Explanation	Key	Explanation
1	TV aerial in rear window	2	Aerial amplifier (TV tuner, 2 pcs)
3	Control Display (CD)	4	Audio system controller (ASK)
5	Mid-range loudspeakers and tweeters:	6	Amplifier (AMP) The illustration shows the TOP-HiFi amplifier ("LOGIC 7")
7	Woofers	8	Video module (VM)
9	DVD changer (DVDC)	10	Controller (CON)

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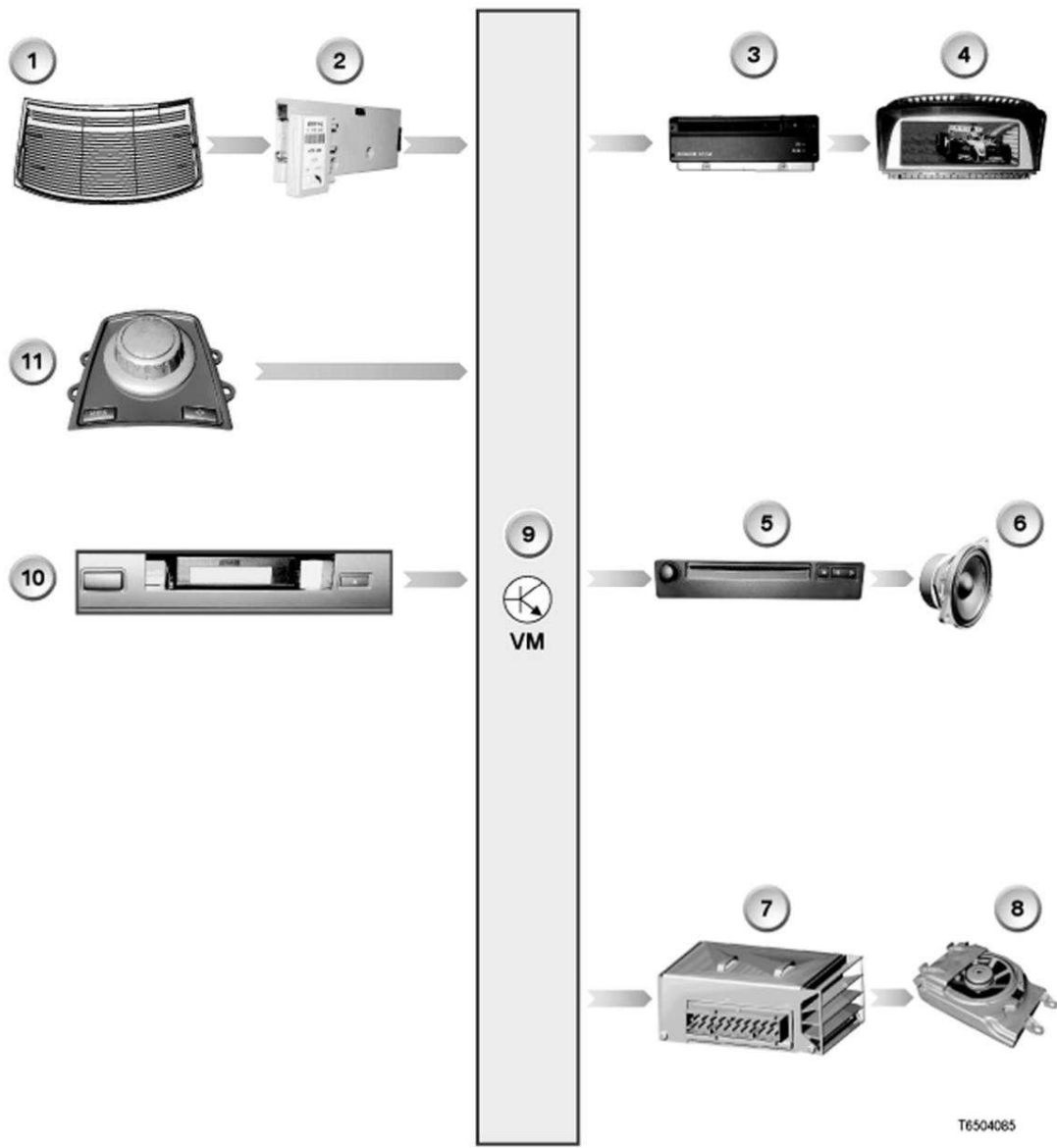
Fig. 34: Legend For Inputs/Outputs Block Diagram - E65, E66 (Television In Front Without Navigation System)
Courtesy of BMW OF NORTH AMERICA, INC.

Key	Explanation	Key	Explanation
1	Controller (CON)	2	Safety and gateway module (SGM)
3	Diagnosis lead	4	Control display (CD)
5	Amplifier (AMP) The illustration shows the TOP-HiFi amplifier ("LOGIC 7")	6	Woofers
7	TV aerial 1 (TV 1)	8	Aerial amplifier (TV tuner, 2 pcs. in 1 housing)
9	TV aerial 2 (TV 2)	10	Aerial amplifier (TV tuner)
11	TV aerial 3 (TV 3)	12	2 coaxial cables with screening
13	Coaxial cable with screening	14	Video module (VM 5 Hybrid Drive, for analogue and digital television. Please refer to enclosure headed "Video module")
15	DVD changer (DVDC)	16	Audio system controller
17	Mid-range loudspeakers and tweeters:	18	MOST port
Kl. 30	Terminal 30 (power supply)	K-CAN S	CAN SYSTEM body
MOST	Media-Oriented Systems Transport (arrow indicates direction of light in MOST)	RGB	Red-green-blue (RGB wire with screening)

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Fig. 36: Legend For System Circuit Diagram - E65, E66 (Television In Front Without Navigation System)
Courtesy of BMW OF NORTH AMERICA, INC.

E65, E66 - System Overview Of TV In Front With Navigation System



G00431786

Fig. 37: Inputs/Outputs Block Diagram - E65, E66 (Television In Front With Navigation System)
 Courtesy of BMW OF NORTH AMERICA, INC.

Key	Explanation	Key	Explanation
1	TV aerial in rear window	2	Aerial amplifier (TV tuner)
3	Control unit for navigation system (NAV)	4	Control display (CD)
5	Audio system controller (ASK)	6	Mid-range loudspeakers and tweeters:
7	Amplifier (AMP) The illustration shows the TOP-HiFi amplifier ("LOGIC 7")	8	Woofers
9	Video module (VM)	10	DVD changer (DVDC)
11	Controller (CON)		

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Fig. 38: Legend For Inputs/Outputs - E65, E66 (Television In Front With Navigation System)
Courtesy of BMW OF NORTH AMERICA, INC.

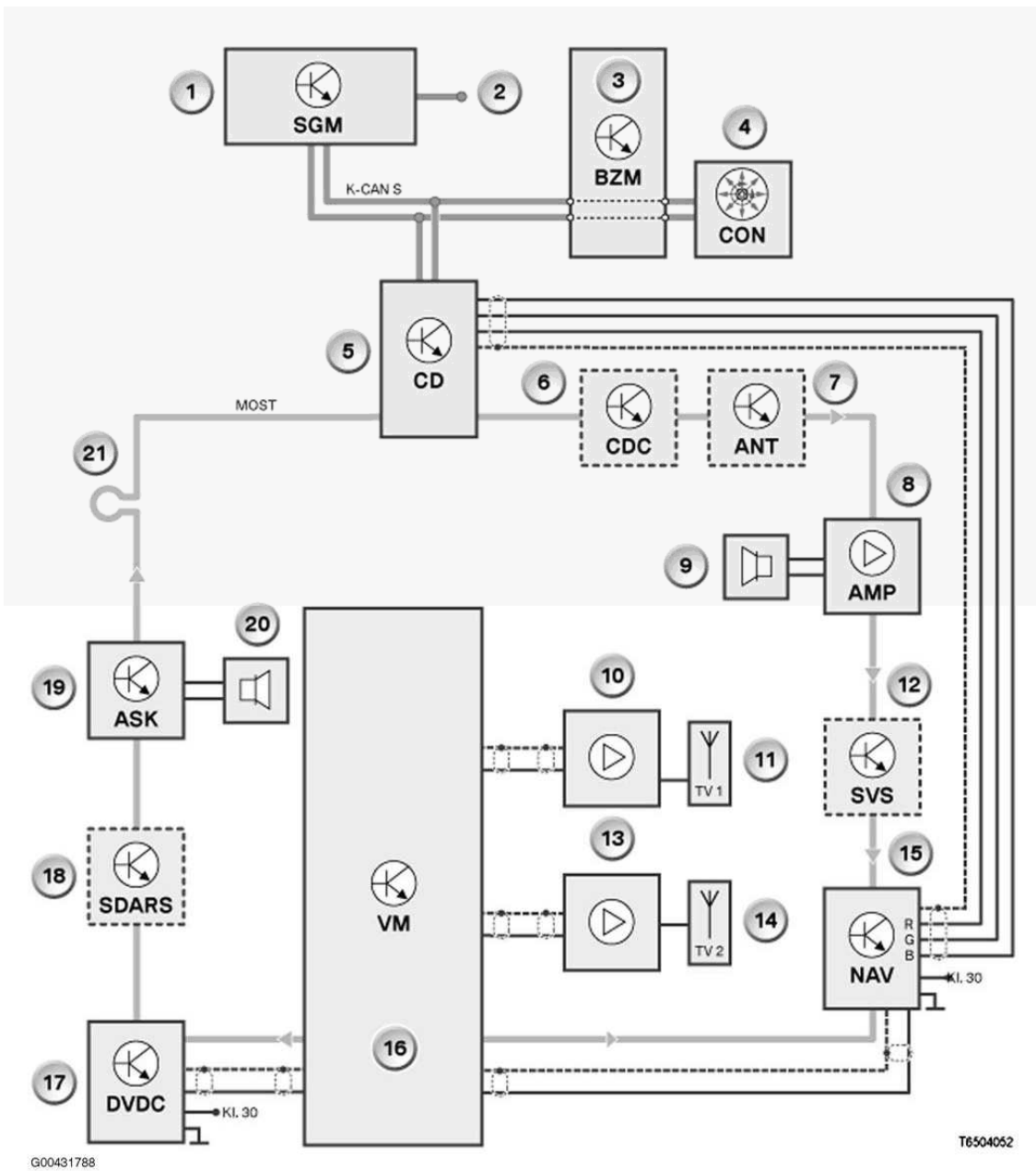


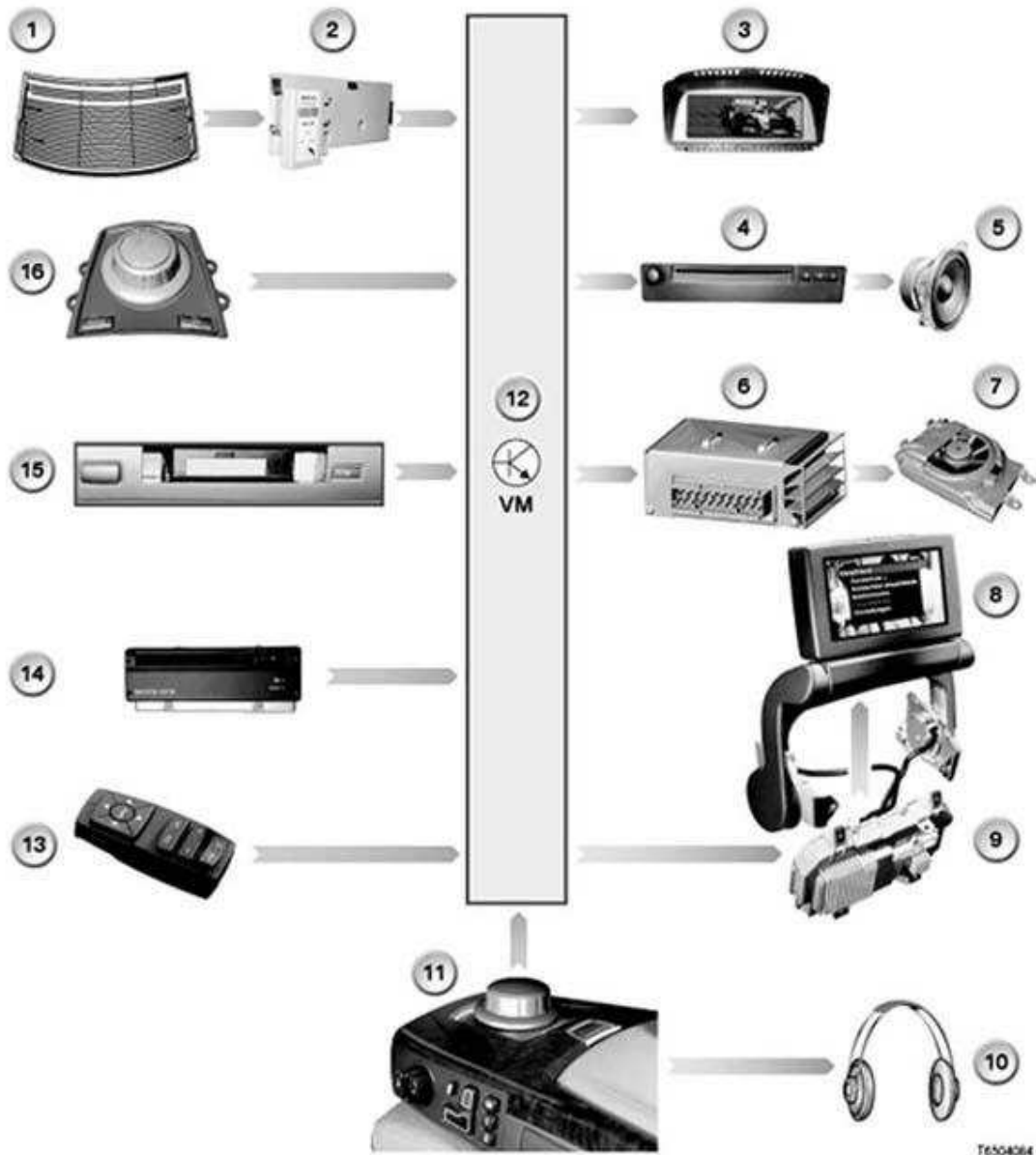
Fig. 39: System Circuit Diagram - E65, E66 (Television In Front With Navigation System)
 Courtesy of BMW OF NORTH AMERICA, INC.

Key	Explanation	Key	Explanation
1	Controller (CON)	2	Safety and gateway module (SGM)
3	Diagnosis lead	4	Control Display (CD)
5	Amplifier (AMP) The illustration shows the TOP-HiFi amplifier ("LOGIC 7")	6	Woofers
7	Navigation system (NAV)	8	Coaxial cable
9	Aerial amplifier (TV tuner)	10	TV aerial 1 (TV 1)
11	Coaxial cable	12	Aerial amplifier (TV tuner)
13	TV aerial 2 (TV 2)	14	Video module (VM)
15	DVD changer (DVDC)	16	Audio system controller (ASK)
17	Mid-range loudspeakers and tweeters:	18	MOST port
K-CAN S	CAN SYSTEM body	Kl. 30	Terminal 30 (power supply)
MOST	Media-Oriented System Transport (arrow shows direction of light in MOST)	RGB	Red-green-blue (RGB wire with earth wire and screening)

G00431789

Fig. 40: Legend For System Circuit Diagram - E65, E66 (Television In Front With Navigation System)
Courtesy of BMW OF NORTH AMERICA, INC.

E65, E66: System Overview Of Television In Front And Rear



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Fig. 41: Inputs/Outputs Block Diagram - E65, E66 (Television In Front And Rear)
 Courtesy of BMW OF NORTH AMERICA, INC.

Key	Explanation	Key	Explanation
1	TV aerial in rear window	2	Aerial amplifier (TV tuner, 3 aerial amplifiers in 2 housings)
3	Control Display (CD)	4	Audio system controller (ASK)
5	Mid-range loudspeakers and tweeters:	6	Amplifier (AMP) The illustration shows the TOP- HiFi amplifier ("LOGIC 7")
7	Woofers	8	Rear display (FD)
9	Rear display control unit (SG- FD)	10	Headphones
11	Rear compartment centre armrest control centre (BZMF) with rear controller (FCON)	12	Video module (VM)
13	Remote control for set-top box (only if digital television reception has been retrofitted)	14	Navigation system (NAV), if fitted
15	DVD changer (DVDC)	16	Controller (CON)

G00431791

Fig. 42: Legend For Inputs/outputs - E65, E66 (Television In Front And Rear)
Courtesy of BMW OF NORTH AMERICA, INC.

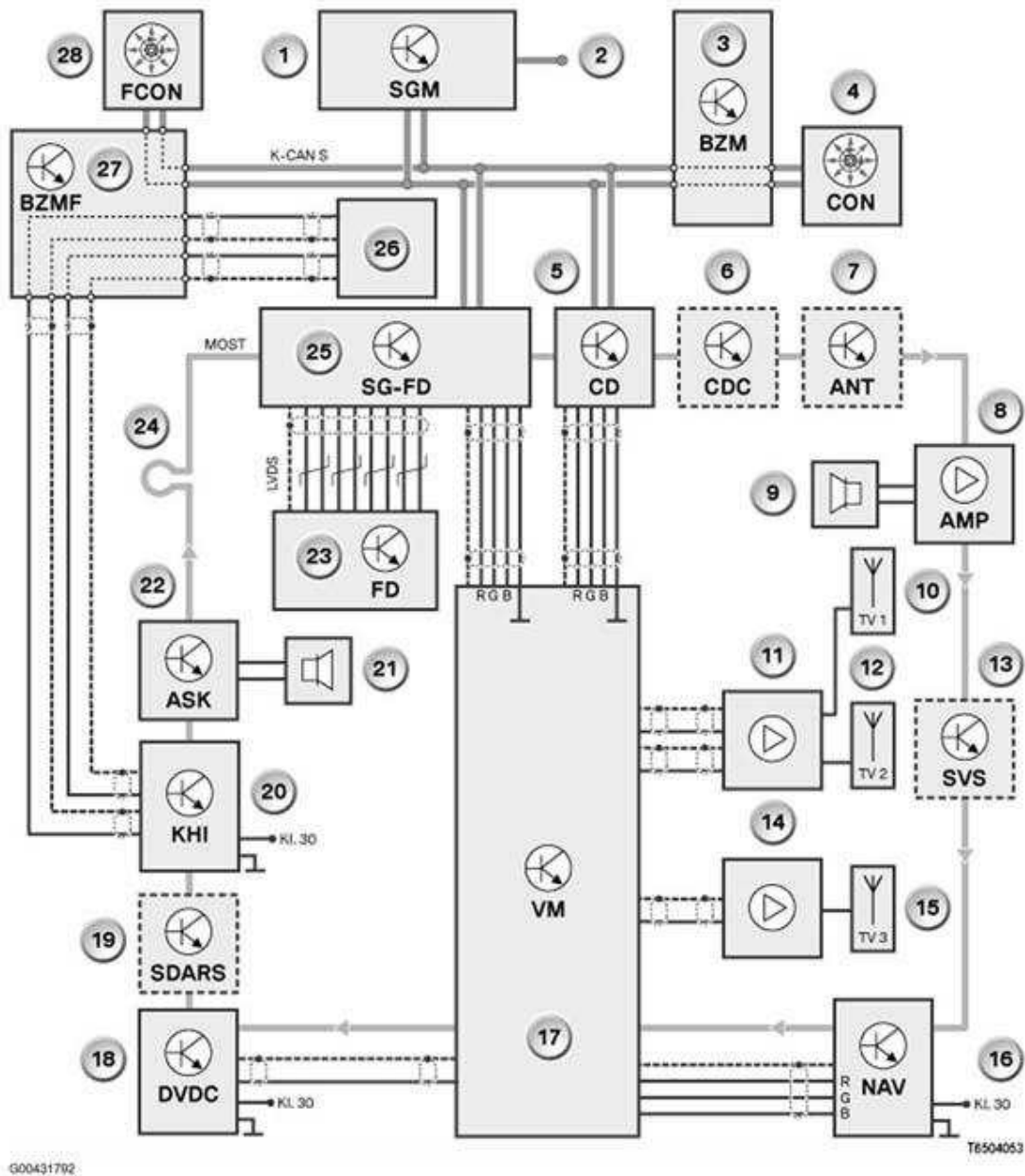


Fig. 43: System Circuit Diagram - E65, E66 (Television In Front And Rear)
 Courtesy of BMW OF NORTH AMERICA, INC.

Key	Explanation	Key	Explanation
1	Controller (CON)	2	Safety and gateway module (SGM)
3	Diagnosis lead	4	Rear controller (FCON)
5	Control centre, rear compartment centre armrest (BZMF)	6	Rear display control unit (SG-FD)
7	Control Display (CD)	8	Headphones connector module
9	Woofers	10	Amplifier (AMP) The illustration shows the TOP-HiFi amplifier ("LOGIC 7")
11	Headphone interface (KHI)	12	TV aerial 1 (TV 1)
13	Aerial amplifier (TV tuner, 2 pcs. in 1 housing)	14	TV aerial 2 (TV 2)
15	Aerial amplifier (TV tuner)	16	TV aerial 3 (TV 3)
17	2 coaxial cables with screening for the two aerial amplifiers in housing	18	Coaxial cable wire with screening
19	Navigation system (NAV), if fitted	20	Video module (VM)
21	DVD changer (DVDC)	22	Audio system controller (ASK)
23	Mid-range loudspeakers and tweeters:	24	Rear display (FD)
25	MOST port		
K-CAN S	CAN SYSTEM body	Kl. 30	Terminal 30 (power supply)
LVDS	Low Voltage Differential Signalling	MOST	Media-Oriented Systems Transport (arrow indicates direction of light in MOST)
RGB	Red-green-blue (RGB wire with earth wire and screening)		

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Fig. 44: Legend For System Circuit Diagram - E65, E66 (Television In Front And Rear)
Courtesy of BMW OF NORTH AMERICA, INC.

BRIEF DESCRIPTION OF COMPONENTS

The following components supply signals or data for the television:

TV Aerial

The TV aerial receive the signals for the television.

2 or 3 TV aerials are used as follows for the best possible TV reception under varying reception conditions:

- E60, E61, E63, E64 - Television in front, digital and analogue 2 TV aerials
- E65, E66 without navigation system: Television in front, digital and analogue 3 TV antennae
- E65, E66: Television in front and rear, analogue: 2 TV aerials
- E65, E66: Television in front and rear, analogue and digital: 3 TV aerials

2 TV aerials are used at all times to guarantee optimum reception.

The TV aerials are in the rear window. The heating areas for the rear-window heater are also used as TV aerials.

MOST port

Control units for the television are programmed and encoded via the MOST port.

Aerial Amplifier

There are always 2 aerial amplifiers (TV tuners) installed.

On equipment versions with 3 TV aerials, 2 TV aerials are amplified by one aerial amplifier. One more TV aerial is amplified by the 2nd aerial amplifier.

The aerial amplifiers are to the right and left of the rear window.

The aerial signals are transmitted to the video module via coaxial cables.

Diagnosis Lead

Control units for the television are diagnosed via the diagnosis lead.

AMP: Amplifier

NOTE: *The following control units are involved in the television system (in alphabetical order):*

The amplifier issues the audio signals to the loudspeakers.

The following amplifier is fitted, depending on equipment variant:

- HiFi amplifier without AMP control unit
- TOP-HiFi amplifier with AMP control unit:

This amplifier belongs to the "TOP-HiFi amplifier" option (Logic 7).

The TOP-HiFi amplifier is a control unit in the MOST network.

The audio signals are transmitted to the TOP-HiFi amplifier via the MOST bus.

ASK: Audio System Controller

> E65, E66

The audio system controller controls the sound.

The audio system controller is a control unit in the MOST network.

BZMF: Control centre, rear compartment centre armrest

> E65, E66

The rear compartment centre armrest control centre controls the headphones.

The BZMF is a control unit in the K-CAN system.

CCC: Car Communication Computer

> E60, E61, E63, E64

The Car Communication Computer controls the information and communication systems.

Depending on the equipment and national version, the CCC processes RGB signals or FBAS signals (RGB: red-green-blue; FBAS: Composite Video Burst Synchronisation).

The CCC converts the analogue picture signals into digital LVDS signals (LVDS: Low Voltage Differential Signalling). The LVDS signals are transmitted to the screen via a special LVDS data wire (monitor is the CD or the CID).

The CCC is a control unit in the MOST network.

For more information, please refer to SI Technology bulletin (SBT) 84 06 03 053. Refer to **CAR COMMUNICATION COMPUTER (CCC) E60, E61, E64, E65** .

CD: Control Display

> E65, E66

The Control Display is the screen for the television and other information and communication systems (e.g. navigation system).

The CD is a control unit in the MOST network.

CID: Central Information Display

> E60, E61, E63, E64

The Central Information Display is the screen for the television and other information and communication systems (e.g. for the navigation system).

The CID is a control unit on the K-CAN.

For more information, please refer to SI Technology bulletin (SBT) 62 01 03 027. Refer to **iDRIVE, CENTRAL INFORMATION DISPLAY AND CONTROLLER E60, E61, E63, E64, E87, E90, E91** .

CON: Controller

The controller is integrated in the centre console switch centre (BZM). The CON is the operating unit and the control unit for operating the screen (Control Display or Central Information Display, see below).

The controller is a control unit on the K-CAN system or K-CAN

(K-CAN-S for E65, E66; K-CAN for E60, E61, E63, E64).

For more information, please refer to SI Technology bulletin (SBT) 62 01 03 027. Refer to **iDRIVE, CENTRAL INFORMATION DISPLAY AND CONTROLLER E60, E61, E63, E64, E87, E90, E91** .

DVD Changer

> E65, E66

The E65 and E66 also have a DVD changer (DVDC). The films on DVD use the components and software of the television.

FCON: Rear Compartment Controller

> E65, E66

The rear compartment controller is part of the "Rear seat area entertainment" option.

The rear compartment controller is integrated into the rear compartment centre armrest control centre (BZMF).

The rear compartment controller is the operating unit and control unit for operating the rear display.

The rear compartment controller is a control unit on the K-CAN system

Signal path when operating the FCON:

FCON -> K-CAN SYSTEM -> BZMF -> K-CAN SYSTEM -> SG-FD -> VM.

KHI: Headphone Interface

> E65, E66

The headphones interface is part of the "Rear seat area entertainment" option.

The headphones interface transmits audio data to the headphones connection module.

The headphones interface is a control unit in the MOST network.

NAV: Navigation System

The navigation system is important for the equipment variant "Television in front" (E60, E61, E63, E64, E65, E66).

With the equipment variant "Television in front", the NAV control unit works as an RGB decoder:

The navigation system converts FBAS signals into RGB signals.

The navigation system is a control unit in the MOST network.

SG-FD: Rear Display Control Unit

> E65, E66

The rear compartment controller control unit is only provided with the option "Rear seat area entertainment".

The SG-FD is installed beneath the rear display.

The SG-FD is a control unit on the K-CAN system

The SG-FD converts the image signal into the screen display on the rear display: e.g. RGB signals into LVDS signals.

The SG-FD is actuated by the video module.

Signal path: VM -> RGB wire -> SG-FD -> LVDS data wire -> FD

SGM: Safety And Gateway Module

The safety and gateway module is the data interface between the K-CAN or K-CAN system and the diagnosis cable.

The control units are diagnosed via the SGM.

VM: Video module

The video module is the central receiver unit for the picture signals from the TV aerials. In addition, the video module is a selector switch for the video sources.

- The video module is the master control unit for the television.
- The video module edits the picture signals from the TV aerials and from the DVD drive or DVD changer.

The video module is a control unit in the MOST network.

The video module (VM) is the master control unit for the television.

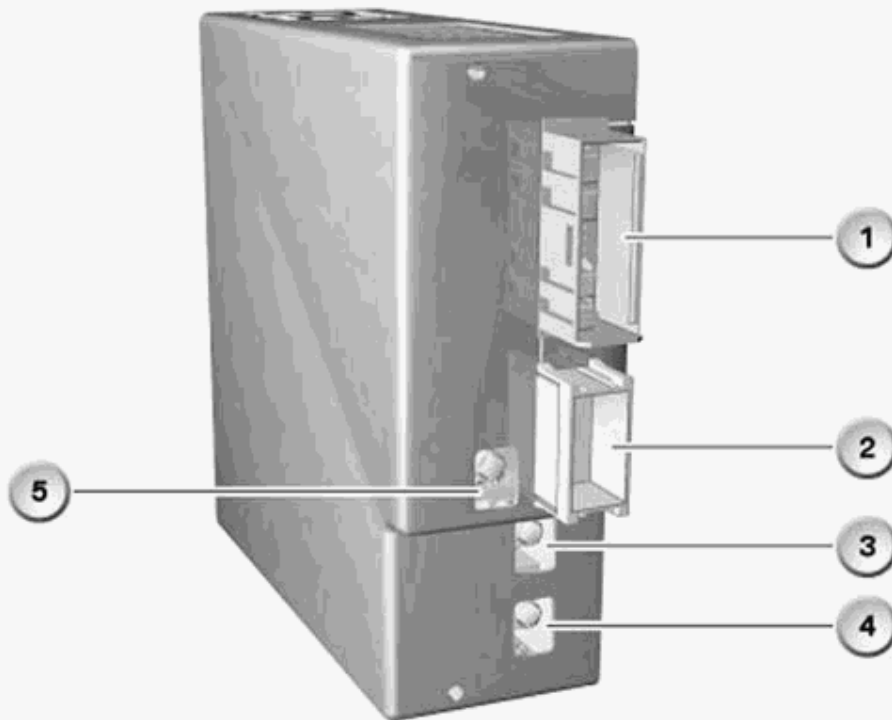
Installation Location

Video module is fitted at the rear left in the luggage compartment.

Construction

The video module comprises the following components:

- 2 Or 3 Aerial Connectors
- TV Tuner
- 2 Large Connectors
- Electronic Circuitry For Signal Processing



T6504098

Key	Explanation	Key	Explanation
1	Connector X18803 for MOST, power supply and outputs	2	Connector X18804 for image signal inputs, e.g. on JNAV or DVDC (JNAV: Japan navigation system; DVDC: DVD changer)
3	Aerial connector	4	Aerial connector
5	Aerial connector		

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Fig. 45: Identifying Video Monitor

Courtesy of BMW OF NORTH AMERICA, INC.

The illustration shows the video module on the E65, E66 for digital and analogue television in the front and rear. The video module with Japan navigation system has a different housing and different aerial inputs (VM5 RGB). For details of the classification of the equipment variants for video modules, see below.

Aerial Connector

Depending on the equipment variant, the following aerial connectors may be fitted:

On vehicles with television in the front and rear, the video module has 2 aerial inputs.

The video module has 3 aerial input with the following equipment variants:

- E65, E66: with analogue and digital television in the front and rear
- E65, E66: Television in front without navigation system

These 3 aerial inputs use the following aerial connectors:

- Aerial connector FAKRA E, green: TV 1 with signal and screening (item "3" in illustration)
- Aerial connector FAKRA F, brown: TV 2 with signal and screening (item "4" in illustration)
- Aerial connector FAKRA F, pink: TV 3 with signal and screening (equipment variant television in front and rear; this connector is shown as item "5" in the illustration)

FAKRA is the name of a standard. FAKRA stands for "Fachausschuss Kraftfahrzeuge" (technical committee for motor vehicles).

The video module also receives TV signals if only one aerial is working. However, signal processing will then be restricted.

Aerial Amplifier

Each aerial amplifier (TV tuner) is connected to its own aerial input.

- Vehicles with television in the front: The video module has 2 aerial amplifiers.
- Vehicles with television in the front and rear: The video module has 3 aerial amplifiers in 2 housings.

The aerial amplifiers work as follows:

Each aerial amplifier is independent of the other aerial amplifiers.

The aerial amplifiers are flexibly used as follows:

- Flexible reception: Depending on reception conditions, each aerial amplifier is able to receive a TV program in the foreground. The best reception quality is then used.
- Flexible background search: An aerial amplifier conducts a background search to find a new frequency for the current TV station. The other aerial amplifier receives the current TV program.

Each aerial amplifier is able to search for new frequencies. This means that the frequency range is scanned as quickly as possible. The list of stations is thus kept as current as possible. Alternative frequencies for the TV program selected are kept on standby.

2 Large Connectors

Depending on equipment variant, the two large connectors have different pin assignments:

- Pin assignment of video module for television in front: X18803 and X18804
- Pin assignment of video module for television in front and rear: X18803 and X18804

Television In Front:

PIN ASSIGNMENT X18803, 18+2-PIN WITH MOST, ENCODING C (BLUE)

Pin	Type	Description
1	M	Terminal 31
2	-	-
3	-	-
4	A	Composite Video Burst Synchronisation (FBAS), output
5	-	-
6	-	-
7	-	-
8	-	-
9	-	-
10	-	-
11	V	Terminal 30
12	A	Screening 1: The wire for the image signal to the Car Communication Computer (CCC) has additional screening (for improved electromagnetic compatibility).
13	A	Composite Video Burst Synchronisation (FBAS), terminal 31, earth
14	-	-
15	-	-
16	-	-
17	A	Screening 2: The wire for the image signal to the Car Communication Computer (CCC) has additional screening (for improved electromagnetic compatibility).
18	-	-
19	-	-
20	-	-
MOST	E/A	2 pins
<p>A = Output E/A = Input/output M = Earth V = Supply voltage For current specifications regarding pin assignment, please refer to BMW diagnosis system.</p>		

PIN ASSIGNMENT X18804, 18-PIN, ENCODING B (NATURAL, I.E. COLOURLESS)

Pin	Type	Description
1	-	-
2	-	-
3	E	DVD changer (DVDC), Composite Video Burst Synchronisation (FBAS)
4	-	-
5	-	-
6	-	-
7	-	-
8	-	-
9	-	-

10	-	-
11	M	DVD changer (DVDC), Composite Video Burst Synchronisation (FBAS), terminal 31, earth
12	-	-
13	-	-
14	-	-
15	-	-
16	-	-
17	-	-
18	-	-
E = Input M = Earth For current specifications regarding pin assignment, please refer to BMW diagnosis system.		

Television In Front And Rear:

PIN ASSIGNMENT X18803, 18-PIN WITH MOST, ENCODING C (BLUE)

Pin	Type	Description
1	M	Terminal 31
2	-	-
3	A	Red 1, 75 ohm
4	A	Green 1, 75 ohm
5	A	Blue 1, 75 ohm
6	M	Red-green-blue 2
7	-	-
8	-	-
9	-	-
10	-	-
11	V	Terminal 30
12	A	Screening 1: The wire for the image signal to the Car Communication Computer (CCC) has additional screening (for improved electromagnetic compatibility).
13	M	Composite Video Burst Synchronisation (FBAS), terminal 31, earth
14	A	Red 2, 75 ohm
15	A	Green 2, 75 ohm
16	A	Blue 2, 75 ohm
17	A	Screening 2: The wire for the image signal to the Car Communication Computer (CCC) has additional screening (for improved electromagnetic compatibility).
18	-	-
19	-	-
20	-	-
MOST	E/A	2 pins

A = Output

E/A = Input/output

M = Earth

V = Supply voltage

For current specifications regarding pin assignment, please refer to BMW diagnosis system.

PIN ASSIGNMENT X18804, 18-PIN, ENCODING B (NATURAL, I.E. COLOURLESS)

Pin	Type	Description
1	-	-
2	-	-
3	E	DVD changer (DVDC), Composite Video Burst Synchronisation (FBAS)
4	-	-
5	E	Red-green-blue, terminal 31
6	-	-
7	-	-
8	E	AUX-In connection (if fitted)
9	-	-
10	-	-
11	M	DVD changer (DVDC), Composite Video Burst Synchronisation (FBAS), terminal 31, earth
12	E	Red, 75 ohm
13	E	Green, 75 ohm
14	E	Blue, 75 ohm
15	-	-
16	-	-
17	E	AUX-In connection, Composite Video Burst Synchronisation (FBAS), terminal 31, earth (if fitted)
18	E	Synchronisation pulse from Japan navigation system (if fitted): The JNAV has an external synchronisation pulse. This synchronisation pulse is transmitted by the JNAV to the video module. The current video modules (VM hybrid) no longer need this synchronisation pulse.
E = Input M = Earth For current specifications regarding pin assignment, please refer to BMW diagnosis system.		

How It Works

The following functions are described:

- Power Supply
- Various Equipment Variants (List)
- Video Modules And Aerial Inputs

Power Supply A cycled current supply (switching power unit) provides power. The power unit creates very little power loss. Voltage peaks are avoided by switching on and off (hence the name "switching power unit").

In addition, a power supply is also created in standby mode.

Various Equipment Specifications Depending on the model series and equipment variant, the video module can work in different ways. In general, the following as described:

- "Analogue": The video module is only suitable for analogue television.
- "Hybrid": The video module is suitable for analogue and digital television.
- "Drive": The video module is suitable for watching television while the vehicle is moving. It is only possible to watch television in the rear while the vehicle is moving.
- "FBAS": The video module is connected to an FBAS wire. Inputs and outputs have FBAS wires. This video module is always hybrid, i.e. suitable for analogue and digital television.
- "RGB": The video module is connected to RGB wires. This video module supports analogue television.

To date, only analogue video modules have been fitted. The analogue video modules work either on the basis of FBAS or on the basis of RGB (FBAS: Composite Video Burst Synchronisation; RGB: red-green-blue).

ANALOGUE VIDEO MODULES: HOW IT WORKS AND MODEL SERIES

How it works	E name	E60, E61, E63, E64	E65, E66	Japan E60, E61, E63, E64	Japan E65, E66
RGB	VM5 RGB	0	0	1 with JNAV	1
FBAS	VM5 ECE	1	1	0	0
DRIVE (with RGB outputs)	VM5 DRIVE	0	1	0	1 With TV in rear and as video switch with rear seat area entertainment with external navigation

1: fitted
0: not fitted
E name: development code

Since 09/2004, hybrid video modules have been fitted in countries with DVB-T (in model series E60, E61, E63, E64, E65, E66). Hybrid video modules process analogue and digital television. The hybrid video modules also work on the basis of either FBAS or RGB.

HYBRID VIDEO MODULES: HOW IT WORKS AND MODEL SERIES

How it works	E name	E60, E61, E63, E64	E65, E66	Japan E60, E61, E63, E64	Japan E65, E66
FBAS	VM hybrid FBAS	1	1 Without TV in rear	0	0
DRIVE (RGB)	VM hybrid DRIVE	0	1 with TV in rear	0	0

		or with TV in front without NAV	
--	--	---------------------------------------	--

1: fitted

0: not fitted

E name: development code

NOTE: *In Japan there is only analogue television. Japan does not have DVB-T. For this reason, an analogue video module is fitted for television in the front in Japan (on RGB basis). With equipment variant television in front and rear, the video module VM5 DRIVE is fitted in Japan (analogue video module on RGB basis).*

Video Modules And Aerial Inputs All video module have 2 aerial inputs, except: video module 5 hybrid DRIVE.

Monitors: Control Display or Central Information Display

NOTE: **The following components are controlled:**

> E65, E66: Control Display

> E60, E61, E63, E64: Central Information Display

FD: Rear Display

> E65, E66

The rear display is part of the "Rear seat area entertainment" option.

The rear display is the monitor for the television in the rear.

The rear display is mounted on the centre console between the driver's and front passenger's seats.

The rear display is actuated by the SG-FD (rear display control unit, via the LVDS data wire).

The rear display is a control unit on the K-CAN system

Loudspeakers

The following loudspeakers are actuated for television sound output:

- Tweeters and medium-range loudspeakers: The loudspeakers are actuated by the CCC or ASK.

(CCC: Car Communication Computer: E60, E61, E63, E64)

(ASK: audio system controller: E65, E66)

- **Woofers:** If an amplifier (AMP) is fitted (HiFi amplifier or TOP-HiFi amplifier), the woofers are actuated by the amplifier.

KHA: Headphones Connector Module

> E65, E66:

The headphones connector module is integrated into the rear compartment centre armrest control centre.

The headphones are connected to the KHA.

FBAS Wire

NOTE: The following wires are important:

FBAS: Farbbild-Austast-Synchronsignal,

English CVBS: Composite Video Burst Synchronisation

> E60, E61, E63, E64:

The FBAS wire connects the video module to the Car Communication Computer.

The FBAS wire consists of 2 wires:

- One wire is used to transmit all three 3 RGB signals (red-green-blue) together.
The synchronisation pulse (for a sharp TV picture) are also transmitted on the wire for RGB signals.
- The other wire is used for screening and earthing.

Coaxial cable

The coaxial cables transmit high-frequency signals, e.g. between the aerial amplifier and the video module (VM):

- E60, E61, E63, E64, E65, E66: between the video module and the aerial amplifier
- E65, E66: between the DVD changer and video module

Construction of coaxial cable:

- Inner conductor ("core"), insulated
- The outer conductor forms a mantle around the inner conductor

LVDS Data Wire

LVDS stands for "Low Voltage Differential Signalling".

There is always a LVDS data wire between the display control unit and the monitor:

- E60, E61, E63, E64:

Between the Car Communication Computer and Central Information Display

- E65, E66:

Between the rear display control unit and the rear display

LVDS is a special technology for fast and secure data transmission:

There are 2 wires for each signal. The signal is transmitted positively on one wire, negatively on the other (inverted). This means that each pair of wires is electrically neutral.

Interference from outside has **no** effect on the signal transmission: such interference affects both wires equally. The signal information is thus unaffected. This is because:

The control unit processes the difference between the positive and negative signals. This difference remains unchanged even in the event of interference from outside.

The LVDS data wire for the television consists of the following wires:

- 2 wires for red
- 2 wires for green
- 2 wires for blue
- 2 earth wires
- Screening

The synchronised pulses are transmitted on the wire for image signals.

RGB Wire

> E60, E61, E63, E64: between the video module and the CCC

> E60, E61, E63, E64: between the NAV and CD

> E65, E66: between the video module and the CD

> E65, E66: between the video module and SG-FD

The RGB wire has 3 wires for image signals: red-green-blue. The synchronised pulse is transmitted on the wire for the green signal.

The RGB wire is screened. The screening carries no current.

In addition, the RGB wire has its own earth wire for improved electromagnetic compatibility. The earth wire conducts current.

MOST Bus

The MOST bus connects the control units for the vehicle's information and communication systems. These control units are programmed via the MOST port.

K-CAN or K-CAN SYSTEM: Body CAN or Body CAN SYSTEM:

> E60, E61, E63, E64: K-CAN

> E65, E66: K-CAN SYSTEM

For more information, please refer to SI Technology bulletin (SBT) 61 02 03 015] **BUS DIAGNOSIS ALL MODELS FROM E60** .

SYSTEM FUNCTIONS

The video module comprises the following functions:

- Digital and analogue television
- Television when the vehicle is stationary (front)
- Television when the vehicle is in motion (rear compartment only)
- Television reception
- Image buildup
- Sound reception
- Transmission of image signals in the vehicle
- Sound output
- Mute
- Station selection
- Aerial diversity for TV aerials TV 1, TV 2 and TV 3 (only E65, E66 with television in front and rear):

Aerial diversity for TV aerials is not a separate component, but rather a software component within the video module.

- Video switch

NOTE: **Digital television: Basic principles and introduction in various countries**
This SI Technology bulletin (SBT) describes digital television as used by BMW.
The enclosures also include the following information:

- **Fundamental information about digital television**

- **An overview of the conversion from analogue to digital television in various countries**

Overview Of E60, E61, E63, E64, E65, E66: Digital Television

This SI Technology bulletin (SBT) principally describes digital television as used by BMW. In addition, the following information is provided:

- Fundamental information: Advantages of and standards for digital television
- An overview of the conversion from analogue to digital television in various countries

Basic Principles Of Digital Television

Advantages of digital television:

- **Number of TV Programs**

Digital television makes better use of the band-width when broadcasting TV programs than analogue television:

The digital signals can be transmitted and compressed without loss. Example: A TV picture with 625 lines (PAL) has an uncompressed data transmission rate of 216 Mbit/s.

With MPEG-2, this TV picture is compressed at least to 8 MBit/s.

Data compression is variable and dynamic, depending on the content of the TV picture.

This provides the following possibilities:

- Multiplex: Several TV stations on one channel:

Because of the data compression, up to 5 TV stations can be digitally broadcast on a single conventional UHF or VHF channel.

This transmission is known as "Bouquet".

- Specification of UHF and VHF channels:

- VHF channel for television: 48-67 MHz

VHF: Very High Frequency, frequency range: 30-300 MHz

- UHF channel for television: 471-860 MHz

UHF: Ultra High Frequency, frequency range: 300 MHz to 3 GHz

- Higher transmission quality due to data compression:

The band-width is used for TV stations with higher resolution (HDTV: High Definition Television, previously only used in Australia).

○ **Improved Transmission Performance**

DVB-T has a better transmission performance than analogue television:

Digital television is some 10 dB "better" than analogue television. This means that a lower transmission output is needed for the same range.

○ **Interference-Free Data Transmission Due To Multipath Reception**

Analogue television produces "shadows" when a TV program is received more than once (caused by the reflection of the signal): A TV picture appears superimposed on top of the same TV picture, shifted slightly to one side and significantly weaker.

Multipath reception is useful for digital reception: Even reflected signals are used for building up the picture.

○ **Mobility**

Because digital television is resistant to interference, it also supports mobile reception: Stable reception is possible at speeds of up to 200 km/h under favourable conditions.

○ **Universal Coverage Of Large Areas With Single-Frequency Network**

Several geographically separate TV stations are linked in a single-frequency network (SFN). The single-frequency network functions as follows:

All TV stations work on the same transmission frequency. The TV stations are synchronised by GPS so that exactly the same information is transmitted to within 100 nanoseconds. Because the information is precisely synchronised, only one frequency is needed for a TV program, even in a large reception area.

○ **Loss-Free Recording**

TV Programs can be stored without loss on CD, PC and laptop.

Digital television (DVB: Digital Video Broadcasting) has the following standards:

- DVB-S: Digital television for data transmission via satellite
- DVB-C: Digital television for data transmission via cable networks
- DVB-T: Digital television for data transmission via stationary antennae for terrestrial reception (frequency ranges: VHF or UHF).
 - Terrestrial, digital television in USA: Standard for digital television in USA: ATSC (Advanced Television Systems Committee).
 - Terrestrial, digital television in Japan: Standard for digital television in Japan: ISDB (Integrated Services Digital Broadcasting).

- DVB-H: Digital television for asynchronised transmission onto mobile final devices (handheld units), also terrestrial.

Digital And Analogue Television

Depending on the equipment variant, analogue and/or digital television can be received.

For digital television the DVB-T standard is supported. Only terrestrial reception is possible.

The abbreviation "DVB-T" stands for "Digital Video Broadcasting" - Terrestrial. In other words "DVB-T" means: digital television transmitted via antenna ("terrestrial").

There are two equipment specifications for analogue and digital television:

1. Television when the vehicle is stationary
2. Television when the vehicle is in motion

Television When The Vehicle Is Stationary (Front)

Viewing television in the front is only possible when the vehicle is stationary.

The television is deactivated when the vehicle reaches walking pace. The sound remains unaffected.

Television in the front is available for the following model series:

> E60, E61, E63, E64, E65 and E66

Television When The Vehicle Is In Motion (Rear Compartment Only)

Television in the rear is only available with the model series E65 and E66.

It is also possible to watch television in the rear when the vehicle is in motion.

Television Reception

The analogue television supports the following television standards:

- NTSC: NTSC is most common in North and South America and in Japan. NTSC is an analogue television standard for colour transmission.

NTSC stands for "National Television Standards Committee".

- PAL: PAL is most common in Europe.

PAL is also used in Australia and in most African and Asian countries (except for Japan). PAL is common in all countries that **do not have** NTSC and SECAM.

PAL is an analogue television standard for colour transmission.

PAL is a further development of NTSC. As with NTSC, the TV pictures are transmitted in lines. PAL, however, evens out colour faults.

PAL stands for "Phase Alternating Line".

- SECAM: SECAM is most common in France and Eastern Europe.

SECAM stands for "Sequentielle Couleur a Memoire", i.e. "sequential colour memory".

Digital television supports data transmission via MPEG.

MPEG stands for "Motion Picture Experts Group". MPEG is the designation of a data compression standard for image signals.

Transmission Of Image Signals In Vehicle

Image signals are transmitted as follows, depending on equipment fitted:

- E65, E66: Television in front:

Depending on the vehicle's equipment, the video module or the navigation system will transmit the RGB signals to the control unit for the monitor (CD or SG-FD:

Control Display or rear display control unit):

If a navigation system is fitted, the navigation system will transmit the RGB signals to the monitor (exception: Japan navigation system)

The red-green-blue image signals are transmitted via the RGB wire.

Signal path: Aerial -> Aerial cable -> Aerial amplifier -> Video module (VM) -> FBAS wire -> Navigation system (NAV) -> RGB wire -> CD (Control Display).

If there is **no** navigation system fitted, the video module will transmit the image signal to the monitor as follows:

- E60, E61, E63, E64: from the video module through the FBAS wire to the Car Communication Computer (CCC).

A LVDS data wire transmits the image signal between the CCC and the CID (Central Information Display).

- E65, E66: From the video module through the RGB wire to the Control Display
- Television in front and rear (E65, E66 only)

The navigation system transmits its image data to the video module.

The image signals are transmitted between the SG-FD and rear display through a LVDS data wire.

Image Buildup

E60, E61, E63, E64, E65, E66:

The TV picture is built up as follows:

- Colours are made up of individual red, green and blue pixels.
- The TV picture is built up line by line.
- Synchronisation of image signals: For a sharp TV picture, the pixels must be precisely synchronised. The synchronisation works as follows:
 - Horizontal synchronisation defines when a line ends and a new line starts.
 - Vertical synchronisation defines when a new image buildup is to start (in the top left corner).

A separate electrical pulse is provided for synchronisation: The synchronisation pulse. The synchronisation pulse is transmitted with the green signal (all model series).

Sound Reception

The sound signal is received together with the image signal in the TV signal.

Signal path for sound: Aerial -> Aerial cable -> Aerial amplifier -> Coaxial cable -> Video module -> MOST bus -> Radio or amplifier (AMP) -> Loudspeakers.

The video module processes the sound for the television.

Sound Output

Sound is output in mono or stereo as follows:

- Analogue TV sound in mono:

The video module receives the analogue TV sound in mono.

The analogue TV sound is digitalised.

The video module lays the digitalised signal on both the left and right synchronous channel of the MOST bus.

The ASK or CCC emit the audio signals to the loudspeakers (via the amplifier, depending on equipment variant).

- Digital TV sound in stereo:

The digital TV sound is received and emitted in stereo.

Precondition: The TV program is transmitted in stereo.

- 2-channel sound:

2-channel sound is only available with digital television reception.

2-channel sound allows, for example, a foreign-language broadcast to be overdubbed in English. With 2-channel sound, the language of the country concerned will be output through the loudspeakers. The other language will be muted.

Depending on the equipment variant, the loudspeakers are actuated by amplifiers are follows:

- HiFi amplifier

> E60, E61, E63, E64, E65, E66

The HiFi amplifier actuates the woofers. CCC or ASK actuate the mid-range loudspeakers and the tweeters.

- TOP-HiFi amplifier "Logic 7"

> E60, E61, E63, E64, E65, E66

The TOP-HiFi amplifier actuates all loudspeakers.

Mute

If necessary, sound output can be switched between navigation system and television.

The sound signals from the radio and television are muted under the following conditions:

- Telephone call
- Navigation system announcements
- Traffic reports

The CCC or the ASK controls the muting.

Station Selection

The video module manages a list of all the television stations that can currently be received.

This list of stations is shown on the Control Display (CD) or Central Information Display (CID) as follows:

- Where station names for individual TV programmes can be determined, the list starts with the station names arranged in alphanumeric order (e.g. ARD, BR3, SAT1 ...).

- After this, a list will appear showing the reception channels with unknown station names. This list is also alphanumerically ordered: e.g. CH3, CH7, CH12, ... for Channel 3, Channel 7, Channel 12.

> E65, E66: Front and rear seat television: The list of stations is updated automatically.

> E60, E61, E63, E64 and E65, E66 with television in front: The list of stations is updated manually by selecting "Autostore".

The list of stations is also updated if another entertainment module is selected (e.g. if you change to the radio or CD changer). When the television is called up again the current list of stations is offered automatically.

Aerial Diversity

> E65, E66 Only: television in front and rear, analogue and digital

The "aerial diversity" function is only available with 3 TV aerials.

To ensure optimum reception, these 3 TV antennae work as follows:

- 2 TV aerials receive the required television station.
- 1 TV aerial searches in the background for other transmission frequencies for this television station.

The required television station is received on the transmission frequencies with the highest signal strength.

Aerial diversity works as follows:

If more than one station have the same name when analogue TV is in use, then there are alternative frequencies. e.g. "Television station 1" is being received on 3 different analogue frequencies. In this case the television station is displayed just once.

Aerial diversity automatically selects the best frequency. "Television station 1" is shown in the display.

If, however, a television station is transmitting "Television station 1" analogue on several frequencies and "1st digital" digitally on another frequency, then the display shows the following:

- Aerial diversity combines all frequencies for analogue television.

The best frequency is selected and displayed. e.g.: "Television station 1".

- However, aerial diversity is **not** able to combine the following TV stations: Analogue reception for "Television station 1" and digital reception for the "1st digital".

This is because: The video module cannot assign the two different notations and meanings to one another.

This means "Television station 1" appears twice in the list of stations: Once analogue as "Television station 1" and once digitally as the "1st digital".

Video Switch

The video module switches between the various video sources, e.g. between television and video.

This function is called "video switch".

OPERATION

The following operations are described:

- Adjusting screen settings
- Selecting television stations
- Updating list of stations

NOTE: ***Please comply with instructions in Owner's Handbook.***
Detailed instructions for the television can be found in the vehicle's Owner's Handbook.

Adjusting Screen Settings

Users can adjust the screen settings for colour, contrast and brightness: Call up the corresponding menu (using the CD and controller on the E65, E66; using the CID and controller on the E60, E61, E63, E64).

The controller controls the monitor settings.

Depending on the equipment specification, the screen setting is processed in the following control units:

- Vehicles with television in the front:
 - > E60, E61, E63, E64: Car Communication Computer (CCC)
 - > E65, E66:

For vehicles with a navigation system the screen setting is processed in the control unit for the navigation system (NAV).

On vehicles **without** navigation system, the video module processes the monitor settings.

- Vehicles with rear display (E65, E66 only): The video module processes the monitor settings.

Selecting Television Stations

- Select country

(On the Control Display or Central Information Display; CD on E65, E66; CID on E60, E61, E63, E64):

When a country is selected, the video module will set the correct television standard.

- Select the required television station from the list of stations.

The video module administers a list of stations with all receivable television stations. This list is displayed on the CD or CID.

Updating List Of Stations

On vehicles with television in the front, the list of stations is manually updated as follows: Call up "Autostore".

SWITCH-ON CONDITIONS

The television is available from terminal R ON.

NOTES FOR SERVICE STAFF

The following information is available for service staff:

- General information: N/A
- Diagnosis: refer to **E60, E61, E63, E64, E65, E66: TELEVISION DIAGNOSIS** .
- Encoding/programming: N/A
- Car & Key Memory: The last settings made remain stored when the vehicle is shut down. The video module remembers the last TV station selected. The colour settings are also stored (in either the video module or navigation system, depending on equipment variant).

E60, E61, E63, E64, E65, E66: Television Diagnosis

The following information is available for diagnosis on the television:

- Measuring With And Without Adapter
- Check Signal Paths Of FBAS Signal And RGB Signal
- Self-Diagnosis For Aerials And Aerial Amplifiers

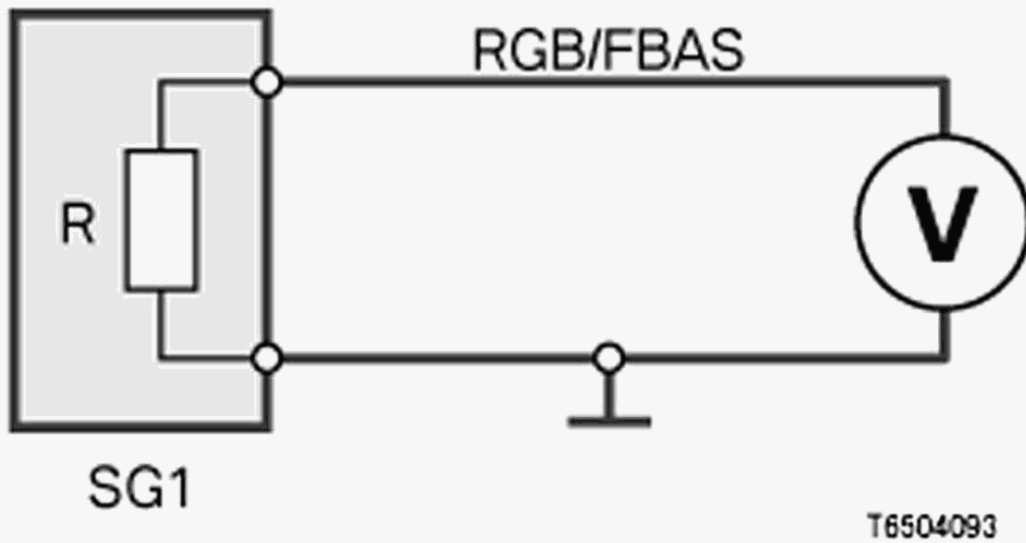
Measuring With And Without Adapter

IMPORTANT: Only connect control units to oscilloscope using adapter. If measurements are made without an adapter, the voltage values will be twice as high as they would be with an adapter. The adapter works as a power diplexer.

Measuring Without Adapter

When measuring without an adapter, the second control unit (SG2, e.g. NAV) is disconnected. The signal is only measured using the resistance R. This means that the signal a voltage that is twice as high as it would be if measured with an adapter.

The illustration shows a measurement without adapter.



T6504093

R Resistance in control unit

SG1 Control unit 1 (e.g. video module)

V Measuring equipment, oscilloscope

RGB RGB wire

(RGB: red-green-blue).

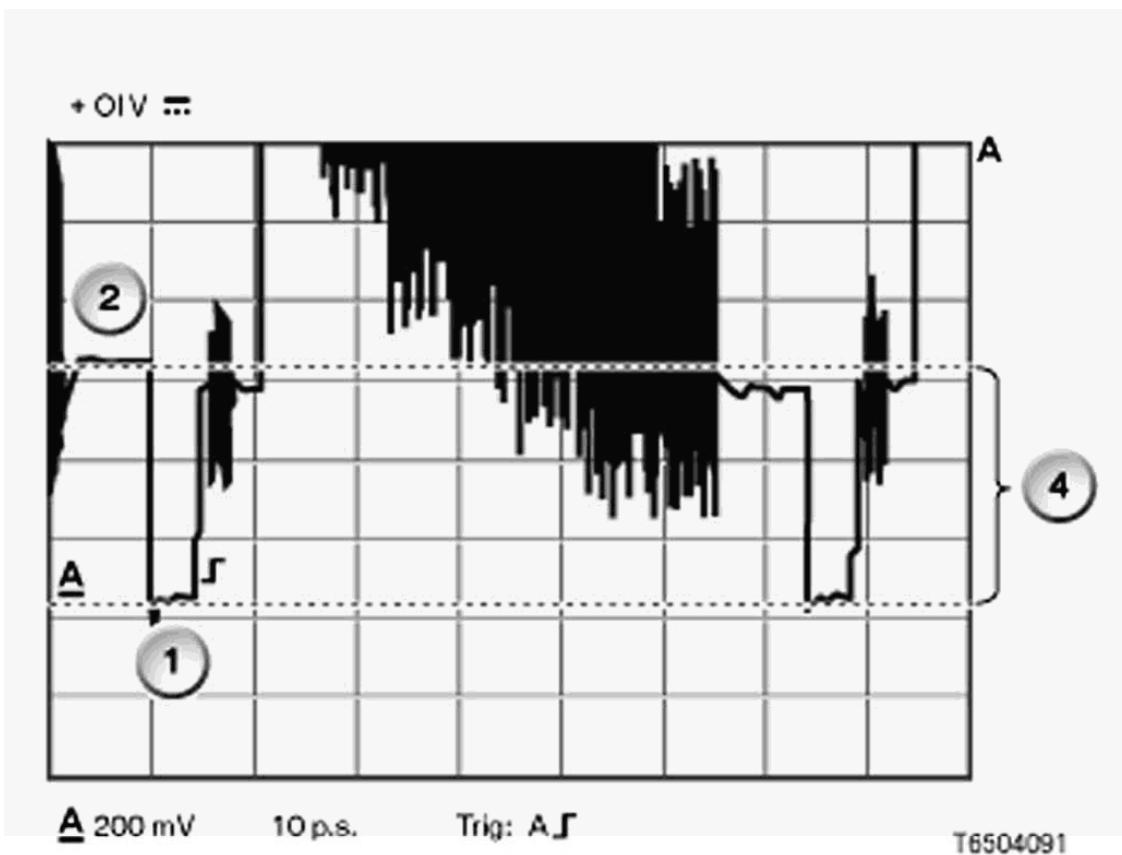
FBAS FBAS wire

(FBAS: Composite Video Burst Synchronisation)

G00431776

Fig. 46: Measuring Signal Without Adapter

Courtesy of BMW OF NORTH AMERICA, INC.



... and this is the signal path of an FBAS signal on oscilloscope, measured **without** an adapter:

1. 0 volt
2. 0.6 V measurement **without** adapter
0.3 V measurement **with** adapter
3. The signal path marked with number 3 is for a measurement taken **without** an adapter at top of the oscillograph.
For oscillograph for measurement with adapter
4. Voltage between 1 and 2

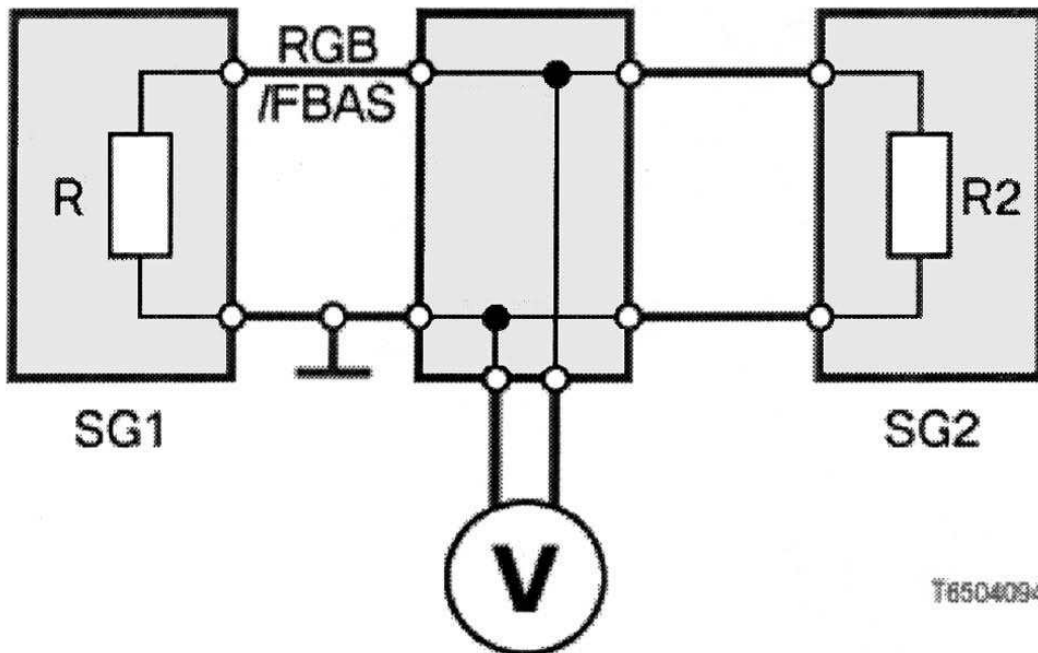
G00431777

Fig. 47: Signal Path Of An FBAS Signal On The Oscilloscope (Measured Without An Adapter)

Courtesy of BMW OF NORTH AMERICA, INC.

Measuring With Adapter

When measuring with an adapter, the second control unit (SG2, e.g. NAV) remains connected. The signal is only measured across the parallel circuit of the two resistances R1 and R2. This means that the signal a voltage that is half that it would be if measured without an adapter.

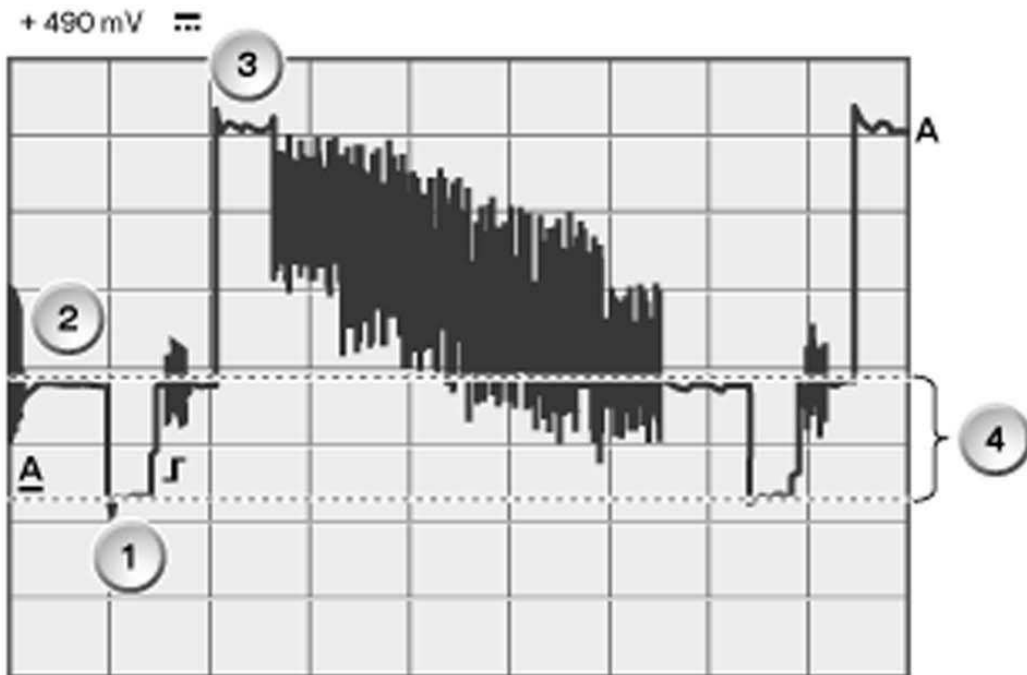


T6504094

- R Resistance in control unit
- R2 Resistance on adapter
- SG1 Control unit 1 (e.g. video module)
- SG2 Control unit 2 in adapter (e.g. NAV)
- V Measuring equipment, oscilloscope
- RGB RGB wire
- FBAS FBAS wire

G00431778

Fig. 48: Measuring Signal With Adapter
 Courtesy of BMW OF NORTH AMERICA, INC.



A 200 mV 10 p.s. Trig: A ⌂ T6504090

1. 0 volt
2. 0.3 V measurement **with** adapter
0.6 V measurement **without** adapter
3. 1 V measurement **with** adapter
2 V measurement **without** adapter
4. Voltage between 1 and 2

G00431779

Fig. 49: Signal Path Of An FBAS Signal On The Oscilloscope (Measured With An Adapter)
 Courtesy of BMW OF NORTH AMERICA, INC.

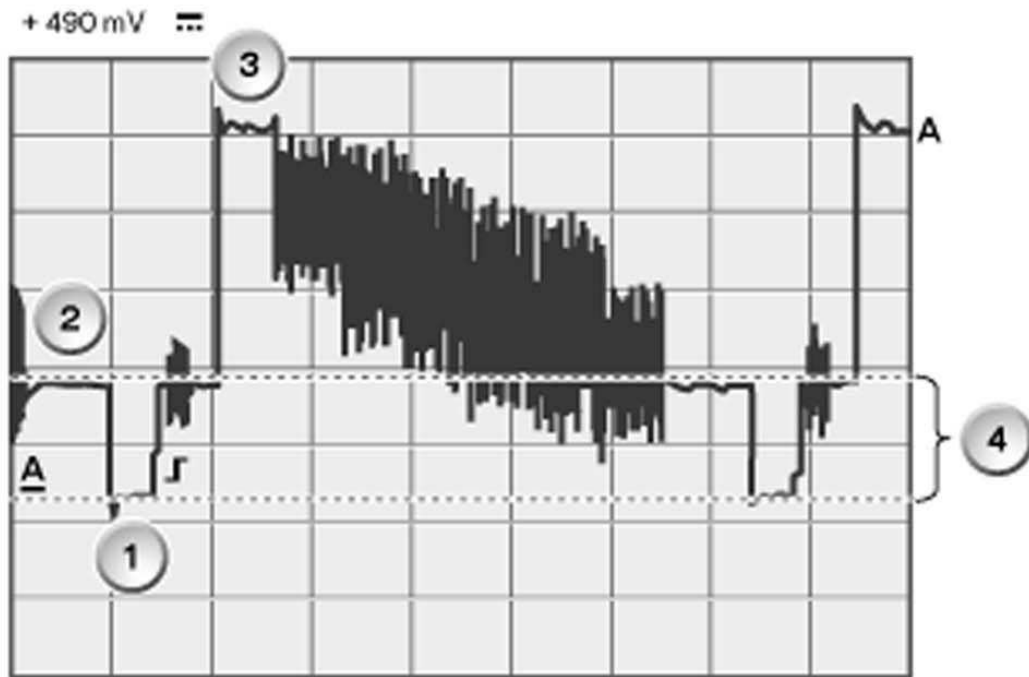
Check Signal Paths of FBAS Signal and RGB Signal

The following signal paths may differ from the voltage values. However, the path must agree at the points

marked.

Checking FBAS Signal

FBAS signal path:



A 200 mV 10 p.s. Trig: A J T6504090

1. 0 volt
2. 0.3 V measurement **with** adapter
0.6 V measurement **without** adapter
3. 1 V measurement **with** adapter
2 V measurement **without** adapter
4. Voltage between 1 and 2

Fig. 50: Checking FBAS Signal Path

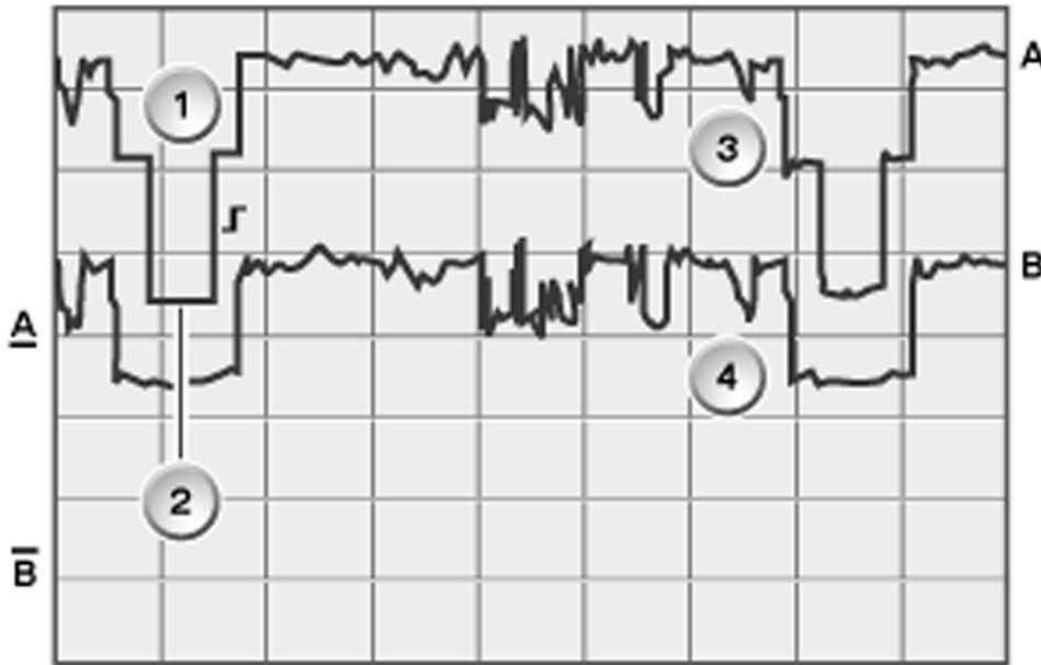
Courtesy of BMW OF NORTH AMERICA, INC.

Composite Video Burst Synchronisation With FBAS, the image signals (red-green-blue) are transmitted via a single wire. The signal path has 3 important points. These points are independent of the oscillograph displayed. These points are meaningful for the measurement.

Checking RGB Signal

RGB signal path: red-green-blue

+ 597 mV



A 200 mV 10 p.s. Trig: A

T6504092

1. With green signal, red signal and blue signal:
0.5 V measurement **with** adapter,
1 V measurement **without** adapter
2. With green signal:
0.1 V measurement **with** adapter,
0.2 V **without** adapter
3. Signal path of green signals **with** synchronisation.
The pulse synchronisation pulse is
marked number 2.
4. Signal path of blue and red signals **without**
synchronisation pulse

Fig. 51: Checking RGB Signal Path

Courtesy of BMW OF NORTH AMERICA, INC.

With the RGB signal, the image signals are separated according to colour and transmitted through 3 wires: green, yellow and blue.

The synchronisation pulse for the RGB signals is carried on the green signal. The signal path has 2 important points. These points are independent of the oscillograph displayed. These points are meaningful for the measurement.

Self-Diagnosis For Aerials And Aerial Amplifiers

The video module recognises how many aerial amplifiers are fitted in the vehicle.

The video module diagnoses the aerial inputs by measuring the supply voltage and supply current.

With hybrid video modules (VM5 hybrid), each aerial input is diagnosed individually. The range 20 mA to 100 mA is recognised as valid. This means that diagnosis is independent of the different aerial amplifiers and their supply currents.

The video module recognises the following states:

- Short circuit: In the event of a short circuit, the power supply from the video module to the aerial amplifier remains switched off until the video module is restarted.
- 1 aerial amplifier connected (all other aerial amplifiers failed or electrically disconnected)
- 2 aerial amplifiers connected (depending on equipment variant, 3rd aerial amplifier failed or electrically disconnected)
- 3 aerial amplifiers connected (only with analogue and digital television in rear)

The video module recognises the following states as faults:

- The aerial amplifiers draw too little current (less than 20 mA).
- The aerial amplifiers draw too much current (more than 100 mA).

Self-diagnosis cannot be deactivated.

NATIONAL VERSIONS

Digital television is already available in many countries.

There are numerous analogue television standards worldwide. The video module supports these television standards and frequencies.

**NOTE: Subscription TV is not supported.
Because special cards and decoders are needed for subscription TV (pay TV),
pay TV is not supported.**

**Pay TV is available, for example in the Netherlands and in the UK.
Free TV stations in the UK are supported.**

The following details are available with regard to national versions:

- US national version
- Japan national version
- Different switch-off conditions when driving in different national versions

**NOTE: The Japan national version is also valid for China and Korea.
The equipment specifications for the Japanese national version also support
television reception in China and Korea.**

US National Version

In the US version, the television is deactivated by encoding.

Reason: watching television in cars is forbidden in the USA.

However, a video module is fitted, depending on the equipment. This video module serves as a video switch between the different entertainment sources (e.g. radio, CD changer).

ANTI-THEFT ALARM SYSTEM E63/E64

NOTE: Refer to AUDIO, NAVIGATION & ANTI-THEFT - SI TECHNIQUES .

ACCESSORIES AND EQUIPMENT

Audio, Navigation and Anti-Theft - Repair Instructions - X3

11 MONO RADIO

65 11 ... INSTRUCTIONS ON SETTING THE INSTALLATION LOCATION ON THE CD CHANGER

NOTE: To ensure trouble-free CD changer operation, ensure both suspension springs are correctly positioned (horizontal/vertical).
If necessary, correct adjustment.
To avoid premature contamination of the CD changer, make sure the magazine compartment flap is permanently closed.

NOTE: For purposes of clarity, the following graphics show the CD changer removed.

NOTE:

- Observe the following repair instructions if the magazine cannot be removed from the CD changer.
 - E83:

Ejection via self-diagnosis

Remove cover cap (1) from CD changer (2).

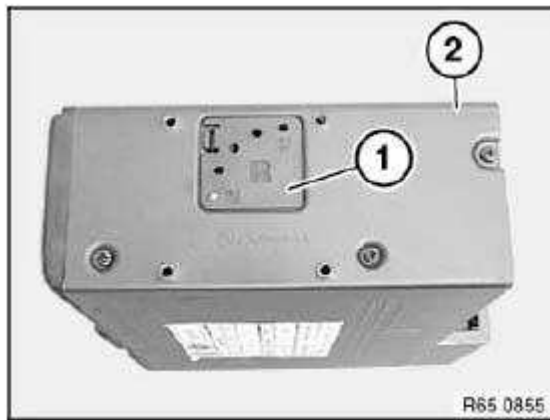


Fig. 1: Cover Cap And CD Changer
Courtesy of BMW OF NORTH AMERICA, INC.

Arrange installation location of CD changer (2) with a suitable tool by sliding suspension spring (1) into required position.

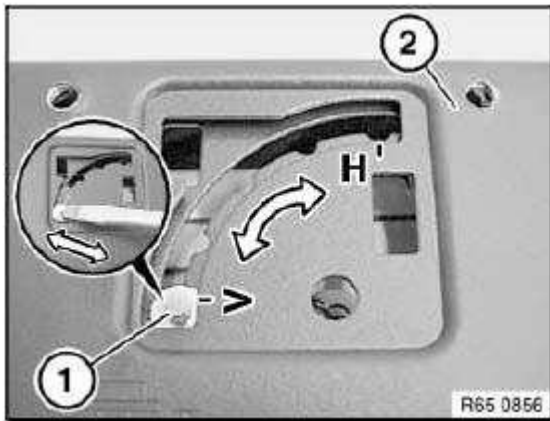


Fig. 2: Suspension Spring

Courtesy of BMW OF NORTH AMERICA, INC.

65 11 045 REMOVING AND INSTALLING/REPLACING RADIO/NAVIGATION CONTROL PANEL

This operation is described under:

"Removing and installing/replacing radio receiver", see **65 11 080 Removing and installing/replacing radio receiver**.

65 11 070 REMOVING AND INSTALLING/REPLACING CD CHANGER

IMPORTANT: Read and comply with 61 35 ... NOTES ON ESD PROTECTION (ELECTRO STATIC DISCHARGE) .

Necessary preliminary tasks:

- Remove CD magazine
- Remove storage compartment, see **51 16 200 REMOVING AND INSTALLING/REPLACING STORAGE COMPARTMENT (WITH CD CHANGER) .**

Release screws (1) on both sides.

Tightening torque: 65 11 1AZ. , see **65 11 CD CHANGER**

Pull CD changer (2) up and out.

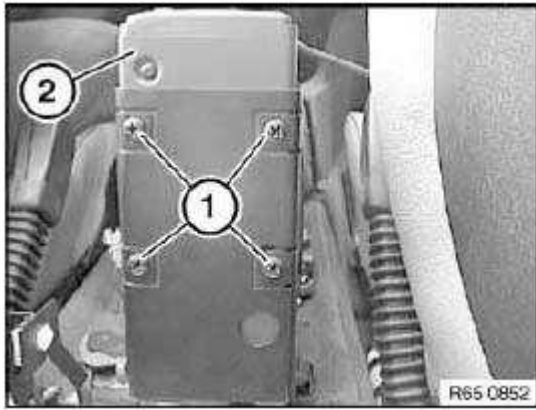


Fig. 3: Screws And CD Changer

Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connections (1) and remove CD changer (2).

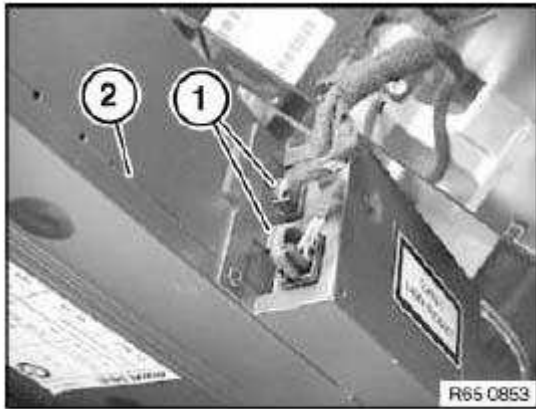


Fig. 4: Plug Connections And CD Changer

Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

Before installation, remove all transport securing screws on equipment floor and seal openings with adhesive spots.

Follow instructions on setting the installation location on the CD changer, see **65 11 ... Instructions on setting the installation location on the CD changer**.

65 11 080 REMOVING AND INSTALLING/REPLACING RADIO RECEIVER

IMPORTANT: Read and comply with 61 35 ... NOTES ON ESD PROTECTION (ELECTROSTATIC DISCHARGE) .

Necessary preliminary tasks:

- Remove operator unit for heater/air conditioner, see **64 11 377 REMOVING AND INSTALLING CONTROL PANEL FOR HEATER - A/C SYSTEM (REPLACING, AUTOMATIC AIR CONDITIONING)** .

Release screws (1).

Pull back radio receiver (2) slightly.

Unlock and disconnect associated plug connections, remove radio receiver (2).

Installation:

Make sure guide pin (3) is correctly seated in associated fixture.

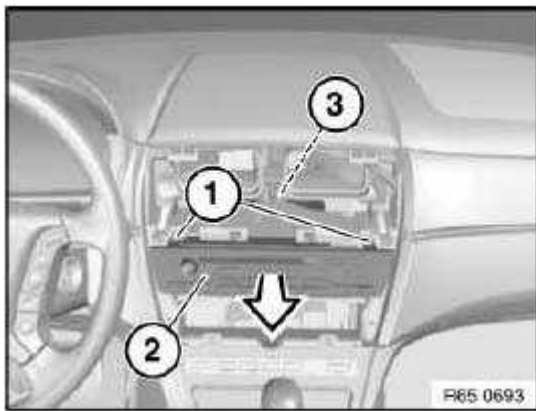


Fig. 5: Radio Receiver And Guide Pin
 Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

Carry out programming/coding using appropriate BMW service tool.

12 STEREO RADIO, AMPLIFIER

65 12 050 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT CENTRAL BASS SPEAKER (UNDER FRONT SEAT)

Necessary preliminary tasks:

- Remove front seat, see **13 FRONT SEAT NORMAL, MA** .
- Remove panel for door pillar, see **51 43 150 REMOVING AND INSTALLING OR REPLACING TRIM FOR LEFT OR RIGHT DOOR PILLAR (BOTTOM)** .

Fold back carpet (1) in direction of arrow.

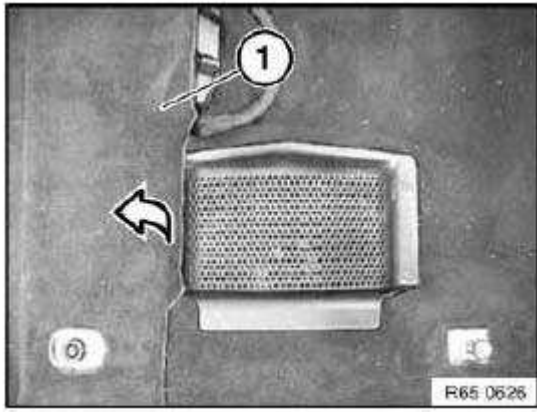


Fig. 6: Carpet
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Remove central bass speaker trim (2) from floor trim (3).

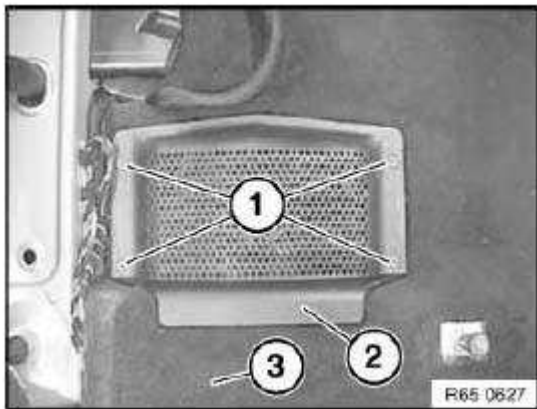


Fig. 7: Screws And Central Bass Speaker Trim
Courtesy of BMW OF NORTH AMERICA, INC.

Pull out floor trim (1) under rear compartment heating duct (2) and fold back in direction of arrow.

Feed electrical lead (3) out of floor trim (1).

Installation:

Ensure correct cable routing.

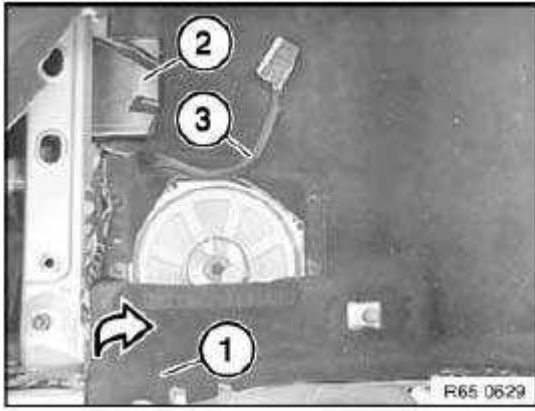


Fig. 8: Floor Trim And Electrical Lead
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten plug connection (1) and disconnect.

Unscrew nuts (2).

Feed out central bass speaker (3) in direction of arrow and remove.

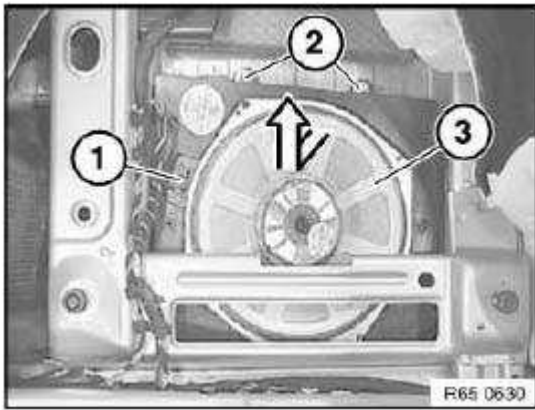


Fig. 9: Plug Connection And Bass Speaker
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Make sure seal (1) is correctly seated on central bass speaker (2).

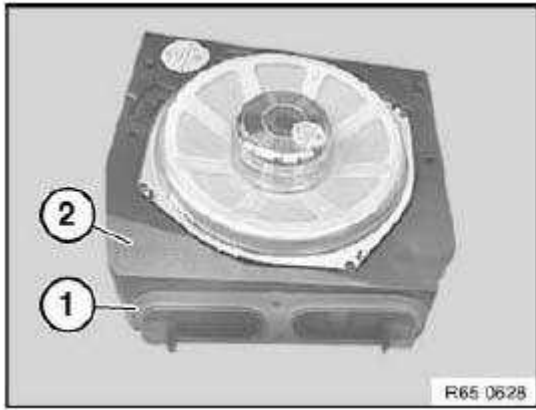


Fig. 10: Central Bass Speaker And Seal
 Courtesy of BMW OF NORTH AMERICA, INC.

65 12 070 REMOVING AND INSTALLING/REPLACING AMPLIFIER

Necessary preliminary tasks:

- Remove luggage compartment wheel arch trim on left, see **51 47 151 REMOVING AND INSTALLING / REPLACING LEFT LUGGAGE COMPARTMENT WHEEL ARCH TRIM** .

Unfasten plug connection (1) and disconnect.

Release screws (2).

Remove amplifier (3) with holder in direction of arrow.

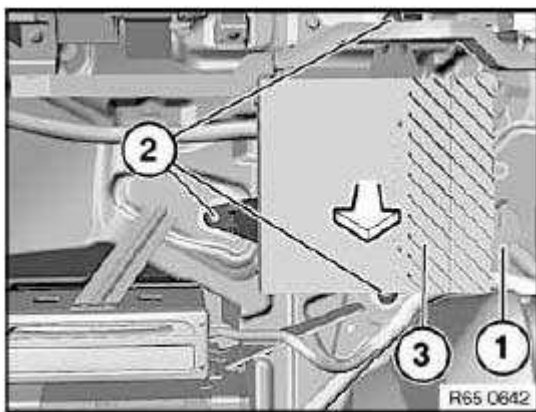


Fig. 11: Screws And Amplifier
 Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

Unscrew nuts (2).

Remove amplifier (3) from holder (4).

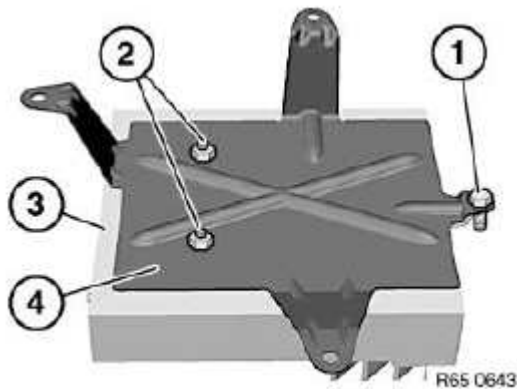


Fig. 12: Screw, Nuts And Amplifier
Courtesy of BMW OF NORTH AMERICA, INC.

65 12 072 REMOVING AND INSTALLING (REPLACING) AMPLIFIER (TOP HI-FI SYSTEM)

IMPORTANT: Read and comply with 61 35 ... NOTES ON ESD PROTECTION (ELECTRO STATIC DISCHARGE) .

Necessary preliminary tasks:

- Remove luggage compartment wheel arch trim on left, see **51 47 151 REMOVING AND INSTALLING / REPLACING LEFT LUGGAGE COMPARTMENT WHEEL ARCH TRIM** .

Unfasten plug connection (1) and disconnect.

Release screws (2).

Remove amplifier (3) with holder in direction of arrow.

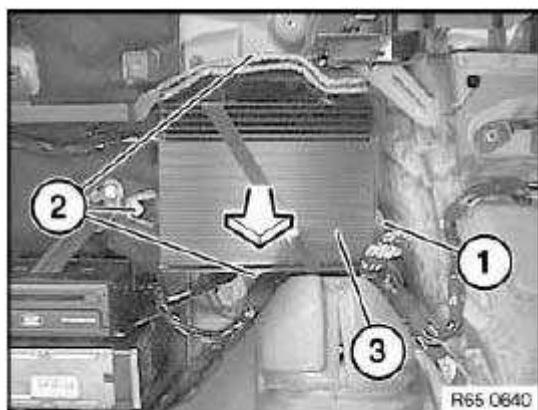


Fig. 13: Screws And Amplifier
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

Fold back retaining bracket (2) in direction of arrow and remove.

Remove amplifier (3) from holder (4).

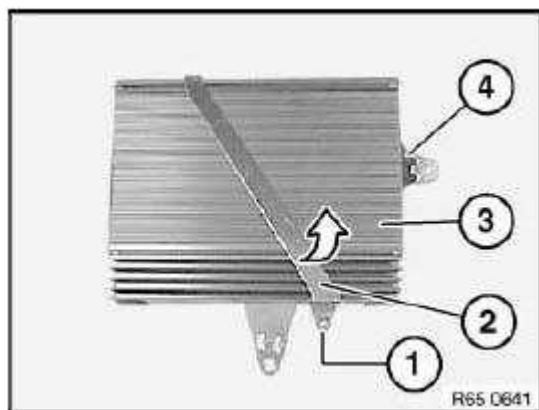


Fig. 14: Retaining Bracket And Amplifier
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

Carry out programming/coding using appropriate BMW service tool.

13 SPEAKER AND COVER

65 13 050 REMOVING AND INSTALLING/REPLACING SPEAKER (TWEETER IN FRONT DOOR)

Necessary preliminary tasks:

- Remove front door trim panel, see **51 41 000 REMOVING AND INSTALLING LEFT OR RIGHT FRONT DOOR TRIM PANEL** .

Unlock catches (1) in direction of arrow and remove tweeter (2) from front door trim panel (3).

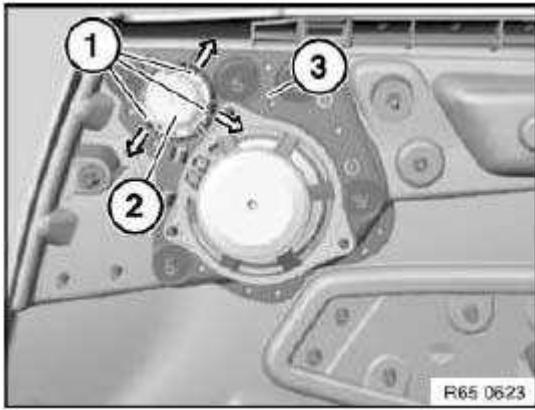


Fig. 15: Catches And Front Door Trim Panel
 Courtesy of BMW OF NORTH AMERICA, INC.

65 13 070 REMOVING AND INSTALLING/REPLACING SPEAKER (MID-RANGE SPEAKER IN FRONT DOOR)

Necessary preliminary tasks:

- Remove front door trim panel, see **51 41 000 REMOVING AND INSTALLING LEFT OR RIGHT FRONT DOOR TRIM PANEL** .

NOTE: **Secure mid-range speaker against falling out.**

Release nuts (1) and remove mid-range speaker (2) in direction of arrow from door trim panel (3).

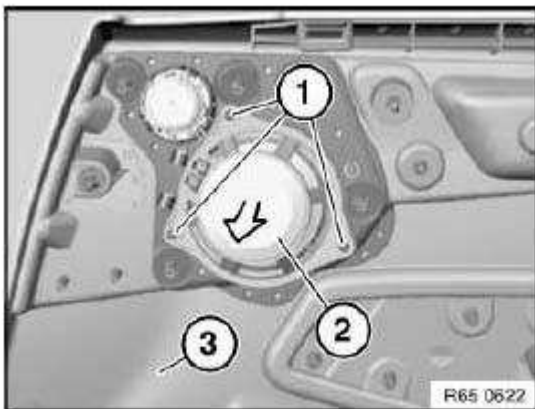


Fig. 16: Nuts And Mid-Range Speaker
 Courtesy of BMW OF NORTH AMERICA, INC.

65 13 080 REMOVING AND INSTALLING/REPLACING SPEAKER (TWEETER IN REAR DOOR)

Necessary preliminary tasks:

- Remove rear door trim, see **51 42 000 REMOVING AND INSTALLING LEFT OR RIGHT REAR DOOR TRIM PANEL** .

Unlock catches (1) in direction of arrow and remove tweeter (2) from rear door trim panel (3).

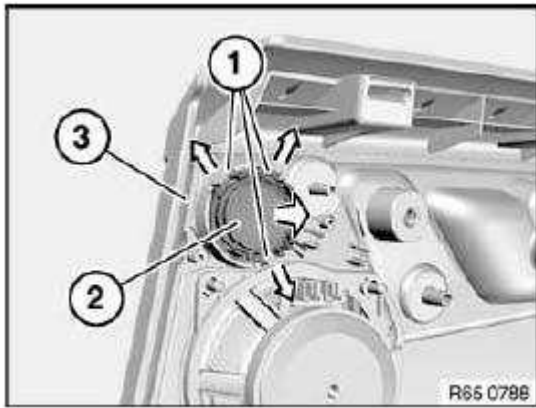


Fig. 17: Catches And Rear Door Trim Panel
 Courtesy of BMW OF NORTH AMERICA, INC.

65 13 090 REMOVING AND INSTALLING/REPLACING SPEAKER (MID-RANGE SPEAKER IN REAR DOOR)

Necessary preliminary tasks:

- Remove rear door trim, see **51 42 000 REMOVING AND INSTALLING LEFT OR RIGHT REAR DOOR TRIM PANEL** .

NOTE: **Secure mid-range speaker against falling out.**

Release nuts (1) and remove mid-range speaker (2) in direction of arrow from rear door trim panel (3).

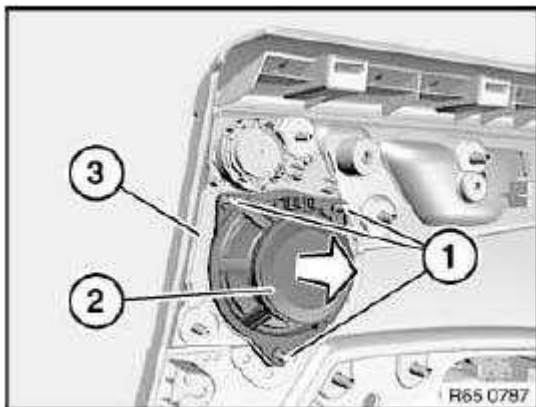


Fig. 18: Nuts And Mid-Range Speaker
 Courtesy of BMW OF NORTH AMERICA, INC.

20 AERIAL/ANTENNA

65 20 035 REMOVING AND INSTALLING/RENEWING ROOF AERIAL

Necessary preliminary tasks:

- Detach **empty housing** for roof-mounted aerial.

Release screw (1) and feed out roof aerial (2) towards top.

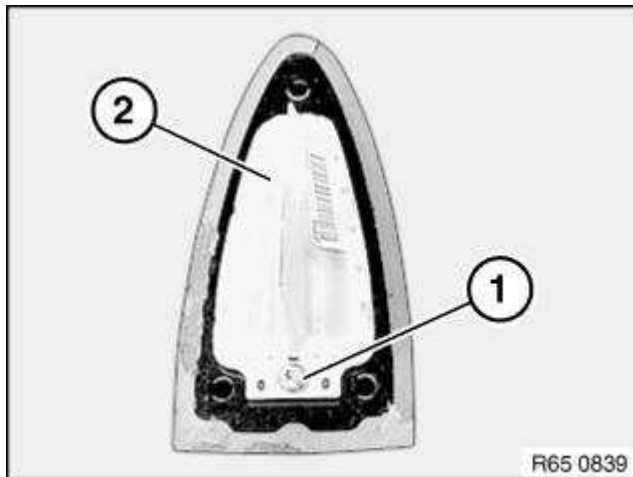


Fig. 19: Release Screw (1) And Feed Out Roof Aerial (2) Towards Top
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connections (1) and remove aerial (2).

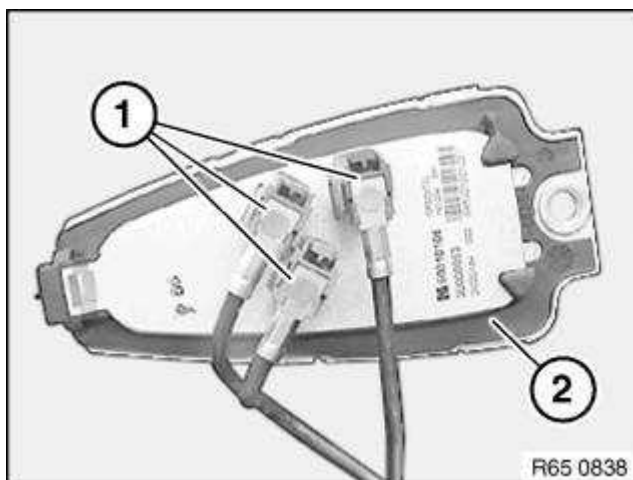


Fig. 20: Disconnect Plug Connections (1) And Remove Aerial (2)
Courtesy of BMW OF NORTH AMERICA, INC.

After installation: Stick on **empty housing** for roof-mounted aerial.

65 20 030 REMOVING AND INSTALLING/REPLACING EMPTY HOUSING FOR ROOF-MOUNTED

Special tools required:

- 65 2 010 (Knife)

WARNING:

- Risk of injury!
- Special tool has sharp edges!
- Adapt working height to vehicle height with non-tilting and non-slip platform.
- Handle special tool correctly and make sure it is positioned without tilting or slipping on the vehicle.
- Special tool 65 2 010 is only permitted in conjunction with a suitable stepladder.
- Risk of damage!
- In order to prevent dents in the roof, do not exert any pressure on the roof.

IMPORTANT: In order to guarantee a permanent connection and adhesive curing: After bonding the empty housing for the roof-mounted aerial, wait 24 hours before driving the vehicle through a car wash.

NOTE: Clean roof. Mask roof (2) around empty housing for roof-mounted aerial (3) with yellow plastic adhesive tape (1). To do so, slide plastic adhesive tape under empty housing (3) slightly.

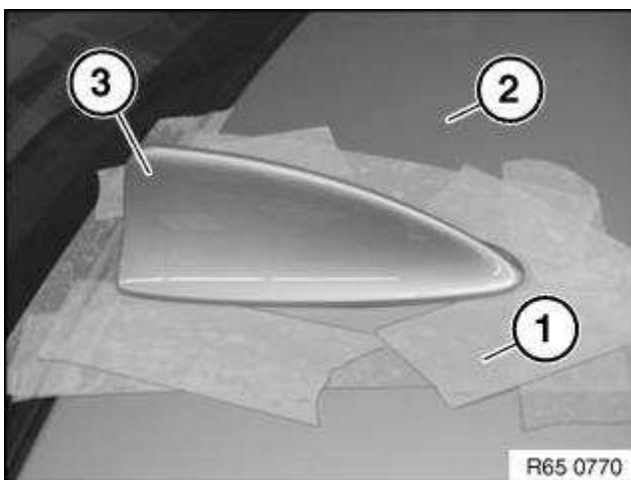


Fig. 21: Mask Roof (2) Around Empty Housing
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage! Make sure your arms do not cross over (1) when holding

special tool 65 2 010. Pull handle must always be ahead of the guiding hand (2).

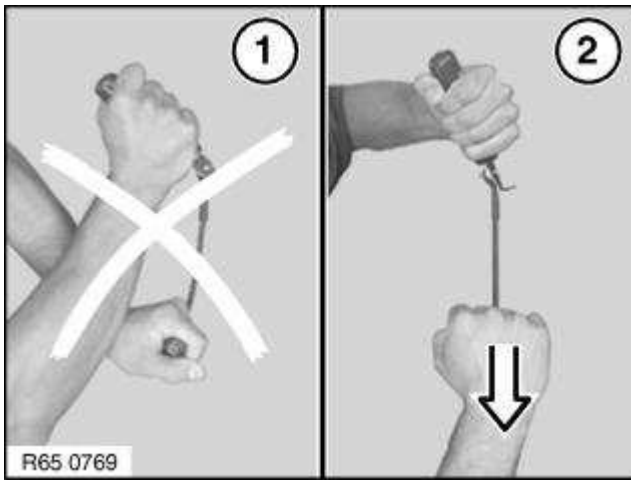


Fig. 22: Pull Handle Must Always Be Ahead Of The Guiding Hand (2)
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage! To avoid damaging the paintwork on the roof and empty housing (3), do not fit special tool 65 2 010 skew.

Cut through adhesive bead all round with special tool 65 2 010. Pull on handle (1) and align blade on handle (2).

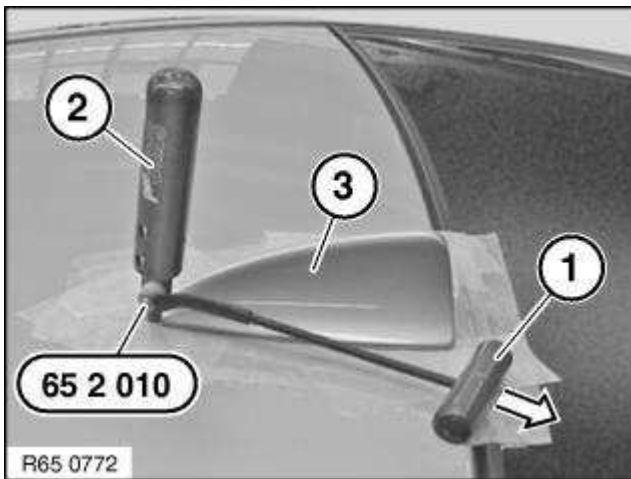


Fig. 23: Pull On Handle (1) And Align Blade On Handle (2)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Use sharp blades only. Replace blade if necessary.

Remove empty housing (3).

Installation: Empty housing for roof-mounted aerial is secured with window glass adhesive. All preparatory operations correspond to the Window cementing instructions.

NOTE: Replace empty housing for roof-mounted aerial if centering pins (1) on empty housing are damaged.

Bonding surface (2) must be clean and free from grease.

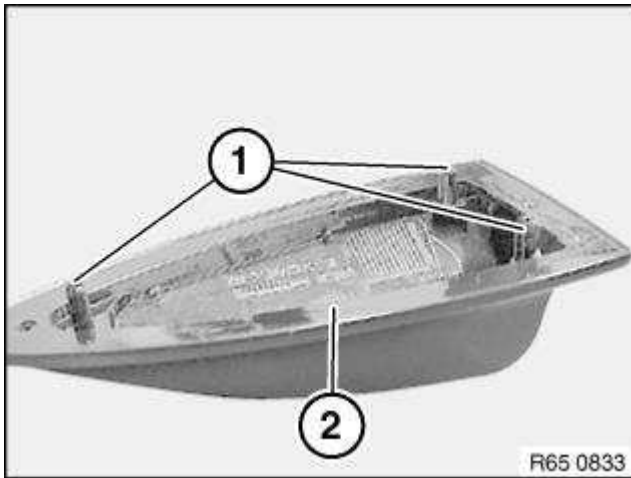


Fig. 24: Bonding Surface (2) Must Be Clean And Free From Grease
Courtesy of BMW OF NORTH AMERICA, INC.

Position two spacers (1) on cleaned empty housing.

Dimensions:

- A. 10 mm
- B. 14 mm

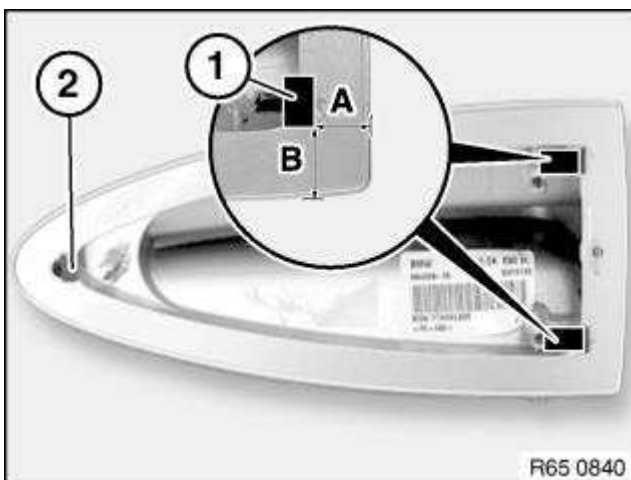


Fig. 25: Position Two Spacers (1) On Cleaned Empty Housing
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Use spacers without fail!

Apply trace of adhesive bead all around outer contour as follows. Distance between adhesive bead and edge of aerial cover: $A = 6.5 \text{ mm} \pm 1 \text{ mm}$

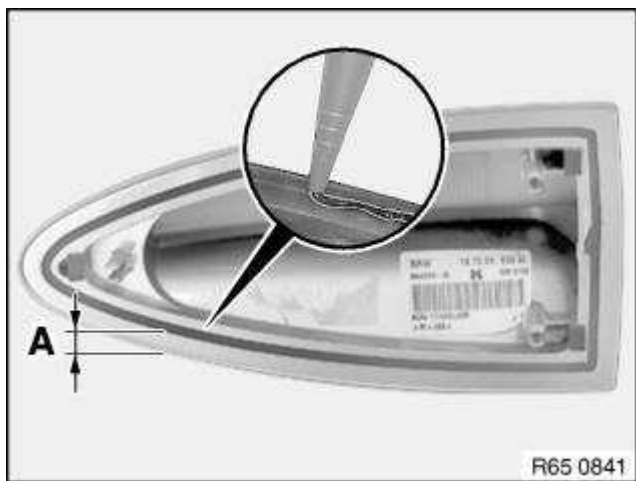


Fig. 26: Apply Trace Of Adhesive Bead All Around Outer Contour
Courtesy of BMW OF NORTH AMERICA, INC.

Start and end of bead trace must have an overlap length of max. 10 mm.

IMPORTANT: To prevent the adhesive from escaping, the adhesive bead diameter must not exceed max. 1.5 mm to 2.5 mm.

NOTE: Attach the empty housing coated with adhesive by hand. To spread the adhesive better, move the housing back and forth horizontally slightly when pressing down. Secure empty housing if necessary with adhesive tape and press down uniformly. After bonding, leave vehicle to stand for at least 3 hours at room temperature.

65 20 090 REMOVING AND INSTALLING OR REPLACING ANTENNA AMPLIFIER

Necessary preliminary tasks:

- Remove trim for rear window frame at top, see **51 49 015 REMOVING AND INSTALLING/REPLACING TRIM FOR REAR WINDOW FRAME AT TOP** .

Unlock plug connections (1) and disconnect.

Unscrew bolt (2).

Remove antenna amplifier (3) in direction of arrow from rear lid (4).

LEFT OR RIGHT INTERIOR LIGHT (SIDE ROOFLINER) .

- Detach mocket in area of roofliner

IMPORTANT: Do not under any circumstance kink roofliner (1).

Unclip roofliner (1) at retaining point (2) towards bottom and lower.

Unlock plug connections (3) and disconnect.

Release screw (4) and remove suppression filter (5).

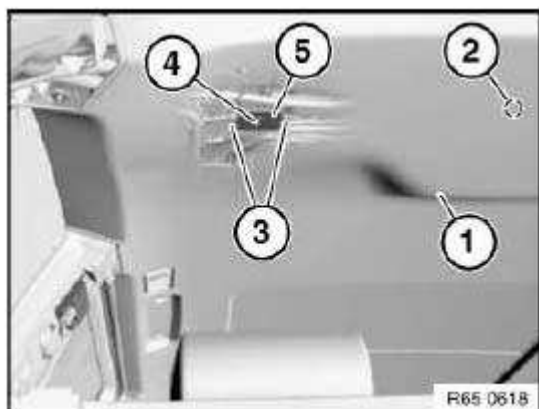


Fig. 29: Roofliner And Suppression Filter

Courtesy of BMW OF NORTH AMERICA, INC.

65 20 380 REMOVING AND INSTALLING/REPLACING RADIO REMOTE CONTROL RECEIVER

NOTE: This operation is described in:
"Removing antenna amplifier." See **65 20 090 Removing and installing or replacing antenna amplifier.**

24 REAR WINDOW AERIAL/ANTENNA

65 24 020 REMOVING AND INSTALLING OR REPLACING BLOCKING CIRCUIT

Necessary preliminary tasks:

- Remove panel for rear lid, see **51 49 008 REMOVING AND INSTALLING/REPLACING PANEL FOR REAR LID .**

Unlock plug connections (1) and disconnect.

Unscrew bolt (2).

Remove blocking circuit (3) in direction of arrow.

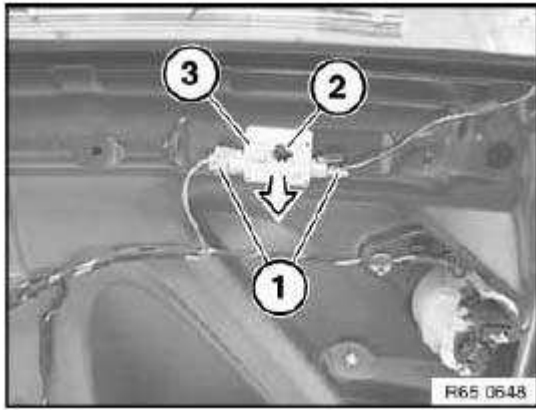


Fig. 30: Bolt And Blocking Circuit
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Fit blocking circuit (1) so that screw (2) engages thread (3) and locating pin (4) engages bore (5).

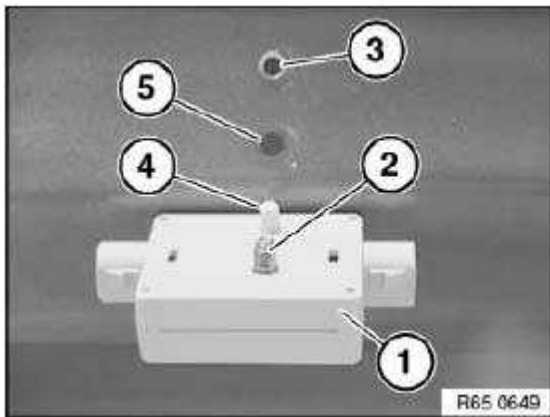


Fig. 31: Blocking Circuit And Locating Pin
 Courtesy of BMW OF NORTH AMERICA, INC.

65 24 030 REMOVING AND INSTALLING/REPLACING TV AMPLIFIER (LEFT OR RIGHT)

Necessary preliminary tasks:

- Remove inner window cavity cover strip for rear side window, see **51 37 261 REMOVING AND INSTALLING/REPLACING WINDOW CAVITY COVER STRIP FOR DOOR WINDOW, REAR LEFT OR RIGHT** .

Unlock plug connections (1) and disconnect.

Release screw (2) and remove TV amplifier (3) in direction of arrow.

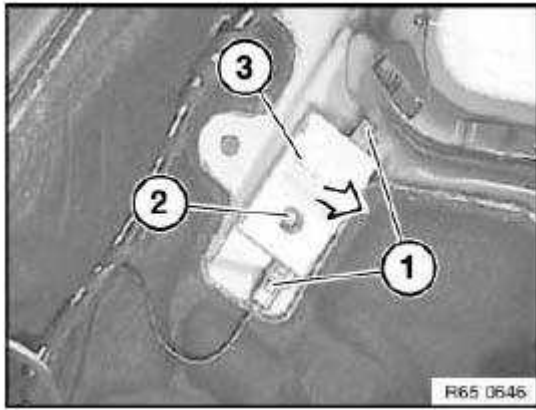


Fig. 32: Screw And TV Amplifier
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Fit TV amplifier (1) so that screw (2) engages thread (3) and locating pin (4) engages bore (5).

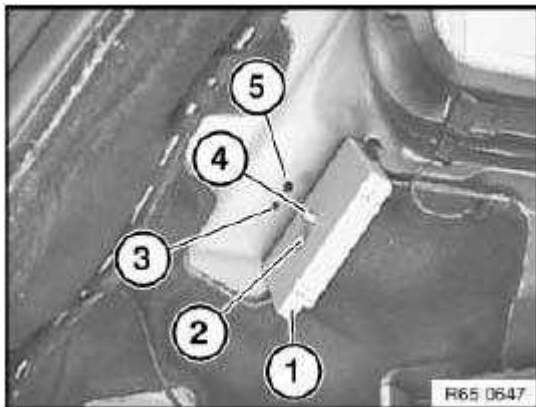


Fig. 33: TV Amplifier
 Courtesy of BMW OF NORTH AMERICA, INC.

50 VIDEO AND TV EQUIPMENT

65 50 011 REMOVING AND INSTALLING (REPLACING) VIDEO MODULE FOR ON-BOARD MONITOR

IMPORTANT: Read and comply with 61 35 ... NOTES ON ESD PROTECTION (ELECTRO STATIC DISCHARGE) .

Necessary preliminary tasks:

- Disconnect battery negative lead, see **THE BATTERY** .
- Remove flap in luggage compartment panel on left, see **51 47 172 REMOVING AND**

INSTALLING/REPLACING FLAP IN LUGGAGE COMPARTMENT TRIM, LEFT OR RIGHT .

Unlock plug connections (1) and disconnect.

Installation:

Do not mix up antenna connectors (2).

Mark antenna plugs (2) and disconnect.

Release screws (3).

Release nut on stud (4).

Guide video module for on-board monitor (5) with holder over stud (4) and feed out in direction of arrow.

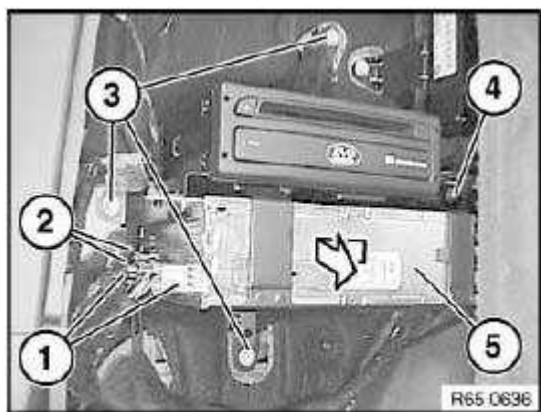


Fig. 34: Antenna Connectors

Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

Unclip wiring harness (2) at point (3) and pull video module for on-board monitor (4) with holder (5) out of side recess slightly.

Feed video module for on-board monitor (4) in direction of arrow out of holder (5) and remove.

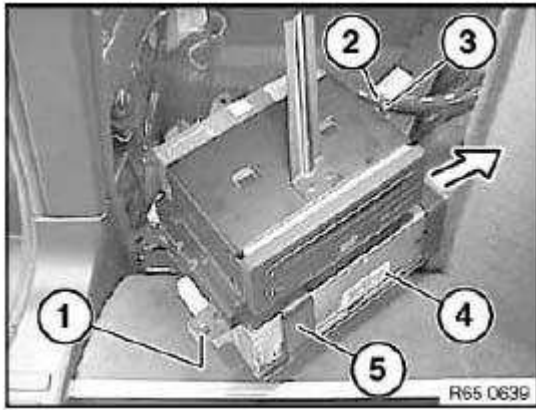


Fig. 35: Wiring Harness And On-Board Monitor With Holder
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

Carry out programming/coding using appropriate BMW service tool.

65 50 055 REMOVING AND INSTALLING/REPLACING CENTRAL INFORMATION DISPLAY

Necessary preliminary tasks:

- Remove operator unit for heater/air conditioner, see **64 11 377 REMOVING AND INSTALLING CONTROL PANEL FOR HEATER - A/C SYSTEM (REPLACING, AUTOMATIC AIR CONDITIONING)** .

Fold monitor (1) open.

Loosen screws (2).

Unlock plug connection for central information display (3) and disconnect.

Raise central information display (4) on passenger side.

Feed out associated wiring harness and remove central information display (4).

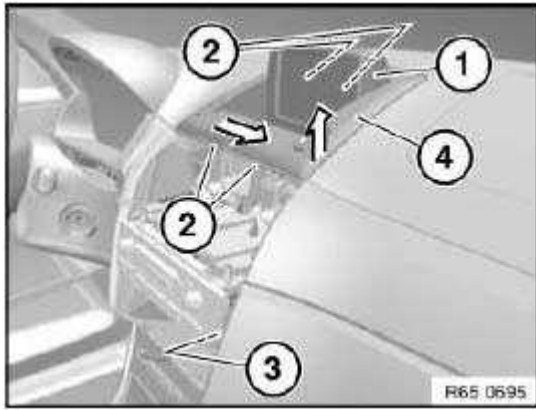


Fig. 36: Central Information Display
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Make sure wiring harness of central information display (4) is correctly routed.

75 ANTI-THEFT ALARM SYSTEM

65 75 055 REMOVING AND INSTALLING/REPLACING EMERGENCY POWER SIREN WITH TILT SENSOR

Necessary preliminary tasks:

- Remove heater bulkhead, see **51 71 080 REMOVING AND INSTALLING/REPLACING HEATER BULKHEAD**.

Unfasten plug connection (1) and disconnect.

Release screw (2) and remove emergency power siren (3) with emergency power siren holder in direction of arrow.

Installation:

Make sure emergency power siren holder is in correct installation position.

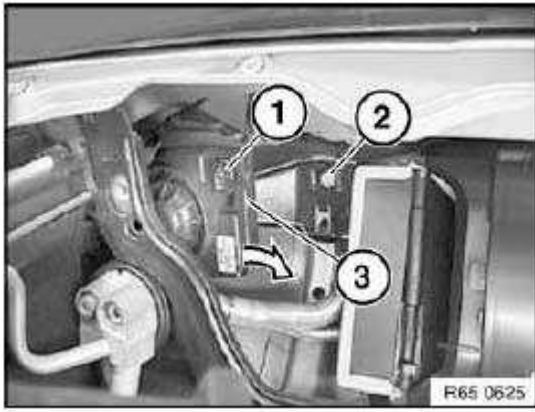


Fig. 37: Emergency Power Siren
 Courtesy of BMW OF NORTH AMERICA, INC.

Release nut (1) and remove emergency power siren (2) from holder (3).

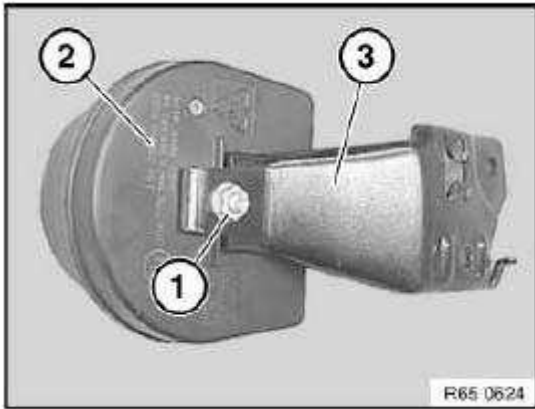


Fig. 38: Nut And Emergency Power Siren
 Courtesy of BMW OF NORTH AMERICA, INC.

65 75 071 REMOVING AND INSTALLING (REPLACING) MODULE FOR PASSENGER COMPARTMENT SENSOR

Necessary preliminary tasks:

- Remove front roofliner trim, see **51 44 ... REMOVING AND INSTALLING FRONT ROOFLINER TRIM**.

Open detent lugs (1) in direction of arrow and remove module for passenger compartment sensor (2) from front roofliner trim (3).

Installation:

Arrow (4) on module for passenger compartment sensor (2) points in direction of travel.

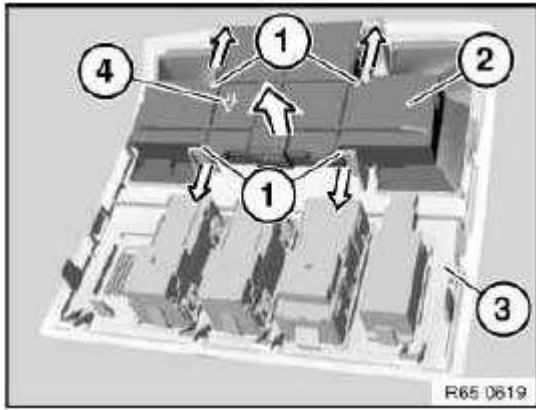


Fig. 39: Detent Lugs And Passenger Compartment Sensor
 Courtesy of BMW OF NORTH AMERICA, INC.

65 75 551 REMOVING AND INSTALLING/REPLACING TILT SENSOR

Necessary preliminary tasks:

- Remove luggage compartment floor trim panel, see **51 47 102 REMOVING AND INSTALLING/REPLACING LUGGAGE COMPARTMENT FLOOR TRIM PANEL** .

Remove clips (1) and fold up front luggage compartment floor trim panel (2) slightly.

Installation:

Make sure front luggage compartment floor trim panel (2) is correctly seated.

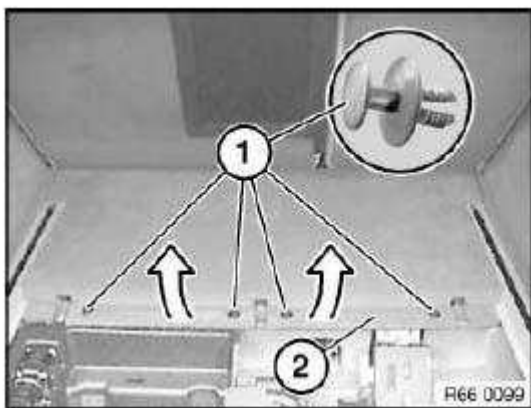


Fig. 40: Front Luggage Compartment Floor Trim Panel
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Front luggage compartment floor trim panel shown removed for purposes of clarity.

Unfasten plug connection (1) and disconnect.

Unscrew nuts (2).

Remove tilt sensor (3) in direction of arrow.

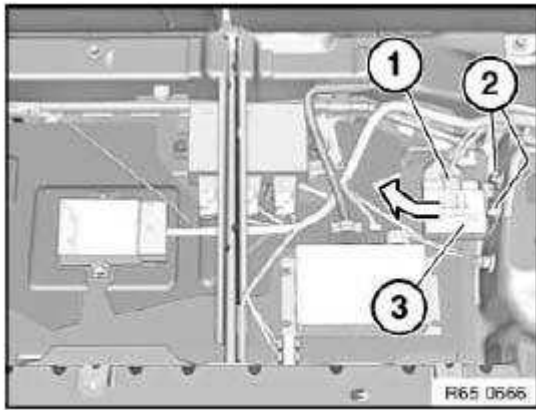


Fig. 41: Nuts And Tilt Sensor

Courtesy of BMW OF NORTH AMERICA, INC.

77 AIRBAG TRIGGER DEVICE

65 77 ... NOTES ON SCRAPPING BMW VEHICLES WITH GAS GENERATORS (CENTRAL AIRBAG CONTROL UNIT, AIRBAG SYSTEM)

The gas generator is a pyrotechnic component of:

- Airbag module
 - Driver's/passenger airbag
 - Side airbags
 - Head airbag
 - Knee airbag
- Belt pretensioner
- Belt buckle tensioner
- Safety battery terminal

X3: E83

Gas generators that have not fired constitute a hazard (also to the environment)!

In accordance with accident prevention regulations and specific national regulations, gas generators must be rendered unusable before they are scrapped. This is necessary because pyrotechnical objects can cause injury if improperly activated (e.g. scrapping with flame cutters).

With above-mentioned vehicles which are scheduled for scrapping, it is always essential prior to draining and further stripping work to ensure that all the gas generators **in the vehicle** are fired. The fired gas generators can then be scrapped together with the vehicle.

Triggering failure

If correct triggering is not possible, the relevant components must (while observing the safety regulations for handling airbag system components) be removed and disposed of by special disposal companies!

If a triggering operation has failed:

- Disconnect the triggering device from the battery and
- only approach the vehicle after a few minutes have elapsed

The components of an airbag system must always be disposed of. Such components must not be sold on as used parts.

Triggering

Triggering of the gas generators may only be carried out by expert personnel and under the supervision of a responsible person. Other standard accident prevention regulations (safety goggles, ear defenders etc.) must also be observed.

The gas generators must be fired from the outside in the vehicle scheduled for scrapping with the doors closed but with the tailgate, door windows and sunroof open. To fire the gas generators, use the BMW-developed triggering device with the corresponding cables.

**WARNING: Once gas generators have been fired, observe a ventilation period of 10 minutes with the doors opened.
Only then is it permitted to continue work inside the vehicle.
Wear protective goggles and protective gloves when handling a fired gas generator!
The burning of solid fuel will heat up airbag unit - danger of burning hands!
Wash skin with water after contact with fired gas generators!**

1. **Vehicles with central airbag control unit (all airbags, seat belt pretensioners, safety battery terminal)**
 - 1.1 Expose airbag control unit, see 65 77 016 Removing and installing/replacing airbag control unit.
 - 1.2 Connect "Airbagmaster".

65 77 016 REMOVING AND INSTALLING/REPLACING AIRBAG CONTROL UNIT

IMPORTANT: Read and comply with 61 35 ... NOTES ON ESD PROTECTION (ELECTRO STATIC DISCHARGE).

WARNING: Note airbag safety instructions! See AIR BAG DEACTIVATION PROCEDURES .

Incorrect handling can activate airbag and cause injury.

Necessary preliminary tasks:

- Remove luggage compartment floor trim, see **51 47 102 REMOVING AND INSTALLING/REPLACING LUGGAGE COMPARTMENT FLOOR TRIM PANEL** .
- Disconnect battery negative lead, see **THE BATTERY** .
- Remove center console, see **51 16 200 REMOVING AND INSTALLING STORAGE COMPARTMENT** .

Unfasten plug connection (1) and disconnect.

Unscrew nuts (2).

Installation:

Before screwing down airbag control unit, make sure negative lead (3) is resting on associated stud bolt.

Tightening torque: 65 77 1AZ, see **65 77 AIRBAG TRIGGERING CONTROL** .

Remove airbag control unit (4) in direction of arrow.

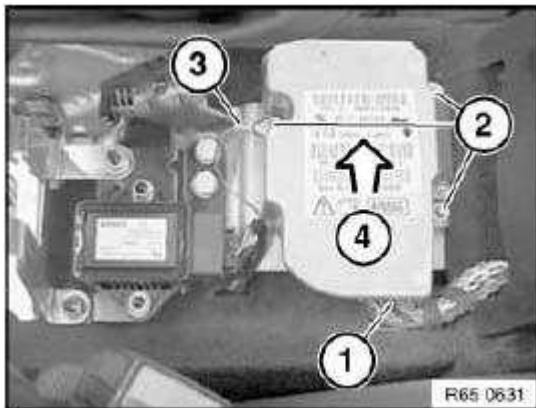


Fig. 42: Airbag Control Unit

Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

Carry out programming/coding using appropriate BMW service tool.

65 77 532 REMOVING AND INSTALLING/REPLACING FRONT LEFT SENSOR

Necessary preliminary tasks:

- **M54 only:**

Remove intake filter housing.

Unfasten plug connection (1) and disconnect.

Tightening torque: 65 77 3AZ, see **65 77 AIRBAG TRIGGERING CONTROL** .

Remove front sensor (3).

Installation:

Position negative lead (4) before screwing sensor on.

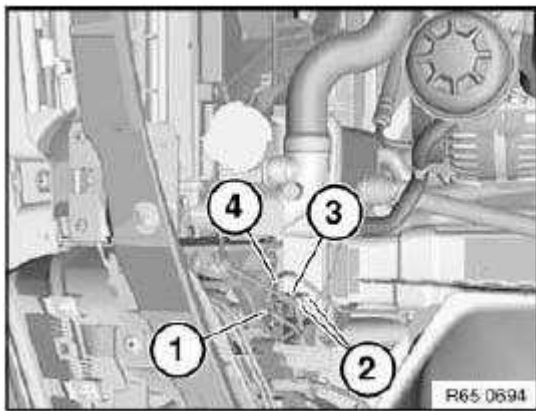


Fig. 43: Front Sensor And Negative Lead
Courtesy of BMW OF NORTH AMERICA, INC.

65 77 534 REMOVING AND INSTALLING/REPLACING FRONT RIGHT SENSOR

Necessary preliminary tasks:

- **M57 only:**

Remove fluid reservoir for windscreen washer system and place to one side, see **61 71 061 REPLACING FLUID RESERVOIR FOR WINDSHIELD WASHER SYSTEM** .

NOTE: Subsequent work is described in:
"Removing front left sensor". See **65 77 532 Removing and installing/replacing front left sensor**.

65 77 560 REMOVING AND INSTALLING/REPLACING CONTROL ELECTRONICS FOR PASSENGER SEAT OCCUPANCY DETECTOR

Necessary preliminary tasks:

- Move seat into most upward position
- Unlock and remove first aid kit under passenger seat

NOTE: Seat removed for purposes of clarity.

Turn control electronics for passenger seat occupancy detector (2) approx. 45° in direction of arrow and unclip from seat frame.

Disconnect plug connections (1) and remove control electronics for passenger seat occupancy detector (3).

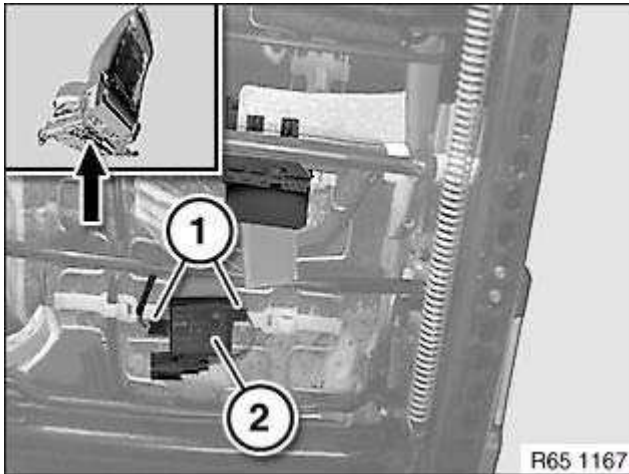


Fig. 44: Disconnecting Plug Connections
 Courtesy of BMW OF NORTH AMERICA, INC.

65 77 600 REPLACING SENSOR MAT FOR PASSENGER SEAT OCCUPANCY DETECTOR

WARNING: US/CND front passenger seat (with OC3 mat) only:
Seat cover must not be separated from padding.
All parts must be replaced completely and released with the diagnosis system in event of defective fan, seat cover, seat heating, OC3 mat or padding.

This operation is described in:

"Replacing seat cover for left or right front seat". See **52 13 400 REPLACING SEAT COVER ON LEFT OR RIGHT FRONT SEAT (NORMAL/MANUAL)** .

65 77 604 REPLACING SENSOR MAT (OC3 MAT) FOR PASSENGER SEAT OCCUPANCY DETECTOR

WARNING: US/CDN front passenger seat (with OC3 mat) only: The OC3 mat can only be removed in conjunction with the padding from the seat cover. If OC3 mat or padding is defective, both parts may only be replaced together. After fitting seat cover, enable OC3 mat with BMW diagnosis system.

The operation for removing the OC3 mat is described in:

52 13 400 REPLACING SEAT COVER ON LEFT OR RIGHT FRONT SEAT (NORMAL/MANUAL)

52 14 400 REPLACING SEAT COVER FOR LEFT OR RIGHT FRONT SEAT (NORMAL/ELECTRIC)

52 15 400 REPLACING SEAT COVER FOR LEFT OR RIGHT FRONT SEAT (SPORT/MANUAL)

52 16 400 REPLACING SEAT COVER FOR LEFT OR RIGHT FRONT SEAT (SPORTS/ELECTRIC)

65 77 720 REMOVING AND INSTALLING (REPLACING) LEFT B-PILLAR SENSOR

IMPORTANT: Read and comply with 61 35 ... NOTES ON ESD PROTECTION (ELECTRO STATIC DISCHARGE) .

**WARNING: Note airbag safety instructions! See AIR BAG DEACTIVATION PROCEDURES .
Incorrect handling can activate airbag and cause injury.**

Necessary preliminary tasks:

- Remove luggage compartment floor trim, see **51 47 102 REMOVING AND INSTALLING/REPLACING LUGGAGE COMPARTMENT FLOOR TRIM PANEL** .
- Disconnect battery negative lead, see **THE BATTERY** .
- Remove trim panel for door pillar (bottom), see **51 43 150 REMOVING AND INSTALLING OR REPLACING TRIM FOR LEFT OR RIGHT DOOR PILLAR (BOTTOM)** .

Release screw (1).

Loosen screw (2).

Installation:

Tightening torque: 65 77 5AZ, see **65 77 AIRBAG TRIGGERING CONTROL** .

Raise B-pillar sensor (3) slightly through opening in B-pillar and feed out towards rear.

Unfasten plug connection (4) and disconnect.

Remove B-pillar sensor (3) from B-pillar.

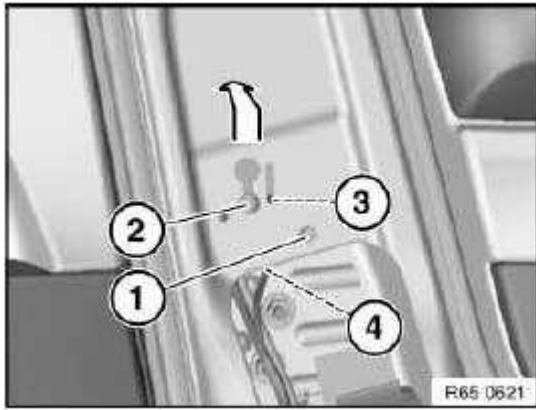


Fig. 45: B-Pillar Sensor And Plug Connection
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Establish correct positioning of B-pillar sensor (1) by means of guide pin (2) and screw (3).

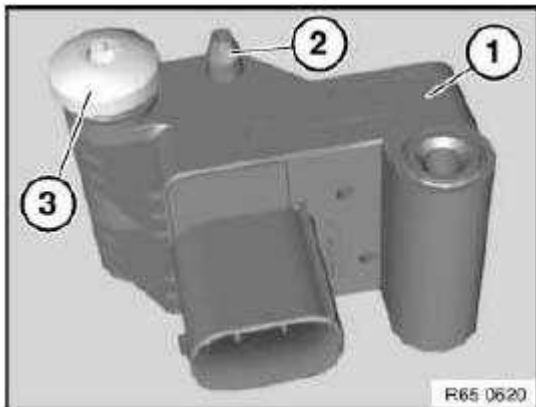


Fig. 46: B-Pillar Sensor And Guide Pin
 Courtesy of BMW OF NORTH AMERICA, INC.

65 77 725 REMOVING AND INSTALLING/REPLACING RIGHT B-PILLAR SENSOR

Operation is identical to: **Removing and installing left B-pillar sensor**

65 77 740 REMOVING AND INSTALLING (REPLACING) LEFT FRONT DOOR SENSOR

IMPORTANT: Read and comply with 61 35 ... NOTES ON ESD PROTECTION (ELECTRO STATIC DISCHARGE) .

WARNING: Note airbag safety instructions!

Incorrect handling can activate airbag and cause injury.

Necessary preliminary tasks:

- Disconnect battery negative lead, see **THE BATTERY** .
- Detach sound insulation in work area, see **51 48 060 REMOVING AND INSTALLING/REPLACING SOUND INSULATION IN LEFT OR RIGHT FRONT DOOR** .

Unfasten plug connection (1) and disconnect.

Tightening torque: 65 77 7AZ, see **65 77 AIRBAG TRIGGERING CONTROL** .

Remove front door sensor (3) in direction of arrow.

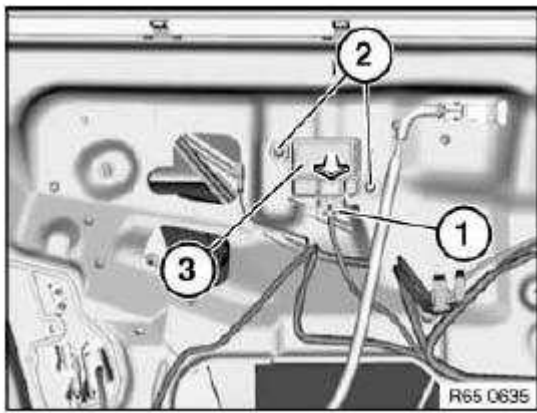


Fig. 47: Front Door Sensor

Courtesy of BMW OF NORTH AMERICA, INC.

81 ON-BOARD COMPUTER

65 81 050 REMOVING AND INSTALLING/REPLACING GONG

Necessary preliminary tasks:

- Remove panel for pedal assembly, see **51 45 185 REMOVING AND INSTALLING/REPLACING TRIM FOR PEDAL ASSEMBLY** .

Disconnect plug connection (1) and unclip catches (2) on both sides.

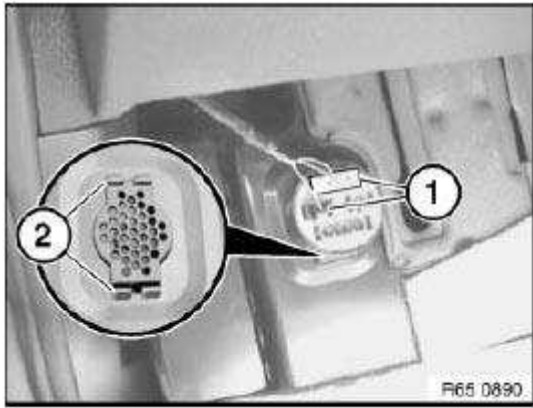


Fig. 48: Plug Connection And Catches
Courtesy of BMW OF NORTH AMERICA, INC.

65 81 060 REMOVING AND INSTALLING/REPLACING EXTERNAL TEMPERATURE SENSOR

Special tools required:

- **64 1 020 RELEASE HOOK**

Expand mount for outside temperature sensor with special tool 64 1 020 and feed out outside temperature sensor (1) in direction of arrow.

Pull out ambient temperature sensor (1).

Disconnect plug connection and remove ambient temperature sensor (1).

Installation:

Make sure ambient temperature sensor (1) engages correctly in its mount.

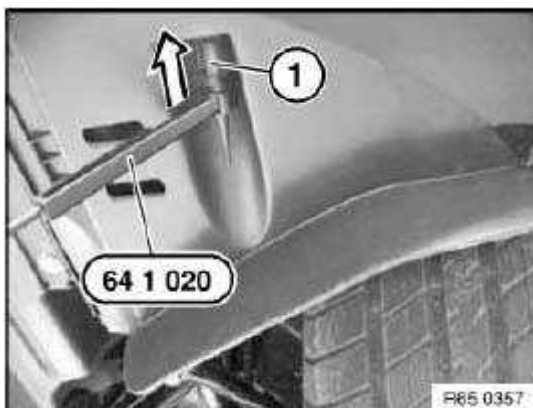


Fig. 49: Special Tool (64 1 020)
Courtesy of BMW OF NORTH AMERICA, INC.

90 NAVIGATION SYSTEMS

65 90 ... NOTES ON HANDLING NAVIGATION COMPUTERS

All model series:

CAUTION: Risk of damage!

The navigation computer must not be disconnected from the power supply while the LED on the computer remains lit (the LED goes out after approx. 1 minute).

NOTE: To ensure full operation of all the communications components, it is necessary in new cars to insert a Road Map CD in the navigation computer. This is absolutely essential as certain functions are disabled for distribution channels. These functions will only be available again after a Road Map CD has been inserted. The mode preset at the factory is automatically reset when this CD is inserted.

Software installation:

The navigation software must be loaded with terminal 15 activated and the navigation system ready for operation.

Make sure there is a stable power supply. If necessary, connect a battery charger to the vehicle.

The charging operation must not be interrupted (terminal 15 remains activated).

When replacing navigation computer:

From E65/66:

- Carry out coding of navigation computer with aid of Diagnosis and Information System via "CIP".

To E65/66:

- Carry out coding of navigation computer with aid of Diagnosis and Information System in path "1 Recoding".

E46 (with radio navigation) only:

When replacing navigation computer:

- Connect Diagnosis and Information System to vehicle.
- Switch on ignition.
- Select Coding/Programming.

- Select path "3 Coding ZCS".
- Select vehicle.
- Select path "4 Retrofitting".
- Select menu item "3 Instrument cluster".
- Select menu item "2 Language".
- Select the desired languages following the user prompting.
- Start coding of the instrument cluster.
- After the prompt from the Diagnosis and Information System "Now follow the instructions on the on-board monitor", insert the operating software CD.
- The following note appears from DIS CD 25 software (and higher):

"With radio navigation insert the operating software CD in the computer and wait until it is ejected. Then follow the instructions on the display. This procedure takes several minutes".

NOTE: The ignition must not be turned off and then on again during this procedure. The software is loaded when the operating software CD is ejected.

- Carry out coding of navigation computer with aid of Diagnosis and Information System in path "1 Recoding".

If the software is updated at a later stage, the last step is omitted if the navigation computer is already configured for a navigation system (radio navigation or navigation system).

65 90 511 REMOVING AND INSTALLING (REPLACING) NAVIGATION COMPUTER WITH CD DRIVE

Special tools required:

- **65 5 400 RELEASE BRACKET**

IMPORTANT: Read and comply with 61 35 ... NOTES ON ESD PROTECTION (ELECTRO STATIC DISCHARGE) .

Necessary preliminary tasks:

- Remove flap in luggage compartment panel on left, see **51 47 172 REMOVING AND INSTALLING/REPLACING FLAP IN LUGGAGE COMPARTMENT TRIM, LEFT OR RIGHT** .

Unlock navigation computer (1) with special tool 65 5 400 and pull out in direction of arrow.

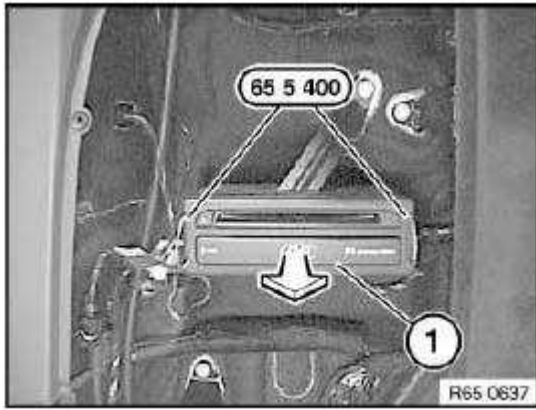


Fig. 50: Navigation Computer With Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect antenna connector (1).

Unlock plug connections (2) and disconnect.

Remove navigation computer (3).

Installation:

Make sure navigation computer (3) is correctly seated.

Wires (4) must not be trapped between navigation computer (3) and insert frame (5).

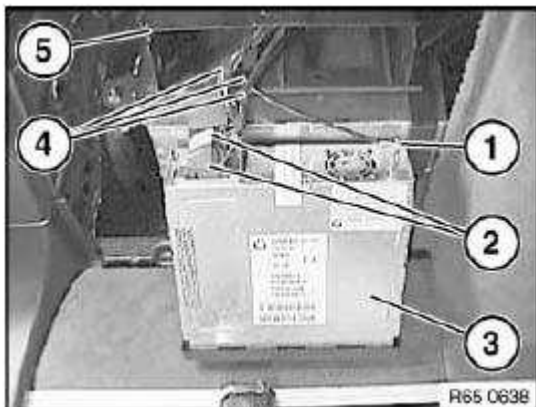


Fig. 51: Antenna Connector And Navigation Computer
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

Carry out programming/coding using appropriate BMW service tool.

65 90 550 REPLACING CD/DVD DRIVE FOR NAVIGATION COMPUTER

Special tools required:

- 00 9 318

IMPORTANT: Read and comply with 61 35 ... NOTES ON ESD PROTECTION (ELECTRO STATIC DISCHARGE) .

Comply with notes and instructions on handling navigation computers, see **65 90 ... Notes on handling navigation computers**.

Replace the destroyed seal on all devices with the new seal supplied.

Necessary preliminary tasks:

- Remove navigation computer, see **65 90 511 Removing and installing (replacing) navigation computer with CD drive**.

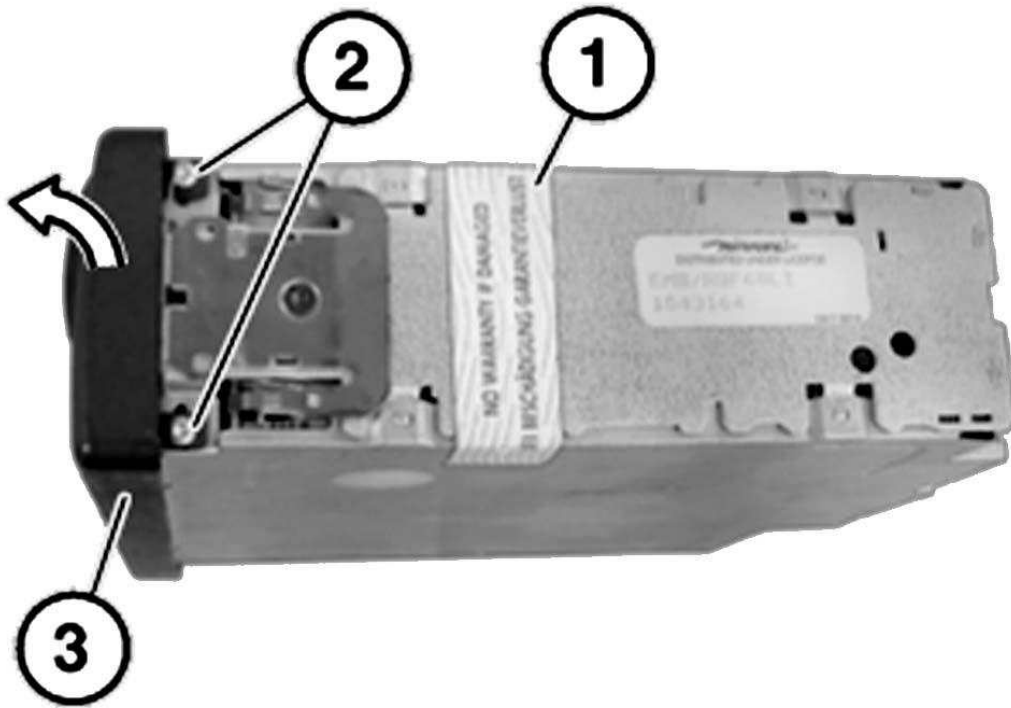
MK II version:

Cut through seal (1).

Release screws (2) on both sides and carefully fold down front panel (3).

Installation:

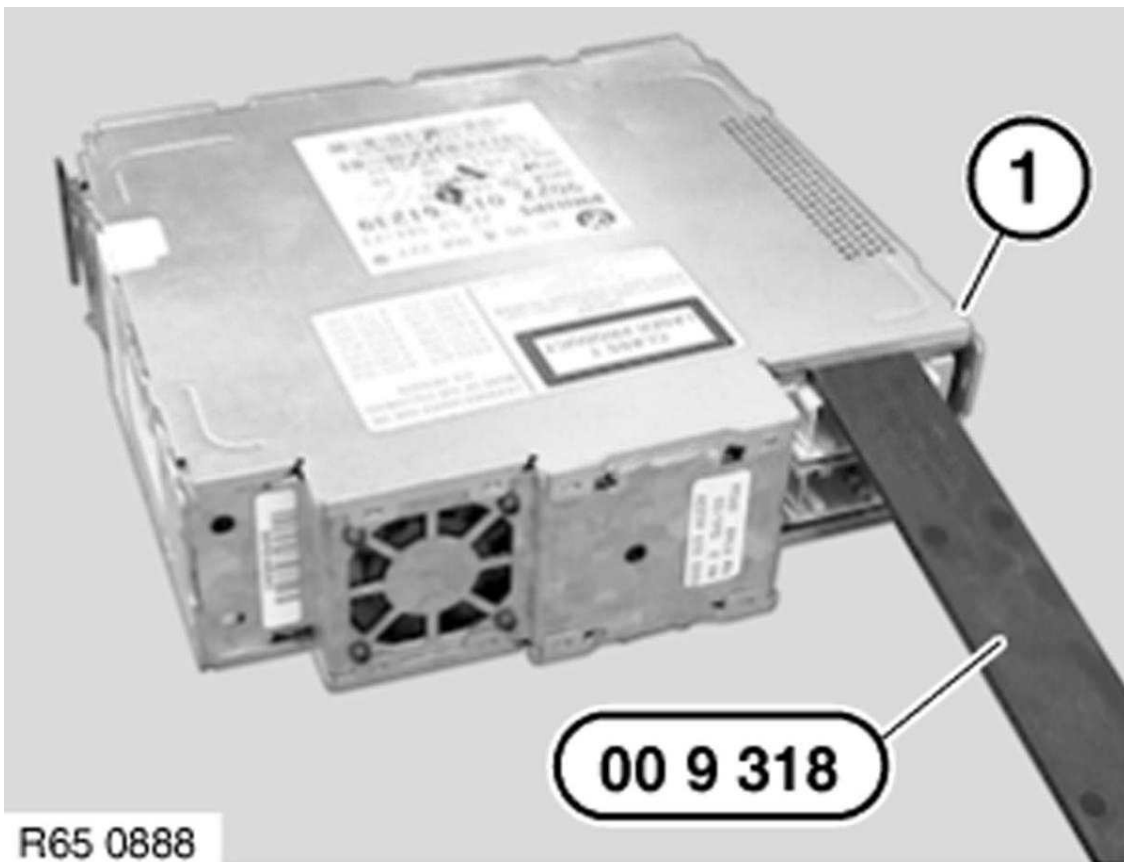
Replace the destroyed seal with the new seal supplied.



G00426793

Fig. 52: Screws On Both Front Panel
Courtesy of BMW OF NORTH AMERICA, INC.

Lever cover (1) with special tool 00 9 318 upwards out of side catches.



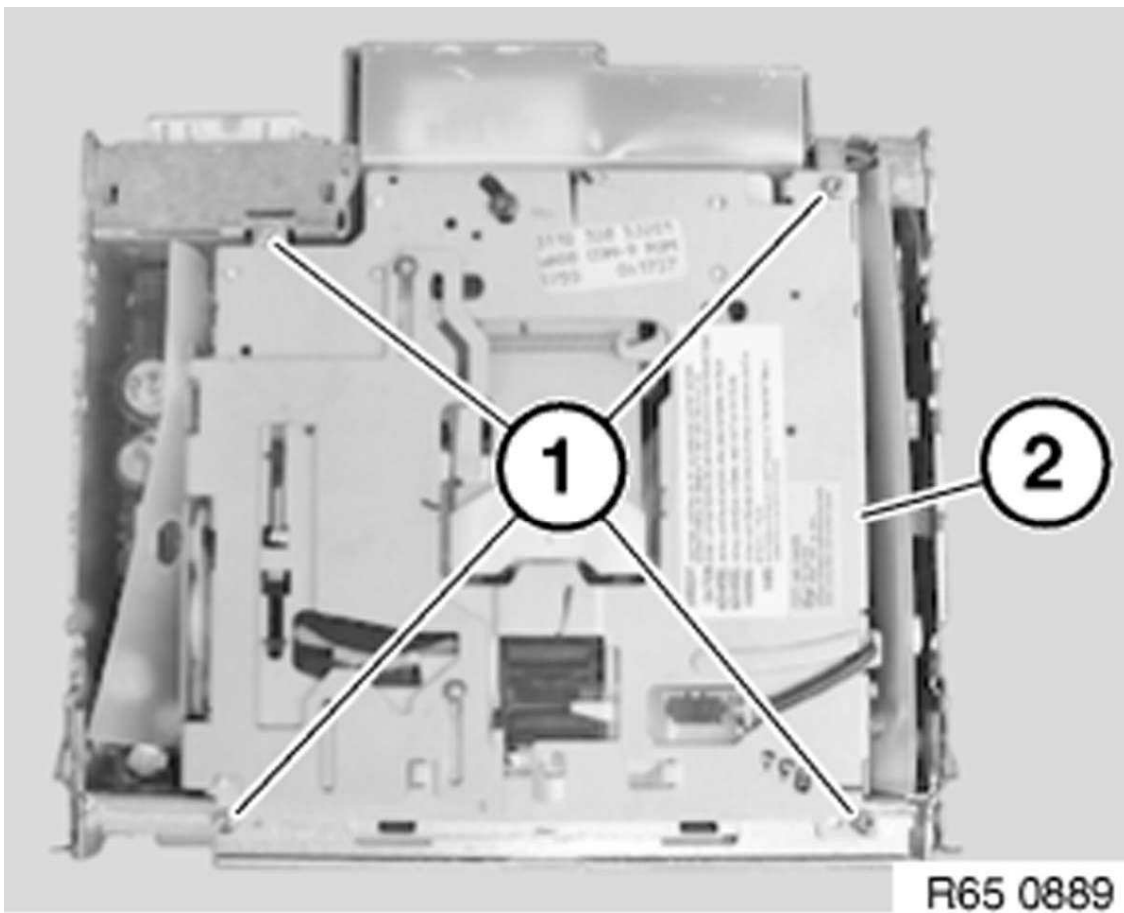
R65 0888

G00426804

Fig. 53: Special Tool (00 9 318)

Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) and carefully lift out CD drive (2).



G00426805

Fig. 54: Screws And CD Drive
Courtesy of BMW OF NORTH AMERICA, INC.

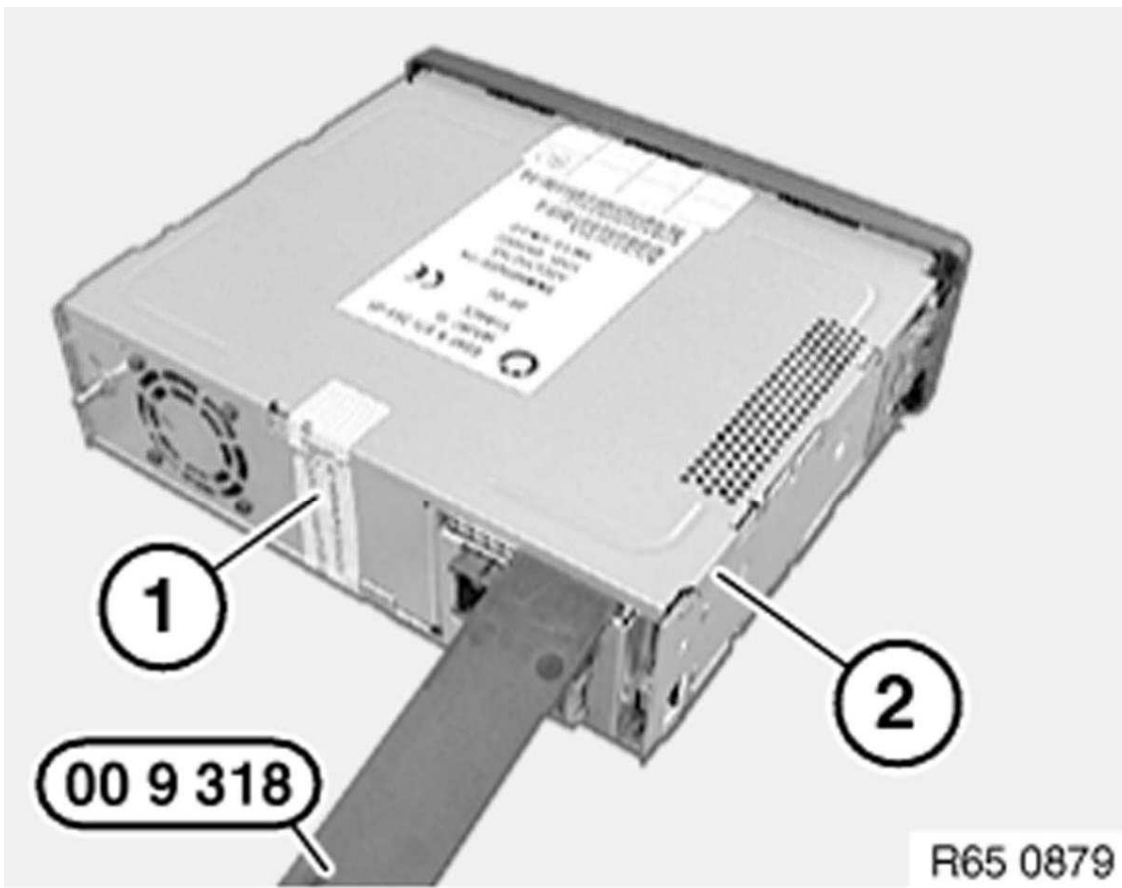
MK III and MK IV versions:

Cut through seal (1).

Carefully lever off cover (2) with special tool 00 9 318.

Installation:

Replace the destroyed seal with the new seal supplied.

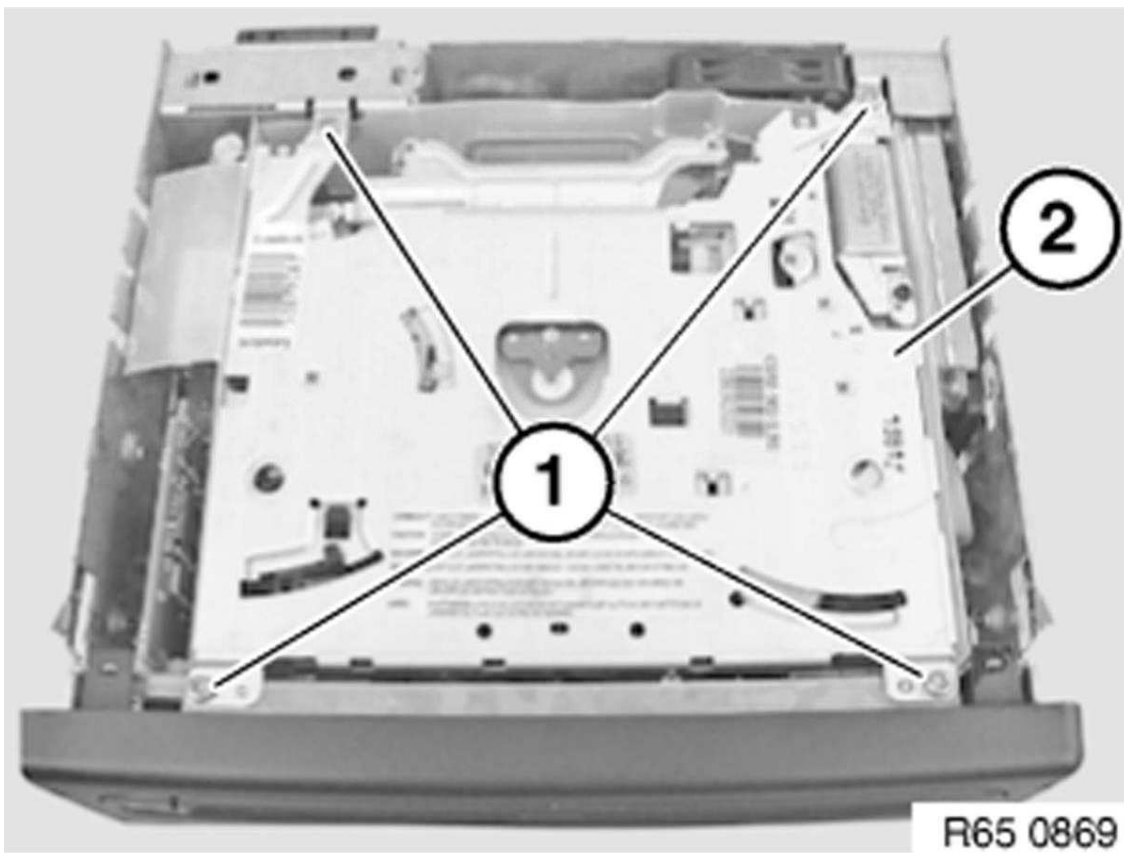


G00426806

Fig. 55: Special Tool (00 9 318)
Courtesy of BMW OF NORTH AMERICA, INC.

MK III version:

Release screws (1) and carefully lift out drive (2).



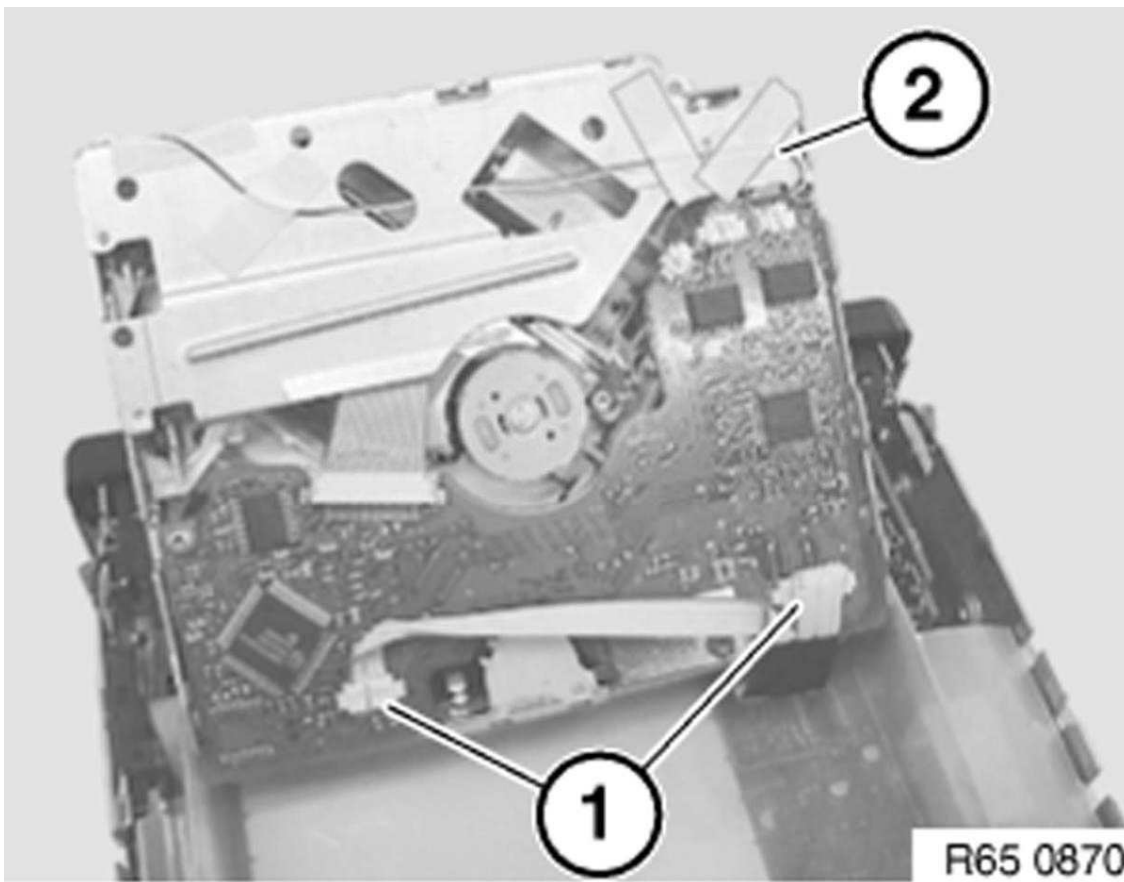
G00426807

Fig. 56: Screws And Drive

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Ribbon cables and connectors must not be damaged!

Disconnect plug connections (1) and remove drive (2).



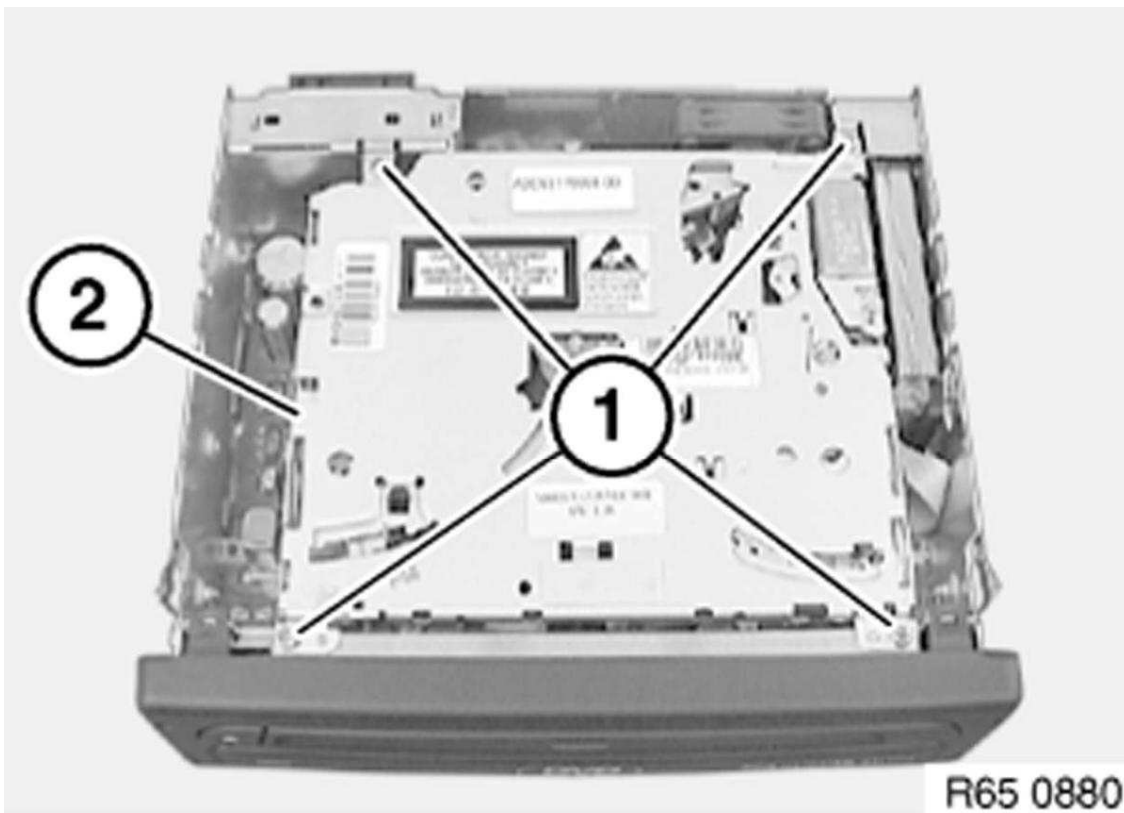
G00426808

Fig. 57: Plug Connections And Drive
Courtesy of BMW OF NORTH AMERICA, INC.

MK IV version:

Release screws (1).

Carefully lift out DVD drive (2).

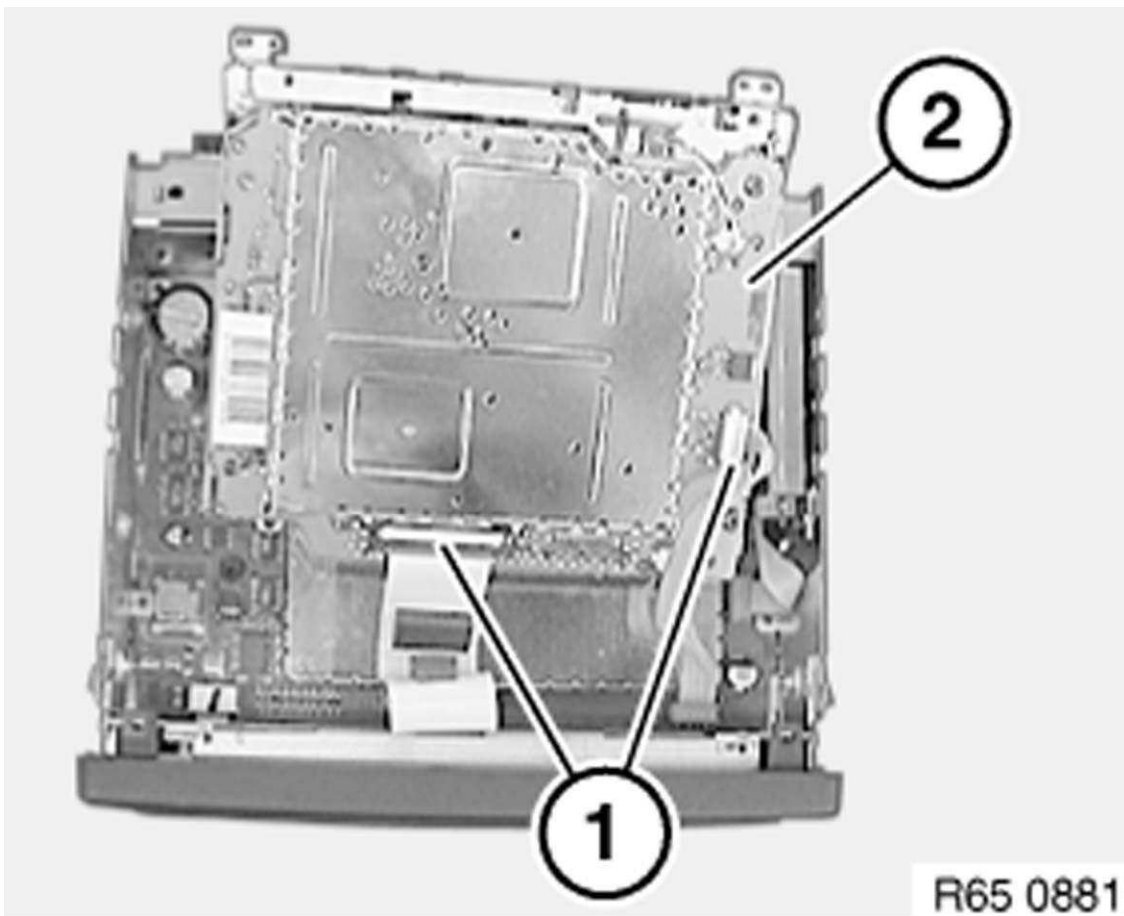


G00426809

Fig. 58: Screws And DVD Drive
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Ribbon cables and connectors must not be damaged!

Disconnect plug connections (1) and remove DVD drive (2).



G00426810

Fig. 59: Plug Connections And DVD Drive
Courtesy of BMW OF NORTH AMERICA, INC.

ACCESSORIES AND EQUIPMENT

Audio, Navigation and Anti-Theft - SI Techniques - X3

MULTIPLE RESTRAINT SYSTEM 4

E83

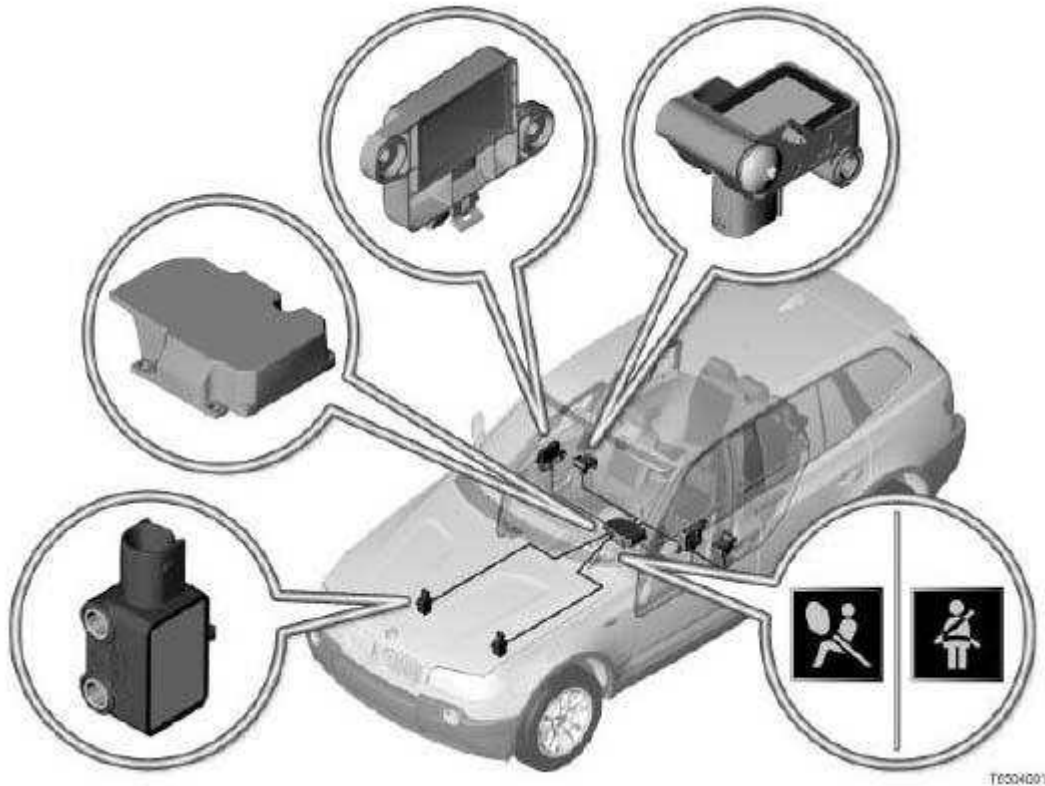


Fig. 1: Multiple Restraint System 4
Courtesy of BMW OF NORTH AMERICA, INC.

INTRODUCTION

Multiple restraint system 4 is a further development of the multiple restraint system (MRS) in the E46.

The MRS performs the following functions:

- Detects an accident situation which could be critical for the occupants
- Activates the necessary restraint systems (selectively, depending on the severity and type of accident)

New features, compared to the previous MRS (E46):

- 2 airbag front sensors
- Front left door satellite and front right door satellite

- Left-hand B-pillar satellite and right-hand B-pillar satellite with lateral and longitudinal acceleration sensors
- The MRS control unit interfaces have been expanded to 75 pins (50 pins in the E46).
- Discontinuation of the MRS acceleration sensors under the front seats

The lateral acceleration sensors are now in the left and right-hand B-pillar satellites.

An advantage compared to the previous multiple restraint system is more precise airbag trigger control

BRIEF DESCRIPTION OF COMPONENTS

The following sensors detect the direction and severity of an impact:

- **Airbag front sensors**

The airbag front sensors are longitudinal acceleration sensors. The front airbag sensors detect a head-on collision.

- **Front left door satellite and front right door satellite**

There is a pressure sensor in each satellite door. The pressure sensors detect a side impact.

- **Left-hand B-pillar satellite and right-hand B-pillar satellite**

The B-pillar satellites each contain a lateral acceleration sensor and a longitudinal acceleration sensor. The sensors are arranged at 90 degrees to each other.

- **Acceleration sensors in the MRS control unit**

There is a lateral acceleration sensor and a longitudinal acceleration sensor in the MRS control unit. The sensors are arranged at 90 degrees to each other.

The following components provide input signals for the multiple restraint system (MRS):

- **Seat-belt-lock switch (driver and passenger seat)**

The seat-belt-lock switch indicates whether the seat belt is engaged or not.

The seat-belt-lock switch is powered by the MRS control unit. The power consumption of the switch forms the signal for the switch position (seat belt engaged or not engaged).

The seat-belt-lock switches on the driver and passenger seats are permanently monitored when terminal R is ON. For example, if a seat belt is released while the vehicle is in motion, there is a seat-belt warning.

A seat-belt warning is started when terminal 15 is ON.

The seat-belt warning indicates to the occupants that they should fasten their seat belts.

The seat-belt warning is an extension of the previous time-dependent display (seat-belt warning lamp in the instrument cluster for approximately 6 seconds after terminal 15 is switched ON).

- **Seat-belt-lock switch (US version)**

When terminal 15 is ON, a seat-belt warning lamp lights up and a warning sounds if the driver and passenger seat belts are not engaged. Once the driver and passenger seat belts are engaged in the corresponding buckles, the seat-belt warning lamp and the audible warning are switched off.

If a seat belt is released while the vehicle is in motion, the seat-belt warning lamp lights up and a warning signal sounds for approximately 90 seconds.

The MRS control unit uses the signal from the seat-belt-lock switch to determine whether an airbag should be triggered at stage 1 (seat belt not engaged) or at stage 2 (seat belt engaged).

- **Passenger seat occupancy detector**

The passenger seat-occupancy detector recognizes whether the seat is occupied or not. When a weight is placed on the seat, resistance in the seat-occupancy mat changes.

If the multiple restraint system (MRS) triggers the driver's airbag, the passenger airbag and belt tensioner will not be triggered if the passenger seat is unoccupied.

- **Passenger seat-occupancy detector (US version)**

Due to legal requirements in the USA, a child seat securing a one-year-old child which is placed on the passenger seat must be automatically detected. Upon detection, the airbags on the passenger side are automatically deactivated (passenger airbag and front right-hand side airbag).

The passenger seat-occupancy detector is based on an evaluation of the surface pressure generated by the person sitting down. The electronic evaluation decides whether a person or a child seat is occupying the seat. If a one-year-old child in a child seat is detected, the airbags on the passenger side are deactivated (warning lamp for passenger-airbag deactivation lights up).

Several control units make up the multiple restraint system (MRS):

- **Multiple restraint system control unit**

All gas generators and sensors in the multiple restraint system (MRS) are connected to the MRS control unit.

The MRS control unit evaluates the data it receives from the sensors. In the event of a head-on or side impact, the control unit determines whether it is necessary to deploy any airbags and which airbags should be deployed.

○ **Digital motor electronics or digital diesel electronics**

When an airbag is triggered, the electric fuel pump is switched off by the DME or DDE (DME = Digital Motor Electronics, DDE = Digital Diesel Electronics).

Signal path: MRS control unit -> K bus -> instrument cluster -> PT-CAN -> DME or DDE -> direct line -> fuel-pump relay> electric fuel pump

○ **Instrument cluster**

The instrument cluster triggers the optical and audible seat-belt warning.

The MRS control unit only sends a message on the status of the seat belts and the seat-occupancy detector.

The instrument cluster receives the status message from the MRS control unit via the body bus when terminal R is ON. Depending on the status, the optical and audible warning is triggered when terminal 15 is ON.

The following components are controlled:

○ **Ignition circuit for the airbags**

With the maximum amount of equipment, the multiple restraint system consists of the following ignition circuits:

- Driver's airbag (stage 1)
- Passenger airbag (stage 1)
- Driver's airbag (stage 2)
- Passenger airbag (stage 2)
- Side airbag in the front left door
- Side airbag in the front right door
- Side airbag in the left rear door (option 261)
- Side airbag in the right rear door (option 261)
- Left-hand head airbag
- Right-hand head airbag
- Belt tensioner, front left
- Belt tensioner, front right
- Safety battery terminal

Driver and passenger airbag

The driver and passenger airbag reduce the risk of injury to the occupants in the event of a head-on collision.

The driver airbag is located in the center pad on the steering wheel. The passenger airbag is integrated into the instrument panel above the glove compartment. The driver and passenger airbags each have a dual-stage gas generator. The airbags are triggered at different levels depending on the severity of the accident.

Side airbags

The side airbags reduce the risk of injury to the occupants in the event of a side collision. The side airbags are located behind the door trim panel. The side airbags are always triggered at stage 1.

Head airbags

The head airbags protect the occupants' head in the event of an impact to the side body panels. They also protect the head from objects that may enter the vehicle.

Belt tensioners

The pyrotechnic belt tensioners pull the front seat belts tight against the occupants' body in the event of a head-on or rear-end collision.

In a normal situation, the seat belt does not sit completely tight against the body. The seat belt always has a small degree of play to guarantee the occupants an adequate degree of comfort. The play of a fastened seat belt is known as slack. To prevent the negative effects of this slack, the seat belt buckle is pulled down several centimeters by gas generators in the event of an accident. This pulls the seat belt tight.

Safety battery terminal

Depending on the severity of the accident, the safety battery terminal disconnects the starter motor and the alternator from the power circuit. This minimizes the risk of short circuits in a serious accident. The trigger signal comes from the MRS control unit.

○ Airbag warning lamp

The airbag warning lamp shows the operational capability of the multiple restraint system (MRS). The airbag warning lamp is located in the instrument cluster and is controlled by the MRS control unit (via the K bus).

After the ignition is switched on, the MRS performs a self test. While this is being run, the airbag warning lamp lights up (approximately 3 to 5 seconds). When the system is ready, the airbag warning lamp goes out.

If, during the self test or while the vehicle is in motion, the MRS control unit detects an existing fault or one that has been stored, the airbag warning lamp remains on.

If the MRS detects a fault, the operational capability is partially maintained, if possible, subject to the following:

- If a fault is detected in an MRS circuit, only the affected circuit is deactivated. The other airbags and belt tensioners remain operational.

- If there is a fault in the airbag warning lamp circuit, the lamp does not light up. If there is no other fault, the MRS remains fully operational.

If there is an internal fault in the MRS control unit or in the power supply, the entire system is deactivated.

- **Deactivation of the passenger airbag and the front right-hand side airbag**

The passenger airbag and the front right-hand side airbag are deactivated by a coding procedure.

- **Warning lamp for passenger-airbag deactivation (US version)**

If the warning lamp for passenger-airbag deactivation (passenger airbag off lamp) is lit, both airbags on the passenger side have been deactivated: the passenger airbag and the front right-hand side airbag. The passenger airbag off lamp is constantly monitored by the MRS control unit. A fault in the power supply or a defective lamp is stored in the MRS control unit's fault memory. If this occurs, the airbag warning lamp is switched on.

The passenger airbag OFF lamp is located in the control panel in the overhead console.

- **Shutting off the fuel pump**

When an airbag is triggered, the fuel feed is also shut off.

Mechanical components in the multiple restraint system (MRS):

- **Seat belts**

The seat belts are the primary restraint system for all occupants. A lap and diagonal automatic belt is fitted on each seat.

If there is a very severe impact, the seat belt strap may cause injuries to the chest of the person it is securing. To minimize this risk, the front seat belts are fitted with belt force limiters as standard. The belt force limiters allow the seat belt to be unrolled in a controlled fashion if the belt force exceeds a critical value. The risk of injury due to the belt force acting on the body is therefore reduced.

- **Passive knee protection (US version)**

Not every state in the USA has a requirement for seat belts to be worn. Therefore, the E83 also has additional plastic impact protection on the driver and passenger sides. In the event of an impact, the passive knee protection provides a flat support for the lower leg, especially if the front passengers are not wearing their seat belts. This causes the forwards movement of the upper body to be controlled towards the relevant airbag (driver or passenger airbag).

SYSTEM FUNCTIONS

The following system functions of the multiple restraint system (MRS) are described:

- Triggering the multiple restraint system
- Emergency call (EURO version)
- Emergency call (US version)

Triggering the multiple restraint system

Extensive testing has allowed the triggering thresholds to be determined for all possible types of accidents.

Various triggering thresholds were set for activating the different restraint systems:

The multiple restraint system comprises:

- Belt tensioners
- Front airbags
- Side airbags
- Head airbags
- Safety battery terminal
- Electric fuel pump

The following examples illustrate how the various restraint systems are triggered:

- **Head-on collision**

The belt tensioners, the front airbags and the safety battery terminal are triggered if the head-on collision is so severe that the triggering threshold of the MRS control unit is exceeded.

The belt tensioners have a lower triggering threshold than the front airbags. The belt tensioners are therefore triggered earlier.

If the seat-belt-lock switch is faulty, the triggering threshold for the front airbag on this side is lowered. Even though there is a fault message, the MRS control unit will try to trigger the belt tensioners.

If the seat-occupancy detector is faulty, the control unit assumes that the passenger seat is occupied. The restraint systems are activated.

The electric fuel pump is switched off. An automatic emergency call is initiated (only in vehicles with the relevant equipment fitted).

- **Side impact**

The side impact must be severe enough for the triggering threshold in the MRS control unit to be exceeded.

The side airbag and the head airbag are deployed on the side affected. The safety battery terminal is also triggered.

The electric fuel pump is switched off. An automatic emergency call is initiated (only in vehicles with the relevant equipment fitted).

○ **Front diagonal impact**

The airbags and belt tensioners are triggered depending on the impact speed and the angle of the impact. If several triggering thresholds are exceeded (e.g. the triggering thresholds for a head-on collision and a side collision), the corresponding restraint systems for head-on and side collisions are triggered.

○ **Rear-end collision**

The belt tensioners and the safety battery terminal are triggered if the rear-end collision is so severe that the triggering threshold of the MRS control unit is exceeded. An automatic emergency call is initiated (only in vehicles with the relevant equipment fitted).

○ **Rollover**

The MRS control unit does not detect the vehicle rolling over. If there is a collision after the vehicle has rolled and the triggering thresholds are exceeded for a head-on and side collision, the relevant restraint systems are triggered.

The electric fuel pump is switched off.

An automatic emergency call is initiated (only in vehicles with the relevant equipment fitted).

Emergency call (EURO version)

In vehicles equipped with BMW Assist, the multiple restraint system (MRS) has an additional function: the automatic emergency call

If at least one airbag is triggered in the event of an accident, BMW Assist automatically initiates an emergency call. The vehicle data and its exact location, which is determined by the GPS navigation system, are transmitted to the emergency call center.

Emergency call (US version)

All vehicles have the emergency control function as follows:

- Telematic control unit (TCU)
- Telephone aerial
- Hands-free device
- GPS aerial for location determination

The E83 has the following types of emergency call as standard:

- **Manual emergency call**

The emergency call button is directly connected to the telephone. Pressing the emergency call button establishes a voice connection with the provider. The voice connection is indicated by a flashing LED in the emergency call button.

The emergency call button is integrated into the control panel in the overhead console.

- **Automatic emergency call:**

If the accident is of corresponding severity, the MRS control unit sends a signal to the Telematics Control Unit (TCU). The TCU initiates an emergency call which also contains the location of the vehicle. The TCU receives the location determination for the navigation system. If a navigation system has not been installed, the location is determined by an internal GPS receiver in the TCU.

ACCESSORIES AND EQUIPMENT

Audio, Navigation and Anti-Theft - Special Tools - X3

65 5 400 AUDIO, NAVIGATION AND ANTI-THEFT

65 5 400 RELEASE BRACKET

Note: For navigation operating unit

Series: E34, E34tou, E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E83, E85, E86, E87, E90, R50, R52, R53, RR1, RR2

Order number: 65 5 400 Release bracket

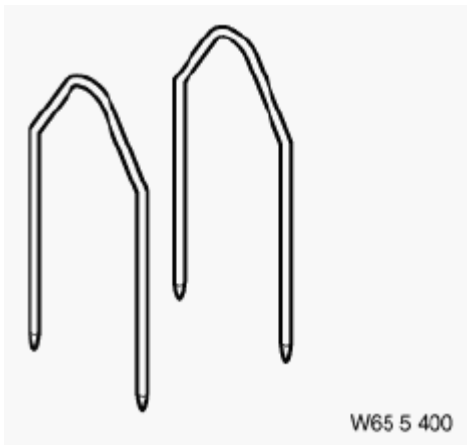


Fig. 1: Release Bracket (65 5 400)

Courtesy of BMW OF NORTH AMERICA, INC.

2007 ACCESSORIES AND EQUIPMENT

Audio, Navigation and Anti-Theft - Tightening Torques - X3

52 VIDEO MONITOR

65 52 CD/DVD DRIVES AND SPECIAL DEVICES

CD/DVD DRIVES AND SPECIAL DEVICES TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Retaining screw, CD/DVD changer to bracket	E60, E61, E63, E64			0.7 Nm
	E65, E66, E67, E70			0.8 Nm
	E83			1.0 Nm
	E53, E85, E90, E91, E92, E93			1.2 Nm
2AZ Mounting bracket CD/DVD changer to body	E83			6.0 Nm
	E90, E91, E92, E93			3.3 Nm
	E53			4.9 Nm
	E60, E61, E63, E64			5 Nm
	E85, E86			4.4 Nm
3AZ CD/DVD drive to Car Communication Computer	E61, E60, E63, E64, E81, E87, E90, E91, E92, E93, R56			0.4 Nm
4AZ Rear cabin DVD player to center console	E70			3 Nm
5AZ CD/DVD changer to glovebox	E70			6 Nm

77 AIRBAG TRIGGER DEVICE

65 77 AIRBAG TRIGGERING CONTROL

AIRBAG TRIGGERING CONTROL TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Airbag control unit	E36, E38, E39, E46, E52, E53			8.8 Nm
	E85			4.6 Nm
	E60, E61, E63, E64, E83, E81, E87, E90, E91, E92, E93			8.0 Nm
	E60 / from 09/2005, E61 / from 09/2005			8.0 Nm
2AZ Impact sensor for side airbag	E36, E38, E39, E46, E52, E53			5.5 Nm

3AZ Sensor, front	E83, E85, E86			8.0 Nm
4AZ Sensor, A-pillar	E65, E66			4.5 Nm
5AZ Sensor, B-pillar	E60, E61, E63, E64, E65, E66, E85, E86			4.6 Nm
	E81, E83, E87, E90, E91, E92, E93			8.0 Nm
6AZ Sensor, vehicle center	E65, E66			5.5 Nm
	E60, E61, E63, E64			8.0 Nm
7AZ Sensor, front door	E65, E66			8.2 Nm
	E60, E61, E90, E91, E92, E93			8.0 Nm
	E85, E86			5.6 Nm
	E83			4.6 Nm
8AZ Sensor, rear seat	E65, E66			8.0 Nm
9AZ Acceleration sensor, front	E63, E64, E90, E91, E92, E93		Replace screws	8.0 Nm
	E60, E61		Replace screws	7.0 Nm

ACCESSORIES AND EQUIPMENT

Cellular Phone Systems - Repair Instructions - X3

11 TRANSCEIVER, HANDSET AND SUPPORT, CARD READER

84 11 519 REMOVING AND INSTALLING/REPLACING EJECT BOX

Special tools required:

See 00 9 340 DISASSEMBLY AID (2)

- 00 9 341

Insert special tool 00 9 341 as shown between eject box (1) and trim (2).

Pull out eject box (1).

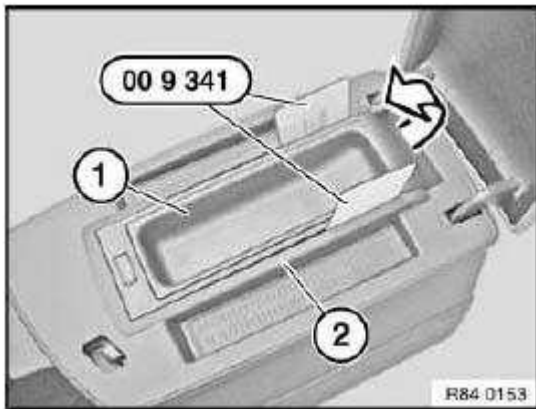


Fig. 1: Special Tool (00 9 341)

Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connections (1 and 2).

Remove eject box.

Installation:

Catches (3) must not be damaged or missing.

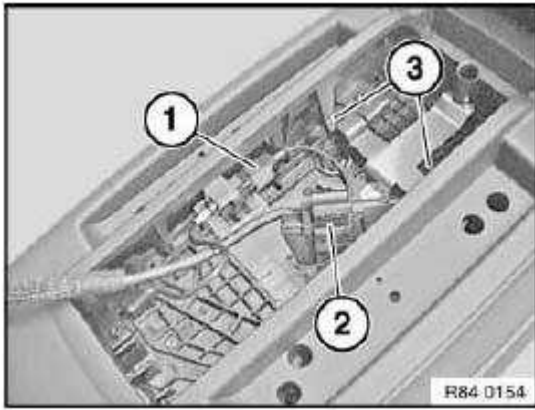


Fig. 2: Plug Connections

Courtesy of BMW OF NORTH AMERICA, INC.

84 11 550 REMOVING AND INSTALLING/REPLACING HANDS - FREE MICROPHONE

Necessary preliminary tasks:

- Remove Front Roofliner Trim, see **51 44 ... REMOVING AND INSTALLING FRONT ROOFLINER TRIM** .

Expand catch (1) and feed hands-free microphone (2) in direction of arrow out of front roofliner trim (3).

Installation:

Arrow (4) on hands-free microphone (2) points in direction of travel.

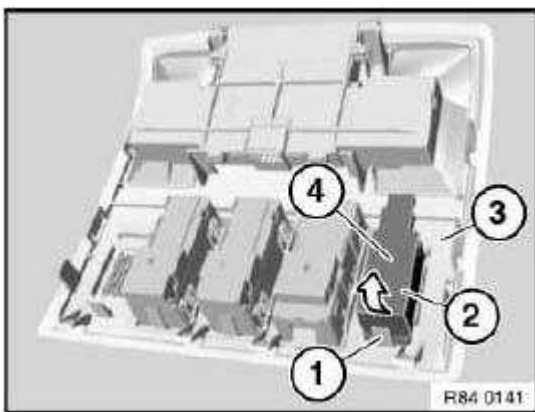


Fig. 3: Catch And Feed Hands-Free Microphone

Courtesy of BMW OF NORTH AMERICA, INC.

84 11 650 REMOVING AND INSTALLING/REPLACING TELEMATIC CONTROL UNIT (TCU) (OPTION SA633/SA638/SA639)

IMPORTANT: Replacement with option SA638:

- Carry out programming/coding using appropriate BMW scan tool.

Replacement with option SA633/SA639:

- Carry out programming/coding using appropriate BMW scan tool.
- Via Diagnosis and Information System (DIS):
 - Service functions
 - Start subsequent assessment

Replacement with option SA633/SA638/SA639:

- If necessary, carry out coupling procedure
- Remove sticker (Bluetooth passkey) from front of TCU and stick to Service Booklet insert

IMPORTANT: Read and comply with 61 35 ... NOTES ON ESD PROTECTION (ELECTRO STATIC DISCHARGE) .

Necessary preliminary tasks:

- Disconnect the battery negative lead, see **THE BATTERY** .
- Remove luggage compartment wheel arch trim on left, see **51 47 151 REMOVING AND INSTALLING / REPLACING LEFT LUGGAGE COMPARTMENT WHEEL ARCH TRIM** .

Disconnect antenna plug (1).

Disconnect plug connection (3).

Release nuts (4) and remove TCU (2).

Installation:

Observe color coding of aerial/antenna plugs (1).

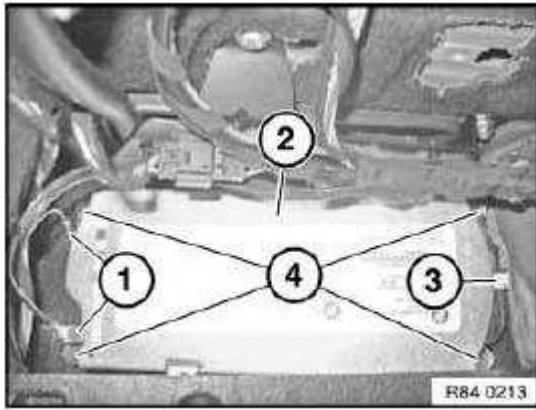


Fig. 4: Antenna Plug And TCU

Courtesy of BMW OF NORTH AMERICA, INC.

21 HANDHELD COMPUTER

84 21 522 REMOVING AND INSTALLING/REPLACING LINE COMPENSATOR

IMPORTANT: Read and comply with 61 35 ... NOTES ON ESD PROTECTION (ELECTRO STATIC DISCHARGE) .

Necessary preliminary tasks:

- Remove hands - free electronics, see **84 21 535 Removing and installing charging hands - free electronics (optional extra 644).**

Turn retaining clip (2) in clockwise direction and remove from holder (5).

Release wiring harness fastener (3).

Release bolt (1) and nut (4).

Slacken nut (6) and remove holder (5).

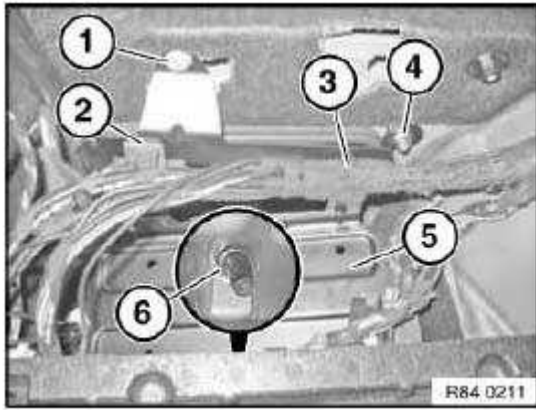


Fig. 5: Wiring Harness Fastener And Holder
 Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1).

Release screws (2).

Remove line compensator (3).

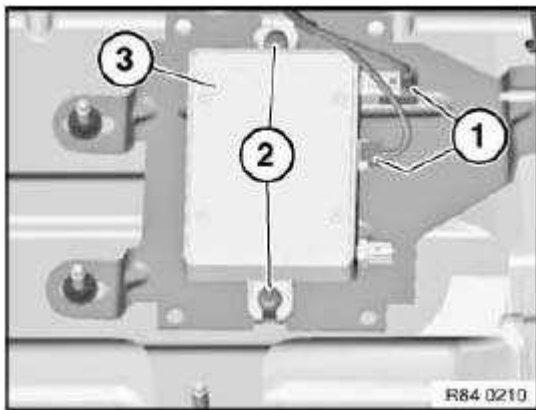


Fig. 6: Screws And Line Compensator
 Courtesy of BMW OF NORTH AMERICA, INC.

**84 21 535 REMOVING AND INSTALLING CHARGING HANDS - FREE ELECTRONICS
 (OPTIONAL EXTRA 644)**

**IMPORTANT: Read and comply with 61 35 ... NOTES ON ESD PROTECTION (ELECTRO
 STATIC DISCHARGE) .**

Necessary preliminary tasks:

- Remove control unit for voice input system, see **84 41 510 Removing and installing/replacing control unit for voice input system.**

Disconnect antenna lead plug connection (1).

Disconnect plug connection (3).

Release screws (4).

Remove hands-free charging electronics (2).

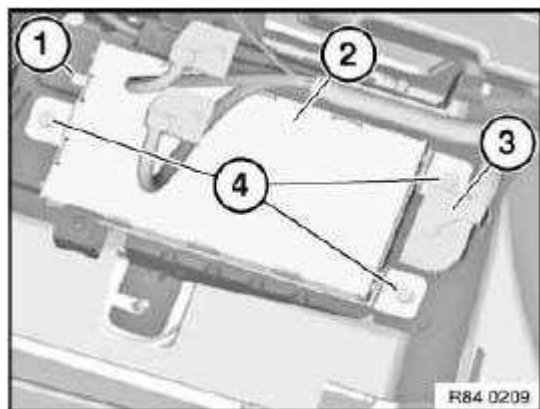


Fig. 7: Hands-Free Charging Electronics

Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

- Carry out vehicle programming/coding using appropriate BMW scan tool.
- If necessary, carry out coupling procedure

41 CONTROL UNIT FOR VOICE

84 41 510 REMOVING AND INSTALLING/REPLACING CONTROL UNIT FOR VOICE INPUT SYSTEM

IMPORTANT: Read and comply with 61 35 ... NOTES ON ESD PROTECTION (ELECTRO STATIC DISCHARGE) .

Necessary preliminary tasks:

- Remove flap in luggage compartment panel on left, see **51 47 172 REMOVING AND INSTALLING/REPLACING FLAP IN LUGGAGE COMPARTMENT TRIM, LEFT OR RIGHT .**

Disconnect plug connection (1).

Release screw (2).

Loosen screw (3).

Remove control unit for voice input system (4).

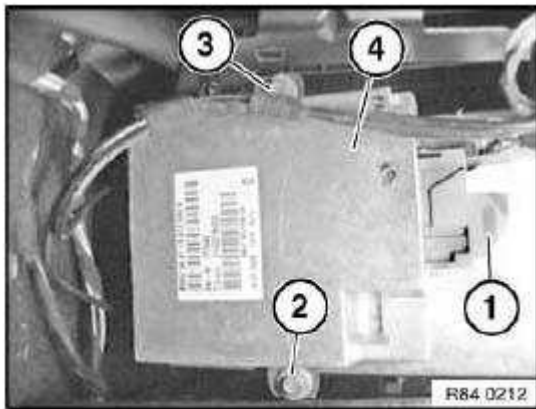


Fig. 8: Plug Connection And Screw

Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

- Carry out vehicle programming/coding using appropriate BMW scan tool.

50 ANTENNA

84 50 060 REMOVING AND INSTALLING/REPLACING BLUETOOTH ANTENNA

Necessary preliminary tasks:

- Remove trim for rear left roof pillar (C-pillar), see **51 43 252 REPLACING TRIM PANEL FOR REAR LEFT OR RIGHT ROOF PILLAR (D-PILLAR)** .

Unfasten plug connection (1) and disconnect.

Release screws (2) and remove bluetooth antenna (3).

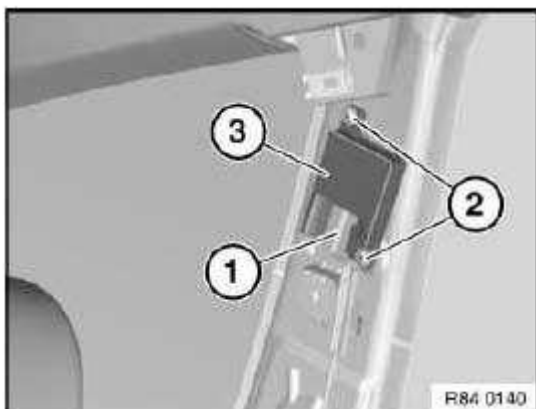


Fig. 9: Screws And Bluetooth Antenna

Courtesy of BMW OF NORTH AMERICA, INC.

ACCESSORIES AND EQUIPMENT

Cruise Control - Special Tools - X3

66 DISTANCE SYSTEMS, CRUISE CONTROL

66 3 140 OPS PACKAGE

Note: (complete set)

Order number: 66 3 140

OPS package

ACCESSORIES AND BODY, CAB

Cruise Control Systems - Repair Instructions - X3

20 PARK DISTANCE CONTROL

66 20 508 REMOVING AND INSTALLING (REPLACING) CONTROL UNIT (PARK DISTANCE CONTROL)

IMPORTANT: Read and comply with 61 35 ... NOTES ON ESD PROTECTION (ELECTROSTATIC DISCHARGE) .

Necessary preliminary tasks:

- Remove Luggage Compartment Floor Trim Panel, see 51 47 102 REMOVING AND INSTALLING/REPLACING LUGGAGE COMPARTMENT FLOOR TRIM PANEL .

Remove clips (1) and fold up front luggage compartment floor trim panel (2) slightly.

Installation:

Make sure front luggage compartment floor trim panel (2) is correctly seated.

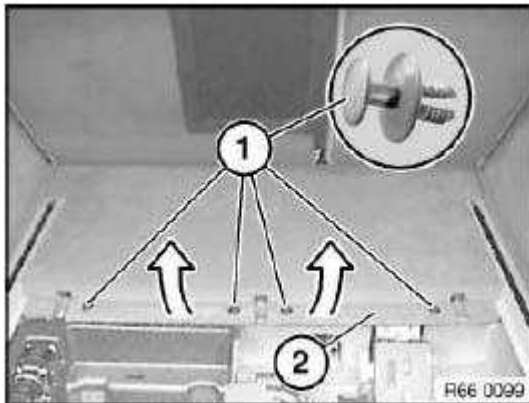


Fig. 1: Clips And Front Luggage Compartment Floor Trim Panel
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Front luggage compartment floor trim panel shown removed for purposes of clarity.

Unlock plug connections (1) and disconnect.

Lift control unit (2) out of mounting for control units (3).

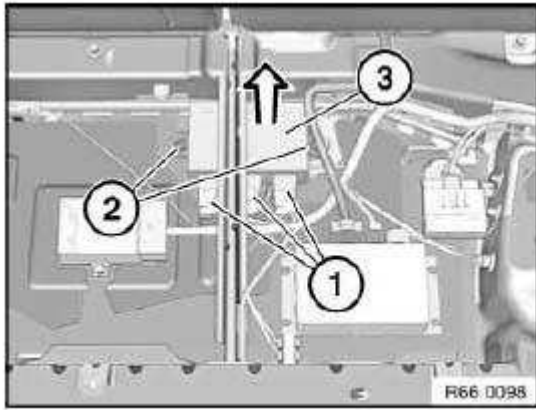


Fig. 2: Plug Connections And Control Unit
 Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

Carry out programming/coding using appropriate BMW service tool.

66 20 520 REMOVING AND INSTALLING/REPLACING AN ULTRASONIC TRANSDUCER AT FRONT (PARK DISTANCE CONTROL)

Necessary preliminary tasks:

- Remove Front Bumper Trim, see **51 11 156 REMOVING AND INSTALLING FRONT BUMPER TRIM (FROM 09/2006)**.

Unlock catches (1) in direction of arrow and pull ultrasonic transducer (2) out of bracket (3).

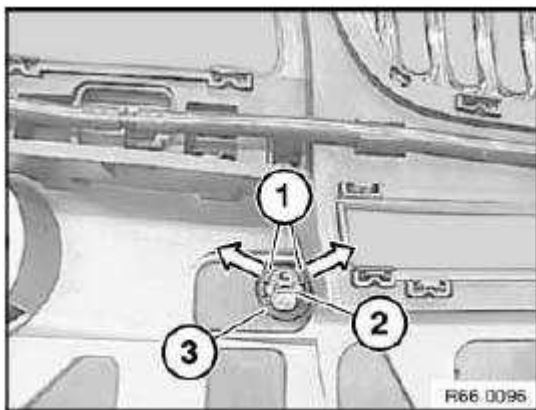


Fig. 3: Catches And Ultrasonic Transducer
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Retaining hooks (1) of ultrasonic transducer (2) must engage exactly in mountings (3).

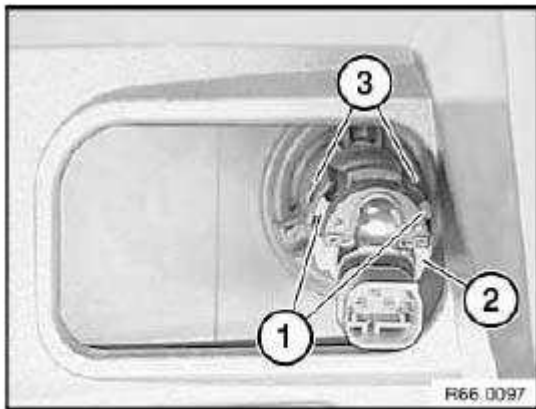


Fig. 4: Retaining Hooks Of Ultrasonic Transducer
Courtesy of BMW OF NORTH AMERICA, INC.

66 20 540 REMOVING AND INSTALLING/REPLACING A REAR ULTRASONIC TRANSDUCER (PARK DISTANCE CONTROL)

Necessary preliminary tasks:

- Remove Rear Bumper Trim, see **51 12 156 REMOVING AND INSTALLING REAR BUMPER TRIM (FROM 09/2006)** .

Unlock catches (1) in direction of arrow and pull ultrasonic transducer (2) out of bracket (3).

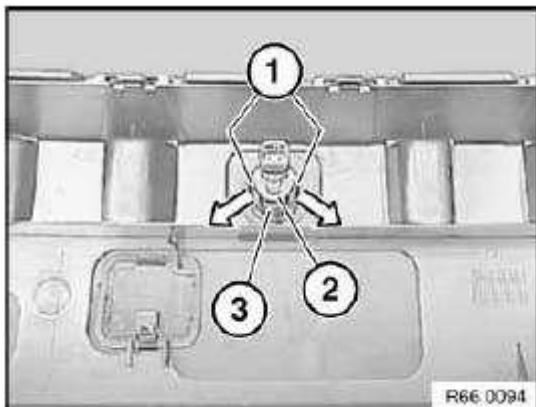


Fig. 5: Catches And Ultrasonic Transducer
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Retaining hooks (1) of ultrasonic transducer (2) must engage exactly in mountings (3).

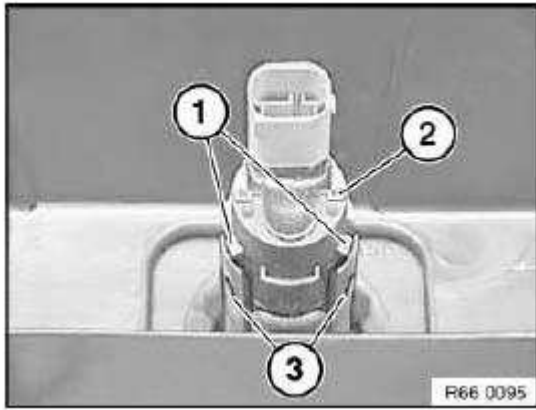


Fig. 6: Retaining Hooks Of Ultrasonic Transducer
Courtesy of BMW OF NORTH AMERICA, INC.

66 20 560 REMOVING AND INSTALLING/REPLACING REAR SIGNAL SENSOR (PARK DISTANCE CONTROL)

Necessary preliminary tasks:

- Remove Right Luggage Compartment Wheel Arch Trim, see **51 47 161 REMOVING AND INSTALLING/REPLACING RIGHT LUGGAGE COMPARTMENT WHEEL ARCH TRIM** .

Unfasten plug connection (1) and disconnect.

Release nut (2) and remove rear signal sensor (3).

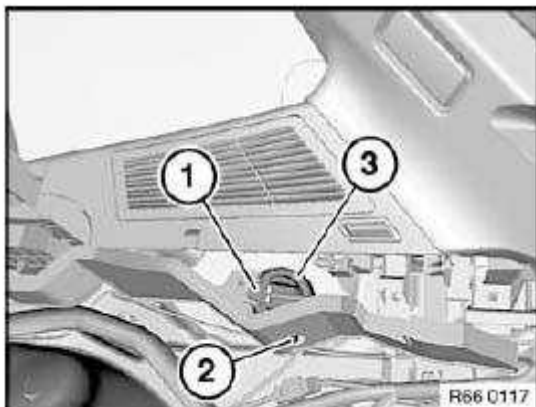


Fig. 7: Rear Signal Sensor
Courtesy of BMW OF NORTH AMERICA, INC.

53 REVERSING CAMERA

66 53 ... INSTRUCTIONS FOR ADAPTING ADJUSTMENT UNIT FOR REVERSING CAMERA (CORGHI KDS QUICK - ACTION CLAMP)

The following operations should only be carried out when using the tool kit for calibrating the reversing camera for the first time.

NOTE: The operation is described for the left-hand side; proceed in the same way for the right-hand side.

Remove support plate (1) from spindle (2).

Replace spindle (2) by spindle (3).

Press support plate (1) on to spindle (3).

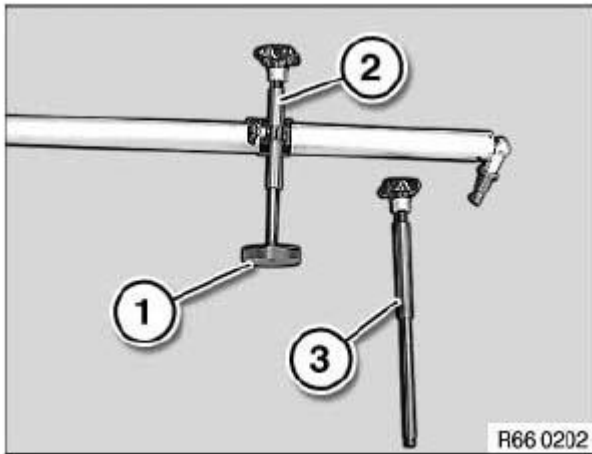


Fig. 8: Support Plate And Spindle
Courtesy of BMW OF NORTH AMERICA, INC.

Release retaining clip (1).

Remove ball pin (2) from rod (3).

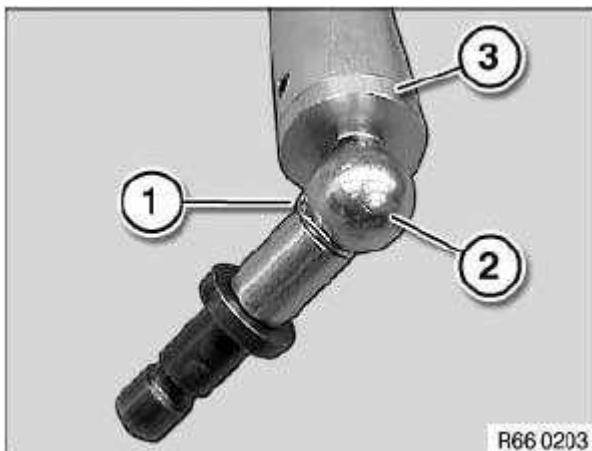


Fig. 9: Retaining Clip And Ball Pin

Courtesy of BMW OF NORTH AMERICA, INC.

Fit new ball pin (1) on rod (2) and secure with retaining clip (3).

Fit ball pin (1) on CORGHI KDS quick-release clamp and secure.

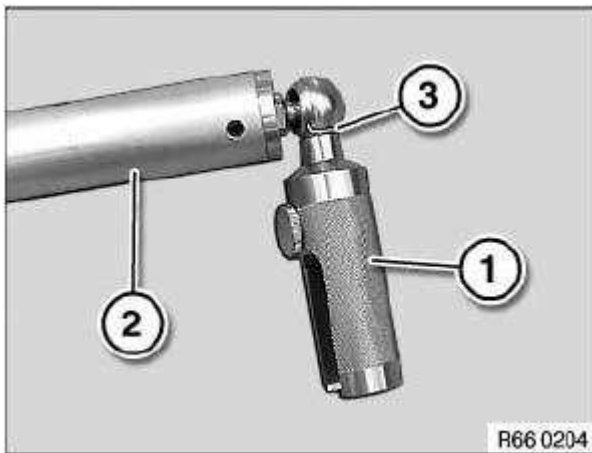


Fig. 10: Ball Pin, Rod And Retaining Clip
Courtesy of BMW OF NORTH AMERICA, INC.

Remove all spacers (1) on cross bar (2).

NOTE: Follow the same procedure for calibrating the reversing camera.

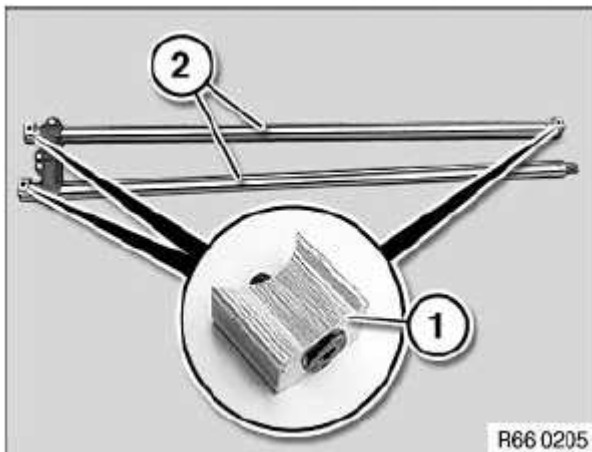


Fig. 11: Spacers On Cross Bar
Courtesy of BMW OF NORTH AMERICA, INC.

ACCESSORIES AND EQUIPMENT

Electrical Drives - Repair Instructions - X3

11 CENTRAL LOCKING UNIT/UNLOCKING UNITS

67 11 510 REMOVING AND INSTALLING/REPLACING SERVODRIVE FOR FRONT LEFT OR RIGHT DOOR LOCKING MECHANISM

NOTE: Servodrive for door locking mechanism is integrated in door lock in front door.

Procedure is described in the document [51 21 090 REMOVING AND INSTALLING/REPLACING DOOR LOCK IN LEFT OR RIGHT FRONT DOOR](#) .

67 11 530 REMOVING AND INSTALLING/REPLACING SERVODRIVE FOR REAR LEFT OR RIGHT DOOR LOCKING MECHANISM

This operation is described in:

[51 22 090 REMOVING AND INSTALLING/REPLACING DOOR LOCK IN LEFT OR RIGHT REAR DOOR](#) .

67 11 555 REMOVING AND INSTALLING/REPLACING SERVODRIVE FOR TANK FILLER FLAP

Necessary preliminary tasks:

- Remove Right Luggage Compartment Wheel Arch Trim, see **[51 47 161 REMOVING AND INSTALLING/REPLACING RIGHT LUGGAGE COMPARTMENT WHEEL ARCH TRIM](#) .**

Unclip emergency actuator (1) on emergency actuator pull strap (2).

Feed out emergency actuator pull strap (2) through opening (3).

Slacken screws (4) and feed servodrive for tank filler flap (5) towards rear out of retaining plate.

If necessary, carry out adjustment of servodrive for tank filler flap (5) via elongated holes of retaining plate. It must be possible to lock or unlock the fuel filler flap completely.

Disconnect associated plug connection and remove servodrive for tank filler flap (5).

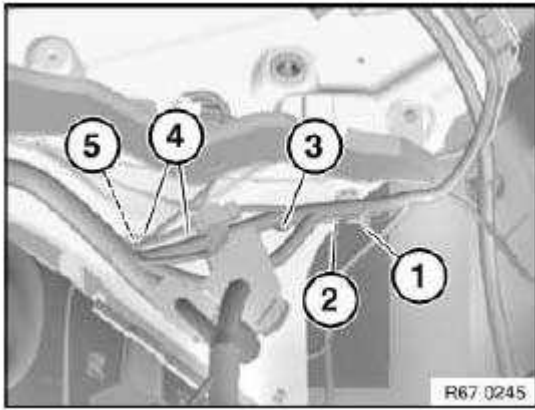


Fig. 1: Emergency Actuator And Strap
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Insert servodrive for tank filler flap (1) in direction of arrow into gaiter (2).

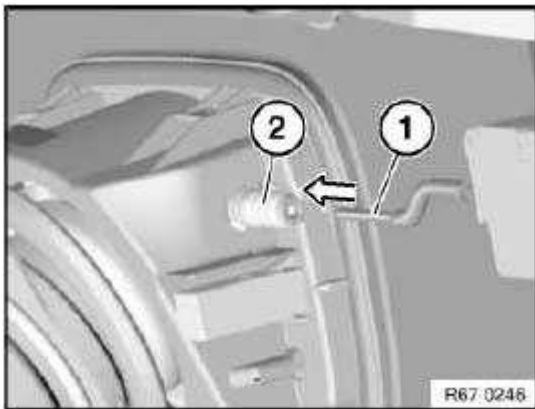


Fig. 2: Tank Filler Flap
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

Unhook emergency actuator pull strap (1) from clip (2) and remove from locking pin (3) of servodrive for fuel filler flap (4).

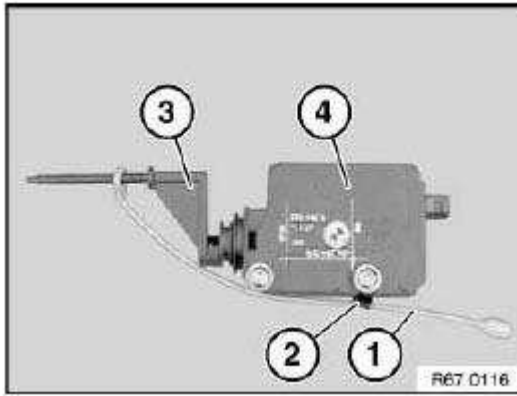


Fig. 3: Servodrive For Fuel Filler Flap
 Courtesy of BMW OF NORTH AMERICA, INC.

67 11 560 REPLACING SERVODRIVE FOR REAR LID LOCK

This operation is described under:

51 24 105 REMOVING AND INSTALLING/REPLACING REAR LID LOCK (LOWER SECTION OF LOCK) .

13 MIRROR ADJUSTMENT

67 13 001 REPLACING DRIVE UNIT FOR ELECTRICALLY OPERATED LEFT OR RIGHT DOOR MIRROR

Necessary preliminary tasks:

- Remove Mirror Glass, see **51 16 026 REPLACING MIRROR GLASS** .

Release screws (1).

Fold out drive unit for electrically operated door mirror (2) in direction of arrow.

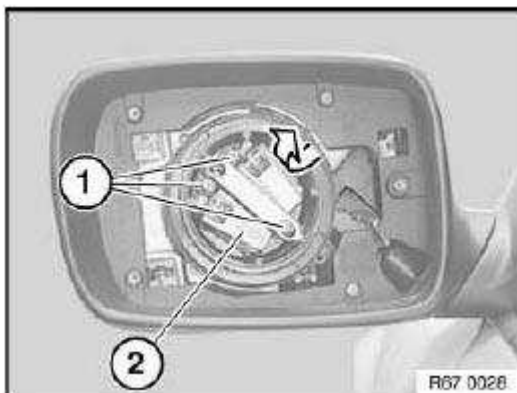


Fig. 4: Screws And Electrically Operated Door Mirror
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1) and remove drive unit for electrically operated door mirror (2).

IMPORTANT: In order to avoid ingress of water in non-sealed plug housing, coat plug housing (1) at cable and connection ends with battery terminal grease.

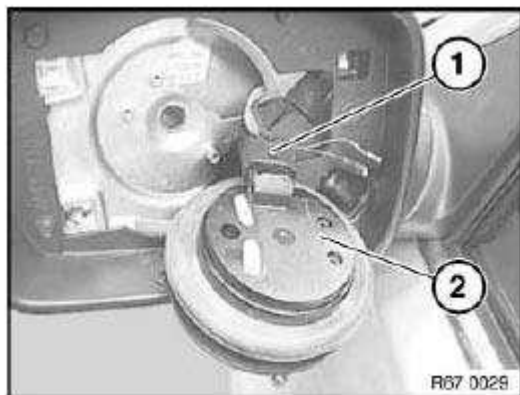


Fig. 5: Plug Connection And Electrically Operated Door Mirror
Courtesy of BMW OF NORTH AMERICA, INC.

67 13 005 REPLACING DRIVE UNIT FOR ELECTRICALLY ADJUSTABLE LEFT OR RIGHT DOOR MIRROR (WITH MEMORY)

Special tools required:

- **61 1 150 RELEASING TOOL KIT**

Necessary preliminary tasks:

- Remove Mirror Glass, see **51 16 026 REPLACING MIRROR GLASS** .
- Remove Mirror On Left Or Right Front Door, see **51 16 000 REMOVING AND INSTALLING/REPLACING MIRROR ON LEFT OR RIGHT FRONT DOOR** .

Release screws (1).

Remove drive unit for electrically adjustable door mirror (2) in direction of arrow.

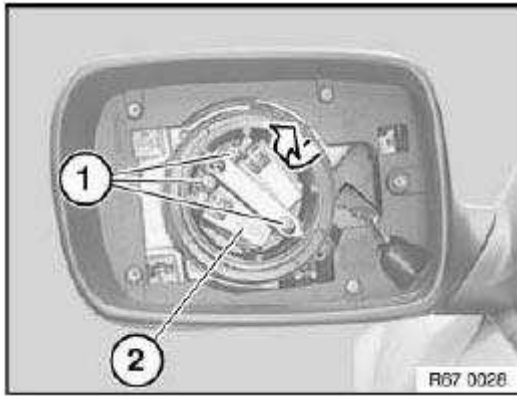


Fig. 6: Screws And Electrically Operated Door Mirror
Courtesy of BMW OF NORTH AMERICA, INC.

Unclip cap (1) with a suitable tool.

Remove sound insulation (2) from mirror. Correctly disconnect cable plug (3) with special tool 61 1 150 .

Feed out cable (4).

Installation:

Make sure ribbon cable (4) is correctly routed. Cable must not be kinked!

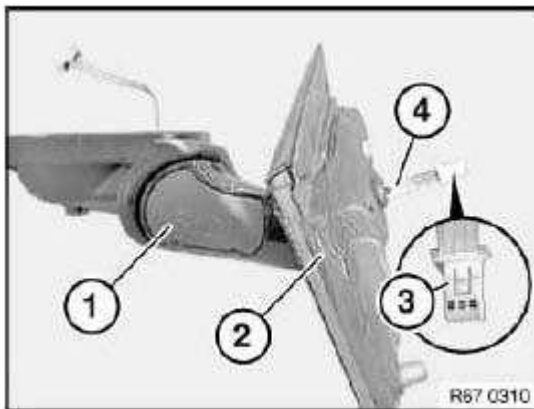


Fig. 7: Sound Insulation And Cable Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Sound insulation (1) on mirror (2) must not be damaged.

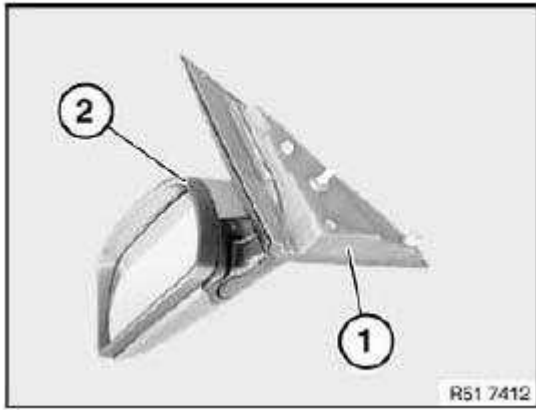


Fig. 8: Sound Insulation On Mirror
 Courtesy of BMW OF NORTH AMERICA, INC.

31 DRIVE, SEAT ADJUSTMENT

67 31 501 REMOVING AND INSTALLING/REPLACING DRIVE FOR LONGITUDINAL SEAT ADJUSTMENT (FRONT SEAT REMOVED)

Disconnect plug connection (1).

Unclip plug housing (2) in direction of arrow from retaining fixture underneath.

NOTE: Secure drive for longitudinal seat adjustment (4) against falling out.

Release screws (3) and remove drive for longitudinal seat adjustment (4) in direction of arrow from flange (5).

If necessary, remove inner drive shaft from drive for longitudinal seat adjustment (4).

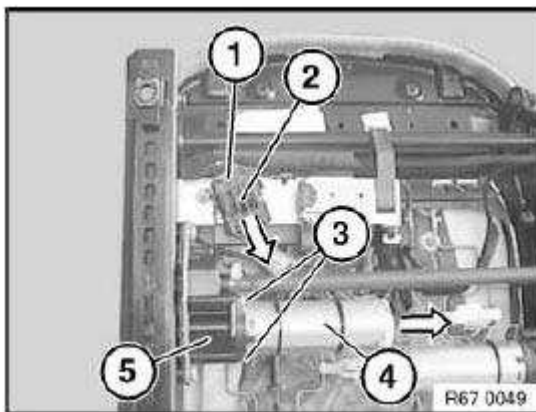


Fig. 9: Plug Housing
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Make sure drive shaft (1) is correctly seated.

Make sure drive for longitudinal seat adjustment (2) is correctly seated on flange (3).

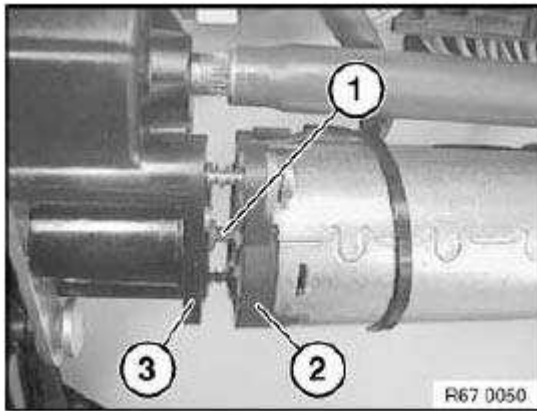


Fig. 10: Drive Shaft

Courtesy of BMW OF NORTH AMERICA, INC.

67 31 511 REMOVING AND INSTALLING/REPLACING DRIVE FOR SEAT TILT ADJUSTMENT (FRONT SEAT REMOVED)

Disconnect plug connection (4).

NOTE: Secure drive for seat tilt adjustment (5) against falling out.

Loosen screws (1).

Remove drive for seat tilt adjustment (5) with fixture for plug connection (3) in direction of arrow from flange (2).

If necessary, remove inner drive shaft from drive for seat tilt adjustment (5).

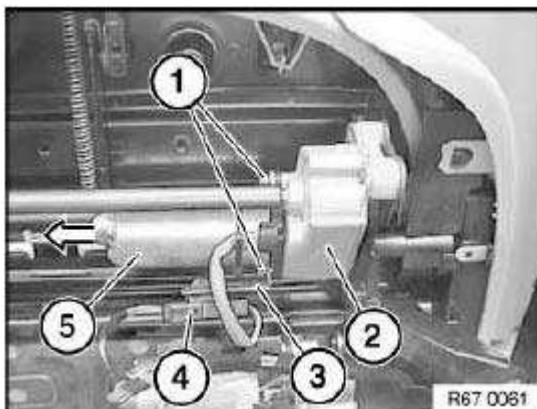


Fig. 11: Seat Tilt Adjustment

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Make sure drive shaft (1) is correctly seated.

Ensure fixture for plug connection (3) and drive for seat tilt adjustment (4) on flange (2) are correctly seated.

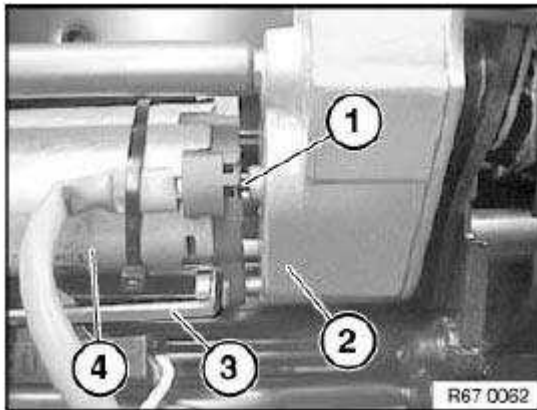


Fig. 12: Drive Shaft And Plug Connection

Courtesy of BMW OF NORTH AMERICA, INC.

67 31 521 REMOVING AND INSTALLING/REPLACING DRIVE FOR SEAT HEIGHT ADJUSTMENT (FRONT SEAT REMOVED)

Disconnect plug connection (2).

NOTE: Secure drive for seat height adjustment (3) against falling out.

Release screws (1).

Remove drive for seat height adjustment (3) with fixture for plug connection (4) in direction of arrow from flange (5).

If necessary, remove inner drive shaft from drive for seat height adjustment (3).

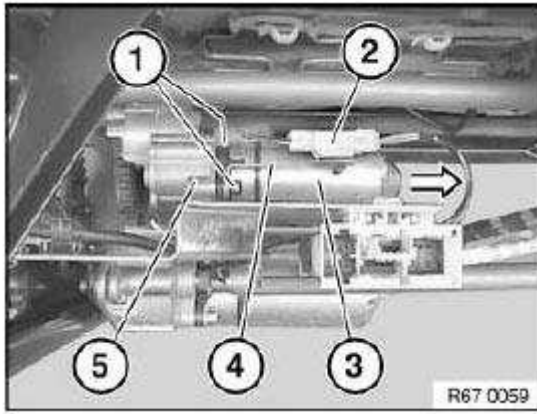


Fig. 13: Seat Height Adjustment And Inner Drive Shaft
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Make sure drive shaft (1) is exactly seated.

Ensure fixture for plug connection (2) and drive for seat height adjustment (3) on flange (4) are correctly seated.

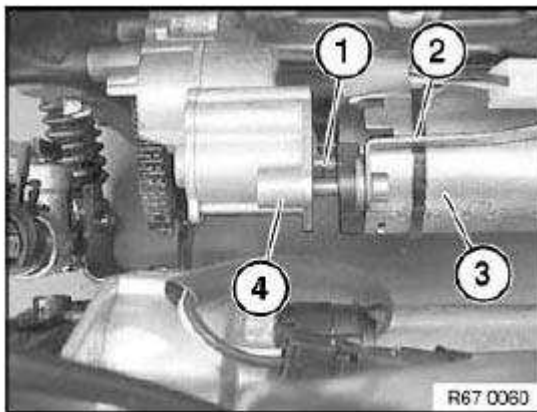


Fig. 14: Drive Shaft And Plug Connection
 Courtesy of BMW OF NORTH AMERICA, INC.

67 31 531 REMOVING AND INSTALLING/REPLACING DRIVE FOR BACKREST ANGLE ADJUSTMENT (FRONT SEAT REMOVED)

Disconnect plug connection (1).

NOTE: **Secure drive for backrest angle adjustment (5) against falling out.**

Release screws (3).

Remove drive for backrest angle adjustment (5) with fixture for plug connection (2) in direction of arrow from

flange (4).

If necessary, remove inner drive shaft from drive for backrest angle adjustment (5).

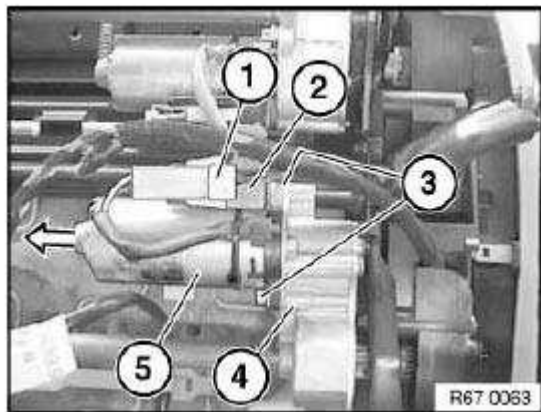


Fig. 15: Backrest Angle Adjustment
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Make sure drive shaft (1) is exactly seated.

Ensure fixture for plug connection (3) and drive for backrest angle adjustment (4) on flange (2) are correctly seated.

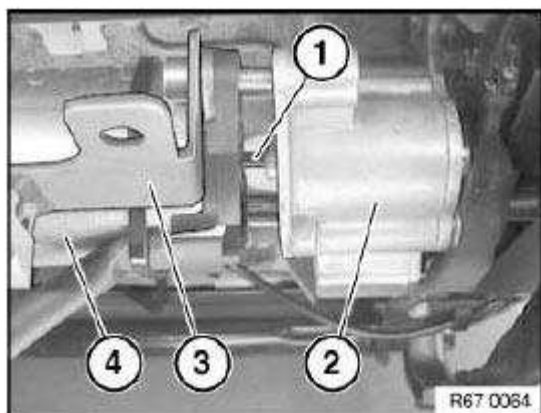


Fig. 16: Drive Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

61 DRIVE, SLIDE-TILT SUNROOF/CONVERTIBLE TOP

67 61 515 REPLACING DRIVE WITH GEAR (FRONT) FOR ACTUATING SLIDE/TILT SUNROOF (PANORAMA GLASS SUNROOF)

Necessary preliminary tasks:

- **E53:** Remove mounting bracket from roofliner at front.
- **E83:** Remove Front Roofliner Trim, see **51 44 ... REMOVING AND INSTALLING FRONT ROOFLINER TRIM** .

NOTE: **Secure drive with gear for actuating slide/tilt sunroof (2) against falling out.**

Release screws (1), tightening torque: 1AZ, see **54 13 ELECTRIC SUN ROOF COMPONENTS** .

Lower drive with gear for actuating slide/tilt sunroof (2).

NOTE: **Screws (1) are microencapsulated.**

Unlock plug connection (3), disconnect and remove drive with gear for actuating slide/tilt sunroof (2).

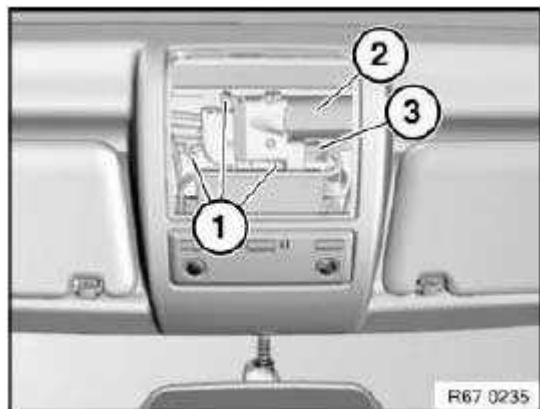


Fig. 17: Screws And Actuating Slide/Tilt Sunroof
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Insert gear wheel (1) of drive with gear for actuating slide/tilt sunroof (2) exactly in gear teeth (3).

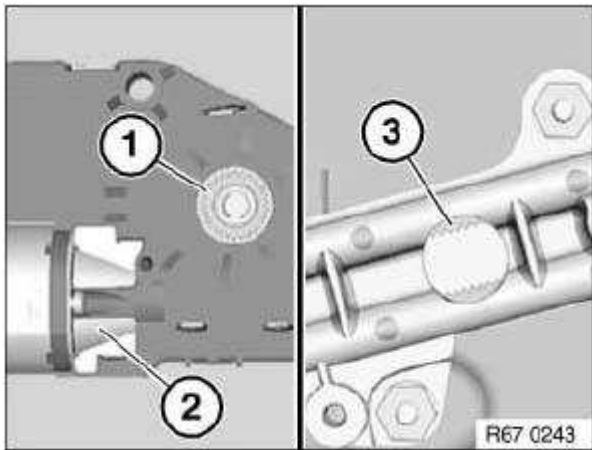


Fig. 18: Gear Wheel And Gear Teeth

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

- Initialize Panorama Glass Roof, see **54 0 ... NOTES ON PANORAMA GLASS ROOF (INITIALIZATION/NORMALIZATION/LEARNING OF CHARACTERISTIC CURVE)** .

67 61 517 REPLACING DRIVE WITH GEAR (REAR) FOR ACTUATING SLIDE/TILT SUNROOF

Necessary preliminary tasks:

- Remove rear grab handles, see **51 16 450 REMOVING AND INSTALLING/REPLACING REAR LEFT/RIGHT GRAB HANDLE** .
- Remove trim for rear left and right roof pillar (C-pillar), see **51 43 251 REMOVING AND INSTALLING/REPLACING TRIM PANEL FOR REAR LEFT OR RIGHT ROOF PILLAR (C - PILLAR)** .
- Remove trim for rear left and right roof pillar (D-pillar), see **51 43 252 REPLACING TRIM PANEL FOR REAR LEFT OR RIGHT ROOF PILLAR (D-PILLAR)** .
- Remove left and right interior lights, see **63 31 015 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT INTERIOR LIGHT (SIDE ROOFLINER)** .
- Detach mucket in area of roofliner

IMPORTANT: Do not under any circumstance kink roofliner (1).

Unclip roofliner (1) at retaining point (2) towards bottom and lower.

NOTE: Secure drive with gear for actuating slide/tilt sunroof (4) against falling out.

Release screws (3), tightening torque: 1AZ, see **54 13 ELECTRIC SUN ROOF COMPONENTS** .

Lower drive with gear for actuating slide/tilt sunroof (4).

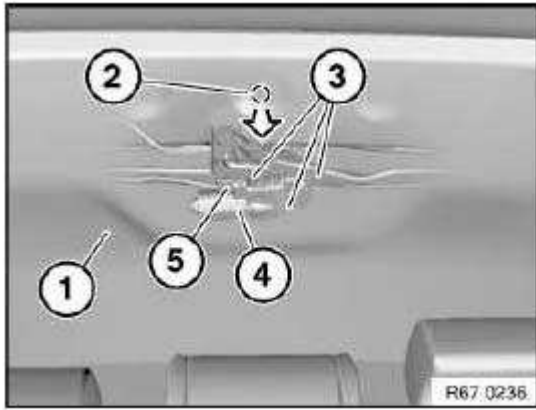


Fig. 19: Roofliner And Actuating Slide/Tilt Sunroof
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Screws (3) are microencapsulated.

Unlock plug connection (5), disconnect and remove drive with gear for actuating slide/tilt sunroof (4).

Installation:

Insert gear wheel (1) of drive with gear for actuating slide/tilt sunroof (2) exactly in gear teeth (3).

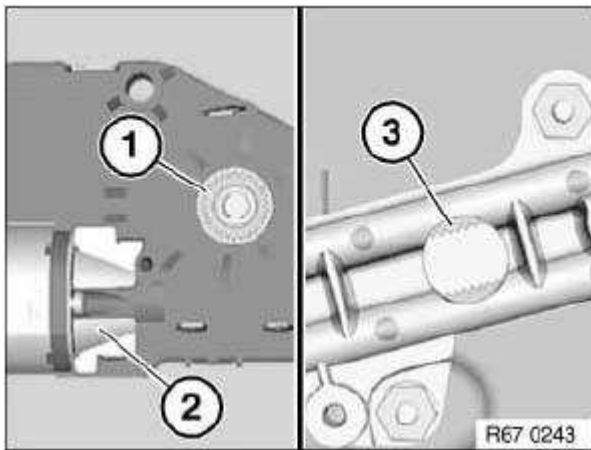


Fig. 20: Gear Wheel And Gear Teeth
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

- Initialize Panorama Glass Roof, see **54 0 ... NOTES ON PANORAMA GLASS ROOF (INITIALIZATION/NORMALIZATION/LEARNING OF CHARACTERISTIC CURVE)**.

62 DRIVE, WINDOW REGULATOR

67 62 000 REMOVING AND INSTALLING / REPLACING FLAT MOTOR FOR FRONT LEFT OR RIGHT POWER WINDOW UNIT

Special tools required:

- **00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)**

Necessary preliminary tasks:

- Detach sound insulation on front door in working area, see **51 48 060 REMOVING AND INSTALLING/REPLACING SOUND INSULATION IN LEFT OR RIGHT FRONT DOOR**.

NOTE: For clearer illustration, shown with sound insulation removed.

Disconnect plug connection (1).

Unfasten screws (2).

Detach flat motor (3) in direction of arrow from power window unit (4) and remove.

IMPORTANT: If necessary, use special tool 00 9 310 to release flat motor (3) from power window unit (4).

Guide wheel must not be pulled out of power window unit (4).

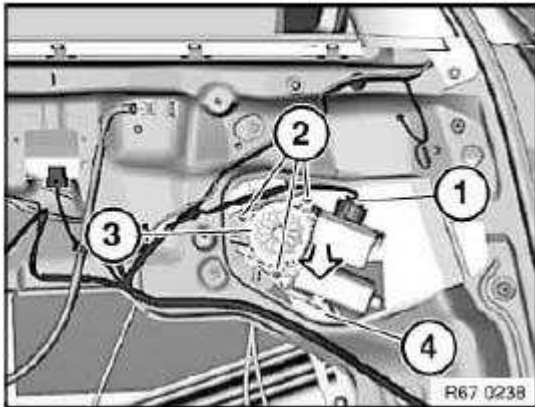


Fig. 21: Screws And Flat Motor

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Fit flat motor (3) exactly on teeth of power window unit.

Replacement:

A normalization must be carried out in order to activate anti - trapping protection.

Operating sequence for normalization:

- Open corresponding window completely.
- Operate corresponding power window switch in "Close" position (second switch stage).
- Once the upper end position has been reached, hold power window switch down for approx. 1 second more.

Normalization is thus completed.

NOTE: Carry out function check (one-touch function, anti-trapping protection and, if necessary, comfort function).

67 62 020 REMOVING AND INSTALLING/REPLACING FLAT MOTOR FOR REAR LEFT OR RIGHT POWER WINDOW UNIT

Necessary preliminary tasks:

- Detach sound insulation on rear door in working area, see **51 48 070 REMOVING AND INSTALLING/REPLACING SOUND INSULATION ON LEFT OR RIGHT REAR DOOR** .

NOTE: For clearer illustration, shown with sound insulation removed.

Unfasten plug connection (1) and disconnect.

Release screws (2).

Detach flat motor for power window unit (3) in direction of arrow from power window unit (4) and remove.

Installation:

Fit flat motor for power window unit (3) exactly on teeth of power window unit.

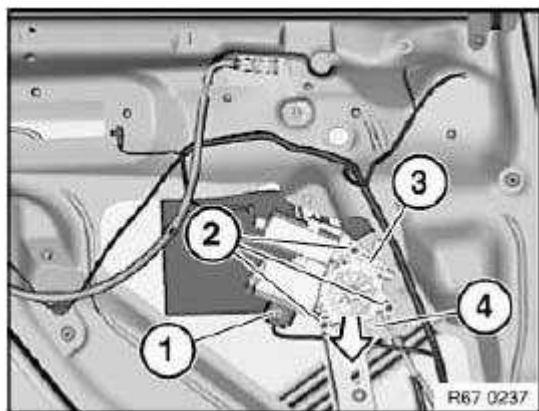


Fig. 22: Screws And Flat Motor

Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

A normalization must be carried out in order to activate anti - trapping protection.

Operating sequence for normalization:

- Open corresponding window completely.
- Operate corresponding power window switch in "Close" position (second switch stage).
- Once the upper end position has been reached, hold power window switch down for approx. 1 second more.

Normalization is thus completed.

NOTE: Carry out function check (one-touch function, anti-trapping protection and, if necessary, comfort function).

66 DRIVE, SEAT ADJUSTMENT

67 66 010 REMOVING AND INSTALLING/REPLACING LUMBAR SUPPORT DRIVE MECHANISM ON FRONT SEAT, LEFT OR RIGHT

Necessary preliminary tasks:

- Remove rear panel on front seat backrest, see **52 13 198 REMOVING AND INSTALLING / REPLACING REAR PANEL ON LEFT OR RIGHT FRONT SEAT BACKREST (NORMAL/MANUAL)** .

E53 comfort seat:

- Remove rear panel at bottom.

Detach backrest cover (1) in direction of arrow from backrest frame (2).

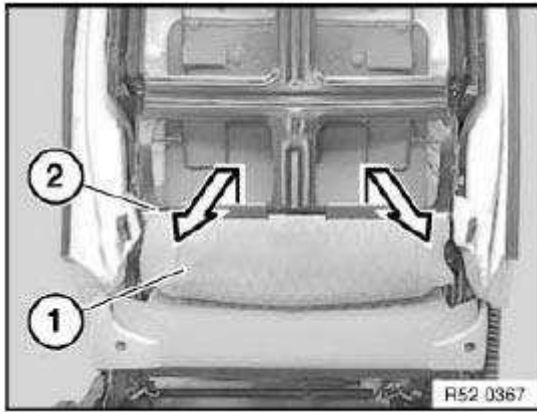


Fig. 23: Backrest Cover And Backrest Frame
 Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1).

Detach transparent hose (2) from valve housing (3).

NOTE: If necessary, gently heat transparent hose (2) if firmly seated.

If necessary, detach fabric adhesive tape (4).

Detach drive unit for lumbar support (5) with jacket in direction of arrow.

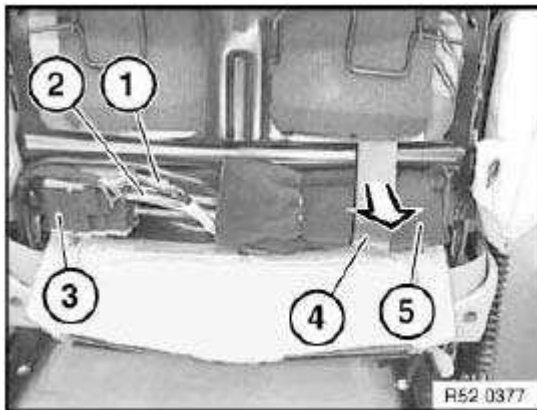


Fig. 24: Transparent Hose And Valve Housing
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Clean adhesive area (1) on backrest frame (2).

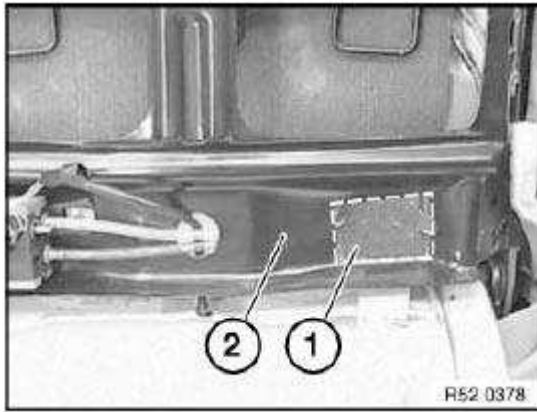


Fig. 25: Adhesive Area On Backrest Frame
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Transparent hose (1) of drive unit for lumbar support must not be kinked.

Pull off protective film (3) from jacket (2). Stick drive unit for lumbar support to backrest frame.

If necessary, secure jacket (2) with cable strap.

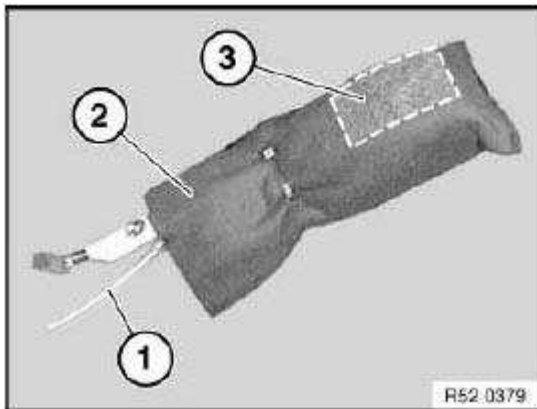


Fig. 26: Transparent Hose And Protective Film
Courtesy of BMW OF NORTH AMERICA, INC.

ACCESSORIES AND EQUIPMENT

Electrical Drives - Tightening Torques - X3

62 DRIVE, WINDOW REGULATOR

67 62 DRIVES, POWER WINDOWS

DRIVES, POWER WINDOWS TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Motor to window regulator	E46, E85, E86, E93			4.5 Nm
	E31, E36, E65, E66			5 Nm
	E81, E83			3 Nm
	E60, E61, E63, E64, E87, E90, E91, E92			6 Nm
	E70		Observe screwing sequence	6 Nm

ACCESSORIES AND BODY, CAB

Instruments - Repair Instructions - X3

11 INSTRUMENT CLUSTER

62 11 280 REMOVING AND INSTALLING (REPLACING) INSTRUMENT CLUSTER

IMPORTANT: Read and comply with 61 35... NOTES ON ESD PROTECTION (ELECTROSTATIC DISCHARGE) .

NOTE: Extend steering wheel completely and lower.

Tape off instrument panel trim (1) and upper steering column casing (2) with crepe tape.

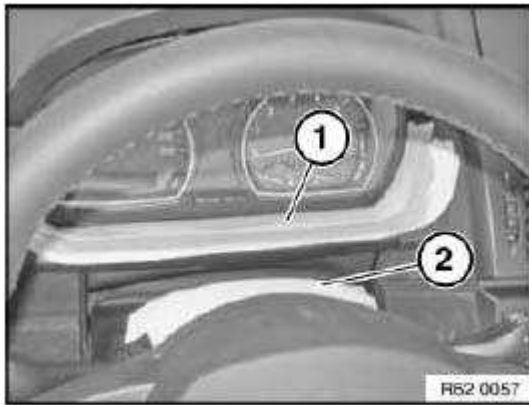


Fig. 1: Identifying Instrument Panel Trim And Upper Steering Column Casing
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Carefully pull back instrument cluster (2).

Disconnect associated plug connection.

Remove instrument cluster (2).

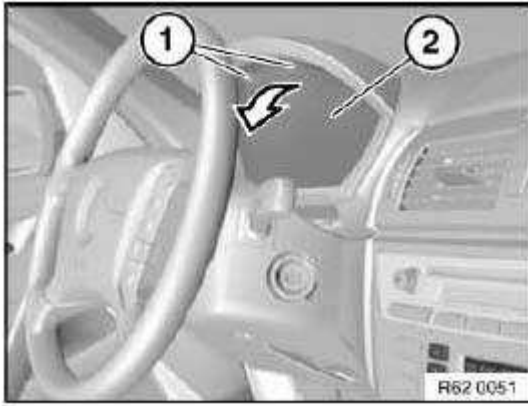


Fig. 2: Identifying Instrument Cluster
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

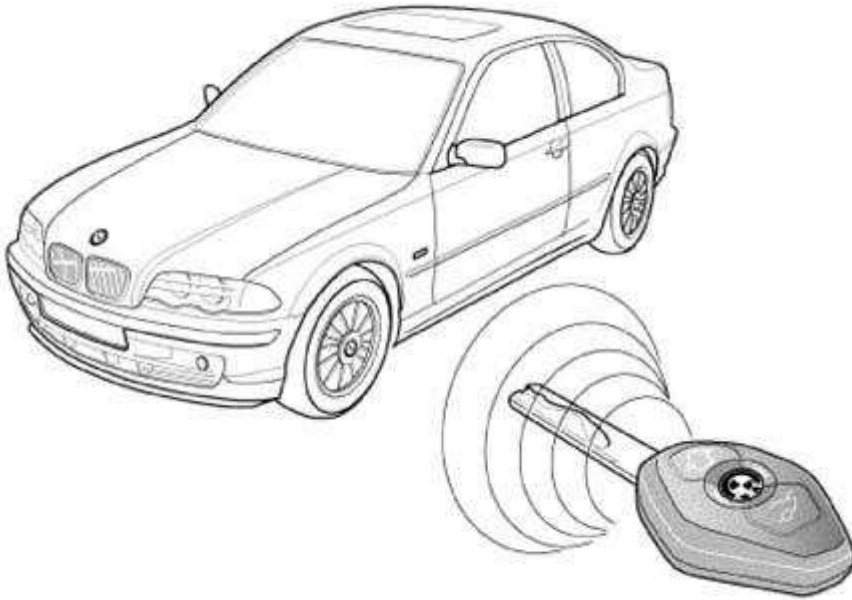
Carry out programming/coding using appropriate BMW scan tool.

ACCESSORIES & BODY, CAB

Remote Keyless Entry - SI Techniques - All Models (Model Year 09/1999 And Up)

NEW RADIO REMOTE CONTROL (RKE)

All Models Beginning 09/99



G03179551

Fig. 1: Identifying New Radio Remote Control
Courtesy of BMW OF NORTH AMERICA, INC.

1. RADIO TECHNOLOGY

Radio technology is a comprehensive term covering all areas of cordless telecommunication such as telephone, radio, television. Transmission is by means of electromagnetic waves.

Due to the fact that the radio waves are not limited to one single direction and have a wider range than the infrared waves, this technology is also being increasingly employed in remote controls.

The same remote-control technology is used in motor vehicle construction as, for example, in construction site cranes, in model construction, alarm systems, garage-door opening systems etc.

These remote controls are operated on the same approved frequency (315 MHz or 433.92 MHz).

2. RADIO REMOTE CONTROL, GENERAL INFORMATION

The radio remote control for the central locking system (FZV) is a further development of the radio-compact

remote control, or the radio remote control which first appeared in the E38.

The radio transmitter is still located in the grip of the car key, the receiver module is installed in the vehicle. All radio telegrams are encoded by means of a constantly changing code. This ensures that the vehicle cannot be opened by someone who has eavesdropped telegrams.

Depending on vehicle type, equipment and country-specific version, in addition to the functions "opening/closing central locking system" and "central arrest" the following functions are also available: "activating/deactivating alarm system", "deactivating tilt sensor/passenger-compartment sensor", "convenient opening/closing window and sliding roof", "switching on interior lighting" and "opening/closing luggage compartment lid".

The remote control keys can be initialized at the vehicle without visiting a BMW Service point when, for example, the owner requires additional keys or, for security reasons, following the loss of a radio remote control key. The initialization procedure is described in the respective Owner's Handbooks.

The radio remote control is available as standard equipment in the models E38, E39, E46 and as an option in the E36 models (option 302).

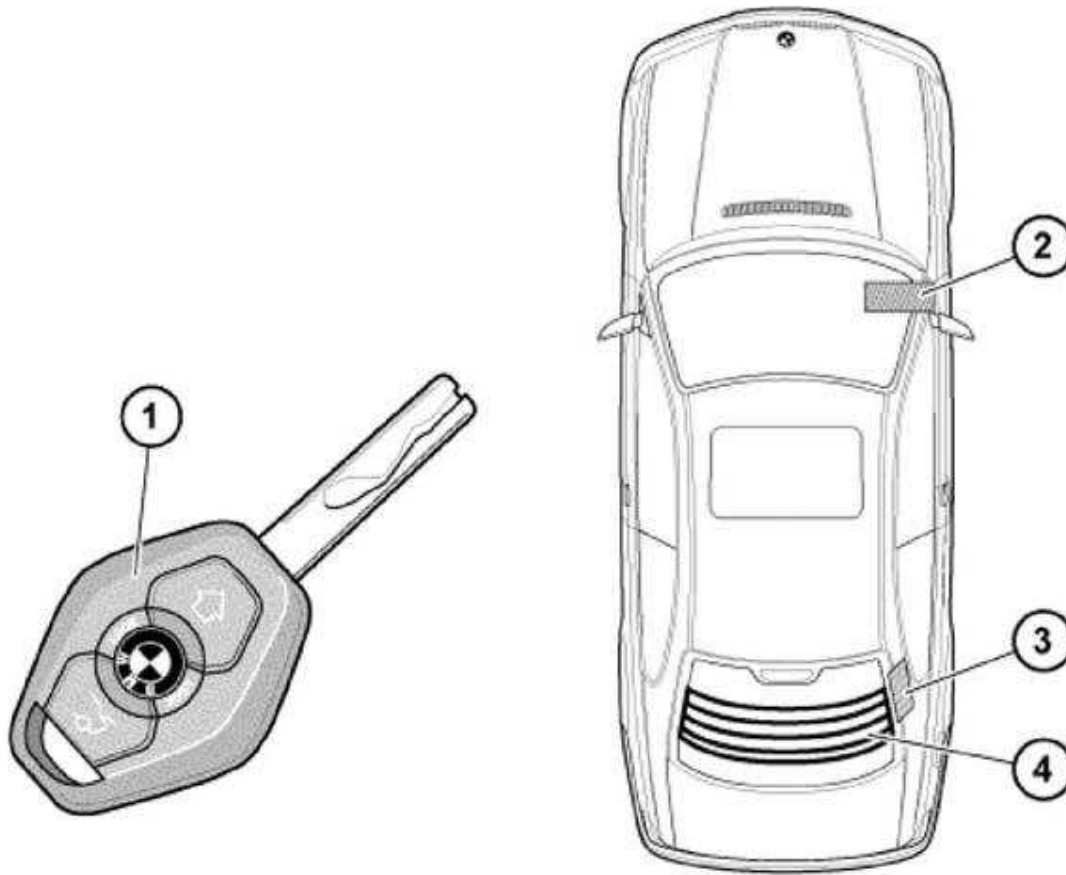
Up to 4 radio transmitters can be operated per vehicle.

In many countries, radio remote controls are subject to radio-technical registration specifications. The required designation is on the key grip.

3. SYSTEM OVERVIEW

The radio remote control consists of:

1. Radio transmitter (integrated in the key grip)
2. General module of the central body electrics (ZKE)
3. Receiver module (integrated in aerial amplifier or aerial diversity)
4. Aerial in rear window or rear side window on touring

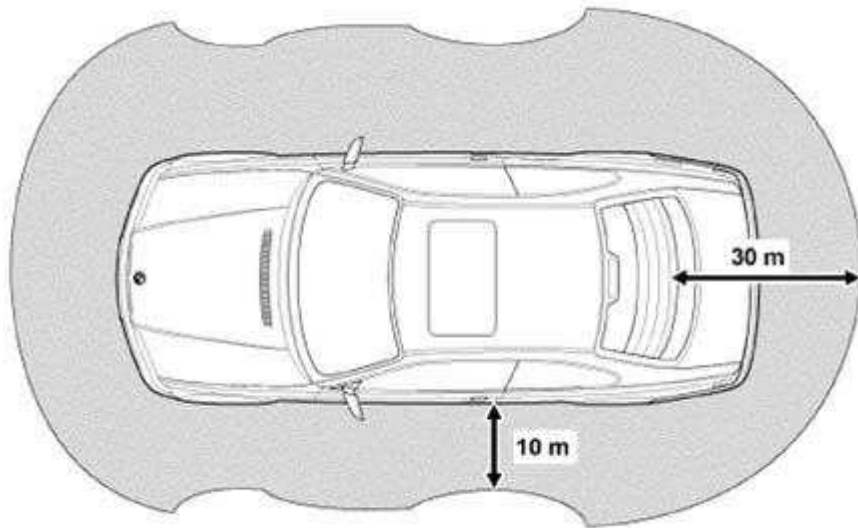


G03179552

Fig. 2: Identifying RKE Components & Locations
Courtesy of BMW OF NORTH AMERICA, INC.

The reception of the radio signals from the transmitter varies according to location in relation to vehicle. The rear area (aerial) of the vehicle is the reference point.

External influences can cause the range or operation of the remote control to deviate from the mean distances specified below either **positively** (through reflection) or **negatively** due to sources of interference (radio-technical systems).



G03179553

Fig. 3: Identifying RKE Range Of Operation
Courtesy of BMW OF NORTH AMERICA, INC.

External radio-technical systems/equipment that are operated on the same frequency (433.92 MHz; 315 MHz; 70 cm band) with a higher output can interfere with the remote control function. Possible sources of interference are:

- Radio Headphones (Known As Cordless Headphones)
- Radio Sets (Amateur Radio; Radio Telephone; Toy Models)
- Radio Modems
- Garage-Door Remote Controls
- Telemetry Transmitters, E.G. Weather Station With Temperature Sensor
- House Burglar Alarm Systems With Sensors
- Remote-Controlled Sockets
- Radio Bells (For Paging)
- TV Radio Systems (Reverse Channel For Television Remote Control)
- Industrial Plants
- Non-Suppressed Electric Motors

4. REMOTE CONTROL FUNCTIONS

- Opening/closing central locking system (ZV)
- Switching on interior lighting
- Activating/deactivating anti-theft alarm system (DWA)
- Activating/deactivating tilt sensor and interior protection of the anti-theft alarm system
- Opening/closing side windows

- Opening/closing sliding roof
- Opening/closing luggage compartment lid
- Activating/deactivating Panic Mode - only US models

If required, this function can be used to trip an alarm via the DWA.

5. OPERATING RELIABILITY

As of ignition lock position 1 (terminal "R", no more remote control functions are carried out.

If the ignition lock switches to position 1 following "Central arrest" of the central locking system (ZV), the ZV changes "Central arrest" to "Central locking".

If there is a key in the ignition lock which is recognised as valid by the electronic immobiliser III, the central locking system cannot be actuated in "Central arrest".

Due to the high range, "Convenient closing" of the rear vent windows is not possible on the E46 coupe as these windows do not have an anti-trap function.

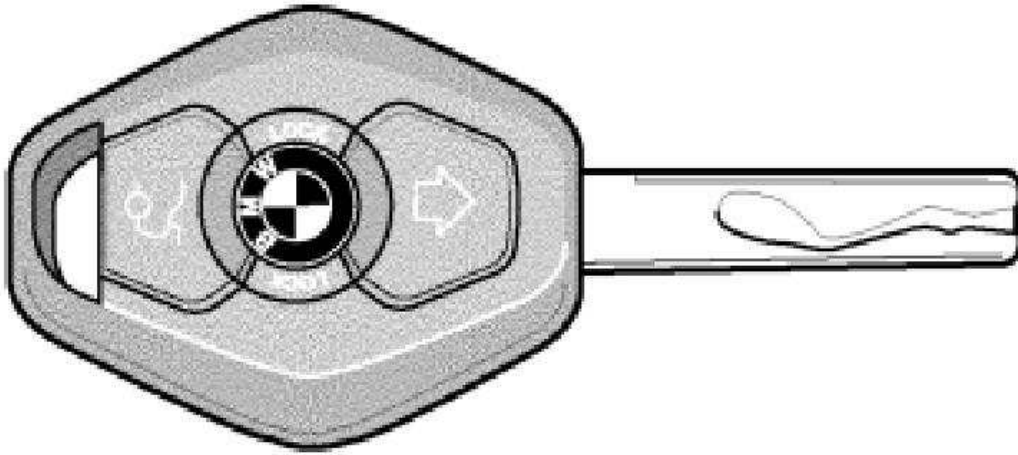
All of the comfort functions and closing of the automatic luggage compartment lid operate only as long as the appropriate button is actuated on the remote control key.

6. NEW RADIO TRANSMITTER (KEY)

Beginning in September 1999, a new generation of radio transmitters will be introduced into series production.

The most important basic functions are the same as those of the present transmitters.

The operating functions will still be actuated via three buttons.



G03179554

Fig. 4: Identifying New Radio Transmitter (Front Of Key)
Courtesy of BMW OF NORTH AMERICA, INC.

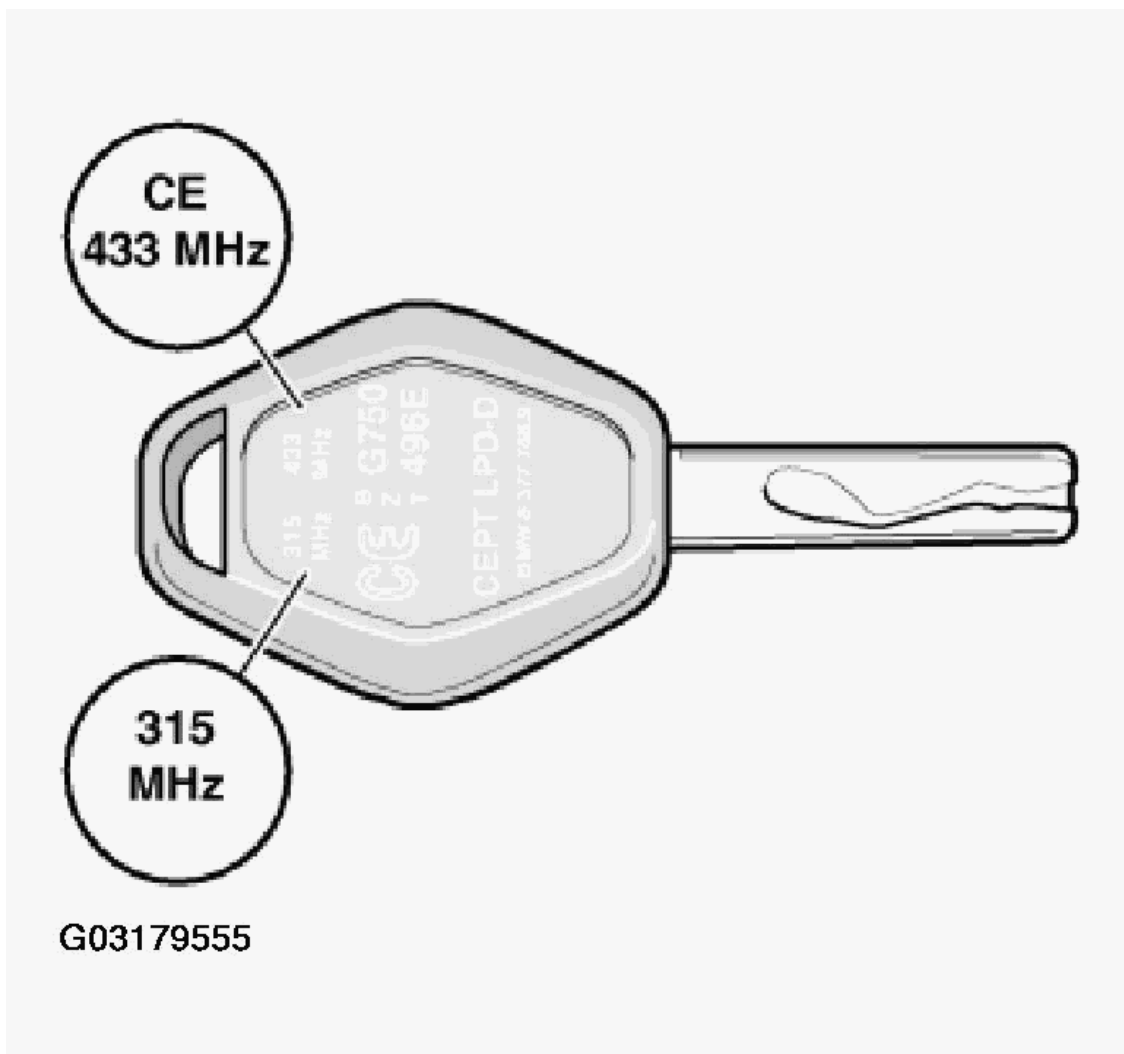


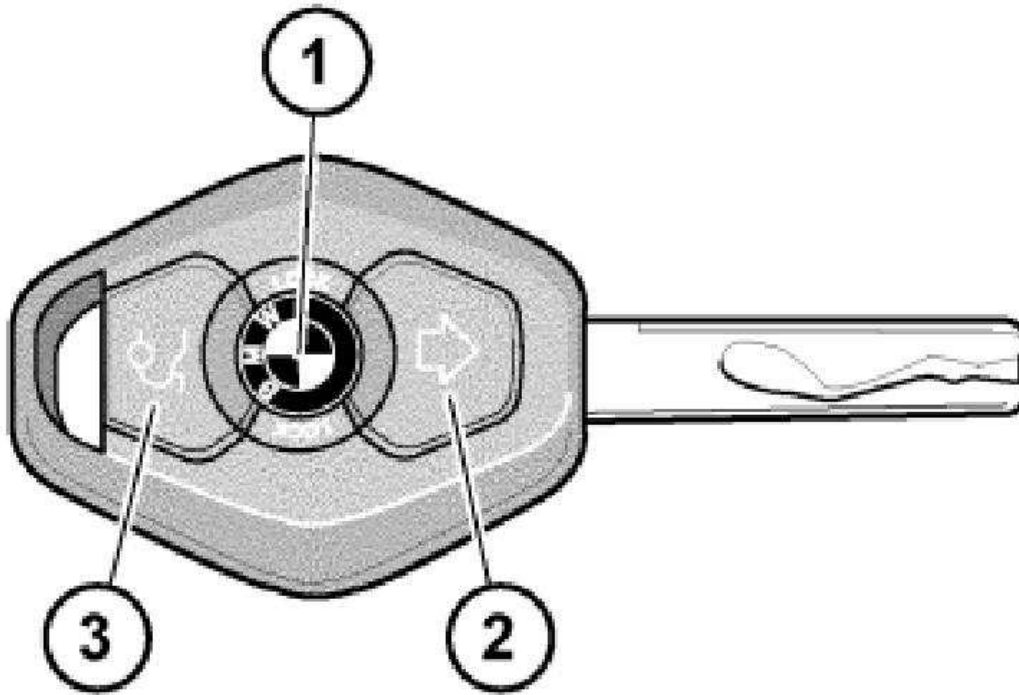
Fig. 5: Identifying New Radio Transmitter (Back Of Key)
Courtesy of BMW OF NORTH AMERICA, INC.

Overview Of Modifications:

1. New appearance with coloured BMW logo.
2. New keyboard arrangement and larger keys.
3. A storage battery instead of a regular battery, charged via the ring aerial at the ignition lock.
4. The key casing is waterproof, dustproof, sealed and cannot be opened.
5. The function display (red LED) has been omitted.

6.1 Operating Principles Of Input Keys

(Basic Functions)



G03179556

Fig. 6: Identifying RKE Input Buttons
Courtesy of BMW OF NORTH AMERICA, INC.

Press **button 1** briefly:

- Central locking system closes, moves into central arrest, the DWA may be activated.
- The interior lighting is switched on when the vehicle is locked.
- Panic Mode (on US models) is deactivated again.

Press **button 1** a second time after a short interval:

- The interior protection and tilt sensor of the DWA are deactivated

Press **button 1** and hold in:

- Central locking system, side windows and sliding roof close ("Convenient closing").
- This function is encoded differently from country to country and is not available in all national versions.

Press **button 2** briefly:

- Central locking system opens, interior lighting switches on, the DWA may be deactivated.

Press **button 2** and hold in:

- Central locking system, side windows and sliding roof open ("Convenient opening").

Press **button 3** briefly:

- Luggage compartment lid opens.

Press **button 3** and hold in:

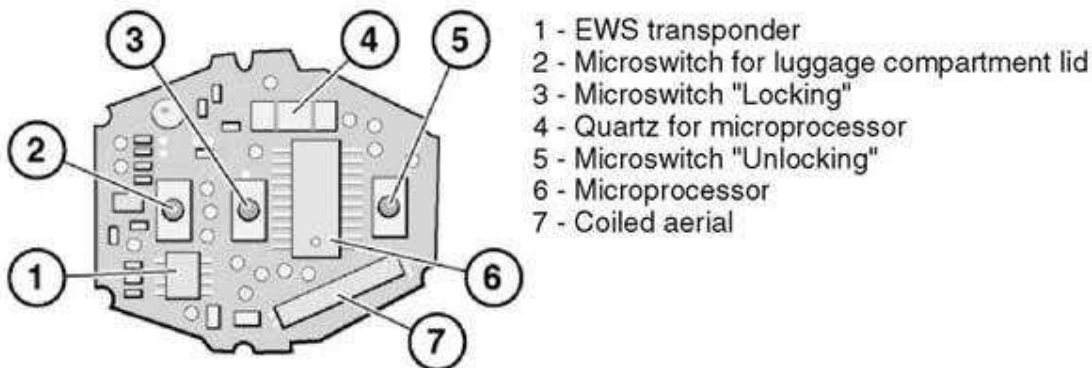
- Panic Mode (on US models) is active again.
- Automatic luggage compartment lid closing.

Individual functions may deviate from those described above; this depends on the respective country-specific encoding and the settings made via Car & Key Memory.

6.2 Signal Processing

Signal processing is by means of a microprocessor on the printed circuit board in the key casing. This microprocessor:

- Evaluates The Key Actuations,
- Generates The New Key Code,
- Relays The Key Code,
- Controls Transmitter Output Stage,
- Monitors Power Supply (Storage Battery) For Radio Transmitter.



G03179557

Fig. 7: Identifying RKE Components On Printed Circuit Board Of Key
 Courtesy of BMW OF NORTH AMERICA, INC.

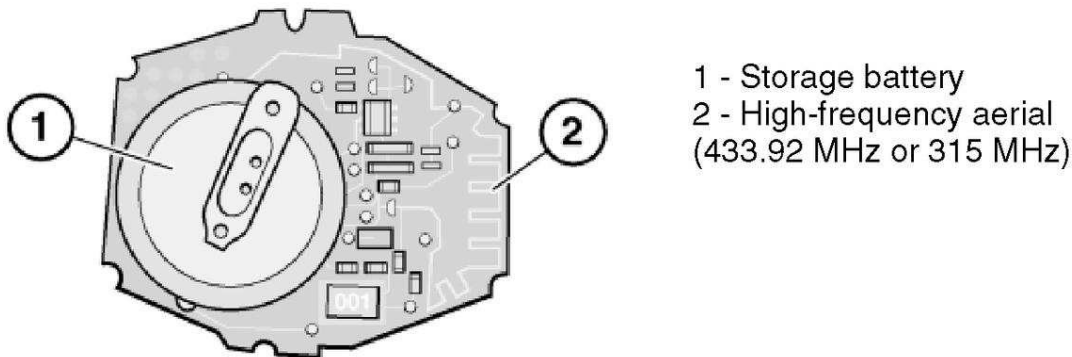
The signals transmitted via the transmitter output stage are radiated via an aerial integrated on the printed circuit board. The carrier frequency is 433.92 MHz (ECE) or 315 MHz (US), depending on country-specific registration.

When the system is being initialized, a key code is created and stored in the microprocessor of the radio transmitter. Following every key actuation at the radio transmitter, a new key code is transmitted (changing code). The codes are recalculated according to a specified process so that the receiver module can differentiate reliably between its own and external radio transmitters.

NOTE: Each transmitter can "lose" its key code if, e.g., someone inadvertently actuates buttons in the initialization sequence outside the car. In this case, all radio transmitters belonging to the car must be re-initialized.

6.3 Power Supply

The new radio transmitter does not use regular batteries but rather a rechargeable vanadium-lithium storage battery. New radio transmitters will be supplied with charged storage batteries.



- 1 - Storage battery
- 2 - High-frequency aerial (433.92 MHz or 315 MHz)

G03179558

Fig. 8: Identifying Storage Battery And High-Frequency Aerial
Courtesy of BMW OF NORTH AMERICA, INC.

As of ignition lock position 1 (terminal "R"), the storage battery is charged inductively. The charging process is realized via the ring aerial of the ignition lock and via the coiled aerial integrated in the radio transmitter. An electronic charging unit on the printed circuit board controls the charging process.

The battery is designed for a very long service life. A prerequisite is that the radio transmitter is used.

If radio transmitters are not used, the storage battery is discharged after approx. 18 months.

With severely discharged storage batteries, the charging period is approx. 30 hours up to maximum capacity. After charging for approx. 30 minutes, the remote control can be actuated approx. 15 times.

6.4 Voltage Monitoring

If cell-end voltage has been reached, the central locking system, for example, can no longer be locked using the remote control. The "Convenient closing" can no longer be used, nor can the radio transmitter be initialized.

Every time a button is actuated, the storage battery voltage in the radio transmitter is monitored. Once the storage battery signal is contained in three consecutive telegrams, it is stored together with the corresponding radio transmitter key number for diagnostic purposes in the general module of the central body electrics. The entry is deleted when five consecutive radio transmitter telegrams no longer contain the storage battery signal.

In the case of E38 and E39 models, this status is already indicated by a signal in the check control.

7. SYSTEM INITIALIZATION

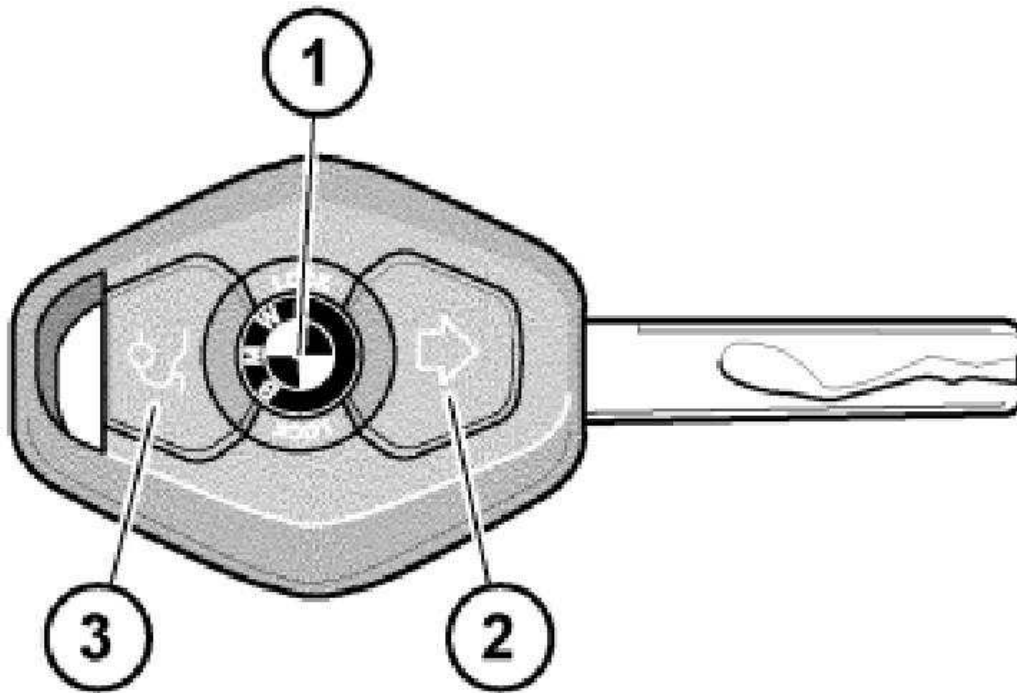
In order that the radio transmitters can communicate with the vehicle, each individual radio transmitter must be initialized with the receiver module.

Up to four radio transmitters can be initialized and used per vehicle.

Since each radio transmitter has its own key code, all existing radio transmitters must be reinitialized when, for example, a new radio transmitter is to be added.

Initialization Procedure:

1. Open central locking system (ZV) using the car key.
2. Get into the car and close all doors.
3. Using the car key, switch the ignition lock briefly to ignition lock position 1 and then switch off again. The switching time must remain under 5 seconds, otherwise the system is not ready for initialization.
4. At the radio transmitter: Press button 2 and hold in.
5. Press button 1 three times (in a space of 10 seconds). Button 2 must remain held in.
6. Release button 2.
7. The ZV signals by means of "Locking" and immediate "Unlocking" that a radio transmitter has been successfully initialized.



G03179559

Fig. 9: Identifying RKE Input Buttons
Courtesy of BMW OF NORTH AMERICA, INC.

If the ZV does not send a return signal, initialization must be restarted.

Once the first initialization process has been completed, another three radio transmitters can be initialized.

For every other radio transmitter, the procedure described under step 4) above must be repeated within 30 seconds, otherwise initialization stand-by is switched off.

During initialization, all other existing radio transmitters must be initialized. The ignition lock must never be reactivated during the initialization process. If this were to happen, then all radio transmitters would have to be re-initialized.

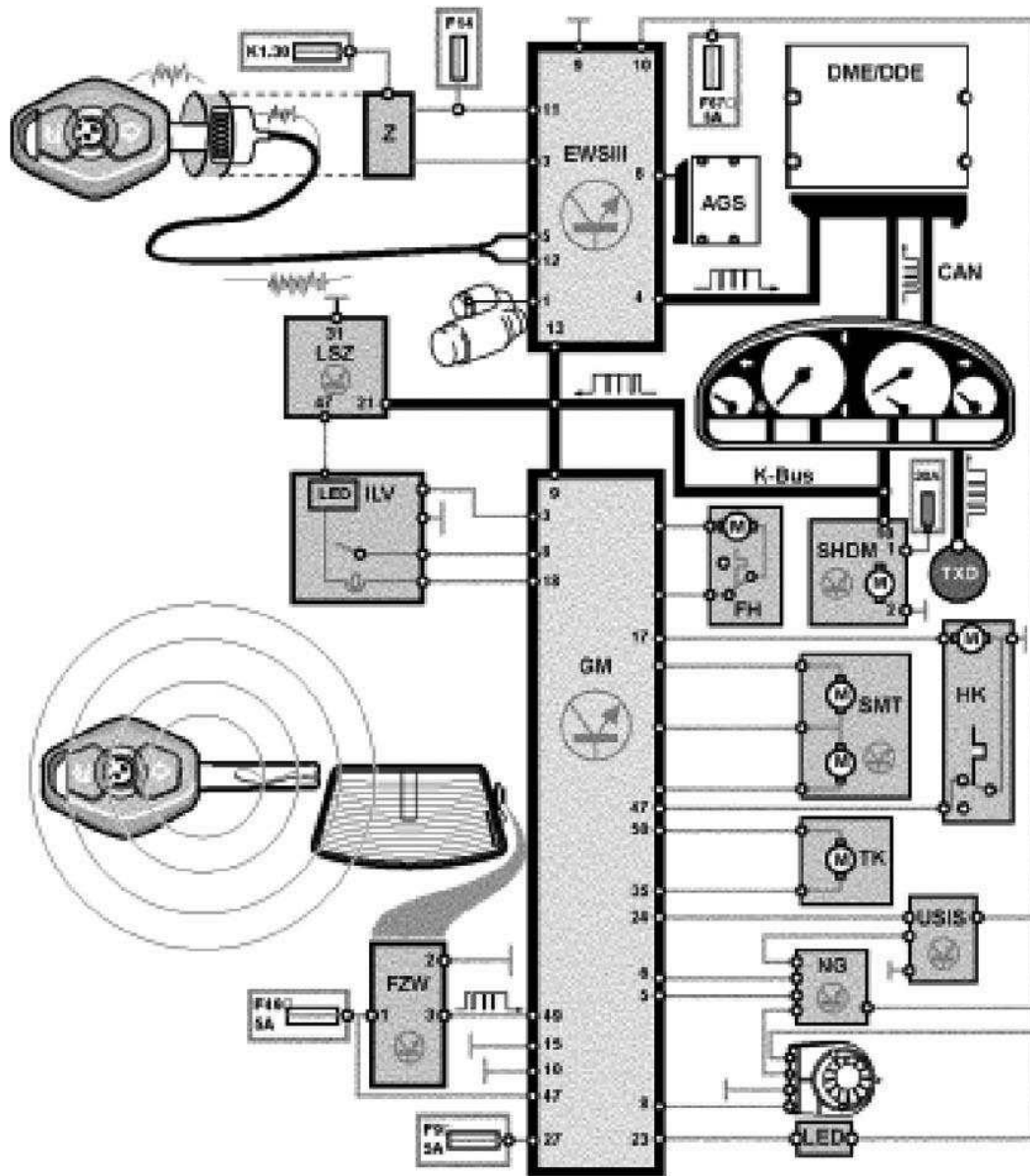
8. DIAGNOSIS

The radio remote control can be diagnosed via DIS and MoDiC under "Central body electrics - ZKE".

9. SYSTEM INTERCONNECTIONS

Various functions in the central body electrics, the anti-theft alarm system (DWA) and the electronic immobiliser (EWS) can be activated or deactivated by means of the radio transmitters.

During vehicle diagnosis, it is important to know how the radio transmitter influences the total system.



G03179560

Fig. 10: Identifying System Interconnections And Function (E46 Shown)
Courtesy of BMW OF NORTH AMERICA, INC.

SYSTEM INTERCONNECTION LEGEND

Component	Designation
Z	Ignition lock, electromechanical part
EWSIII	Electronic immobiliser, control unit
EWSIII/1	Output - starter signal (X1659)
EWSIII/3	Input - ignition/starter switch signal (X1659)
EWSIII/4	Output - engine control unit signal, uni-directional (X1659)
EWSIII/5	Output - ring coil signal (X1659)
EWSIII/6	Input - transmission control unit switch signal (X1659)
EWSIII/9	Ground/earth (X1659)
EWSIII/10	Input - terminal 30 of fuse F67 (X1659)
EWSIII/11	Input - terminal R from ignition lock via fuse F14 (X1659)
EWSIII/12	Output - ring coil signal (X1659)
EWSIII/13	Input/output - K bus signal (X1659)
F9	Terminal 30/5A fuse
F46	Terminal 30/30A fuse
F49	Terminal 30/5A fuse
F67	Terminal 30/5A fuse
LSZ	Central light switch
LSZ/21	Input/output K bus (X12)
LSZ/31	Ground/earth (X12)
LSZ/47	Output - search light signal (58g) (X12)
ILV	Interior lighting, front
ACS	Automatic transmission control unit
DME/DDE	Digital Engine Electronics/Digital Diesel Electronics
DME/33	Input - EWS release signal (X6004)
CAN	Controller Area Network (CAN bus)
K-Bus	Bodyshell bus
FH	Window lift (stands for all window lifts in vehicle)
SHDM	Sunroof module
SMT	Lock module (stands for all doors)
HK	Luggage compartment lid motor
TK	Fuel filler cap drive
USIS	Ultrasonic interior protection
NG	Tilt sensor
FZV	Radio central locking receiver
FZV/1	Input - terminal 30 signal of fuse F49 (X1143)
FZV/2	Ground/earth - (X1143)

FVZ/3	Input/output - radio transmitter signal (X1153)
GM	General module V
GM/3	Output - electric consumer cut-out signal (X332)
GM/5	Output - tilt sensor monitoring signal (X254)
GM/6	Input - tilt sensor monitoring, immobiliser signal (X254)
GM/8	Input - interior lighting switch signal, front, continuous operation (X253)
GM/8	Output - control signal, DWA emergency power siren alarm (X254)
GM/9	Input/output - K bus signal (X253)
GM/10	Ground/earth (X253)
GM/17	Output - luggage compartment lid unlocking motor signal to luggage compartment lid drive (X253)
GM/18	Input - interior lighting signal (X253)
GM/23	Output - DWA light emitting diode signal (X254)
GM/24	Input - passenger-compartment sensor signal (USIS) (X254)
GM/27	Input - terminal R of fuse F9 (X253)
GM/35	Output - fuel filler cap unlocking signal (X253)
GM/42	Input - luggage compartment lid contact signal from luggage compartment lid drive (X253)
GM/47	Input - terminal 30 signal of fuse F49 (X253)
GM/49	Input/output - radio remote control data line signal (X253)
GM/50	Output - fuel filler cap locking signal (X253)
TXD	Diagnostic bus to diagnostic connector

ACCESSORIES & EQUIPMENT

Seats - Operating Fluids

1.0 SEAT LEATHER CARE

"Karneol" leather care cleans the leather upholstery of mild stains or dirt. It also provides conditioners to prevent drying out. Not suitable for suede.

BMW Part No. 81 22 9 400 901.

2.0 PREMIUM LEATHER CARE KIT

BMW Part No. 81 11 024 455.

ACCESSORIES AND EQUIPMENT

Seats - Repair Instructions - X3

13 FRONT SEAT NORMAL, MANUAL

52 13 ... REMOVING AND INSTALLING/REPLACING GUIDE FOR FRONT LEFT OR RIGHT HEAD RESTRAINT

Remove rear panel on front seat backrest:

Basic seat, refer to 52 13 198.

Sports seat, refer to 52 15 198.

Guide for head restraint with pushbutton:

Release catches (1) and (2) and slide guide (3) upwards.

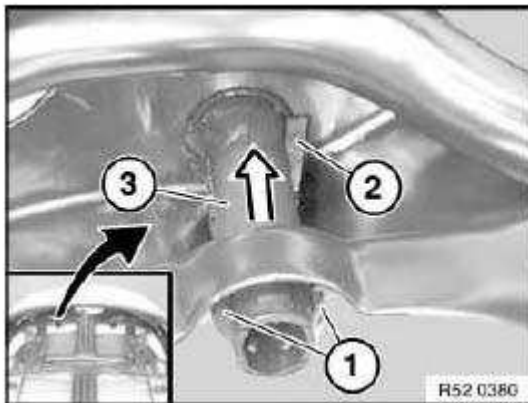


Fig. 1: Releasing Catches And Slide Guide
Courtesy of BMW OF NORTH AMERICA, INC.

Pull guide (1) out of backrest (2).

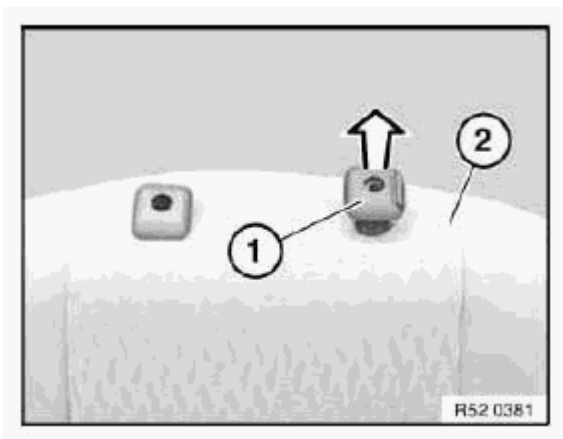


Fig. 2: Pulling Guide Out Of Backrest
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Catches (1) and (2) on guide (3) must not be damaged.

Check that pushbutton (4) works properly.

After installing guide (3), make sure it is properly seated.

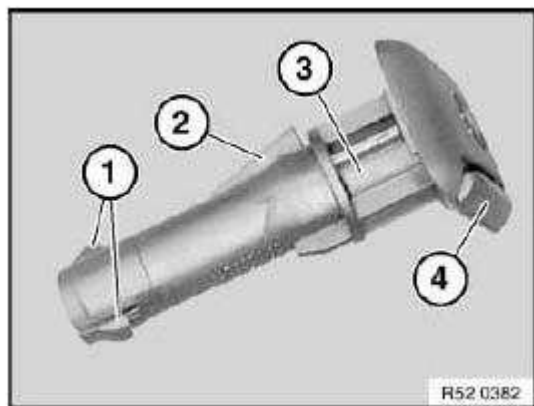


Fig. 3: Catches And Pushbutton
Courtesy of BMW OF NORTH AMERICA, INC.

Guide for head restraint without pushbutton:

Release catches (1) and slide guide (2) upwards.

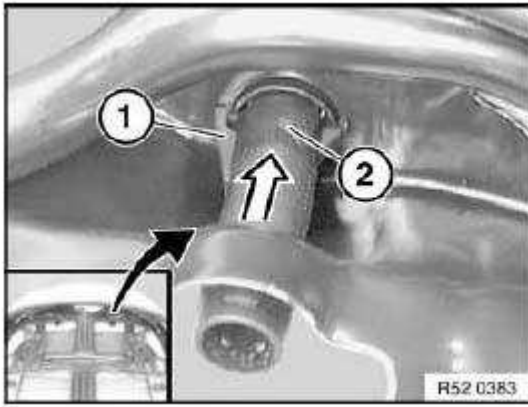


Fig. 4: Releasing Catches And Slide Guide
Courtesy of BMW OF NORTH AMERICA, INC.

Pull guide (1) out of backrest (2).

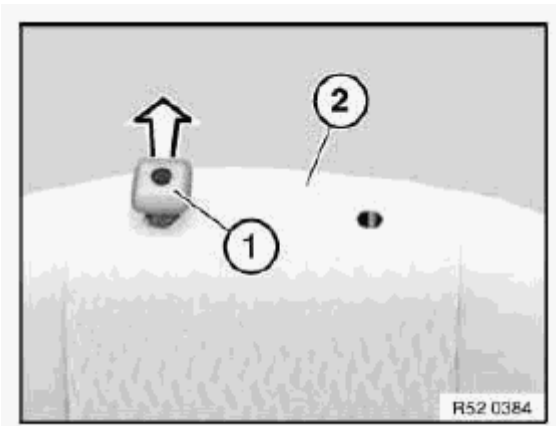


Fig. 5: Pulling Guide Out Of Backrest
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Catch (1) on guide (2) must not be damaged.

After installing guide (2), make sure it is properly seated.

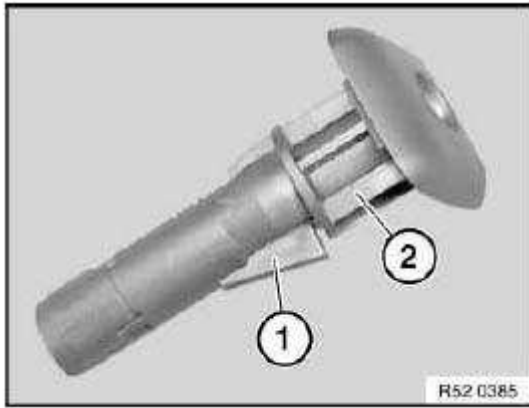


Fig. 6: Catches And Installing Guide
Courtesy of BMW OF NORTH AMERICA, INC.

52 13... REMOVING AND INSTALLING/REPLACING SEAT PAN AND FLEXMAT (NORMAL/MANUAL), LEFT OR RIGHT

Remove seat cover with support,

refer to 52 13 400.

Release left screw (1) and slacken right screw only.

Release left/right screws (3).

Slacken left/right screws (4) only.

Remove left retaining plate (2) downwards.

Installation:

Tightening torque: 52 10 9AZ, see **52 10 FRONT SEATS** .

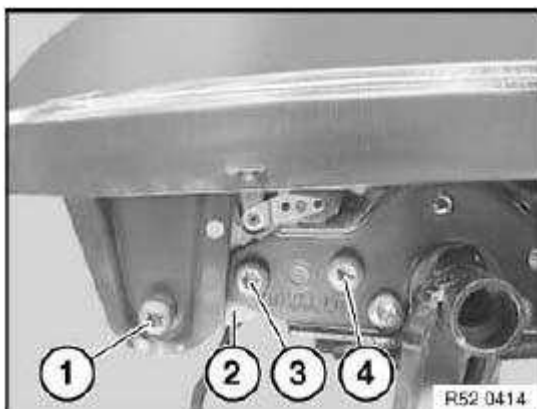


Fig. 7: Left Retaining Plate And Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Press seat pan (1) upwards, thereby relieving tension on flexmat.

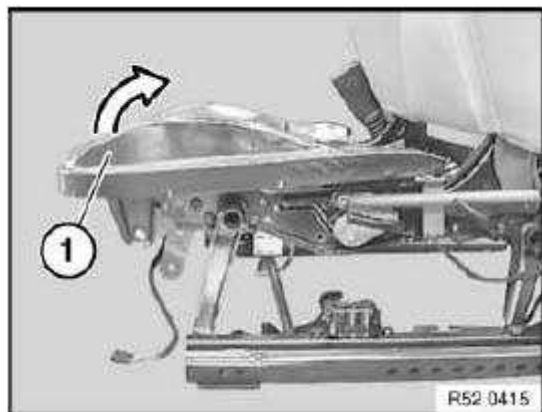


Fig. 8: Pressing Seat Pan Upwards

Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) and remove retaining plates (2).

Installation:

Tightening torque: 52 10 9AZ, see **52 10 FRONT SEATS** .

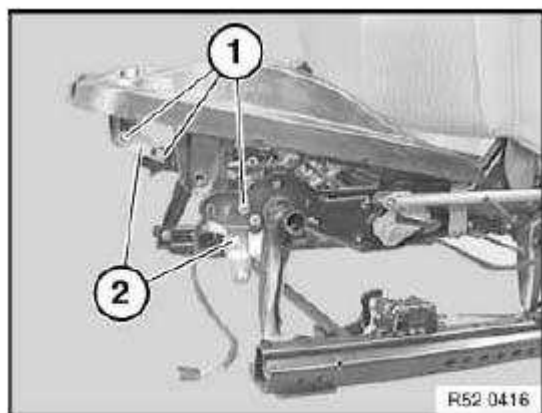


Fig. 9: Retaining Plates And Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Unhook cable (1) from holder (2).

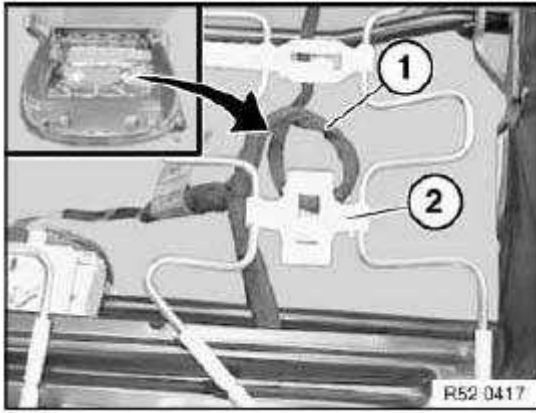


Fig. 10: Releasing Cable From Holder
Courtesy of BMW OF NORTH AMERICA, INC.

Turn seat pan (1) upwards.

Detach flexmat (2) at rear from mounts (3).

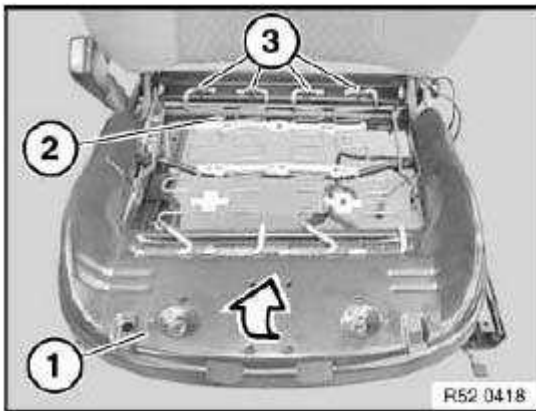


Fig. 11: Turning Seat Pan Upwards
Courtesy of BMW OF NORTH AMERICA, INC.

Detach seat pan (1) on left/right backwards/top from mount (2) and remove.

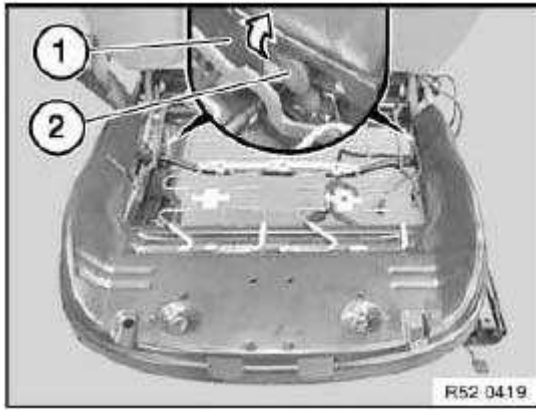


Fig. 12: Separating Seat Pan

Courtesy of BMW OF NORTH AMERICA, INC.

Detach flexmat (1) from mounts (2) on seat pan (3).

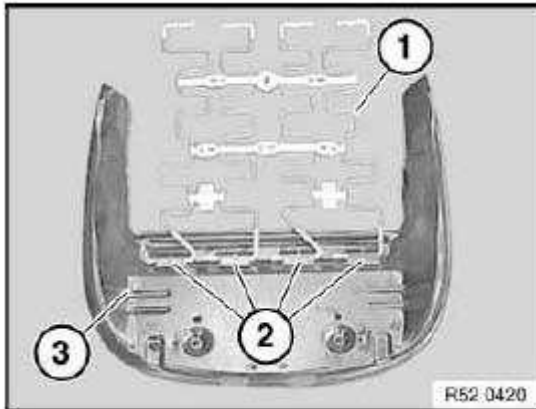


Fig. 13: Separating Flexmat From Mounts

Courtesy of BMW OF NORTH AMERICA, INC.

52 13 015 REMOVING AND INSTALLING / REPLACING CONTROLS ON LEFT / RIGHT FRONT SEAT (NORMAL / MANUAL)

WARNING: The actuating unit for front seats which was fitted during car production is different from the spare part.

Actuating unit version (A):

The two adjusting screws (1) and (2) for eccentric disks, have a commercially available Torx screw head which is sealed with hot-melt adhesive.

- The adjusting screws (1) and (2) must not be adjusted in the workshop.
- The actuating unit may only be removed from and refitted to the same front seat.

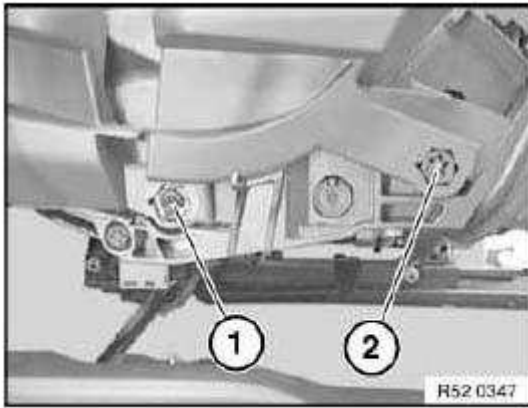


Fig. 14: Adjusting Screws And Eccentric Disks (Actuating Unit Version A)
Courtesy of BMW OF NORTH AMERICA, INC.

Actuating unit version (B):

The two adjusting screws (1) and (2) for eccentric disks, are secured with tamper protection in the screw head.

- The adjusting screws (1) and (2) must not be adjusted in the workshop.
- The actuating unit may only be removed from and refitted to the same front seat.

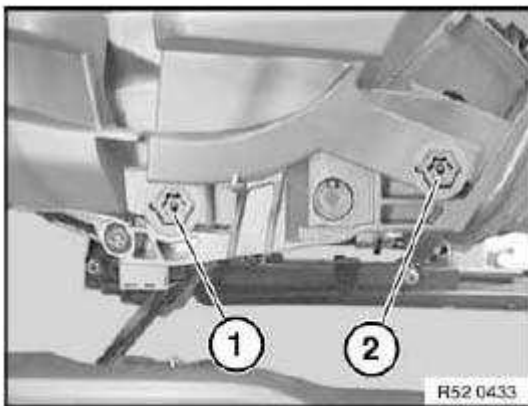


Fig. 15: Adjusting Screws And Eccentric Disks (Actuating Unit Version B)
Courtesy of BMW OF NORTH AMERICA, INC.

Actuating unit version (C) (spare part):

The two adjusting screws for the eccentric disk have conventional Phillips heads.

- The adjusting screws (1) and (2) can be adjusted in the workshop.
- The actuating unit may be fitted to either front seat.
- Prior to installation, apply an acid-free grease to thread; the grease forces the eccentric disk upwards during adjustment

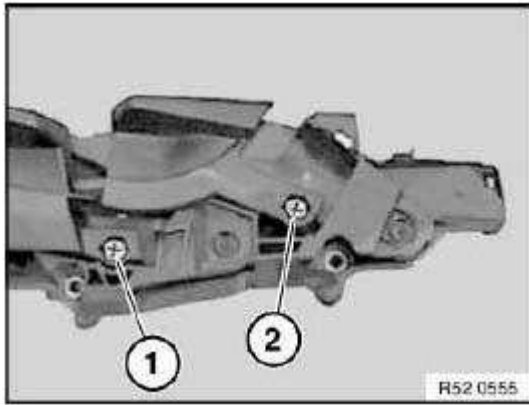


Fig. 16: Adjusting Screws And Eccentric Disks (Actuating Unit Version C
Courtesy of BMW OF NORTH AMERICA, INC.

Removing and installing actuating unit:

Remove front seat,

refer to .

Remove outer cover on front seat,

refer to **52 13 040**.

Move front seat to basic position:

CAUTION: One seat runner is spring-loaded, risk of injury when unlocking.

Operate actuating lever (1) and snap seat runners (2) into position by sliding.

Operate actuating lever (3) and snap seat cushion (4) into position by loading.

Operate actuating lever (5) and snap seat backrest (6) into position by moving.

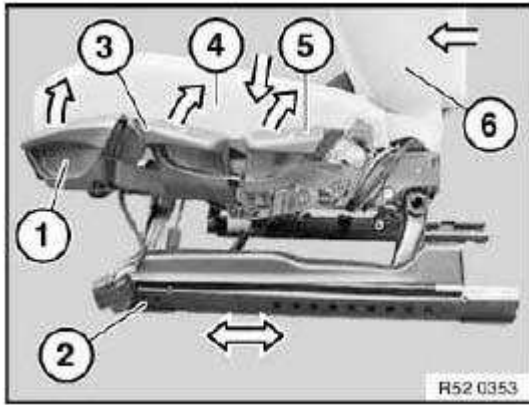


Fig. 17: Removing Actuating Lever And Snap Seat Backrest
 Courtesy of BMW OF NORTH AMERICA, INC.

Lever out rear trim (1), unclip clips (2) and remove trim (1).

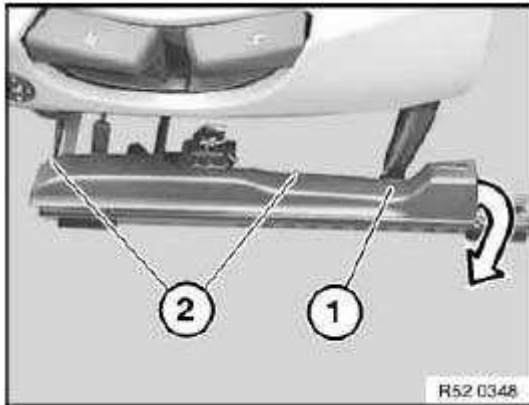


Fig. 18: Removing Trim
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Catch (1) and clips (2) on trim (3) must not be damaged; replace if necessary.

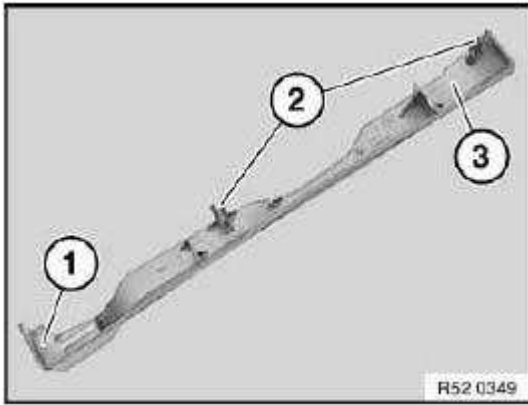


Fig. 19: Catch, Clips And Trim

Courtesy of BMW OF NORTH AMERICA, INC.

Version with seat heater and/or lumbar support:

Slide cable (1) out of fixture (2) of actuating unit (3).

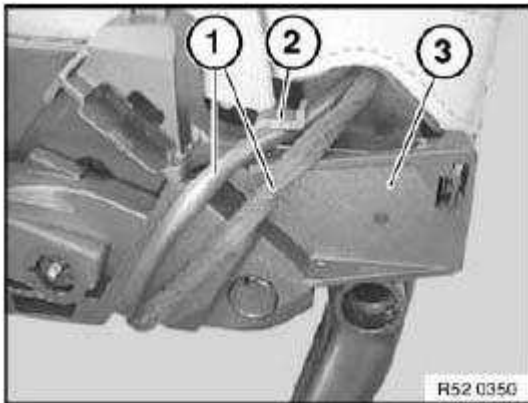


Fig. 20: Slide Cable And Actuating Unit

Courtesy of BMW OF NORTH AMERICA, INC.

Version with seat heater and/or lumbar support:

Slide cable (1) out of fixture (2) of actuating unit (3).

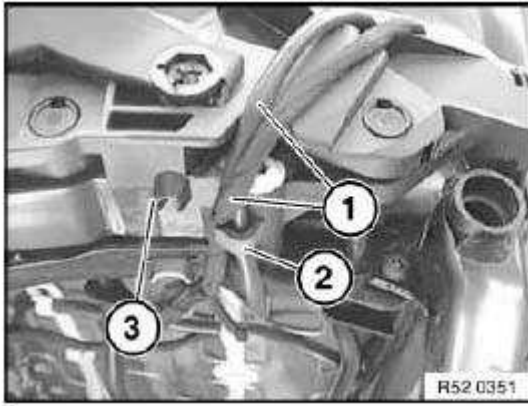


Fig. 21: Slide Cable And Fixture
Courtesy of BMW OF NORTH AMERICA, INC.

Model with lumbar supports:

If necessary, slide cable (1) out of fixture (2) of actuating unit (3).

If necessary, disconnect switch (4).

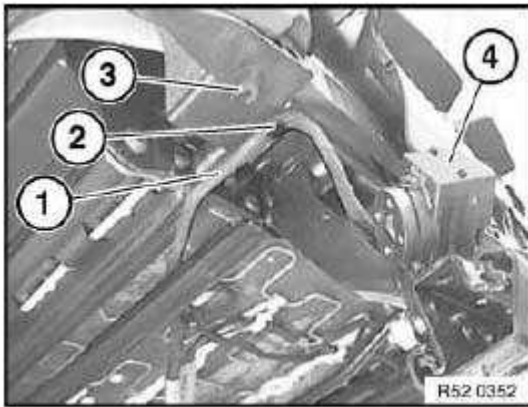


Fig. 22: Slide Cable And Actuating Unit
Courtesy of BMW OF NORTH AMERICA, INC.

Release expansion rivet (1) and detach rocker (2) (adjustment lever) from lever (3).

CAUTION: Do not turn adjustment lever (2) on threaded rod (2).

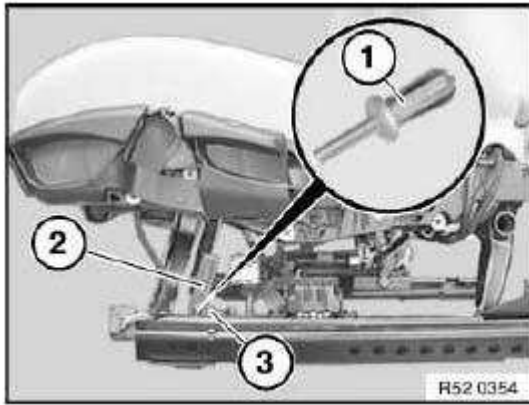


Fig. 23: Releasing Expansion Rivet
 Courtesy of BMW OF NORTH AMERICA, INC.

Lift actuating lever (1) and release screw (2).

Release screws (3) and (4) and detach actuating unit (5).

Installation:

Screw (3) is shorter than the others.

Insert screw (3) for assembly into actuating unit (5).

Tightening torque: 52 10 7AZ, see **52 10 FRONT SEATS** .

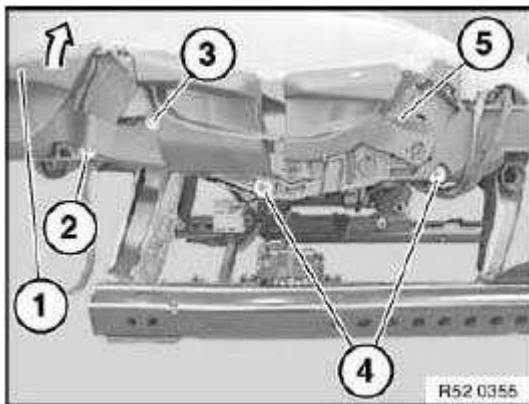


Fig. 24: Lifting Actuating Lever
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Front guide (1) and eccentric disks (2) on actuating unit (3) must not be damaged.

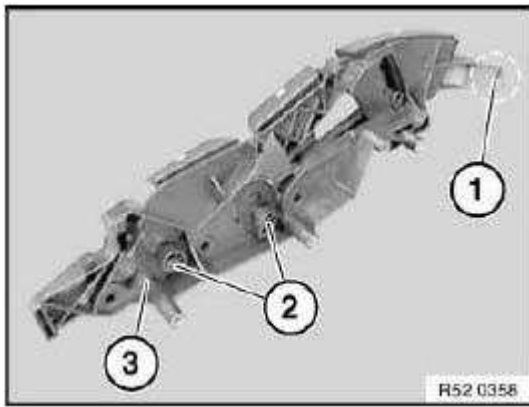


Fig. 25: Eccentric Disks And Actuating Unit
 Courtesy of BMW OF NORTH AMERICA, INC.

Replacement of actuating unit version (C) (spare part) only:

Installation:

For adjustment, coat threads (1) with acid-free grease.

The eccentric disks (2) and (4) are carried upwards for adjustment by the grease.

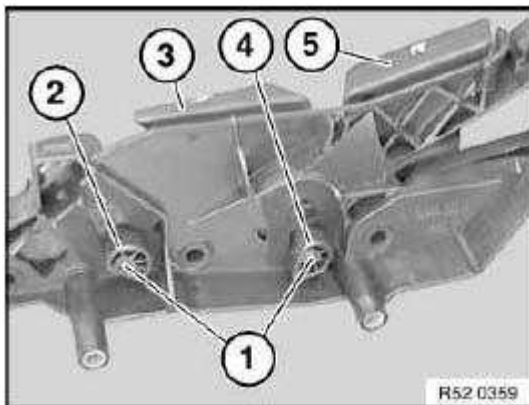


Fig. 26: Coat Threads And Eccentric Disks
 Courtesy of BMW OF NORTH AMERICA, INC.

1. Threads for eccentric disks
2. Eccentric disk for backrest adjustment
3. Actuating lever for backrest adjustment
4. Eccentric disk for seat height adjustment
5. Actuating lever for seat height adjustment

Adjusting actuating unit, actuating unit version (C) (spare part) only:

Adjusting seat height and backrest inclination:

- The screw heads of threads (2) must remain clipped in place
- Unscrew eccentric disk (1)
- Apply acid-free grease to threads (2)
- Screw on eccentric disk (1)
- Turn eccentric disk (1) to zero position: straight surface (3) of eccentric disk (1) must be at top.

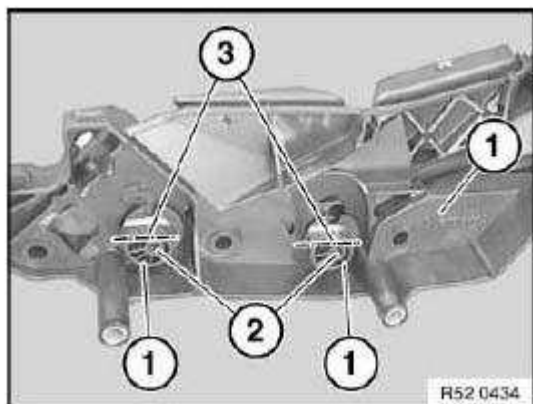


Fig. 27: Actuating Unit And Eccentric Disk

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The picture does not match the replacement unit, the replacement unit has **Phillips screws**.

- Install actuating unit.
- Press screws (1) and (2) out of hexagon head to seat center and screw down.

Tightening torque: 51 12 8AZ, see **51 12 REAR BUMPER** .

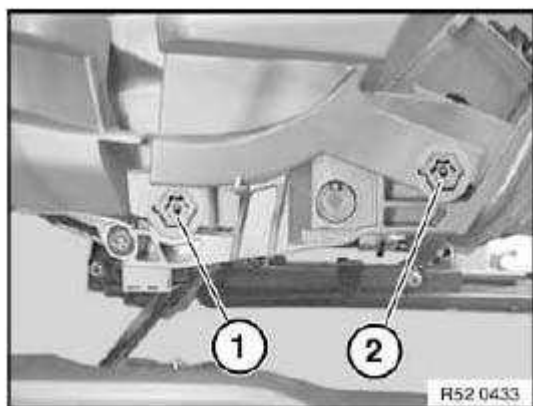


Fig. 28: Adjusting Screws And Eccentric Disks (Actuating Unit Version B)

Courtesy of BMW OF NORTH AMERICA, INC.

Adjust longitudinal seat setting:

- Compress unlocking plates (1) and (2) on seat runner on left/right with gripping pliers (3) (free of play)

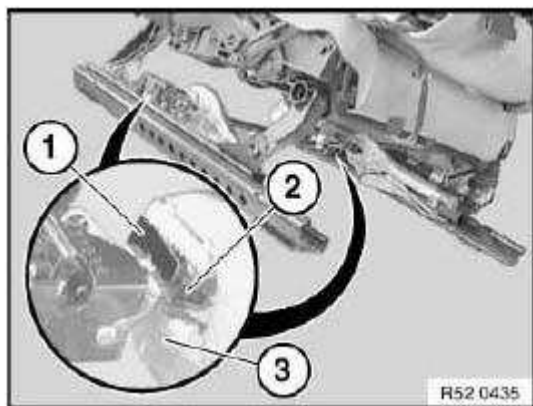


Fig. 29: Unlocking Plates And Pliers
Courtesy of BMW OF NORTH AMERICA, INC.

Adjust longitudinal seat setting:

- Push new coupling link (1) (adjustment lever) onto threaded rod (3) and secure with expansion rivet (2)

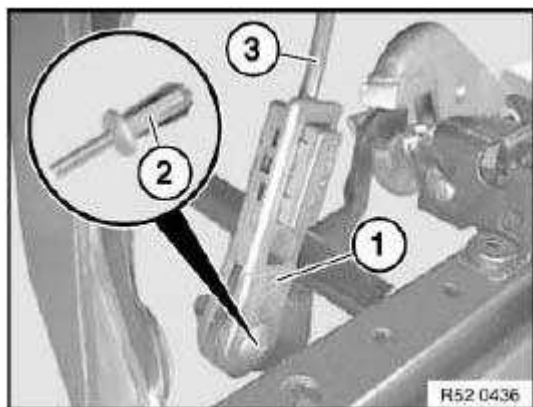


Fig. 30: Coupling Link And Expansion Rivet
Courtesy of BMW OF NORTH AMERICA, INC.

Adjust longitudinal seat setting:

- Press actuating lever (1) for longitudinal seat adjustment downwards and press together locking clip (3) on coupling link (4)

(coupling link (4) is now firmly connected to threaded rod (2))

- Install front seat in the car.

- If necessary, release expansion rivet (5) and readjust by turning coupling link (4)

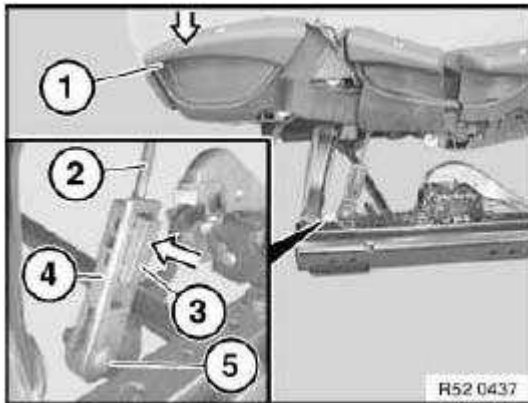


Fig. 31: Pressing Actuating Lever
 Courtesy of BMW OF NORTH AMERICA, INC.

Move front seat to basic position:

- Operate actuating lever (1) and snap seat runners (2) into position by sliding.
- Operate actuating lever (3) and snap seat cushion (4) into position by loading.
- Operate actuating lever (5) and snap seat backrest (6) into position by moving.
- Each actuating lever must have clearance until the mechanism is unlocked
- If there is no clearance, the mechanism may be in a semi - unlocked state (risk of injury in event of an accident)
- If there is excessive clearance, the mechanism may not unlock completely (no adjustment possible)

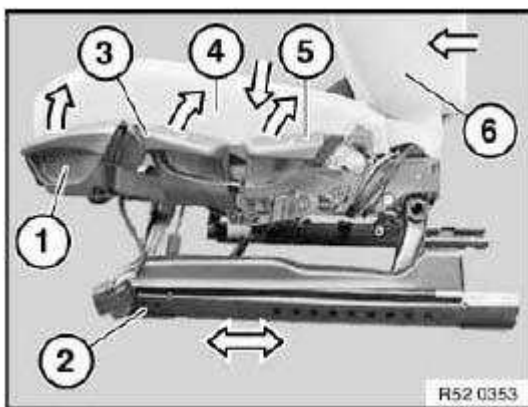


Fig. 32: Removing Actuating Lever And Snap Seat Backrest
 Courtesy of BMW OF NORTH AMERICA, INC.

Carrying out checks of seat height and backrest inclination adjustment (danger to life of vehicle occupants):

Check backrest inclination:

- Front seat must be in basic position
- Actuating lever (1) must be in zero position
- Pin (2) must rest against pull rod (3)
- There must be a clearance (A)

(A) 0 to 0.5 mm

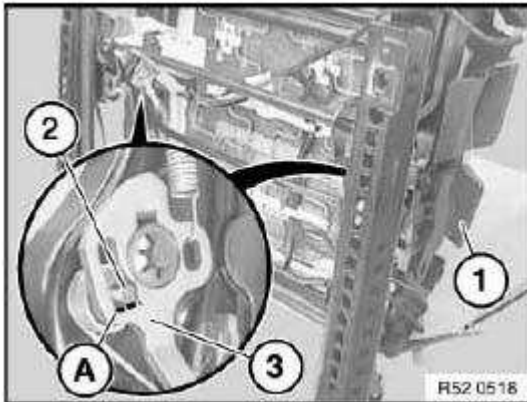


Fig. 33: Actuating Lever And Pin

Courtesy of BMW OF NORTH AMERICA, INC.

Check seat height:

- Front seat must be in basic position
- Actuating lever (1) must be in zero position
- Metal lever (2) must rest against metal lever (3)
- There must be a clearance (A)

(A) 0 to 0.5 mm

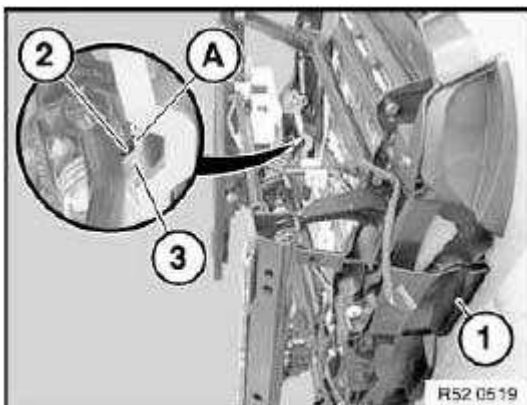


Fig. 34: Actuating Lever And Metal Lever
Courtesy of BMW OF NORTH AMERICA, INC.

52 13 025 REMOVING AND INSTALLING/REPLACING SEAT MECHANISM (ON FRONT SEAT NORMAL/MANUAL), LEFT OR RIGHT

Remove seat pan and flexmat on front seat,

refer to **52 13...**

Remove backrest frame on front seat,

refer to **52 13 030.**

Remove seatbelt tensioner,

refer to **72 11 030** .

Release screw (1) and cable tie (3).

Remove retaining bracket (2) with seat wiring harness from seat mechanism (4).

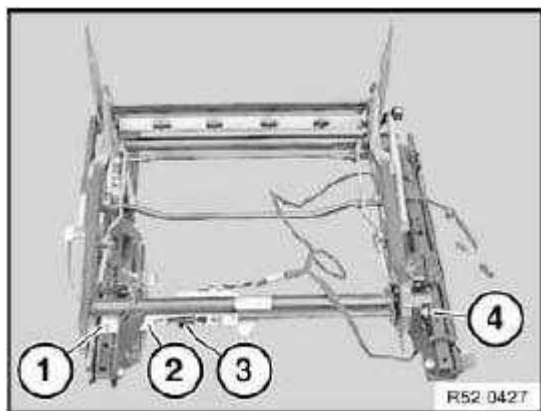


Fig. 35: Releasing Screw And Cable Tie
Courtesy of BMW OF NORTH AMERICA, INC.

52 13 030 REMOVING AND INSTALLING / REPLACING BACKREST FRAME ON LEFT OR RIGHT FRONT SEAT (NORMAL / MANUAL).

Remove backrest frame and backrest cover with support,

refer to **52 13 405.**

Model with lumbar supports:

If necessary, remove lumbar cushion on front seat,

refer to **52 13 050**.

If necessary, remove valve housing for lumbar support, front,

refer to .

If necessary, remove lumbar support drive mechanism on front seat,

refer to **67 66 010** .

If necessary, release screw (1) and remove metal nut (2).

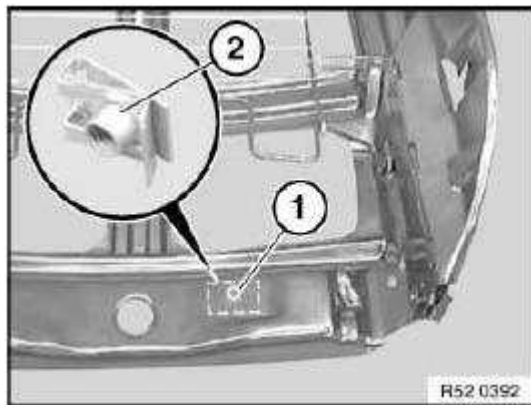


Fig. 36: Metal Nut

Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, remove mat (1) from spring wire (2) of backrest frame (3).

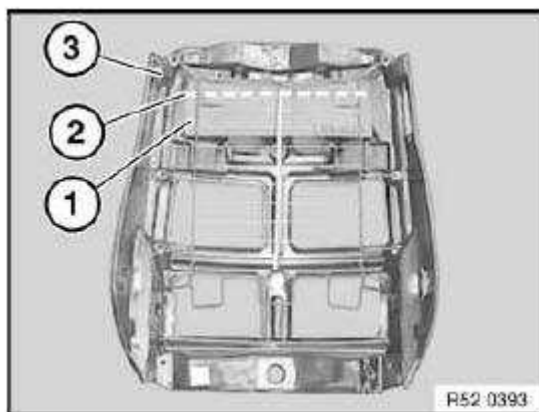


Fig. 37: Mat And Spring Wire

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

If necessary, suspend mat (1) on uppermost spring wire (2) on backrest frame (3).

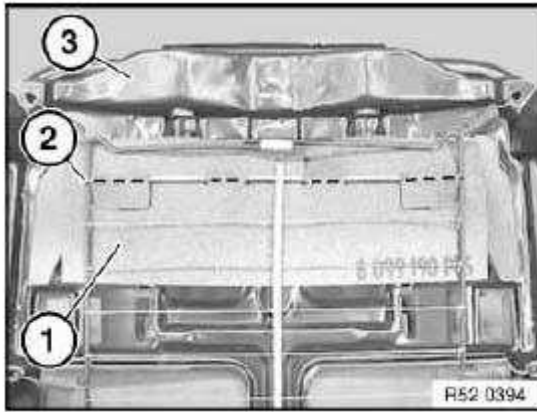


Fig. 38: Spring Wire And Backrest Frame
Courtesy of BMW OF NORTH AMERICA, INC.

52 13 040 REMOVING AND INSTALLING / REPLACING OUTER COVER ON LEFT OR RIGHT FRONT SEAT BACK-REST (NORMAL / MANUAL)

Unscrew bolt (1).

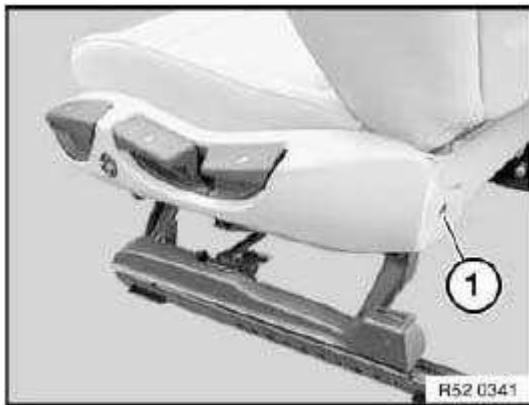


Fig. 39: Outer Cover Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Snap out catches (1) at front/rear
and tongue (2) at rear
from cover (3) towards top and
pull outwards a little.

Installation:

Slide tongue (2) into mounts and snap into place.

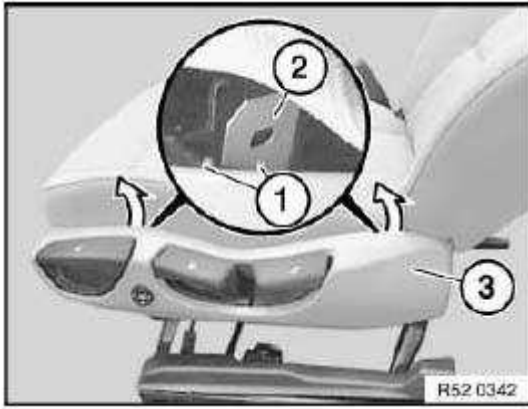


Fig. 40: Removing Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Lever lugs (1) on cover (3) out of brackets (2).

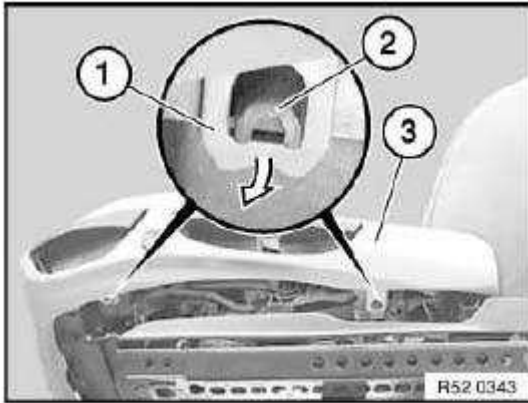


Fig. 41: Removing Lever Lugs
Courtesy of BMW OF NORTH AMERICA, INC.

Lever out cover (1) at rear, detach at front from guide and remove.

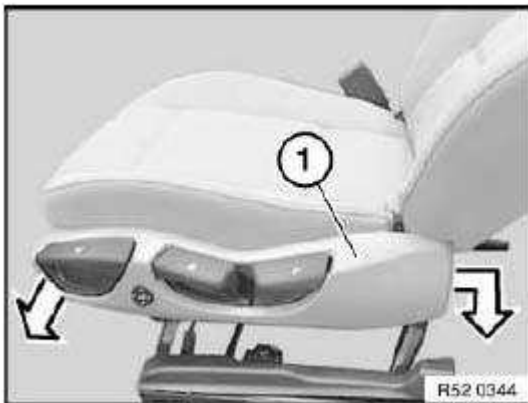


Fig. 42: Removing Front From Guide
Courtesy of BMW OF NORTH AMERICA, INC.

Model with lumbar supports:

If necessary, press down catches (1) on left/right and remove switch (2) from cover (3).

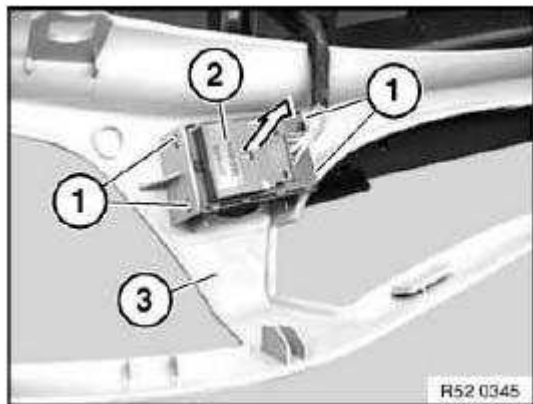


Fig. 43: Removing Switch From Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Following parts must not be damaged,

replace cover (4) if necessary:

1. Catches, top
2. Guide, front
3. Lugs, bottom

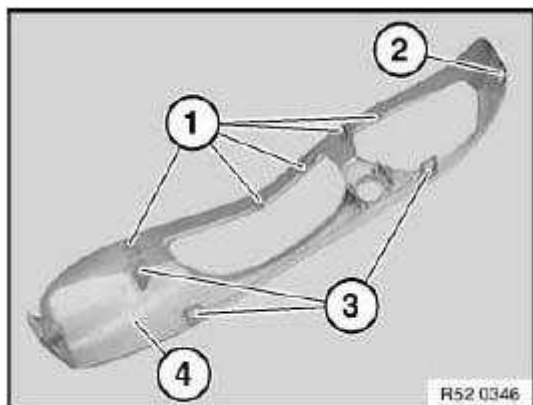


Fig. 44: Catches, Guide And Lugs
Courtesy of BMW OF NORTH AMERICA, INC.

52 13 041 REMOVING AND INSTALLING / REPLACING INNER COVER ON LEFT OR RIGHT FRONT SEAT BACKREST (NORMAL/ MANUAL)

NOTE: Shown removed for purposes of clarity.
Release screw (1) and remove trim (2).

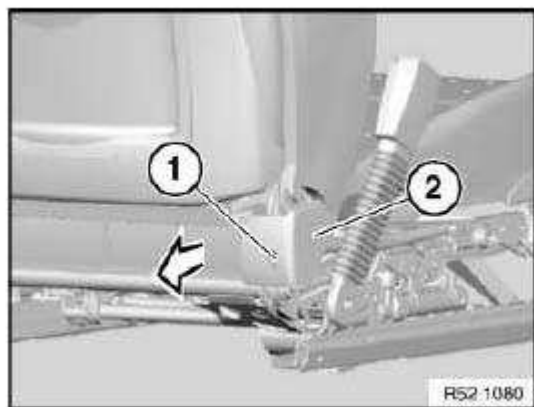


Fig. 45: Removing Trim

Courtesy of BMW OF NORTH AMERICA, INC.

52 13 050 REPLACING LUMBAR CUSHION ON FRONT LEFT OR RIGHT SEAT

Carry out following tasks beforehand:

Removing rear panel on front seat backrest:

- Basic seat, see 52 13 198 Removing and installing / replacing rear panel on left or right front seat backrest (normal/manual)
- Sports seat, see 52 15 198 Removing and installing/replacing rear panel on front left or right seat backrest (sports/manual).

Detach backrest cover (1) from backrest frame (2).

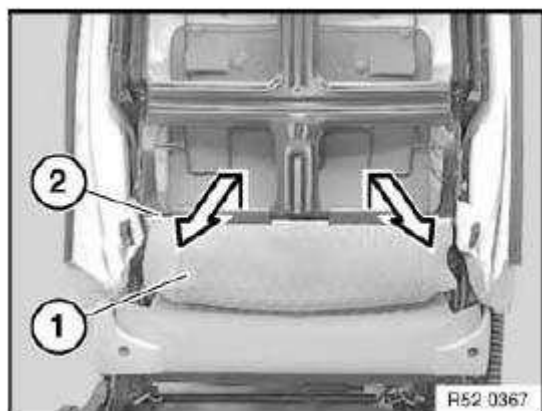


Fig. 46: Removing Backrest Cover From Backrest Frame
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: If necessary, gently heat air hose when firmly seated. Housing (valve block) must not be unclipped (leaks). If it is unclipped, release screw and clip housing together.

Disconnect hoses (2) and (3) from valve housing (1).

2 Hose (blue) top cushion

3 Hose (red) bottom cushion

Installation:

Air hoses (2) and (3) must be laid without kinks.

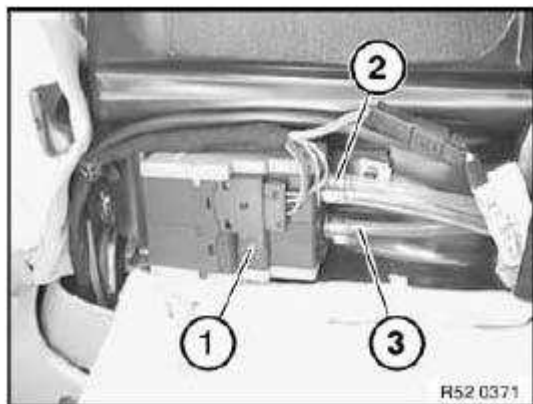


Fig. 47: Hoses And Valve Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Unhook lumbar cushion (1) from spring wire (2).

Version with seat heating:

Slide cable (3) for backrest heating to one side a little.

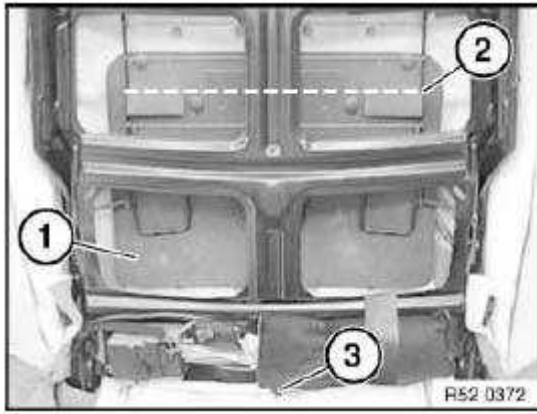


Fig. 48: Spring Wire And Slide Cable
Courtesy of BMW OF NORTH AMERICA, INC.

Press back support (1) a little.

Turn lumbar cushion (2) and pull out downwards.

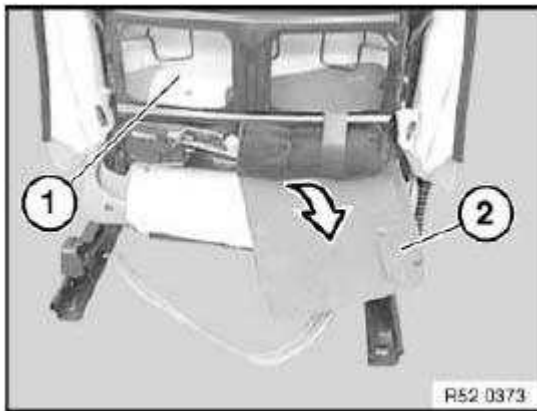


Fig. 49: Pulling Out Lumbar Cushion
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check lumbar cushion (1) at top and (2) bottom for damage.

Air hoses (3) must not be kinked.

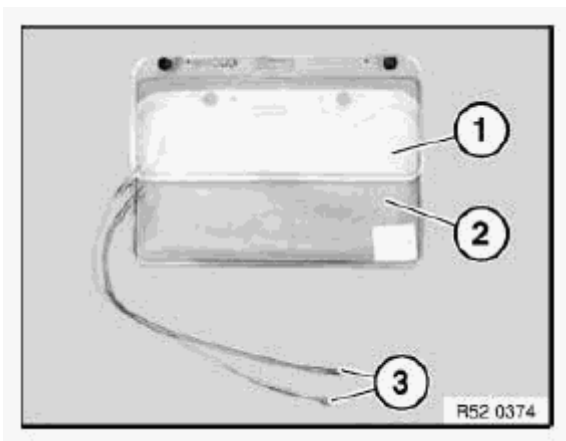


Fig. 50: Air Hoses And Lumbar Cushion
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Attach lumbar cushion (1) to third wire (2) above spring (3).

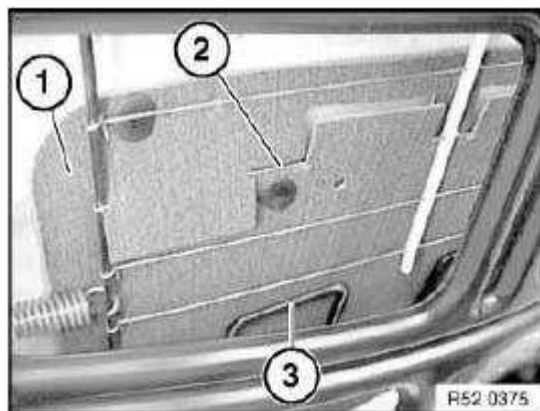


Fig. 51: Lumbar Cushion And Wire
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: For purposes of clarity, shown here without valve housing.

Installation:

Observe cable guide (1) for backrest heating.

Lay air hoses (2) without kinks through hole (3).

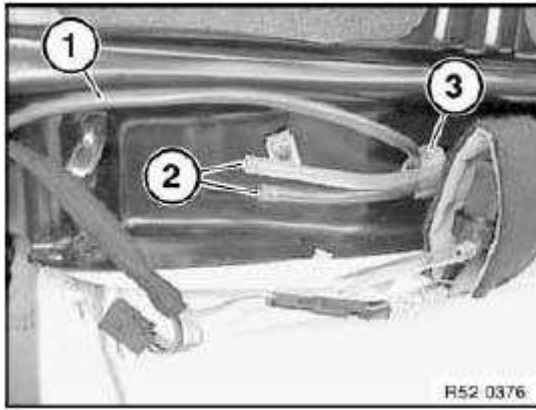


Fig. 52: Cable Guide And Hoses

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check function.

**52 13 070 REMOVING AND INSTALLING/REPLACING SEAT ANGLE ADJUSTER
(NORMAL/MANUAL) ON LEFT OR RIGHT FRONT SEAT**

Special tools required:

- **51 2 100 CLAMPING LEVER**

Necessary preliminary tasks:

- Remove front seat
- Remove actuating unit, see **52 13 015 Removing and installing / replacing controls on left / right front seat (normal / manual)**

WARNING: Torsion bar spring (1) is subject to tension. Risk of injury.

Lever torsion bar spring (1) with special tool 51 2 100 in direction of arrow from seat angle adjuster.

Feed torsion bar spring (1) out of seat mechanism.

Installation:

Make sure plastic protector is correctly positioned on contact surface between torsion bar spring and seat mechanism (grating noises).

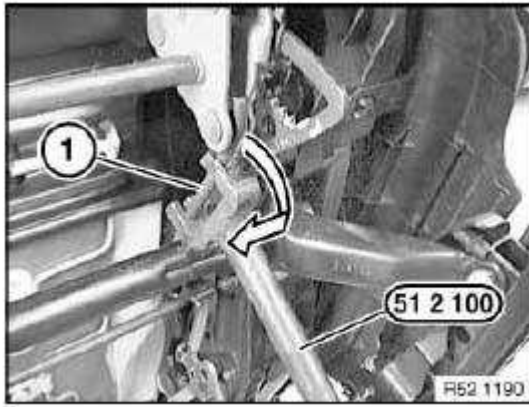


Fig. 53: Removing Bar Spring

Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Installation:

Replace Taptite screws (1).

Tightening torque: 52 10 16AZ, see **52 10 FRONT SEATS** .

Release screw (2).

Tightening torque: 52 10 17AZ, see **52 10 FRONT SEATS** .

Remove seat angle adjuster (3).

Installation:

Slide left and right O-rings onto shaft. Make sure O-rings are correctly located between seat angle adjuster and seat pan.

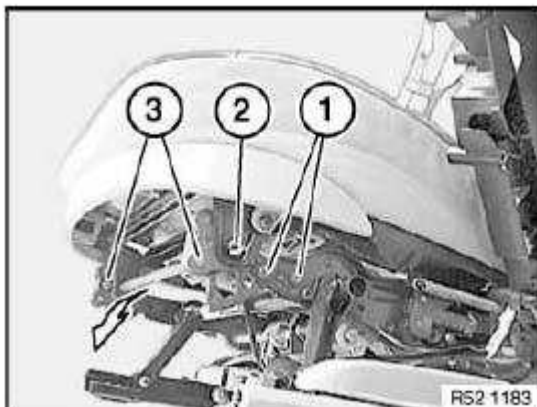


Fig. 54: Removing Seat Angle Adjuster

Courtesy of BMW OF NORTH AMERICA, INC.

52 13 198 REMOVING AND INSTALLING / REPLACING REAR PANEL ON LEFT OR RIGHT FRONT SEAT BACKREST (NORMAL/MANUAL)

Remove front seat.

Release clips (1) with side cutting pliers.

NOTE: Remove clip remainders.



Fig. 55: Clips

Courtesy of BMW OF NORTH AMERICA, INC.

Carefully pull cover (1) with piping (2) out of groove in rear panel (3).

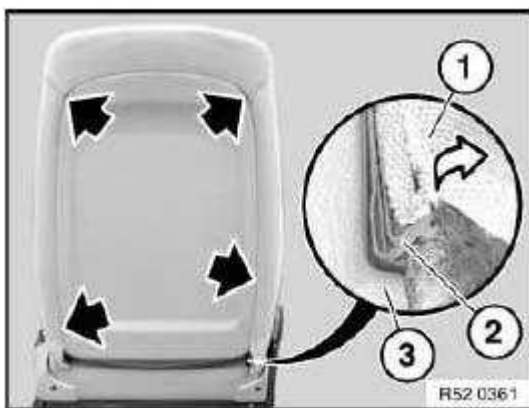


Fig. 56: Pulling Cover With Piping Out Of Groove

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

The cover piping (1) has a marking (2) which must line up with hole (3) in rear panel groove (4).

From marking (2), press in piping (1) completely to left and right at bottom.

Five new repair clips must be fitted after each disassembly.

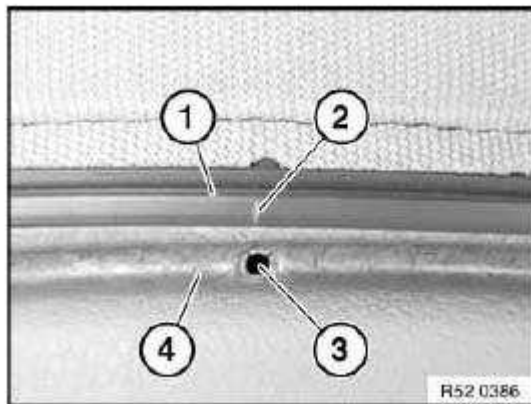


Fig. 57: Piping And Rear Panel Groove
Courtesy of BMW OF NORTH AMERICA, INC.

Release clips (1) (cut through with side cutting pliers).

NOTE: Remove clip remainders.

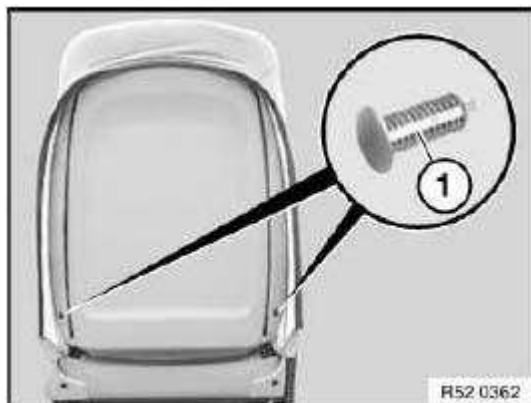


Fig. 58: Clips
Courtesy of BMW OF NORTH AMERICA, INC.

Pull rear panel (1) off backrest cover (2).

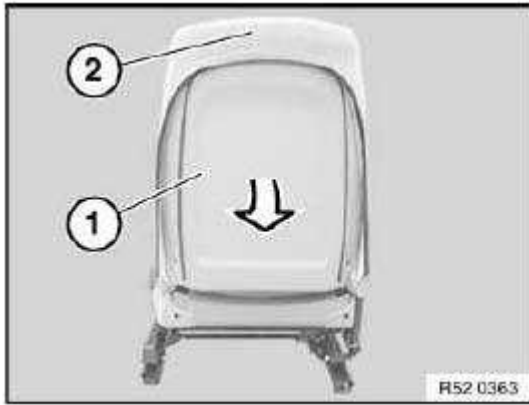


Fig. 59: Pulling Rear Panel Off Backrest Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Holes (1) and (2) on rear panel (3) must not be damaged.

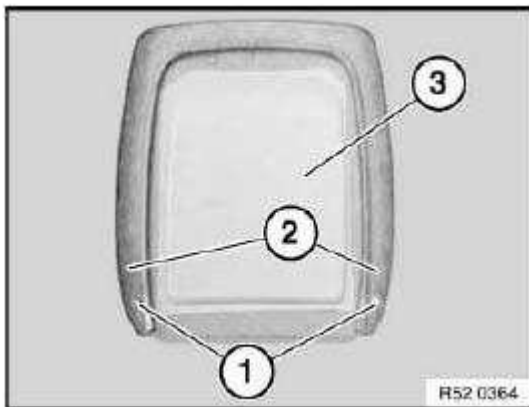


Fig. 60: Holes And Rear Panel
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Slide backrest cover (1) on left/right over clip mount (2).

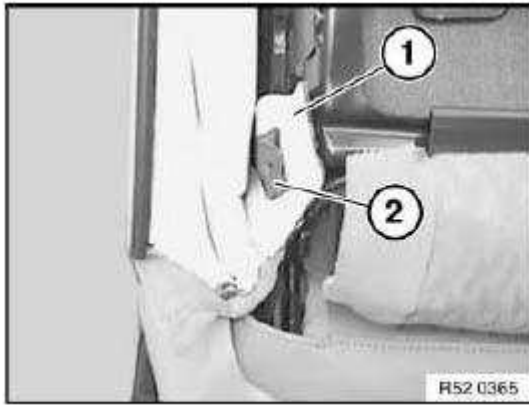


Fig. 61: Clip And Backrest Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

To prevent noise:

Stick felt strip (1) to raised frame area (2).

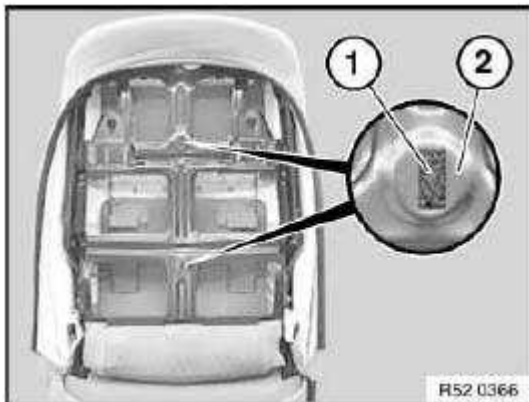


Fig. 62: Frame Area
Courtesy of BMW OF NORTH AMERICA, INC.

**52 13 390 REMOVING AND INSTALLING / REPLACING FRONT HEADREST (NORMAL/
MANUAL)**

Move backrest back.

Move headrest (1) as far upwards as possible.

Unlock lock (2) and remove headrest (1).

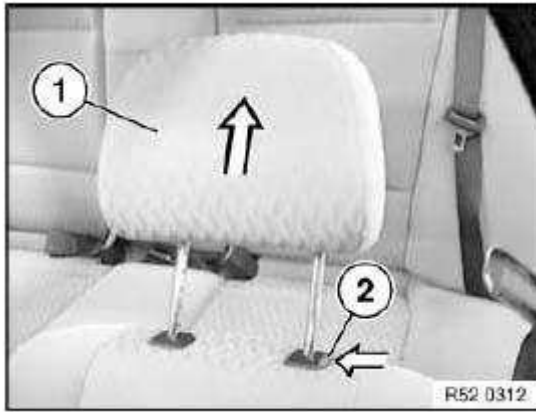


Fig. 63: Removing Headrest

Courtesy of BMW OF NORTH AMERICA, INC.

52 13 400 REPLACING SEAT COVER ON LEFT OR RIGHT FRONT SEAT (NORMAL/MANUAL)

Special tools required:

- 52 0 050

Necessary preliminary tasks:

- Remove inner cover, see **52 13 041 Removing and installing / replacing inner cover on left or right front seat backrest (normal/ manual)**
- Remove cover (normal/electric) **52 16 040 Removing and installing/replacing outer cover on front left or right seat (sports/electric)** or outer actuating unit **52 13 015 Removing and installing / replacing controls on left / right front seat (normal / manual)**

WARNING: US/CDN front passenger seat (with OC3 mat) only:

To avoid damaging the OC3 mat, it is essential to carry out the following operations with extra care.

When replacing seat cover:

If seat cover is defective, seat cover and padding with OC3 mat must be replaced together.

New seat cover is supplied with padding, OC3 mat and if necessary seat heating.

When replacing padding with OC3 mat:

If OC3 mat or padding is defective, both parts may only be replaced together.

These must be fitted with the seat cover from the car.

Enabling seat occupancy detector (OC3 mat):

- Connect BMW diagnosis system
- Release seat occupancy detector
- Clear fault memory if necessary

Seat with electric actuating unit only:

Release screws (1).

Pull trim (2) out a little and release screw (3).

Release clip (5) from carrier (4).

Remove trim (2) and carrier (4).

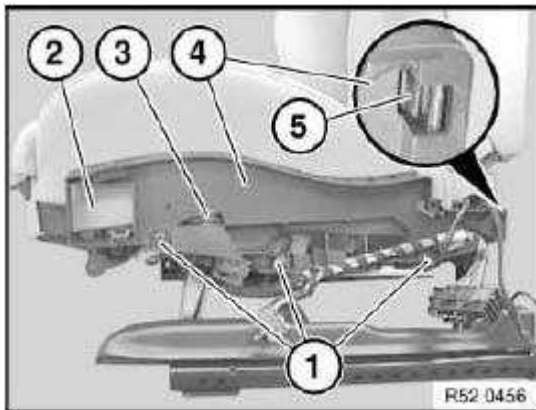


Fig. 64: Releasing Clip From Carrier
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Cable holders (1) on carrier (2) must not be damaged.

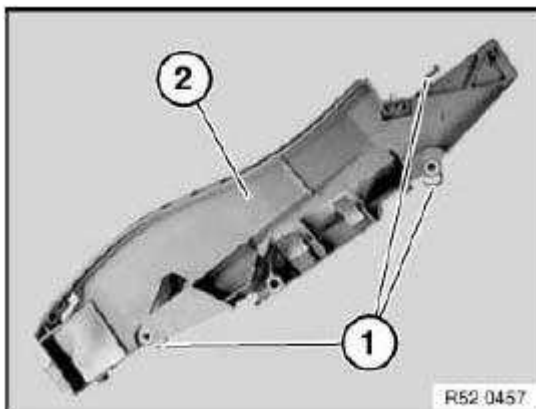


Fig. 65: Cable Holder And Carrier

Courtesy of BMW OF NORTH AMERICA, INC.

E46 only:

Pull out tongue (1) on seat cover (2) on left/right.

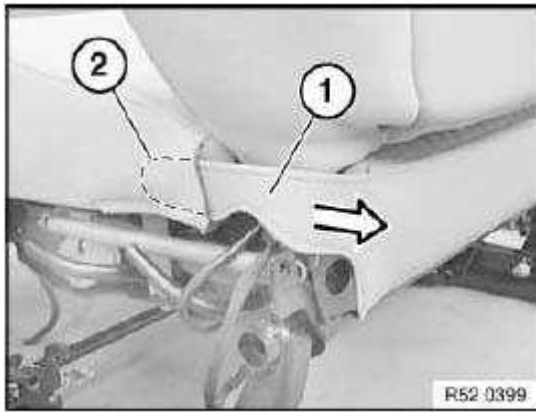


Fig. 66: Pulling Out Tongue On Seat Cover On Left/Right
Courtesy of BMW OF NORTH AMERICA, INC.

Detach seat cover (1) from seat frame (2).

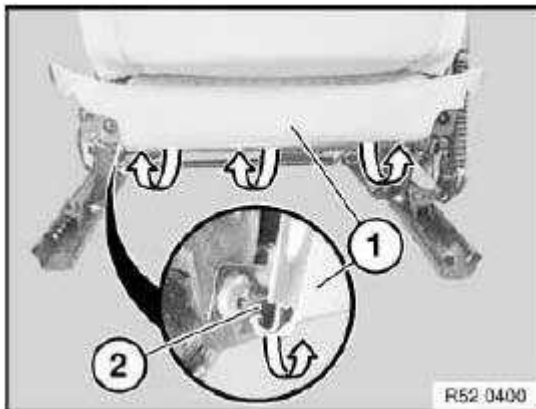


Fig. 67: Removing Seat Cover From Seat Frame
Courtesy of BMW OF NORTH AMERICA, INC.

Version with seat occupancy detector:

If necessary, disconnect plug connection (1) from control unit (2).

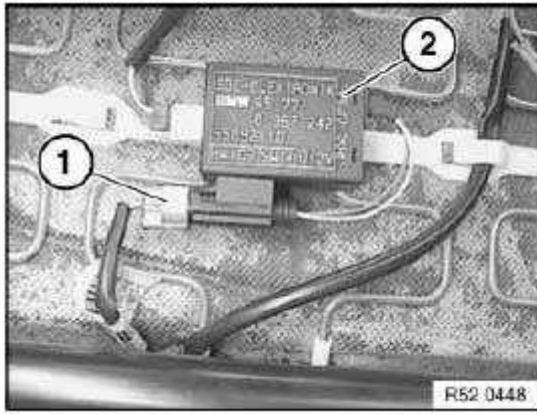


Fig. 68: Plug Connection And Control Unit
Courtesy of BMW OF NORTH AMERICA, INC.

Version with seat heating:

If necessary, lever catch (1) towards top and detach cover (2).

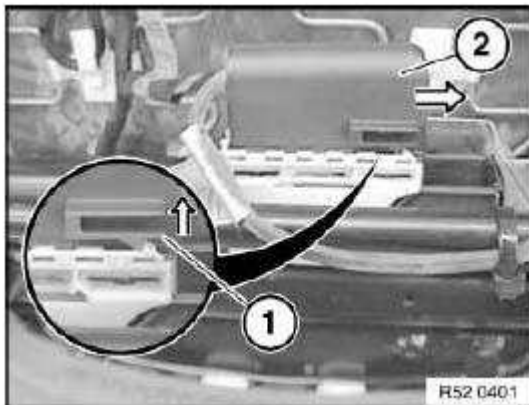


Fig. 69: Lever Catch And Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1) from seat heating.

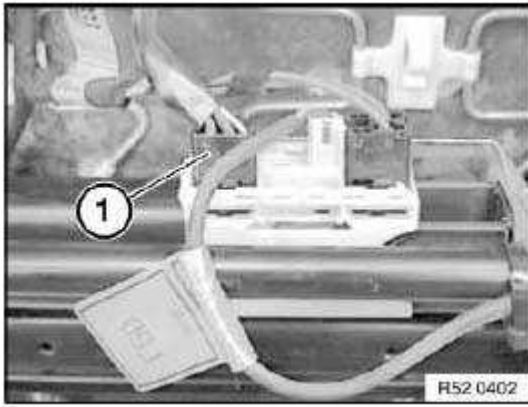


Fig. 70: Plug Connection

Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1) from seat heating.

Expose cable (2).

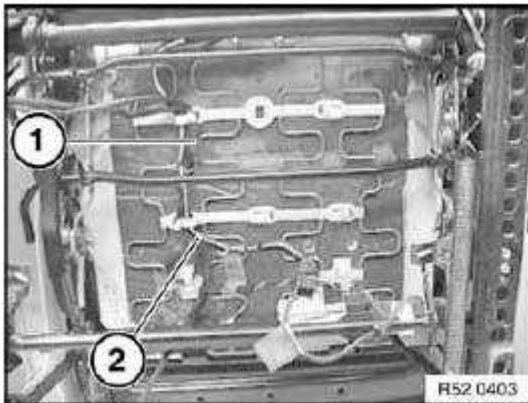


Fig. 71: Plug Connection And Cable

Courtesy of BMW OF NORTH AMERICA, INC.

Release retainers (1) on left/right.

Pull out cover tabs (2) on left/right.

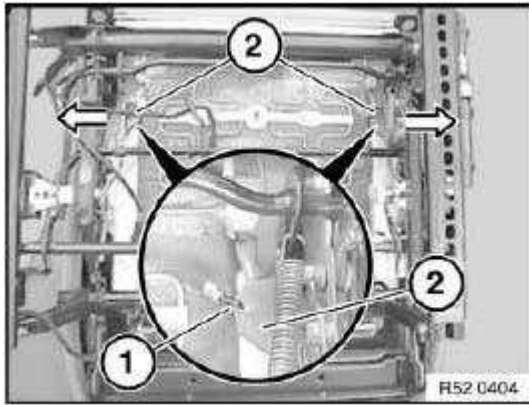


Fig. 72: Pulling Out Cover Tabs On Left/Right
Courtesy of BMW OF NORTH AMERICA, INC.

Pull out cover welt (1) completely from seat frame (2).

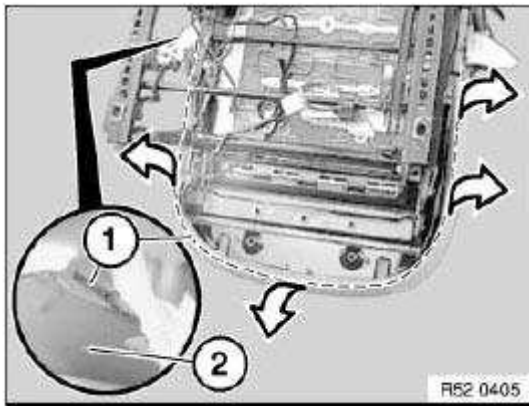


Fig. 73: Pulling Out Cover Welt Completely From Seat Frame
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Begin assembly in middle.

Cover piping (1) and seat frame (2) have markings for middle position.

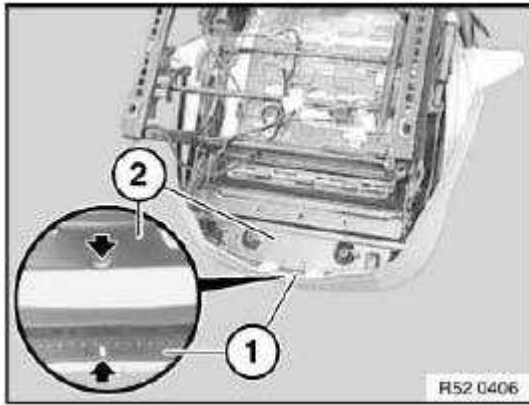


Fig. 74: Cover Piping And Seat Frame
Courtesy of BMW OF NORTH AMERICA, INC.

Fold in tongues (1) on seat cover and push through under backrest (2) towards front.

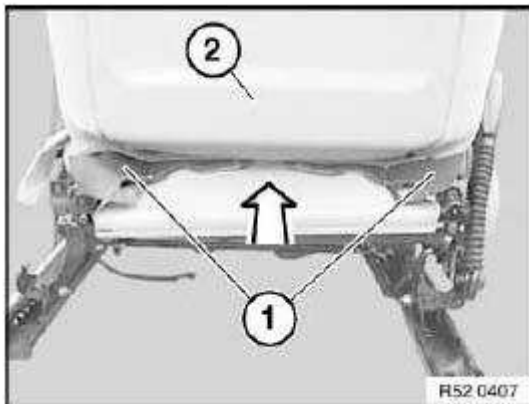


Fig. 75: Pushing Under Backrest Towards Front
Courtesy of BMW OF NORTH AMERICA, INC.

Model without seat heating and without seat occupancy detector:

Remove seat cover (1) towards front/top.

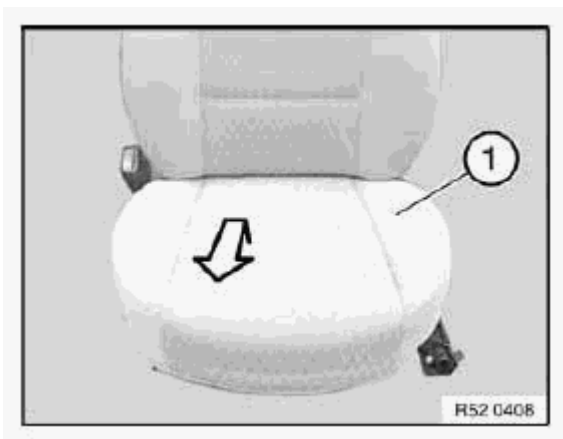


Fig. 76: Cover Piping And Seat Frame
Courtesy of BMW OF NORTH AMERICA, INC.

Version with seat heater and/or with seat occupancy detector:

Pull seat cover (1) forward a little and feed cable (2) out.

Remove seat cover (1) towards front/top.

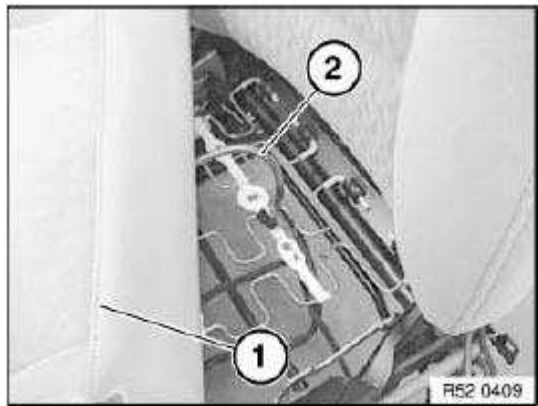


Fig. 77: Seat Cover And Cable
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

The support is coated with wax to prevent grinding noises.

Do not remove wax (1) on seat pan (2).

NOTE: **The operation "Removing complete seat cushion" ends here.**

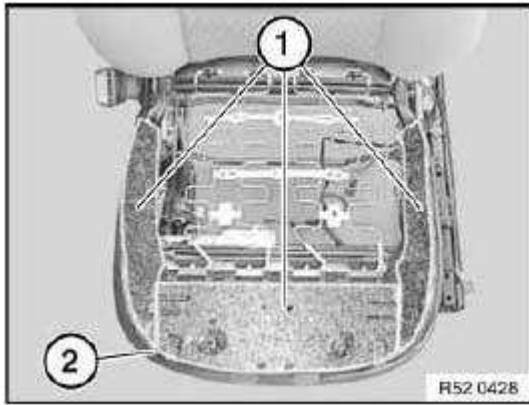


Fig. 78: Wax And Seat Pan
Courtesy of BMW OF NORTH AMERICA, INC.

Replacing support:

Detach retainers (1) at rear left/right from support (2).

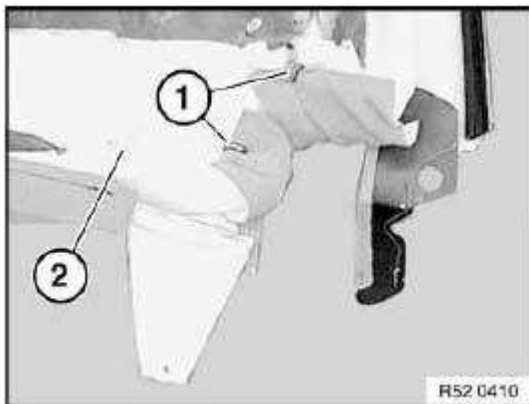


Fig. 79: Retainers
Courtesy of BMW OF NORTH AMERICA, INC.

Version with OC3 mat:

- OC3 mat must not be kinked under any circumstances.

Detach all retainers in side area from longitudinal wires (1).

Pull trim wires (1) forward out of seat cover.

Carefully fold back seat cover and release retainers from cross - wires (2).

Remove seat cover from padding.

IMPORTANT: Remove all remnants of clips from seat cover and padding.

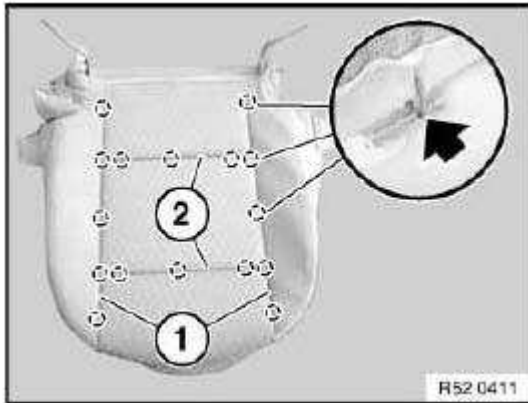


Fig. 80: Removing Seat Cover From Padding
Courtesy of BMW OF NORTH AMERICA, INC.

Padding (1) with OC3 mat (2).

IMPORTANT: No retainer remainders may be fitted as well.
Handle OC3 mat with extreme care.
Do not kink OC3 mat.
Do not clamp OC3 mat.
OC3 mat must lie without folds under seat cover.

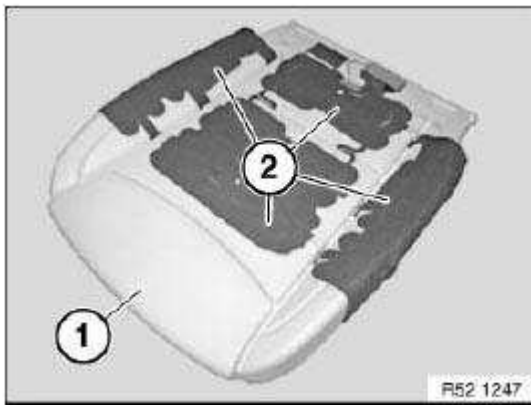


Fig. 81: Padding And OC3 Mat
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Bend new clips (2) with special tool 52 0 050.

1. Padding
2. Retainer

3. Trim thread in padding
4. Trim thread in cover
5. Seat cover

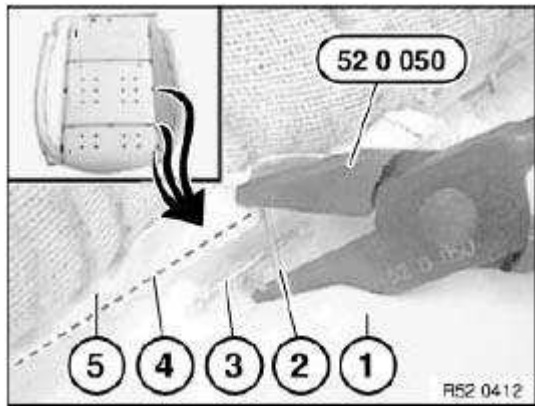


Fig. 82: Padding And Seat Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

The support is coated with wax to prevent grinding noises.

Do not remove wax (1) on support (2).

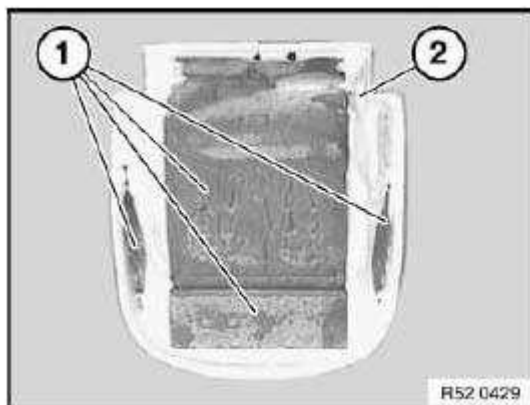


Fig. 83: Removing Wax
Courtesy of BMW OF NORTH AMERICA, INC.

Passenger seat only (replacing padding):

Installation:

In order to guarantee the function and fastening (adhesive strength) at the sticking surfaces of sensor mat (1), the foam most not show any traces of damage at all!

Replace the foam if it is hardened or damaged particularly in the area of the sticking surfaces.

Fit new sensor mat (1) for passenger seat occupancy detector.

Align new sensor mat (1) on foam (2).

Feed plug (3) through bore hole (4).

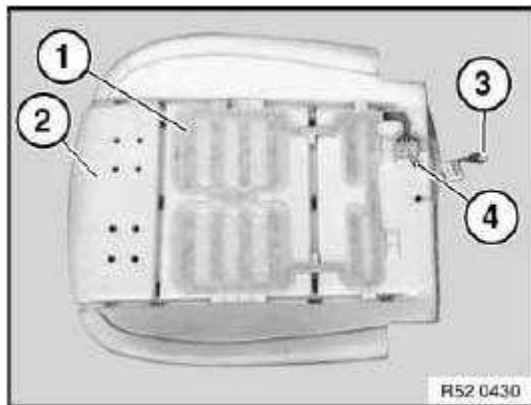


Fig. 84: Plug, Sensor Mat And Bore Hole
Courtesy of BMW OF NORTH AMERICA, INC.

Passenger seat only (replacing sensor mat):

Passenger seat only (replacing padding):

Installation:

Detach liner (1) at individual points and stick sensor mat (2) onto foam (3).

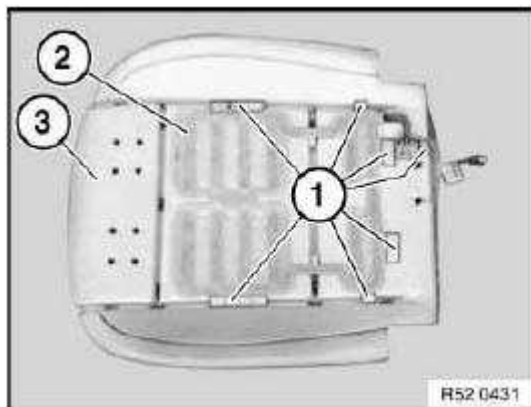


Fig. 85: Liner And Foam
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The work for "Replacing support" ends here.

Passenger seat only (replacing sensor mat):

Pull plug (1) out of bore hole (2).

In order to guarantee the function and fastening (adhesive strength) at the sticking surfaces of sensor mat (3), the foam most not show any traces of damage at all!

Replace the foam if it is hardened or damaged particularly in the area of the sticking surfaces.

Cut sticking surfaces on sensor mat (3) with cutter knife or razor blade from foam without damaging the foam.

Carefully remove sensor mat (3) from support (4).

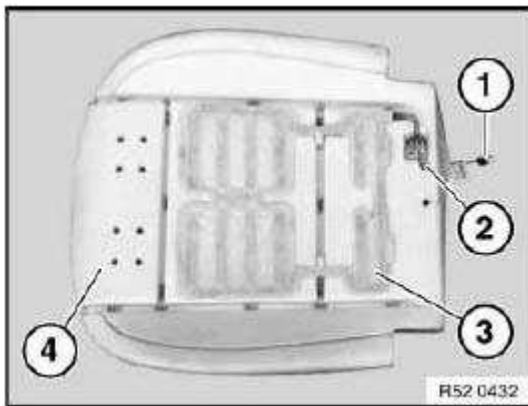


Fig. 86: Sensor Mat And Support
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The operation "Replacing sensor mat" ends here.

Replacing seat cover:

Remove trim threads (1) from seat cover (2).

Cut new seat cover (2) to size and insert trim threads (1).

Cable (3) for seat heating.

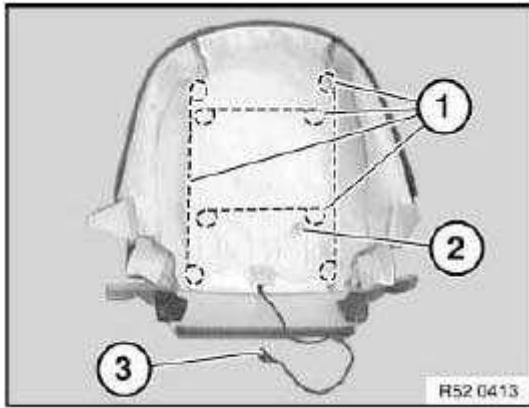


Fig. 87: Removing Trim Threads
 Courtesy of BMW OF NORTH AMERICA, INC.

52 13 405 REPLACING BACK-REST COVER FOR LEFT OR RIGHT FRONT SEAT (NORMAL / MANUAL)

Remove rear panel on front seat backrest,

refer to **52 13 198**.

Detach backrest cover (1) from backrest frame (2).

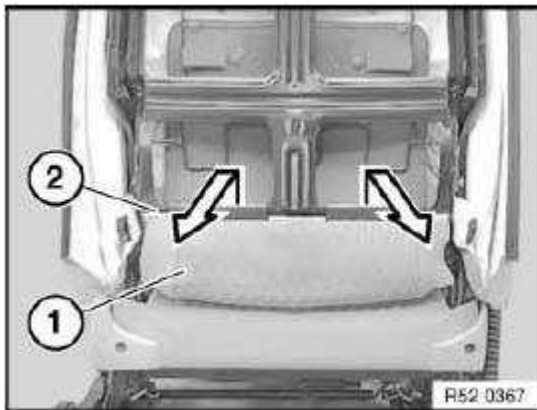


Fig. 88: Removing Backrest Cover From Backrest Frame
 Courtesy of BMW OF NORTH AMERICA, INC.

Version with seat heating only: expose seat heating cable:

Remove outer cover on front seat:

Manual operation, refer to **52 13 040**.

Electrical operation, refer to **52 16 040**.

Unfasten plug connection (1).

Pull cable (2) out of holder (3).

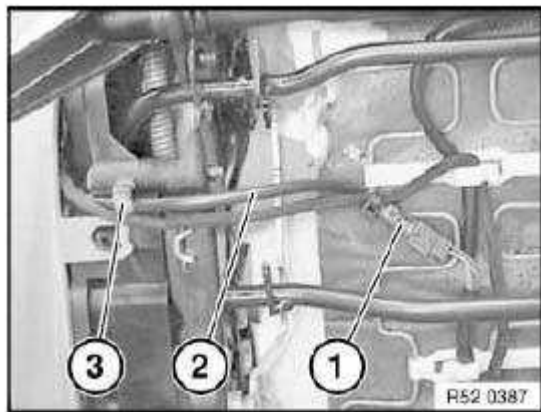


Fig. 89: Plug Connection And Holder
Courtesy of BMW OF NORTH AMERICA, INC.

Model with seat heating only:

Pull out tongue (1).

Pull cable (2) out of holder (3).

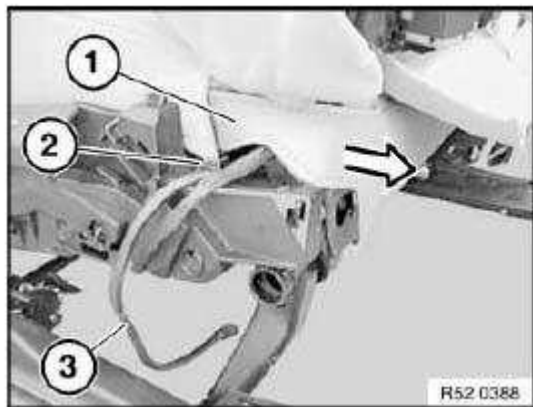


Fig. 90: Pulling Cable Out Of Holder
Courtesy of BMW OF NORTH AMERICA, INC.

Model with seat heating only:

Lift out Omega clip (1).

Pull out cable (2) from Omega clip (1).

Model with lumbar supports:

If necessary, disconnect plug connections (3) and (4).

Lift out Omega clip (1).

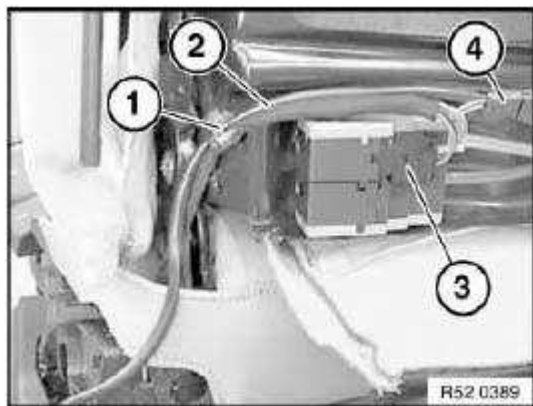


Fig. 91: Omega Clip, Cable And Plug Connections
Courtesy of BMW OF NORTH AMERICA, INC.

Removal/replacement of backrest frame only:

Detach cover (1) on left/right.

CAUTION: Do not under any circumstances turn screw underneath screw (2), this would destroy the seat frame.

Loosen left/right screw (2).

Detach backrest frame (3) with backrest cover upwards.

Installation:

Replace screws (microencapsulated).

Tightening torque: 52 10 2AZ, see **52 10 FRONT SEATS** .

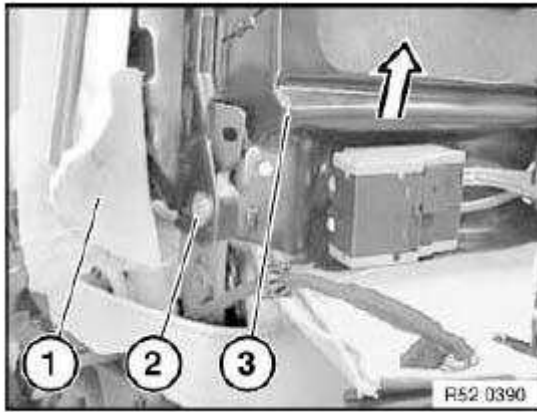


Fig. 92: Removing Backrest Frame

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The operation "Removing complete backrest" ends here.

Removal of backrest cover with padding/replacement of backrest frame only:

Remove both guides for front head restraint,

refer to **52 13 ... Removing and installing/replacing guide for front left or right head restraint**

Version with lumbar support only:

NOTE: If necessary, gently heat air hose when firmly seated.

Valve housing must not be unclipped, leakage.

If the valve housing is unclipped, release screw and clip valve housing together.

Disconnect hoses (2) and (3) from valve housing (1).

2 Hose (blue), top cushion

3 Hose (red), bottom cushion

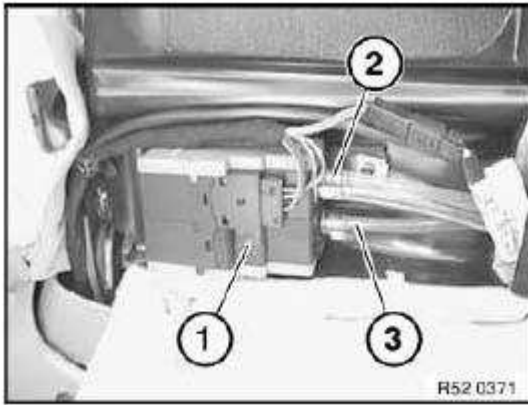


Fig. 93: Hoses And Valve Housing

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: For purposes of clarity, shown here without valve housing.

Installation:

Observe cable guide (1) for backrest heating.

Lay air hoses (2) without kinks through hole (3).

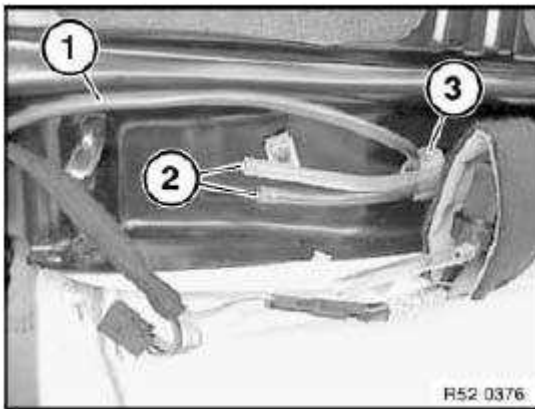


Fig. 94: Cable Guide And Hoses

Courtesy of BMW OF NORTH AMERICA, INC.

Detach backrest cover (1) at sides towards front and remove with support upwards from backrest frame (2).

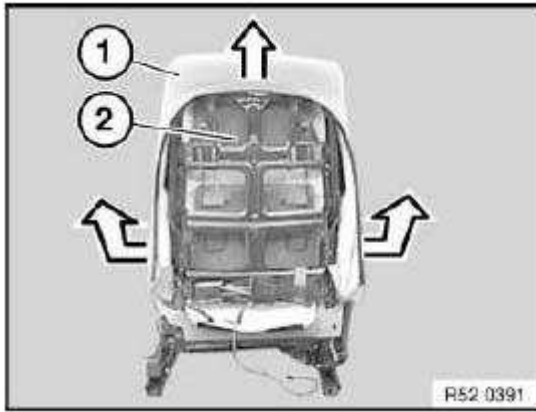


Fig. 95: Removing Backrest Cover At Sides Towards Front
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The operation "Removing backrest cover with support" ends here.

Removal of backrest cover from padding, replacing padding:

Release retainers (1) on left/right of backrest cover (2).

NOTE: Support (3) is reinforced in this area.

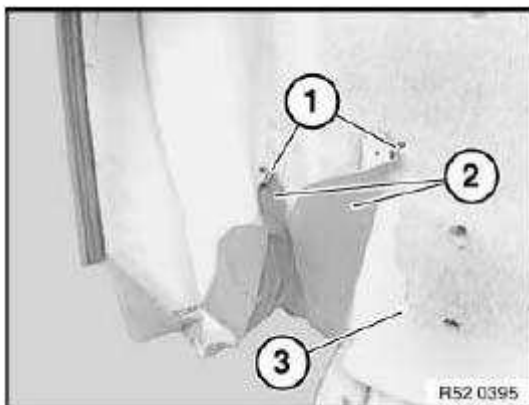


Fig. 96: Retainers And Backrest Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Release all retainers.

Remove backrest cover (1) from padding.

Remove all remnants of retainers from backrest cover (1) and padding.

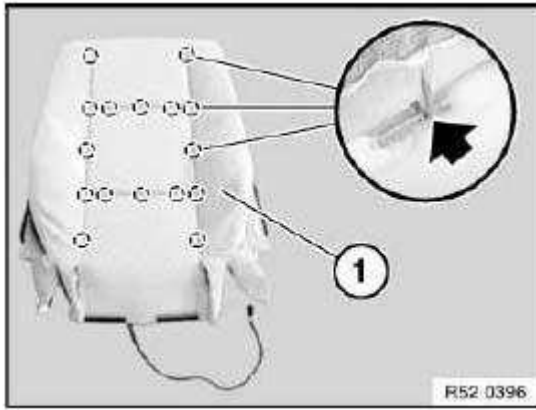


Fig. 97: Removing Backrest Cover From Padding
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Fold in new clip (2) with special tool 52 0 050.

1. Support
2. Retainer
3. Trim thread in support
4. Trim wire in backrest cover
5. Back-rest cover

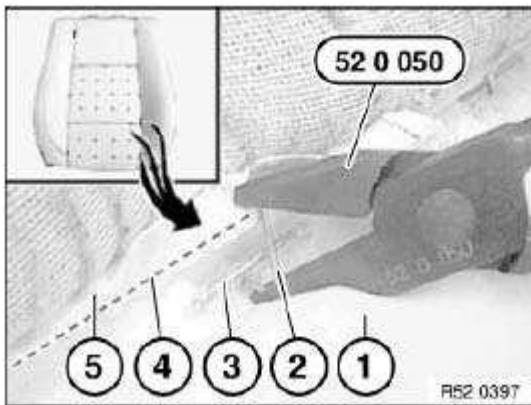


Fig. 98: Folding New Clip With Special Tool 52 0 050
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The operation "Replacing support" ends here.

Replacement of backrest cover:

Pull trim threads (1) out of backrest cover.

Cut new backrest cover to size and insert trim threads (1).

2 Seat heater cable

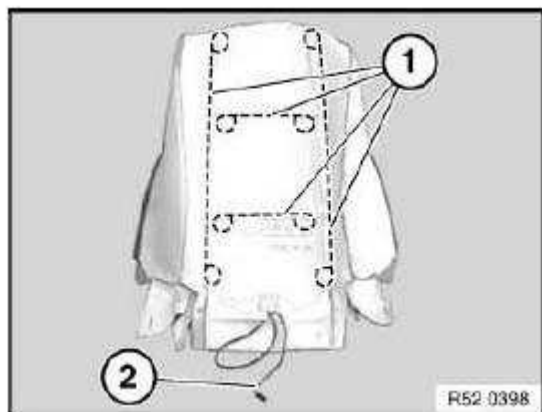


Fig. 99: Seat Heater Cable

Courtesy of BMW OF NORTH AMERICA, INC.

52 13 410 REPLACING SEAT AND BACKREST COVERS FOR FRONT SEAT (NORMAL/MANUAL), LEFT OR RIGHT

Operation is described in:

- Replace seat cover for left or right front seat, see **52 13 400 Replacing seat cover on left or right front seat (normal/manual)**
- Replace backrest cover for left or right front seat, see **52 13 405 Replacing back-rest cover for left or right front seat (normal / manual)**

52 13 415 REPLACING LEFT OR RIGHT SUPPORT FOR FRONT SEAT (NORMAL / MANUAL)

This operation is described in section on:

Replacing seat cover on left or right front seat, see **52 13 400 Replacing seat cover on left or right front seat (normal/manual)**

52 13 420 REPLACING LEFT OR RIGHT SUPPORT FOR FRONT SEAT BACK-REST (NORMAL / MANUAL)

This operation is described in section on:

Replacing backrest cover for left or right front seat, see **52 13 400 Replacing seat cover on left or right front seat (normal/manual)**

14 FRONT SEAT NORMAL, ELECTRIC

52 14... REMOVING AND INSTALLING/REPLACING GUIDE FOR FRONT LEFT OR RIGHT HEAD RESTRAINT (NORMAL/ELECTRIC)

Operation is identical to:

- **52 13 390 Removing and installing / replacing front headrest (normal/ manual)**

52 14 000 REMOVING AND INSTALLING LEFT OR RIGHT FRONT SEAT (NORMAL/ELECTRIC)

Necessary preliminary tasks:

- Remove head restraint, see **52 13 390 Removing and installing / replacing front headrest (normal/ manual)**

WARNING: Read and comply with safety regulations for handling airbag modules and pyrotechnical belt tensioners, see **41 00 ... HANDLING AIRBAGS AND RESTRAINT SYSTEMS**

Incorrect or improper handling may trigger the pyrotechnical belt pretensioner or side airbag and thereby cause injury.

Adjust front seat as far forward and upward as possible.

Switch off ignition!

Release seatbelt screw (1) and feed out seatbelt strap (2).

Tightening torque: 72 11 1AZ, see **72 11 SEAT BELTS** .

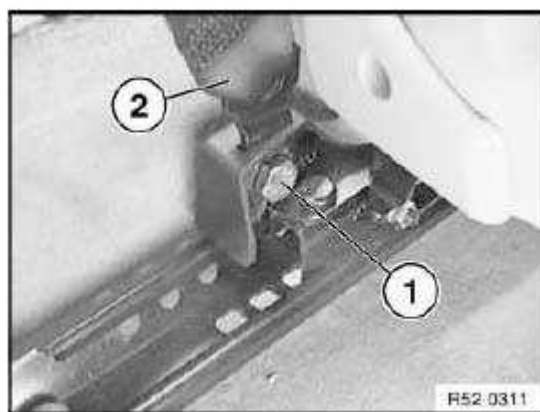


Fig. 100: Seatbelt Screw And Feed Out Seatbelt Strap
Courtesy of BMW OF NORTH AMERICA, INC.

Move front seat forwards/upwards as far as possible.

Release bolts (1).

Installation:

Replace microencapsulated screws.

Tightening torque: 52 10 1AZ, see **52 10 FRONT SEATS** .

Move front seat backwards/downwards as far as possible.

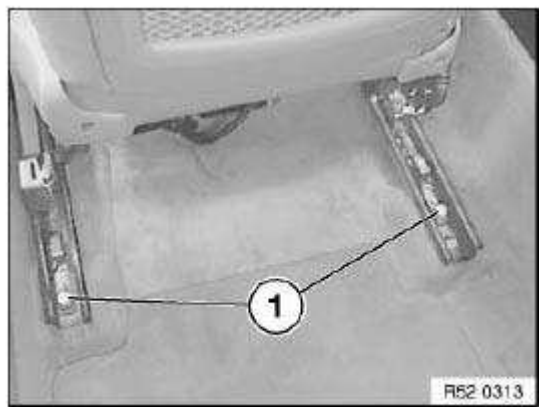


Fig. 101: Seat Bolts

Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, unclip protective caps upwards.

Release screws (3).

Installation:

Replace microencapsulated screws.

Tightening torque: 52 10 1AZ, see **52 10 FRONT SEATS** .

Move seat runners forward so that they are flush.

Unlock lock (1) and disconnect plug connection (2).

IMPORTANT: Cover door sill with protective covers (risk of damage).

Lift out front seat.

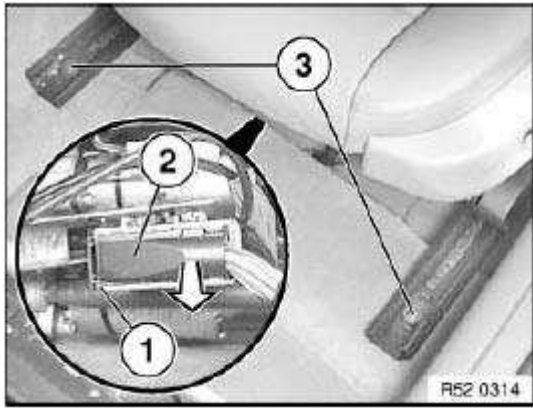


Fig. 102: Lifting Out Front Seat

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Carpet must not get between seat rails and floor pan in area of fastening points (grating noises).

Tightening torque: 52 10 1AZ, see **52 10 FRONT SEATS** .

52 14 025 REMOVING AND INSTALLING/REPLACING SEAT MECHANISM ON LEFT OR RIGHT FRONT SEAT (NORMAL/ELECTRIC)

Special tools required:

- 61 2 071
- 61 2 074

Carry out following tasks beforehand:

- Remove seat pan and flexmat on front seat, see **52 13... Removing and installing/replacing seat pan and flexmat (normal/manual), left or right**
- Remove backrest frame on front seat, see **52 13 030 Removing and installing / replacing backrest frame on left or right front seat (normal / manual).**
- Remove seat belt tensioner.

Release screw (1) and cable holder (3).

Remove retaining bracket (2) with seat wiring harness from seat mechanism (4).

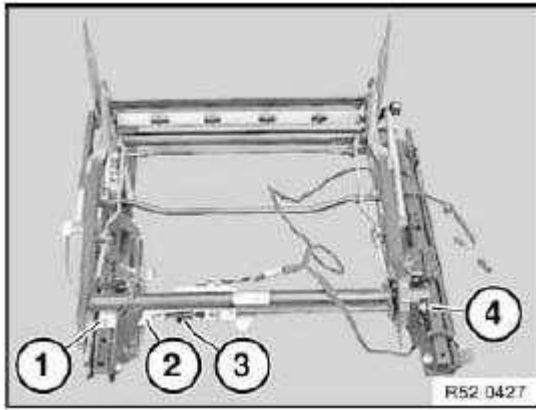


Fig. 103: Releasing Screw And Cable Tie
 Courtesy of BMW OF NORTH AMERICA, INC.

Attach cable 61 2 074 to cable 61 2 071 and connect plug connection (1) to front seat.

Connect cable 61 2 071 to battery.

Check function.

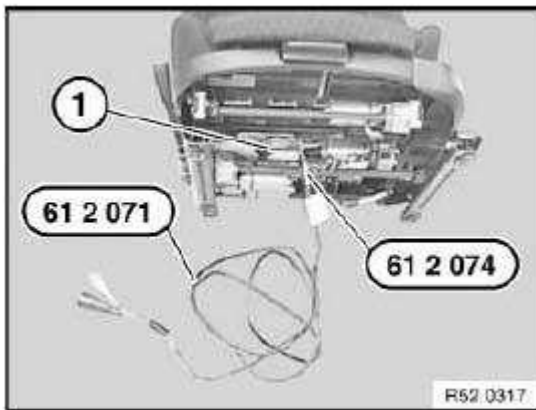


Fig. 104: Plug Connection And Special Tool
 Courtesy of BMW OF NORTH AMERICA, INC.

52 14 030 REMOVING AND INSTALLING/REPLACING BACKREST FRAME ON FRONT LEFT OR RIGHT SEAT (NORMAL/ELECTRIC)

Necessary preliminary tasks:

- Remove rear panel on front seat, see **52 14 198 Removing and installing/replacing rear panel on left or right front seat backrest (normal/electric)**

Replacement only:

- Remove backrest cover, see 52 16 405 Replacing backrest cover on front left or right seat (sports/electric)
- Remove lumbar cushion, see 52 14 050 Replacing lumbar cushion on front left or right seat (normal/electric)
- Remove valve housing for lumbar support
- Remove drive unit for lumbar support, see 67 66 010 REMOVING AND INSTALLING/REPLACING LUMBAR SUPPORT DRIVE MECHANISM ON FRONT SEAT, LEFT OR RIGHT
- Remove release mechanism on front seat

Removing backrest frame only:

Unhook backrest cover (1) on left and right.

IMPORTANT: Do not under any circumstances turn screw underneath screw (2), this would destroy the seat frame.

Release screws (2) on left and right.



Fig. 105: Removing Backrest Frame
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace screws (microencapsulated).

Tightening torque: 52 10 2AZ, see 52 10 FRONT SEATS .

Remove backrest frame (3) with backrest cover towards top.

Replacing backrest frame only:

Detach mount (1) for rear panel towards top/rear from backrest frame (2).

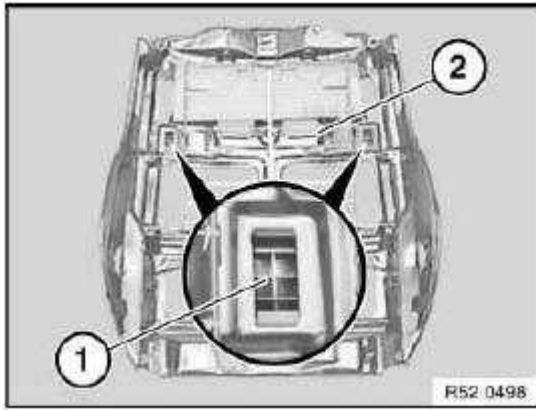


Fig. 106: Out Mount, And Backrest Frame
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Catch (1) and guide (2) on mount (3) for rear panel must not be damaged.

Guide taper (4) must point downwards.

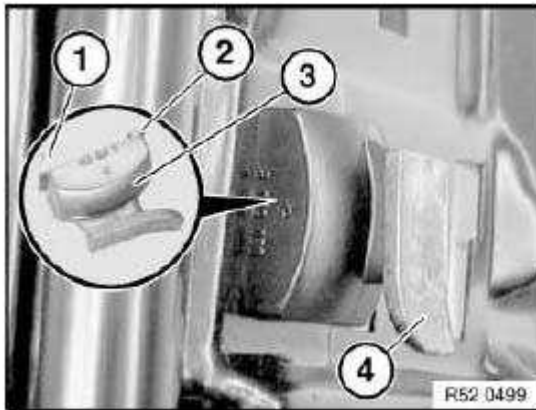


Fig. 107: Taper And Mount
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, remove mat (1) from spring wire (2) of backrest frame (3).

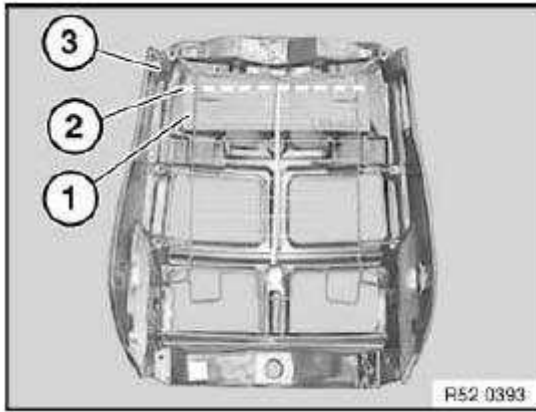


Fig. 108: Mat And Spring Wire

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

If necessary, suspend mat (1) on uppermost spring wire (2) on backrest frame (3).

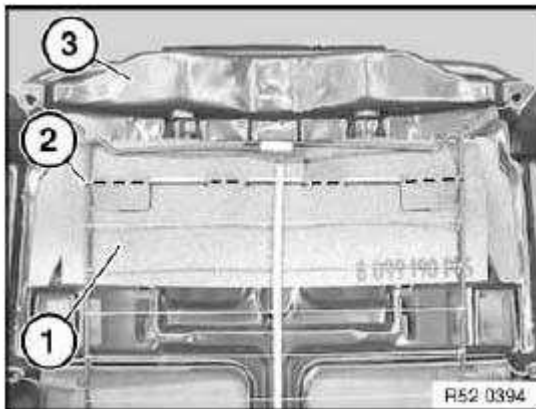


Fig. 109: Spring Wire And Backrest Frame

Courtesy of BMW OF NORTH AMERICA, INC.

52 14 040 REMOVING AND INSTALLING/REPLACING OUTER COVER ON FRONT LEFT OR RIGHT SEAT (NORMAL/ELECTRIC)

Operation is identical to:

Remove and install/replace outer cover on front left or right seat (sports/electric),

refer to **52 16 040**.

52 14 041 REMOVING AND INSTALLING/REPLACING INNER COVER ON FRONT LEFT OR RIGHT SEAT (NORMAL/ELECTRIC)

Operation is identical to:

Replacing inner cover on left or right front seat (normal/electric), see **52 13 041 Removing and installing / replacing inner cover on left or right front seat backrest (normal/ manual)**

52 14 050 REPLACING LUMBAR CUSHION ON FRONT LEFT OR RIGHT SEAT (NORMAL/ELECTRIC)

Operation is identical to:

Replacing lumbar cushion on left or right front seat (normal/manual), see **52 13 050 Replacing lumbar cushion on front left or right seat**

52 14 060 REMOVING AND INSTALLING / REPLACING VALVE HOUSING FOR FRONT LEFT OR RIGHT LUMBAR SUPPORT (NORMAL / MANUAL)

Special tools required:

- **52 0 050 PLIERS**

Necessary preliminary tasks:

- Remove rear panel on front seat

E83:

If necessary, detach tensioning cables from backrest frame (2).

Detach backrest cover (1) in direction of arrow from backrest frame (2).

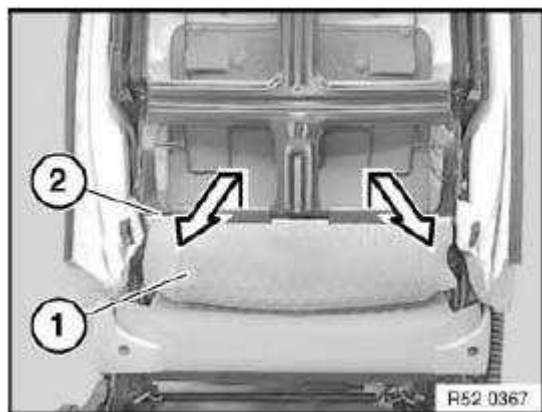


Fig. 110: Removing Backrest Cover From Backrest Frame
Courtesy of BMW OF NORTH AMERICA, INC.

E63:

Detach tensioning cables (1) from backrest frame (2).

Disconnect all retainers.

Detach partial cover (2) from backrest frame.

Installation:

Lock new retainers by bending with special tool 52 0 050.

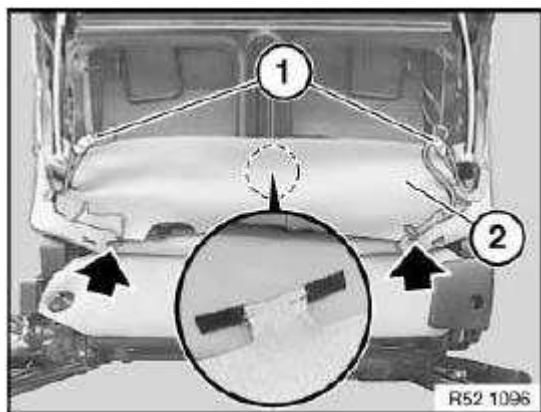


Fig. 111: Removing Partial Cover

Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (5).

NOTE: If necessary, gently heat air hose when firmly seated.

Disconnect air hoses (2...4) from valve housing (1).

2 Hose (blue) top cushion

3 Hose (clear) lumbar drive

4 Hose (red) bottom cushion

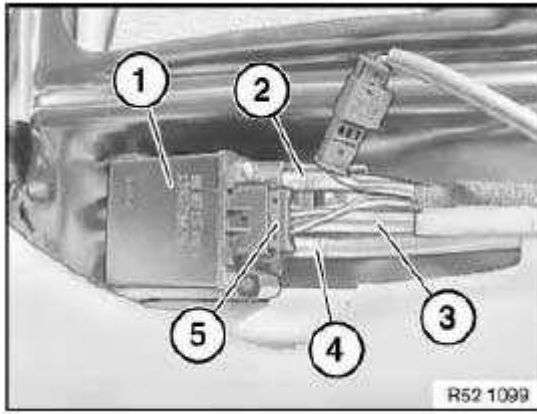


Fig. 112: Disconnecting Air Hoses
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1) from inside.

Remove valve housing (3) with metal nut (2).

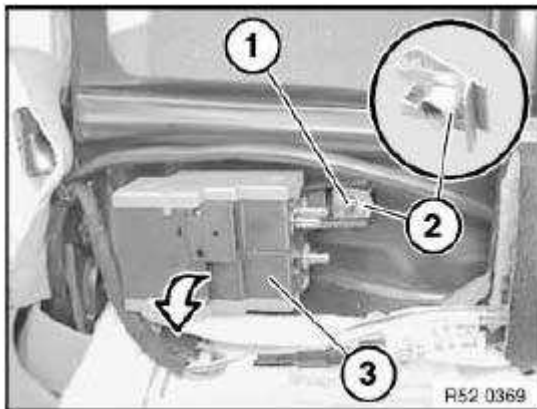


Fig. 113: Removing Valve Housing With Metal Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Pay attention to seat heating cable guide (1).

Lay air hoses (2) without kinks through hole (3).

Check function.

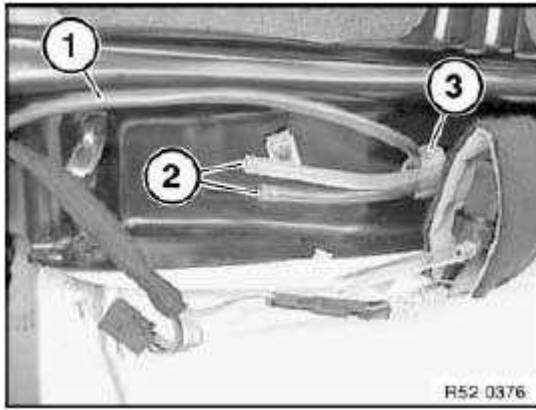


Fig. 114: Cable Guide And Hoses

Courtesy of BMW OF NORTH AMERICA, INC.

52 14 070 REMOVING AND INSTALLING/REPLACING SEAT ANGLE ADJUSTER ON LEFT OR RIGHT FRONT SEAT (NORMAL/ELECTRIC)

Necessary preliminary tasks:

- Remove front seat, see **52 14 000 Removing and installing left or right front seat (normal/electric)**
- Remove outer cover, see **52 16 040 Removing and installing/replacing outer cover on front left or right seat (sports/electric)**

Release screws (1).

Release screw (2).

Unclip carrier (3) from seat mechanism at rear.

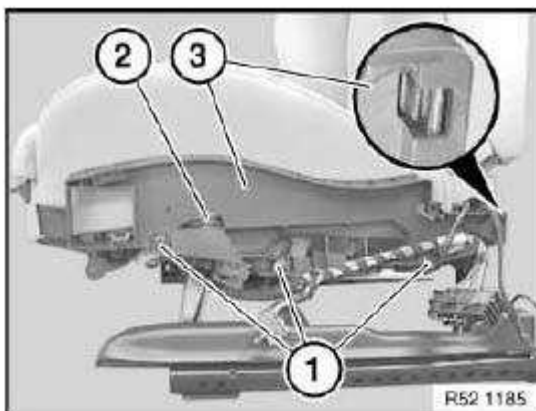


Fig. 115: Release Screw And Carrier

Courtesy of BMW OF NORTH AMERICA, INC.

Unlock plug connection (1) on drive unit (2) and disconnect.

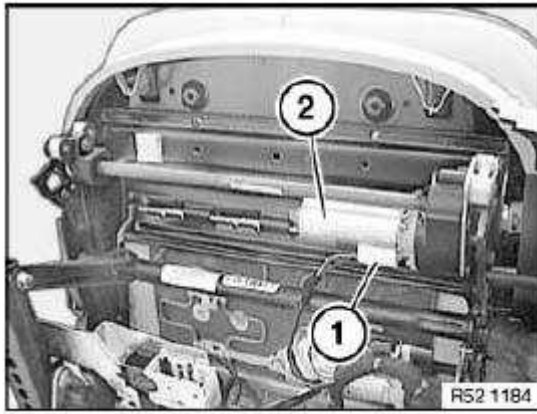


Fig. 116: Plug Connection And Drive Unit
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Installation:

Replace Taptite screws (1).

Tightening torque: 52 10 16AZ, see **52 10 FRONT SEATS** .

Release screw (2).

Tightening torque: 52 10 17AZ, see **52 10 FRONT SEATS** .

Remove seat angle adjuster (3).

Installation:

Slide left and right O-rings onto shaft. Make sure O-rings are correctly located between seat angle adjuster and seat pan.

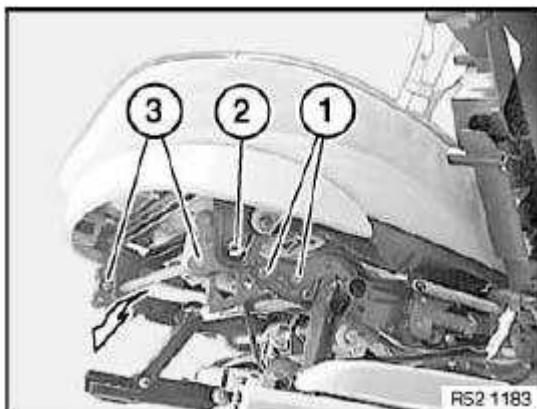


Fig. 117: Removing Seat Angle Adjuster
Courtesy of BMW OF NORTH AMERICA, INC.

52 14 198 REMOVING AND INSTALLING/REPLACING REAR PANEL ON LEFT OR RIGHT FRONT SEAT BACKREST (NORMAL/ELECTRIC)

Operation is identical to:

Replacing rear panel on left or right front seat backrest (normal/manual), see **52 13 198 Removing and installing / replacing rear panel on left or right front seat backrest (normal/manual)**

52 14 390 REMOVING AND INSTALLING OR REPLACING FRONT LEFT OR RIGHT HEAD RESTRAINTS (NORMAL/ELECTRIC)

Operation is identical to:

Replacing front left or right head restraint (normal/manual), see **52 13 390 Removing and installing / replacing front headrest (normal/ manual)**.

52 14 400 REPLACING SEAT COVER FOR LEFT OR RIGHT FRONT SEAT (NORMAL/ELECTRIC)

Operation differs as follows and is described in:

Replacing seat cover without thigh support for left or right front seat, see **52 13 400 Replacing seat cover on left or right front seat (normal/manual)**.

Replacing seat cover with thigh support for left or right front seat, see **52 16 400 Replacing seat cover for left or right front seat (sports/electric)**.

52 14 405 REPLACING BACKREST COVER FOR FRONT LEFT OR RIGHT SEAT (NORMAL/ELECTRIC)

Operation is identical to:

Replacing backrest cover for left or right front seat (normal/manual), see **52 13 405 Replacing back-rest cover for left or right front seat (normal / manual)**.

52 14 415 REPLACING SUPPORT FOR LEFT OR RIGHT FRONT SEAT (NORMAL/ELECTRIC)

WARNING: US/CND front passenger seat (with OC3 mat) only:
The support can only be removed in conjunction with the OC3 mat.
If support is defective, both parts may only be replaced together.
After fitting new support, enable OC3 mat with BMW diagnosis system.

The operation for removing the support with/without OC3 mat is described in:

- Replacing seat cover on front seat, see **52 14 400 Replacing seat cover for left or right front seat (normal/electric)**

Enabling seat occupancy detector (OC3 mat):

- Connect BMW diagnosis system
- Release seat occupancy detector
- Clear fault memory if necessary

52 14 420 REPLACING PADDING FOR LEFT OR RIGHT FRONT SEAT BACKREST (NORMAL/ELECTRIC)

This operation is described in section on:

Replace backrest cover for left or right front seat, see **52 14 405 Replacing backrest cover for front left or right seat (normal/electric)**.

52 14 899 ADDITIONAL WORK (NORMAL/ ELECTRIC) WITH DEFECTIVE DRIVE FOR LONGITUDINAL ADJUSTMENT

Set seat tilt adjustment to max. up setting.

Release screw (1) on actuator drive (2) of longitudinal seat adjustment.

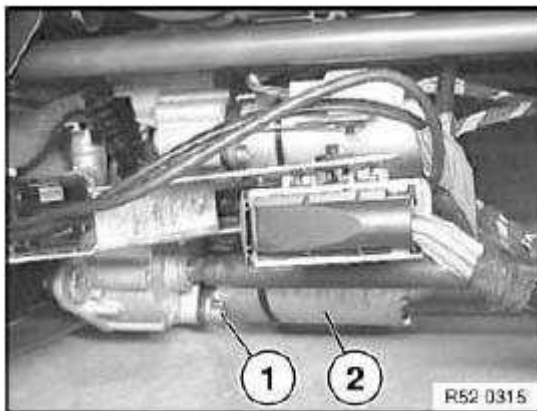


Fig. 118: Actuator Drive And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1) on servodrive (2) of longitudinal seat adjustment and remove servodrive (2).

Activate the operating switch for the seat position adjustment:

- A. No function:
- Disconnect plug for longitudinal seat adjustment
 - Connect new servodrive and check function

- If servodrive is running, gear is O.K.
- Reassemble front seat

B. Actuator drive running:

- Transmission for longitudinal seat adjustment defective!
- Continue with

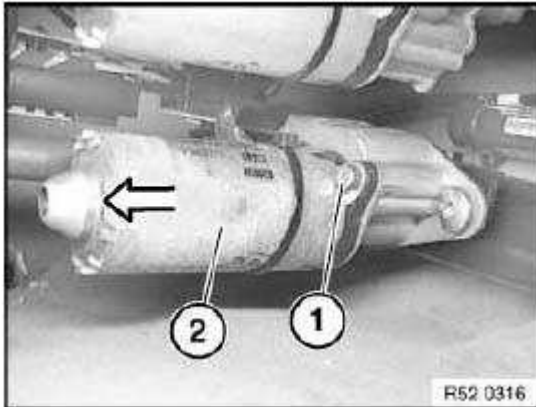


Fig. 119: Removing Servodrive

Courtesy of BMW OF NORTH AMERICA, INC.

Disassembly of faulty gear for longitudinal seat adjustment

Disassembly of faulty gear (1) for longitudinal seat adjustment:

NOTE: For purposes of clarity, the backrest frame and seat cover are shown removed.

(2) Input shaft

(3) Internal gear

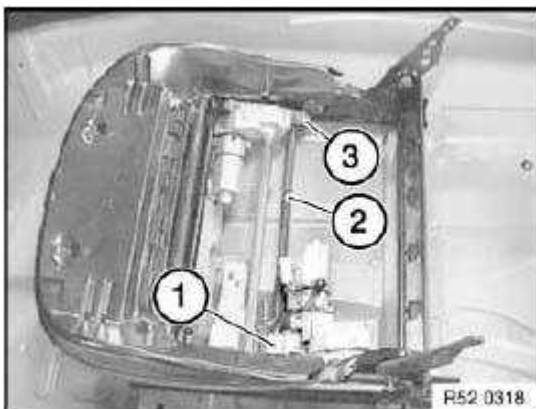


Fig. 120: Input Shaft And Internal Gear

Courtesy of BMW OF NORTH AMERICA, INC.

Using a pneumatic saw (1),
cut through drive shaft (2) from rear.

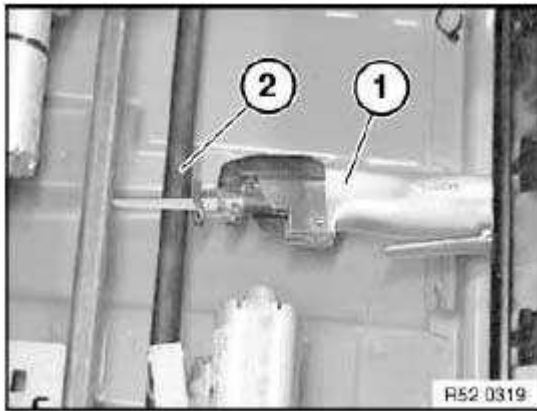


Fig. 121: Pneumatic Saw And Drive Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Remove drive shaft (1) from gear (2).

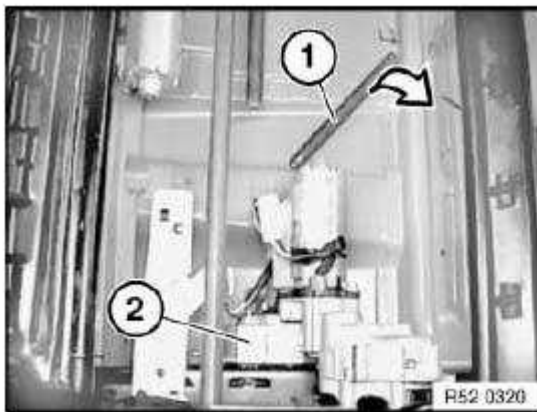


Fig. 122: Removing Drive Shaft From Gear
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1) and remove gear (2).

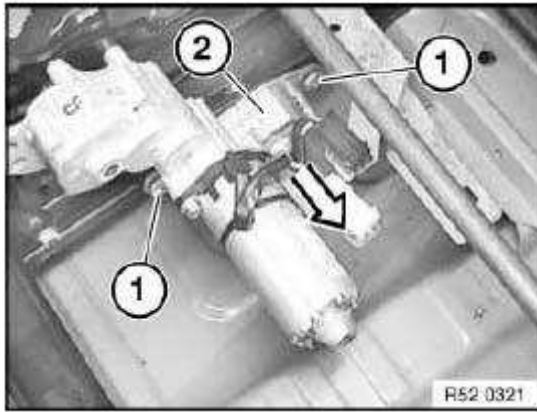


Fig. 123: Removing Gear And Screw
 Courtesy of BMW OF NORTH AMERICA, INC.

Over rest of drive shaft (1),
 adjust front seat,
 release screws on floor panel
 and remove front seat.

NOTE: If gear (4) is faulty,
 detach cover (2),
 release screws (3),
 and remove gear (4).

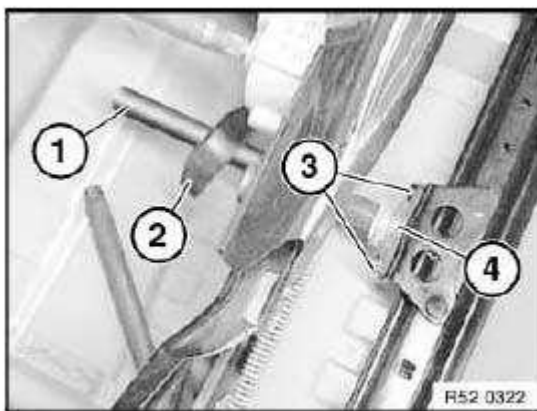


Fig. 124: Removing Gear And Screw
 Courtesy of BMW OF NORTH AMERICA, INC.

Replace seat mechanism on front seat.

52 15... REMOVING AND INSTALLING/REPLACING GUIDE FOR FRONT LEFT OR RIGHT HEAD RESTRAINT (SPORTS/NORMAL)

Operation is identical to:

- Removing and installing guide for front head restraint (normal/manual), see **52 13 ... Removing and installing/replacing guide for front left or right head restraint**

52 15 000 REMOVING AND INSTALLING FRONT SEAT (SPORTS/MANUAL), LEFT OR RIGHT

Operation is identical to:

Removing and installing front seat (normal/manual), left or right.

52 15 015 REMOVING AND INSTALLING/REPLACING ACTUATING UNIT ON FRONT LEFT OR RIGHT SEAT (SPORTS/MANUAL)

Operation is identical to:

Remove and install/replace actuating unit on front left or right seat (normal/manual),

refer to **52 13 015**.

52 15 025 REMOVING AND INSTALLING/REPLACING SEAT MECHANISM ON LEFT OR RIGHT FRONT SEAT (SPORT/MANUAL)

Operation is identical to:

Replacing seat mechanism on left or right front seat (normal/electric), see **52 14 025 Removing and installing/replacing seat mechanism on left or right front seat (normal/electric)**

52 15 030 REMOVING AND INSTALLING/REPLACING BACKREST FRAME ON LEFT OR RIGHT FRONT SEAT (SPORT/MANUAL)

Remove backrest frame and backrest cover with padding,

refer to **52 13 405**.

Replacement only:

Model with lumbar supports:

If necessary, remove lumbar cushion on front seat,

refer to **52 13 050**.

If necessary, remove valve housing for front lumbar support,

If necessary, remove drive unit for lumbar support on front seat,

refer to **67 66 010** .

Lift out mount (1) for rear panel

at top and pull off

towards rear/top from backrest frame (2).

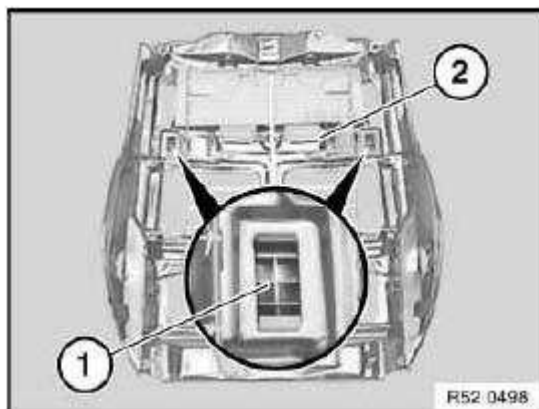


Fig. 125: Out Mount, And Backrest Frame
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Catch (1) and guide (2) on mount (3) for rear panel must not be damaged.

Guide taper (4) must point downwards.

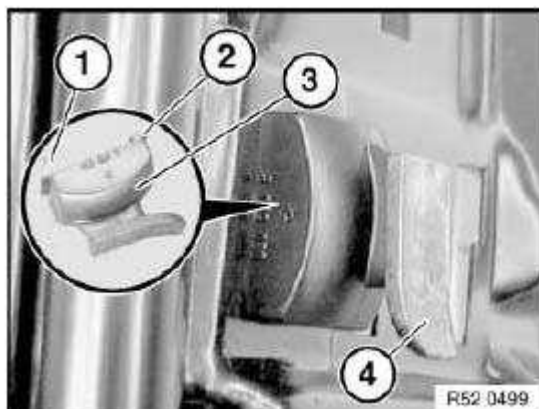


Fig. 126: Taper And Mount
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, release screw (1) and remove metal nut (2).

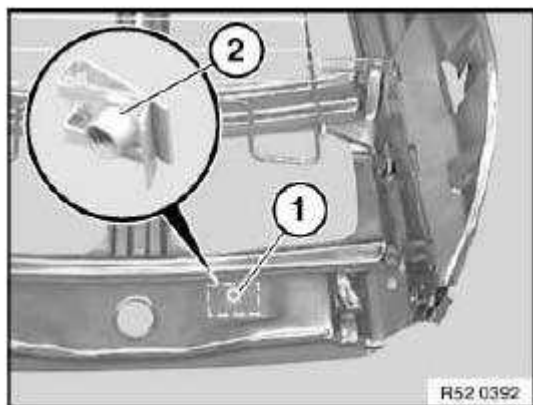


Fig. 127: Metal Nut

Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, remove mat (1) from spring wire (2) of backrest frame (3).

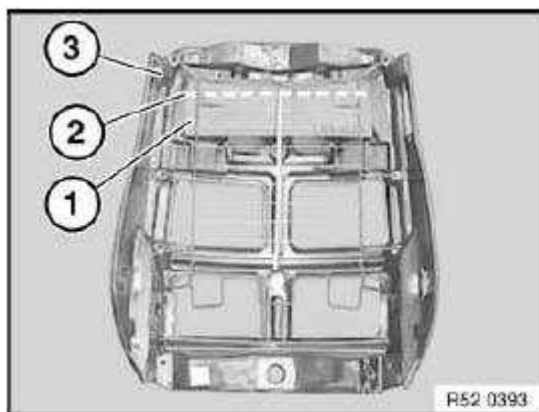


Fig. 128: Mat And Spring Wire

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

If necessary, suspend mat (1) on uppermost spring wire (2) on backrest frame (3).

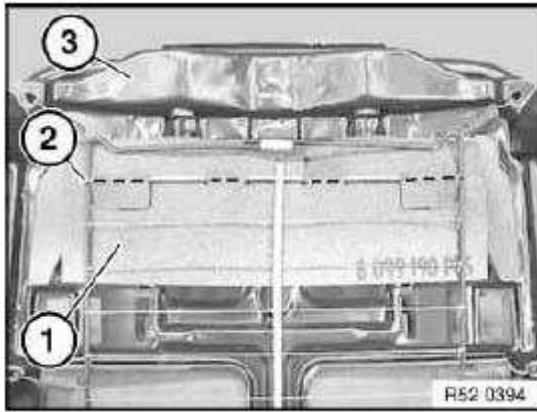


Fig. 129: Spring Wire And Backrest Frame

Courtesy of BMW OF NORTH AMERICA, INC.

52 15 040 REMOVING AND INSTALLING/REPLACING OUTER COVER ON FRONT LEFT OR RIGHT SEAT (SPORTS/MANUAL)

Operation is identical to:

Remove and install/replace outer cover on front left or right seat (normal/manual),

refer to **52 13 040**.

52 15 041 REMOVING AND INSTALLING/REPLACING INNER COVER ON FRONT LEFT OR RIGHT SEAT (SPORTS/MANUAL)

Operation is identical to:

Replacing inner cover on left or right front seat (normal/electric), see **52 13 041 Removing and installing / replacing inner cover on left or right front seat backrest (normal/ manual)**.

52 15 050 REPLACING LUMBAR CUSHION ON FRONT LEFT OR RIGHT SEAT (SPORTS/MANUAL)

Operation is identical to:

Replace lumbar cushion on front left or right seat (normal/manual),

refer to **52 13 050**.

52 15 070 REMOVING AND INSTALLING/REPLACING SEAT ANGLE ADJUSTER (SPORT/MANUAL) ON LEFT OR RIGHT FRONT SEAT

Special tools required:

- **51 2 100 CLAMPING LEVER**

Necessary preliminary tasks:

- Remove front seat, see **52 15 000 Removing and installing front seat (sports/manual), left or right**
- Remove actuating unit, see **52 13 015 Removing and installing / replacing controls on left / right front seat (normal / manual)**

WARNING: Torsion bar spring (1) is subject to tension. Risk of injury.

Lever torsion bar spring (1) with special tool 51 2 100 in direction of arrow from seat angle adjuster.

Feed torsion bar spring (1) out of seat mechanism.

Installation:

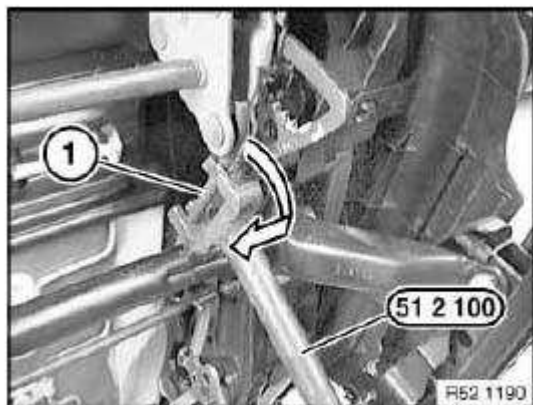


Fig. 130: Removing Bar Spring

Courtesy of BMW OF NORTH AMERICA, INC.

Make sure plastic protector is correctly positioned on contact surface between torsion bar spring and seat mechanism (grating noises).

Release screws (1).

Installation:

Replace Taptite screws (1).

Tightening torque: 52 10 16AZ, see **52 10 FRONT SEATS** .

Release screw (2).

Remove seat angle adjuster (3).

Installation:

Slide left and right O-rings onto shaft. Make sure O-rings are correctly located between seat angle adjuster and seat pan.

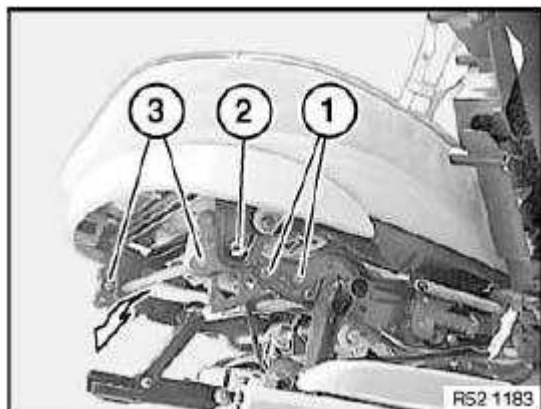


Fig. 131: Removing Seat Angle Adjuster
Courtesy of BMW OF NORTH AMERICA, INC.

52 15 095 REMOVING AND INSTALLING/REPLACING THIGH SUPPORT HOLDER ON FRONT LEFT OR RIGHT SEAT (SPORTS/MANUAL)

Operation is identical to:

Remove and install/replace thigh support holder on front left or right seat (sports/electric),

refer to **52 16 095**.

52 15 198 REMOVING AND INSTALLING/REPLACING REAR PANEL ON FRONT LEFT OR RIGHT SEAT BACKREST (SPORTS/MANUAL)

Release clips (1) with side cutting pliers.

NOTE: Remove clip remainders.



Fig. 132: Clip Reminders

Courtesy of BMW OF NORTH AMERICA, INC.

Lever out rear panel (1) at bottom towards rear and pull out towards bottom from backrest frame (2).

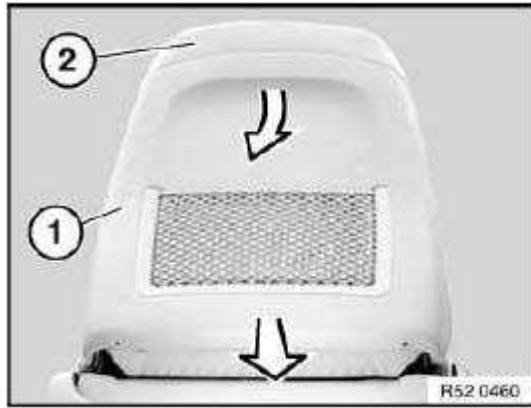


Fig. 133: Pulling Out Rear Panel At Bottom Towards Rear

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Bores (1) and fastening set (2) of rear panel (3) must not be damaged.

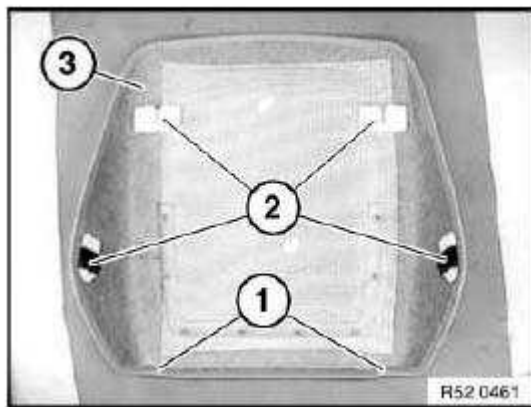


Fig. 134: Fastening Set And Rear Panel

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Slide backrest cover (1) on left/right over clip mount (2).

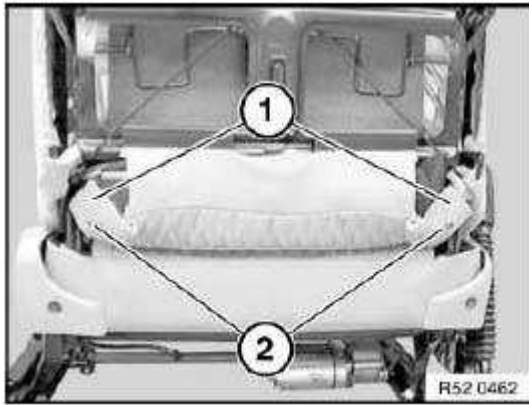


Fig. 135: Backrest Cover And Clip Mount
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Mounts (1) on backrest frame (2) must not be damaged.

To install rear panel, first slide into mounts (1) and then slide in at sides at bottom, refer to next work step.

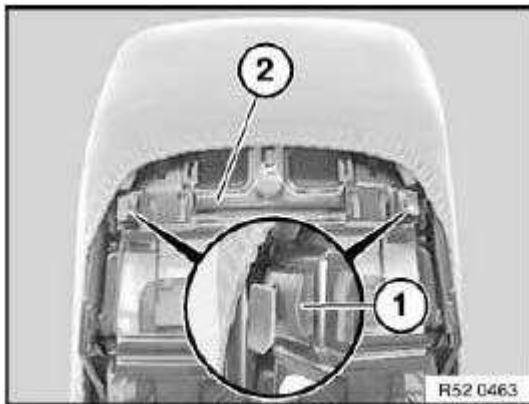


Fig. 136: Mounts And Backrest Frame
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

After installing rear panel in upper mounts,

refer to previous work step:

Feed rear panel at sides into opening in backrest cover and

insert into mounts (1) on left/right on backrest frame (2) and snap into place.

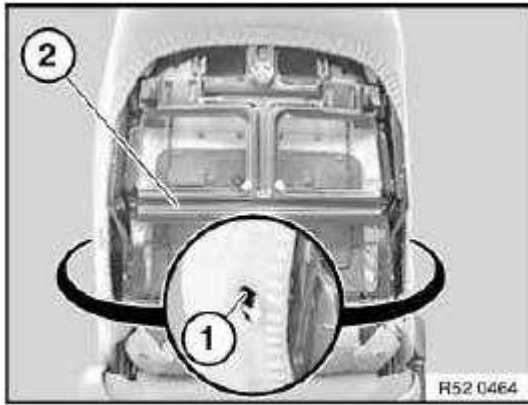


Fig. 137: Installing Rear Panel In Upper Mounts
Courtesy of BMW OF NORTH AMERICA, INC.

52 15 390 REMOVING AND INSTALLING OR REPLACING FRONT LEFT OR RIGHT HEAD RESTRAINTS (SPORTS/MANUAL)

Operation is identical to:

Replacing front left or right head restraint (normal/manual), see **52 13 390 Removing and installing / replacing front headrest (normal/ manual)**

52 15 400 REPLACING SEAT COVER FOR LEFT OR RIGHT FRONT SEAT (SPORT/MANUAL)

Operation is identical to:

Replacing seat cover for left or right front seat (normal/manual), see **52 16 400 Replacing seat cover for left or right front seat (sports/electric)**

52 15 405 REPLACING BACKREST COVER FOR LEFT OR RIGHT FRONT SEAT (SPORT/MANUAL)

Operation is identical to:

Replacing backrest cover for left or right front seat (normal/manual), see **52 13 405 Replacing back-rest cover for left or right front seat (normal / manual)**

52 15 415 REPLACING PADDING FOR LEFT OR RIGHT FRONT SEAT (SPORT/MANUAL)

This operation is described in section on:

Replacing seat cover on left or right front seat, see **52 13 400 Replacing seat cover on left or right front seat (normal/manual)**

52 15 420 REPLACING PADDING FOR LEFT OR RIGHT FRONT SEAT BACKREST (SPORT/MANUAL)

This operation is described in section on:

Replace backrest cover for left or right front seat, see **52 13 405 Replacing back-rest cover for left or right front seat (normal / manual)**

16 FRONT SEAT SPORTS, ELECTRIC

52 16... REMOVING AND INSTALLING/REPLACING CARRIER FOR OUTER COVER ON LEFT OR RIGHT FRONT SEAT (SPORTS/ELECTRIC)

Remove outer front cover.

Release screws, remove lower section.

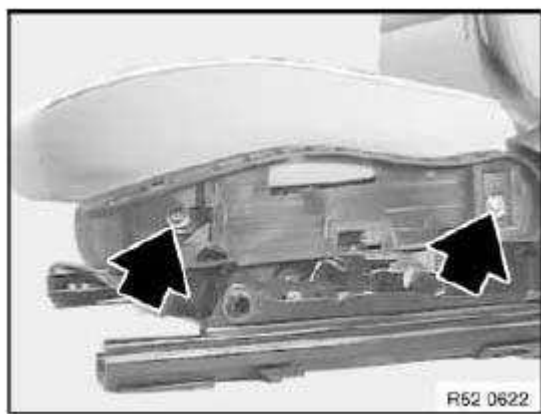


Fig. 138: Locating Lower Section

Courtesy of BMW OF NORTH AMERICA, INC.

52 16... REMOVING AND INSTALLING/REPLACING GUIDE FOR FRONT LEFT OR RIGHT HEAD RESTRAINT (SPORTS/ELECTRIC)

Operation is identical to:

- Removing and installing guide for front head restraint (normal/manual), see **52 13 ... Removing and installing/replacing guide for front left or right head restraint**

52 16... REMOVING AND INSTALLING/REPLACING SEAT PAN AND FLEX MAT ON FRONT LEFT OR RIGHT SEAT (SPORTS/ELECTRIC)

Remove seat cover with padding,

refer to **52 16 400**.

Release left screw (1) and slacken right screw only.

Release left/right screws (3).

Slacken left/right screws (4) only.

Lever out retaining plate (2) on left.

Installation:

Tightening torque: 52 10 9AZ, see **52 10 FRONT SEATS** .

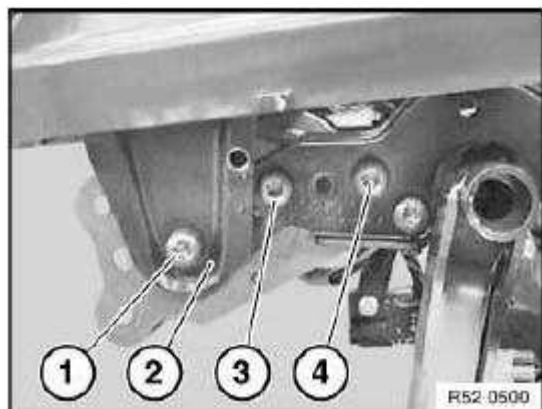


Fig. 139: Retaining Plate And Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Press seat pan (4) upwards, thereby relieving tension on flex mat.

Release screw (1) and remove support (2) from gear (3).

Installation:

Tightening torque: 52 10 9AZ, see **52 10 FRONT SEATS** .

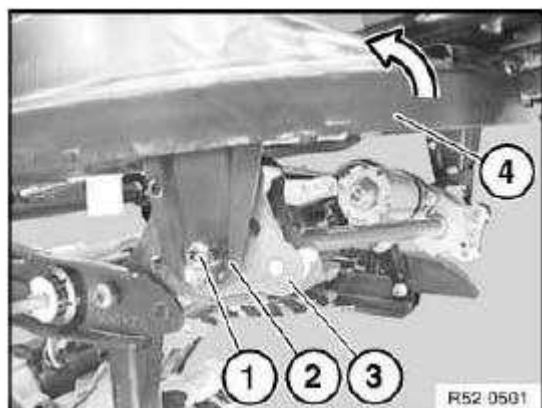


Fig. 140: Removing Support From Gear

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Using split-pin drift (1), lift support (2) onto guide (3).

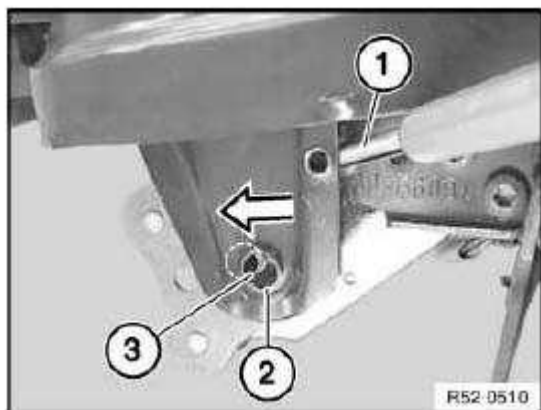


Fig. 141: Lifting Support Onto Guide
Courtesy of BMW OF NORTH AMERICA, INC.

Version with seat occupancy detector:

If necessary, unhook control unit (1) and cable (3) from holders (2).

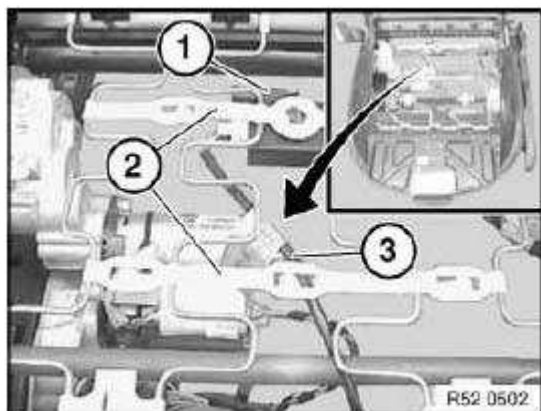


Fig. 142: Releasing Control Unit And Cable From Holders
Courtesy of BMW OF NORTH AMERICA, INC.

Turn seat pan (1) upwards.

Detach flexmat (2) at rear from mounts (3).

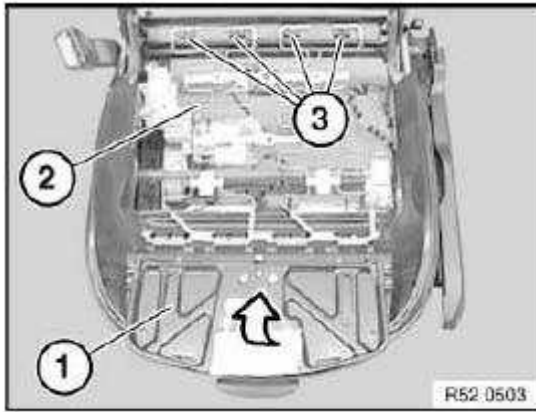


Fig. 143: Detaching Flexmat At Rear From Mounts
Courtesy of BMW OF NORTH AMERICA, INC.

Detach seat pan (1) on left/right backwards/top from mount (2) and remove.

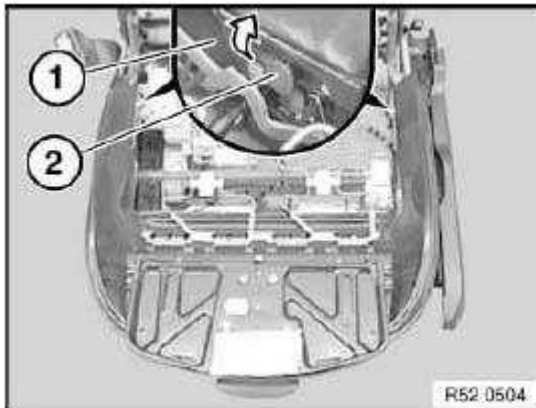


Fig. 144: Detaching Seat Pan On Left/Right Backwards/Top
Courtesy of BMW OF NORTH AMERICA, INC.

Detach flexmat (1) from mounts (2) on seat pan (3).

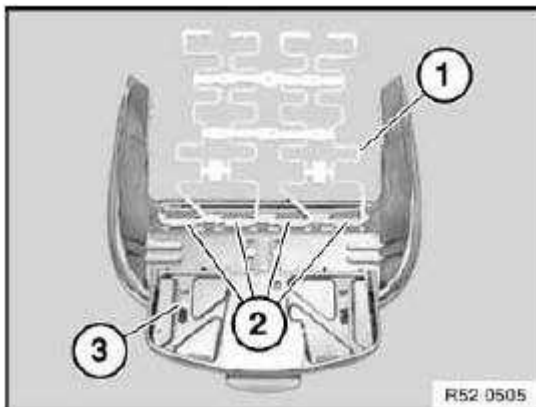


Fig. 145: Removing Flexmat From Mounts On Seat Pan
Courtesy of BMW OF NORTH AMERICA, INC.

Removing thigh support from seat pan:

Unhook spring (1) from thigh support (2).

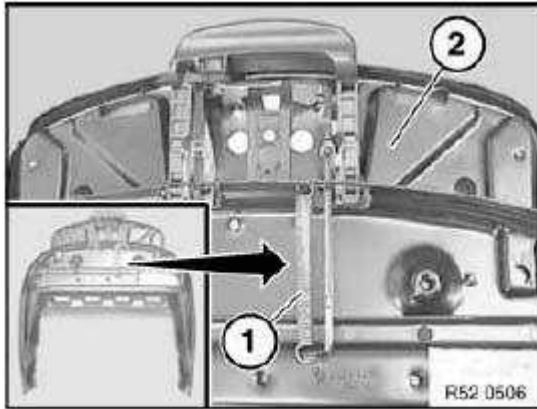


Fig. 146: Releasing Spring From Thigh Support
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) and remove thigh support (2).

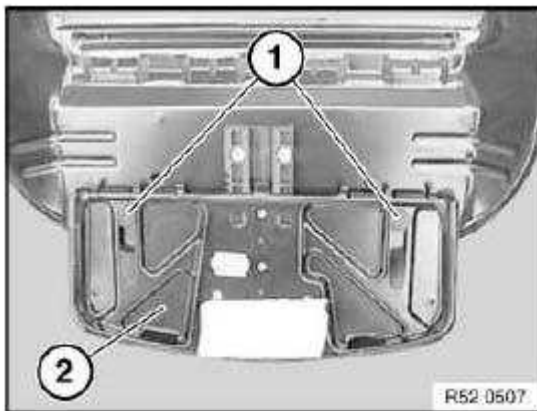


Fig. 147: Thigh Support And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, release screws (1) and remove guide rails (2) from seat pan (3).

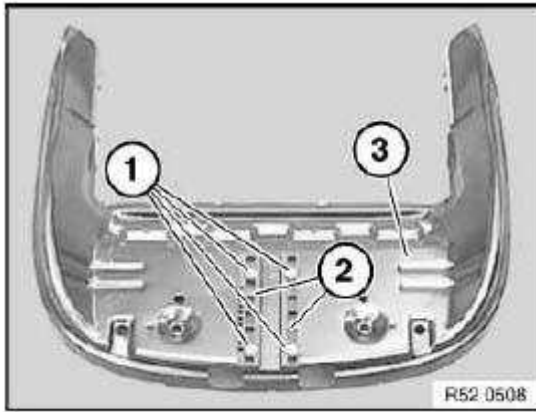


Fig. 148: Guide Rails And Seat Pan

Courtesy of BMW OF NORTH AMERICA, INC.

52 16 000 REMOVING AND INSTALLING FRONT SEAT (SPORTS/ELECTRIC), LEFT OR RIGHT

Operation is identical to:

Removing and installing front seat (normal/manual), left or right.

52 16 025 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT SEAT MECHANISM (ON SPORT/ELECTRIC FRONT SEAT)

Remove seat pan and flexmat on front seat,

Remove backrest frame on front seat,

refer to **52 13 030**.

Remove seatbelt tensioner,

refer to **72 11 030** .

Disconnect all plug connections (1) from actuator drives.

Remove seat wiring harness from seat mechanism (2).

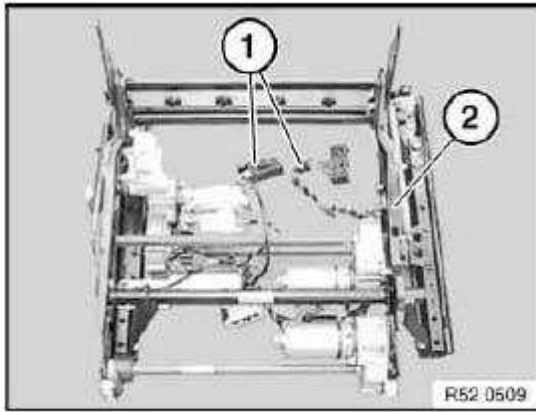


Fig. 149: Plug Connections And Seat Mechanism
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Perform function check:

Connect cable 61 2 071 to battery,

connect cable 61 2 074 to cable 61 2 071 and plug connection (1) to front seat.

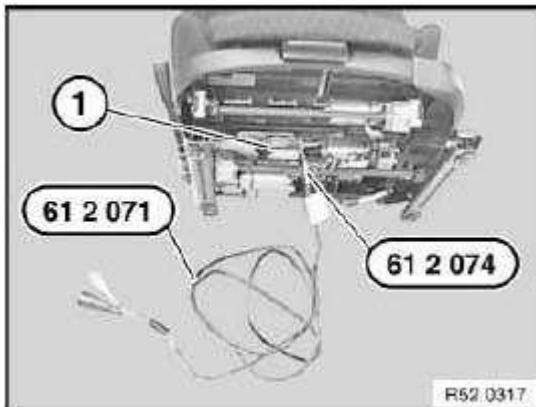


Fig. 150: Plug Connection And Special Tool
 Courtesy of BMW OF NORTH AMERICA, INC.

52 16 030 REMOVING AND INSTALLING/REPLACING BACKREST FRAME ON LEFT OR RIGHT FRONT SEAT (SPORT/ELECTRIC)

Operation is identical to:

Replacing backrest frame on left or right front seat (sport/manual), see **52 15 030 Removing and installing/replacing backrest frame on left or right front seat (sport/manual)**

52 16 040 REMOVING AND INSTALLING/REPLACING OUTER COVER ON FRONT LEFT OR RIGHT SEAT (SPORTS/ELECTRIC)

Unscrew bolt (1).

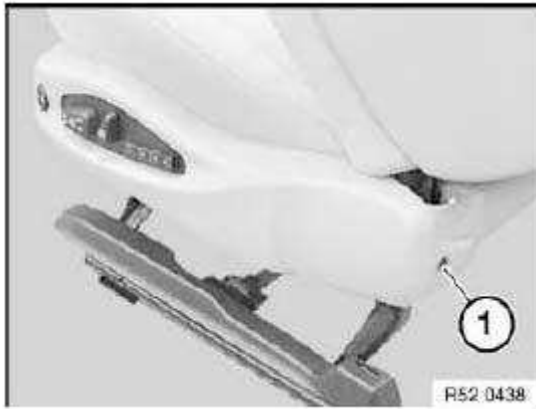


Fig. 151: Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Removing top cover:

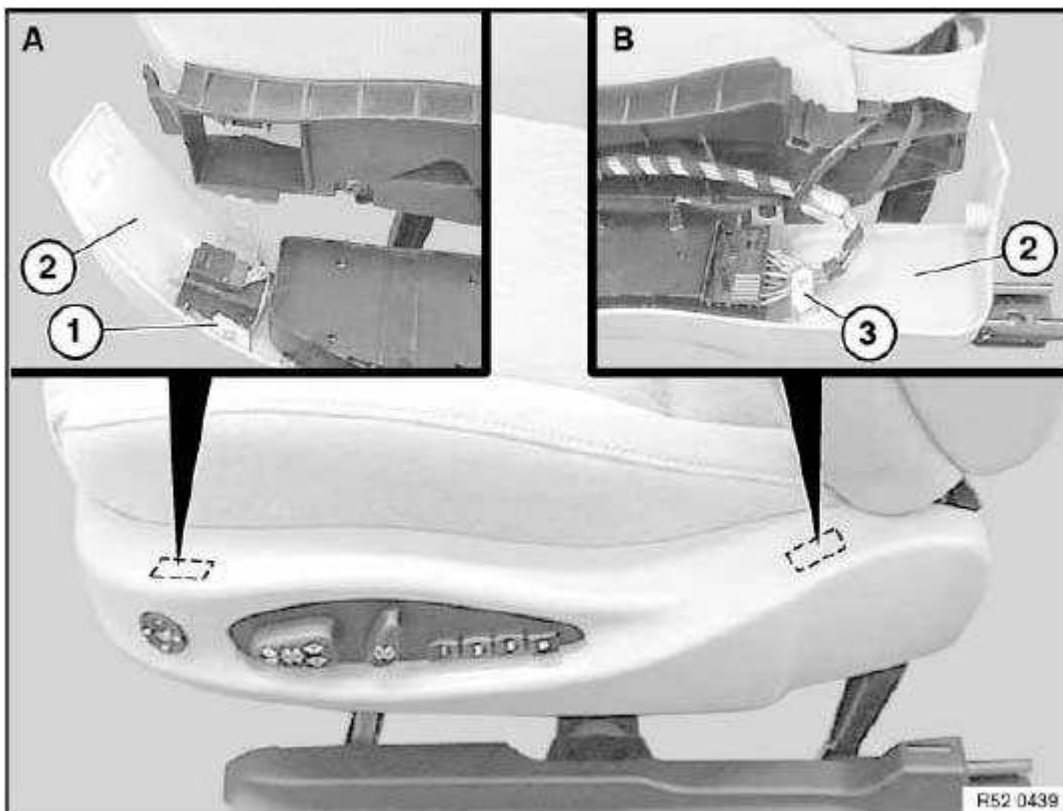


Fig. 152: Pulling Rear Cover Outwards

Courtesy of BMW OF NORTH AMERICA, INC.

- A. Snap out catch (1) on front cover (2) towards bottom and pull cover (2) outwards a little.
- B. Snap out catch (3) on rear cover (2) towards front/bottom and pull cover (2) outwards a little.

Lever lugs (1) on cover (3) out of brackets (2).

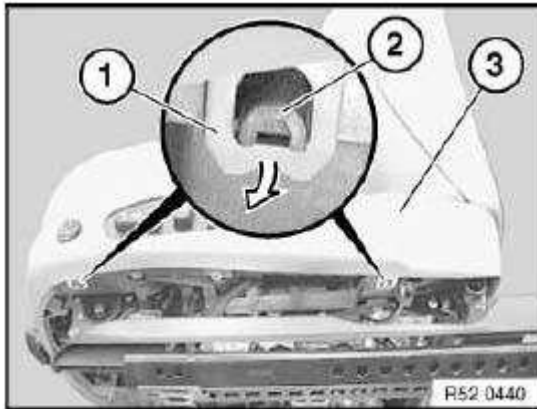


Fig. 153: Removing Lugs On Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Lever out cover (1) at rear, detach at front from guide and remove.



Fig. 154: Removing Front From Guide
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Do not crush cables (1) during installation.

Insert lugs (2) into mounts (3) and snap into place.

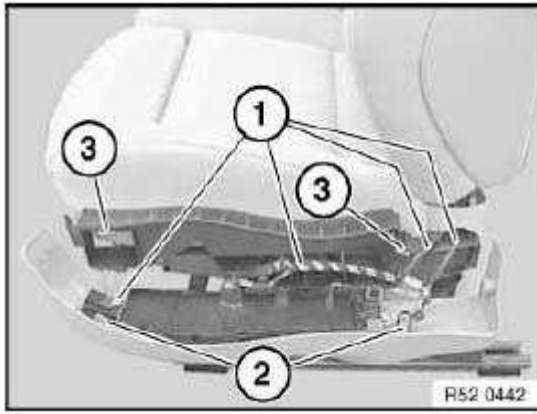


Fig. 155: Crush Cables, Lugs And Mounts
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1).

Lever out lugs (2) and detach switch combination (3).

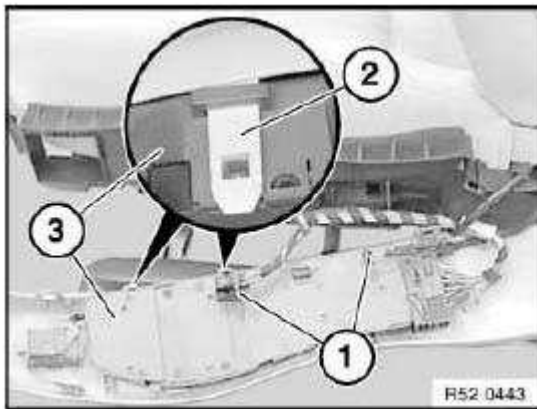


Fig. 156: Out Lugs And Switch Combination
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Guides (1) and catches (2) on switch combination (3) must not be damaged.

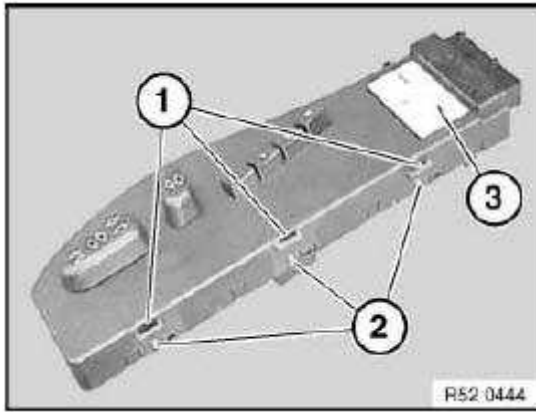


Fig. 157: Guides, Catches And Switch Combination
 Courtesy of BMW OF NORTH AMERICA, INC.

Model with lumbar supports:

If necessary, expose cable (1) and disconnect plug connection (2).

Replacement only:

If necessary, press down catches (3) on left/right and remove switch (4) from cover.

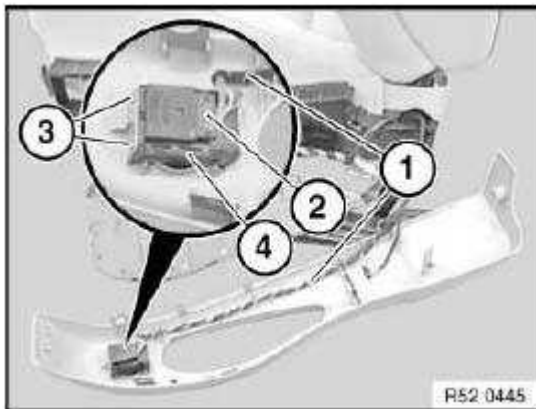


Fig. 158: Expose Cable, Catches And Switch
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Following parts must not be damaged, replace cover (4) if necessary:

1. Mounts for switch combination
2. Guide, front
3. Tabs

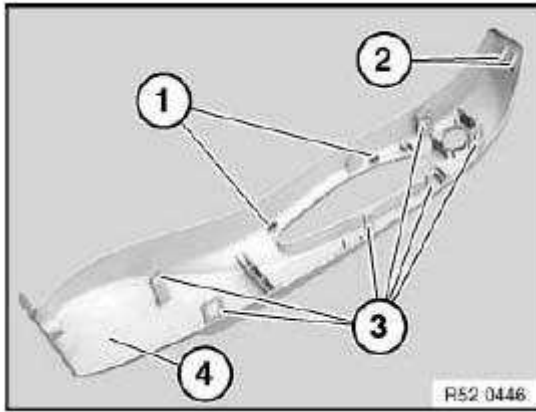


Fig. 159: Guide, Tabs And Switch Combination
 Courtesy of BMW OF NORTH AMERICA, INC.

Replacement of switch combination only or in event of further work on front seat:

Disconnect plug connection (1) and remove switch combination (2).

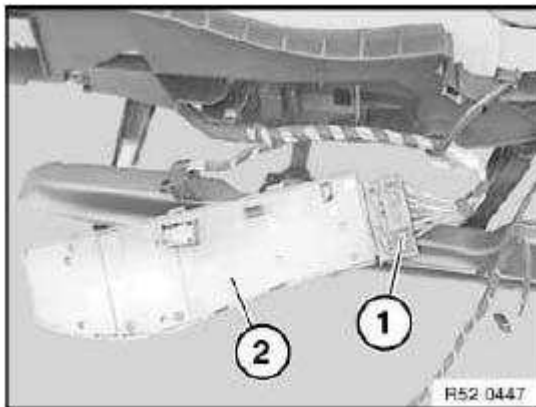


Fig. 160: Plug Connection And Switch Combination
 Courtesy of BMW OF NORTH AMERICA, INC.

52 16 041 REMOVING AND INSTALLING/REPLACING INNER COVER ON FRONT LEFT OR RIGHT SEAT (SPORTS/ELECTRIC)

Operation is identical to:

Replacing inner cover on left or right front seat (normal/electric), see **52 13 041 Removing and installing / replacing inner cover on left or right front seat backrest (normal/ manual).**

52 16 070 REMOVING AND INSTALLING/REPLACING SEAT ANGLE ADJUSTER ON LEFT OR RIGHT FRONT SEAT (SPORT/ELECTRIC)

Necessary preliminary tasks:

- Remove front seat, see **52 14 000 Removing and installing left or right front seat (normal/electric)**
- Remove outer cover, see **52 16 040 Removing and installing/replacing outer cover on front left or right seat (sports/electric)**

Release screws (1).

Release screw (2).

Unclip carrier (3) from seat mechanism at rear.

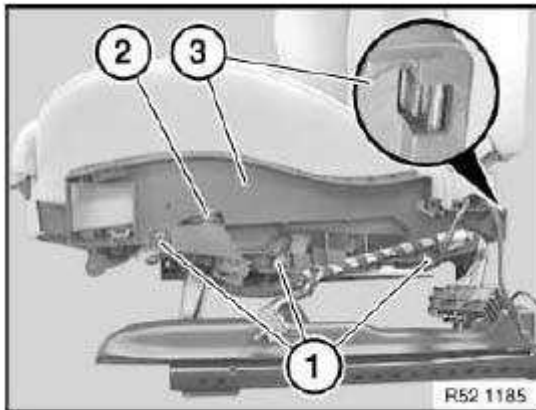


Fig. 161: Release Screw And Carrier
 Courtesy of BMW OF NORTH AMERICA, INC.

Unlock plug connection (1) on drive unit (2) and disconnect.

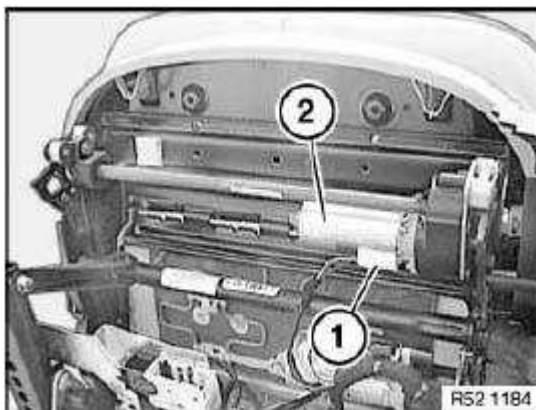


Fig. 162: Plug Connection And Drive Unit
 Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Installation:

Replace Taptite screws (1).

Tightening torque: 52 10 16AZ, see **52 10 FRONT SEATS** .

Release screw (2).

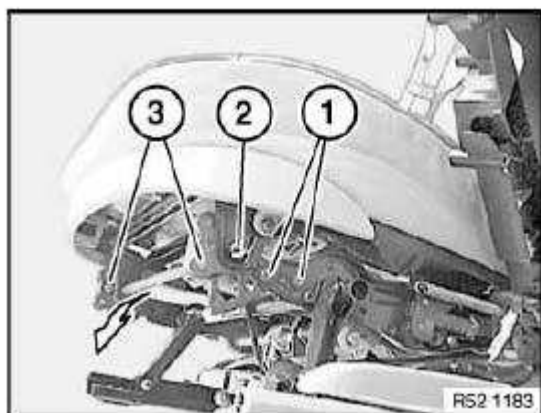


Fig. 163: Removing Seat Angle Adjuster
Courtesy of BMW OF NORTH AMERICA, INC.

Tightening torque: 52 10 17AZ, see **52 10 FRONT SEATS** .

Remove seat angle adjuster (3).

Installation:

Slide left and right O-rings onto shaft. Make sure O-rings are correctly located between seat angle adjuster and seat pan.

52 16 095 REMOVING AND INSTALLING/REPLACING THIGH SUPPORT HOLDER ON FRONT LEFT OR RIGHT SEAT (SPORTS/ELECTRIC)

Unfasten thigh support and pull completely towards front.

Detaching cushion for thigh support:

Bend open retaining plates (1) and remove cover piping (2).

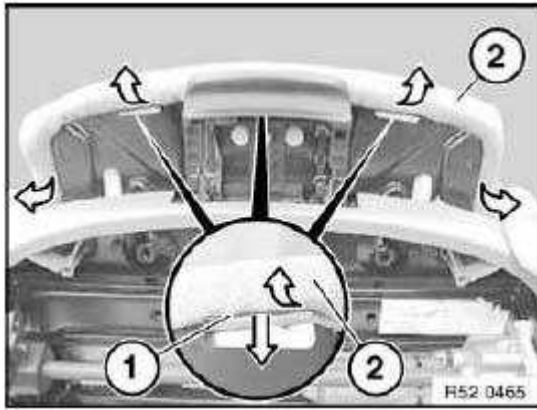


Fig. 164: Removing Retaining Plates And Cover Piping
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Cushion (1) is attached at front with double-sided adhesive tape (3) to holder (2).

Pull cushion (1) towards top off holder (2).

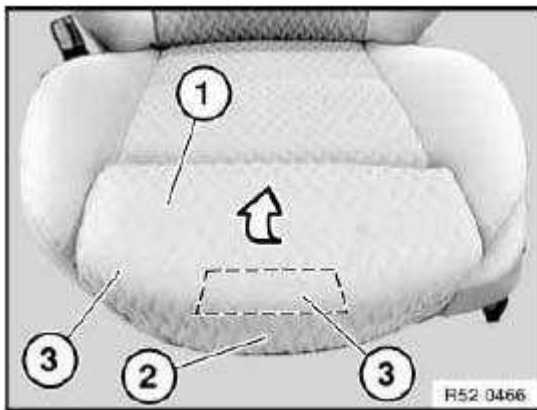


Fig. 165: Pulling Cushion Towards Top Off Holder
 Courtesy of BMW OF NORTH AMERICA, INC.

Lever trim wire (1) out of mounts (2).

Installation:

Stick new double-sided adhesive tape (4) to holder (3) or attach mount with spray adhesive.

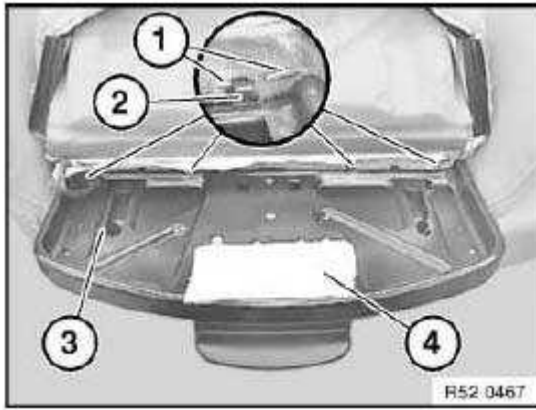


Fig. 166: Lever Trim Wire And Mounts
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The operation "Removing cushion for thigh support" ends here.

Removal of "Thigh support holder" only:

Unhook spring (1) at bottom from holder (2) and seat frame (3).

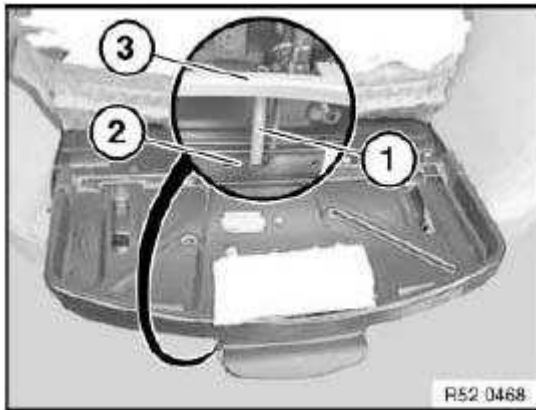


Fig. 167: Releasing Spring At Bottom From Holder
 Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Press operating lever (2) fully and detach holder (3) for thigh support towards front from seat frame (4).

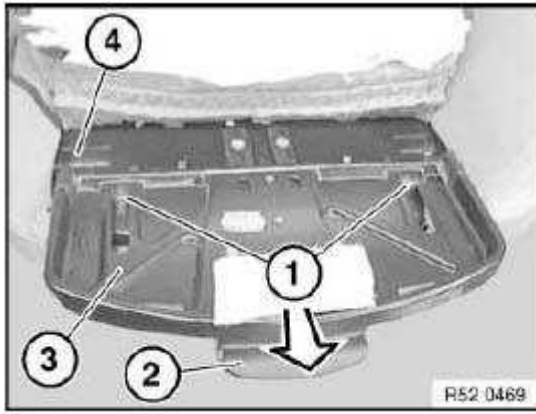


Fig. 168: Pressing Operating Lever
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Following parts on holder (5) must not be damaged:

1. Mounts for trim wire
2. Holding-down elements for trim wire
3. Guide sleeves
4. Double-sided adhesive tape (replace or coat with spray adhesive for assembly)

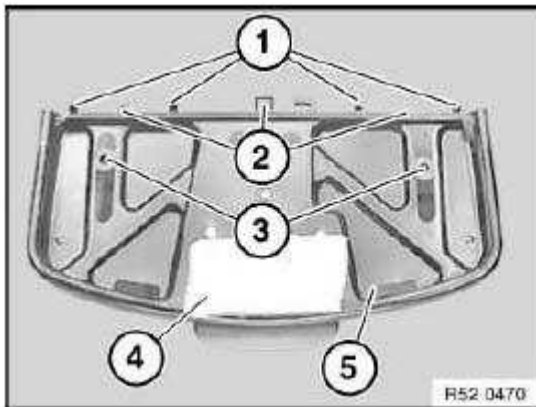


Fig. 169: Holder, Guide Sleeves And Trim Wire
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

If necessary, release screws (1) and remove guide rails (2) from seat frame (3).

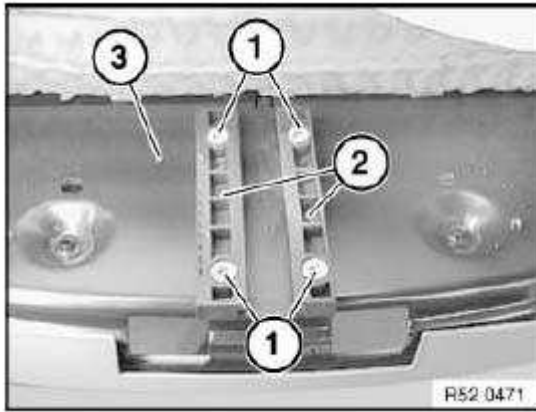


Fig. 170: Release Screws And Seat Frame
 Courtesy of BMW OF NORTH AMERICA, INC.

52 16 095 REMOVING AND INSTALLING/REPLACING THIGH SUPPORT HOLDER ON FRONT LEFT OR RIGHT SEAT (SPORTS/ELECTRIC)

Necessary preliminary tasks:

- Move thigh support forwards fully

Unfasten plug connection (1) and disconnect.

Release screws (2).

Installation:

Insert screws (2) with Loctite.

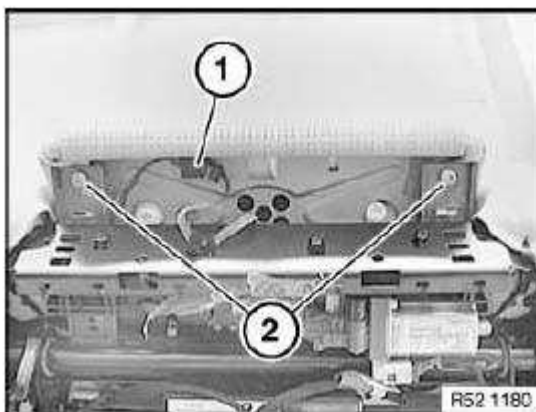


Fig. 171: Plug Connection And Screws
 Courtesy of BMW OF NORTH AMERICA, INC.

Detach seat cover (1) in marked area from carrier (2) for thigh support.

Feed plug out of carrier (2) for thigh support.

Remove carrier (2) for thigh support.

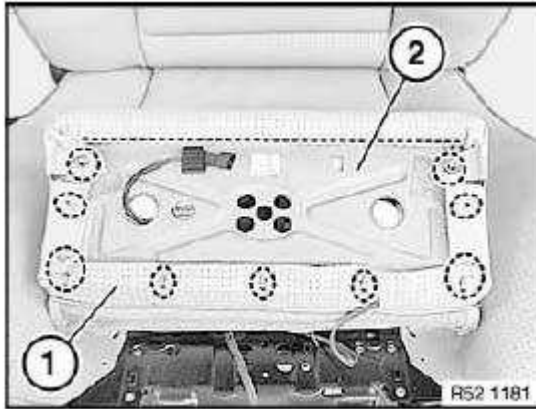


Fig. 172: Detaching Seat Cover

Courtesy of BMW OF NORTH AMERICA, INC.

52 16 198 REMOVING AND INSTALLING/REPLACING REAR PANEL ON FRONT LEFT OR RIGHT SEAT BACKREST (SPORTS/ELECTRIC)

Operation is identical to:

Remove and install/replace rear panel on front left or right seat backrest (sports/manual),

refer to **52 15 198**.

52 16 390 REMOVING AND INSTALLING/REPLACING FRONT HEAD RESTRAINT (SPORTS/ELECTRIC) ON LEFT OR RIGHT

Operation is identical to:

Replacing front left or right head restraint (normal/manual), see **52 13 390 Removing and installing / replacing front headrest (normal/ manual)**

52 16 400 REPLACING SEAT COVER FOR LEFT OR RIGHT FRONT SEAT (SPORTS/ELECTRIC)

Special tools required:

- 52 0 050

Necessary preliminary tasks:

- Remove front seat, see **52 16 000 Removing and installing front seat (sports/electric), left or right**
- Remove outer cover with actuating unit, see **52 16 040 Removing and installing/replacing outer cover on front left or right seat (sports/electric)**

- Remove inner cover, see 52 16 041 Removing and installing/replacing inner cover on front left or right seat (sports/electric)

WARNING: US/CDN front passenger seat (with OC3 mat) only:
To avoid damaging the OC3 mat, it is essential to carry out the following operations with extra care.

When replacing seat cover:

If seat cover is defective, seat cover and padding with OC3 mat must be replaced together.

New seat cover is supplied with padding, OC3 mat and if necessary seat heating.

When replacing padding with OC3 mat:

If OC3 mat or padding is defective, both parts may only be replaced together.

These must be fitted with the seat cover from the car.

Enabling seat occupancy detector (OC3 mat):

- Connect BMW diagnosis system
- Release seat occupancy detector
- Clear fault memory if necessary

Version with seat heating:

If necessary, disconnect plug connection (1).

Release cable strap (2).

Detach cable (3) from holder (4).

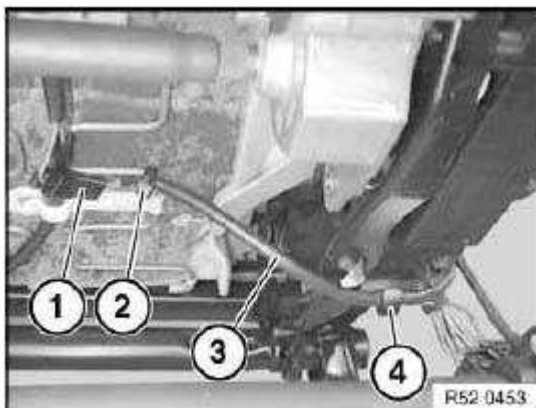


Fig. 173: Cable Strap And Holder

Courtesy of BMW OF NORTH AMERICA, INC.

Detach cable (1) from holder (2).

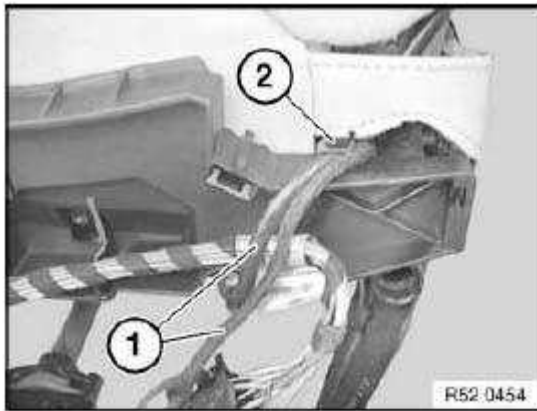


Fig. 174: Removing Cable From Holder
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1) on inside/outside.

Unclip clips (3) towards bottom and pull trim (2) out a little.

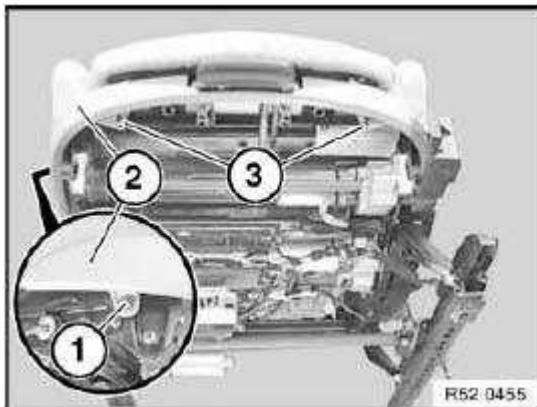


Fig. 175: Releasing Screw On Inside/Outside
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Pull trim (2) out a little and release screw (3).

Release clip (5) from carrier (4).

Remove trim (2) and carrier (4).

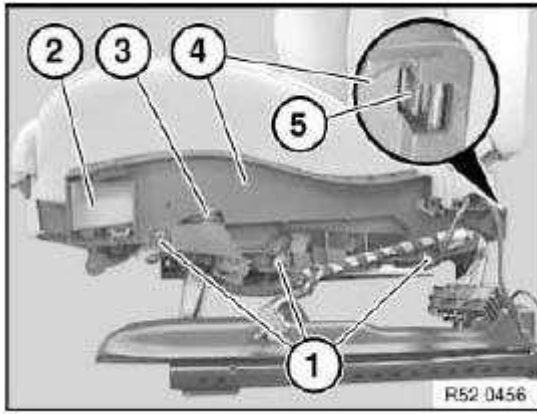


Fig. 176: Releasing Clip From Carrier
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Cable holders (1) on carrier (2) must not be damaged.

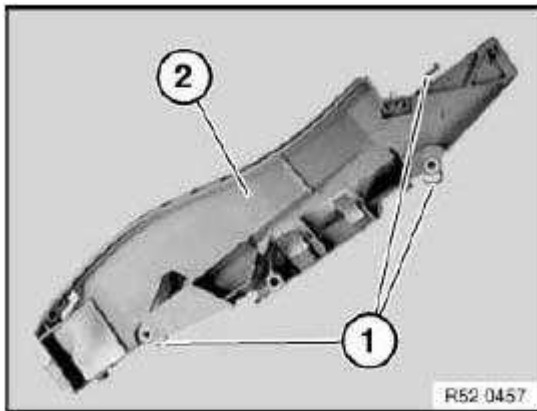


Fig. 177: Cable Holder And Carrier
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Clips (1) on sports seat trim (2) must not be damaged.

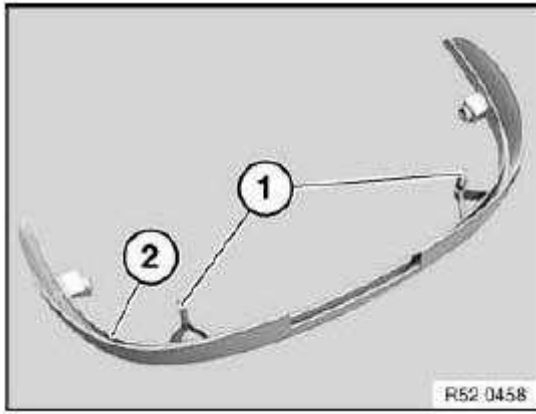


Fig. 178: Clips And Seat Trim

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The operation "Removing holder for actuation" ends here.

Version with seat occupancy detector:

If necessary, disconnect plug connection (1) from control unit (2).

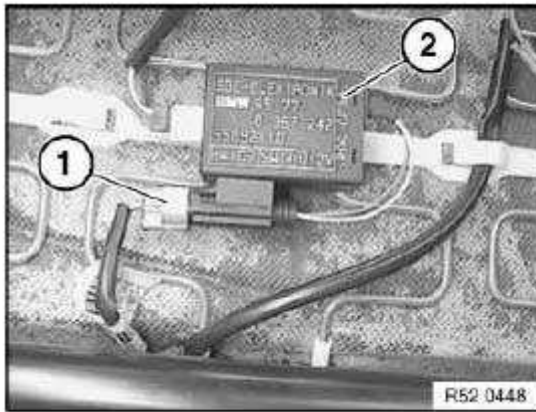


Fig. 179: Plug Connection And Control Unit

Courtesy of BMW OF NORTH AMERICA, INC.

Version with seat heating:

If necessary, release locks (1) and detach plug housing (2).

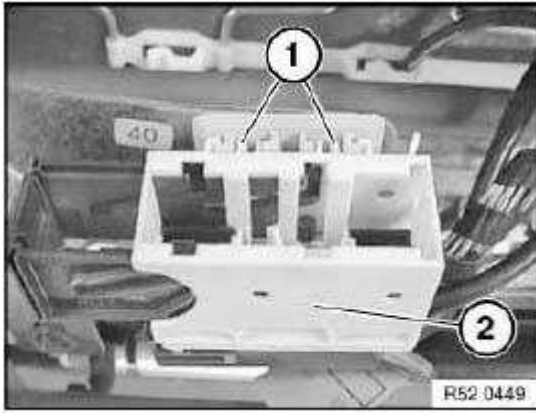


Fig. 180: Locks And Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, press lock (1) downwards and detach cover (2).

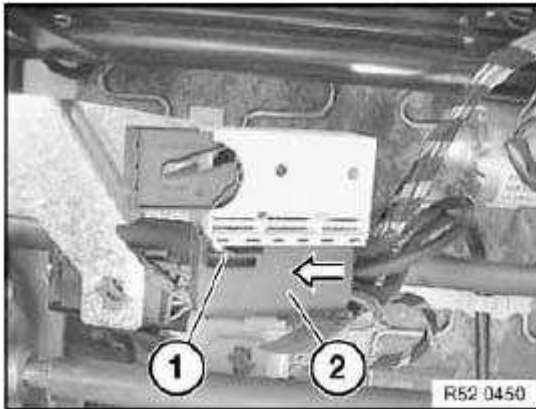


Fig. 181: Pressing Lock Downwards
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1) for seat heating from plug housing (2).

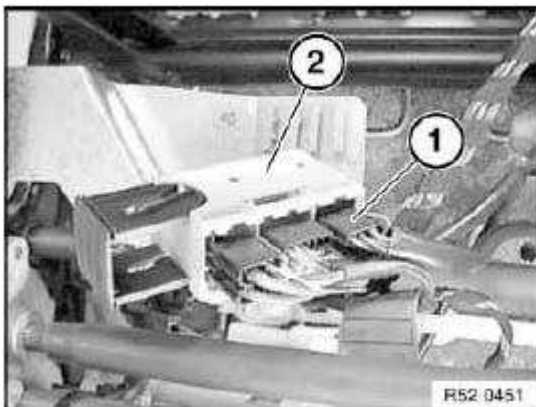


Fig. 182: Disconnecting Plug Connection For Seat Heating
Courtesy of BMW OF NORTH AMERICA, INC.

Pull cable (1) out of holders (2).

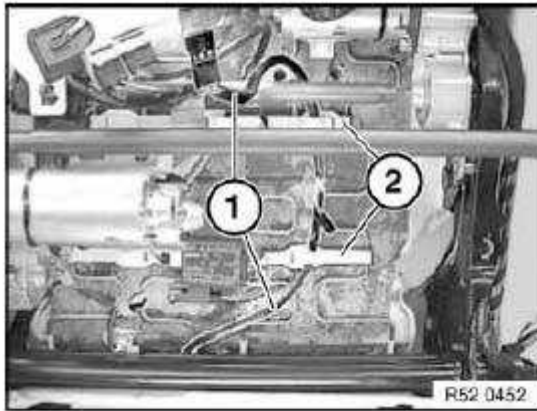


Fig. 183: Pulling Cable Out Of Holders
Courtesy of BMW OF NORTH AMERICA, INC.

E46 only:

Pull out tongue (1) on seat cover (2) on left/right.

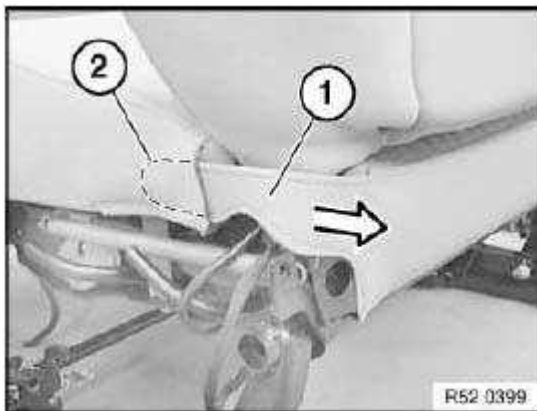


Fig. 184: Pulling Out Tongue On Seat Cover On Left/Right
Courtesy of BMW OF NORTH AMERICA, INC.

Detach seat cover (1) from seat frame (2).

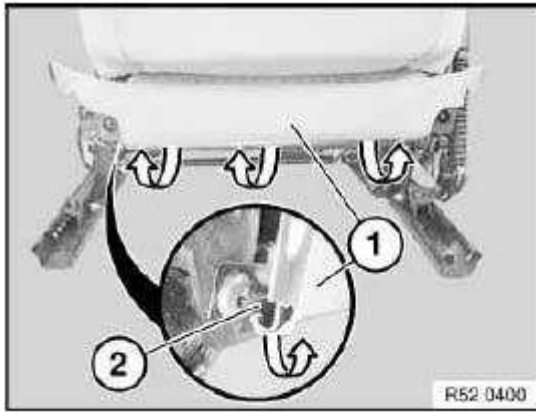


Fig. 185: Removing Seat Cover From Seat Frame
 Courtesy of BMW OF NORTH AMERICA, INC.

Pull out cover welt (1) completely from seat frame (2).

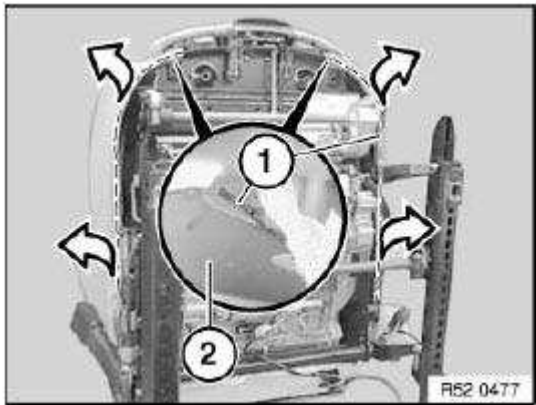


Fig. 186: Pulling Out Cover Welt Completely From Seat Frame
 Courtesy of BMW OF NORTH AMERICA, INC.

Fold in ends (1) on seat cover and push through under backrest (2) towards front.

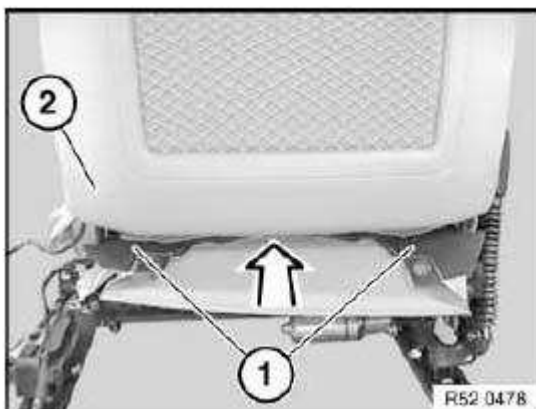


Fig. 187: Pushing Through Under Backrest Towards Front
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten thigh support and pull completely towards front.

Bend open retaining plates (1) and remove cover piping (2).

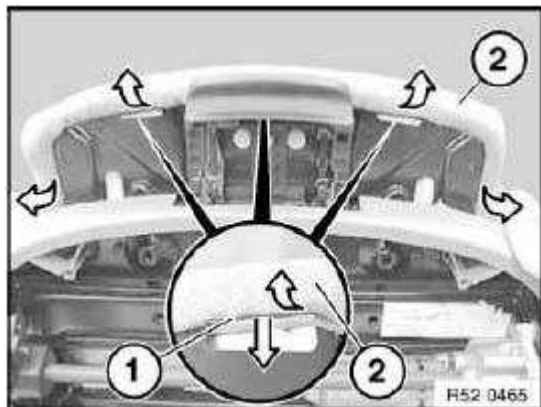


Fig. 188: Removing Retaining Plates And Cover Piping
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Cushion (1) is secured at front with double-sided adhesive tape (3) to carrier (2).

Pull cushion (1) towards top off carrier (2).

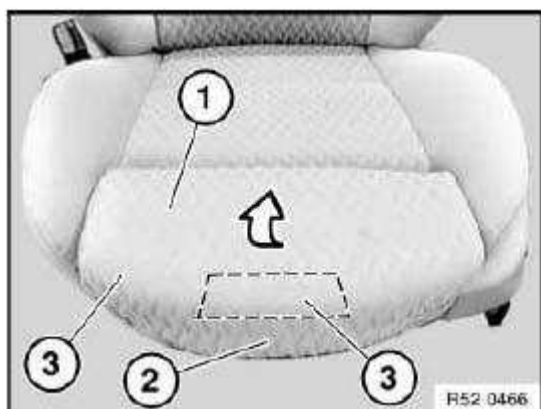


Fig. 189: Pulling Cushion Towards Top Off Holder
Courtesy of BMW OF NORTH AMERICA, INC.

Lever trim wire (1) out of mounts (2).

Installation:

Stick new double-sided adhesive tape (4) to carrier (3) or attach mount with spray adhesive.

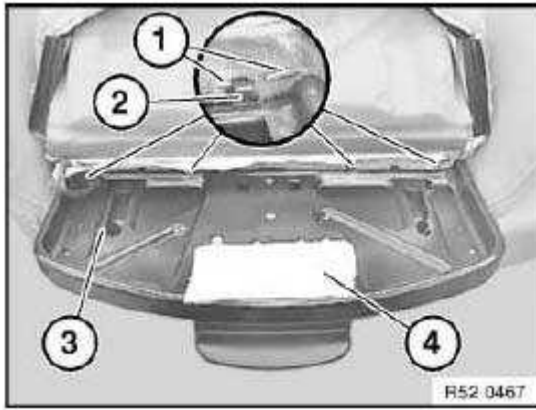


Fig. 190: Lever Trim Wire And Mounts
Courtesy of BMW OF NORTH AMERICA, INC.

Model without seat heating and without seat occupancy detector:

Remove seat cover (1) with thigh support (2) towards front/top.

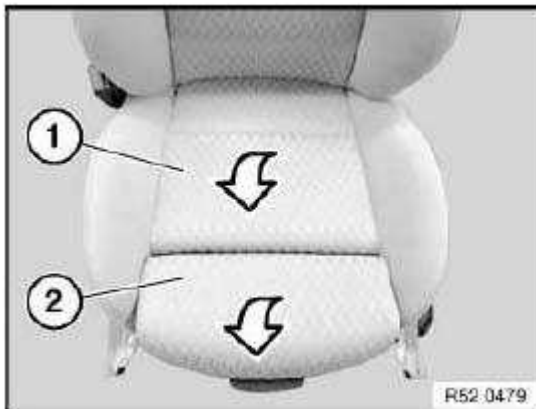


Fig. 191: Removing Seat Cover With Thigh Support Towards Front/Top
Courtesy of BMW OF NORTH AMERICA, INC.

Model with seat heating and/or with seat occupancy detector:

Pull seat cover (1) forward a little and feed cable (2) out.

Remove seat cover (1) with thigh support towards front/top.

NOTE: **The operation "Removing complete seat cushion" ends here.**

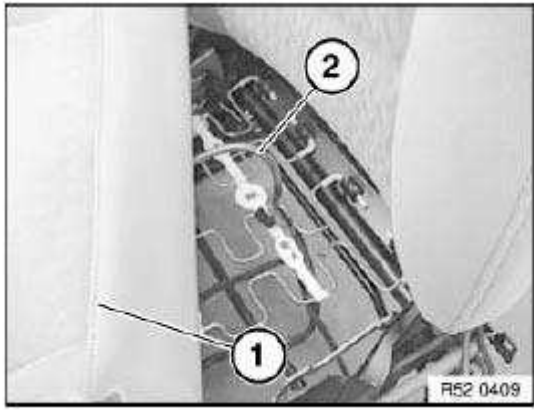


Fig. 192: Seat Cover And Cable
Courtesy of BMW OF NORTH AMERICA, INC.

Replacing padding or sensor mat:

Release clips (1) and (2) at rear left/right from support (3).

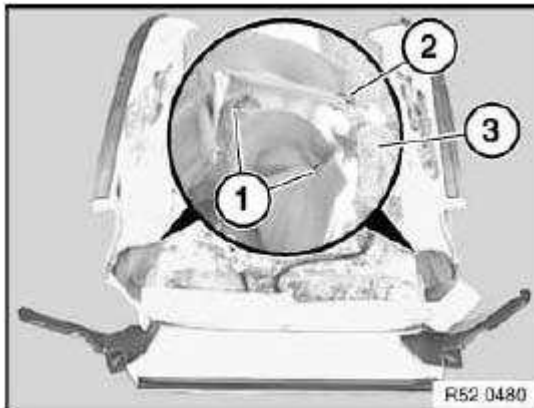


Fig. 193: Clips And Rear Left/Right
Courtesy of BMW OF NORTH AMERICA, INC.

Release all clips (1) on left/right and center (2) from support (3).

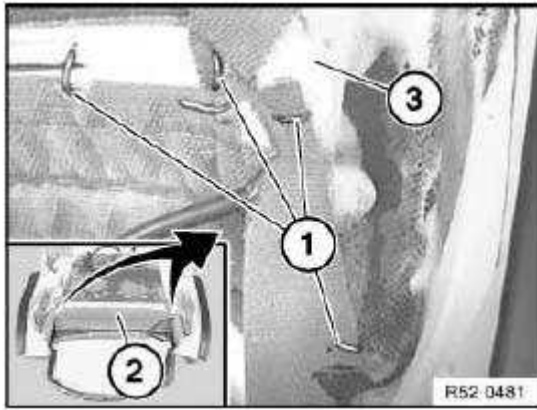


Fig. 194: Releasing All Clips On Left/Right
 Courtesy of BMW OF NORTH AMERICA, INC.

Version with seat heating:

Installation:

Note routing of seat heater cable (1).

Do not damage with clips.

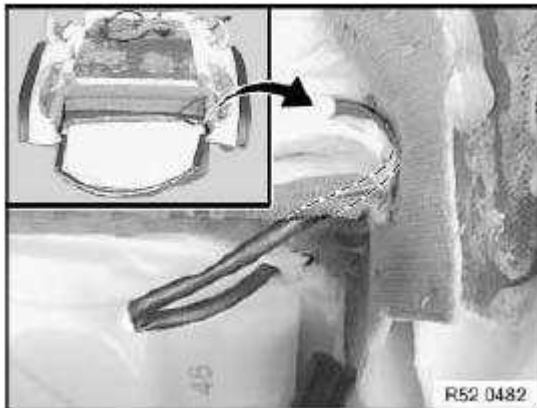


Fig. 195: Locating Seat Heater Cable
 Courtesy of BMW OF NORTH AMERICA, INC.

Version with OC3 mat:

- OC3 mat must not be kinked under any circumstances.

Detach all retainers in side area from longitudinal wires (1).

Pull trim wires (1) forward out of seat cover.

Carefully fold back seat cover and release retainers from cross - wires (2).

Remove seat cover from padding.

IMPORTANT: Remove all remnants of clips from seat cover and padding.

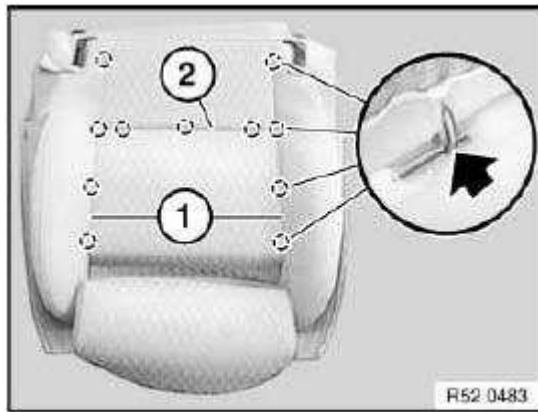


Fig. 196: Pulling Trim Wires

Courtesy of BMW OF NORTH AMERICA, INC.

Remove padding (1) from seat cover (2).

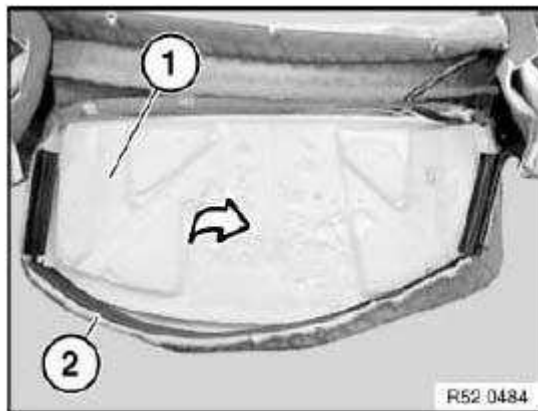


Fig. 197: Removing Padding From Seat Cover

Courtesy of BMW OF NORTH AMERICA, INC.

Version with seat heating:

Installation:

If necessary, detach heating mat (1) from adhesive tape (2) of thigh support.

3 Seat heater cable

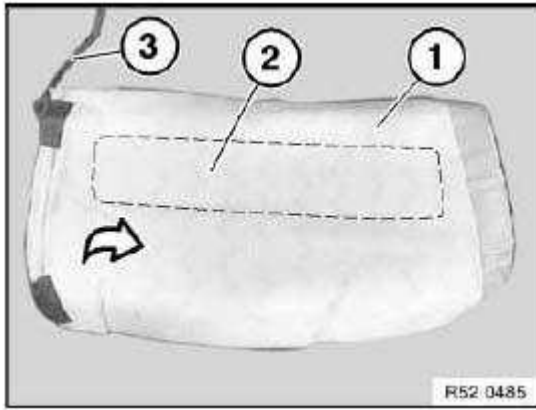


Fig. 198: Removing Mat From Adhesive Tape Of Thigh Support
Courtesy of BMW OF NORTH AMERICA, INC.

Stick double-sided adhesive tape (2) to support (1) or coat with spray adhesive.

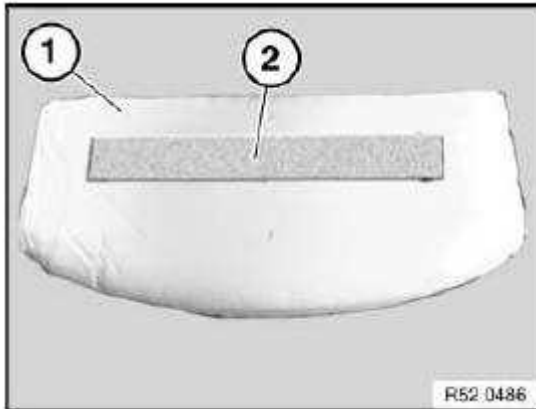


Fig. 199: Double-Sided Adhesive Tape
Courtesy of BMW OF NORTH AMERICA, INC.

Version with seat heater and/or with seat occupancy detector:

Installation:

Feed seat heater cable (1) through bore hole (3).

Feed seat heater cable (2) through bore hole (4).

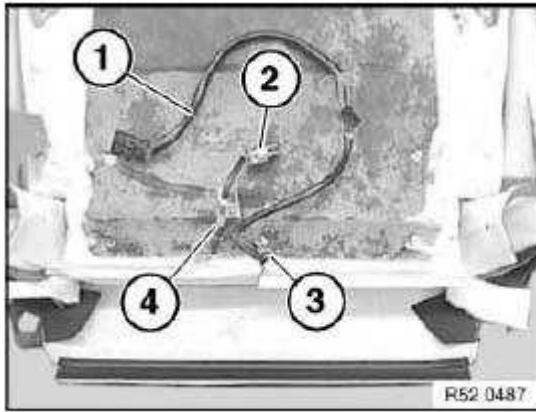


Fig. 200: Seat Heater Cable And Bore Hole
 Courtesy of BMW OF NORTH AMERICA, INC.

Padding (1) with OC3 mat (2).

IMPORTANT: No retainer remainders may be fitted as well.
 Handle OC3 mat with extreme care.
 Do not kink OC3 mat.
 Do not clamp OC3 mat.
 OC3 mat must lie without folds under seat cover.

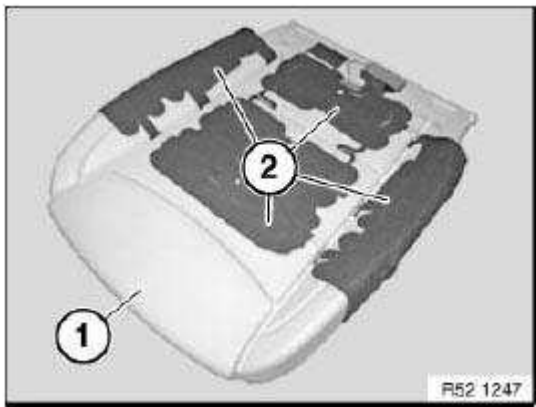


Fig. 201: Padding And OC3 Mat
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Bend new clips (2) with special tool 52 0 050.

1. Padding
2. Retainer
3. Trim thread in padding

4. Trim thread in cover
5. Seat cover

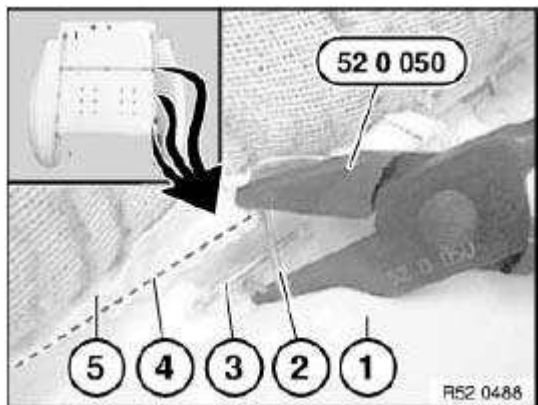


Fig. 202: Clips And Special Tool
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Support (2) must be coated with wax (1) to prevent grinding noises.

Do not remove wax (1) on support (2).

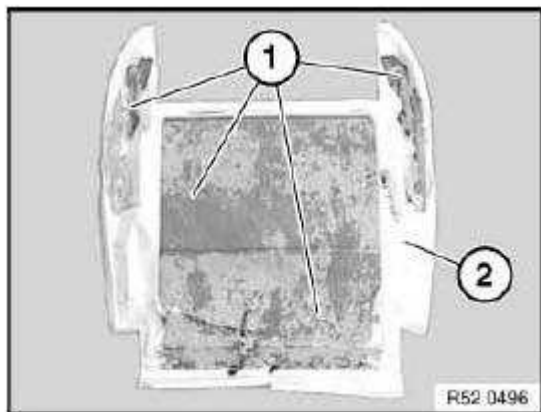


Fig. 203: Wax And Support
 Courtesy of BMW OF NORTH AMERICA, INC.

Passenger seat only (replacing sensor mat):

Installation:

In order to guarantee the function and fastening (adhesive strength) at the sticking surfaces of sensor mat (1), the foam most not show any traces of damage at all!

Replace the foam if it is hardened or damaged particularly in the area of the sticking surfaces.

Lay sensor mat connection without creasing into groove on support.

Fit new sensor mat (1) for passenger seat occupancy detector.

Align new sensor mat (1) on foam (2).

Feed plug (3) through bore hole (4).

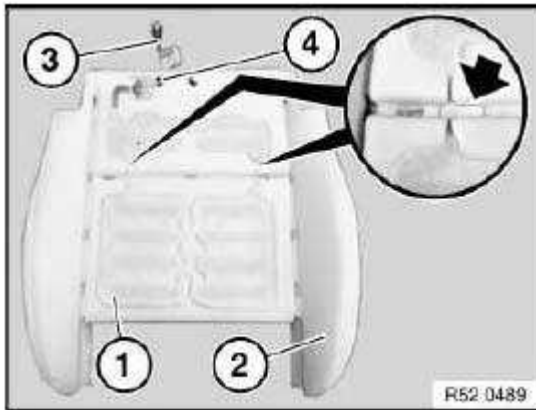


Fig. 204: Locating Bore Hole

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Detach liner (1) at individual points and stick sensor mat (2) onto foam (3).

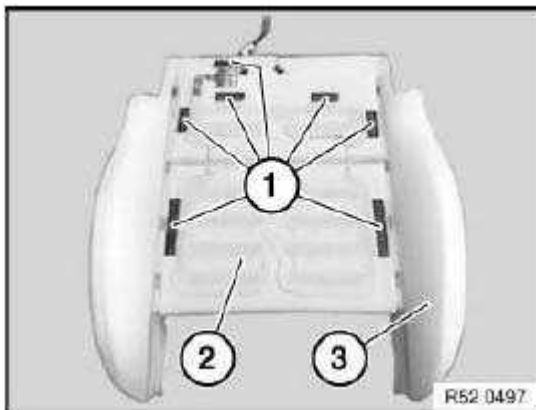


Fig. 205: Liner, Sensor Mat And Foam

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The operation "Replacing support or sensor mat" ends here.

Replacing seat cover:

Remove trim threads (1) from seat cover (2).

Cut new seat cover (2) to size and insert trim threads (1).

3 Seat heater cable

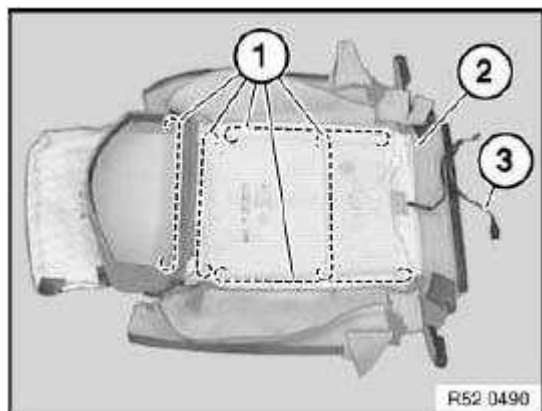


Fig. 206: Trim Threads, Seat Cover And Heater Cable
Courtesy of BMW OF NORTH AMERICA, INC.

52 16 405 REPLACING BACKREST COVER ON FRONT LEFT OR RIGHT SEAT (SPORTS/ELECTRIC)

Remove rear panel from front seat backrest,

refer to **52 15 198**.

Detach backrest cover (1) from backrest frame (2).

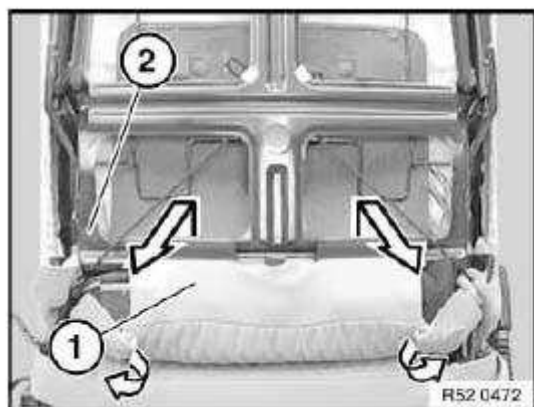


Fig. 207: Removing Backrest Cover From Backrest Frame
Courtesy of BMW OF NORTH AMERICA, INC.

Unhook ends of tensioning cord (1) from backrest frame (2).

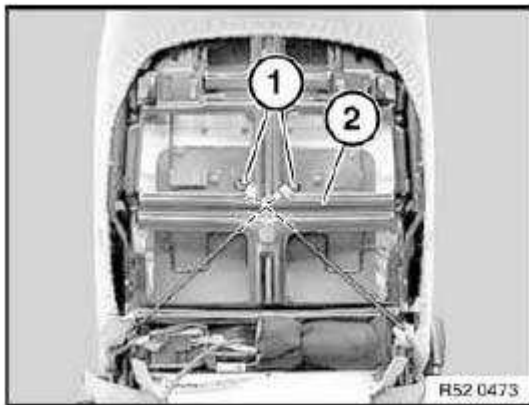


Fig. 208: Tensioning Cord And Backrest Frame
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Pass tensioning cord (1) with backrest cover (3) on left/right round clip mount (2).

Hook ends of tensioning cord to backrest frame, refer to previous work step.

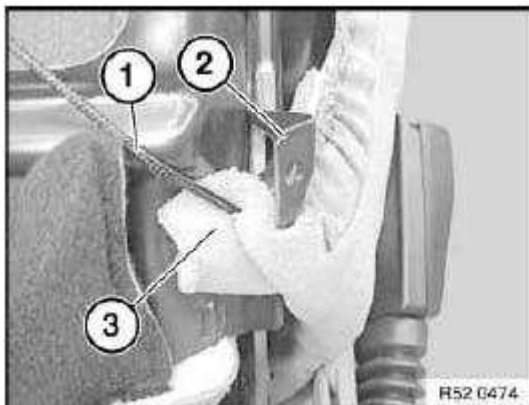


Fig. 209: Tensioning Cord And Backrest Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Installation instruction for backrest width adjustment:

Lay tension cables (1...2) underneath hoses (3) and cables (4).

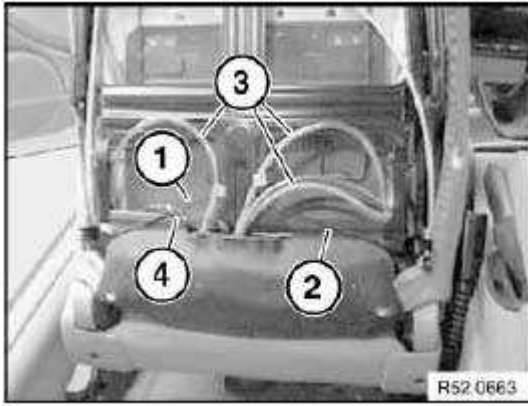


Fig. 210: Tension Cables And Hoses

Courtesy of BMW OF NORTH AMERICA, INC.

Exposing cable for seat heating on version with seat heating only:

Removing outer cover on front seat:

Manual controls, refer to **52 13 040**.

Electrical controls, refer to **52 16 040**.

Unfasten plug connection (1).

Pull cable (2) out of holder (3).

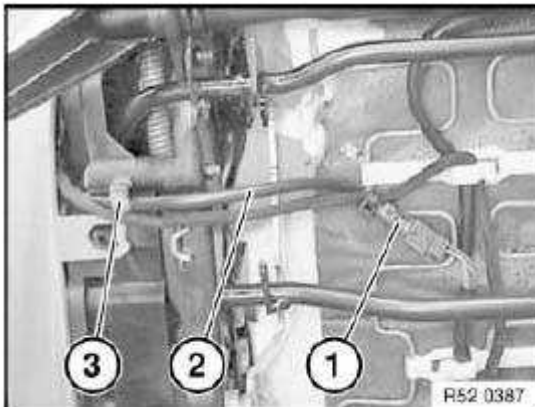


Fig. 211: Plug Connection And Holder

Courtesy of BMW OF NORTH AMERICA, INC.

Model with seat heating only:

Pull out tongue (1).

Pull cable (2) out of holder (3).

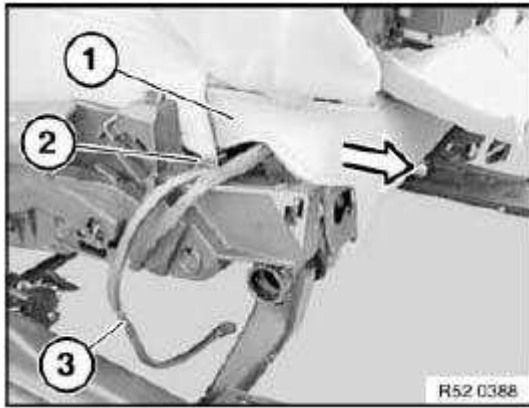


Fig. 212: Pulling Cable Out Of Holder
Courtesy of BMW OF NORTH AMERICA, INC.

Model with seat heating only:

Lift out Omega clip (1).

Pull out cable (2) from Omega clip (1).

Model with lumbar supports:

If necessary, disconnect plug connections (3) and (4).

Lift out Omega clip (1).

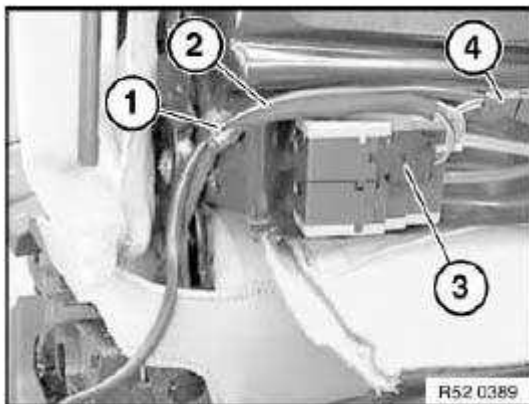


Fig. 213: Omega Clip, Cable And Plug Connections
Courtesy of BMW OF NORTH AMERICA, INC.

Removal or replacement of backrest frame only:

CAUTION: Do not under any circumstances turn screw underneath screw (2), this would destroy the seat frame.

Press backrest cover (1) to one side and release screw (2) on left/right.

Detach backrest frame (3) with backrest cover upwards.

Installation:

Replace screws (2) (microencapsulation).

Tightening torque: 52 10 2AZ, see **52 10 FRONT SEATS** .

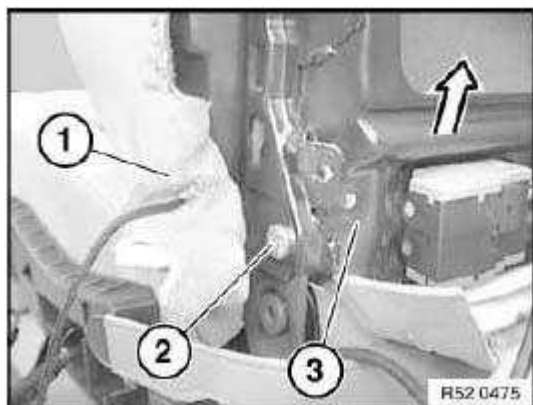


Fig. 214: Removing Backrest Frame With Backrest Cover Upwards
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: **The work for "Removing complete backrest" ends here.**

Removal of backrest cover with padding or replacement of backrest frame only:

Remove both guides for head restraint at front,

refer to **52 13...**

Version with lumbar support only:

Disconnect hoses (2) and (3) from valve housing (1).

NOTE: **If necessary, gently heat air hose when firmly seated.**

Valve housing must not be unclipped: leakage. If the valve housing is unclipped, release screw and clip valve housing together.

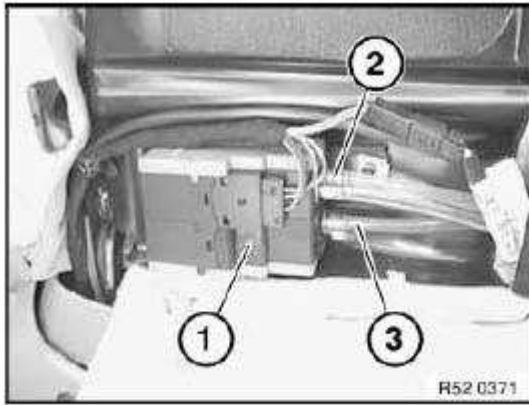


Fig. 215: Hoses And Valve Housing
Courtesy of BMW OF NORTH AMERICA, INC.

2 Hose (blue), top cushion

3 Hose (red), bottom cushion

NOTE: For purposes of clarity, shown here without valve housing.

Installation:

Observe cable guide (1) for backrest heating.

Lay air hoses (2) without kinks through hole (3).

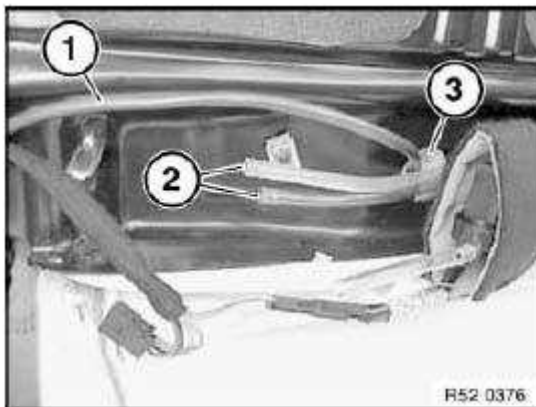


Fig. 216: Cable Guide And Hoses
Courtesy of BMW OF NORTH AMERICA, INC.

Version with lumbar support and backrest width adjustment only:

Detach hoses (1) and (2) at cutting line (heat with hot air blower if necessary).

1. Hose (blue) upper cushion (lumbar support)
2. Hose (red) lower cushion (lumbar support)
3. Hose (white) right cushion (backrest width adjustment)
4. Hose (white) left cushion (backrest width adjustment)
5. Motor pump unit

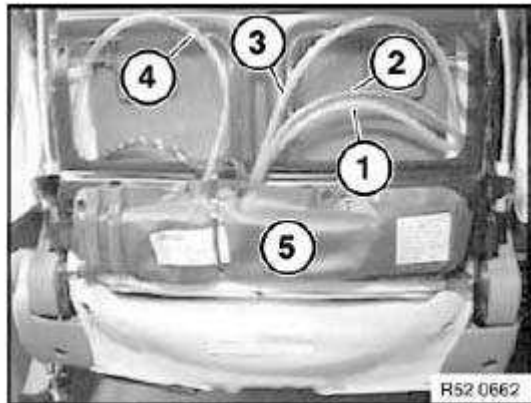


Fig. 217: Hoses And Cutting Line

Courtesy of BMW OF NORTH AMERICA, INC.

Detach backrest cover (1) at sides towards front and remove with support upwards from backrest frame (2).

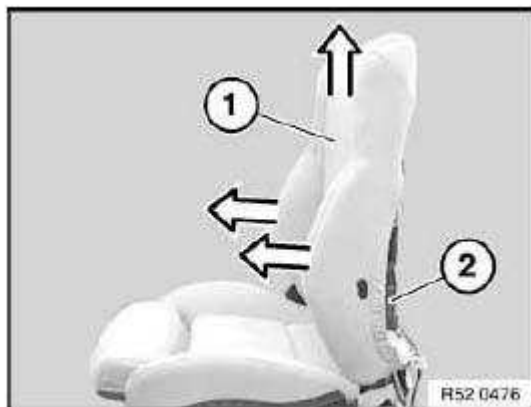


Fig. 218: Removing Backrest Cover At Sides Towards Front

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The work for "Removing backrest cover with padding" ends here.

Removal of backrest cover from padding, replacing padding:

Release retainers (1) on left/right of backrest cover (2).

NOTE: Support (3) is reinforced in this area.

Note routing of tensioning strap (4).

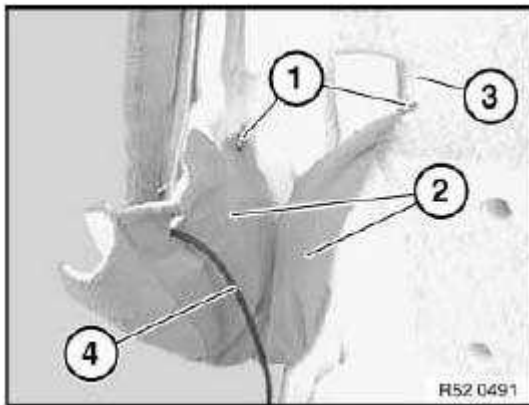


Fig. 219: Retainers, Backrest Cover And Support
Courtesy of BMW OF NORTH AMERICA, INC.

First detach clips (1).

Fold back piping (2) with backrest cover (3).

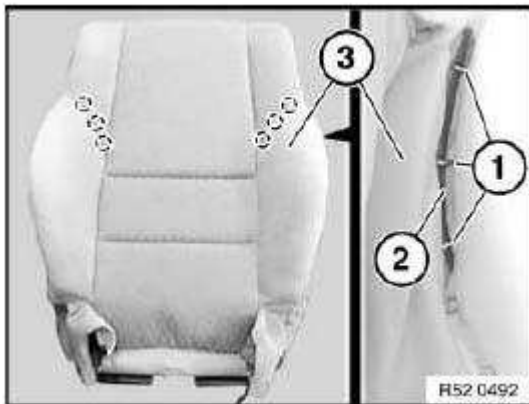


Fig. 220: Clips, Backrest Cover And Back Piping
Courtesy of BMW OF NORTH AMERICA, INC.

Detach all remaining clips.

Remove backrest cover (1) from padding.

Remove all remnants of retainers from backrest cover (1) and padding.

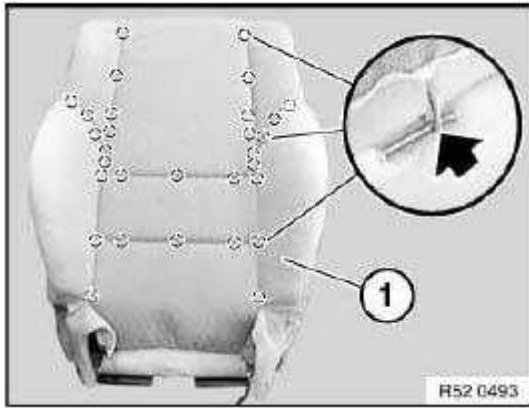


Fig. 221: Locating Backrest Cover Clips
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Fold in new clip (2) with special tool 52 0 050.

1. Support
2. Retainer
3. Trim thread in support
4. Trim wire in backrest cover
5. Backrest cover

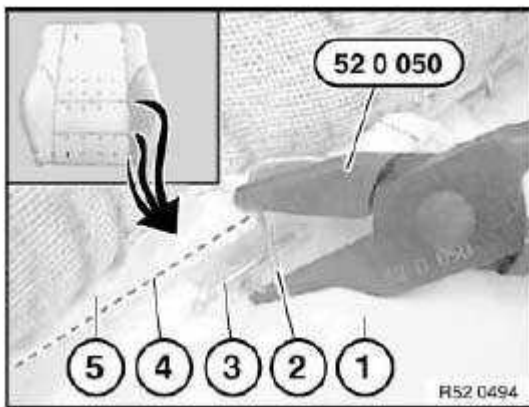


Fig. 222: Support, Retainer And Backrest Cover
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The work for "Replacing padding" ends here.

Replacement of backrest cover:

Pull trim threads (1) out of backrest cover.

Cut new backrest cover to size and insert trim threads (1).

2 Seat heater cable

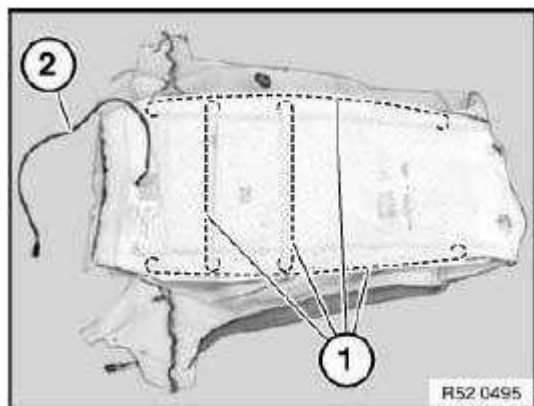


Fig. 223: Trim Threads And Seat Heater Cable
Courtesy of BMW OF NORTH AMERICA, INC.

52 16 415 REPLACING SUPPORT FOR LEFT OR RIGHT FRONT SEAT (SPORT/ELECTRIC)

WARNING: US/CND front passenger seat (with OC3 mat) only:
The support can only be removed in conjunction with the OC3 mat.
If support is defective, both parts may only be replaced together.
After fitting new support, enable OC3 mat with BMW diagnosis system.

The operation for removing the support with/without OC3 mat is described in:

- Replacing seat cover on front seat, see **52 16 400 Replacing seat cover for left or right front seat (sports/electric)**

Enabling seat occupancy detector (OC3 mat):

- Connect BMW diagnosis system
- Release seat occupancy detector
- Clear fault memory if necessary

52 16 420 REPLACING PADDING FOR LEFT OR RIGHT FRONT SEAT BACKREST (SPORT/ELECTRIC)

This operation is described in section on:

Replace backrest cover for left or right front seat, see **52 16 405 Replacing backrest cover on front left or right seat (sports/electric)**

26 REAR SEAT THROUGH-LOADING

52 26... REMOVING AND INSTALLING/REPLACING FINISHING STRIP ON ARMREST FOR REAR SEAT

Special tools required:

- 00 9 317 **00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)**

Slide special tool 00 9 317 behind retaining pin of upper cover section underneath finishing strip and unclip strip towards rear.

Repeat procedure if necessary on other side.

Feed finishing strip out of armrest pins.

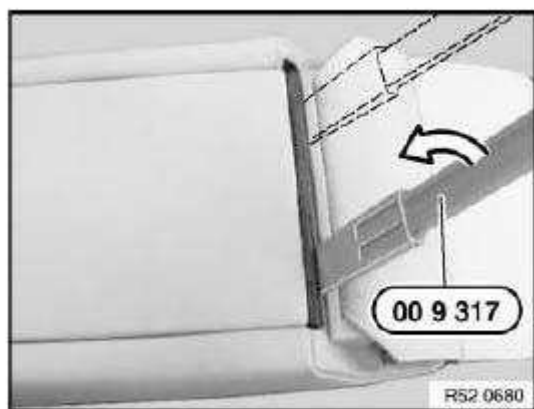


Fig. 224: Sliding Special Tool

Courtesy of BMW OF NORTH AMERICA, INC.

52 26... REMOVING AND INSTALLING/REPLACING FIXTURE FOR ROLLER BLIND ON REAR SEAT (THROUGH - LOADING SYSTEM) ON LEFT/RIGHT

Unclip cover (1) on both sides towards top.

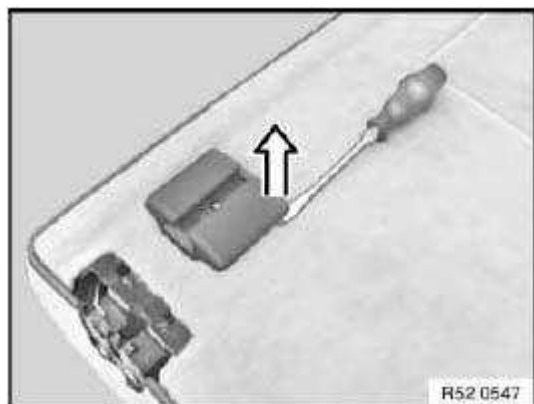


Fig. 225: Removing Cover On Both Sides Towards Top

Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws (2).

Installation:

Clips (1) must not be damaged.

Fit opening of cover for upper backrest edge.

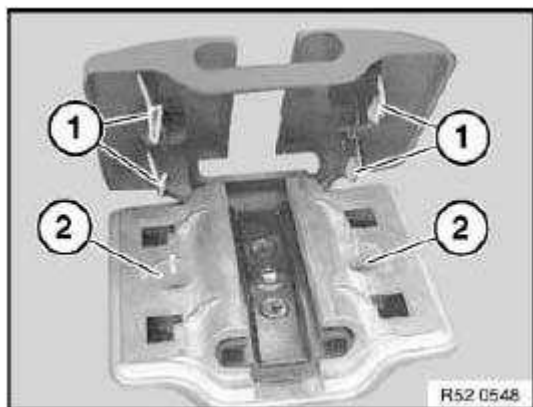


Fig. 226: Clips And Screws

Courtesy of BMW OF NORTH AMERICA, INC.

52 26... REMOVING AND INSTALLING/REPLACING SKI BAG WITH CASING ON REAR SEAT (THROUGH-LOADING SYSTEM)

Special tools required:

- 00 9 317 **00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)**

Necessary preliminary tasks:

- Remove center armrest, see **52 26 030 Removing and installing/replacing armrest for rear seat backrest (through-loading system)**

Press ski bag (1) on rear side out of backrest.

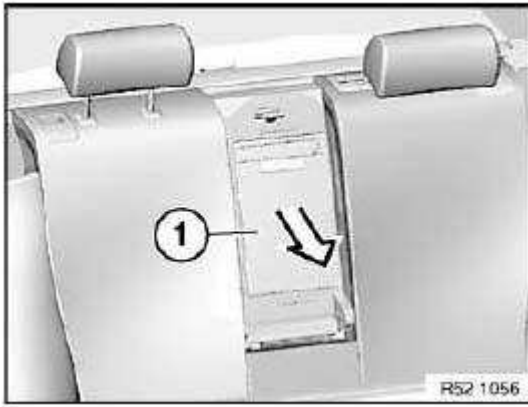


Fig. 227: Pressing Ski Bag On Rear Side Out Of Backrest
Courtesy of BMW OF NORTH AMERICA, INC.

Lift off cover (1).

Release screws (2).

Installation:

Make sure cover is correctly installed.

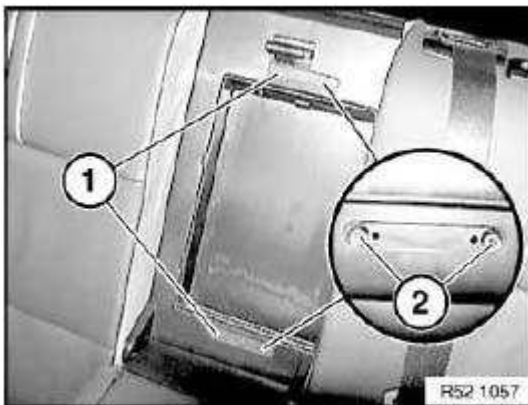


Fig. 228: Cover And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Unclip mounting frame (1) on rear side with special tool 00 9 317.

Installation:

Do not damage plastic clips. Danger of kinking!

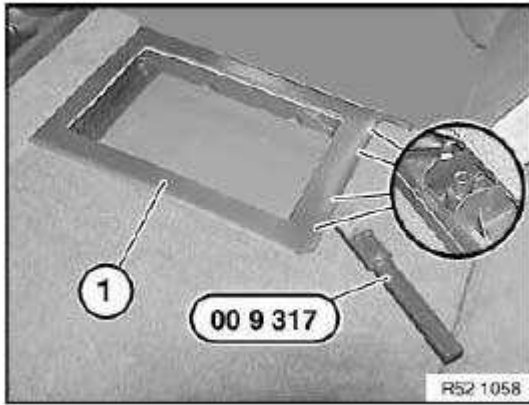


Fig. 229: Mounting Frame And Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Remove skibag trim (1).

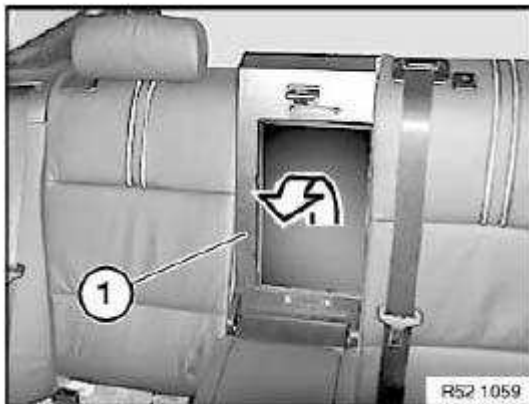


Fig. 230: Removing Skibag Trim
Courtesy of BMW OF NORTH AMERICA, INC.

52 26 005 REMOVING AND INSTALLING/REPLACING REAR SEAT (THROUGH-LOADING SYSTEM)

Unclip rear seat on left/right towards top.

For op. ext. seat heating only:

Unfasten plug connection.

Lift out rear seat.

Installation:

Feed belt buckles (1) through designated openings into correct location.

Make sure ISOFIX covers (2) are correctly engaged.

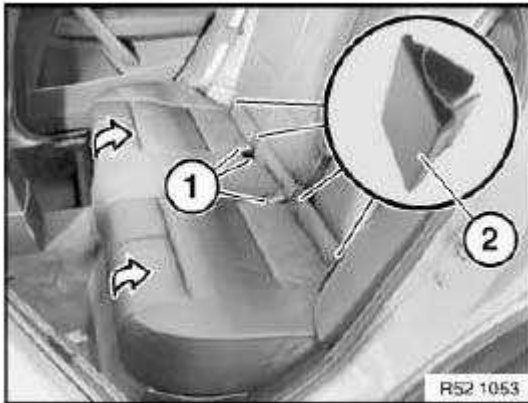


Fig. 231: Removing ISOFIX Covers

Courtesy of BMW OF NORTH AMERICA, INC.

52 26 008 REMOVING AND INSTALLING/REPLACING LEFT/RIGHT SIDES OF BACKREST ON REAR SEAT BACKREST (THROUGH-LOADING)

Necessary preliminary tasks:

- Release rear-seat backrest and fold forward.

Unclip rest side section (1) and pull out in direction of arrow (2).

Installation:

Make sure rest side section is correctly seated in guide.

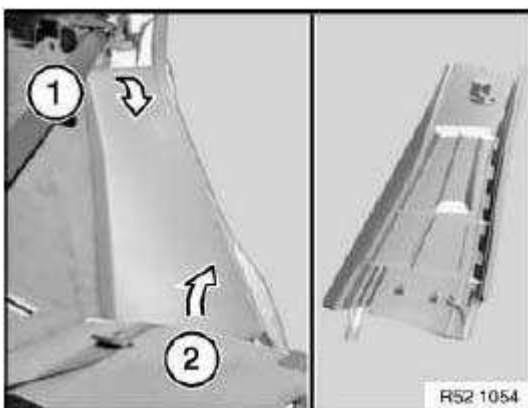


Fig. 232: Removing Rest Side Section

Courtesy of BMW OF NORTH AMERICA, INC.

52 26 015 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT REAR SEAT BACKREST (THROUGH-LOADING SYSTEM)

Carry out following tasks beforehand:

- Remove armrest side section on rear seat backrest, see **52 26 008 Removing and installing/replacing left/right sides of backrest on rear seat backrest (through-loading)**
- Remove center seat belt (lower fastening), see **72 11 103 REMOVING AND INSTALLING/REPLACING REAR CENTER SEAT BELT**

Fold down backrests.

Release screws (1) of outer mount.

Release screws (2) of center mount.

Remove center mount (3).

Installation:

Correctly place center mount on bearing pedestal.

If necessary, replace faulty outer mount, see **52 26 412 Replacing backrest cover for right rear seat (through-loading system)**

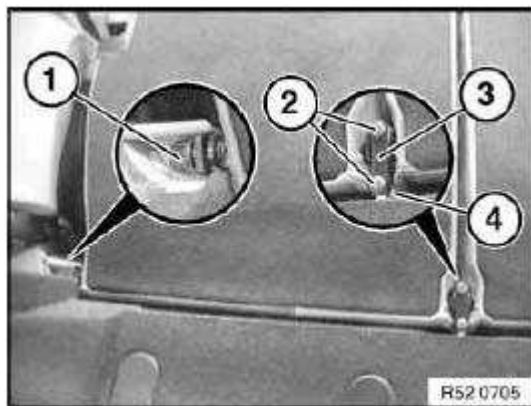


Fig. 233: Backrests Screws And Center Mount
Courtesy of BMW OF NORTH AMERICA, INC.

Lever both backrests out of center mount (1) and pull out left backrest (2) towards left. In the process, mounting shaft of right backrest is pulled out of left backrest.

Remove left backrest (2) from vehicle.

NOTE:

- **Removal of both backrests:**

Release screws on outer mount of right backrest and remove backrest.

- Removal of right backrest:

Proceed in mirror-inverted fashion to left backrest.

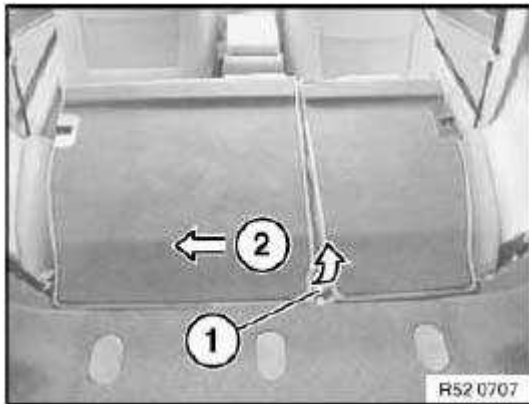


Fig. 234: Pulling Out Left Backrest Towards Left
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Bearing bushings (1) must not be damaged.

Replace faulty bearing bushings, see **52 26 412 Replacing backrest cover for right rear seat (through-loading system)**

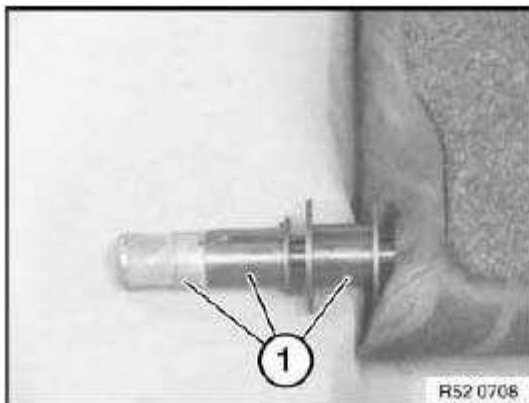


Fig. 235: Bearing Bushings
Courtesy of BMW OF NORTH AMERICA, INC.

52 26 030 REMOVING AND INSTALLING/REPLACING ARMREST FOR REAR SEAT BACKREST (THROUGH-LOADING SYSTEM)

Fold down right backrest.

Unscrew bolt (1).

Remove armrest first towards front and then sideways.

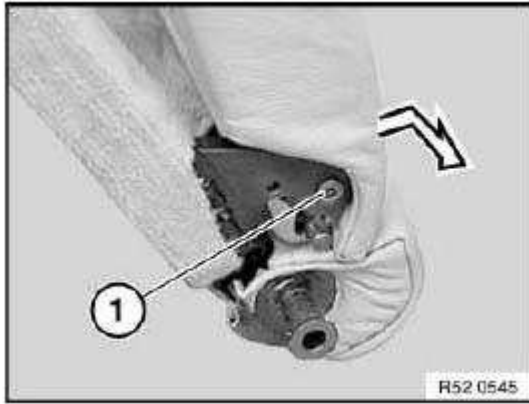


Fig. 236: Removing Armrest

Courtesy of BMW OF NORTH AMERICA, INC.

52 26 033 REMOVING AND INSTALLING/REPLACING UPPER COVER SECTION ON ARMREST FOR REAR SEAT

Drive out two-part hinge pin (1) with a suitable tool (bar, etc.), pressing material in area (2) on both sides (risk of damage).

Installation:

Drive in one hinge pin each from right and left. Hinge pins must be flush with outer edge of hinge.

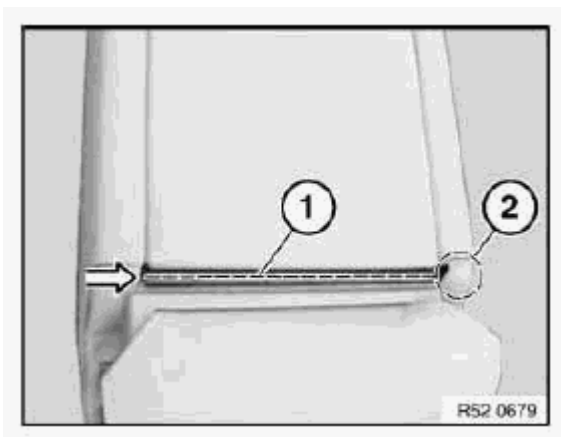


Fig. 237: Removing Upper Cover Section On Armrest

Courtesy of BMW OF NORTH AMERICA, INC.

52 26 080 REMOVING AND INSTALLING/REPLACING BACKREST FRAME FOR LEFT REAR SEAT (THROUGH - LOADING SYSTEM)

Necessary preliminary tasks:

- Remove backrest cover with padding on left, see **52 26 411 Replacing backrest cover for rear seat (through-loading system) on left**
- Remove mounting for roller blind, see **52 26... Removing and installing/replacing fixture for roller blind on rear seat (through - loading system) on left/right**
- Remove lock for rear seat backrest, see **52 26 309 Removing and installing/replacing lock for left rear seat backrest (through-loading system)**

Unclip retainers and remove.

Remove backrest frame (1).

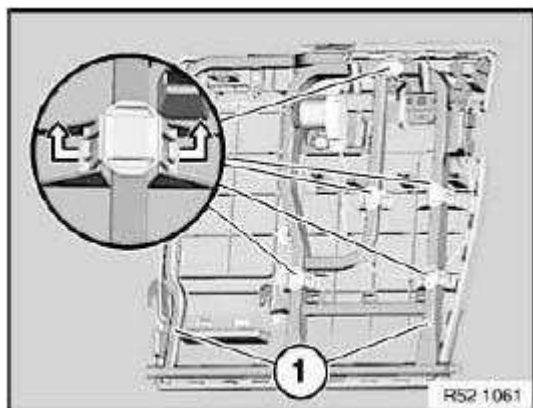


Fig. 238: Removing Backrest Frame
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement only:

Release screws (1).

Remove retaining hook (2).

Unscrew bolt (3).

Tightening torque: 72 11 15AZ, see **72 11 SEAT BELTS** .

Remove automatic reel (4) with Bowden cable.

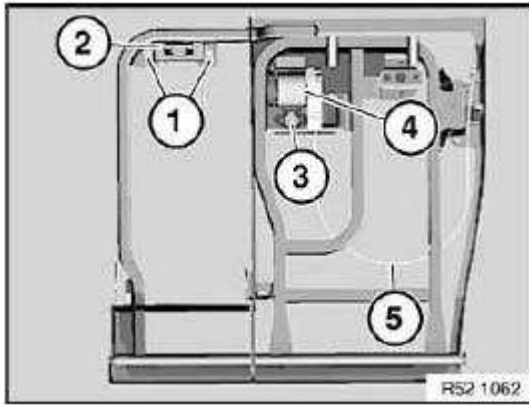


Fig. 239: Retaining Hook, Bolt And Screws
 Courtesy of BMW OF NORTH AMERICA, INC.

52 26 085 REMOVING AND INSTALLING/REPLACING BACKREST FRAME FOR RIGHT REAR SEAT (THROUGH-LOADING SYSTEM)

Necessary preliminary tasks:

- Remove backrest cover with padding on right, see **52 26 412 Replacing backrest cover for right rear seat (through-loading system)**
- Remove mounting for roller blind, see **52 26... Removing and installing/replacing fixture for roller blind on rear seat (through - loading system) on left/right**
- Remove lock for rear seat backrest, see **52 26 309 Removing and installing/replacing lock for left rear seat backrest (through-loading system)**

Unclip retainers and remove.

Remove backrest frame (1).

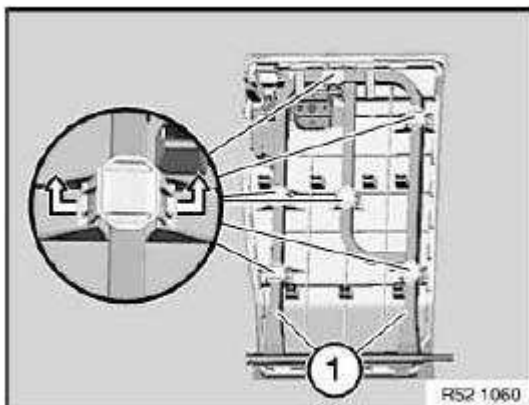


Fig. 240: Removing Backrest Frame
 Courtesy of BMW OF NORTH AMERICA, INC.

52 26 199 REMOVING AND INSTALLING/REPLACING REAR PANEL ON LEFT REAR SEAT BACKREST (THROUGH - LOADING SYSTEM)

Operation is described in:

- Removing and installing/replacing backrest frame for left rear seat backrest, see **52 26 080 Removing and installing/replacing backrest frame for left rear seat (through - loading system)**

52 26 200 REMOVING AND INSTALLING/REPLACING REAR PANEL ON RIGHT REAR SEAT BACKREST (THROUGH - LOADING SYSTEM)

Operation is described in:

- Removing backrest frame for right rear seat backrest, see **52 26 085 Removing and installing/replacing backrest frame for right rear seat (through-loading system)**

52 26 301 REMOVING AND INSTALLING /REPLACING ACTUATING MECHANISM FOR LEFT REAR SEAT BACKREST (THROUGH-LOADING SYSTEM)

Grasp trim (1) for release lever from inside and pry out upward.

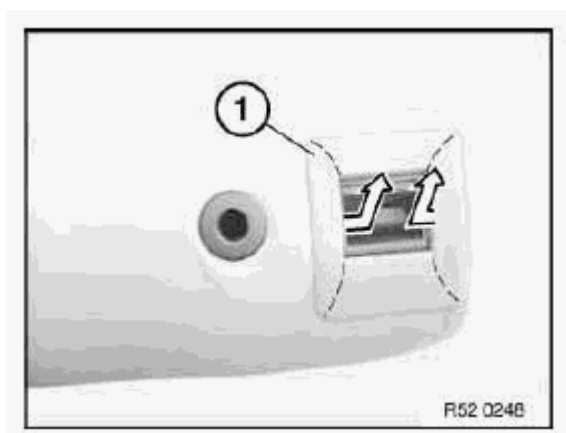


Fig. 241: Releasing Lever From Inside
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Retaining straps (1) must not be damaged.

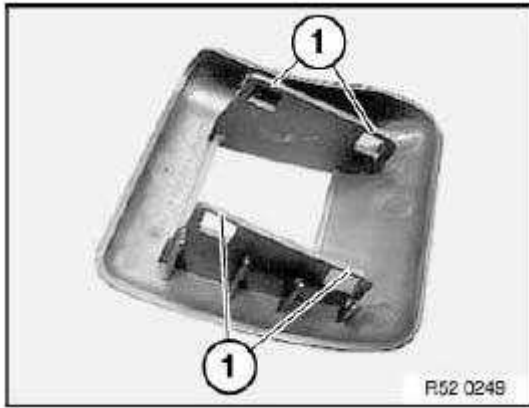


Fig. 242: Retaining Straps

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Place cloth (1) over locking rod to prevent the rear seat backrest from locking down.

Pry out actuating mechanism (2) by pulling forwards and upwards.



Fig. 243: Prying Out Actuating Mechanism

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Locking tabs (1) on left/right sides (for trim on actuating mechanism) must not be damaged.

Locking tabs (2) at front and (3) back (for actuating mechanism) must not be damaged.

Actuating rod (4) must be correctly mounted and should not be bent.

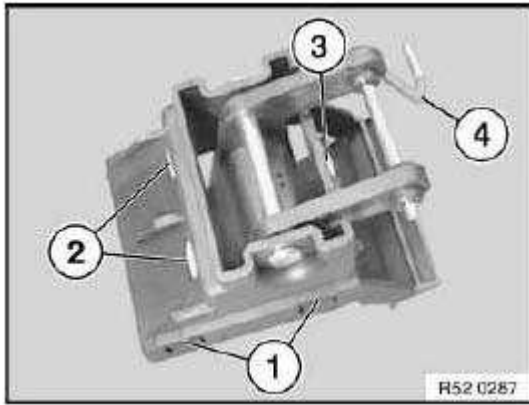


Fig. 244: Locking Tabs And Actuating Rod
Courtesy of BMW OF NORTH AMERICA, INC.

52 26 309 REMOVING AND INSTALLING/REPLACING LOCK FOR LEFT REAR SEAT BACKREST (THROUGH-LOADING SYSTEM)

Slide lock trim on edge of backrest side upwards slightly and clip out to one side, then slide trim section on rear side slightly to center, unclip and remove.

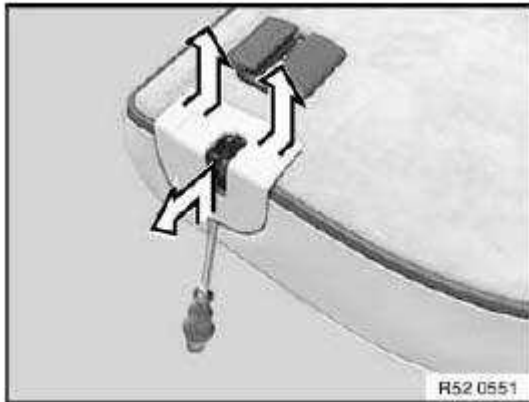


Fig. 245: Sliding Lock Trim On Edge Of Backrest Side Upwards Slightly
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Clips of trim must not be damaged.

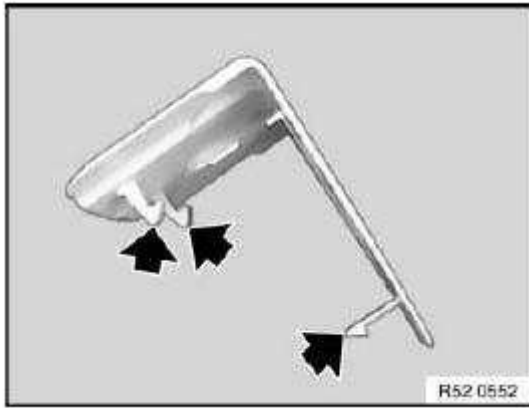


Fig. 246: Locating Clips Of Trim
Courtesy of BMW OF NORTH AMERICA, INC.

Partially lift cover (1) off rear seat backrest.

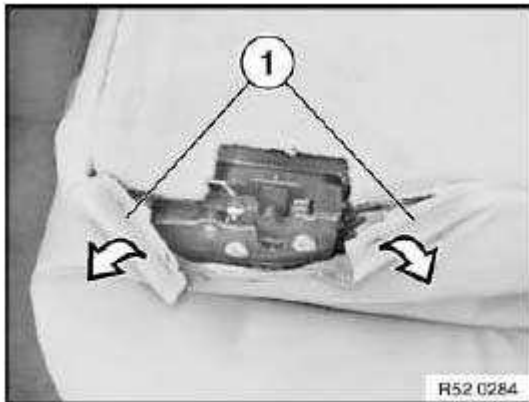


Fig. 247: Removing Lift Cover
Courtesy of BMW OF NORTH AMERICA, INC.

E46 only:

Remove lockplate (1) and unhook actuating rod (2) for seatback release.

E83 only:

Lockplate (1) omitted. Unhook actuating rod (2) for seatback release.

Installation:

Fit bush (3) and new lockplate (1).

Perform function check with rear seat back-rest folded forward.

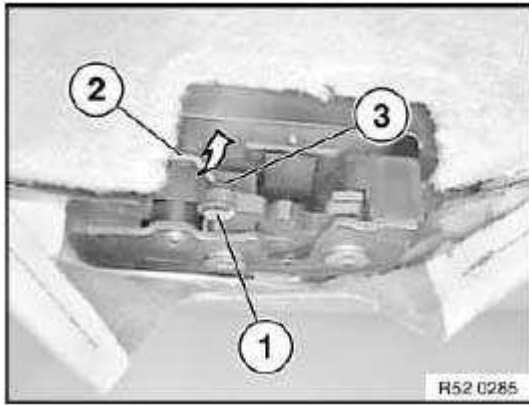


Fig. 248: Removing Lockplate
 Courtesy of BMW OF NORTH AMERICA, INC.

Release screws and fold back backrest lock.

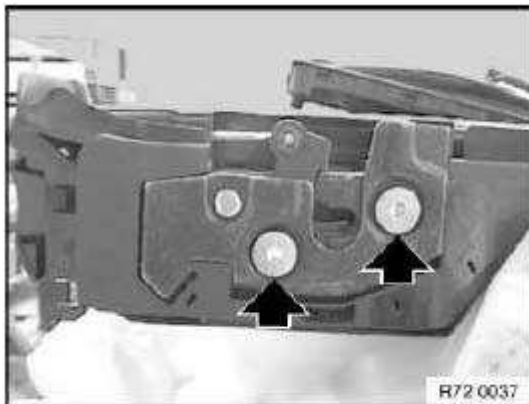


Fig. 249: Locating Backrest Lock
 Courtesy of BMW OF NORTH AMERICA, INC.

Summary, backrest lock, left:

1. Actuating rod for backrest lock
2. Lower section, backrest lock, left
3. Bowden cable of safety belt
4. Backrest lock, left
5. Bush for mounting of actuating rod

backrest locking fixture

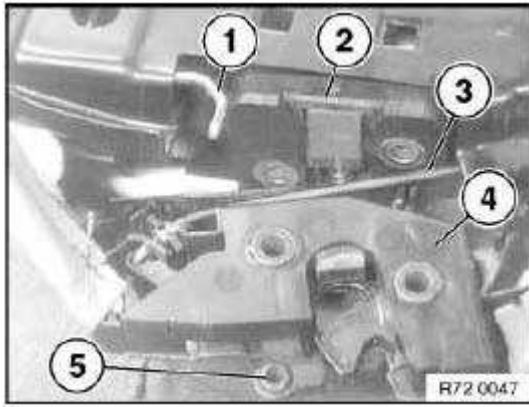


Fig. 250: Actuating Rod, Bowden Cable And Backrest Lock
 Courtesy of BMW OF NORTH AMERICA, INC.

Unhooking seat belt Bowden cable from backrest lock:

Press lever (1) forwards in direction of arrow.

Remove sleeve for Bowden cable (2) from holder (3) in backrest lock.

Unhook Bowden cable from lever (1).

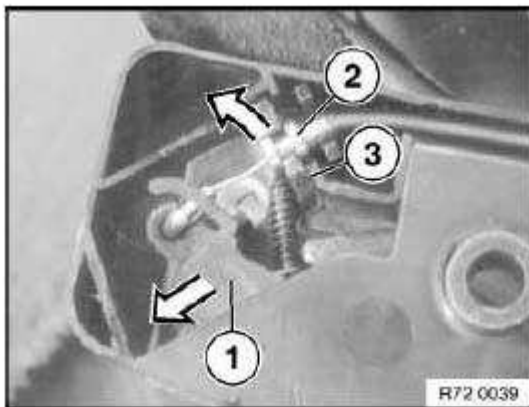


Fig. 251: Removing Sleeve For Bowden Cable From Holder
 Courtesy of BMW OF NORTH AMERICA, INC.

Summary, backrest lock, left:

1. Actuating lever for backrest lock in left backrest lock
2. Hole for Bowden cable of safety belt
3. Retaining lug for Bowden cable on actuating lever for backrest lock
4. Bracket for Bowden cable of safety belt
5. Bowden cable sleeve

6. Bowden cable of safety belt

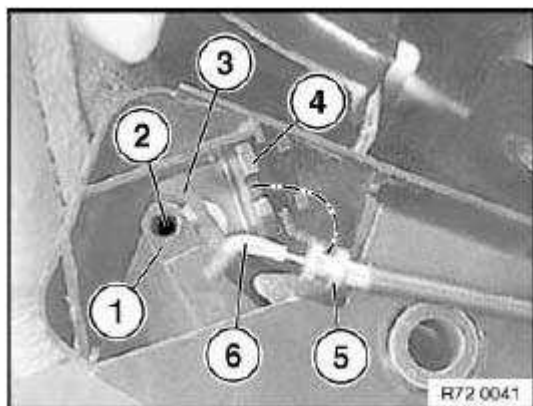


Fig. 252: Actuating Lever And Bowden Cable
Courtesy of BMW OF NORTH AMERICA, INC.

52 26 388 REMOVING AND INSTALLING/REPLACING REAR HEAD RESTRAINTS (THROUGH-LOADING SYSTEM), MIDDLE (COMPACT)

Operation is described in:

- Removing and installing rear head restraints (through-loading system), left or right, see **52 26 390 Removing and installing/replacing rear head restraint (through-loading system), left or right (Compact)**

52 26 388 REMOVING AND INSTALLING/REPLACING REAR MIDDLE HEAD RESTRAINT

Fold back head restraint (1) and move upwards to max. extent.

Press lock (2) and pull out head restraint.

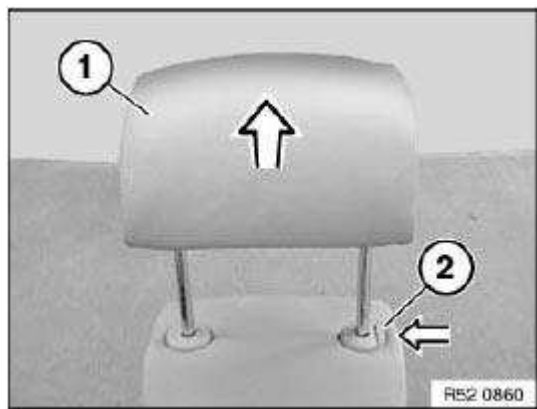


Fig. 253: Pulling Out Head Restraint
Courtesy of BMW OF NORTH AMERICA, INC.

52 26 390 REMOVING AND INSTALLING OR REPLACING LEFT OR RIGHT REAR HEAD RESTRAINT

Move head restraint (1) upwards to maximum extent.

Press lock (2) and pull out head restraint.

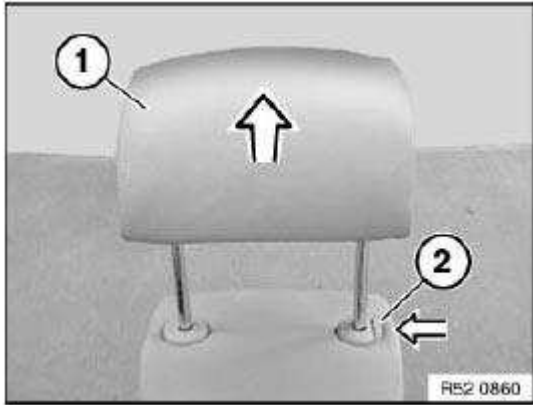


Fig. 254: Pulling Out Head Restraint
Courtesy of BMW OF NORTH AMERICA, INC.

52 26 390 REMOVING AND INSTALLING/REPLACING REAR HEAD RESTRAINT (THROUGH-LOADING SYSTEM), LEFT OR RIGHT (COMPACT)

Fold back head restraint and move upwards to max. extent.

If necessary, press gently on guides towards front and rear and pull out firmly.

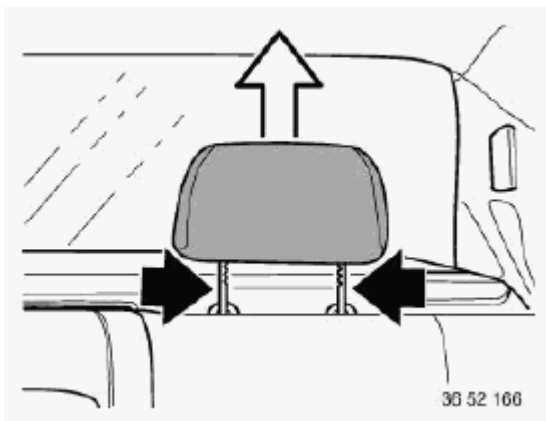


Fig. 255: Folding Back Head Restraint
Courtesy of BMW OF NORTH AMERICA, INC.

52 26 400 REPLACING SEAT COVER FOR REAR SEAT (THROUGH-LOADING SYSTEM)

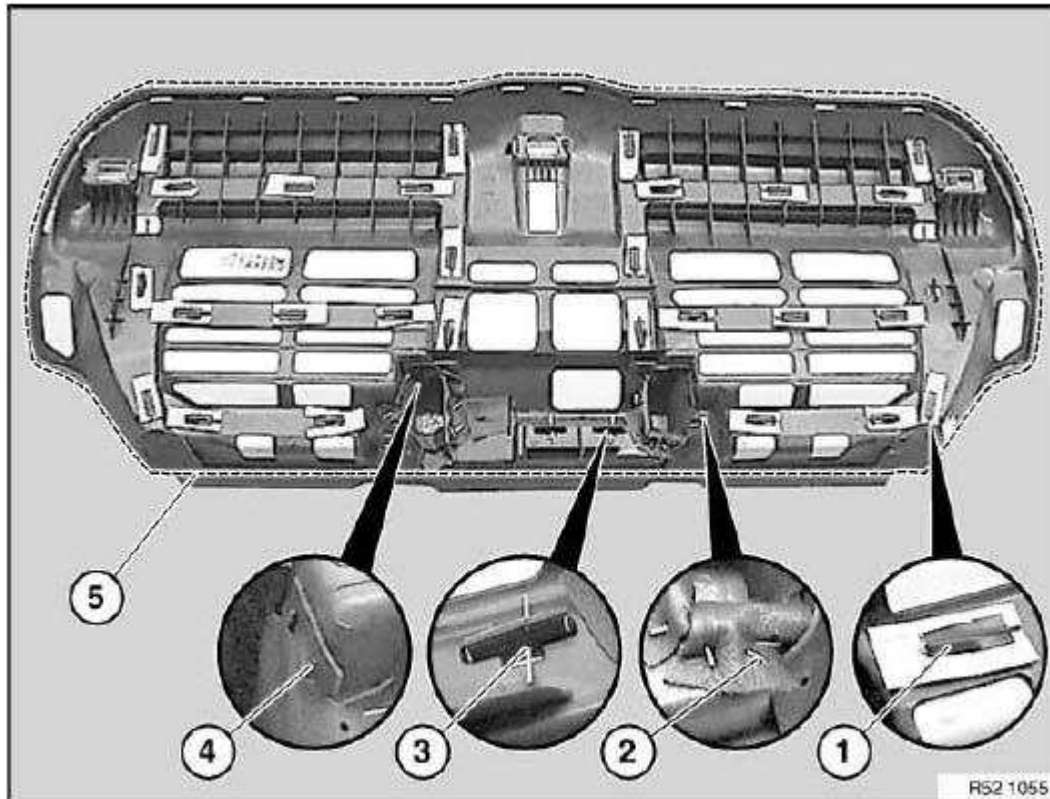
Special tools required:

- 00 9 323

Necessary preliminary tasks:

- Remove rear seat, see **52 26 005 Removing and installing/replacing rear seat (through-loading system)**

Overview of attachment points of cover to seat pan:



- | | | | |
|---|-------------------|---|---------------|
| 1 | Cover lugs (28 x) | 2 | Clips |
| 3 | Cover lugs (2 x) | 4 | Plastic hooks |
| 5 | Piping | | |

Fig. 256: Cover Lugs, Plastic Hooks And Piping
 Courtesy of BMW OF NORTH AMERICA, INC.

Removing seat cover:

- Remove retainers (2).
- Unhook cover from plastic hooks (4)
- Detach retaining elements from cover tabs (1 & 3).

Feed out piping.

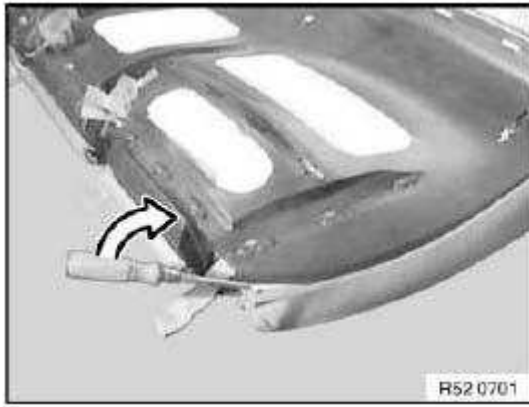


Fig. 257: Feeding Out Piping

Courtesy of BMW OF NORTH AMERICA, INC.

Slide cover lugs with special tool 00 9 323 through opening in seat pan.

Carefully remove seat pan.

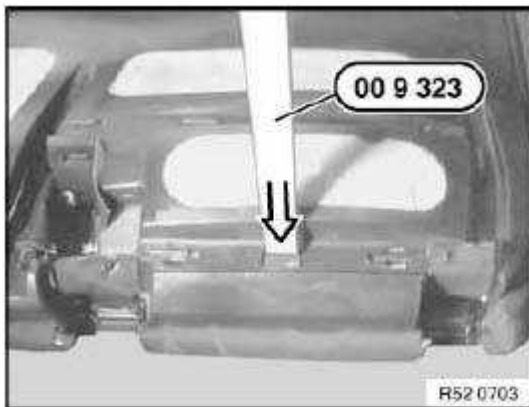


Fig. 258: Sliding Cover Lugs With Special Tool

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Feed cover lugs (1) through openings (2) in padding and before laying on seat pan pull through fully on rear side.

Push retaining elements back onto cover lugs.

Reattach seat cover to plastic hooks.

Attach new clips with pneumatic tacker.

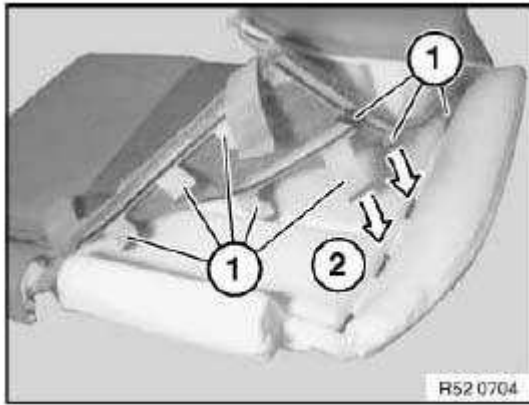


Fig. 259: Cover Lugs

Courtesy of BMW OF NORTH AMERICA, INC.

52 26 411 REPLACING BACKREST COVER FOR REAR SEAT (THROUGH-LOADING SYSTEM) ON LEFT

Special tools required:

- 00 9 317
- 00 9 323

Necessary preliminary tasks:

- Remove and install left backrest **52 26 015 Removing and installing/replacing left or right rear seat backrest (through-loading system)**
- Remove and install rear head restraints, see **52 26 388 Removing and installing/replacing rear middle head restraint**
- Remove lock trim of left rear seat backrest, see **52 26 309 Removing and installing/replacing lock for left rear seat backrest (through-loading system)**

Release screw (1) of seat outer mount.

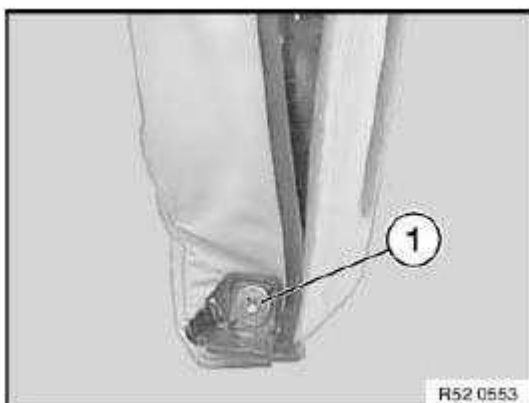


Fig. 260: Seat Outer Mount Screw

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Insert screw (1) and plastic washer (2) as shown into bearing pedestal (3) and screw down.

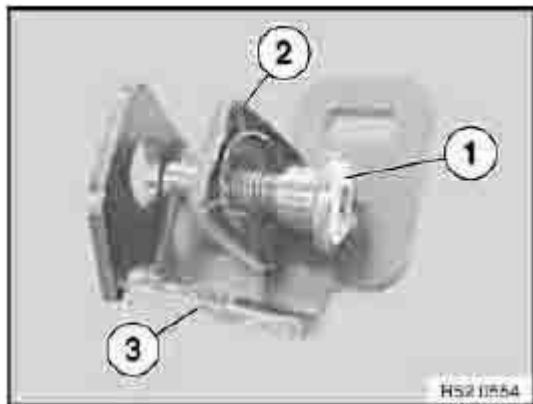


Fig. 261: Plastic Washer And Bearing Pedestal

Courtesy of BMW OF NORTH AMERICA, INC.

Move backrest into installation position and pull out belt slightly.

Clamp belt firmly.

E46 only:

Unfasten screws.

Remove trim.

E83 only:

Trim not screwed down.

Lever out trim with special tool 00 9 317.

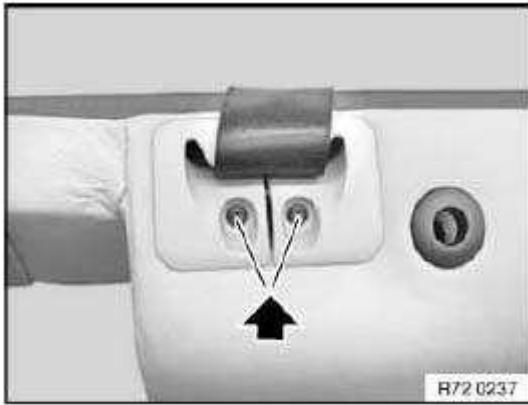


Fig. 262: Locating Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Separate webbing.

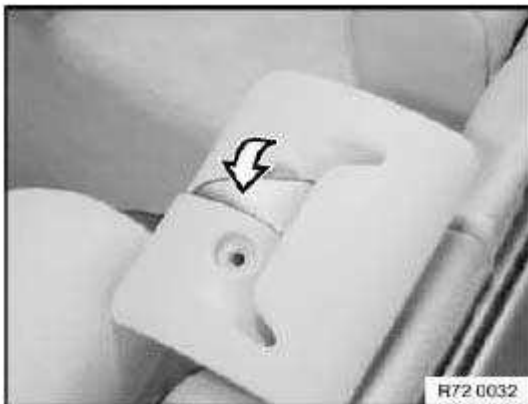


Fig. 263: Separating Webbing

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Feed out strap so that belt stopper (1) is located between upper guide (2) and lower guide (3) of belt finisher.

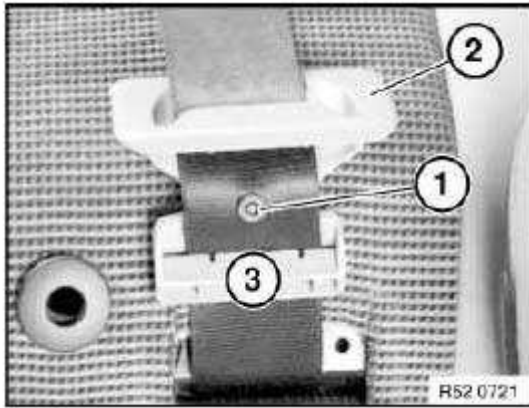


Fig. 264: Belt Stopper, Upper And Lower Guide
Courtesy of BMW OF NORTH AMERICA, INC.

Lever cover with trim wires (1) out of metal clutches (2).

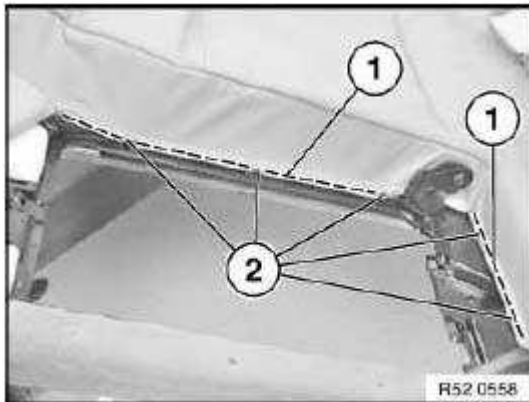


Fig. 265: Trim Wires And Metal Clutches
Courtesy of BMW OF NORTH AMERICA, INC.

Detach cover all round by lifting out piping (1).

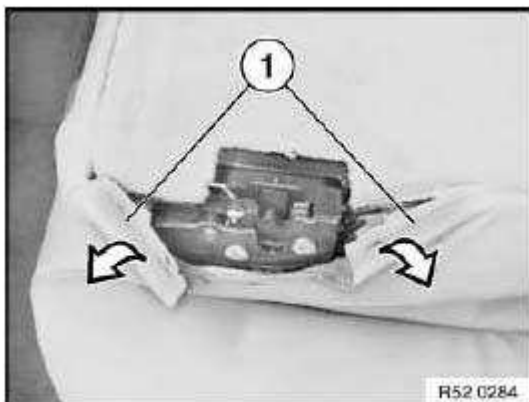


Fig. 266: Removing Lift Cover

Courtesy of BMW OF NORTH AMERICA, INC.

Carefully pull cover towards front.

Slide all retaining tabs (1) in succession out of retaining fixture.

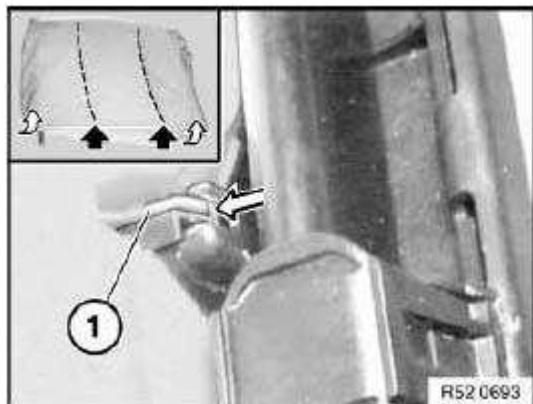


Fig. 267: Sliding Retaining Tabs

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Press tabs with special tool 00 9 323 into mounting on both sides.

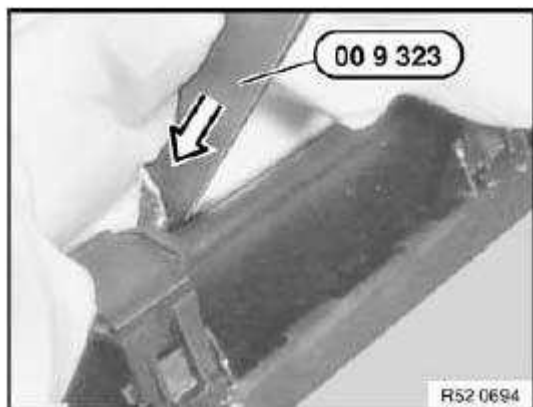


Fig. 268: Pressing Tabs With Special Tool

Courtesy of BMW OF NORTH AMERICA, INC.

Grip under cover (1) and padding and gently press clips (2) together, pull out head restraint guide (3).

Remove cover and padding.

Installation:

Clips of head restraint guide (2) must not be damaged.

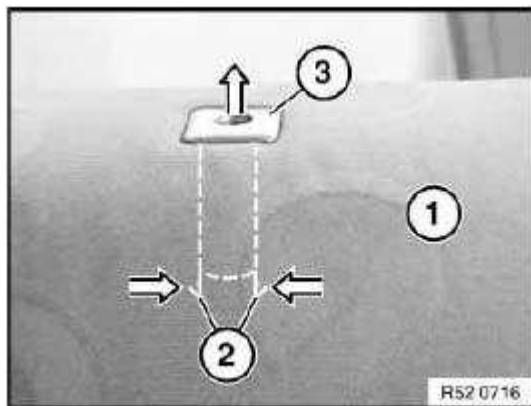


Fig. 269: Pulling Out Head Restraint Guide
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement of backrest cover or padding only:

Pull cover out of padding.

Installation:

Feed cover lugs (1) into openings of padding (2).

Make sure piping (3) is resting in opening of padding (4).

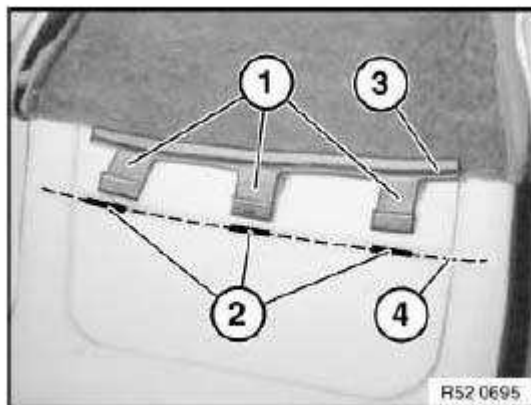


Fig. 270: Cover Lugs And Padding
Courtesy of BMW OF NORTH AMERICA, INC.

52 26 412 REPLACING BACKREST COVER FOR RIGHT REAR SEAT (THROUGH-LOADING SYSTEM)

Special tools required:

- 00 9 317
- 00 9 323

Necessary preliminary tasks:

- Remove and install left rear seat (through-loading), see **52 26 005 Removing and installing/replacing rear seat (through-loading system)**
- Remove and install rear head restraints, see **52 26 390 Removing and installing/replacing rear head restraint (through-loading system), left or right (Compact)**
- Remove backrest for rear seat (through-loading system), see **52 26 015 Removing and installing/replacing left or right rear seat backrest (through-loading system)**
- Remove actuator trim for left rear seat, see **52 26 301 Removing and installing /replacing actuating mechanism for left rear seat backrest (through-loading system)**
- Remove lock trim, see **52 26 309 Removing and installing/replacing lock for left rear seat backrest (through-loading system)**

Release mounting for center and outer mounts.

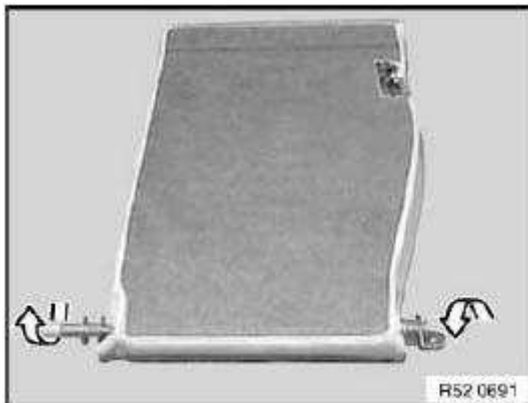


Fig. 271: Releasing Mounting For Center And Outer Mounts
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Installation sequence for mounting kit for center mount (1) and outer mount (2).

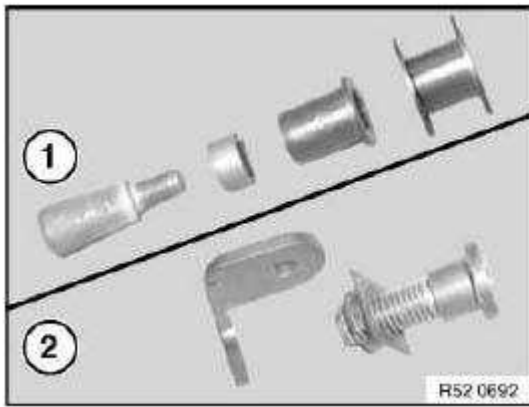


Fig. 272: Center And Outer Mount
Courtesy of BMW OF NORTH AMERICA, INC.

Move backrest into installation position and pull out belt slightly.

Clamp belt firmly.

E46 only:

Unfasten screws.

Remove trim.

E83 only:

Trim not screwed down.

Lever out trim with special tool 00 9 317.

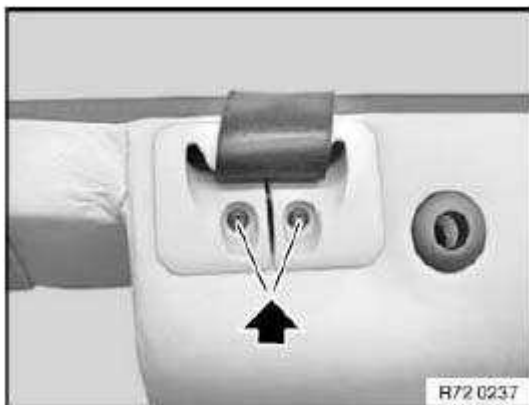


Fig. 273: Locating Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Separate webbing.

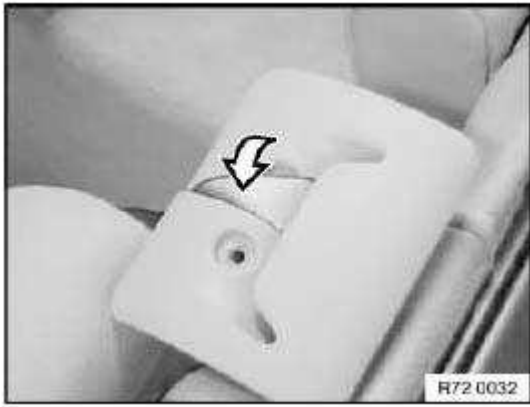


Fig. 274: Separating Webbing
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Feed out strap so that belt stopper (1) is located between upper guide (2) and lower guide (3) of belt finisher.

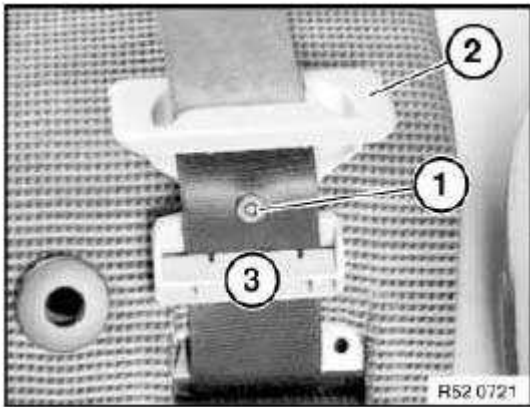


Fig. 275: Belt Stopper, Upper And Lower Guide
Courtesy of BMW OF NORTH AMERICA, INC.

Lever out cover all round.

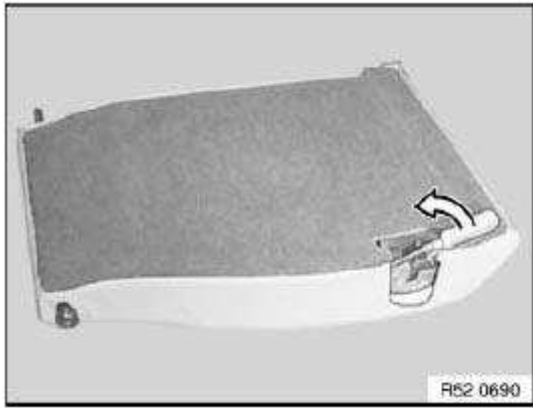


Fig. 276: Removing Lever Out Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Carefully pull cover over mounts towards front.

Slide all cover lugs (1) in succession in direction of backrest center (if necessary with cleaning wedge 00 9 323).

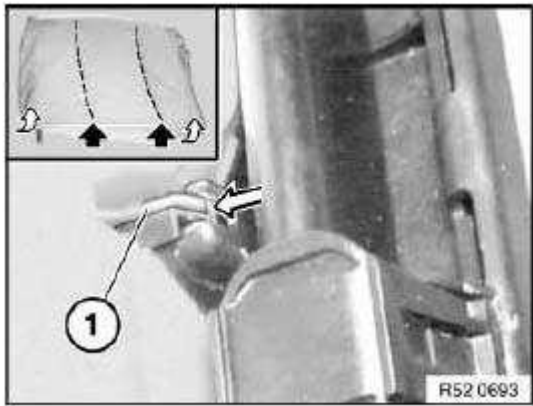


Fig. 277: Sliding Retaining Tabs
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Press tabs with special tool 00 9 323 into mounting on both sides.

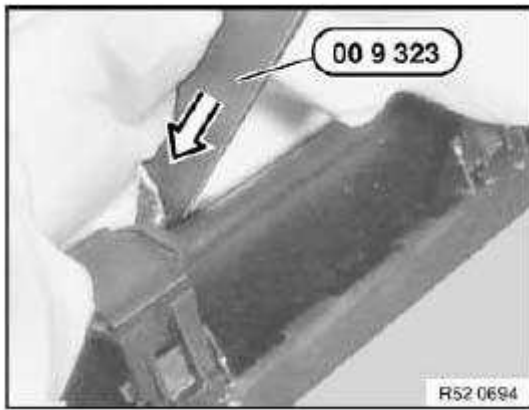


Fig. 278: Pressing Tabs With Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Grip lower cover (1) and padding and gently press clips (2) together, pull out head restraint guide (3).

Remove cover and padding.

Installation:

Clips of head restraint guide (2) must not be damaged.

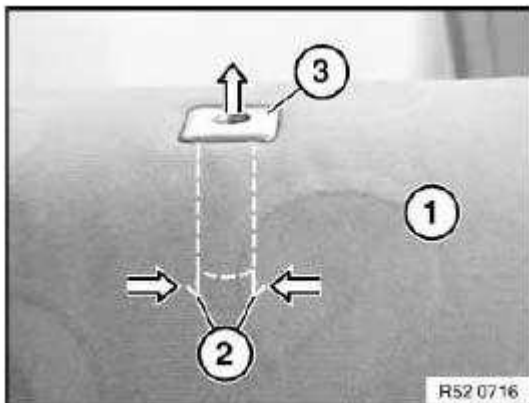


Fig. 279: Pulling Out Head Restraint Guide
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement of backrest cover or padding only:

Pull cover out of padding.

Installation:

Feed cover lugs (1) into openings of padding (2). Make sure piping (3) is resting in opening of padding (4).

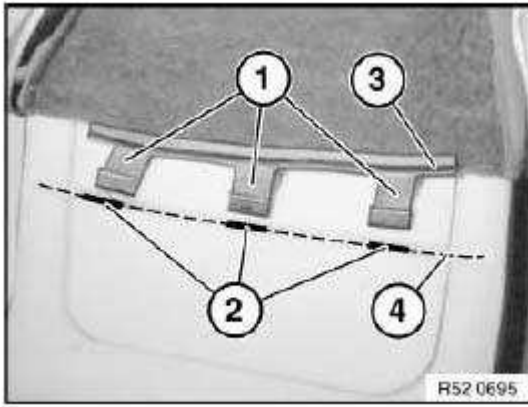


Fig. 280: Cover Lugs And Padding

Courtesy of BMW OF NORTH AMERICA, INC.

52 26 450 REPLACING PADDING FOR REAR SEAT

Necessary preliminary tasks:

- Replacing seat cover for rear seat, see **52 26 400 Replacing seat cover for rear seat (through-loading system)**

ACCESSORIES AND EQUIPMENT

Seats - Special Tools - X3

52 SEATS

52 0 050 PLIERS

Note: For securing clips on seat cover

Series: E12, E21, E23, E24, E28, E30, E30/C, E30tou, E31, E32, E32/3, E34, E34tou, E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E68, E70, E81, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53, R56, RR1, RR2

SI number: 52 06 87 (808)

Order number: 52 0 050 Pliers

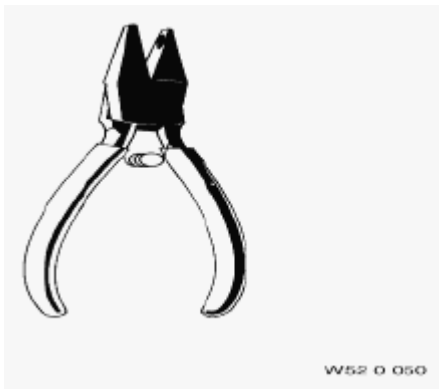


Fig. 1: Pliers (52 0 050)

Courtesy of BMW OF NORTH AMERICA, INC.

ACCESSORIES AND EQUIPMENT

Seats - Tightening Torques - X3

10 FRONT SEATS

52 10 FRONT SEATS

FRONT SEATS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Seat to floor plate	E31 / E32 / E34 / E36	M10		44 Nm
	E36 / Z3 front	M8		22 Nm
	E36 / Z3 rear	M10		43 Nm
	E38 / E39 / E46 / E52 / E53 / E63 / E64 / E83 / E85	M10		45 Nm
			Torque angle	90°
	E60 / E61 / E65 / E66 / E67 / E87 / E90 / E91	M10 (trilobular)	Replace Powerlok screw	44 Nm
2AZ Backrest frame to seat frame	E36			60 Nm
	E63 / E64 / E83 / E85			32 Nm
	E46 all except Convertible		Replace screws	32 Nm
	E65 / E66 / E67 / E60 / E61	M10 (trilobular)	Replace Powerlok screw	33 Nm
	E53			45 Nm
3AZ Support (backrest shell) to headrest rail	E31			6.5 Nm
4AZ Head restraint rail to backrest frame	E31			25 Nm
5AZ Finisher on seat rail	E38 / E39	M4		4 Nm
6AZ Seat frame to seat runner	E38 / E39	M6		15 Nm
	E60 / E61 / E65 / E66	M8		27 Nm
7AZ Actuating unit to seat frame	E46 / E85			10 \pm ² Nm
8AZ Adjusting screw for eccentric element	E46 / E85			1.4 Nm
9AZ Seat pan to seat frame	E46 / E53 / E63 / E64 / E83 / E85			10 \pm ² Nm
10AZ Microswitch to front seat	E46			2 \pm ¹ Nm
11AZ Backrest frame to seat rail	E31			25 Nm
12AZ Trims to seat mechanism	E63 / E64			3 Nm
13AZ Trim to seat cushion shell	E63 / E64			4.4 Nm
14AZ Backrest frame to seat				24 \pm ⁴

frame - Screw	E46 Convertible		Replace screws	Nm
15AZ Backrest frame to seat frame - Pin with knurling and lock nut	E46 Convertible		Replace screws	40 \pm^5 Nm
16AZ Seat tilt adjuster to seat mechanism	E46 / E53 / E83 / E85	M6 x 10 (trilobular)	Replace Taptite screw	9 Nm
17AZ Seat tilt adjuster to seat pan	E46 / E53 / E83 / E85			9 Nm
18AZ Active head restraint Sliding rails with gas cartridge	E60 / E61 / E65 / E66 / E67			8 Nm
19AZ Belt guide to backrest	E85			1.25 Nm
20AZ Kinematic element to backrest frame	E46 Convertible			3 $^{+2}$ Nm

24 REAR SEAT, NORMAL

52 24 REAR SEAT (NORMAL), MANUAL

REAR SEAT (NORMAL), MANUAL - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Backrest on body	E38	M6		5 Nm
	E60	M8		18.5 Nm
2AZ Head restraint support to backrest	E60	M6	Screws, top	5.6 Nm
			Screws, bottom	8 Nm
3AZ Armrest lock to backrest	E60	M6		8 Nm
4AZ Backrest lock to backrest	E60	M6		19 Nm
5AZ Center armrest to backrest frame	E60	M6		19 Nm
6AZ Storage compartment casing to body	E63 / E64			7.5 Nm
7AZ Ski bag casing to body (hexagon screw)	E63 / E64	M8		24 Nm
8AZ Lock to body				
9AZ Top Tether eyelet	E60 / E63 / E65 / E66			17 Nm

25 REAR SEAT, NORMAL, ELECTRIC

52 25 REAR SEAT (NORMAL), ELECTRIC

REAR SEATS (THROUGH-LOADING SYSTEM) - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Backrest on body	E38			5 Nm
	E65 / E66 / E67		Install nuts with Loctite	20 Nm
2AZ Seat to floor plate	E65 / E66 / E67			20 Nm

	E65 / E66 / E67		Plastic nut	12 Nm
3AZ Backrest frame to seat frame	E65 / E66 / E67			18 Nm
4AZ Center armrest to body	E65 / E66 / E67			19 Nm

26 REAR SEAT, THROUGH-LOADING

52 26 REAR SEATS (THROUGH-LOADING SYSTEM)

REAR SEATS (THROUGH-LOADING SYSTEM) - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Outer mount (backrest) to body	E60			12.5 Nm
2AZ Center mount (backrest) to body	E60			12.5 Nm
3AZ Backrest lock to seat back	E60			12.5 Nm
4AZ Center armrest to seat back	E60	M6		6 Nm
5AZ Outer mount to seat back	E60			38 Nm
6AZ Skibag cover to skibag frame	E60			6 Nm
7AZ Striker to body				
8AZ Lashing eye to backrest				
9AZ Lock to backrest	E61			20+5 Nm
10AZ Lock to body	E60			18.5 Nm

ACCESSORIES AND EQUIPMENT

Trailers - Tightening Torques - X3

10 LOADING PLATFORM

86 10 PLATFORM

PLATFORM - TIGHTENING TORQUES

	Type	thread	tightening specification	Measure
1AZ Nut to retaining thread, rear light		M5		7 Nm
2AZ Bar to platform		M8x35		23 Nm
3AZ Lashing plate to platform		M8x35		15 Nm
4AZ Front guard to cross-member		M8x55		28 Nm
5AZ Front guard to longitudinal member		M8x25		34 Nm
6AZ Saucer head screw to rail		M5x15		7 Nm
7AZ Rail, loading ramp frame to cross strut		M6x16		11.5 Nm
8AZ Rail, loading ramp frame to longitudinal member mount		M6x16		11.5 Nm
9AZ Cross strut to rail		M6x16		5.5 Nm
10AZ Footplate to drawbar member		M6x25		11.5 Nm
11AZ Bracket to drawbar member		M8x25		34 Nm
12AZ Wiring harness mount to reversing housing		M10x1x20		58 Nm
13AZ Socket holder to drawbar		M10x95		55 Nm
14AZ Top reversing housing and bracket to drawbar member		M10		55 Nm
15AZ Towing attachment to tow tube		M12x70		96 Nm
16AZ Drawbar member to cross-member		M8x20		28 Nm
17AZ Cross-member to drawbar member		M8x25		40 Nm
18AZ Drawbar member to cross-member		M8x25		28 Nm
19AZ Disk wheel to brake hub				100 Nm
20AZ Brake hub to axle				280 Nm
21 AZ Shock absorber to bracket		M12x55		96 Nm
22AZ Trailing arm to coil spring		M10x35		46 Nm
23AZ Coil spring to longitudinal member		M10x25		46 Nm
24AZ Wheel brake to trailing arm		M10x1.5x30		145 Nm
25AZ Trailing arm to mount		M12x85		96 Nm
26AZ Rear apron to bracket		M8x25		26 Nm
27AZ Bracket to mounting bracket		M6x16		11 Nm
28AZ Rotary striker lock to cross strut		M8x35		18 Nm
29AZ Bearing pedestal to loading ramp frame		M6x16		10 Nm

30AZ Outer towbar mount to longitudinal member	M10x25	55 Nm
31AZ Mounting bracket to longitudinal member	M10x25	78 Nm
32AZ Base plate to cross-member	M10x35	78 Nm

21 HOOD

86 21 HOOD

HOOD - TIGHTENING TORQUES

	Type	thread	tightening specification	Measure
1AZ Roof railing, front and rear, to roof railing adapter		M8		22.5 Nm
2AZ Roof railing, middle, to roof railing adapter		M8		22.5 Nm
3AZ Roof railing, front and rear, to support		M6		15 Nm
4AZ Roof railing, middle, to support		M6		10 Nm
5AZ Upper lock striker fixture to lower lock striker fixture		M8		27 Nm
6AZ Hinge, side lid, to support		M8		27 Nm
7AZ Support, lid to lid		M8		23 Nm
8AZ Screw, depth adjustment, side lid		M8		27 Nm
9AZ Screw, depth adjustment, rear lid		M8		27 Nm
10AZ Ball pivot to retaining bracket		M8		23 Nm
11AZ Retaining bracket to support		M8		27 Nm
12AZ Rotary striker lock to support		M5		7 Nm

ACCESSORIES & EQUIPMENT

Trailers & Equipment - Repair Instructions - X3

10 LOADING PLATFORM

00 00 ... BODY AND UNDERBODY: CHECKING FOR CORROSION AND DAMAGE

Inspect chassis, underbody and wheel arches and check for corrosion and damage.

NOTE: It is absolutely essential to rectify any identified faults after consulting the customer and to issue a separate invoice.

00 00 ... RAISING BMW MULTI-TRAILER

CAUTION: Twin-strut underfloor platforms and twin-pillar lifting platforms are suitable for raising the BMW multi-trailer.

Lifting platforms with drive-on surfaces are not suitable for raising in order to carry out maintenance and repair work.

The lifting platform must comply with the relevant statutory accident prevention regulations and be serviced according to the manufacturer's instructions. It is essential to follow the lifting platform operating instructions, in particular the safety instructions and carrying capacity!

Make sure you adhere to the BMW-recommended work area of 5 x 7 m and to an escape route of 0.6 m between two lifting platforms.

Before raising the BMW multi-trailer, please observe the following points:

- Raise the trailer only when it is unloaded
- Remove a supplied loading ramp from the loading ramp frame so that all chassis areas of the BMW multi-trailer are freely accessible
- There must be sufficient clearance between the carrier arms/flat girder bridges and the GFK aprons or the front guard of the BMW multi-trailer
- The BMW multi-trailer must always be positioned in the middle of the lifting platform.

CAUTION: You will need special additional supports for the lifting platform in order to bridge the difference in height between longitudinal member and lower edge of GFK side apron or front guard of the BMW multi-trailer. The minimum height of the additional supports is 145 mm. Use only the additional supports approved by the platform manufacturer or specified in these repair instructions.

You will find appropriate examples in the repair instructions for the

majority of lifting platforms present in BMW workshops. For lifting platforms that are not named, the relevant manufacturers will offer you appropriate additional supports. Please contact directly the manufacturer of the lifting platform used in your dealership.

CAUTION: The BMW multi-trailer may only be raised by its longitudinal members. Do not under any circumstances raise the BMW multi-trailer by the GFK aprons. Make sure the additional supports bear the longitudinal members over their entire width and no attachments or wiring harnesses are touched or jammed. Check the securing equipment of the additional supports for correct seating. Under no circumstances should any work be carried out underneath the BMW multi-trailer if it is not adequately secured against slipping off the lifting platform.

The areas (2) on the longitudinal members (1) marked in the adjacent diagram are the best areas for attaching the additional supports.

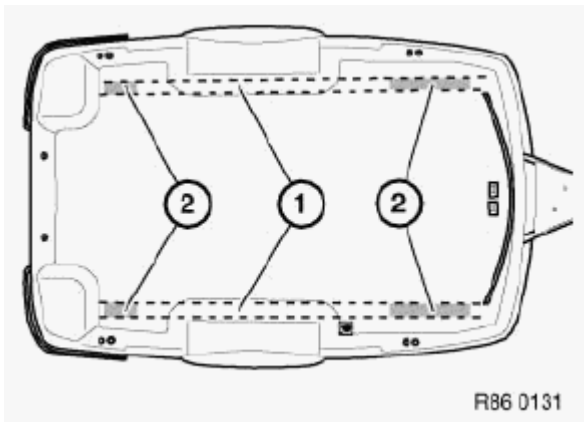


Fig. 1: Identifying Marked Areas On Longitudinal Members
Courtesy of BMW OF NORTH AMERICA, INC.

General Notes On Using Twin-Pillar Lifting Platforms

For the twin-pillar lifting platforms described, the BMW multi-trailer is positioned in the direction of travel on the platform. For lifting platforms which do not create sufficient clearance between disk wheel and carrier arms, move the BMW multi-trailer against the direction of travel onto the platform.

Becker & Sohne Twin-Strut Underfloor Platform

The BMW multi-trailer can only be raised if it is supported at right angles to the direction of travel. For raising, use the high additional supports (1) of Becker & Sohne.

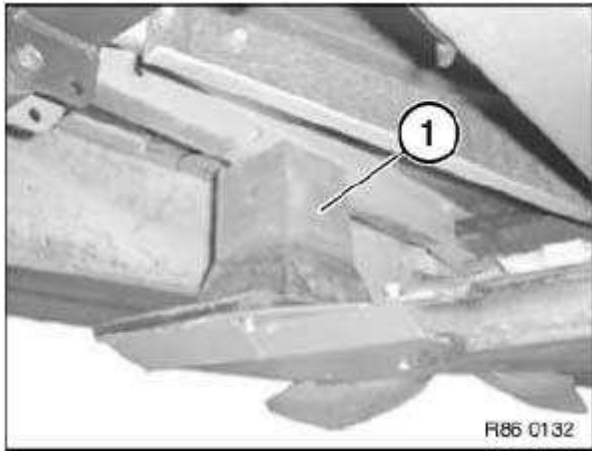


Fig. 2: Identifying High Additional Supports
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Also lash the BMW multi-trailer to the flat girder bridges of the lifting platform. Flag the protruding tow hitch and the drawbar member of the BMW multi-trailer conspicuously so as to prevent injury, e.g. with a red cloth.

MAHA Twin-Pillar Lifting Platform

The BMW multi-trailer can only be raised if you use the support plate attachment sleeves for transporters (1). Position the axle of the BMW multi-trailer in the direction of travel in front of the pillars of the platform in order to obtain the specified lifting ranges and to establish sufficient clearance between disk wheel and carrier arms. The long carrier arms raise the front and the short carrier arms raise the rear of the BMW multi-trailer.

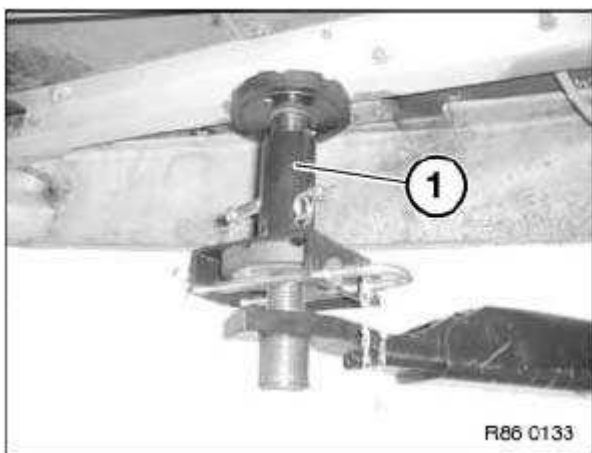


Fig. 3: Identifying MAHA Twin-Pillar Lifting Platform
Courtesy of BMW OF NORTH AMERICA, INC.

Romaico-Lift Twin-Pillar Lifting Platform

The BMW multi-trailer can only be raised if you use the 146 mm high attachments (1). Position the axle of the BMW multi-trailer in the direction of travel in front of the pillars of the platform in order to obtain the specified lifting ranges and to establish sufficient clearance between disk wheel and carrier arms. The long carrier arms raise the front and the short carrier arms raise the rear of the BMW multi-trailer.

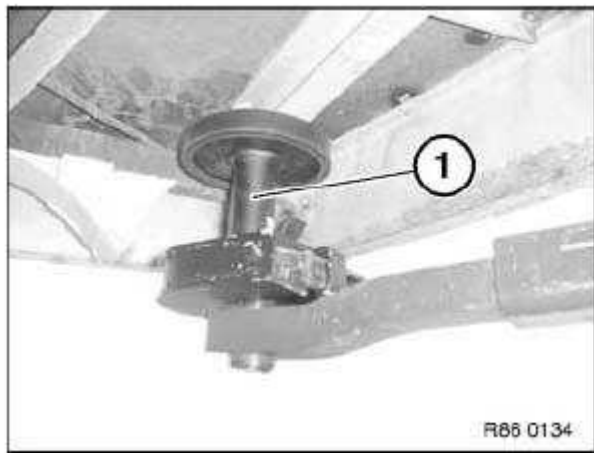


Fig. 4: Identifying Romaico-Lift Twin-Pillar Lifting Platform
Courtesy of BMW OF NORTH AMERICA, INC.

Working Pit

The BMW multi-trailer can be serviced or repaired in conjunction with a working pit if the following measures are taken into consideration. The BMW multi-trailer must be secured against slipping/tilting sideways. The drawbar jockey wheel must be firmly secured against rolling.

86 10 ... ADJUSTING BRAKE SYSTEM

Proper adjustment of the brake system is only possible if the brake Bowden cables and all brake system moving parts move freely and are ready for operation.

The wheels must be completely fitted and able to rotate freely. Always adjust both brake sides. The left and right sides are adjusted in the same way.

Pull out overrunning equipment (1) fully in direction of arrow.

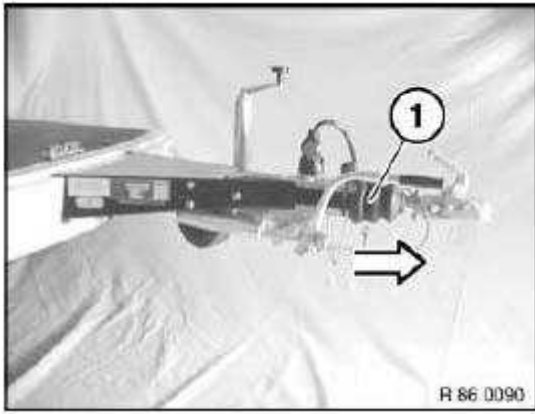


Fig. 5: Identifying Overrunning Equipment
 Courtesy of BMW OF NORTH AMERICA, INC.

Reversing lever (1) must rest directly on inner lying tow tube of overrunning brake.

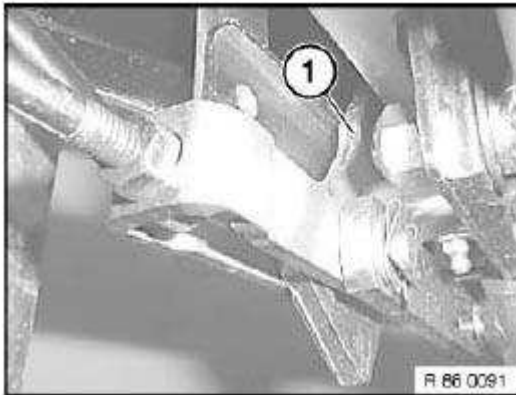


Fig. 6: Identifying Reversing Lever
 Courtesy of BMW OF NORTH AMERICA, INC.

Screw brake linkage (1) into nut (2) until distance (3) (nut (2) - end of brake linkage (1)), is 10 - 15 mm. Lock brake linkage (1) in position with nut (4). Check distance (3) and nuts (2, 4) with brake linkage installed.

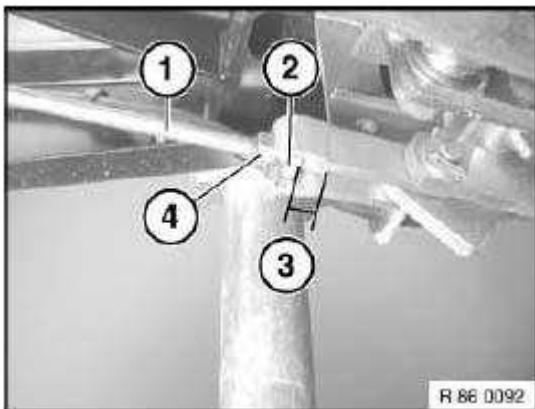


Fig. 7: Identifying Screw Brake Linkage & Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Insert pull rod (1) in brake compensator (2) and screw nut (3) onto pull rod (2).

Tighten nut (3) until pull rod (1) is free of play.

Check pull rod (1) already fitted for zero play.

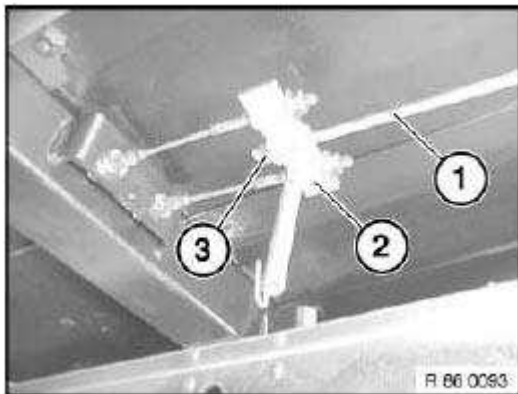


Fig. 8: Identifying Pull Rod, Brake Compensator & Screw Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Hook tension spring (1) to tension spring mount (2).

Installation:

The brake shoes are adjusted in two work steps. In the first step, the distance between the lower half of the brake shoes and the brake drum is adjusted. In the second step, the distance between the upper half of the brake shoes and the brake drum is adjusted.

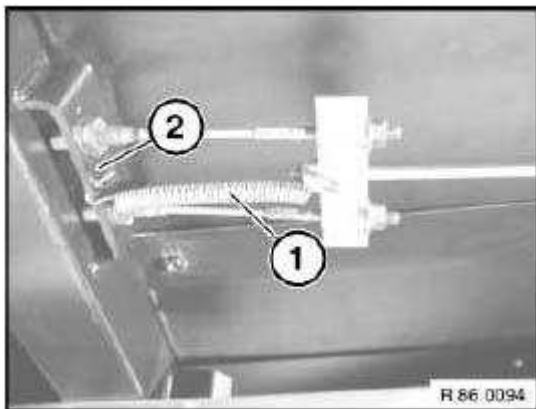


Fig. 9: Identifying Hook Tension Spring & Tension Spring Mount
Courtesy of BMW OF NORTH AMERICA, INC.

Rotate road wheel (1) in direction of travel and simultaneously turn adjusting screw (2) in direction of arrow.

Tighten adjusting screw (2) until road wheel (1) can no longer be turned.

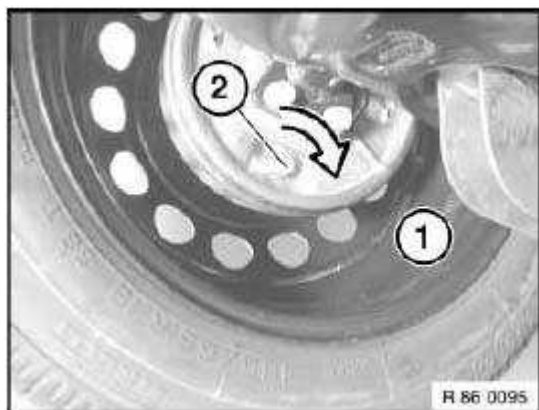


Fig. 10: Identifying Adjusting Screw & Road Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

Turn adjusting screw (1) in direction of arrow and release slowly until road wheel (2) can rotate.

Finish adjustment procedure when slight grinding noises can be heard in lower brake shoe halves.



Fig. 11: Identifying Adjusting Screw & Road Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

Firmly tighten handbrake lever three to five times.

Depending on road wheel side, tighten nut (1) or (2) until slight grinding noises can be heard in upper brake shoe halves.

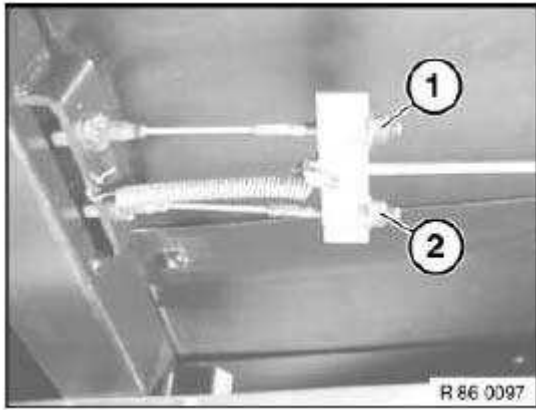


Fig. 12: Identifying Depending On Road Wheel Side, Nut
Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... ADJUSTING SPRING FORCE ACCUMULATOR

The spring force accumulator requires no maintenance and generally does not need to be readjusted.

Adjustment dimension, spring force accumulator: distance between end of support tube-internal washer (1) is 90 mm.

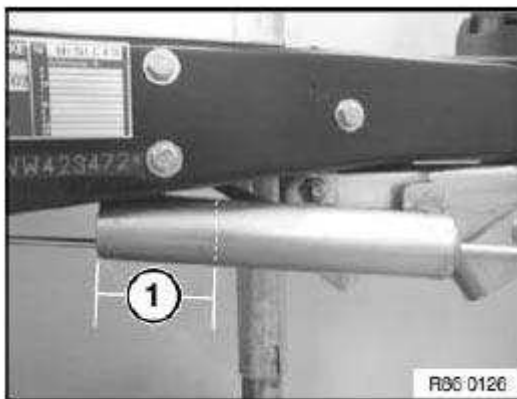


Fig. 13: Identifying Distance Between End Of Support Tube-Internal Washer
Courtesy of BMW OF NORTH AMERICA, INC.

To tension spring force accumulator: turn nut (2) located in support tube (1) clockwise.

To relieve tension on spring force accumulator: turn nut (2) located in support tube (1) counterclockwise.

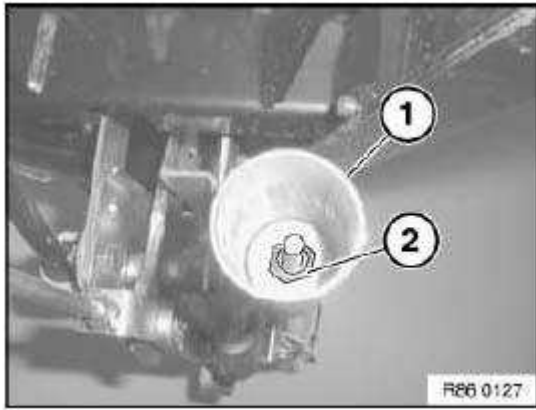


Fig. 14: Identifying Support Tube & Nut
Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... DISASSEMBLY OF CAMLOCK RETAINING CAM

Unscrew bolts (1).

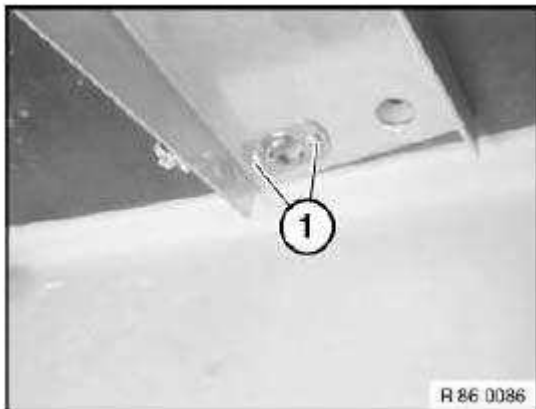


Fig. 15: Identifying Camlock Retaining Cam Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... DISASSEMBLY OF BASE PLATE

- NOTE:**
- Disassembly of bar, refer to 86 10 ... REPLACING BAR**
 - Disassembly of lashing plate, refer to 86 10 ... REPLACING LASHING PLATE AND LASHING EYE.**
 - Disassembly of 12 volt socket, refer to 86 10 ... REPLACING 12 VOLT SOCKET**
 - Remove plastic bush/metal bush, refer to 86 10 ... REMOVING PLASTIC BUSH/METAL BUSH.**

Disassembly of light guard, refer to 86 10 ... REPLACING REAR LIGHT

Disassembly of front apron, refer to 86 10 ... DISASSEMBLY OF FRONT APRON

Disassembly of left and right aprons, refer to 86 10 ... DISASSEMBLY OF LEFT AND RIGHT APRONS

Disassembly of left and right wheel boxes, refer to 86 10 ... DISASSEMBLY OF LEFT AND RIGHT WHEEL BOXES

Disassembly of rear apron, refer to 86 10 ... DISASSEMBLY OF REAR APRON

Disassembly of left and right lamp housings, refer to 86 10 ... DISASSEMBLY OF LEFT AND RIGHT LAMP HOUSINGS

Disassembly of rivet connection, rear support: refer to Disassembly procedure of rivet connection, rear support, see 86 10 ... REMOVING REAR SUPPORTS AND BRACKET

Unscrew bolts (1).

CAUTION: Before drilling out rivet heads, drive in rivet pins with a punch.

Drill out rivet connections (2).

Installation:

Tightening Torque: 86 10 32AZ, see 86 10 PLATFORM .

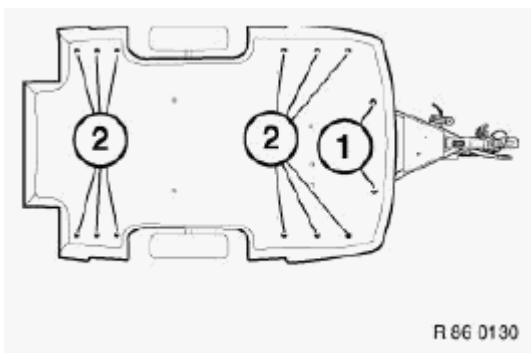


Fig. 16: Identifying Bolts & Rivet Connections
Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... DISASSEMBLY OF BRACKET ON PLATFORM BASE

Unscrew bolts (1).

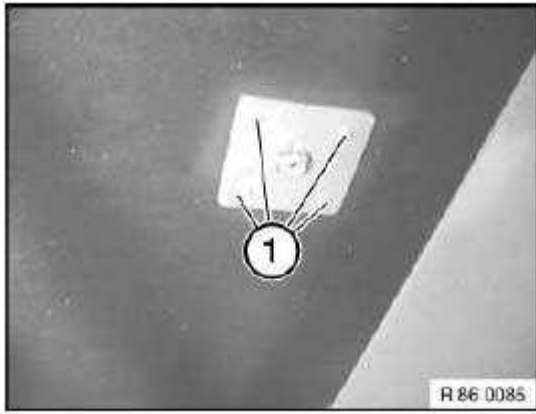


Fig. 17: Identifying Bolts

Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... DISASSEMBLY OF FRONT APRON

Drill out rivets (1) on lower apron edge.

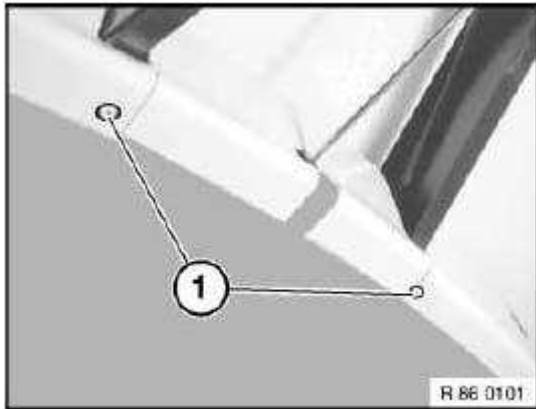


Fig. 18: Identifying Rivets On Lower Apron Edge

Courtesy of BMW OF NORTH AMERICA, INC.

Remove sealing compound (1).

Drill out rivets (2).

Installation:

Use Sikaflex 221 as sealing compound.

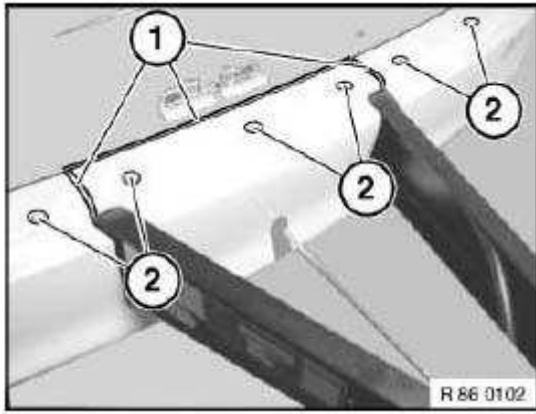


Fig. 19: Identifying Sealing Compound & Rivets
 Courtesy of BMW OF NORTH AMERICA, INC.

Press side sections (1) to side in direction of arrow. Tilt center section (2) downwards and remove to side.

Installation:

Use Sikaflex 221 as sealing compound.

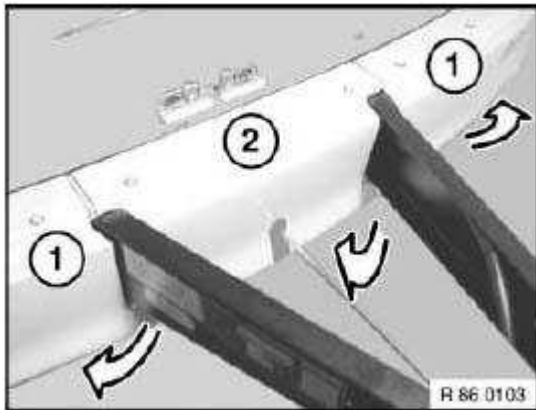


Fig. 20: Press Side Sections To Side And Tilt Center Section Downward
 Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... DISASSEMBLY OF FRONT PROTECTION BAR

Release screws (1) on cross-member (2).

Installation:

Use new self-locking nuts.

Tightening Torque: 86 10 4AZ, see **86 10 PLATFORM** .

Installation:

Tightening Torque: 86 10 5AZ, see 86 10 PLATFORM .

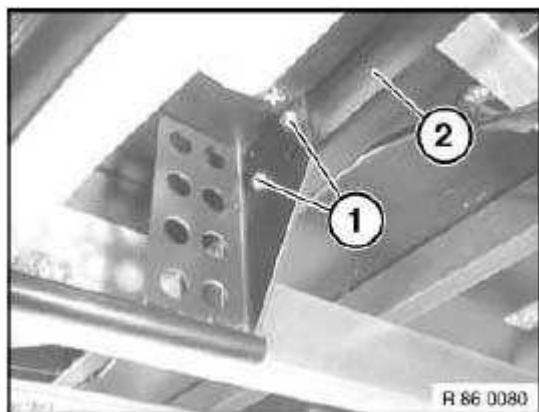


Fig. 21: Identifying Screws On Cross-Member
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) on longitudinal member (2).

Installation:

Tightening Torque: 86 10 5AZ, see 86 10 PLATFORM .

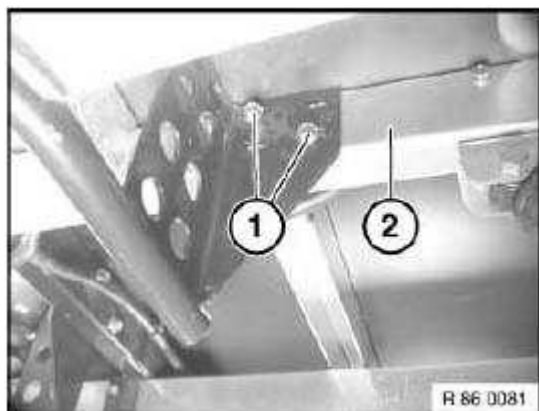


Fig. 22: Identifying Screws On Longitudinal Member
Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... DISASSEMBLY OF JOCKEY WHEEL OR JOCKEY WHEEL MOUNT

Turn clamping lever (1) in direction of arrow and release clamping connection. Open clamping bracket (2) and remove jockey wheel (3). Release screws on mount (4) and remove screws.

Installation:

Tightening Torque: 86 10 11AZ, see **86 10 PLATFORM** .

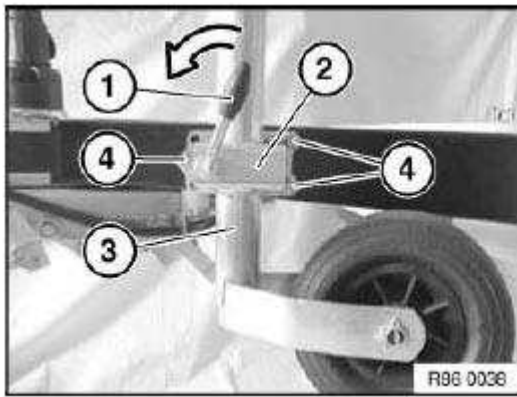


Fig. 23: Identifying Clamping Lever & Jockey Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... DISASSEMBLY OF LEFT AND RIGHT APRONS

NOTE: Remove position light, refer to **86 10 ... REPLACING POSITION LIGHT**.

Remove rear light, refer to **86 10 ... REPLACING REAR LIGHT**.

Remove plastic bush/metal bush, refer to **86 10 ... REMOVING PLASTIC BUSH/METAL BUSH**.

Drill out rivets (1) on lower apron edge.

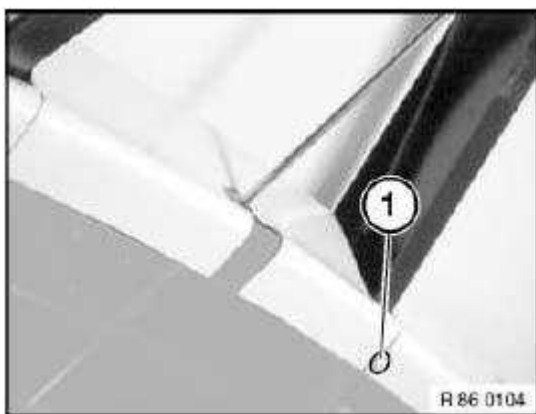


Fig. 24: Identifying Rivets On Lower Apron Edge
Courtesy of BMW OF NORTH AMERICA, INC.

Remove sealing compound (1).

Drill out all rivets (2) along apron edge.

Installation:

Use Sikaflex 221 as sealing compound.

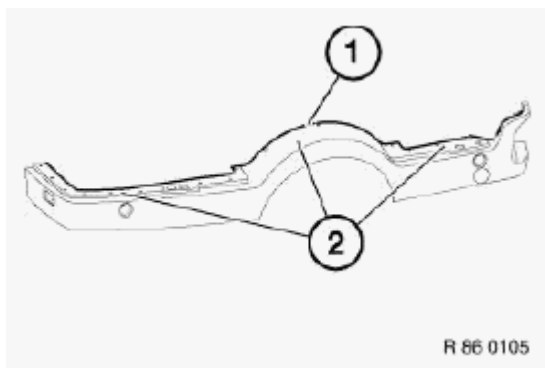


Fig. 25: Identifying Sealing Compound & Rivets
Courtesy of BMW OF NORTH AMERICA, INC.

Remove sealing compound (1).

Drill out rivets (2) on lower apron edge.

Installation:

Use Sikaflex 221 as sealing compound.

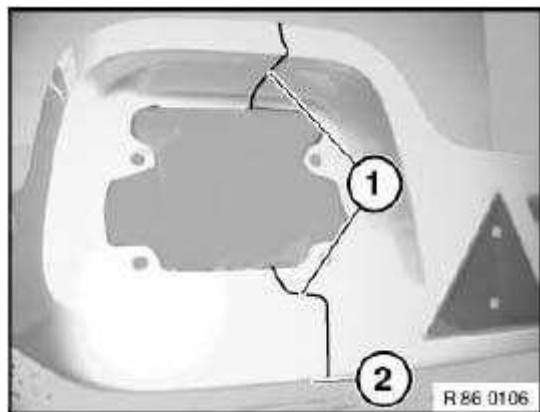


Fig. 26: Identifying Rivets On Lower Apron Edge
Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... DISASSEMBLY OF LEFT AND RIGHT LAMP HOUSINGS

Cut through sealing compound (1) and remove.

Drill out rivet connections (2).

Installation:

Use Sikaflex 221 as sealing compound.

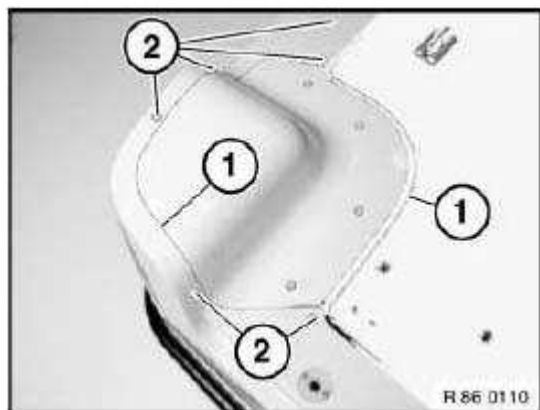


Fig. 27: Identifying Sealing Compound & Rivet Connections
Courtesy of BMW OF NORTH AMERICA, INC.

Drill out rivet connections (1).

Raise side sections (2, 3).

Pull out lamp housing (4) towards inside in direction of platform.

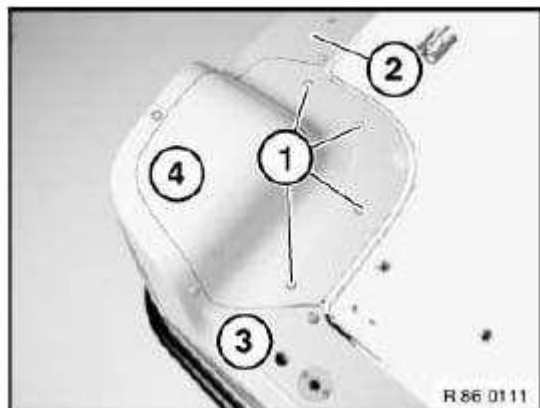


Fig. 28: Identifying Rivet Connections & Raise Side Sections
Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... DISASSEMBLY OF LEFT AND RIGHT WHEEL BOXES

Remove sealing compound (1).

Drill out rivets (2).

Raise side apron (3). Pull out wheel box (4) towards rear.

Installation:

Use Sikaflex 221 as sealing compound.

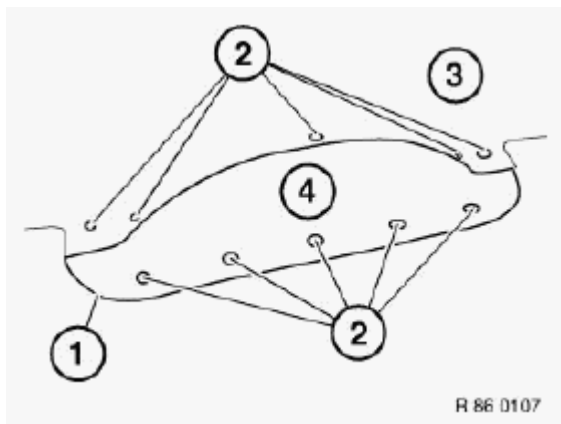


Fig. 29: Identifying Sealing Compound, Raise Side Apron & Wheel Box
Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... DISASSEMBLY OF LICENSE PLATE MOUNTING PLATE

CAUTION: Once the connecting screws (1) have been removed, the closing spring of the hinge retracts. Risk of trapping!

Release screws (1) in loading ramp frame (2) on left and right sides.

Installation:

Use new self-locking nuts.

Tightening Torque: 86 10 7AZ, see **86 10 PLATFORM** .

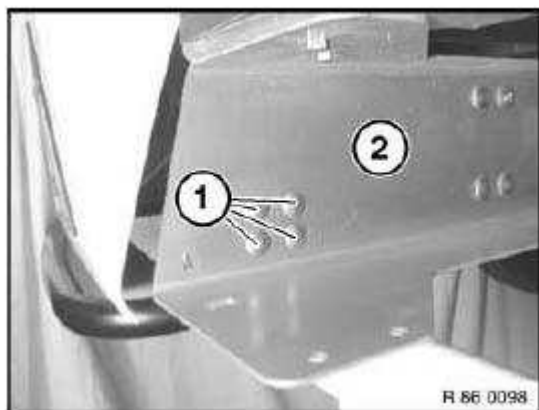


Fig. 30: Identifying Screws In Loading Ramp Frame
Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... DISASSEMBLY OF LOADING RAMP FRAME/DISASSEMBLY OF RAIL, LEFT/RIGHT

NOTE: Two persons are required to disassemble the loading ramp frame.

Disassembly of license plate mounting plate, refer to 86 10 ... Disassembly of licence plate mounting plate

Disassembly of pull rod, refer to 86 10 ... Removing overrunning equipment/maintaining or replacing guide bush/installing overrunning equipment.

Release screws (1) of loading ramp frame (2) on cross-strut (3).

Installation:

Tightening Torque: 86 10 7AZ, see **86 10 PLATFORM** .

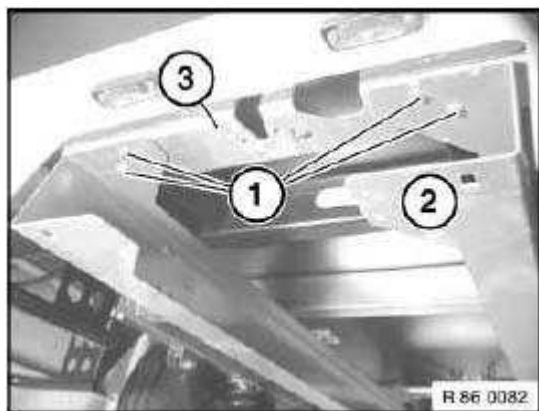


Fig. 31: Identifying Loading Ramp Frame On Cross-Strut
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1, 2) on left and right sides of loading ramp frame (3).

Installation:

Use new self-locking nuts.

Tightening Torque: 86 10 8AZ, see **86 10 PLATFORM** .

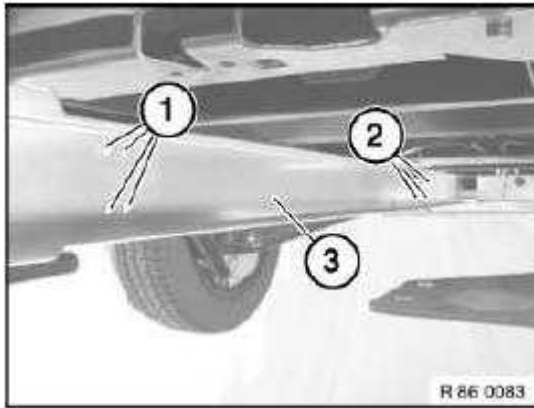


Fig. 32: Identifying Screws On Loading Ramp Frame
 Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1, 2, 3).

Installation:

Use new self-locking nuts.

Tightening Torque: 86 10 9AZ, see **86 10 PLATFORM** .

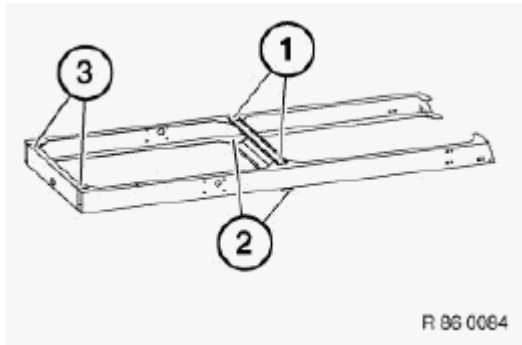


Fig. 33: Identifying Screws
 Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... DISASSEMBLY OF REAR APRON

NOTE: Remove rear light, refer to **86 10 ... REPLACING REAR LIGHT**.

Remove plastic bush/metal bush, refer to 86 10 ... REMOVING PLASTIC BUSH/METAL BUSH.

Cut through sealing compound (1) on left and right and remove.

Drill out rivets (2) on left and right sides on lower apron edge.

Installation:

Use Sikaflex 221 as sealing compound.

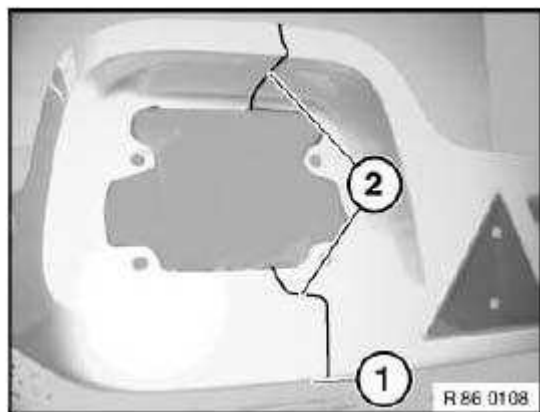


Fig. 34: Identifying Rivets On Lower Apron Edge
Courtesy of BMW OF NORTH AMERICA, INC.

Cut through sealing compound (1) and remove.

Drill out rivets (2).

Installation:

Use Sikaflex 221 as sealing compound.

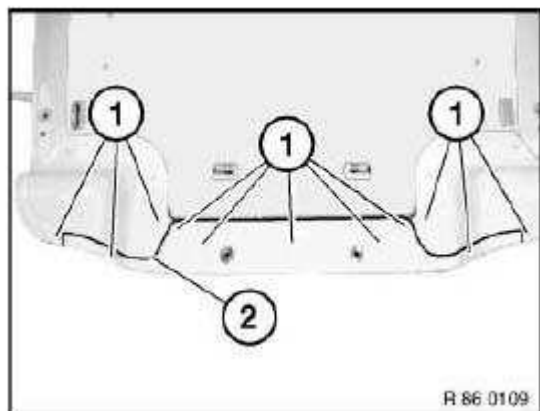


Fig. 35: Identifying Sealing Compound & Rivets
Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... DISCONNECTING PLUG CONNECTION, WIRING HARNESS, FRONT/REAR

Spread levers (1) on socket housing apart in direction of arrow and disconnect female connector (2) in direction of arrow towards bottom.

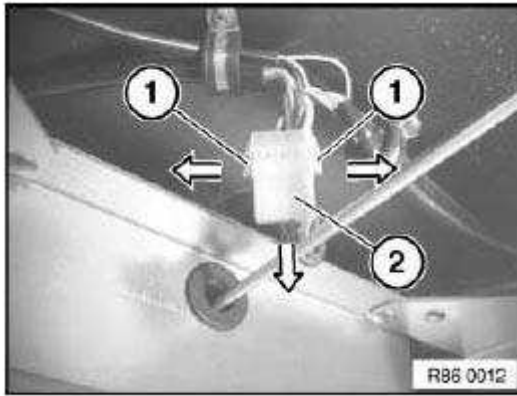


Fig. 36: Identifying Spread Levers & Female Connector
 Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... INSTALLATION POSITION OF BMW LETTERING

Top edge of lettering at same height as recess for position light (1).

Distance between drawbar member and lettering (2) is 300 mm.

Installation:

Remove grease from gluing surfaces.

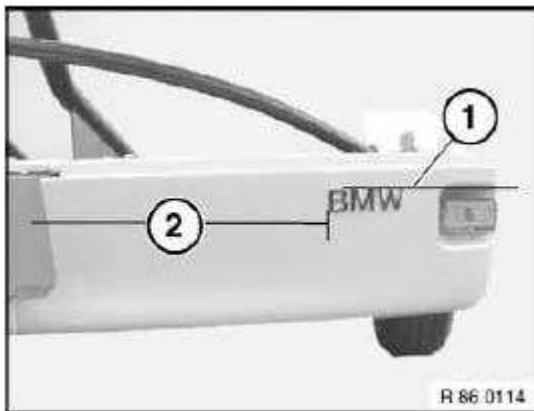


Fig. 37: Identifying Distance Between Drawbar Member & Lettering
 Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... POSITIONING OF MULTITRAILER HOOD FOR MAINTENANCE AND REPAIR WORK

IMPORTANT: At least two persons are needed to install and remove the hood from the platform.

Before installing and removing the hood, secure the BMW multitrailer and the

entire combination against rolling. For this purpose, use the parking brake and the chocks of the BMW multitrailer.

The hood can also be set up and lowered with the aid of the universal lift available from BMW in conjunction with the roof racks and the hood adapter. Under no circumstances should work of any kind be carried out below the suspended hood.

For maintenance and repair work, raise the hood using a lifting platform. Twin-column lifting platforms, body lifting platforms and twin-stamp underfloor platforms are suitable. The seating plates and areas of the lifting platform must be adjustable according to the dimensions of **Fig. 38**.

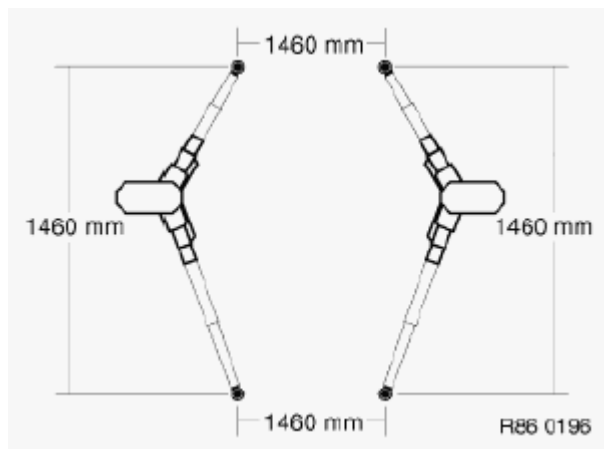


Fig. 38: Identifying Lifting Platform Adjustable Dimensions
Courtesy of BMW OF NORTH AMERICA, INC.

The lifting platform must conform to the relevant legal provisions of the accident prevention regulations and be serviced as specified. Comply with the lifting platform operating instructions, in particular the safety instructions and the carrying capacity.

Make sure you adhere to the BMW-recommended work area of 5 x 7 m and to an escape route of 0.6 m between two lifting platforms.

Please comply with the following instructions before raising the hood:

- Raise only when it is unloaded;
- Ensure sufficient clearance between the seating plates/seating areas and the GFP edge of the hood;
- The hood must always be positioned in the middle of the lifting platform.

IMPORTANT: The hood may only be raised at the pin (1). Under no circumstances may the hood be raised at the GFP edge of the hood (2). See **Fig. 39**. Exclusively for removal of pin (1), raise the hood in the GFP area.

Also refer to: **86 21 ... Removing centering pin from mounting bracket**

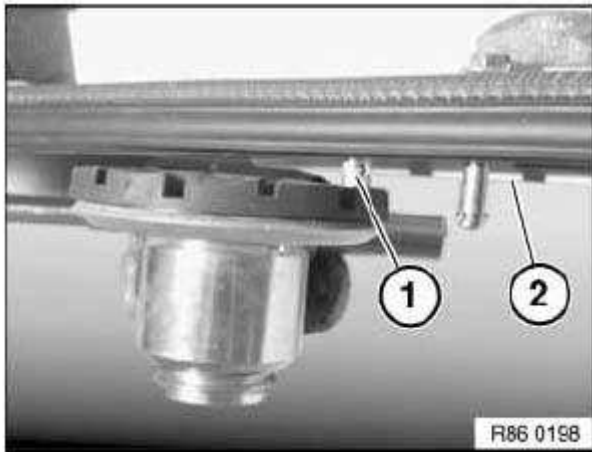


Fig. 39: Identifying Centering Pin & Mounting Bracket
Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... REMOVING CAMLOCK RETAINING CAM ON LOADING RAMP

Drill out rivets (1).

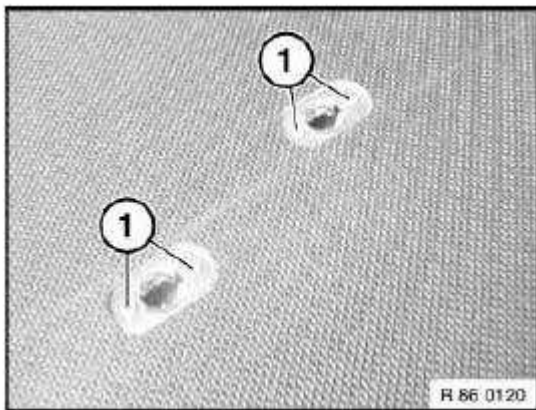


Fig. 40: Identifying Rivets
Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... REMOVING CAMLOCK SCREW CAP

Bend back edges (1) of tab washer (2). Remove tab washer (2) over cross pin (3) towards bottom.

Installation:

Replace lockplate.

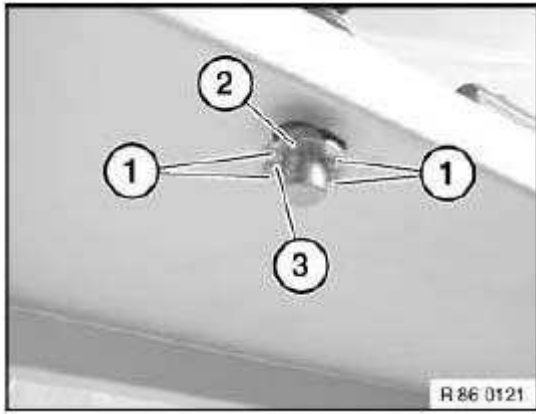


Fig. 41: Bend Back Edges Of Tab Washer
 Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... REMOVING AND INSTALLING OR REPLACING LEFT OR RIGHT COIL SPRING

Release screw (1) and remove, tilt shock absorber (2) in direction of arrow towards rear.

Installation:

Use new self-locking nut.

Hold shock absorber vertically and protective cap points upwards. Completely press in shock absorber once and pull out up to required installation length. Do not tilt shock absorber further than is needed for installation.

Tightening Torque: 86 10 21AZ, see **86 10 PLATFORM** .

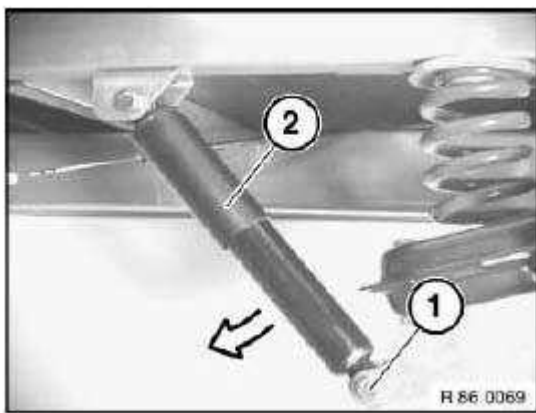


Fig. 42: Remove Screw & Tilt Shock Absorber
 Courtesy of BMW OF NORTH AMERICA, INC.

The trailing arm folds down once the coil spring on the arm has been released.

No persons should be located underneath trailing arm. Risk of injury!

Release screw (1) between trailing arm (2) and coil spring.

Installation:

Tightening Torque: 86 10 22AZ, see **86 10 PLATFORM** .

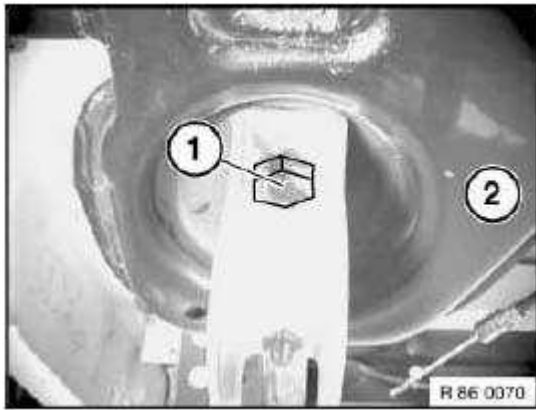


Fig. 43: Identifying Screw & Trailing Arm
Courtesy of BMW OF NORTH AMERICA, INC.

Remove pressure plate (1) from coil spring (2).

Installation:

Use pressure plate with nut.

Fit pressure plate (1) according to its shape (3) into pressure spring (2).

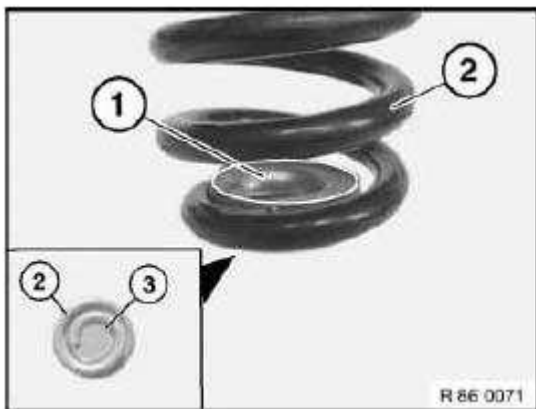


Fig. 44: Identifying Pressure Plate & Coil Spring
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1) between coil spring (2) and longitudinal member (3). Remove small pressure plate (4) and large pressure plate (5).

Installation:

Use pressure plate without nut.

Fit small pressure plate (4) according to its shape (6) into pressure spring (2).

Tightening Torque: 86 10 23AZ, see **86 10 PLATFORM** .

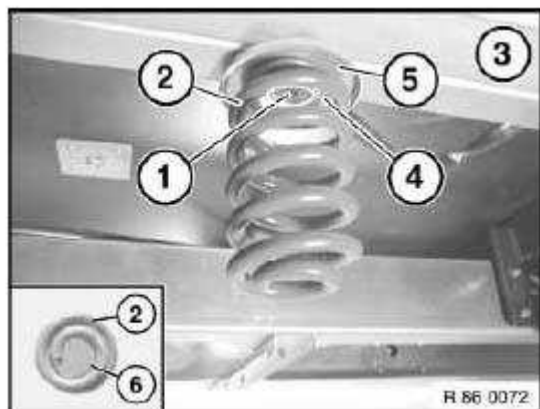


Fig. 45: Identifying Screw Between Coil Spring & Longitudinal Member
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Two persons are needed to install the coil spring correctly. One person presses down the pressure plate (2) seated inside the coil spring (1) and tightens the coil spring (1)/trailing arm (3) screw connection. At the same time, the second person levers the coil spring (1) with a screwdriver into its correct seat.

For coil spring (1)/trailing arm (3), Tightening Torque: 86 10 22AZ, see **86 10 PLATFORM** .

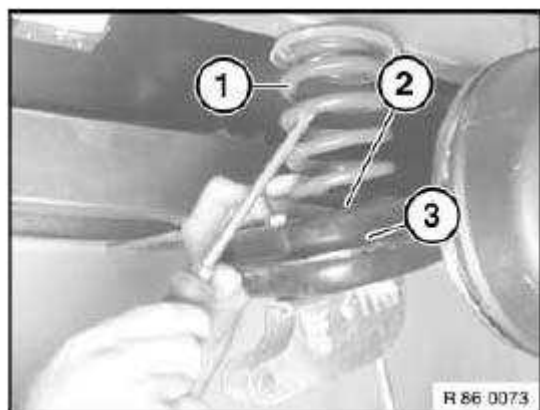


Fig. 46: Identifying Coil Spring & Pressure Plate
Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... REMOVING BOLT ON LOADING RAMP

Insert a drift into hole (1) of bolt (2) and turn clockwise.

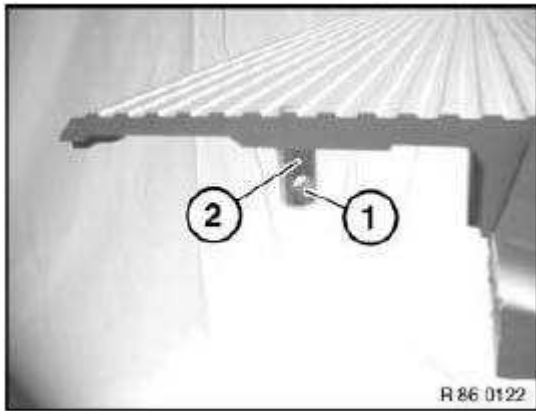


Fig. 47: Identifying Bolt On Loading Ramp
Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... REMOVING BRAKE SHOES

The wheels of the multi-trailers must be able to rotate freely. Adjust and check brake system after installing brake shoes.

Unhook tension spring (1) from tension spring mount (2).

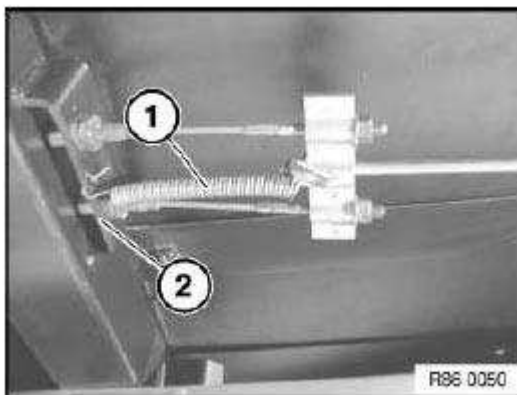


Fig. 48: Identifying Tension Spring & Tension Spring Mount
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Once nut (1) of pull rod (2) has been released, do not move handbrake lever. Handbrake lever can flick upwards.

Release nut (1) on pull rod (2) and remove hexagon nut. Slide brake compensator (3) towards rear.

Installation:

Use new self-locking nut.

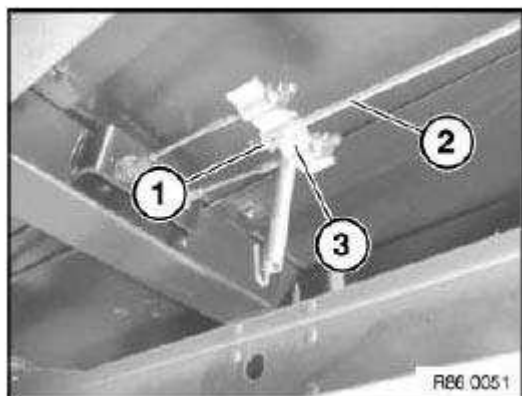


Fig. 49: Identifying Nut On Pull Rod
Courtesy of BMW OF NORTH AMERICA, INC.

Grip openings (1) in wheel trim (2) with both hands and pull off wheel trim (2).

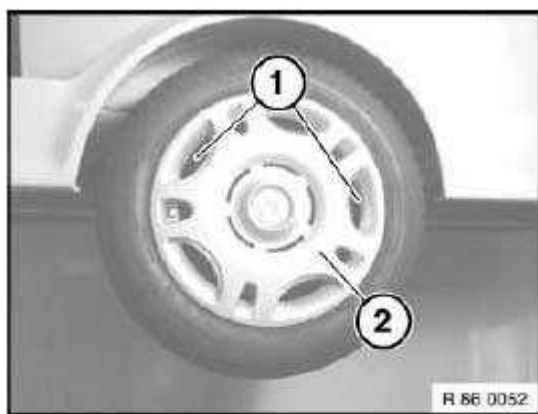


Fig. 50: Identifying Grip Openings & Wheel Trim
Courtesy of BMW OF NORTH AMERICA, INC.

Release wheel bolts (1) and remove disk wheel (2).

Installation:

Tightening Torque: 86 10 19AZ, see **86 10 PLATFORM** .

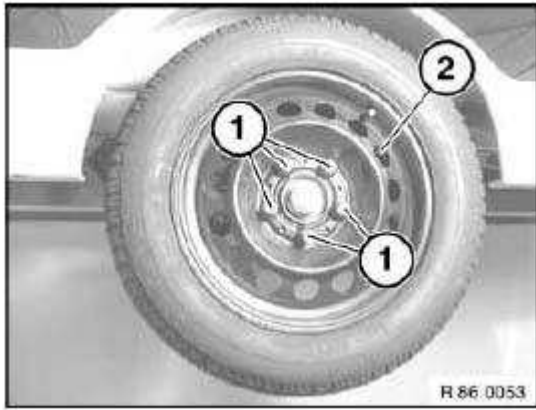


Fig. 51: Identifying Wheel Bolts & Disk Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

Turn brake shoe adjusting screw (2) on brake carrier (1) in direction of arrow and release fully. The brake shoes do not rest against the drum.

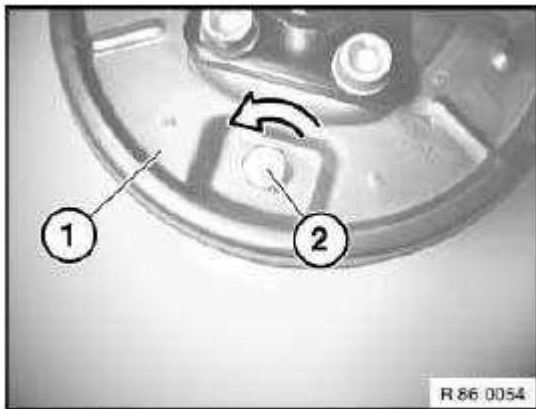


Fig. 52: Identifying Brake Shoe Adjusting Screw On Brake Carrier
Courtesy of BMW OF NORTH AMERICA, INC.

Lever off cap (1).

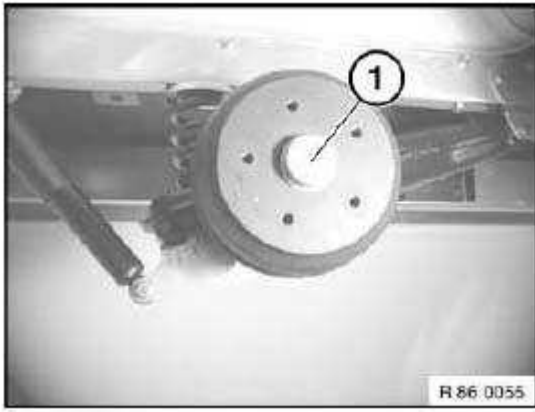


Fig. 53: Levering Off Cap

Courtesy of BMW OF NORTH AMERICA, INC.

Release nut (1) and remove. Pull off brake hub (2) with both hands.

Installation:

Only a new nut is permitted for reinstallation.

Tightening Torque: 86 10 20AZ, see **86 10 PLATFORM** .

Do not screw off brake hub under any circumstances.

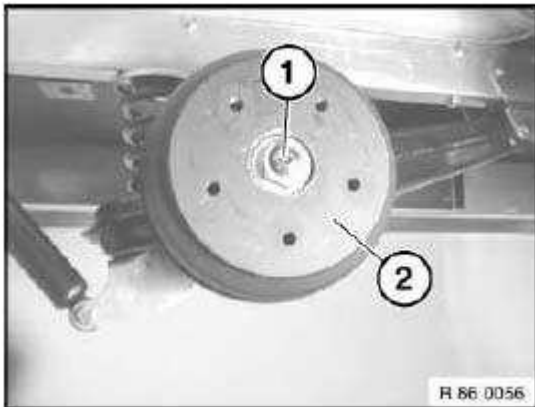


Fig. 54: Identifying Nut & Brake Hub

Courtesy of BMW OF NORTH AMERICA, INC.

This procedure is not necessary for removing the brake shoes.

Push back cable (1).

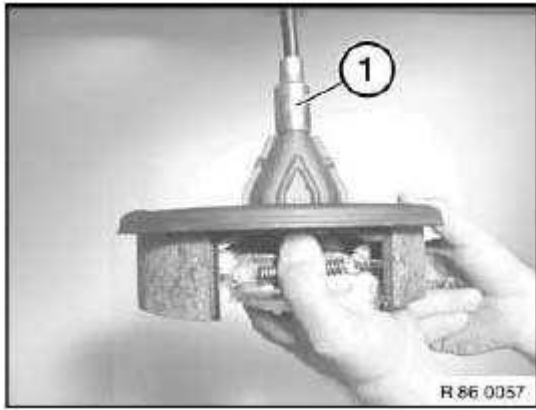


Fig. 55: Identifying Back Cable
Courtesy of BMW OF NORTH AMERICA, INC.

Remove shell (1).

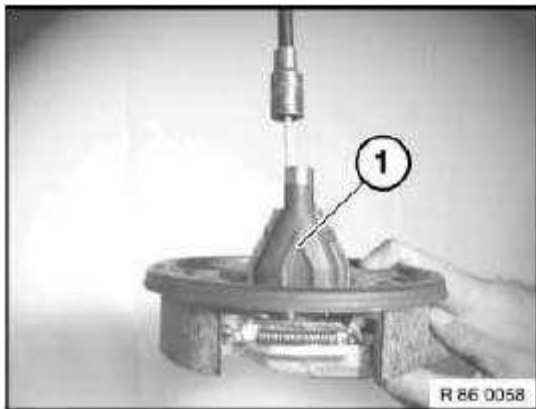


Fig. 56: Identifying Shell
Courtesy of BMW OF NORTH AMERICA, INC.

Remove brake cable (1) from mounting (2).

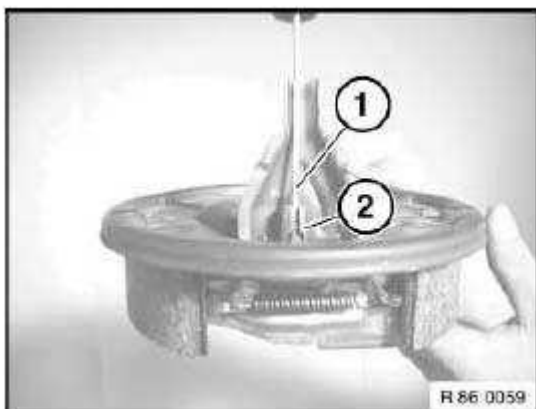


Fig. 57: Identifying Brake Cable & Mounting
Courtesy of BMW OF NORTH AMERICA, INC.

Unhook pressure spring (1) from fixed brake shoe (2) and brake carrier (3).

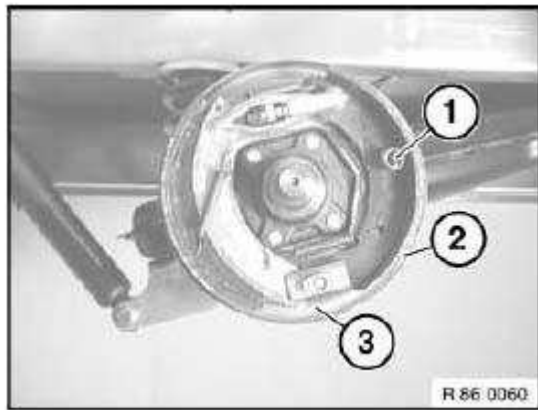


Fig. 58: Identifying Pressure Spring & Fixed Brake Shoe
Courtesy of BMW OF NORTH AMERICA, INC.

Remove tension spring (1) from both brake shoe fixtures (2).

Remove brake lever assembly (3).

Installation:

The fixed part of the brake lever assembly (3) is seated on the moving brake shoe. The moving part of the brake lever assembly is seated on the fixed brake shoe.

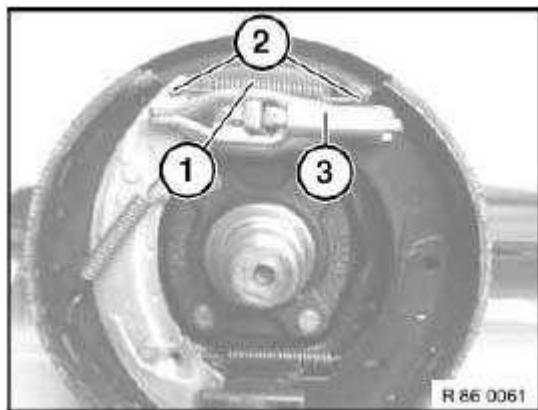


Fig. 59: Identifying Tension Spring & Brake Lever Assembly
Courtesy of BMW OF NORTH AMERICA, INC.

Pull brake shoes (1) apart in direction of arrow, tilt forward and remove from adjustment device (2).

Installation:

Always replace the four shoes and use the same make.

Minimum lining thickness: 1.5 mm

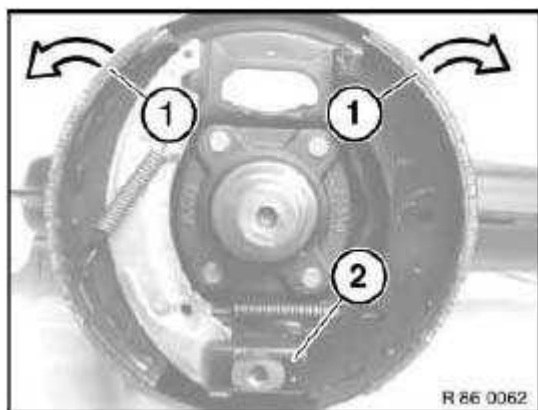


Fig. 60: Identifying Brake Shoes & Adjustment Device
Courtesy of BMW OF NORTH AMERICA, INC.

Check adjustment device (1).

Check wedge (2) and setting pins (3) for ease of movement and wear.

Apply grease if necessary.

Check brake cables for ease of movement and wear.

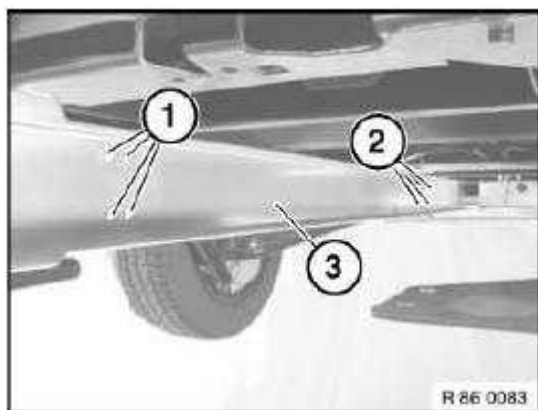


Fig. 61: Identifying Screws On Loading Ramp Frame
Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... REMOVING ENTRY PROFILE SECTION ON LOADING RAMP, LEFT, RIGHT AND CENTER

CAUTION: Before drilling out rivets, drive in rivet pins with a punch.

Drill out rivets (1). Remove entry profile section (2) towards front.

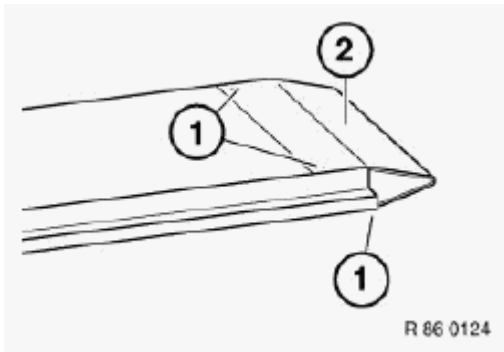


Fig. 62: Identifying Entry Profile Section On Loading Ramp
Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... REMOVING LEFT OR RIGHT SHOCK ABSORBER

Inspect the shock absorber while installed to ascertain whether it needs to be replaced.

Replace shock absorber if it is leaking. Replace shock absorber if it can be easily pushed in or pulled out when removed.

Release screw (1) and remove. Tilt shock absorber in direction of arrow. Release screw (2) and remove shock absorber.

Installation:

Hold shock absorber vertically: protective cap points upwards. Completely press in shock absorber once and pull out up to required installation length. Do not tilt shock absorber further than is needed for installation.

Tightening Torque: 86 10 21AZ, see **86 10 PLATFORM** .

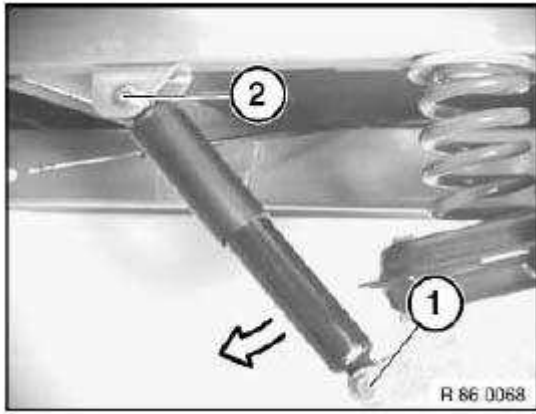


Fig. 63: Identifying Screw & Shock Absorber
 Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... REMOVING LOADING RAMP LOCK

Unscrew bolts (1).

Installation:

Tightening Torque: 86 10 28AZ, see **86 10 PLATFORM** .

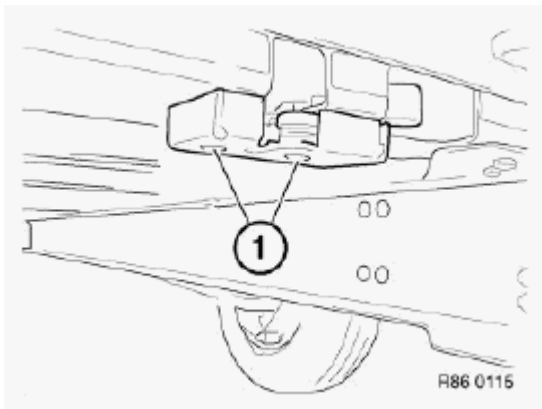


Fig. 64: Identifying Bolts
 Courtesy of BMW OF NORTH AMERICA, INC.

Pass lever (1) of rotary striker lock (2) out of square hole (3) by twisting from side to side.

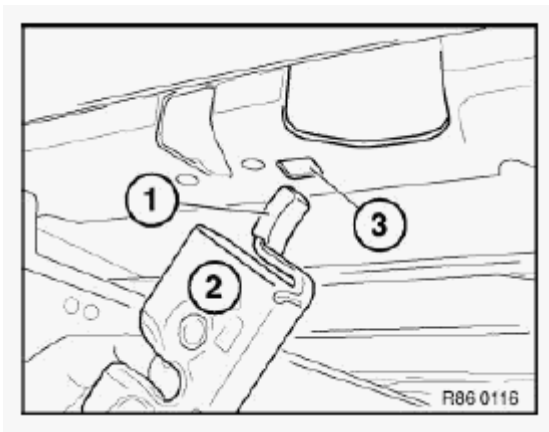


Fig. 65: Identifying Rotary Striker Lock & Hole
 Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew bolts (1).

Installation:

Opening for securing clip (2) points to front or rear.

Square-head nut (3) rests with its square surface parallel to bearing pedestal (4).

Tightening Torque: 86 10 29AZ, see **86 10 PLATFORM** .

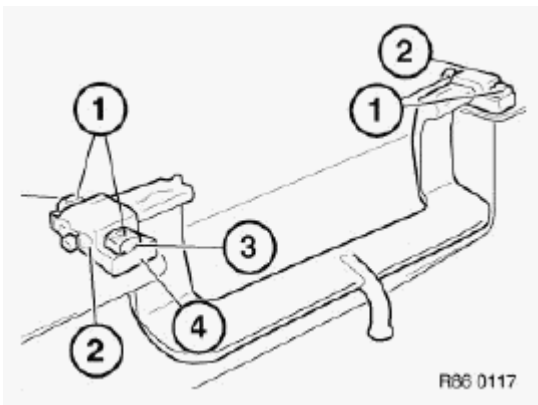


Fig. 66: Identifying Square-Head Nut & Bearing Pedestal
 Courtesy of BMW OF NORTH AMERICA, INC.

Raise edge (1) of securing clip and slide in direction of arrow towards rear.

Detach bearing pedestal (2).

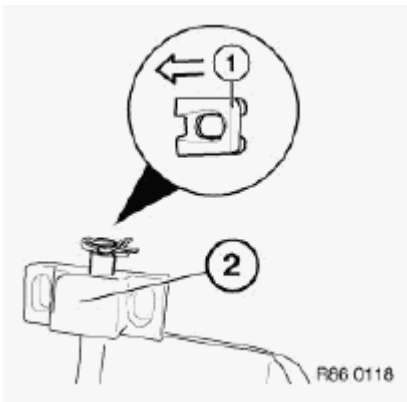


Fig. 67: Identifying Raised Edge & Bearing Pedestal
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Install bearing pedestal (1) on stub (2) of locking bracket (3).

Off-center bore (4) in bearing pedestal (1) points with short distance (A) to locking bracket (3).

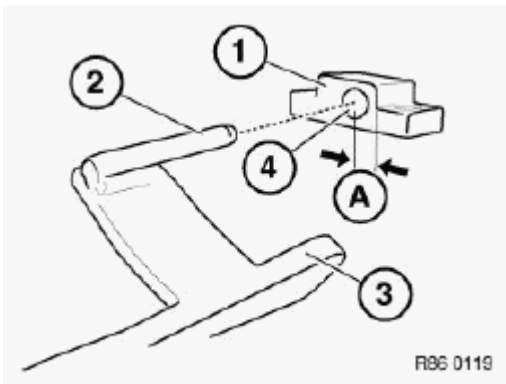


Fig. 68: Identifying Bearing Pedestal On Stub
 Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... REMOVING MOUNTING BRACKET SEALING CAP

Cut out mounting bracket (3) along markings (1, 2) and lever out of apron (4).

Installation:

For gluing, use two-component adhesive ICEMA R 101 and hardener 7.

Mixture ratio: ICEMA R 101 7 parts; hardener 7 1 part.

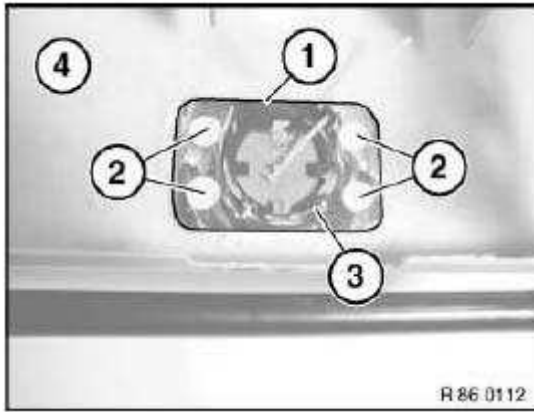


Fig. 69: Identifying Mounting Bracket Sealing Cap
 Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... REMOVING MOUNTING BRACKET, CENTER, LEFT AND RIGHT

NOTE: Disassembly of Camlock retaining cam

refer to **86 10 ... DISASSEMBLY OF CAMLOCK RETAINING CAM**

Unscrew bolts (1).

Installation:

Tightening Torque: 86 10 31AZ, see **86 10 PLATFORM** .

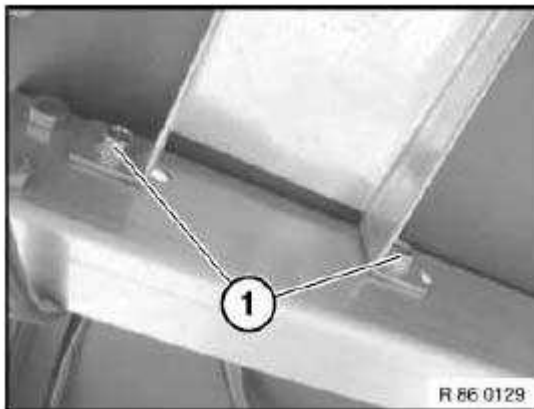


Fig. 70: Identifying Bolts
 Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... REMOVING OUTER PULL ROD MOUNT, LEFT AND RIGHT

Release screws (1) and remove pull rod mount (2).

Installation:

Tightening Torque: 86 10 30AZ, see 86 10 PLATFORM .

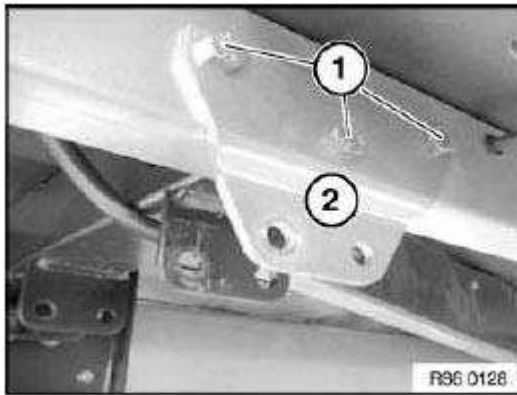


Fig. 71: Identifying Screws & Pull Rod Mount
Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... REMOVING OVERRUNNING EQUIPMENT/MAINTAINING OR REPLACING GUIDE BUSH/INSTALLING OVERRUNNING EQUIPMENT

After installing overrunning equipment, readjust brake system, refer to 86 10 ... ADJUSTING BRAKE SYSTEM

Check the guide bush while installed to ascertain whether it needs to be replaced. Raise ball end area and replace guide bush if play is detected in ball end area.

NOTE: **After installing, readjust and check brake system.**

Release round head screws (1) and remove running board (2) towards top.

Installation:

Use new self-locking nuts.

Tightening Torque: 86 10 10AZ, see 86 10 PLATFORM .

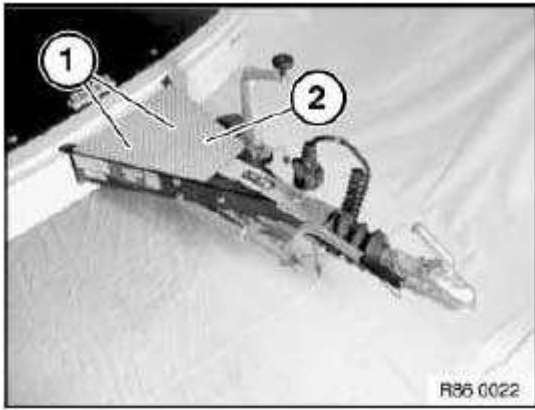


Fig. 72: Identifying Round Head Screws & Running Board
Courtesy of BMW OF NORTH AMERICA, INC.

Unhook tension spring (1) from tension spring mount (2).

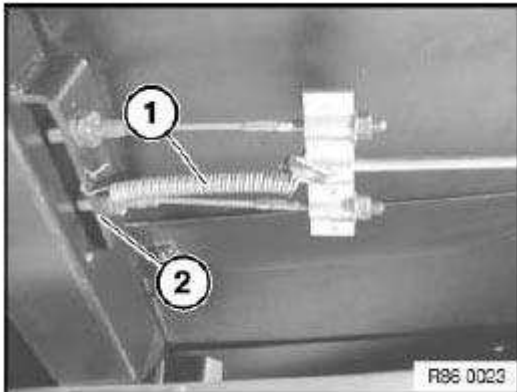


Fig. 73: Identifying Tension Spring & Tension Spring Mount
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Once nut (1) of pull rod (2) has been released, do not move handbrake lever. Handbrake lever can flick upwards.

Release screw (1) on pull rod (2) and remove hexagon nut. Slide brake compensator (3) towards rear.

Installation:

Use new self-locking nut.

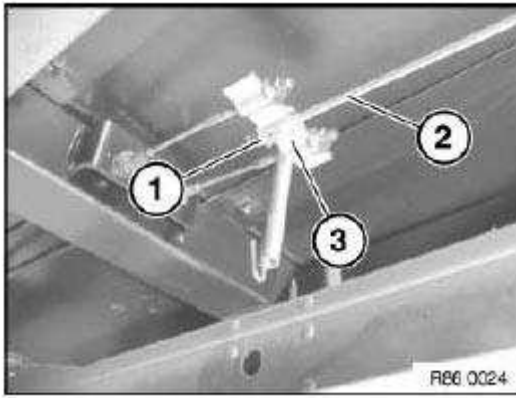


Fig. 74: Identifying Brake Compensator, Screw & Rod
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) on jockey wheel mount and remove.

Release wiring harness mount (2) and remove. Reinstall screw and tighten until hand-tight.

Installation:

Tightening Torque for jockey wheel mount (1), 86 10 311AZ, see **86 10 PLATFORM** .

Tightening Torque for wiring harness mount (2), 86 10 12AZ, see **86 10 PLATFORM** .

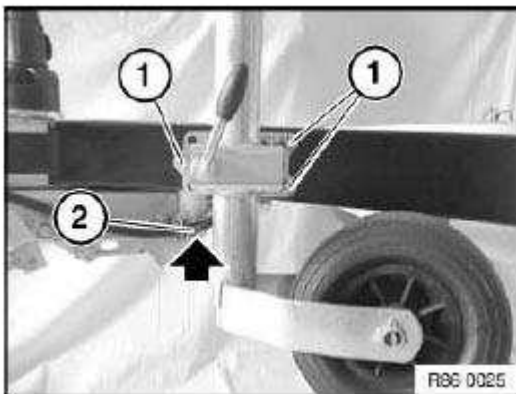


Fig. 75: Identifying Wiring Harness Mount & Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw on socket holder (1) and remove. Cut through strap (2) and lay wiring harness to one side. Pull gaiter (3) in direction of arrow.

Installation:

Use new self-locking nut.

Tightening Torque: 86 10 13AZ, see **86 10 PLATFORM** .

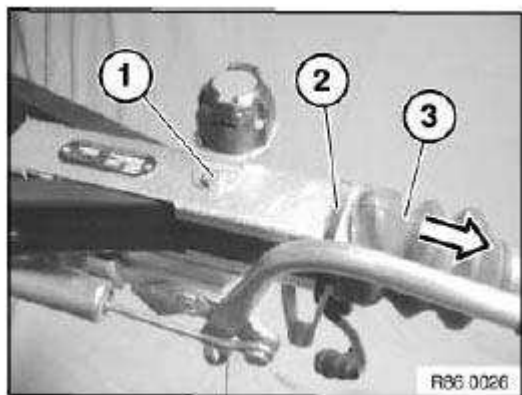


Fig. 76: Pulling Gaiter

Courtesy of BMW OF NORTH AMERICA, INC.

Remove protective caps (1).

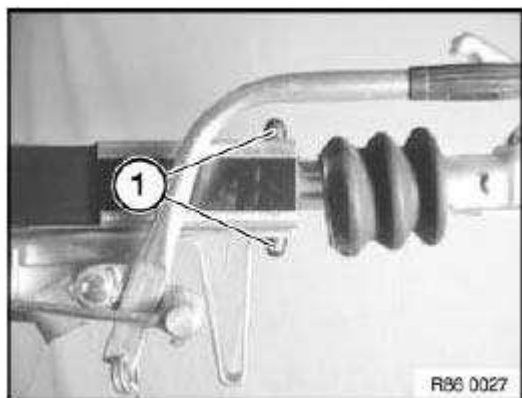


Fig. 77: Identifying Protective Caps

Courtesy of BMW OF NORTH AMERICA, INC.

Release nuts (1) and remove.

Installation:

Use new self-locking nuts.

Tightening Torque: 86 10 14AZ, see **86 10 PLATFORM** .

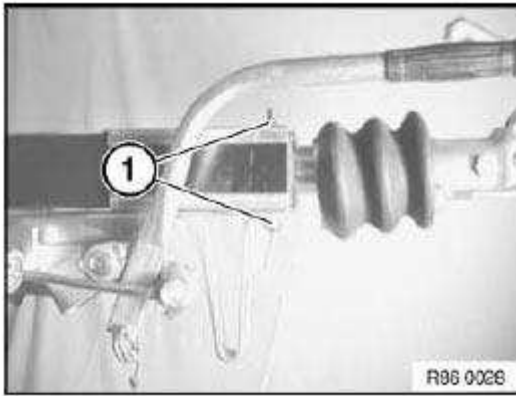


Fig. 78: Identifying Self-Locking Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Tilt top reversing housing (1) in direction of arrow towards rear. Slide out top reversing housing (1) and bottom reversing housing with handbrake lever unit (2) in direction of arrow towards rear.

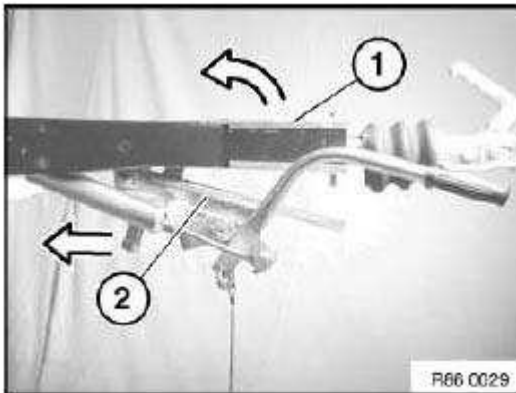


Fig. 79: Sliding Out Top Reversing Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Remove holder (1) towards bottom.

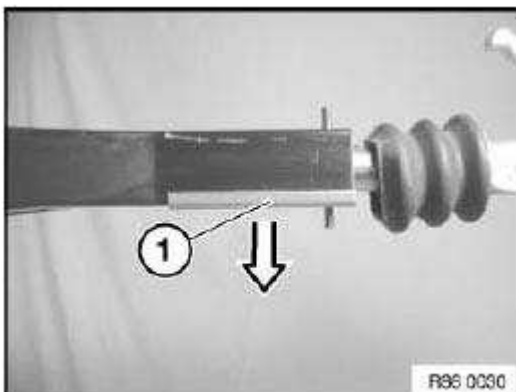


Fig. 80: Removing Holder

Courtesy of BMW OF NORTH AMERICA, INC.

Pull drawbar member (1) in direction of arrow and pull out overrunning equipment (2) in direction of arrow towards front.

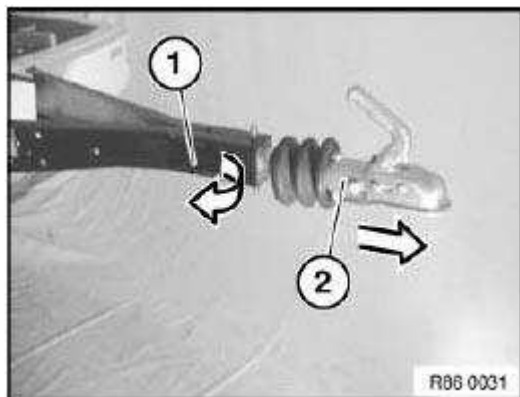


Fig. 81: Removing Overrunning Equipment

Courtesy of BMW OF NORTH AMERICA, INC.

Remove spacer tubes (1) and threaded pins (2) from guide bush (3).

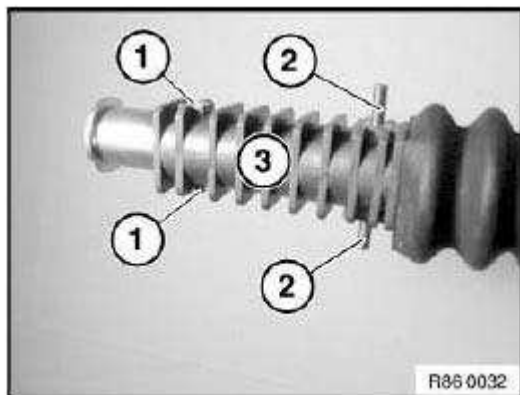


Fig. 82: Identifying Spacer Tubes, Threaded Pins & Guide Bush

Courtesy of BMW OF NORTH AMERICA, INC.

Press pins (1) inwards. Detach counter support (2) and guide bush (3).

Maintenance:

Grease tow tube (4) and attach guide bush (3).

Installation:

Secure counter support (2) with new clamping sleeves to tow tube (4).

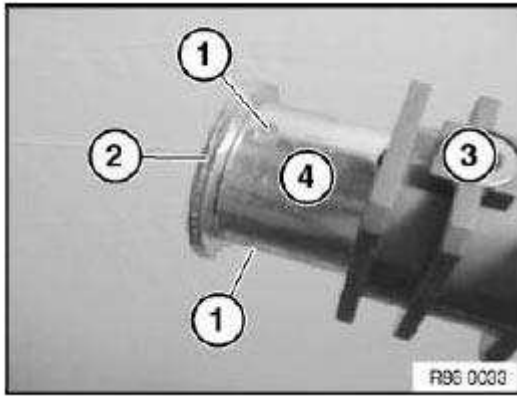


Fig. 83: Identifying Pins, Counter Support & Guide Bush
 Courtesy of BMW OF NORTH AMERICA, INC.

Insert spacer tubes (1) and threaded pins (2) in guide bush (3).

Make sure spacer tubes (1) are correctly seated in guide bush (3).

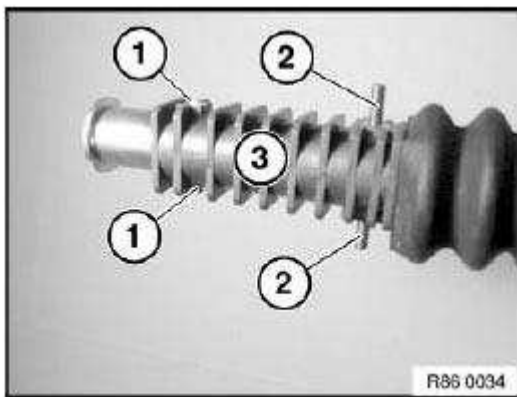


Fig. 84: Identifying Spacer Tubes, Threaded Pins & Guide Bush
 Courtesy of BMW OF NORTH AMERICA, INC.

Using a screwdriver, link spacer tubes (1) and shock absorber located in tow tube. This ensures that the shock absorber remains in the correct installation position. Pull drawbar member (2) in direction of arrow and push in overrunning equipment (3) in direction of arrow towards rear.

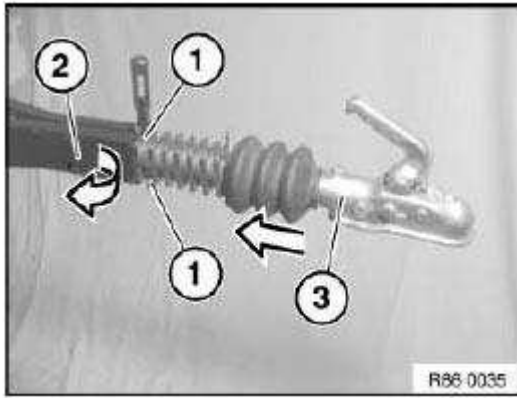


Fig. 85: Pulling Drawbar Member
Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... REMOVING PLASTIC BUSH/METAL BUSH

Release countersunk metal screws (1).

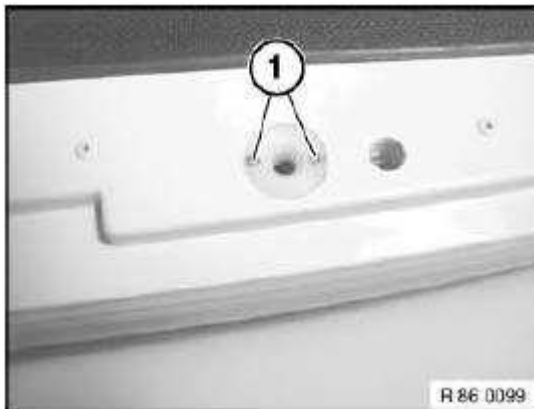


Fig. 86: Identifying Countersunk Metal Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Lever out plastic bush/metal bush (1) with a screwdriver.

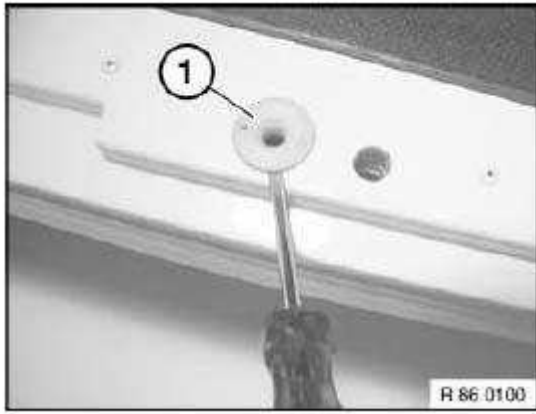


Fig. 87: Identifying Plastic Bush/Metal Bush
 Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... REMOVING REAR SUPPORTS AND BRACKET

Release screws (1) and remove rear support (2) from bracket (3).

Installation:

Tightening Torque: 86 10 26AZ, see **86 10 PLATFORM** .

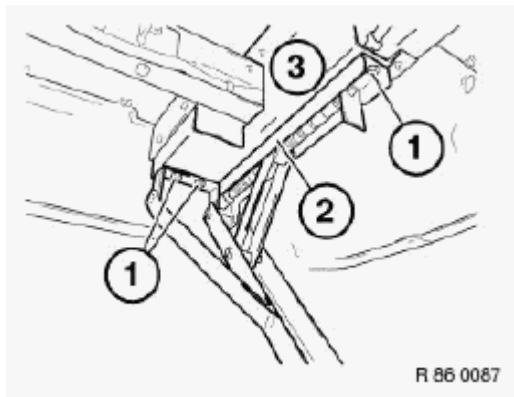


Fig. 88: Identifying Screws, Rear Support & Bracket
 Courtesy of BMW OF NORTH AMERICA, INC.

Remove cable holders (1) from bracket (2). Release screws (3) on left and right sides of bracket (2). Drill out rivets (4) from underside of platform. Drill out rivets (5) from upper side of platform.

Installation:

Tightening Torque: 86 10 27AZ, see **86 10 PLATFORM** .

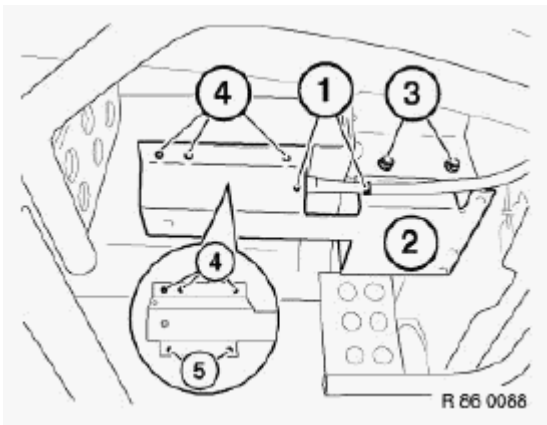


Fig. 89: Identifying Cable Holders, Bracket, Screws & Rivets
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Feed cable for rear light (1) through opening (2). Fit cable holders (4) in holes (3).

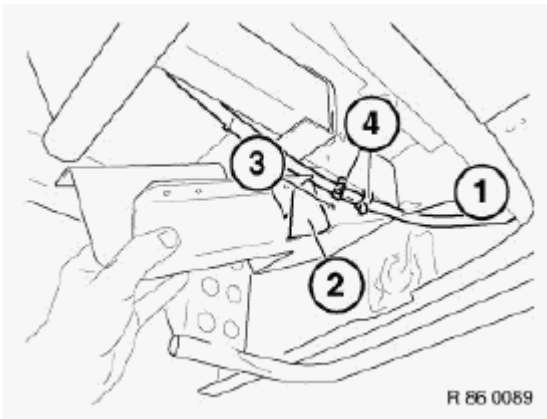


Fig. 90: Identifying Screw & Tilt Shock Absorber
 Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... REMOVING REFLECTING REAR LIGHT

From rear side of GFK apron, drive out plastic pins (1) with a drift.

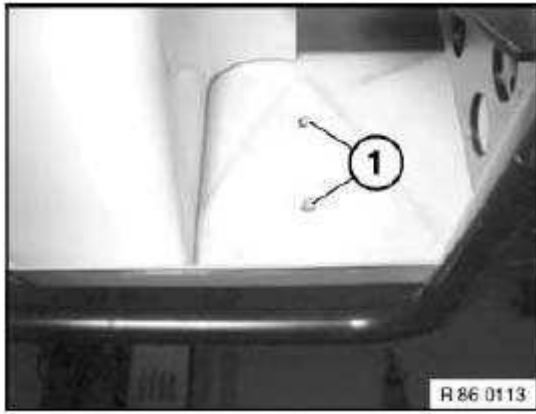


Fig. 91: Identifying Plastic Pins

Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... REMOVING REST ON LOADING RAMP, LEFT, RIGHT AND CENTER

CAUTION: Before drilling out rivets, drive in rivet pins with a punch.

Drill out rivets (1). Remove rest (2) towards front.

Installation:

Stick on new sealing tape.

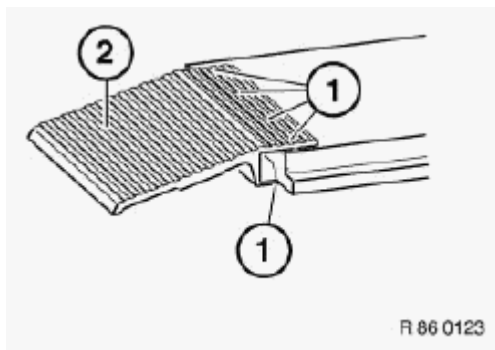


Fig. 92: Identifying Rivets & Rest

Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... REMOVING SHOCK ABSORBER FROM OVERRUNNING EQUIPMENT

Check the overrunning equipment shock absorber while installed to ascertain whether it needs to be replaced.

Apply handbrake. Push in and pull out tow ball end by hand. If it is very easy to pull out the tow ball end, the shock absorber must be replaced.

NOTE: Complete disassembly of overrunning equipment and guide bush, refer to **86 10 ... REMOVING OVERRUNNING EQUIPMENT/MAINTAINING OR REPLACING GUIDE BUSH/INSTALLING OVERRUNNING EQUIPMENT.**

Release screw (1) and remove. Pull out internal shock absorber (2) from opening in tow tube (3) towards rear.

Installation:

Tightening Torque: 86 10 15AZ, see **86 10 PLATFORM** .

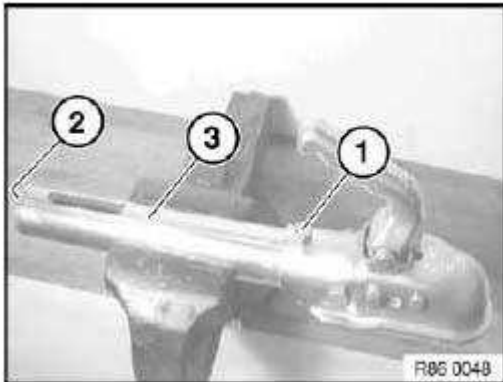


Fig. 93: Identifying Shock Absorber, Tow Tube & Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Push in new shock absorber (1) through opening in tow tube (2).

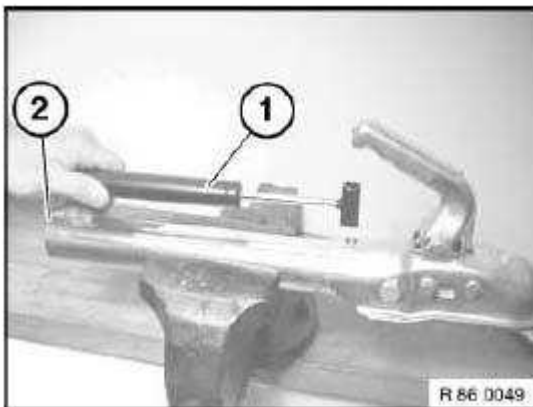


Fig. 94: Identifying Shock Absorber & Tow Tube
Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... REMOVING TRAILING ARM, REMOVING AND INSTALLING OR REPLACING MOUNTING

Replace bearing in trailing arm if there is play in trailing arm.

NOTE: Remove brake cable, refer to 86 10 ... REMOVING BRAKE SHOES.

Remove shock absorber and coil spring, refer to 86 10 ... Removing and installing or replacing left or right coil spring.

Release screws (1) between wheel brake (2) and trailing arm (3) and remove complete wheel brake (2).

Installation:

Do not reuse screws (1). Use only the socket-head cap screws intended for this purpose. Stamped arrow on the reverse side of the brake carrier points in the direction of travel and stands at the 12 o'clock position.

Tightening Torque: 86 10 24AZ, see 86 10 PLATFORM .

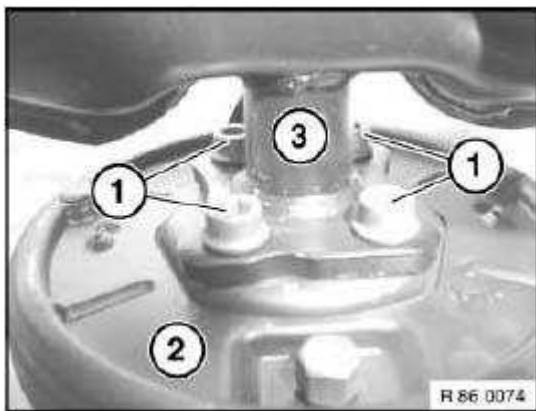


Fig. 95: Identifying Screws, Wheel Brake & Trailing Arm
Courtesy of BMW OF NORTH AMERICA, INC.

The trailing arm folds down once the coil spring on the arm has been released.

No persons should be located underneath trailing arm. Risk of injury!

Release screws (1, 2). Use assembly hole (3) to release screw connection (2).

Press out screws (1, 2) with a mandrel.

Installation:

Use new self-locking nut.

Tightening Torque: 86 10 25AZ, see 86 10 PLATFORM .

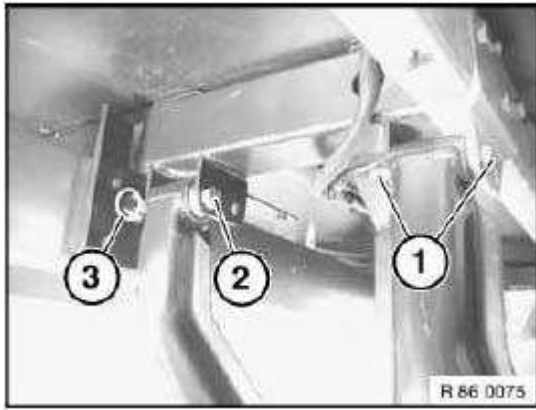


Fig. 96: Identifying Screws & Hole
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Mount trailing arms (1) at rear mounts (4) only, viewed in direction of travel, with screws (2, 3).

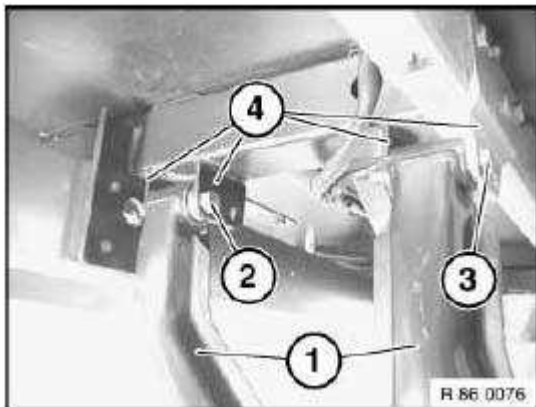


Fig. 97: Identifying Trailing Arms, Rear Mounts & Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Do not damage trailing arm with drill when drilling.

Drill spacer tube (1) with a 4 mm drill at three evenly offset points. Place drill as near as possible to compensating bush (2).

Bores relieve tension on material of spacer tube.

Press out spacer tube (1) and compensating bush (2) with a drift.

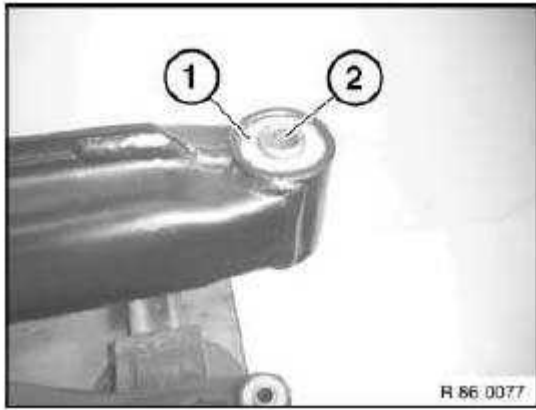


Fig. 98: Identifying Spacer Tube & Compensating Bush
Courtesy of BMW OF NORTH AMERICA, INC.

Grease new spacer tube (1) for installation with Synthoso Glep I. Drive new spacer tube (1) with a rubber mallet into trailing arm mount (2).

Installation:

Make sure spacer tube (1) is not tilted when driven in.

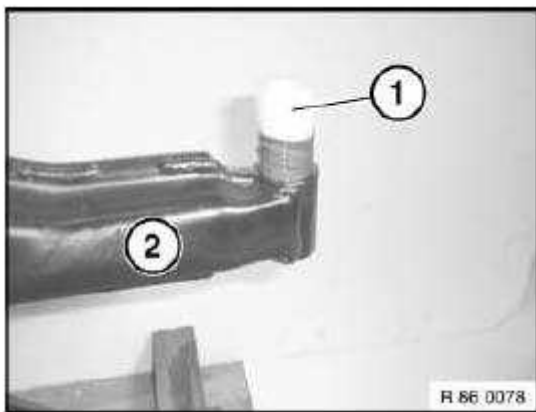


Fig. 99: Identifying Spacer Tube & Trailing Arm Mount
Courtesy of BMW OF NORTH AMERICA, INC.

Drive compensating bush (1) with a drift into spacer tube (2). Set compensating bush (1) and spacer tube (2) centrally in trailing arm mount (3).

Installation:

Make sure compensating bush (1) is not tilted when driven in.

Install coil spring, refer to **86 10 ... Removing and installing or replacing left or right coil spring.**

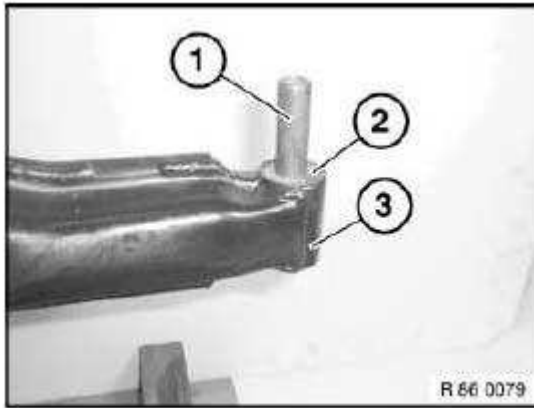


Fig. 100: Identifying Compensating Bush, Spacer Tube & Trailing Arm Mount
 Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... REMOVING WHEEL BEARING

The angular-contact ball bearings do not require maintenance and have lifetime lubrication. The bearings cannot be readjusted.

Remove brake drum, refer to **86 10 ... REMOVING BRAKE SHOES.**

Lever out both snap rings (1).

Installation:

Replace expanded or damaged snap rings (1). Ensure correct seating.



Fig. 101: Identifying Snap Rings
 Courtesy of BMW OF NORTH AMERICA, INC.

Press out wheel bearing with special tool 24 1 010. See **24 1 010 INSTALLATION SLEEVE**

CAUTION: Do not reuse old wheel bearing.

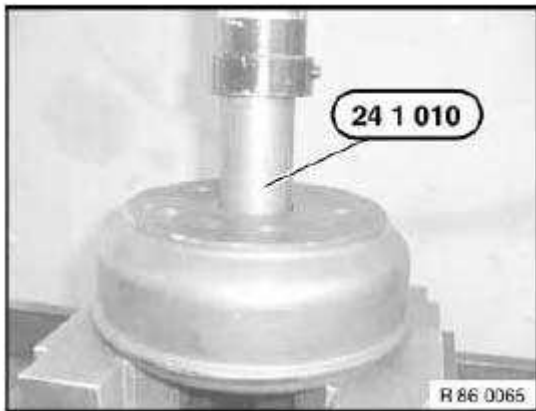


Fig. 102: Identifying Wheel Bearing With Special Tool (24 1 010)
Courtesy of BMW OF NORTH AMERICA, INC.

Place new wheel bearing (1) with lathe-turned end (2) in center of bore in brake drum (3).

Installation:

Before pressing in new wheel bearing, check bearing seat for possible damage.

Make sure wheel bearing is not tilted when pressed in.



Fig. 103: Identifying Wheel Bearing, Lathe-Turned End & Center Of Bore In Brake Drum
Courtesy of BMW OF NORTH AMERICA, INC.

Press in new wheel bearing (1) with special tool 23 2 150 and 33 1 374. See **23 2 150 PRESSURE SLEEVE** .



Fig. 104: Identifying Wheel Bearing With Special Tool (23 2 150 & 33 1 374)
 Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... REMOVING WOODEN REST ON LOADING RAMP, LEFT, RIGHT AND CENTER

CAUTION: Before drilling out rivets, drive in rivet pins with a punch.

Drill out rivets (1).

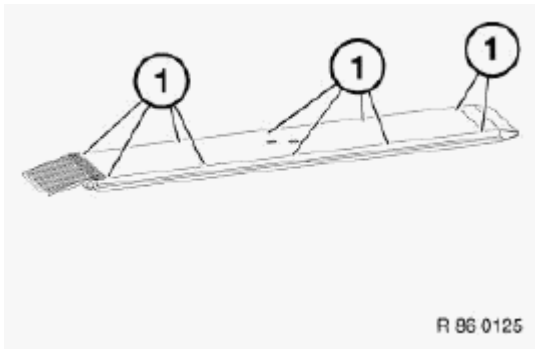


Fig. 105: Identifying Rivets
 Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... REPAIR WORK ON GFP COMPONENTS WITH GELCOAT SURFACE

Scratches in Gelcoat surface

Scratches in the Gelcoat surface which do not allow the GFP mat structure to show through can be touched up. Sand out scratches with water and 800 wet sandpaper. Then sand with water and 2000 wet sandpaper. Prepare repair area for polishing.

Cracks in Gelcoat surface

Sand the cracked area in a V shape beyond the end of the crack and clean.

There must be no grease or oil residues, moisture or dust remaining in the crack to be repaired.

When repairing holes such as e.g. rivet holes, deburr hole edge and heavily roughen large area around hole.

Prepare required amount of Gelcoat paste with 2% hardener and fill prepared repair area with spatula.

Apply Gelcoat paste in several applications to repair areas.

Adhere to mixture ratio (2 parts hardener to 100 parts Gelcoat paste) as precisely as possible.

Too much added hardener slows down the hardening time and changes the paint color.

The hardening period is at least 12 hours at 20°C room temperature.

The hardening period can be longer depending on the temperature.

Once the Gelcoat paste has hardened, sand the touched-up area with water and 800 wet sandpaper. Sand with water and 2000 wet sandpaper and prepare for polishing.

86 10 ... REPLACING 12 VOLT SOCKET

From underside of platform, cut through cable tie (1) and remove. Disconnect plug with grommet (2) from socket (3) towards bottom.

Installation:

Position all seals correctly. Also secure plug with grommet (2) using new cable tie to other socket.



Fig. 106: Identifying Cable Tie, Grommet & Socket
Courtesy of BMW OF NORTH AMERICA, INC.

On upper side of platform, release Phillips screws (1) on mounting bracket (2).

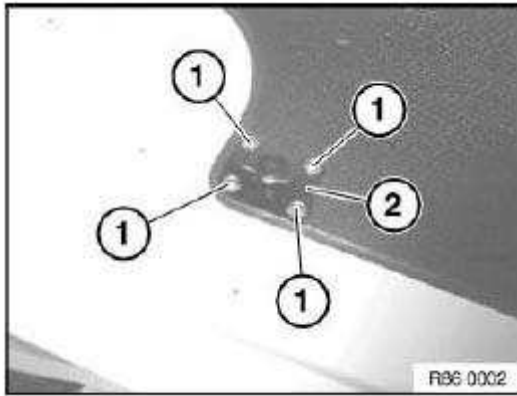


Fig. 107: Identifying Phillips Screws On Mounting Bracket
Courtesy of BMW OF NORTH AMERICA, INC.

Remove sealing compound along white marking (1).

Installation:

Make sure cable is correctly laid.

Use Sikaflex 221 as sealing compound.

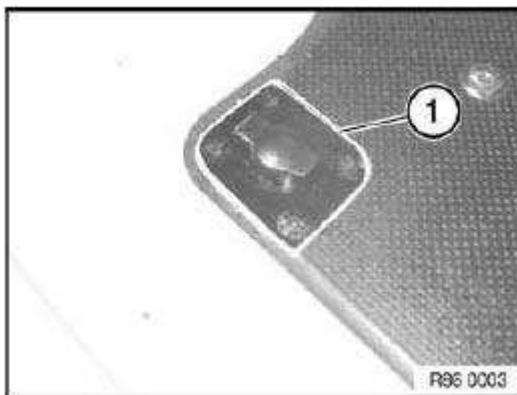


Fig. 108: Identifying Sealing Compound Along White Marking
Courtesy of BMW OF NORTH AMERICA, INC.

Grip under mounting bracket (1) with a screwdriver and lever out bracket (1) towards top. Remove bracket (1).

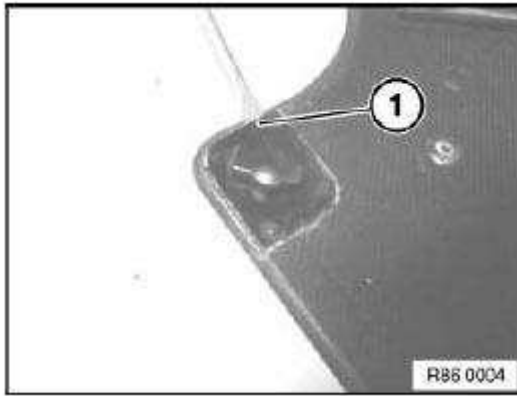


Fig. 109: Identifying Grip Under Mounting Bracket
Courtesy of BMW OF NORTH AMERICA, INC.

Release nut (1). Remove socket (2) from mounting bracket (3).

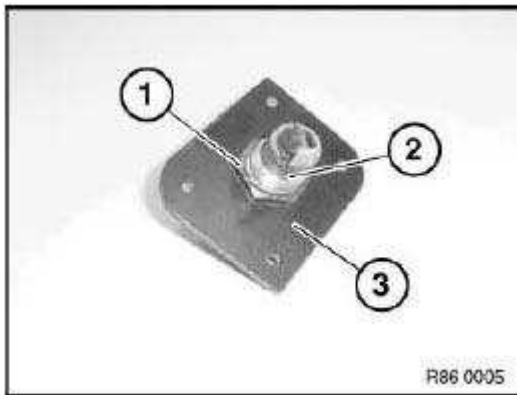


Fig. 110: Identifying Nut, Socket & Mounting Bracket
Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... REPLACING BAR

NOTE: Disassembly of lashing eyes, refer to **86 10 ... REPLACING LASHING PLATE AND LASHING EYE.**

Remove lashing eyes (1).

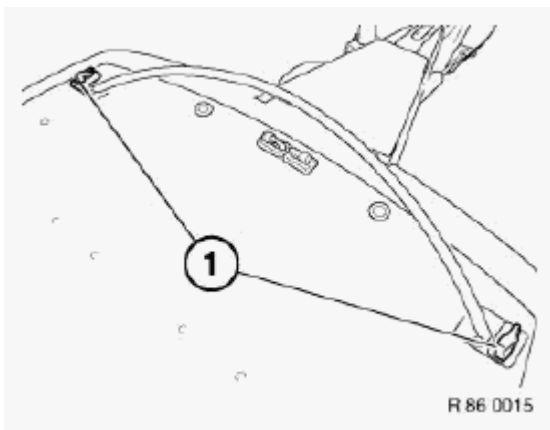


Fig. 111: Identifying Lashing Eyes
Courtesy of BMW OF NORTH AMERICA, INC.

Remove protective caps (1) on left/right.

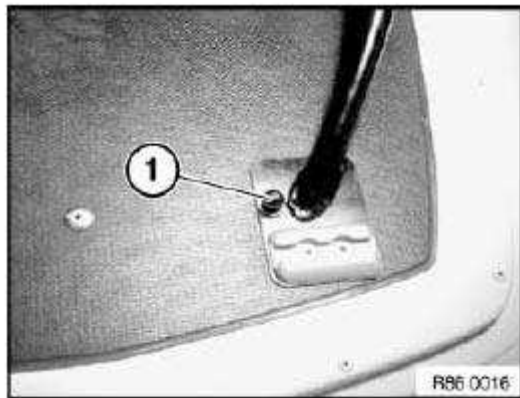


Fig. 112: Identifying Protective Caps
Courtesy of BMW OF NORTH AMERICA, INC.

Release hexagon screws (1) and countersunk head screws (2) on left/right.

Remove bar.

Installation:

For hexagon screw, Tightening Torque: 86 10 2AZ, see **86 10 PLATFORM** .

For countersunk head screw, Tightening Torque: 86 10 3AZ, see **86 10 PLATFORM** .

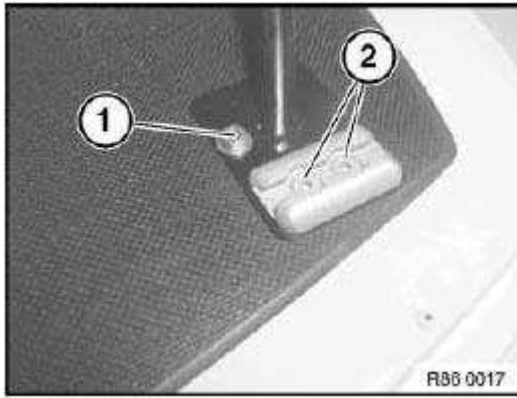


Fig. 113: Identifying Hexagon Screws & Countersunk Head Screws
Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... REPLACING DRAWBAR MEMBERS, LEFT AND RIGHT

Remove complete brake pull rod.

Removal of position light cable, refer to **86 10 ... REPLACING LICENSE PLATE LIGHT.**

Release screws (1) on cross-member (2). Pull out crossmember (2) towards rear.

Installation:

Tightening Torque: 86 10 16AZ, see **86 10 PLATFORM** .

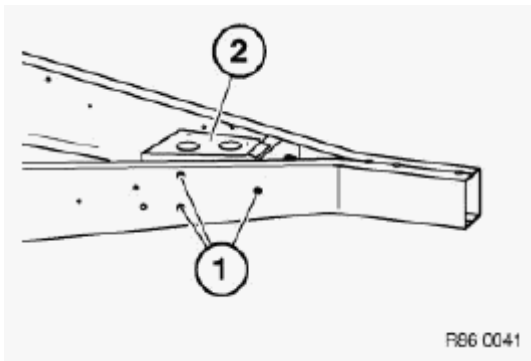


Fig. 114: Identifying Screws On Cross-Member
Courtesy of BMW OF NORTH AMERICA, INC.

Release countersunk head screws (1) and remove.

Installation:

Tightening Torque: 86 10 3AZ, see **86 10 PLATFORM** .

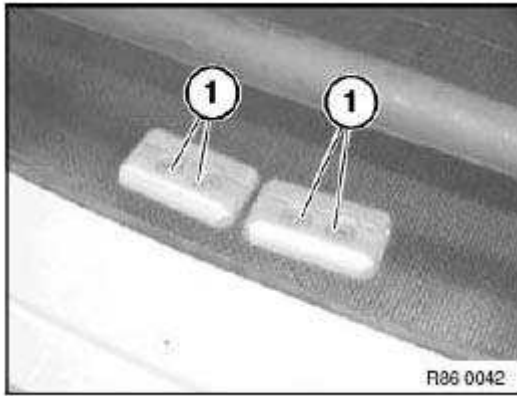


Fig. 115: Identifying Countersunk Head Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Remove cable holder (1) and remove wiring harness (2) from drawbar member (3).

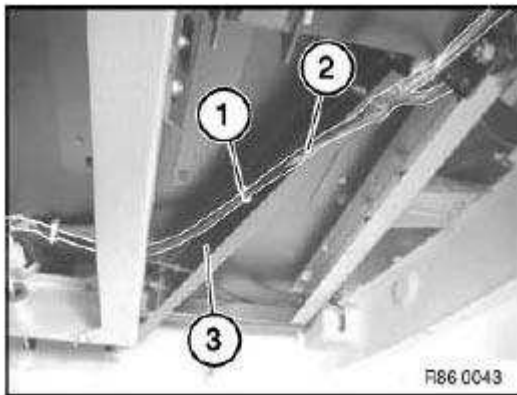


Fig. 116: Identifying Cable Holder, Wiring Harness & Drawbar Member
Courtesy of BMW OF NORTH AMERICA, INC.

Remove cable (1) from position light housing (2). Pull out cable (1) through drawbar member aperture (3).

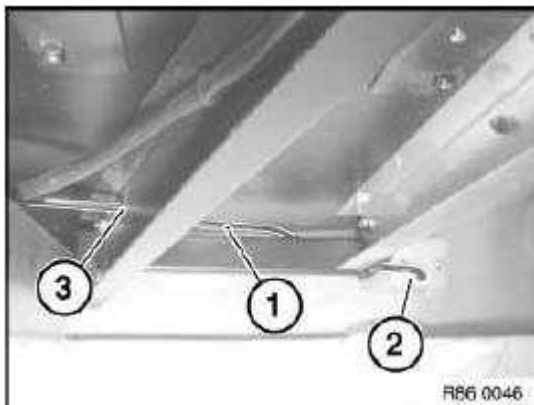


Fig. 117: Identifying Cable, Housing & Drawbar Member Aperture

Courtesy of BMW OF NORTH AMERICA, INC.

Release all screws on cross-member (1) and remove crossmember (1).

If necessary, release screws on mounting brackets (2) and remove cross-members (3).

Installation:

Use new self-locking nuts.

Tightening Torque: 86 10 17AZ, see **86 10 PLATFORM** .

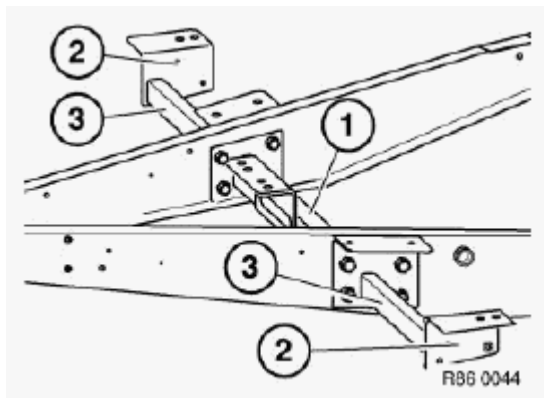


Fig. 118: Identifying Screws On Cross-Member
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew bolt (1). Grip nut from rear through assembly hole (2) in cross-member.

Installation:

Use new self-locking nuts.

Tightening Torque: 86 10 18AZ, see **86 10 PLATFORM** .

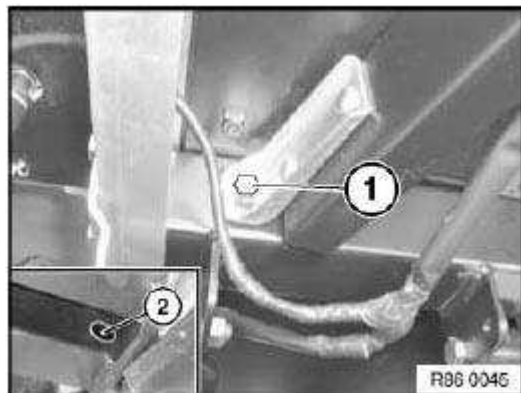


Fig. 119: Identifying Bolt & Assembly Hole

Courtesy of BMW OF NORTH AMERICA, INC.

Tilt drawbar member (1) down in direction of arrow A and pull out towards rear in direction of arrow B.

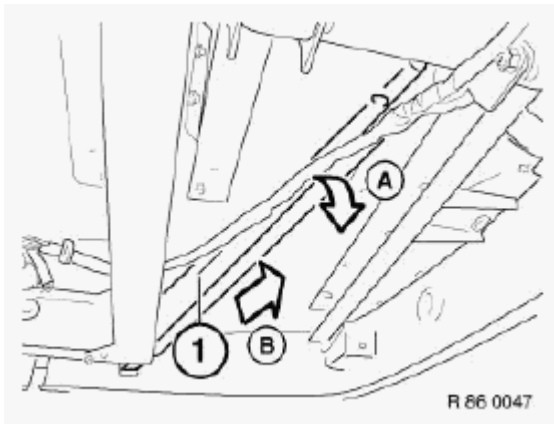


Fig. 120: Pulling Drawbar Member

Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... REPLACING GAITER

Position brake lever fully towards rear.

Release screws (1) and (2) and remove. Pull off towing attachment (3) in direction of arrow.

Installation:

Tightening Torque: 86 10 15AZ, see **86 10 PLATFORM** .

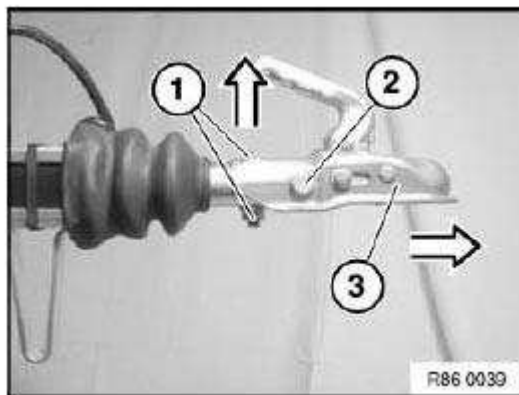


Fig. 121: Identifying Screws & Towing Attachment

Courtesy of BMW OF NORTH AMERICA, INC.

Pull off gaiter (1) in direction of arrow.

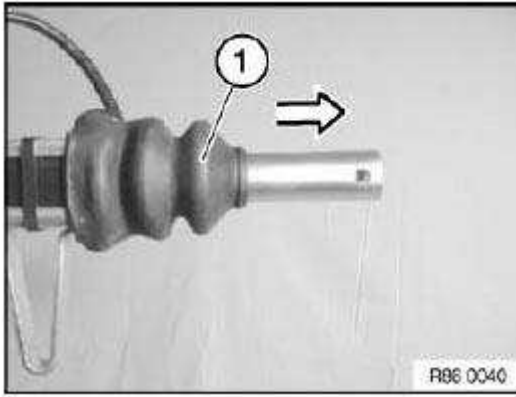


Fig. 122: Identifying Gaiter
Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... REPLACING HOLDER FOR CHOCK

Pull bar (1) down in direction of arrow A. Pull out chock (2) in direction of arrow B at an angle towards bottom.

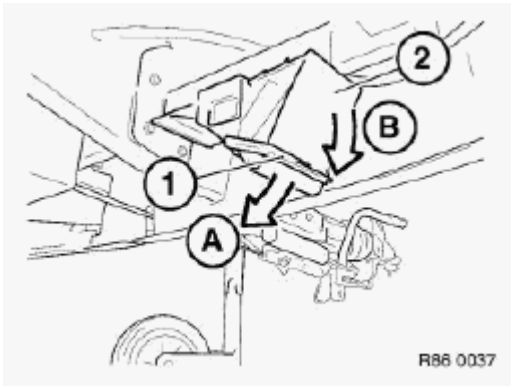


Fig. 123: Pulling Out Chock
Courtesy of BMW OF NORTH AMERICA, INC.

Release and unscrew cheese head tapping screws (1) on holder (2).

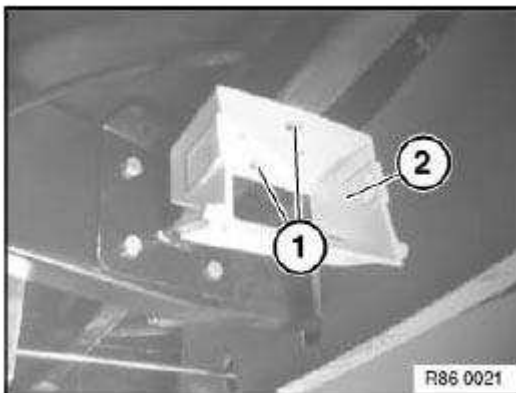


Fig. 124: Identifying Cheese Head Tapping Screws On Holder
Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... REPLACING LASHING PLATE AND LASHING EYE

Releasing lashing eye

Pull spring bar (1) upwards in direction of arrow A. Slide lashing eye (3) in direction of arrow B and remove from lashing plate (2).

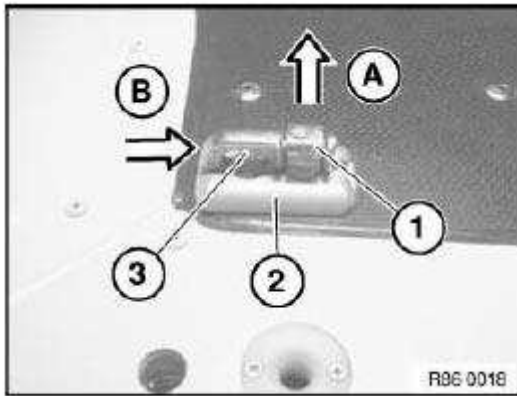


Fig. 125: Identifying Spring Bar & Lashing Plate
Courtesy of BMW OF NORTH AMERICA, INC.

Release countersunk head screws (1) and remove lashing plate.

Installation:

Tightening Torque: 86 10 3AZ, see **86 10 PLATFORM** .

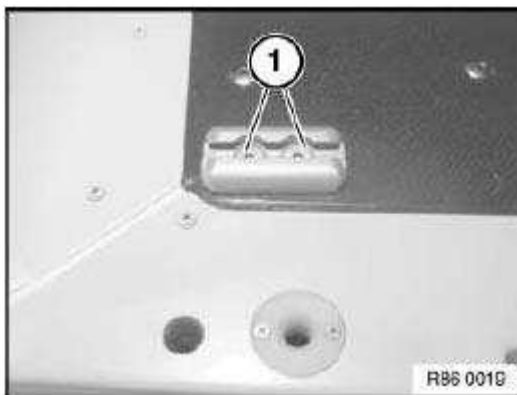


Fig. 126: Identifying Countersunk Head Screws & Lashing Plate
Courtesy of BMW OF NORTH AMERICA, INC.

Locking lashing eye

Position lashing eye (1) on circular openings on lashing plate (2). Press lashing eye (1) in direction of arrow A into lashing plate (2). In this position, slide lashing eye (1) in direction of arrow B. Spring bar (3) snaps in, anchors and secures lashing eye (1) in lashing plate (2).

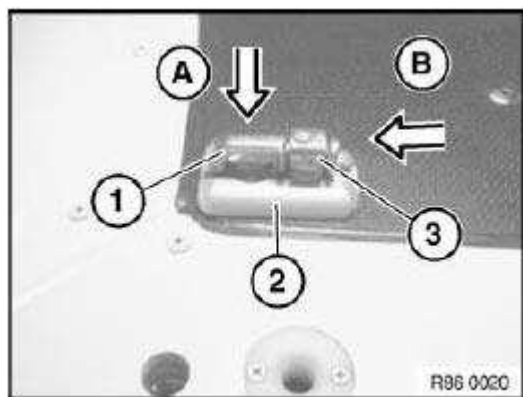


Fig. 127: Identifying Lashing Eye & Lashing Plate
Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... REPLACING LICENSE PLATE LIGHT

Release screws (1) and remove license plate light (2) from mounting.

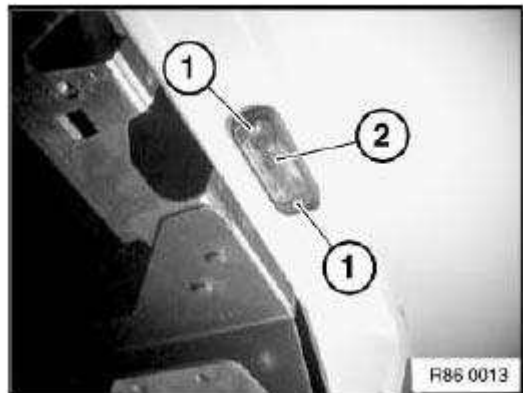


Fig. 128: Identifying Screws & License Plate
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect flat connector (1) in direction of arrow.

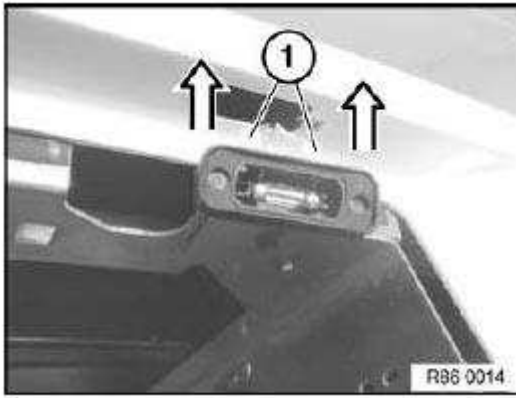


Fig. 129: Identifying Flat Connector
Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... REPLACING POSITION LIGHT

Unclip cover (1) on side recess (arrow).

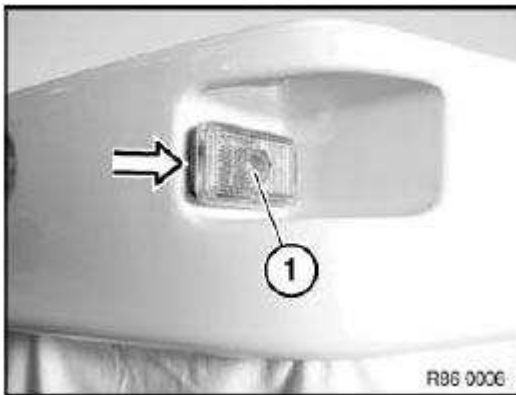


Fig. 130: Identifying Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Pull flat connector (1) from flat contact.

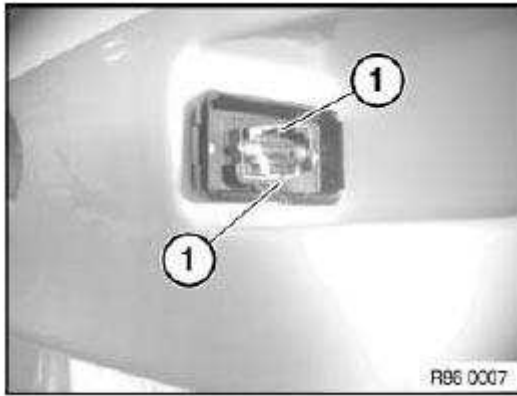


Fig. 131: Identifying Flat Connector
Courtesy of BMW OF NORTH AMERICA, INC.

Pull out cable (1) completely.

CAUTION: Before drilling out rivet heads, drive in rivet pins with a punch.

Drill out rivet heads (2) and remove position light housing from front.

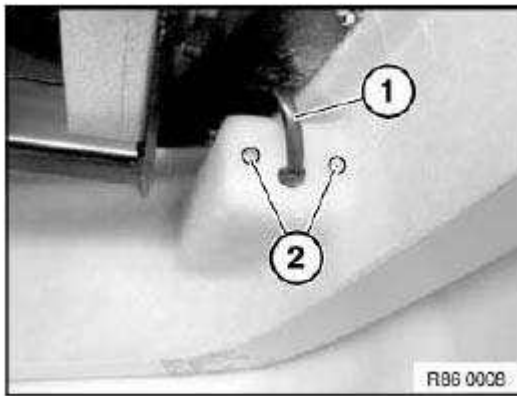


Fig. 132: Identifying Cable & Rivet Heads
Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... REPLACING REAR LIGHT

Release thumb screws (1), slide light guard (2) in direction of middle of car and tilt out towards rear.

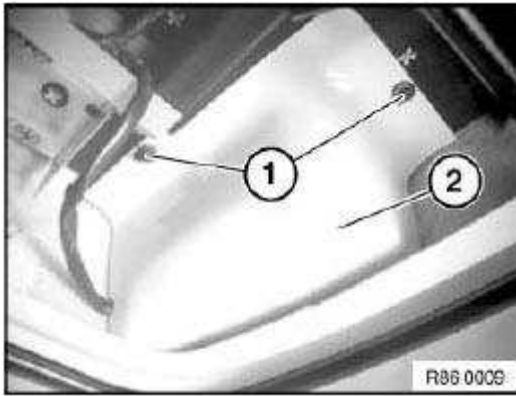


Fig. 133: Identifying Screws, Slide Light Guard
Courtesy of BMW OF NORTH AMERICA, INC.

Turn handwheel (1) counterclockwise in direction of arrow and remove base (2).

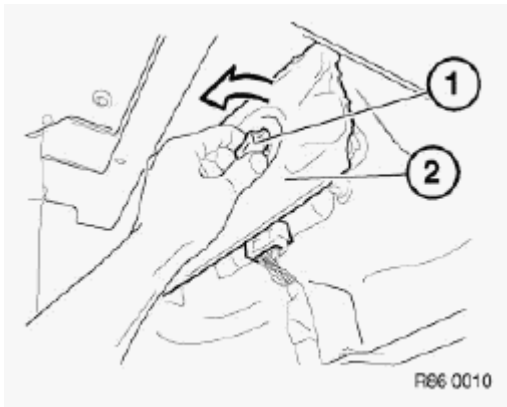


Fig. 134: Removing Base
Courtesy of BMW OF NORTH AMERICA, INC.

Release nuts (1) and press rear light (2) out towards front.

Installation:

Use new self-locking nuts.

Tightening Torque: 86 10 1AZ, see **86 10 PLATFORM**.

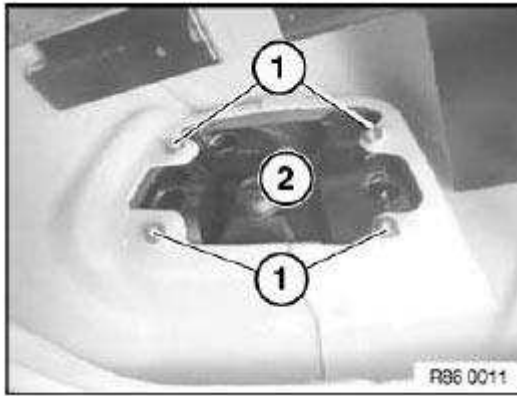


Fig. 135: Identifying Nuts & Rear Light
 Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... TROUBLESHOOTING ON MULTI-TRAILER

MULTI-TRAILER TROUBLESHOOTING TABLE

Fault	Cause	Remedy
Trailer already brakes when foot is taken off accelerator	Shock absorber of overrunning equipment faulty	Replace shock absorber of overrunning equipment
Reversing sluggish or not possible	Brake system adjusted too strongly	Adjust brake system
NOTE: When automatic reversing is activated, there is a residual braking torque caused by the design. This results	Brake shoes jammed	Free brake shoes, replace complete brake shoes with brake shoe carrier if necessary
in slightly heavier overrunning.	Cables overtensioned	Adjust brake system
Handbrake effect too weak	Faulty adjustment	Adjust brake system
-	Faulty spring force accumulator	Adjust spring force accumulator
-	Brake cables heavily contaminated, corroded or kinked	Free cables, replace if necessary
Wheel brakes overheating	Brake system incorrectly adjusted	Adjust brake system
-	Overrunning equipment is sluggish	Lubricate overrunning equipment
-	Brake cables heavily contaminated, corroded or kinked	Free cables, replace if necessary
-	Cables overtensioned	Adjust brake system
-	Wheel brakes contaminated	Clean wheel brakes

-	Reversing lever of overrunning equipment jammed	Remove reversing lever, clean and grease with conventional BMW lubricants
Braking effect too weak	Excessive play in brake system	Adjust brake system
-	Brake linings glazed, fouled by oil, damaged or worn	Replace complete brake shoes, clean brake drums, replace if necessary
-	Overrunning equipment is sluggish	Lubricate overrunning equipment
-	Brake cables heavily contaminated, corroded or kinked	Free cables, replace if necessary
Jolting braking or starting off	Excessive play in brake system	Adjust brake system
-	Shock absorber of overrunning equipment faulty	Replace shock absorber of overrunning equipment
-	Brake shoes jammed	Replace complete brake shoes with brake shoe carrier
Brakes squeal or rattle	Wheel brakes contaminated or worn	Clean wheel brakes, replace brake shoes and/or brake drums if necessary
-	Out-of-round or banging brake drum	Replace brake drums
-	Pad loose	Replace brake shoes
-	Wheel-bearing play excessive	Replace wheel bearings
Brakes pull to one side	Tire pressure incorrect	Correct tire pressure
-	Brake linings glazed, fouled by oil, damaged or worn	Replace complete brake shoes, clean brake drums, replace if necessary
-	Suspension shock absorber has no effect	Replace suspension shock absorber
Brake pads worn at angle	Wheel-bearing play excessive	Replace wheel bearings
-	Pads worn to less than minimum thickness	Replace brake shoes
Towing attachment fails to engage after connection	Internal attachment parts contaminated	Clean and lubricate attachment

21 HOOD

86 21 ... ADJUSTING HOOD PRETENSION - CAMLOC FASTENER WITH SPACERS

NOTE: At least two persons are needed to install and remove the hood. Before installing and removing the hood, secure the BMW multitrailer and the entire combination against rolling. For this purpose, use the parking brake and the chocks of the BMW multitrailer.

To help adjust the hood pretension, you will need four blocks with a minimum height of 60 mm.

Installation:

Before attaching the hood, thoroughly clean the top side of the GFP apron of the BMW multitrailer.

It is particularly important to clean the contact surface of the GFP apron (1) (marked in gray) on which the rubber seal of the hood rests. Refer to **Fig. 136**.

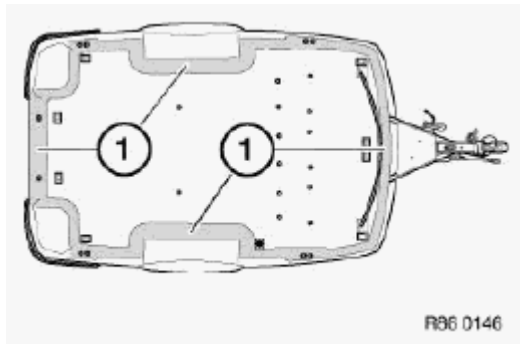


Fig. 136: Identifying GFP Apron
Courtesy of BMW OF NORTH AMERICA, INC.

The following text describes how to adjust the hood pretension as an example at one support area of the platform or at one hood fastener. The pretension is adjusted at the other support areas and fasteners in the same sequence.

The hood must be fixed on the platform in such a way that the rubber seal of the hood is placed under pretension or compressed. Only with this pretension is it possible to obtain a tight seal between hood and platform. Pretension is achieved with the Camloc fasteners and by using spacers.

Two different types of spacers (2) are available for each Camloc fastener (1): one thick and one thin. You can fit one, two or no spacer (2) on the Camloc fastener (1).

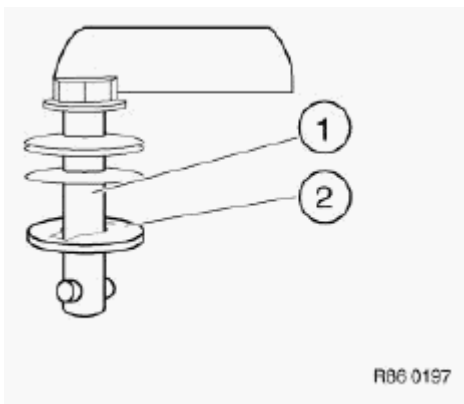


Fig. 137: Identifying Spacer On Camloc Fastener
 Courtesy of BMW OF NORTH AMERICA, INC.

Access to hood lighting plug (1):

Right side lid.

Open out spring-loaded cap (2) on socket (3) and remove hood lighting plug (1). Close cap (2). Insert hood lighting plug (1) into plug receptacle (4).

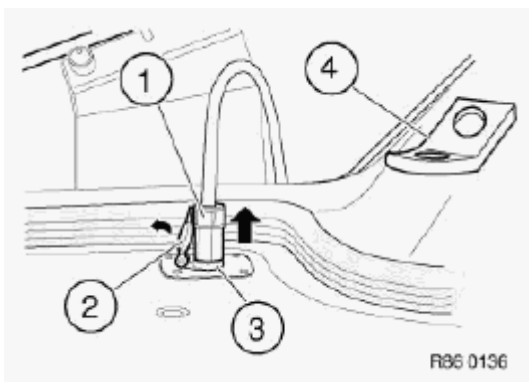


Fig. 138: Removing Hood Lighting Plug
 Courtesy of BMW OF NORTH AMERICA, INC.

Unlocking Camloc fastener:

Wing (1) of Camloc fastener (2) is parallel to outer edge of hood. Turn Camloc fastener (2) counterclockwise until it is heard and felt to unlock.

Locking

Press hood in lid frame downwards by hand. Turn Camloc fastener clockwise until it is heard and felt to lock into place. Wing (1) of Camloc fastener is parallel to outer edge of hood.

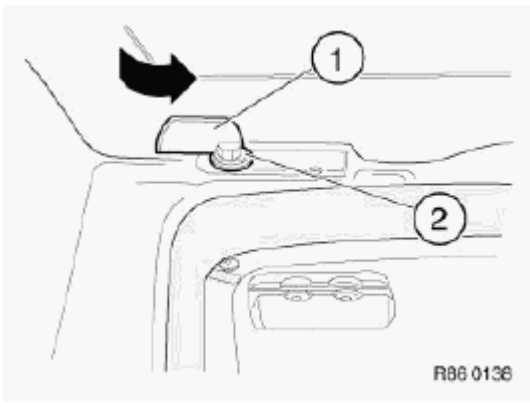


Fig. 139: Identifying Wing & Camloc Fastener
Courtesy of BMW OF NORTH AMERICA, INC.

Raise hood and place block (1) between centering pin (2) and platform. Lower hood and position centering pin (2) on block (1).

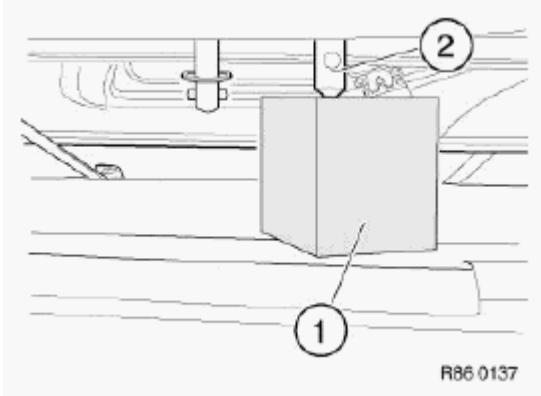


Fig. 140: Identifying Centering Pin On Block
Courtesy of BMW OF NORTH AMERICA, INC.

Remove spring nut (1) from Camloc fastener (2).

Installation:

Use new spring nut.

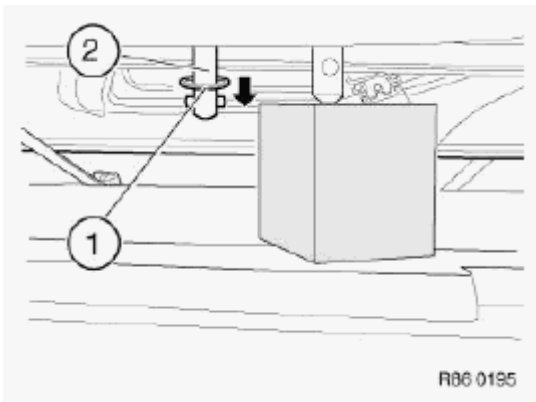


Fig. 141: Identifying Spring Nut & Camloc Fastener
 Courtesy of BMW OF NORTH AMERICA, INC.

Remove Camloc fastener (1) from locating hole (2).

Installation:

Press Camloc fastener (1) downwards until contact is made with hood stop. Wing (3) of Camloc fastener points to middle of hood.

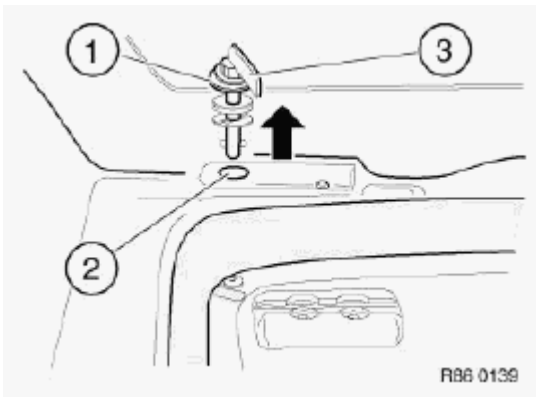


Fig. 142: Identifying Camloc Fastener & Locating Hole
 Courtesy of BMW OF NORTH AMERICA, INC.

Replacing spacer:

Remove spacer (1) from Camloc fastener (4) by aligning opening (2) over lateral pin (3).

Reducing pretension:

Reduce spacer thickness, replace spacer or install Camloc fastener without spacer.

Increasing pretension:

Fit a thicker spacer or two spacers.

Installation:

Place spacer (1) on Camloc fastener (4) and turn until it is in a secure position.

Check that hood seal is correctly seated.

Check that Camloc fasteners are locked. Lift hood by handle recesses. Hood must not be able to move with respect to platform of BMW multitrailer.

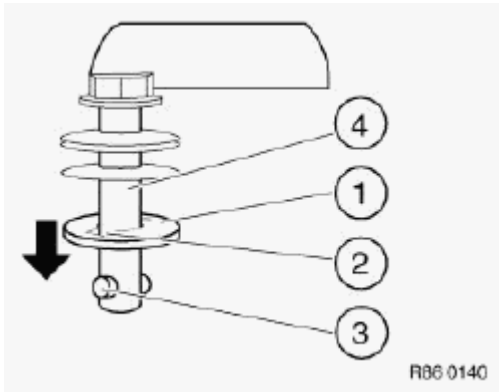


Fig. 143: Identifying Spacer On Camloc Fastener
Courtesy of BMW OF NORTH AMERICA, INC.

86 21 ... ADJUSTING REAR LID TO FIT

NOTE: The following text describes how to adjust the rear lid to fit at one mounting point as an example. Proceed in the same way for the other mounting points.

Height adjustment of rear lid:

Release screws (1) and move rear lid in direction of arrows.

Depth adjustment of rear lid:

Release screws (2) and move rear lid in direction of arrows.

Installation:

Tightening Torque, height adjustment,

refer to **86 21 HOOD** .

Tightening Torque, depth adjustment,

refer to **86 21 HOOD** .

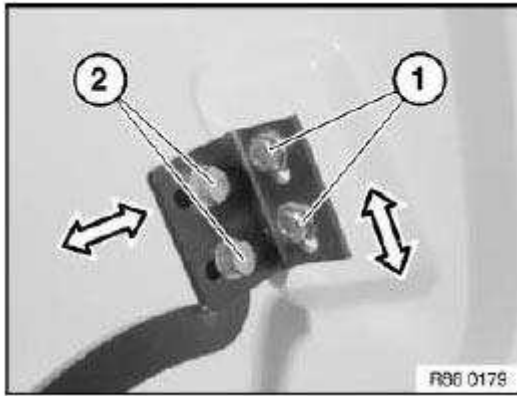


Fig. 144: Identifying Rear Lid Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Adjust gap (A) evenly all around without displacement and correct if necessary.

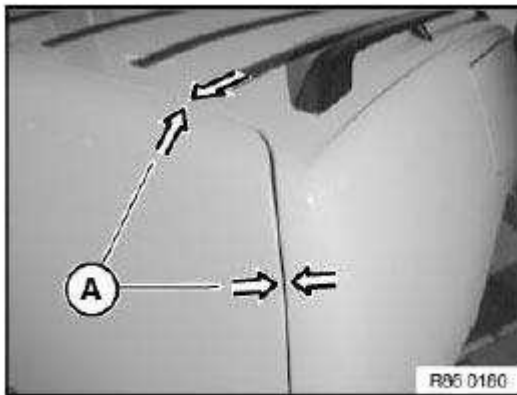


Fig. 145: Identifying Rear Lid Gap
Courtesy of BMW OF NORTH AMERICA, INC.

Check lid in transition (B) to hood for displacement and correct if necessary (flush).

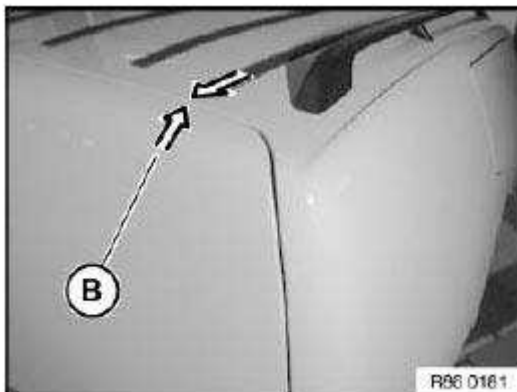


Fig. 146: Identifying Lid In Transition To Hood

Courtesy of BMW OF NORTH AMERICA, INC.

To align lid in transverse direction, you can install or remove plastic washers (3) between hinge bracket (1) and mounting bracket (2).

Installation:

There must always be a plastic washer (3) fitted on left and right sides of mounting bracket (2). Plastic washers are available in thicknesses of 1 mm and 3 mm.

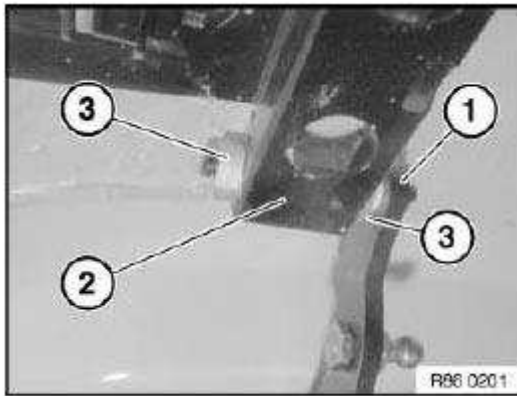


Fig. 147: Identifying Plastic Washer, Mounting Bracket & Hinge Bracket
Courtesy of BMW OF NORTH AMERICA, INC.

Check lid in transition (C) to hood (flush) and correct if necessary. Correction is made by inserting or omitting plastic washers (refer to Fig. 147).

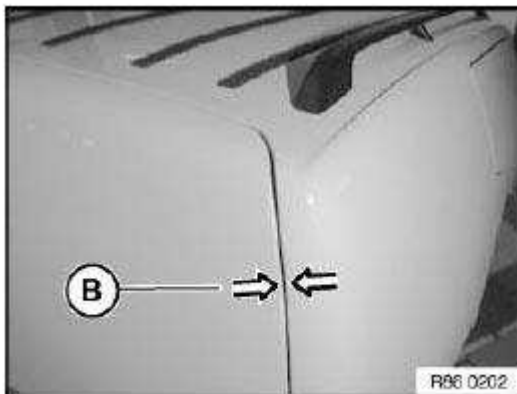


Fig. 148: Identifying Lid In Transition To Hood
Courtesy of BMW OF NORTH AMERICA, INC.

86 21 ... ADJUSTING ROTARY STRIKER LOCK

The following text describes how to adjust the rotary striker lock on the rear lid as an example. Proceed in the same way for the side lids. Adjust the lock while the lid is open.

Release screws (1) and adjust rotary striker lock (2) in elongated hole area in direction of arrows.

Installation:

Tightening Torque, refer to **86 21 HOOD** .

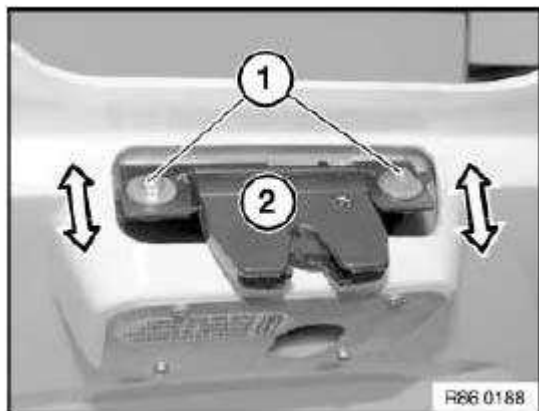


Fig. 149: Adjusting Rotary Striker Lock
Courtesy of BMW OF NORTH AMERICA, INC.

86 21 ... ADJUSTING SIDE LID TO FIT

NOTE: The following text describes how to adjust the side lid to fit at one mounting point as an example. Proceed in the same way for all other mounting points.

Height adjustment of side lid:

Release screws (1) and move side lid in direction of arrows.

Installation:

Tightening Torque, refer to **86 21 HOOD** .

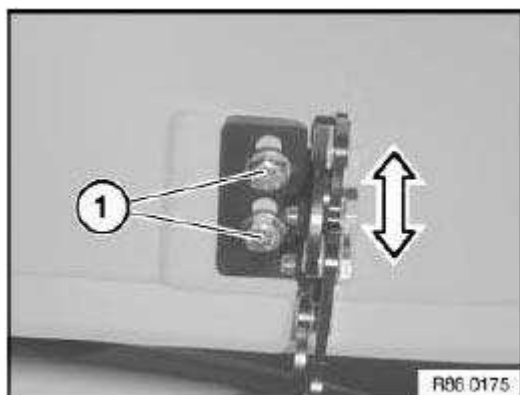


Fig. 150: Adjusting Side Lid Height Adjustment
Courtesy of BMW OF NORTH AMERICA, INC.

Depth adjustment of side lid:

Release screws (1) and move side lid in direction of arrows.

Installation:

Tightening Torque, refer to **86 21 HOOD** .

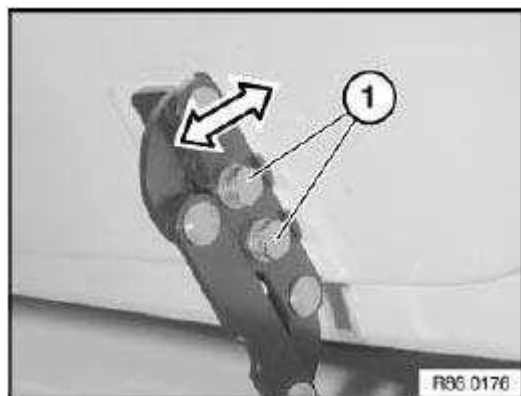


Fig. 151: Adjusting Side Lid Depth Adjustment
Courtesy of BMW OF NORTH AMERICA, INC.

Adjust gap (A) evenly all around and correct if necessary.

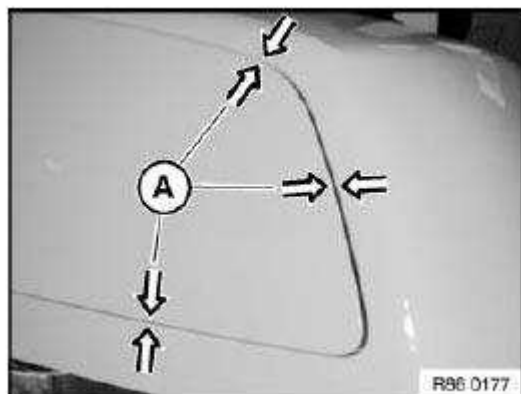


Fig. 152: Identifying Side Lid Gap
Courtesy of BMW OF NORTH AMERICA, INC.

Check lid in transition (B) to hood for displacement and correct if necessary (flush).

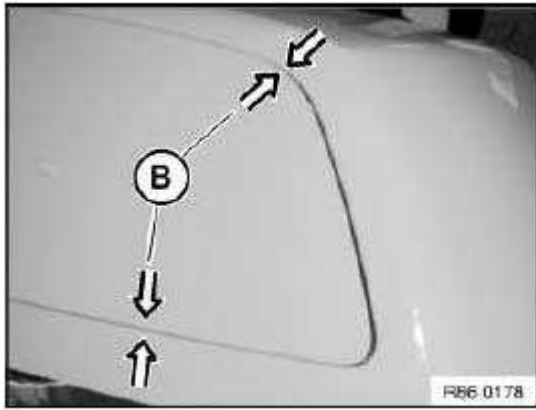


Fig. 153: Identifying Lid In Transition To Hood
Courtesy of BMW OF NORTH AMERICA, INC.

To align lid in direction of travel, you can install or remove a spacer plate (3) between mounting bracket (1) and hinge (2).

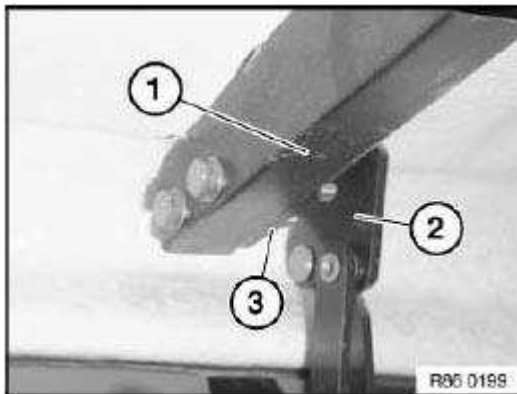


Fig. 154: Identifying Spacer Plate, Mounting Bracket & Hinge
Courtesy of BMW OF NORTH AMERICA, INC.

Check lid in transition (C) to hood for displacement and correct if necessary (flush). Correction is made by inserting or omitting spacer plates (refer to **Fig. 154**).

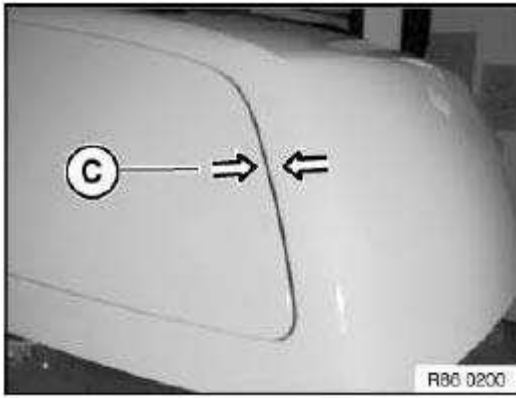


Fig. 155: Identifying Lid In Transition To Hood
Courtesy of BMW OF NORTH AMERICA, INC.

86 21 ... ATTACHING/REPLACING BMW BADGE

Position of attachment: inside of rear lid

Remove plastic cover (1) from bore holes (2).

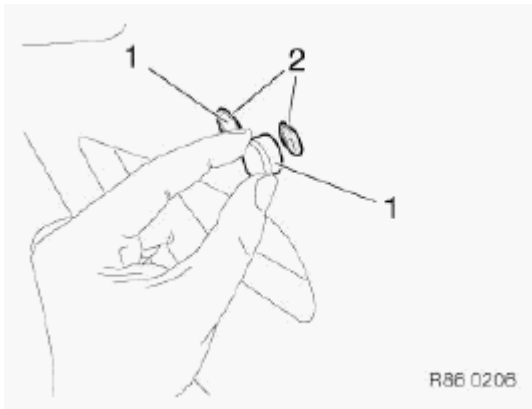


Fig. 156: Identifying Plastic Cover & Bore Holes
Courtesy of BMW OF NORTH AMERICA, INC.

Inserting a set of pointed pliers through bore holes (1), detach retaining washers (2) from pins of BMW badge.

Installation:

Use only new retaining washers.

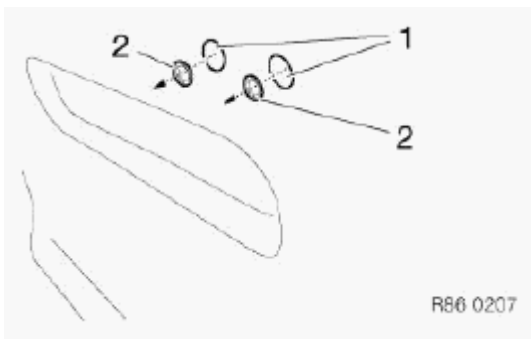


Fig. 157: Identifying Bore Holes & Retaining Washers
 Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Instruction for removing BMW badge:

Slide a blunt object (e.g. a wooden wedge) under the BMW badge and carefully lever off the badge.

Position of attachment: outside of rear lid

The BMW badge must be attached at room temperature.

Degrease bonding area with petroleum ether.

Rub down bonding area with a dry cloth.

Peel off protective film on BMW badge (1).

Insert BMW badge (1) with pin (2) into bore hole (3). If bore holes (3) are considerably larger than pin (2), optically align BMW badge (1) exactly.

Press down BMW badge (1) firmly.

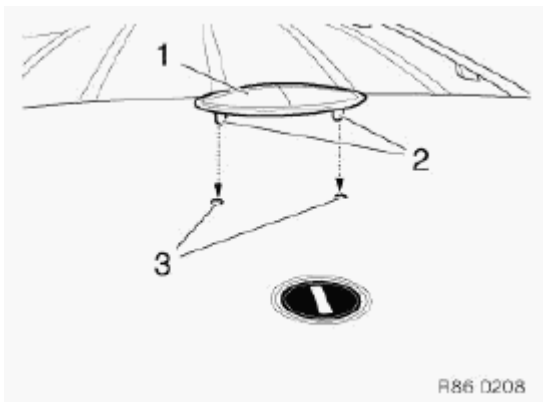


Fig. 158: Identifying BMW Badge, Pin & Bore Hole
 Courtesy of BMW OF NORTH AMERICA, INC.

Position of attachment: inside of rear lid

By inserting a 1/4" ratchet with extension and socket wrench insert (7 mm A/F) through bore holes (2), attach a retaining washer (1) in each case to pin of BMW badge. In so doing, press down on outside of rear lid with one hand on BMW badge and grip.

Push on relevant retaining washer (1) as far as it will go.

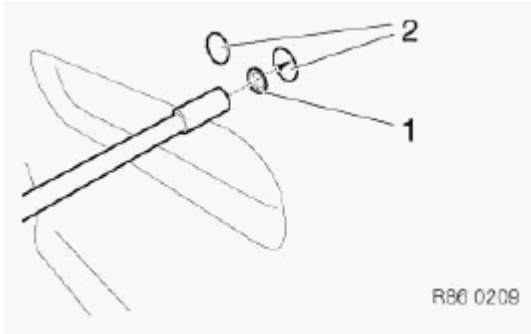


Fig. 159: Identifying Bore Holes & Retaining Washers
Courtesy of BMW OF NORTH AMERICA, INC.

Position of attachment: inside of rear lid

Insert plastic cover (1) in bore holes (2).

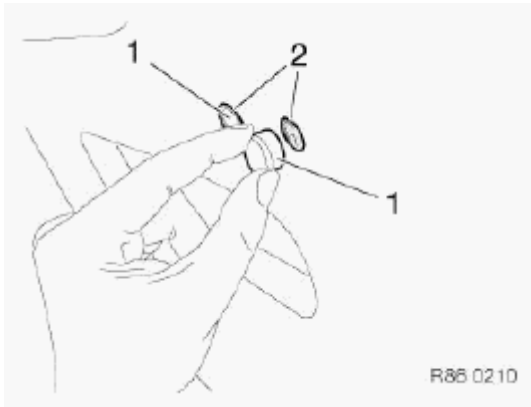


Fig. 160: Identifying Plastic Cover & Bore Holes
Courtesy of BMW OF NORTH AMERICA, INC.

86 21 ... FITTING BMW LOGO

Distance between hood edge and lower edge of BMW logo (1) is 100 mm.

Distance between middle of lock and lettering (2) is 300 mm.

Installation:

Degrease bonding areas with benzine. Rub down bonding area with a dry cloth.

Position of BMW logo (1): parallel to lower edge.

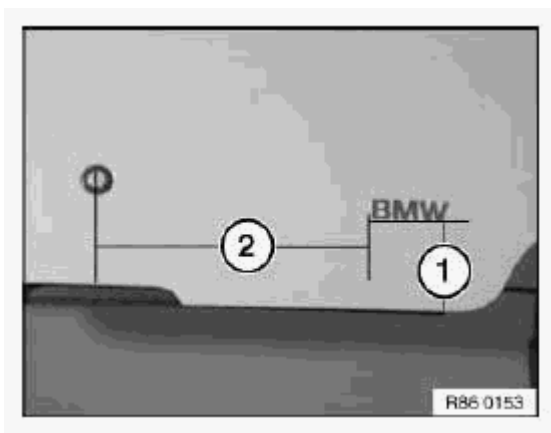


Fig. 161: Identifying Distance Between Middle Of Lock & Lettering
Courtesy of BMW OF NORTH AMERICA, INC.

86 21 ... INSTALLING HOOD SEAL

NOTE: Removing old seal: In a straight area of hood, grip old seal piping with a pair of pliers and pull off horizontally. Grip detached seal with both hands and uniformly pull away from hood ridge.

Push seal piping (1) by hand onto hood ridge (2). Using a rubber hammer, gently tap seal piping (1) as far as it will go onto hood ridge (2). Make sure piping is evenly positioned especially in radii of hood ridge.

Installation:

Position end face of seal at front end of hood in a straight area. Lay seal from front to rear.

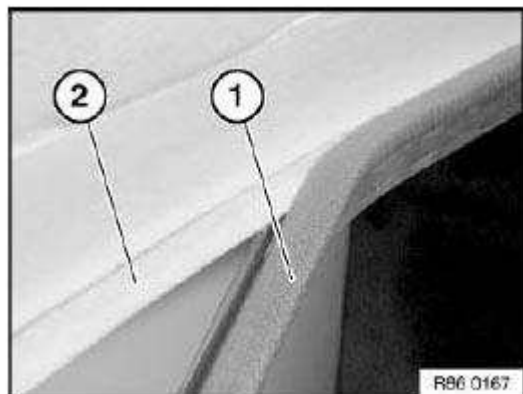


Fig. 162: Identifying Seal Piping & Hood Ridge
Courtesy of BMW OF NORTH AMERICA, INC.

86 21 ... INSTALLING RUBBER ROOF STRIP

NOTE: Pull off old rubber roof strip and remove remaining traces of adhesive with universal cleaner, refer to BMW Operating Fluids. Rub down with a dry cloth.

Select rubber roof strip according to length of roof recess (1). Arrange chamfered ends of rubber roof strip to match shape of roof recess (1).

Installation:

Pretreat bonding area and stick on rubber roof strip according to manufacturer's instructions.

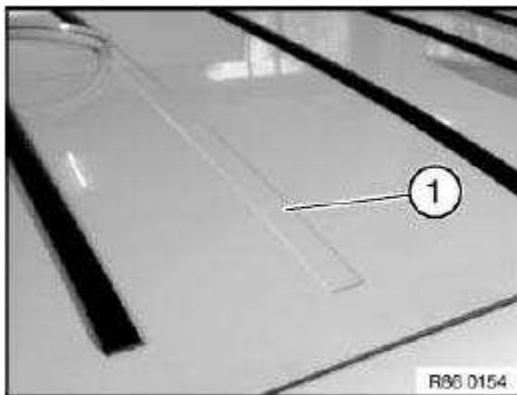


Fig. 163: Identifying Roof Recess

Courtesy of BMW OF NORTH AMERICA, INC.

86 21 ... INSTALLING SEAL FOR REAR LID AND SIDE LID

NOTE: The following text describes how to install the seal for the rear lid as an example. Proceed in the same way for the side lids.

Removing old seal: Open lid. Grip seal piping with both hands and pull seal off hood ridge. Remove old seal over lid.

Push seal piping (1) by hand onto hood ridge (2). Using a rubber hammer, gently tap seal piping (1) as far as it will go onto hood ridge (2). Make sure piping (1) is evenly positioned especially in radii of hood ridge.

Installation:

Always position end face of seal in a straight area only:

e.g. on cross-member or on upper hood ridge of rear lid.

Suitable areas on side lids:

Upper and lower hood ridge.

Sealing lip of seal must point outwards.

After installing from inside and outside, check correct seating between lid seal and lid. Lid must rest without air on lid seal.

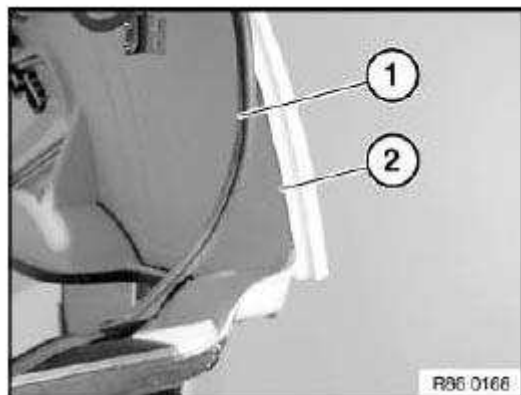


Fig. 164: Identifying Seal Piping & Hood Ridge
Courtesy of BMW OF NORTH AMERICA, INC.

86 21 ... INSTALLING SPONGE RUBBER SEAL

NOTE: Removing old sponge rubber seal: Pull off old sponge rubber seal. Remove remaining traces of adhesive with universal cleaner, refer to BMW Operating Fluids.

Sponge rubber seal runs along area marked gray (1).

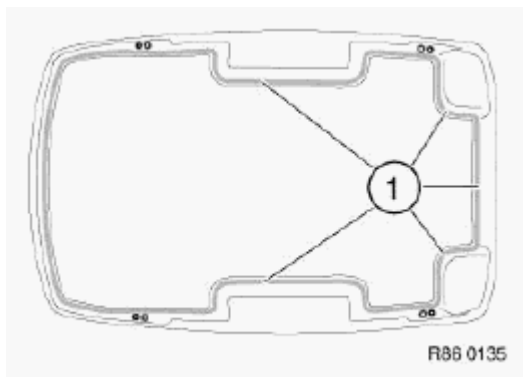


Fig. 165: Identifying Rubber Seal Area
Courtesy of BMW OF NORTH AMERICA, INC.

Lay sponge rubber seal (1) in middle of hood contact surface (2).

Installation:

Degrease contact surface (2) with benzine and rub down with a dry cloth. Stick on sponge rubber seal (1)

according to manufacturer's instructions. Position end face of seal (1) in a straight area.

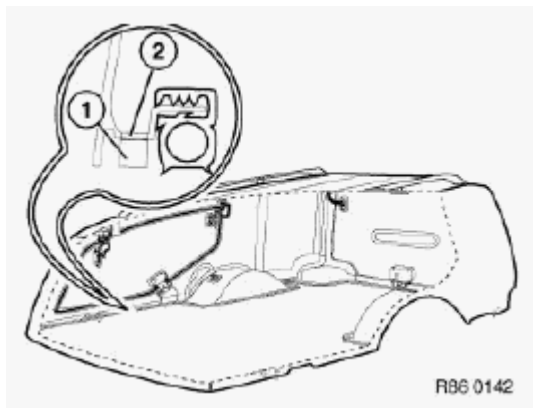


Fig. 166: Identifying Seal End Face & Contact Surface
Courtesy of BMW OF NORTH AMERICA, INC.

86 21 ... REMOVING BALL PIVOT

NOTE: Remove gas spring, refer to **86 21 ... REMOVING GAS SPRING.**

NOTE: The following text describes how to remove the ball pivot from the hinge retaining bracket on the rear lid as an example. Proceed in the same way for the other ball pivots.

Make sure the attachments are reinstalled in the correct sequence. Only in this way will the gas springs open and close properly.

Grip ball pivot (1) at hexagon mount (2) and release nut (3).

Installation:

Use new self-locking nut.

Tightening Torque, refer to **86 21 HOOD** .

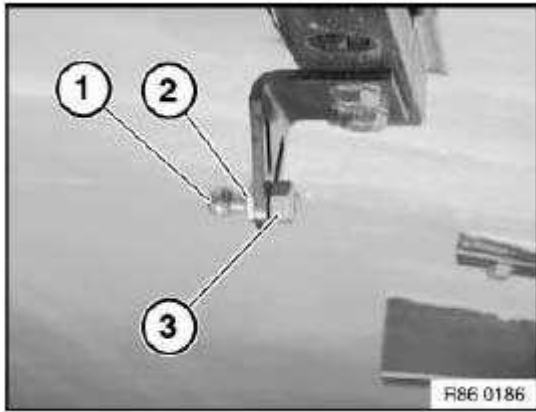


Fig. 167: Adjusting Rotary Striker Lock
Courtesy of BMW OF NORTH AMERICA, INC.

86 21 ... REMOVING CENTERING PIN FROM MOUNTING BRACKET

NOTE: Exclusively for removal of pin, raise the hood in the GFP area. For raising, use a wooden block with a maximum width of 35 mm and a height of 45 mm. The length must be selected depending on the lifting platform securing point. Ensure the hood is secure on the blocks.

Position block (1) so that it is only located in area of sponge rubber seal (2).

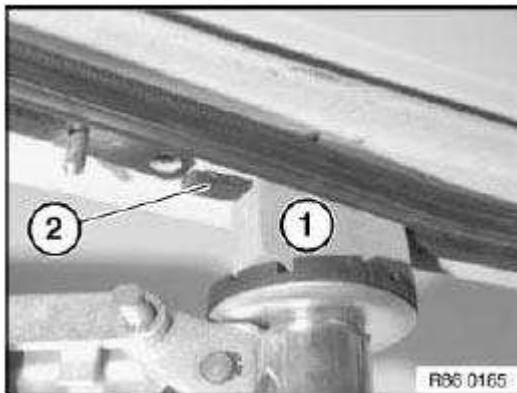


Fig. 168: Identifying Block & Rubber Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Insert a mandrel into hole (1) of pin (2) and turn counterclockwise.

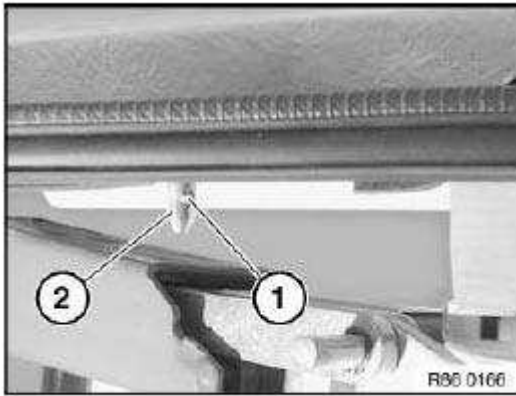


Fig. 169: Identifying Mandrel Into Hole Of Pin
Courtesy of BMW OF NORTH AMERICA, INC.

86 21 ... REMOVING GAS SPRING

Only remove the gas spring while the lid is open. The gas spring will then not be subjected to load and the spring piston will not jump out of the spring housing. Prop the lid open with one hand to prevent it dropping closed. Remove the gas spring with your other hand.

NOTE: Side lids are each fitted with a gas spring. Rear lid is fitted with two gas springs. The following text describes how to remove the gas spring at one mounting point as an example. Proceed in the same way for all other mounting points.

Rear lid: Replace gas springs in pairs only.

Lever out retaining clip (1) in recess (2) and push on gas spring head (3) in direction of arrow. Detach spring head (3) from ball pivot.

Installation:

Push retaining clip (1) back into its original position. Press spring head (3) onto ball pivot until spring head (3) snaps audibly into place.

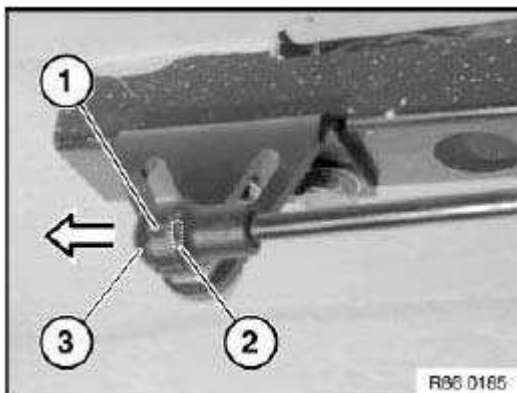


Fig. 170: Detaching Spring Head From Ball Pivot
Courtesy of BMW OF NORTH AMERICA, INC.

86 21 ... REMOVING GAS SPRING RETAINING BRACKET

NOTE: Remove gas spring, refer to **86 21 ... REMOVING GAS SPRING.**

Remove ball pivot, refer to **86 21 ... REMOVING BALL PIVOT.**

Release screws (1) and remove gas spring retaining bracket (2) from mounting bracket (3).

Installation:

Install retaining bracket so that it is centered in elongated holes.

Tightening Torque, refer to **86 21 HOOD .**

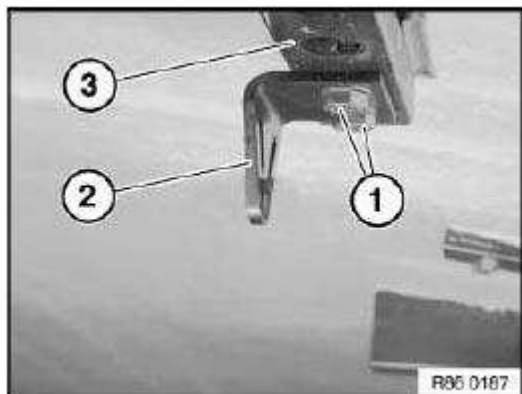


Fig. 171: Identifying Screws, Gas Spring Retaining Bracket & Mounting Bracket
Courtesy of BMW OF NORTH AMERICA, INC.

86 21 ... REMOVING HINGE BRACKET ON REAR LID

NOTE: Remove rear lid, refer to **86 21 ... REMOVING LID.**

Remove gas spring, remove gas spring on hinge side only, refer to **86 21 ... REMOVING GAS SPRING.**

Raise edge (1) of retaining clip (2) and slide in direction of arrow towards rear.

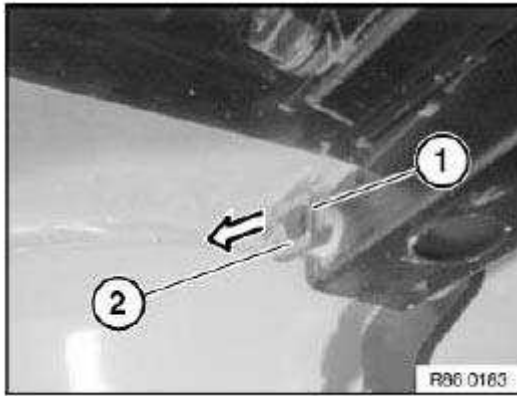


Fig. 172: Sliding Retaining Clip

Courtesy of BMW OF NORTH AMERICA, INC.

Remove plastic washer (1). Pull hinge bracket (2) in direction of arrow out of mounting bracket (3).

Installation:

There must always be a plastic washer (1) fitted on left and right sides of mounting bracket (3).

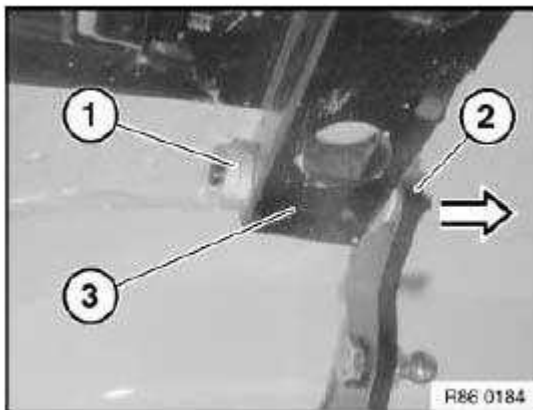


Fig. 173: Removing Hinge Bracket From Mounting Bracket

Courtesy of BMW OF NORTH AMERICA, INC.

86 21 ... REMOVING LID

NOTE: Adjusting side lid to fit, refer to **86 21 ... ADJUSTING SIDE LID TO FIT.**

Adjusting rear lid to fit, refer to **86 21 ... ADJUSTING REAR LID TO FIT.**

NOTE: The text describes how to remove the lid at one rear lid mounting point as an example. Proceed in the same way for the side lids. Spare part lids are always supplied without complete locking systems.

Two persons are required for this task.

NOTE: **Open lid.**

Loosen screws (1). Remove lid (2).

Installation:

Rear lid: shoulder (3) points to middle of hood.

Side lid: shoulder (3) points to outside of hood.

Tightening Torque: refer to **86 21 HOOD** .

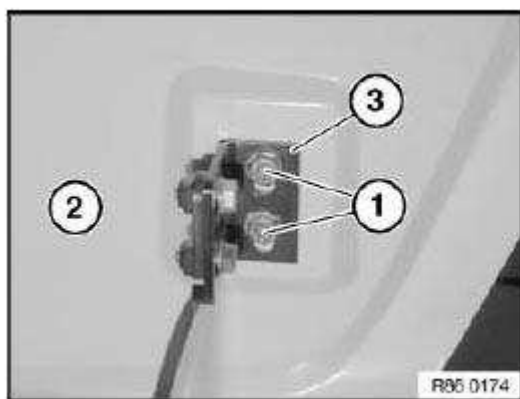


Fig. 174: Identifying Lid & Screws

Courtesy of BMW OF NORTH AMERICA, INC.

86 21 ... REMOVING LOCK BARREL

NOTE: **The following text describes how to remove the lock barrel on the rear lid as an example.**

Proceed in the same way for the side lids. Remove the lock barrel while the lid is open.

Remove cover, spring nut and pull rod, refer to 86 21 ... REMOVING ROTARY STRIKER LOCK.

Slide retainer (1) in direction of arrow away from lock barrel (2). Remove lock barrel (2).

Installation:

Examine rubber backing for damage and replace if necessary. When replacing lock barrel, make sure coding of new lock barrel matches coding of fitted lock barrel (simultaneous closing).

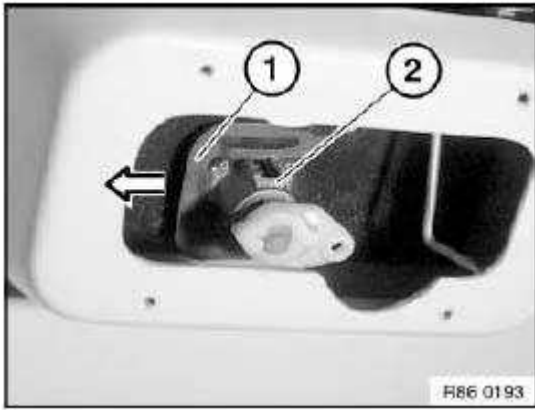


Fig. 175: Sliding Retainer From Lock Barrel
Courtesy of BMW OF NORTH AMERICA, INC.

86 21 ... REMOVING LOCK STRIKER FIXTURE ON REAR LID

Grip rubber seal on seal piping (1) and pull off in area of lock striker fixture (2). Grip lid seal (3) on seal piping (4) and pull off in area of lock striker fixture (2).

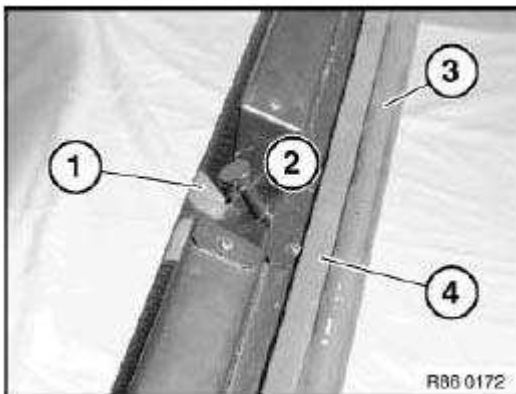


Fig. 176: Identifying Lid Seal & Seal Piping
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Before drilling out rivets, drive in rivet pins with a punch.

Drill out rivets (1+2) and remove lock striker fixture (3).

Installation:

Rivets (1) have black heads and long shanks. Rivets (2) have silver heads and short shanks.

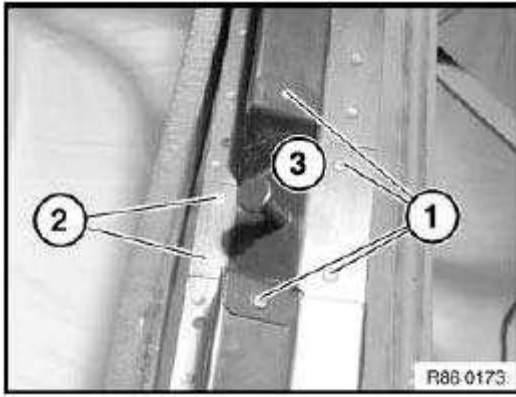


Fig. 177: Identifying Lock Striker Fixture & Rivets
Courtesy of BMW OF NORTH AMERICA, INC.

86 21 ... REMOVING PLUG FOR INSIDE LIGHT

NOTE: Two different types of plugs are used for the inside light. Both types function in the same way, only their designs are different.

Type 1:

Release screw (1) and separate housing plug (2).

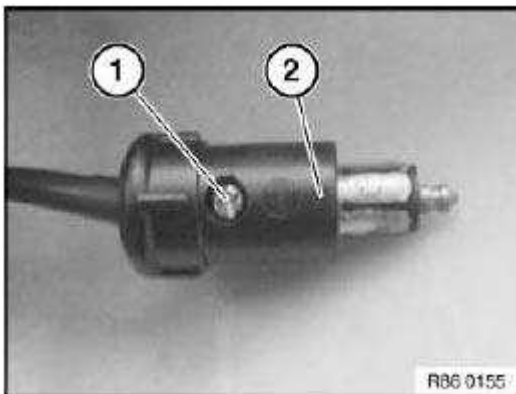


Fig. 178: Identifying Housing Plug & Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) and disconnect cables (2) from screw clamp.

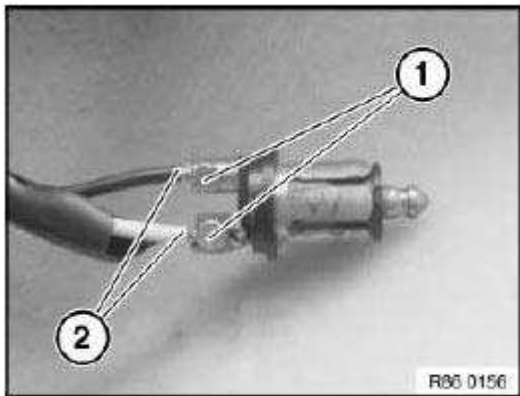


Fig. 179: Identifying Cables & Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Type 2:

Release screw (1) and separate housing plug (2).

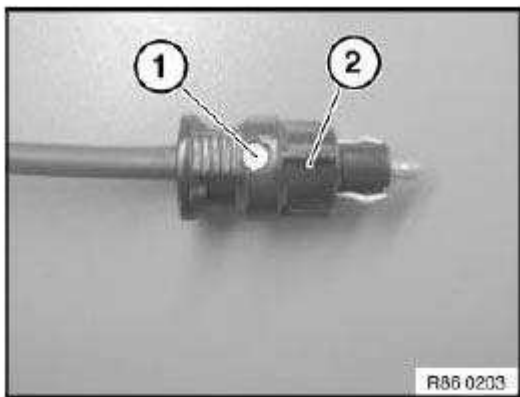


Fig. 180: Identifying Housing Plug & Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Remove contact parts (1+2).

Installation:

When installing, make sure contact parts (1+2) are in correct installation position.

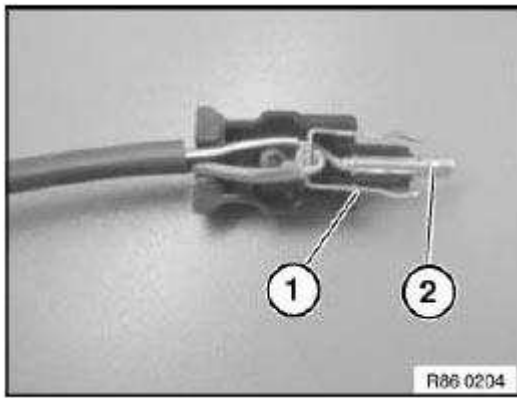


Fig. 181: Identifying Contact Parts
Courtesy of BMW OF NORTH AMERICA, INC.

86 21 ... REMOVING ROOF RAILING

NOTE: The text describes how to remove the roof railing at one mounting point as an example. Proceed in the same way for the other mounting points.

Open cover (1) and fold down.

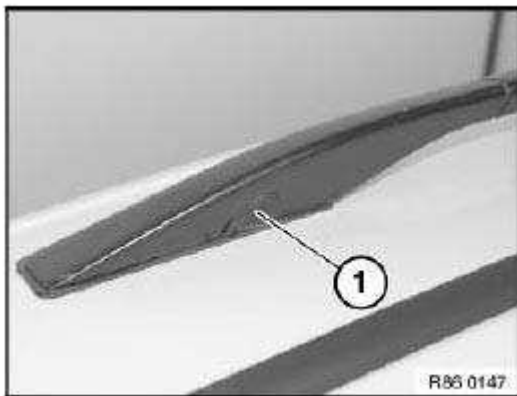


Fig. 182: Identifying Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew bolt (1).

After releasing three retaining screws, lift off roof railing (2).

Installation:

Check molded sealing parts for faults and replace if necessary. Pay attention to identification of molded sealing parts and position accordingly.

Check butylene tape seal.

Use new screws. Coat all screws with OKS 90 thread locking adhesive.

First screw down railing adapter in middle. Then press roof railing downwards with a force of approx. 50 N. Then screw down railing adapter at front and rear.

Tightening Torque for roof railing at front and rear, refer to **86 21 HOOD** .

Tightening Torque for roof railing in middle, refer to **86 21 HOOD** .

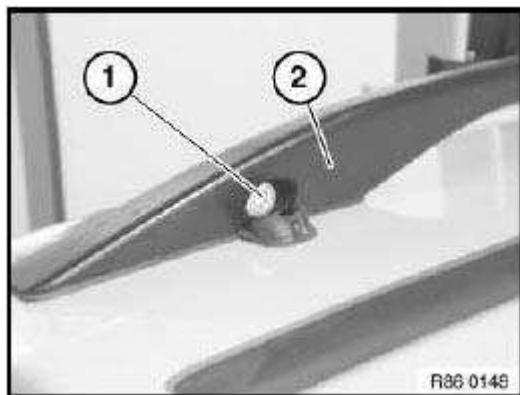


Fig. 183: Identifying Roof Railing And Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

86 21 ... REMOVING ROOF RAILING ADAPTER

NOTE: Removing roof railing, refer to **86 21 ... REMOVING ROOF RAILING**

Remove molded sealing part (1).

Installation:

All molded sealing parts must rest flat on hood. Molded sealing parts are marked according to their position.

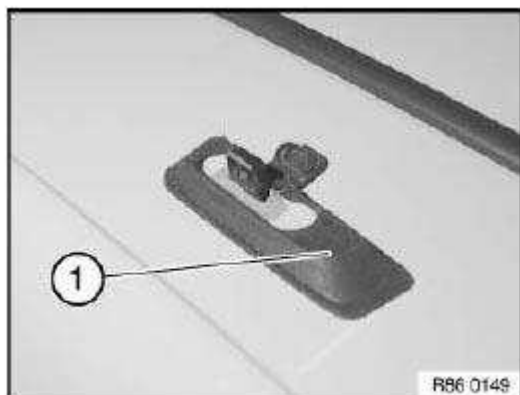


Fig. 184: Identifying Molded Sealing Part

Courtesy of BMW OF NORTH AMERICA, INC.

Cut butylene tape (1) out of railing adapter (2) along dotted line (3) with a knife.

Installation:

Use butylene tape, 5 mm round, for sealing railing adapter on hood roof.

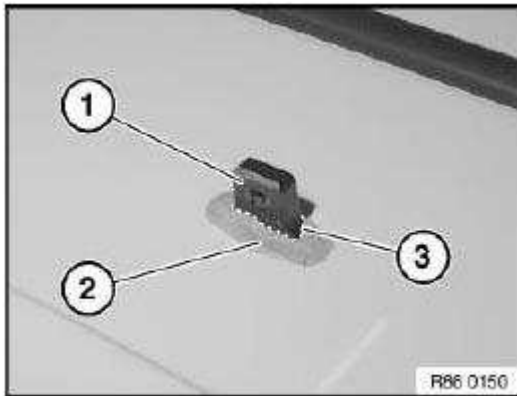


Fig. 185: Identifying Butylene Tape & Railing Adapter
Courtesy of BMW OF NORTH AMERICA, INC.

Railing adapters at front and rear: Release screws (1) from inside of hood. Pull out railing adapter (2) and spacer plate (3) towards bottom.

Installation:

Use new screws. Coat all screws with OKS 90 thread locking adhesive. Install spacer plate (3) in its original position.

Tightening Torque for railing adapters at front and rear, refer to **86 21 HOOD** .

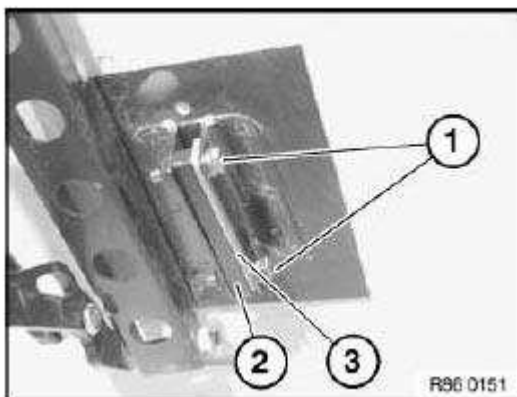


Fig. 186: Identifying Railing Adapter, Screws & Spacer Plate
Courtesy of BMW OF NORTH AMERICA, INC.

Railing adapter in middle: Release screws (1) from inside of hood. Twist out railing adapter from outside.

Installation:

Use new screws. Tightening Torque for railing adapter in middle, refer to **86 21 HOOD** .

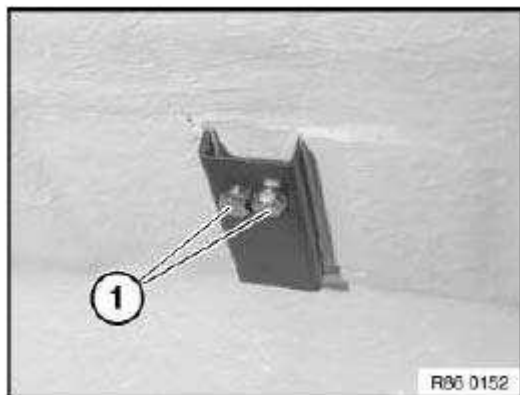


Fig. 187: Identifying Hood Screws

Courtesy of BMW OF NORTH AMERICA, INC.

86 21 ... REMOVING ROTARY STRIKER LOCK

The following text describes how to remove the rotary striker lock on the rear lid as an example. Proceed in the same way for the side lids. Remove the lock while the lid is open.

Release screws (1) and remove cover (2). On rear lid, remove red cap (3).

Installation, rear lid only:

Place red cap back on pull rod. Red cap serves to indicate rear lid emergency unlocking facility.

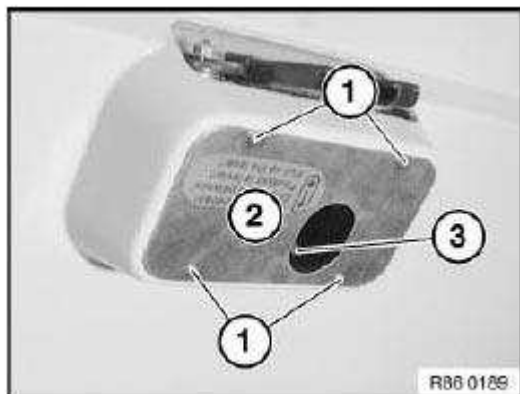


Fig. 188: Identifying Screws, Cover & Red Cap

Courtesy of BMW OF NORTH AMERICA, INC.

Remove spring nut (1) from pull rod (2).

Installation:

Use new spring nut.

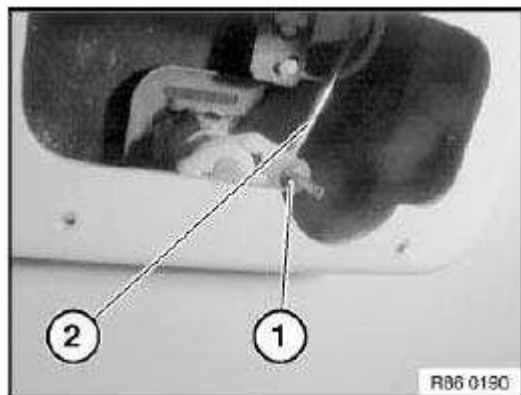


Fig. 189: Identifying Spring Nut & Rod
Courtesy of BMW OF NORTH AMERICA, INC.

Unhook pull rod (1) from rocker (2).

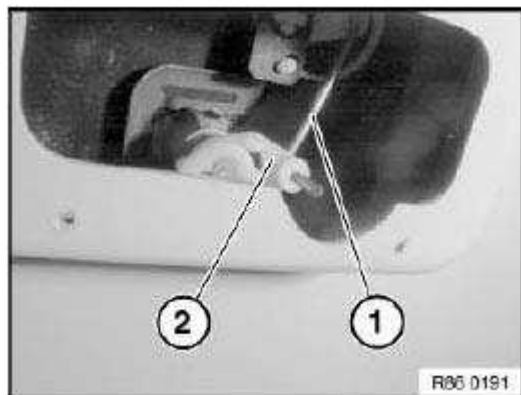


Fig. 190: Identifying Rod & Rocker
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) and remove rotary striker lock (2) from opening (3).

Installation:

Tightening Torque, refer to **86 21 HOOD** .

Use new Stover nuts.

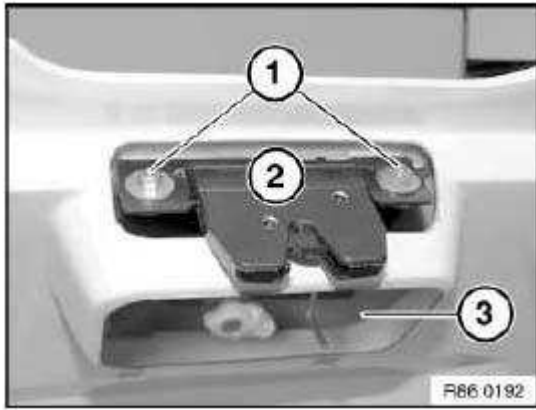


Fig. 191: Identifying Sealing Compound & Rivets
 Courtesy of BMW OF NORTH AMERICA, INC.

Detach spring nut (1) from pull rod (2). Remove pull rod (2) from rotary striker lock (3).

Installation:

Use new spring nut.

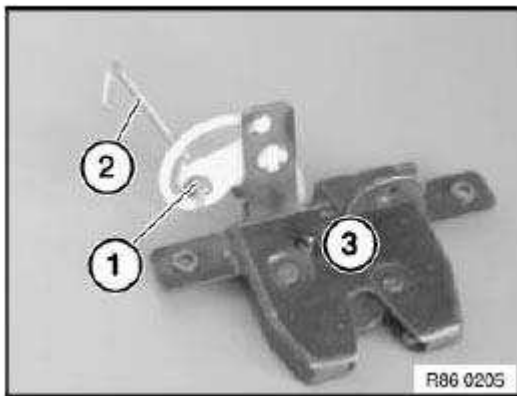


Fig. 192: Identifying Spring Nut, Rod & Rotary Striker Lock
 Courtesy of BMW OF NORTH AMERICA, INC.

86 21 ... REMOVING SIDE LID HINGE

NOTE: Remove side lid, refer to 86 21 ... REMOVING LID.

Remove gas spring, remove gas spring on hinge side only, refer to 86 21 ... REMOVING GAS SPRING.

Unscrew bolt (1). Remove hinge (2). If fitted, remove spacer plate(s) (3).

Installation:

Pass screws (1) again through spacer tubes. Reinstall existing spacer plate(s) in its/their original position(s). Use new self-locking nuts.

Tightening Torque, refer to **86 21 HOOD** .

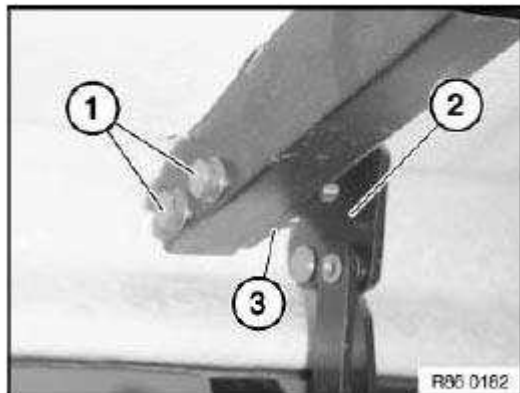


Fig. 193: Identifying Hinge, Spacer Plate & Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

86 21 ... REPLACING INSIDE LIGHT

Unclip cover (1) at side recess (arrowed) and remove towards bottom.

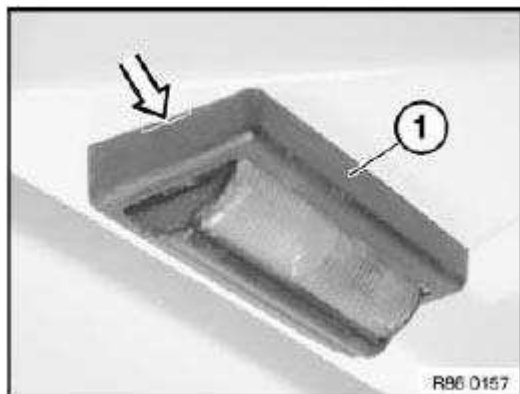


Fig. 194: Removing Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Unclip lamp housing (1) at side recess (arrowed).

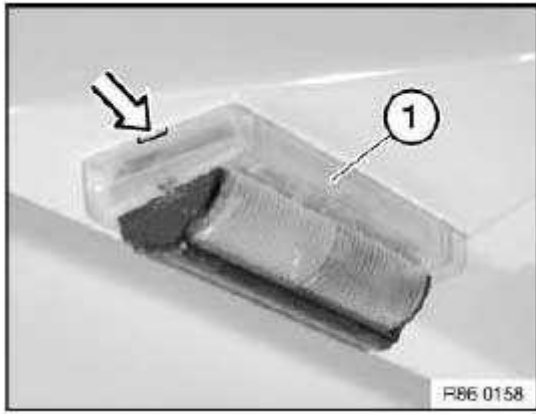


Fig. 195: Unclipping Lamp Housing At Side Recess
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect flat connector (1) from flat connector contact.

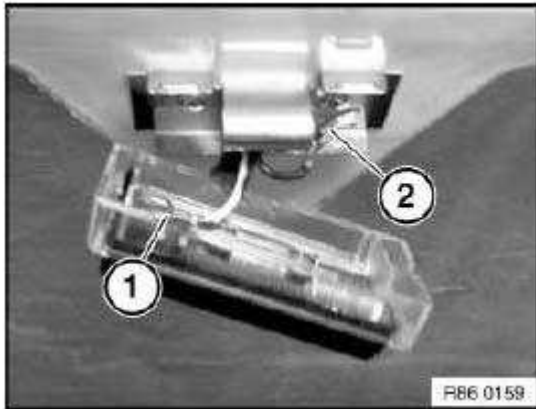


Fig. 196: Disconnecting Flat Connector From Flat Connector Contact
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Before drilling out rivets, drive in rivet pins with a punch. Drill out rivets (1). Pull off inside light mounting bracket (2) over flat connector (3).

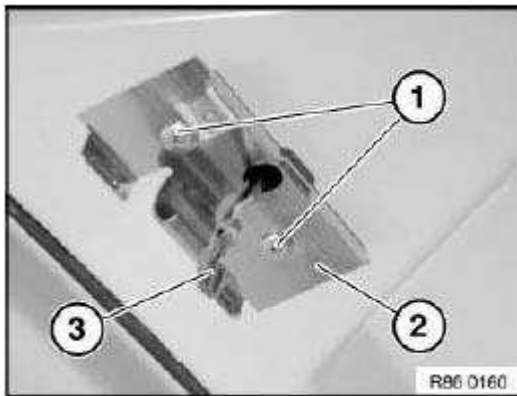


Fig. 197: Identifying Rivets, Inside Light Mounting Bracket & Flat Connector
Courtesy of BMW OF NORTH AMERICA, INC.

86 21 ... REPLACING INSIDE LIGHT POWER CABLE

NOTE: Remove inside light cover and lamp housing,
refer to **86 21 ... REPLACING INSIDE LIGHT.**

Remove inside light plug, refer to **86 21 ... REMOVING PLUG FOR INSIDE LIGHT**

Carefully remove adhesive bonds of power cable (1) from hood surface.

Installation:

Carefully remove traces of old adhesive with a scraper. Use standard heat gun adhesive as adhesive.

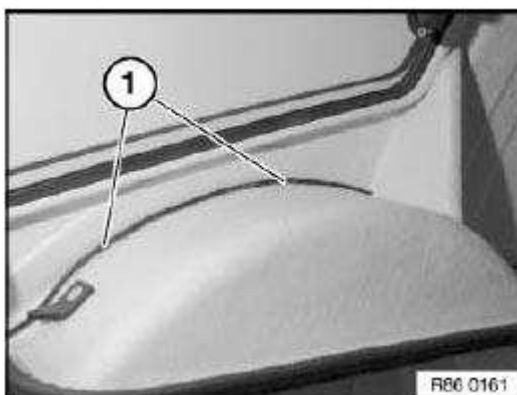


Fig. 198: Identifying Power Cable
Courtesy of BMW OF NORTH AMERICA, INC.

Carefully remove adhesive bonds of power cable (1) from hood surface.

Installation:

Carefully remove traces of old adhesive with a scraper. Use standard heat gun adhesive as adhesive.

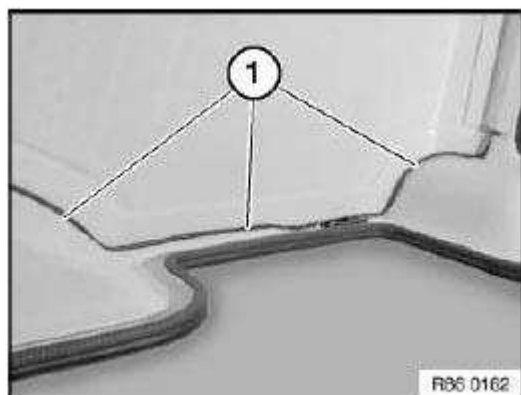


Fig. 199: Identifying Power Cable

Courtesy of BMW OF NORTH AMERICA, INC.

Remove flat connectors (1). Strip cable ends (2) and connect to a new cable. Feed cable connection through opening (3).

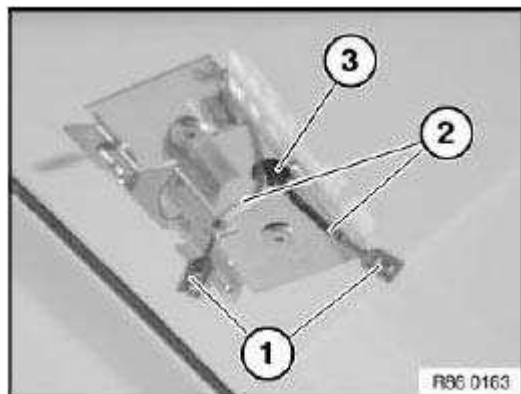


Fig. 200: Identifying Opening, Flat Connectors & Cable Ends

Courtesy of BMW OF NORTH AMERICA, INC.

Lay new power cable with old power cable through duct (1).

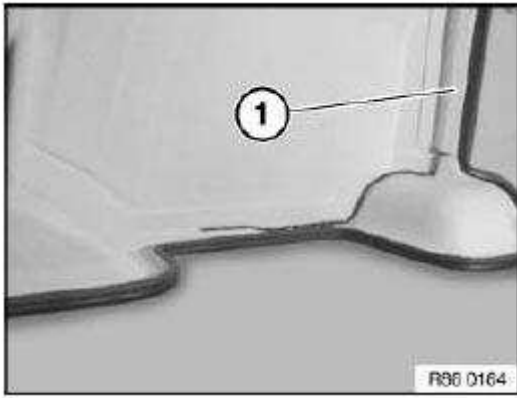


Fig. 201: Identifying Duct
Courtesy of BMW OF NORTH AMERICA, INC.

ACCESSORIES AND EQUIPMENT

Various Accessories - Tightening Torques - X3

60 VARIOUS ACCESSORIES

71 60 TRAILER HITCH

TRAILER HITCH TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Trailer tow hitch to body	E53	Nut M10 and screw M10 10.9	<ol style="list-style-type: none">1. Collar nuts M10 trailer tow hitch / rear panel2. M10 screws to axial struts, top and bottom	59 Nm
	E70		Replace nuts	108 Nm
	E83	M12		71 Nm

ACCESSORIES & EQUIPMENT

Body Cavity Sealing and Undercoating - Operating Fluids

1.0 GENERAL INFORMATION ON PRESERVATION MEASURES

The classic quality of BMW automobiles is based on the long-term comprehensive research and testing, the design, the applied materials and the manufacturing procedures in modern production plants.

BMW recommends cleaning the engine, engine compartment, vehicle underside, axles and engine/transmission at least twice annually, and then waxing the car or repairing the wax coating. This should be performed before or after the period of salt usage on streets.

New cars parked outdoors should be waxed at BMW centers before delivery to customers. This is to avoid deposits damaging to the paint finish, such as air-born rust particles, chemical dust, oil saturated soot, sulfur dioxide (acid) rain, etc. settling on the horizontal surfaces. Bird and insect droppings as well as tree resin could mar the paint finish, forming spots, swelling and pitting in the paint coat.

Wax films on the engine, engine compartment and A pillars (hinge areas) are intentional and prevent corrosion. Such wax film should not be removed.

Unwaxed cars should be washed at least once each week. Parked cars must never be protected with plastic or other nonporous material covers. This will damage the paint finish due to condensed water in conjunction with plastic softener diffusion and scratching.

2.0 BODY CAVITY SEALING

It is only necessary to re wax or seal the affected area after repairing the body.

Only BMW approved products may be used to comply with the six year warranty against rust perforation. These products protect cavities effectively and permanently against corrosion. Their excellent coating and waterproofing properties let them flow into all inaccessible corners and folds for unsurpassed overall protection.

Underbody and Body Cavity Sealing Compound

For sealing of body cavities, such as doors, A-pillars, front, side and cross members, etc.

(Former BMW Part No. 81 22 9 407 479)

3M Part No. 8891

Wurth Part No. 892080

Also: Wurth "Brushable Seam Sealer", Part No. 8901021.

3.0 BODY CORROSION PROTECTION

To comply with the six year warranty against rust, specially selected waxes and additives produce an elastic, temperature-proof, corrosion inhibiting protectant. The corrosion protection thickness should measure a maximum of 30 microns, but can be varied as desired by repeating the spraying procedures accordingly.

Procedure:

Clean underside of car to remove grease, oil and dirt. Cover rotating parts and parts not undercoated, such as driveshaft, brake discs, brake hoses, springs, exhaust pipes, etc.

After completion of body repairs, the affected areas must have corrosion protection reapplied. This applies, also, if the BMW Annual Check shows that the corrosion protection has to be repaired.

UNDERBODY SEALING

Quick-drying, rubber-based, paintable. Compatible with PVC-based undercoat, front apron and door sill coatings. (Former BMW Part Nos. 81 22 9 407 001, 81 22 9 407 521/522)

3M Part No. 8883

Wurth Part No. 892072

Loctite Part No. 81833 (or PX135EA)

CRC Part No. Siloo 28A

Also: Wurth "Body Seal, beige", Part No. 0892091 U.

BODY SEALANT, LIGHT

Sealing compound for all joints and seams, can be painted over. Good adhesion, free of shrinkage, resistant to heat and cold temperatures, permanently elastic.

(Former BMW Part Nos. 81 22 9 400 013 and 81 22 9 407 313)

3M Part No. 8361

Wurth Part No. 893430

SEAM SEALER, WHITE

Elasto-plastic sealing compound based on polyacrylate.

Applications: Protection of door and hood panel seams.

(Former BMW Part No. 81 22 9 407 675)

3M Part No. 8361

Würth Part No. 890100025

Also: Würth "Gray Seam Sealer", Part No. 089228 U.

TRANSPARENT WAX

Prevents corrosion on painted and non-painted metal surfaces. Serves mainly for treating edges and folded-over seams. (Former BMW Part No. 81 22 9 400 711)

3M Part No. 8892

Würth Part No. 893082

ANTI-CHIP COMPOUND

Sprayable coating compound for outside and inside. For sealing, noise-insulation and as protection against flying stones.

Quick-drying can be painted over, permanently elastic, heat and cold-resistant.

(Former BMW Part Nos. 81 22 9 407 001 and 81 22 9 407 416)

3M Part No. 8964

Würth Part No. 893075

Loctite Part No. 81833/PX135EA

4.0 OTHER FLUIDS

ADHESIVE REMOVER

(Former BMW Part No. 81 22 9 407 388)

3M Part No. 8984

RUST REMOVER

(Former BMW Part No. 81 22 9 407 121)

Würth Part No. 89091801

ACCESSORIES & EQUIPMENT

Body Equipment - Operating Fluids

1.0 ADHESIVES/SEALANTS FOR GLASS

Sikaflex 255 Adhesive is a single component polyurethane with a minimum curing time of 4 hours at 72°F/22°C and 38% relative humidity.

The windshield or rear window must be installed within 10 minutes of applying the adhesive or a skin will form on the adhesive's surface and reduce the adhesive effectiveness.

Sikaflex 255, BMW Part No. 81 22 9 407 497 Cold Kit, or

Sika Ultrafast, BMW Part No. 83 19 9 407 714 in conjunction with Heater, BMW Part No. 83 19 9 407 820.

2.0 OTHER FLUIDS

Cleaning E53 black glossy exterior ornamental trim please use Meguiar's Mirror Glaze Number 9 Professional Swirl Remover 2.0

Glass treatment, all models: Aquapel® Glass Treatment, BMW Part No. 83 19 9 408 523.

3.0 CONTACT CEMENT

A powerful adhesive for leather and leatherette, rubber moldings, felt linings, insulating materials, convertible top adhesive, etc.

(former BMW Part No. 81 22 9 407 524)

3M 1357 High Performance Contact Adhesive

4.0 INSTANT ADHESIVE FOR RUBBER, METAL AND PLASTIC SURFACES.

Applications: Rubber profiles on windows, doors, bumpers (soft and hard rubber), seals, inner covers, buttons and controls (plastic/plastic, plastic/steel), circuit elements (electronics), rear lights, turn indicators, ornamental strips and moldings.

(former BMW Part No. 81 22 9 407 143)

BMW PART NUMBER SPECIFICATION

3M	Part No. 8155
Loctite	Part No. 49450

5.0 LOCTITE 380

Black cyanoacrylate adhesive for joining metals, but also rubber, PVC etc.

Particularly recommended for attaching rubber door seals on the BMW 5 Series (E34). (former BMW Part No. 81 22 9 407 394)

BMW PART NUMBER SPECIFICATION

3M	Part No. 8155
Würth	Part No. 893 4103
Loctite	Part No. 38050

6.0 GLASS ADHESIVE

BMW Part No. 81 22 9 407 497.

7.0 PREMIUM LEATHER CARE KIT

BMW Part No. 81 11 024 455.

ACCESSORIES AND EQUIPMENT

Body Equipment - SI Techniques - X3

INTERIOR MIRROR WITH DIGITAL COMPASS

E70, E83, E90, E91, E92, E93



Fig. 1: Interior Mirror With Digital Compass
Courtesy of BMW OF NORTH AMERICA, INC.

INTRODUCTION

A digital compass in the interior mirror is offered as an optional extra (option 4NA) for the following BMW vehicles: 3 Series and X3 and X5.

> **Up to 09/2006**

A small LC display at top right in the interior mirror indicates the point of the compass in which the direction of travel is pointing: e.g. **SW** for South West.

> **From 09/2006**

The display is effected with transmitted light technology. An LC display (window) is no longer needed. The display can be deactivated.

The compass offers an additional benefit especially in the USA. In large cities the streets are frequently arranged according to the points of the compass. The points of the compass are also marked on signposts. The compass also makes orientation in European cities easier.

NOTE: Option 4NA only in conjunction with option 430 or 431.

Option 4NA "Interior mirror with digital compass" is offered only in conjunction with the following option:

- Option 430 "Interior mirror and exterior mirrors with automatic antiglare control"
- Option 431 "Interior mirror with automatic antiglare control"

Option 4NA **cannot** be combined with option 449 "Interior mirror with toll function for Japan".

Option 4NA **cannot** be combined with option 802 "Korea version".

Option 4NA **cannot** be combined with option 5AC "Main-beam assistant".

BRIEF DESCRIPTION OF COMPONENTS

The following components deliver signals for the digital compass:

- **Magnetic field sensor**

> **up to 09/2006**

The magnetic field sensor is installed in the mirror base. The magnetic field sensor measures the current alignment of the magnetic field. The signal is sent to the control electronics for the compass in the interior mirror.

> **from 09/2006**

The magnetic field sensor is on the PCB in the interior mirror.

- **Control electronics for the compass**

The interior mirror is electrically connected to the roof control panel (FZD).

The control electronics for the compass are integrated into the board for the interior mirror. The signals from the magnetic field sensor are received by the control electronics. The LCD display is activated directly by the control electronics.

The following components are controlled:

- **Display in interior mirror**

> up to 09/2006

The LC display (window) is situated at top right in the interior mirror.

The points of the compass are presented digitally on the LCD display (LCD: Liquid Crystal Display). The display is divided into eight compass points.

> from 09/2006

The point of the compass is displayed in transparent light technology in the interior mirror as well. The display is likewise situated at top right in the interior mirror. The display is divided into 8 points of the compass.

SYSTEM FUNCTIONS

The following system functions for the digital compass are described:

- Display
- Brightness control of display
- Adjustment of magnetic field zones and calibration
- from 09/2006: Further adjustments
- up to 09/2006: Fault display

Display

The 8 points of the compass are digitally displayed by abbreviations.

> From 09/2006

The display is available in English and German (delivery status: English LHD)

N: North

NE: North East

E: East

SE: South East

S: South

SW: South West

W: West

NW: North West

The changeover between displays is carried out as follows:

- The current vehicle position is the center of a 360° circle.
- The eight points of the compass divide these 360° into sixteen 22.5° segments.
- The display changes over if the direction of travel changes by more than 22.5°.

Brightness control of display

2 photocells in the electrochromic interior mirror record the surrounding brightness (1 photocell for the surrounding brightness coming from the front, 1 photocell for the surrounding brightness coming from the rear).

The photocells deliver the signals for the display brightness control.

The brightness of the display is adjusted by the interior mirror control electronics to suit the surrounding brightness.

Adjustment of magnetic field zones and calibration

The worldwide magnetic field zones are permanently stored in the interior mirror. The magnetic field zones represent the deviations in relation to an ideal magnetic field for earth. The orientation "North" is precisely determined by the magnetic field zones.

The current magnetic field zone may be adjusted according to the geographic location. For example, Germany is located in magnetic field zone "8".

A vehicle has its own magnetic field. This makes it possible for the magnetic field sensor to measure an overlapping of the magnetic field with the earth's magnetic field. This overlapping is "worked out" by calibrating the compass.

A changed magnetic field is normally calibrated "automatically".

The vehicle's magnetic field may change under the following special circumstances:

- Powerful vibration during an accident
- Very large external magnetic field - e.g. if a vehicle passes under a train when travelling through an underpass

However, a manual calibration may speed up the automatic calibration.

For procedure to be followed when setting the magnet field zones as well as manual calibration: see notes for service staff.

from 09/2006: Further adjustments

Different time-based adjustment menus can be obtained by means of the adjustment button:

- 0 to 3 seconds: Display ON/OFF

- 3 to 6 seconds: Adjustment of magnetic field zones (0 -15)
- 6 to 9 seconds: Calibration (C)
- 9 to 12 seconds: Left-hand drive or right-hand drive (L or R)
- 12 to 15 seconds: English or German (E or O)

Release the adjustment button when the correct menu is obtained. Select values in the menu by pressing briefly. After approx. 5 seconds the value is stored and the menu is automatically exited.

up to 09/2006: Fault display

The LC matrix for the LCD display lights up completely if a system fault develops. A fault is displayed under the following conditions:

- If the vehicle is highly magnetized (2,200-2,500 milligauss), the measuring range of the magnetic field sensor will be exceeded.
- If a fault develops in the circuitry of the magnetic field sensor.

NOTE: regarding the physical unit "gauss".

Gauss is the unit of measurement for magnetic flux density.

ACCESSORIES AND EQUIPMENT

Body Equipment - Special Tools - X3

51 BODY EQUIPMENT

51 0 010 TEST GAUGE FOR WINDSCREEN AND REAR WINDOW INSTALLATION

Minimum set: Mechanical tools

Note: (replaces special tool 51 3 210 from 06/2005)

Series: E38, E38/3, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E68, E70, E81, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53, R56, RR1, RR2

SI number: 1 10 05 (189)

Order number: 51 0 010

Test gauge for windscreen and rear window installation

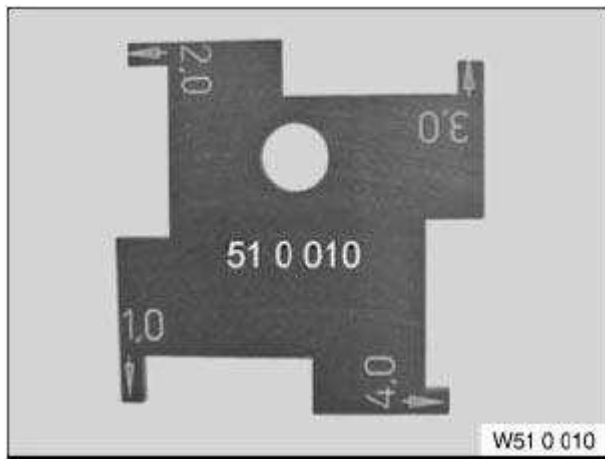


Fig. 1: Test Gauge For Windscreen And Rear Window (51 0 010)
Courtesy of BMW OF NORTH AMERICA, INC.

51 0 040 HOOD/BONNET STAY (2 X)

Minimum set: Mechanical tools

Note: For locking hood/bonnet in assembly position

Series: E83

Storage location: C48

SI number: 1 24 03 (040)

Order number: 51 0 040

Hood/bonnet stay (2 x)

51 0 101 SUPPORT, RIGHT

Note: Gantry crane

SI number: 6 04 03 (046)

Order number: 51 0 101

Support, right

51 0 102 SUPPORT, LEFT

Note: Gantry crane

SI number: 6 04 03 (046)

Order number: 51 0 102

Support, left

51 0 103 BRIDGE

Note: Gantry crane

SI number: 6 04 03 (046)

Order number: 51 0 103

Bridge

51 0 104 WINDSCREEN/REAR WINDOW LOCATING FIXTURE

Note: Gantry crane

SI number: 6 04 03 (046)

Order number: 51 0 104

Windscreen/rear window locating fixture

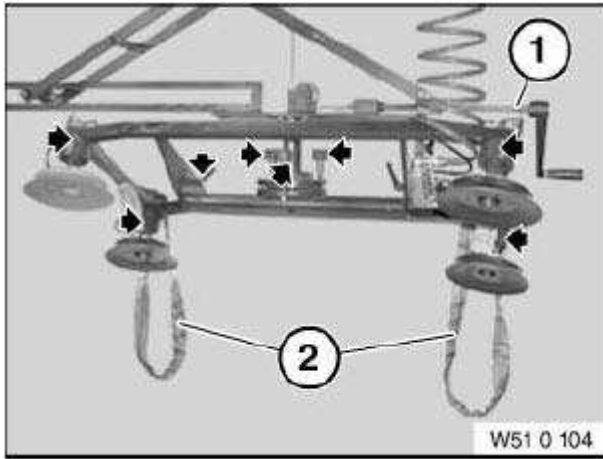


Fig. 2: Windscreen/Rear Window Locating Fixture (51 0 104)
Courtesy of BMW OF NORTH AMERICA, INC.

51 0 105 SIDE WINDOW LOCATING FIXTURE

Note: for gantry crane

SI number: 6 04 03 (046)

Order number: 51 0 105

Side window locating fixture

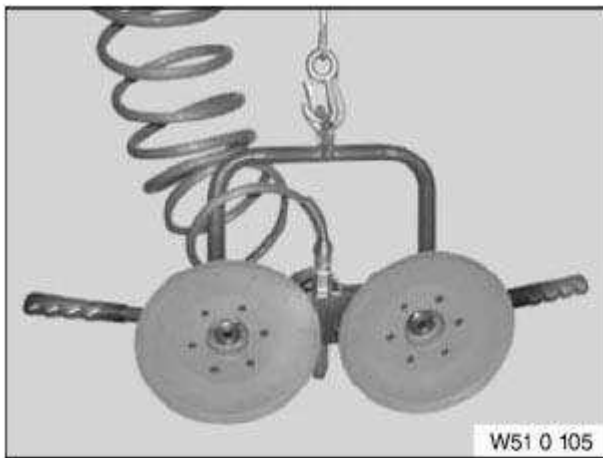


Fig. 3: Side Window Locating Fixture (51 0 105)
Courtesy of BMW OF NORTH AMERICA, INC.

51 0 106 VACUUM PUMP

Note: for gantry crane

SI number: 6 04 03 (046)

Order number: 51 0 106

Vacuum pump

51 0 107 HOISTING WINCH

Note: for windscreen/rear window locating fixture on gantry crane

SI number: 6 04 03 (046)

Order number: 51 0 107

Hoisting winch

51 0 108 HOISTING WINCH

Note: for side window locating fixture on gantry crane

SI number: 6 04 03 (046)

Order number: 51 0 108

Hoisting winch

51 0 109 SUCTION CUP

Note: Gantry crane

SI number: 6 04 03 (046)

Order number: 51 0 109

Suction cup

51 0 300 PRESSURE ROLLER

Note: For pressing sound insulation into doors, various rubber seals and trims

Series: E46, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53, R56, RR1

SI number: 01 07 06 (271)

Order number: 51 0 300

Pressure roller

Consisting of:

1 = 51 0 301 Handle

2 = 51 0 302 Roller



Fig. 4: Pressure Roller (51 0 300)

Courtesy of BMW OF NORTH AMERICA, INC.

51 0 310 CLIP RELEASE TOOL

Note: For releasing trim panels and headliners.

Series: E52, E53, E60, E61, E63, E64, E65, E66, E67, E68, E70, E81, E83, E85, E86, E87, E90, E91, E92, E93

SI number: 1 03 07 337

Order number: 51 0 310

Clip release tool

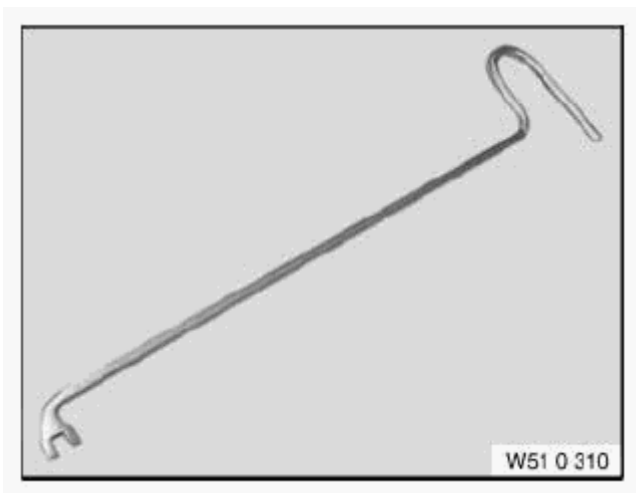


Fig. 5: Clip Release Tool (51 0 310)
Courtesy of BMW OF NORTH AMERICA, INC.

51 2 100 CLAMPING LEVER

Note: For torsion bar springs of rear lid. Torsion bar spring for seat tilt adjustment (E46, E53, E83 and E84).

Series: E12, E21, E23, E24, E28, E30, E46, E46/16, E46/2, E46/3, E46/5, E53, E83, E85

Storage location: B5, C5

Order number: 51 2 100

Clamping lever

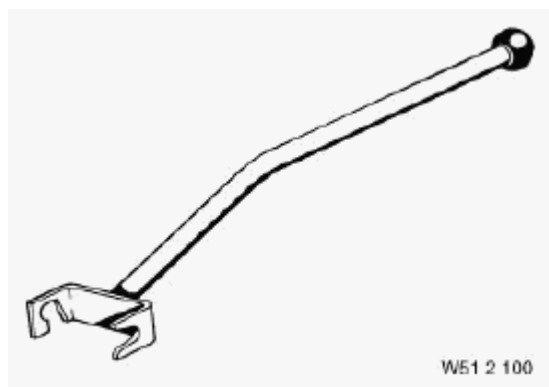


Fig. 6: Clamping Lever (51 2 100)
Courtesy of BMW OF NORTH AMERICA, INC.

51 2 190 DOOR LOCK TENSIONER

Minimum set: Mechanical tools

Note: For pretensioning front and rear door locks during installation. Change to tool through use of noise-

optimized locks from 02/2004. Illustration items: 1 = Knurled nut 51 2 191 2 = Support 51 2 192 3 = Guard 51 2 196 4 = Mandrel 51 2 197

Series: E60, E61, E63, E64, E65, E66, E67, E70, E81, E83, E85, E86, E87, E90, E91, E92, E93, RR1

Storage location: B44, C44

SI number: 1 06 02 (864)

Order number: 51 2 190

Door lock tensioner

Consisting of:

1 = 51 2 191 Knurled nut

2 = 51 2 192 Support

3 = 51 2 196 Guard

Note: replaces guard 51 2 193

4 = 51 2 197 Mandrel

Note: replaces mandrel 51 2 194

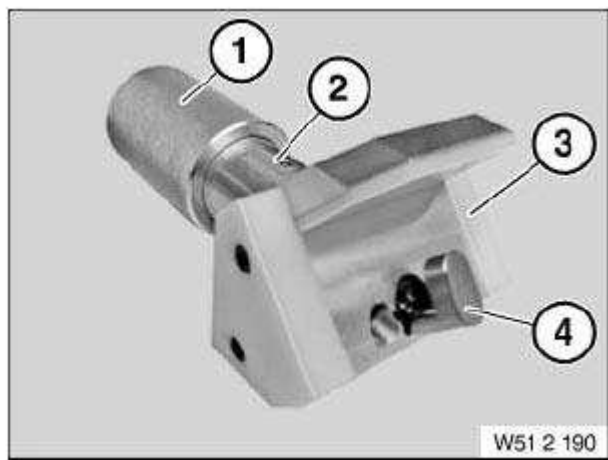


Fig. 7: Door Lock Tensioner (51 2 190)
Courtesy of BMW OF NORTH AMERICA, INC.

51 2 196 PROTECTION

Note: Replaces protection 51 2 193

Order number: 51 2 196

Protection

51 2 197 DRIFT

Note: Replaces drift 51 2 194

Order number: 51 2 197

Drift

51 2 220 TORX

Minimum set: Mechanical tools

Note: For removing door handles and window glass

Series: E60, E61, E63, E64, E83, E93, R52, RR2

Storage location: B47, C47

SI number: 1 08 03 (988)

Order number: 51 2 220

Torx

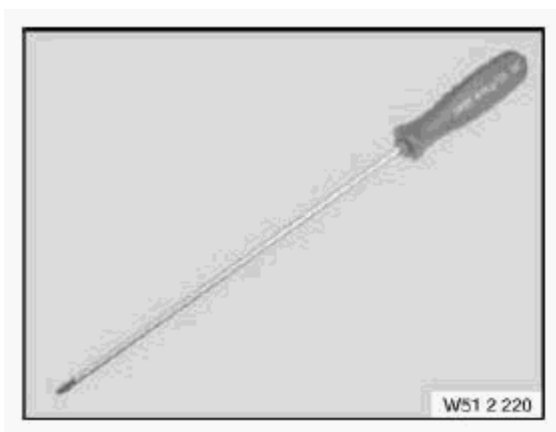


Fig. 8: Torx (51 2 220)

Courtesy of BMW OF NORTH AMERICA, INC.

51 3 010 SUCTION LIFT (2 X)

Minimum set: Mechanical tools

Note: For removing and installing window glass

Series: E12, E21, E23, E24, E28, E30, E30/C, E30tou, E31, E32, E32/3, E34, E34tou, E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E68, E70, E81, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53, R56, RR1, RR2

SI number: 1 05 86(604)

Order number: 51 3 010

Suction lift (2 x)

Consisting of:

1 = 51 3 011 Suction cup

Note: With elongated hole, suspension moveable about all axes

2 = 51 3 012 Suction cup

Note: With bore, suspension only moveable in longitudinal direction

3 = 51 3 013 Grab handle

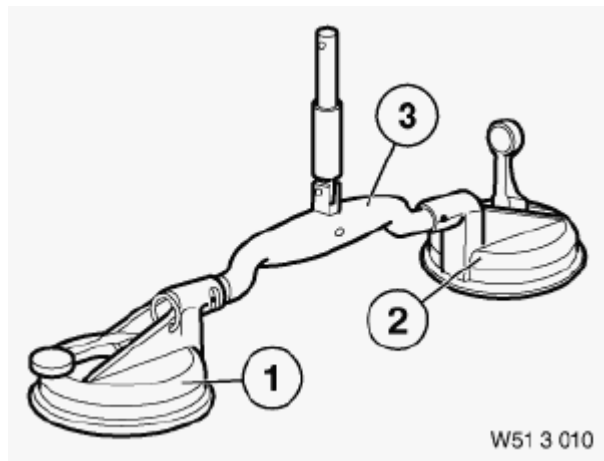


Fig. 9: Suction Lift (2 x) (51 3 010)

Courtesy of BMW OF NORTH AMERICA, INC.

51 3 090 CLAMPING STRAP

In conjunction with: 51 3 010

Note: For installing rear side windows

Series: E30tou, E34tou, E39, E39tou, E61, E83, E91, RR1

SI number: 1 04 93 (664)

Order number: 51 3 090

Clamping strap

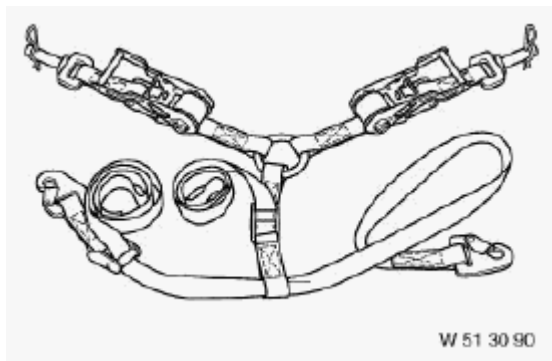


Fig. 10: Clamping Strap (51 3 090)

Courtesy of BMW OF NORTH AMERICA, INC.

51 3 180 LEVER

Note: For removing fixed rear side windows and for removing elasto-belt.

Series: E34, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E60, E61, E70, E83, E87, E90

Storage location: B4

Order number: 51 3 180

Lever

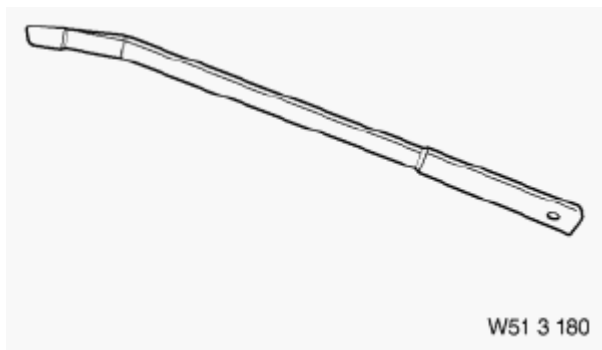


Fig. 11: Lever (51 3 180)

Courtesy of BMW OF NORTH AMERICA, INC.

51 3 210 GAUGE

Note: For adjusting cemented windscreen to fit Replaced by special tool 51 0 010

Series: E38, E39, E60, E61, E63, E64, E65, E66, E67, E83, E85, E87, E90, E91, R50, R52, R53, RR1

Storage location: C5

SI number: 1 10 96(097)

Order number: 51 3 210

Gauge

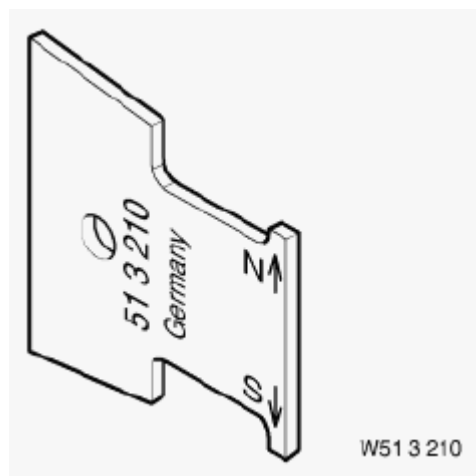


Fig. 12: Gauge (51 3 210)

Courtesy of BMW OF NORTH AMERICA, INC.

51 3 220 HAND-HELD SUCTION CUP

Note: For lifting out side windows

Series: E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E83, E85, E87, E90, E91, E92, E93, R50, R52, R53, R56, RR1

SI number: 1 17 00(623)

Order number: 51 3 220

Hand-held suction cup

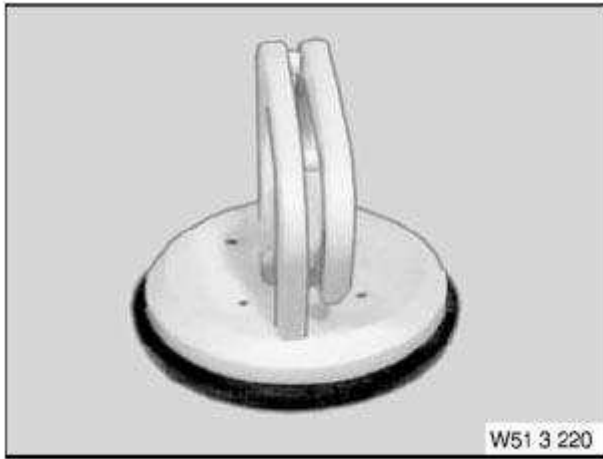


Fig. 13: Hand-Held Suction Cup (51 3 220)
Courtesy of BMW OF NORTH AMERICA, INC.

51 3 270 PULL HANDLES

Note: Cutting wire pull handles fore removing rear, quarterlight and side windows

Series: E36, E38, E39, E46, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53, RR1, RR2

SI number: 1 13 03 (001)

Order number: 51 3 270

Pull handles

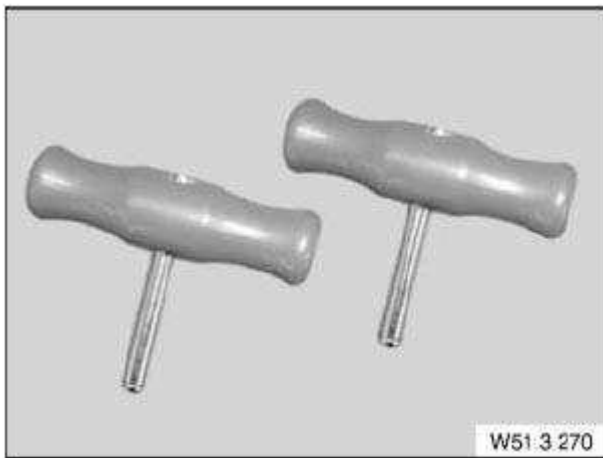


Fig. 14: Pull Handles (51 3 270)
Courtesy of BMW OF NORTH AMERICA, INC.

ACCESSORIES AND EQUIPMENT

Body Equipment - Tightening Torques - X3

31 ROOF OUTER SKIN

41 31 ROOF

ROOF - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Retaining plate, roof rack, to body	R56	M5x11		5 Nm

41 31 ROOF

ROOF - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Roof to body	E86	M6x12		8 Nm

41 31 CONVERTIBLE TOP COMPARTMENT LID

CONVERTIBLE TOP COMPARTMENT LID - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Hinge to convertible top compartment lid	RR2	M8		20 Nm

33 FRONT TRIM PANEL

41 33 FRONT TRIM PANEL

FRONT TRIM PANEL - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Front panel to support carrier	E87 / E90 / E91	M6		10 Nm
	E92 / E93	M6		12 Nm
	E85 / E86	M8x18		19 Nm
2AZ Headlight holder to front panel	E87	M6x18		8 Nm
	E90 / E91	M6x18		4.5 Nm
	E92 / E93	M6x18		6 Nm
3AZ Headlight holder to side panel, front	E87 / E90 / E91 / E92 / E93	Sheet metal screw ST4.8x22		2.5 Nm
	E90 / E91 / E92 / E93	M6		6 Nm

35 SIDE PANELS

41 35 SIDE PANELS

SIDE PANELS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Front side panel to body	E63 / E64	M6x22 10.9		12 Nm
	E83	ST6.3x14		7 Nm
	E60 / E61 / E85 / E86 / E87 / E90 / E91 / E92 / E93	M6		7.6 Nm
2AZ Front side panel to body	E63 / E64	M6 nut		5 Nm
	E60 / E61	M6 nut		7.6 Nm
3AZ Front side panel to body	E60 / E61	Sheet metal screw ST4.8x19		7.6 Nm
4AZ Combination holder, side panel, front, to body	E87 / E92	M6		7.6 Nm
5AZ Side panel, rear, to body	E85 / E86	M6		7.6 Nm
6AZ Side panel, front, to module carrier/bumper carrier	E70	M6x16		8 Nm
7AZ Front side panel to body Area, A-pillar	E70	M6x16		6 Nm
8AZ Front side panel to body Area, sill	E70	Sheet metal screw ST4.8x19		2.5 Nm
9AZ Front side panel to body Area, cowl panel	E70	M5x20		2.5 Nm
10AZ Module carrier, top, to support carrier	E70	M6x26		8 Nm
11AZ Module carrier, bottom, to engine carrier	E70	M6 nut		8 Nm

51 FRONT SIDE DOORS

41 51 FRONT DOORS

FRONT DOORS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Hinge pin	E83	M10x56		10 Nm
	E60 / E61 / E85 / E86 / E70	M8 nut		27 Nm
	E63 / E64	M6x22 8.8		10.5 Nm
	E87 / E90 / E91 / E92 / E93	M10x1.25		25 Nm
2AZ Door to door				

hinge	E63 / E64	M8 nut	20 Nm
	E60 / E61	M8x28	20 Nm
	E70	M8x28	20 Nm
	E83	M8 nut	18.5 Nm
	E85 / E86 / E87 / E90 / E91 / E92 / E93	M8 nut	20 Nm
3AZ Door hinge to body	E63 / E64	M10x35 10.9	46 Nm
	E60 / E61 / E70	M12x36 8.8	66 Nm
	E83	M10x35 10.9	56 Nm
	E85 / E86	M10x35 10.9	30 Nm
4AZ Door plug connection to body	E60 / E61 / E63 / E64 / E70 / E83 / E85 / E86 / E87 / E90 / E91 / E92	M5x16	3 Nm

41 51 DOORS

DOORS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Hinge pin	RR	M8 nut		27 Nm
2AZ Door to door hinge	RR2	M8x25		24 Nm
3AZ Door hinge to body	RR2	M12x36		66 Nm
4AZ Rear door to hinge	RR1	M8x28		28 Nm
5AZ Hinge, rear door, to body	RR1	M8x24		28 Nm
6AZ Door plug connection to body	RR	M5x16		3 Nm

52 REAR SIDE DOORS

41 52 REAR SIDE DOORS

REAR SIDE DOORS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Hinge pin	E83	M10x56		10 Nm
	E60 / E61 / E70	M8 nut		27 Nm
	E87 / E90 / E91	M10x1.25		25 Nm
2AZ Door to door hinge	E83	M8 nut		18.5 Nm
	E60 / E61	M8x25		24 Nm
	E70	M8x28		20 Nm
	E87 / E90 / E91	M8 nut		20 Nm
		M10x35		

3AZ Door hinge to body	E83	10.9		56 Nm
	E60 / E61 / E70	M12x36 8.8		66 Nm
4AZ Door plug connection to body	E60 / E61 / E70 / E83 / E87 / E90 / E91	M5x16		3 Nm
5AZ Crash reinforcement to inner door panel	E70	M8x20		18.5 Nm

61 FRONT LID

41 61 ENGINE BONNET/HOOD

ENGINE BONNET/HOOD - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Engine bonnet/hood to bonnet/hood hinge	E63 / E64	M8 8.8		18.5 Nm
	E83 / E87 / E90 / E91 / E92 / E93	M8		15 Nm
	E60 / E61	M8x24 8.8		18.5 Nm
	E85 / E86 / E70	M8		20 Nm
2AZ Bonnet/hood hinge to body	E63 / E64	M8 8.8		18.5 Nm
	E83	M8x20 10.9		15 Nm
	E83 / from 05/2006	M8x30 10.9		25 Nm
	E60 / E61	M8x24 8.8		18.5 Nm
	E85 / E86 / E87 / E90 / E91 / E92 / E93 / E70	M8		20 Nm
3AZ Threaded pin, spacer	E70	M6		14 Nm

41 61 ENGINE BONNET/HOOD

ENGINE BONNET/HOOD - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Engine bonnet/hood to bonnet/hood hinge	RR1 / RR2	M8		20 Nm
2AZ Bonnet/hood hinge to body	RR1 / RR2	M8		20 Nm

62 REAR LID

41 62 REAR LID

REAR LID - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Rear lid to rear lid hinge	E63	M6x22		10 Nm
	E64	M8x24		18.5 Nm
	E61	ASA nut M8		20 Nm
	E61	M10 nut		38 Nm
	E60	M8x19.5 8.8		18.5 Nm
	E83 / E85 / E86	M8		20 Nm
	E70 / E87	M8		18.5 Nm
	E90 / E92	M8		15 Nm
	E91	M8		30 Nm
	E93	M8x25		20 Nm
2AZ Adjustment, rear lid hinge	E91	M8		20 Nm
3AZ Rear lid hinge to body	E61 / E83 / E85 / E86 / E90 / E92	M8		20 Nm
	E60 / E64 / E87	M8 nut		18.5 Nm
	E63 / E70	M8		18.5 Nm
	E91	M8 nut		20 Nm
4AZ Hinge pin	E60	M8 nut		18.5 Nm
5AZ Grounding cable strap to hinge	E87	M5 nut		4.4 Nm
6AZ Rear lid, bottom, to rear lid hinge, bottom	E70	M8x22		18.5 Nm
7AZ Rear lid hinge, bottom, to body	E70	M8x22		18.5 Nm
8AZ Setscrew to rear lid hinge	E70			18.5 Nm
9AZ Stop, rear lid to body	E70	M12x1.5		16 Nm
	E70	M6 nut		8 Nm

41 62 REAR LID

REAR LID - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Rear lid to rear lid hinge bracket	E46 Touring	M8x18 10.9		20 Nm
2AZ Rear lid hinge bracket to rear lid hinge	E46 Touring	M8x13 10.9		20 Nm
3AZ Nut of guide of adjustable buffer	E46 Touring	M12x1		15 Nm
	E83	M12x1.5		15 Nm
	E46			

4AZ Lock nut of adjustable buffer	Touring	M8		15 Nm
	E83	M8		10 Nm
5AZ Rear window hinge bracket to rear window hinge	E46 Touring	M8x1x13 10.9		30 Nm
6AZ Rear window to rear window hinge bracket	E46 Touring	M8x16 8.8		16 Nm

41 62 REAR LID

REAR LID - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Hinge to rear lid/hinge to upper rear lid section	RR1 / RR2	M8		18.5 Nm
2AZ Hinge, rear lid, to body/hinge, upper rear lid section, to body	RR1 / RR2	M8		18.5 Nm
3AZ Setscrews, hinge lower rear lid section	RR2	M10, countersunk screw		36 Nm
	RR2	M10, hexagon screw		27 Nm
4AZ Hinge bracket to lower rear lid section	RR2	M8		18.5 Nm
5AZ Hinge, lower rear lid section, to body	RR2	M8		20 Nm
6AZ Grounding cable strap to hinge	RR2	M6		8 Nm

ACCESSORIES AND EQUIPMENT

Exterior/Interior Trim - Repair Instructions - X3

00 GENERAL

51 00 ... INSTRUCTIONS ON STICKING FILM

1. General notes

- Bonding at room and object temperature of 18 to 25°C.
- Newly painted parts may only be bonded after a drying time of at least 24 hours.
- Optimal attachment of the film to the background surface is achieved after approx. 48 hours. Film must not be exposed to mechanical strain beforehand (car wash, strength test, etc.).

2. Auxiliary materials and tools

- Spirit, plastic squeegee, needle, cleaning cloth
- Low-surface-tension water

NOTE: Mixture ratio: 3 drops low-surface-tension detergent to 1 liter tap water.

3. Preparations

- If necessary, heat defective/old film with hot air blower and detach
- Remove all remnants of adhesive or clean new part thoroughly
- Clean the areas to be bonded with spirit immediately before bonding to remove silicone and grease residues.

NOTE: Observe ventilation time greater than 1 minute.

4. Bonding

1. Moist bonding

- Thoroughly moisten the background surface to be bonded with low-surface-tension water.
- Pull off the backing film, position the film on the background surface and slide into position.

NOTE: In the case of small-size film, the backing film can be pulled off completely and the adhesive side of the film can be moistened with low-surface-tension water.

- Press film down with plastic squeegee in overlapping strokes from inside outwards.
- Remove remaining water with a clean cloth.
- If necessary, carefully and slowly pull off protective film flat.
- Check film for bubbles and folds. If necessary, remove bubbles or folds with plastic squeegee or pierce with a needle and force out air or water.

2. Dry bonding

- Pull off backing film on adhesive side.
- Align film in correct position on car.
- Press film down with plastic squeegee in overlapping strokes (watch out for formation of bubbles and folds).
- If necessary, carefully and slowly pull off protective film flat.
- If necessary, pierce bubbles with a needle and force out air with plastic squeegee.

51 00 ... NOTES ON BONDING/ATTACHING COMPONENTS WITH DOUBLE-SIDED ADHESIVE TAPE

1. General notes

- Bonding at room and object temperature of 18 to 25°C.
- Newly painted parts may only be bonded after a drying time of at least 24 hours.
- Optimal bonding/attachment to the background surface is achieved after approx. 48 hours. Components must not be exposed to mechanical strain beforehand (car wash, strength test, etc.).
- Do not touch bonding area.
- It is not the length of time that pressure is applied but rather the level of pressure applied that is crucial.
- Detaching the adhesive tape after pressing destroys the adhesive layer.
- After being pressed on gently, adhesive tape can be pulled off again up to 3 times.

2. Auxiliary materials and tools

- Spirit, fluff-free cleaning cloths
- Pressure roller

3. Preparations

- Remove all remnants of adhesive or clean new part thoroughly
- Clean the areas to be bonded with spirit immediately before bonding to remove silicone and grease residues.

NOTE: Observe ventilation time greater than 1 minute.

4. Bonding

1. Components without pre-fitted adhesive tape

- Pull off liner* from adhesive tape.
- Position adhesive tape on component and stick on.
- Press down adhesive tape over entire bonding area.
- Continue with Point 4.2

* Liner is the protective film on the adhesive tape

2. Components with pre-fitted adhesive tape

- Pull off liner on adhesive side.

- Align component in correct position on vehicle.
- Press down component over entire bonding area.

51 00 ... SAFETY INSTRUCTIONS FOR WORKING ON CARS WITH AIRBAG SYSTEMS

WARNING: If work is carried out in area of airbag systems, e.g. on:

- Door trim panels
- Interior trims
- Instrument panel etc.

the ignition must be turned off in each case.

- The ignition must always be off.
- The ignition key must be removed from the ignition lock.

This eliminates the risk of injury.

51 00 ... SERVICE POSITION OF ENGINE HOOD/BONNET

Special tools required:

- **51 0 040 HOOD/BONNET STAY (2 X)**
- 51 2 160
- 51 2 170
- 51 2 180
- 51 2 240

NOTE: Only the special tool pertaining to the model series can be selected.

SPECIAL TOOL CHART

Model series	Special tool
E46, R50, R52, R53	51 2 160
E53, E60, E61, E63, E64, E81, E85, E86, E87, E90, E91, E92, E93	51 2 170
E65, E66, E67	51 2 180
E83	51 0 040
E70	51 2 240

**WARNING: Risk of injury and damage!
Engine hood/bonnet must be held by a second person helping.**

NOTE: The illustrations below serve as examples for all corresponding vehicles. The operation is described on the left side; proceed in the same way for the right side.

Special tool can only be used on housing (1) of gas spring strut (thick part).

NOTE: Gas spring strut can also be installed the other way round (housing on hood/bonnet).
Special tool can be used in both directions.

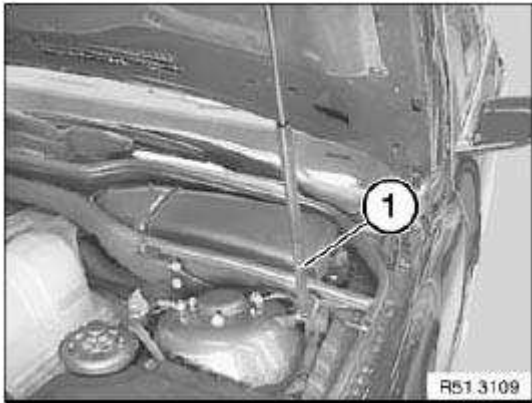


Fig. 1: Rubber Pad, Catches, Spring And Guide
Courtesy of BMW OF NORTH AMERICA, INC.

Release gas spring strut on left/right housing side.

Slide special tool (1) over housing (2) of gas spring strut.

Clip ball socket of special tool on ball stud.

Proceed in same way on other side.

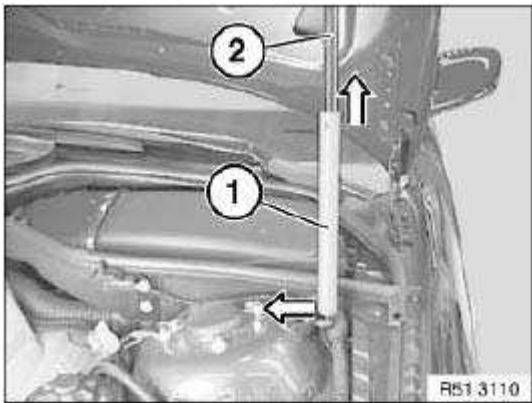
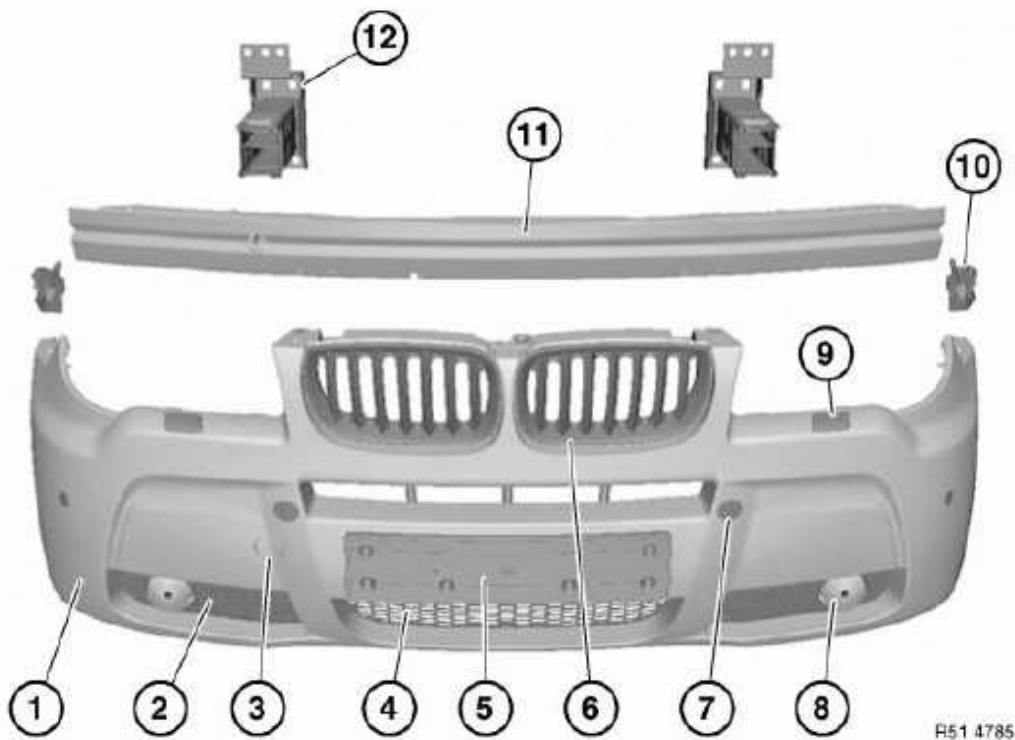


Fig. 2: Special Tool And Housing

Courtesy of BMW OF NORTH AMERICA, INC.

11 FRONT BUMPER

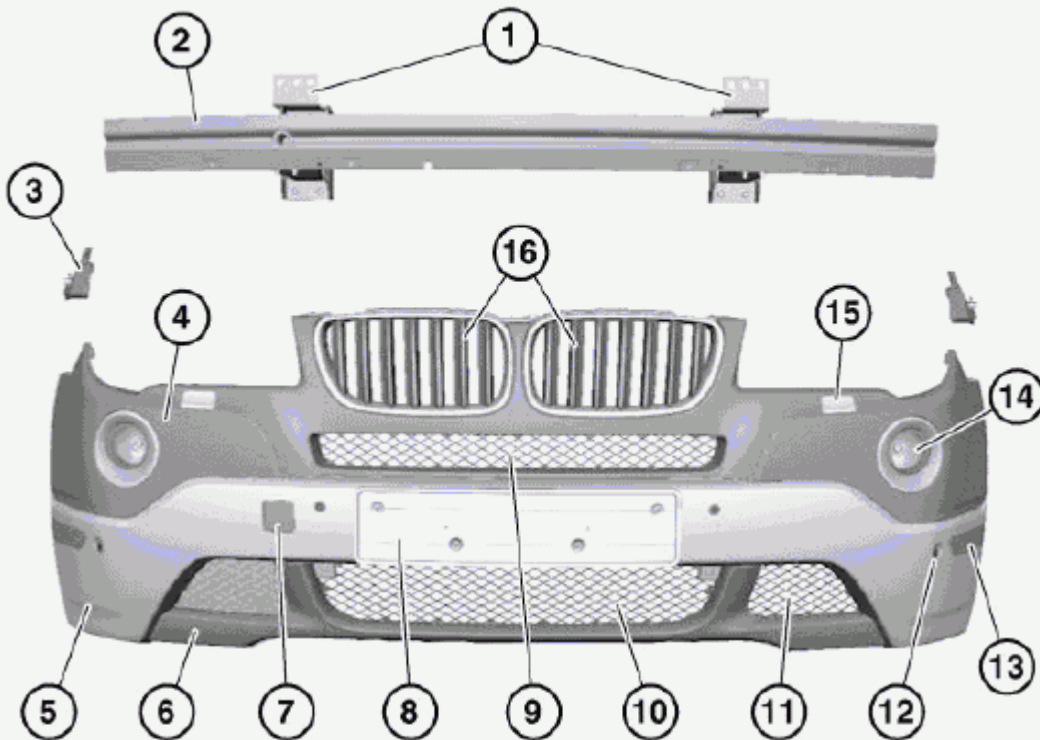
51 11 .. OVERVIEW OF FRONT BUMPER (M TECHNIC AERODYNAMIC KIT)



- | | | | |
|---|--|----|--|
| 1 | Bumper trim | 7 | Ultrasonic transducer |
| 2 | Trim, fog lamp | 8 | Fog lamp |
| 3 | Cover on towing eye | 9 | Cover, headlight washer system/high-pressure nozzles |
| 4 | Grille | 10 | Holder, side |
| 5 | Holder for license plate | 11 | Front carrier |
| 6 | Middle front radiator grille | 12 | Deformation element |

Fig. 3: Front Bumper (M Technic Aerodynamic Kit) Components
Courtesy of BMW OF NORTH AMERICA, INC.

51 11 ... OVERVIEW OF FRONT BUMPER (FROM 09/2006)

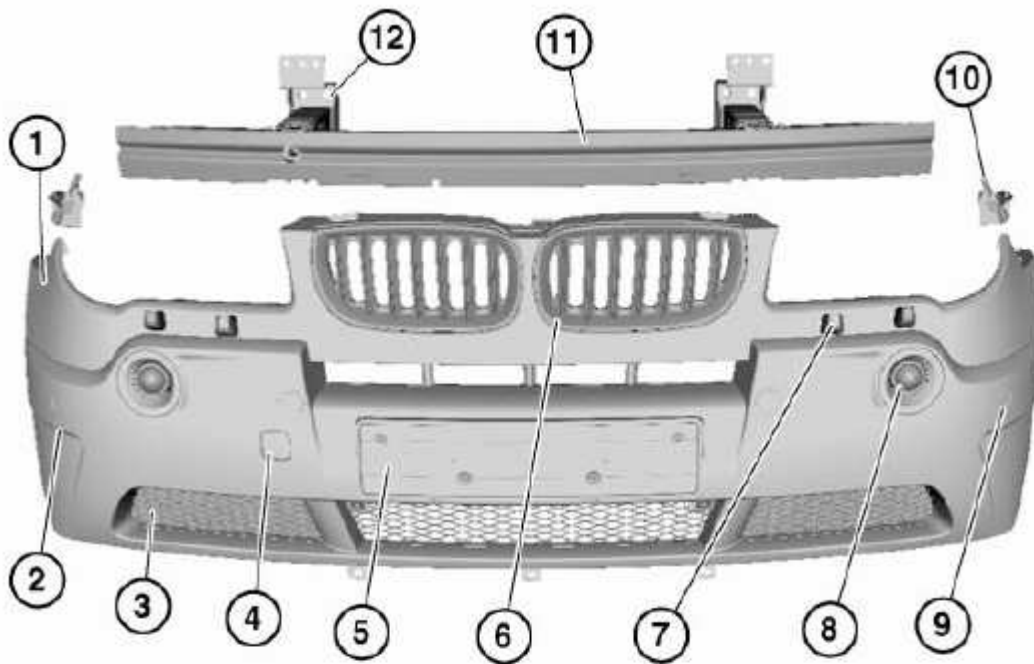


R51 4993

- | | | | |
|---|---|----|--|
| 1 | Deformation element | 9 | Top (upper) grille |
| 2 | Carrier | 10 | Middle grille |
| 3 | Holder, side | 11 | Side grille |
| 4 | Bumper trim upper section | 12 | Ultrasonic transducer |
| 5 | Bumper trim | 13 | Side marker (US only) |
| 6 | Bumper trim lower section | 14 | Fog lamp |
| 7 | Cover on towing eye | 15 | Cover, headlight washer |
| 8 | Holder for license plate | 16 | Middle front radiator grille |

Fig. 4: Front Bumper (From 09/2006) Components
 Courtesy of BMW OF NORTH AMERICA, INC.

51 11 ... OVERVIEW OF FRONT BUMPER (UP TO 08/2006)



R51 3913

- | | | | |
|---|--|----|---------------------------------------|
| 1 | Bumper trim upper section | 7 | Spray nozzles |
| 2 | Bumper trim lower section | 8 | Fog lamp |
| 3 | Grille | 9 | Ultrasonic transducer |
| 4 | Cover on towing eye | 10 | Holder, side |
| 5 | Holder for license plate | 11 | Front carrier |
| 6 | Middle front radiator grille | 12 | Deformation element |

Fig. 5: Front Bumper (Up To 08/2006) Components
 Courtesy of BMW OF NORTH AMERICA, INC.

51 11 ... REMOVING AND INSTALLING/REPLACING COVER FOR HEADLIGHT WASHER SYSTEM ON LEFT OR RIGHT (FROM 09/2006)

Slowly pull out spray nozzle (1) by cover (2).

IMPORTANT: Risk of damage!

When releasing cover (2), grip spray nozzle (1) firmly and then allow to slide back slowly

Release cover (2) sideways from spray nozzle (1).

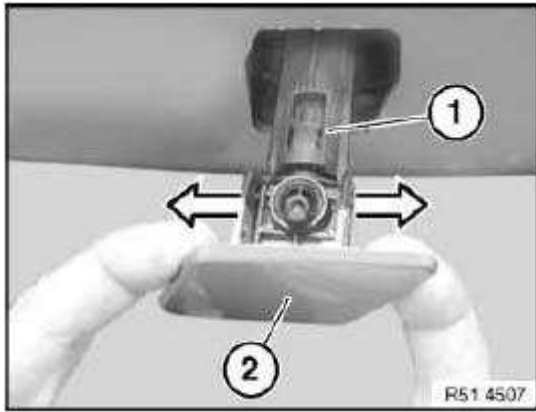


Fig. 6: Cover And Spray Nozzle
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Guides (1) on cover (2) must not be damaged.

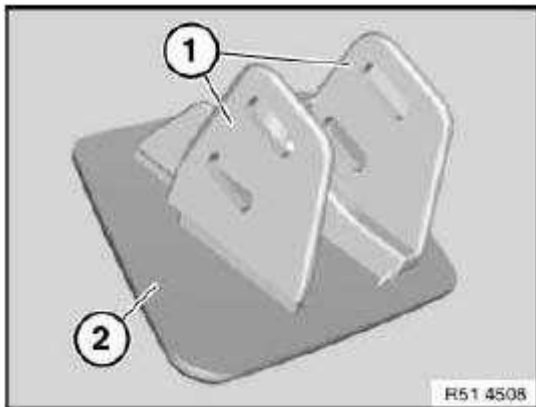


Fig. 7: Guides And Cover
Courtesy of BMW OF NORTH AMERICA, INC.

51 11 ... REMOVING AND INSTALLING/REPLACING FRONT COVER FOR HEADLIGHT WASHER SYSTEM ON LEFT OR RIGHT (M TECHNIC AERODYNAMIC KIT)

Slowly pull out spray nozzle (1) by cover (2).

IMPORTANT: Risk of damage!

When releasing cover (2), grip spray nozzle (1) firmly and then allow to slide back slowly

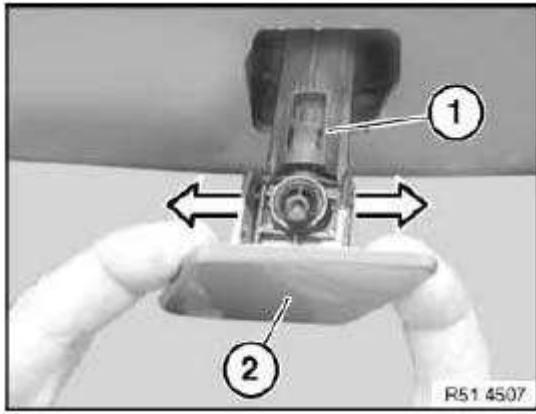


Fig. 8: Cover And Spray Nozzle
Courtesy of BMW OF NORTH AMERICA, INC.

Release cover (2) sideways from spray nozzle (1).

Installation:

Guides (1) on cover (2) must not be damaged.

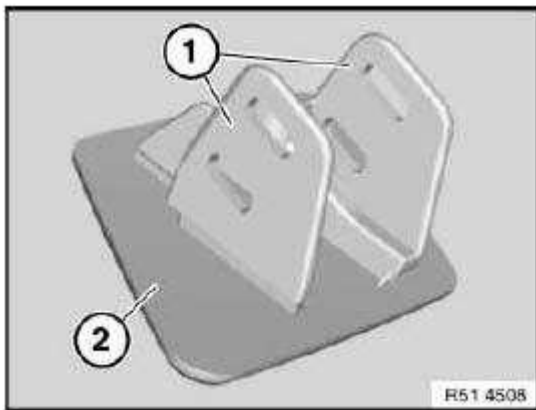


Fig. 9: Guides And Cover
Courtesy of BMW OF NORTH AMERICA, INC.

51 11 ... REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT FRONT FOG LAMP TRIM (M TECHNIC AERODYNAMIC KIT)

Special tools required:

- 00 9 317 **00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)**

Release catches (1) on trim (2) with special tool 00 9 317 and remove trim (2).

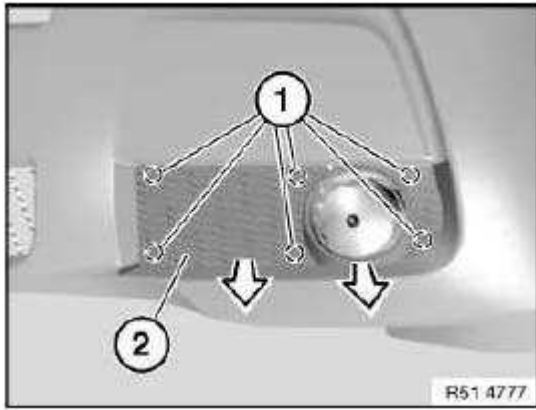


Fig. 10: Catches And Trim
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Retaining lugs (1) on trim (3) must not be damaged.

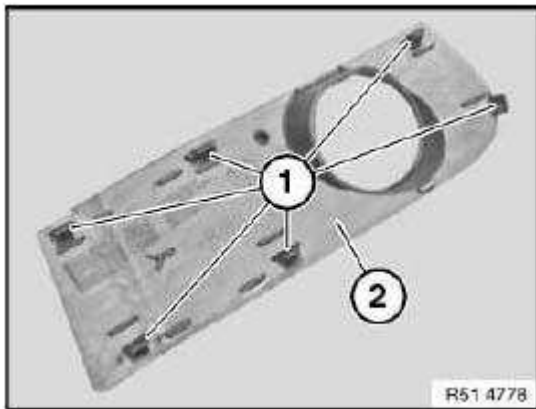


Fig. 11: Lugs And Trim
 Courtesy of BMW OF NORTH AMERICA, INC.

51 11 050 REMOVING AND INSTALLING / REPLACING CARRIER FOR FRONT BUMPER TRIM

Necessary preliminary tasks:

- Remove front bumper trim, see **51 11 156 Removing and installing front bumper trim (from 09/2006)**

Release cable holders (1) from carrier (3).

Disconnect plug connections (2) for fanfare horns.

If necessary, feed out line for headlight washer system.

Installation:

If necessary, replace cable holders (1).

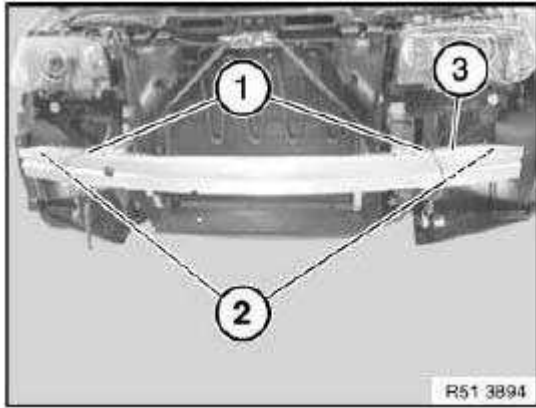


Fig. 12: Cable Holders And Carrier
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw connection (1).

Remove screws and shims (3).

Remove carrier (2).

Tightening torque: 51 11 5AZ, see **51 11 FRONT BUMPER**

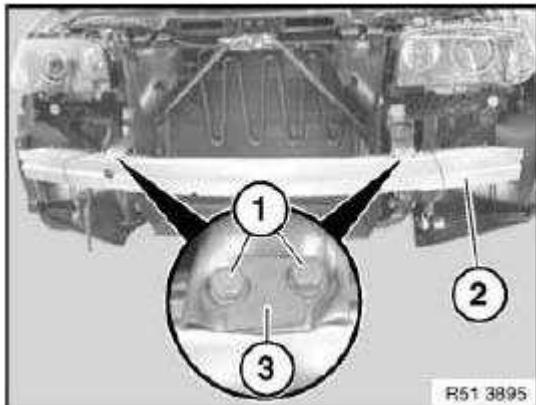


Fig. 13: Screw Connection, Shims And Carrier
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

- A. Release nuts (2) and remove fanfare horns (1).
- B. Release screws or rivets (3) and remove holder (4)

NOTE: Depending on build date, different holders (4) are installed with different attachments:

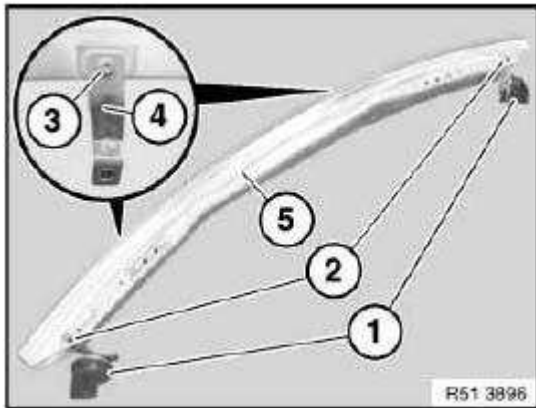


Fig. 14: Nuts, Rivets And Fanfare Horns
Courtesy of BMW OF NORTH AMERICA, INC.

Standard bumper:

- Holder (4) at front riveted to carrier (5)

M Technic aerodynamic kit up to 02/2006:

- Holder (4) at rear screwed to carrier (5)

M Technic aerodynamic kit from 03/2006:

- Holder (4) at front screwed to carrier (5)

51 11 140 REMOVING AND INSTALLING/REPLACING BUMPER TRIM UPPER SECTION (FROM 09/2006)

Necessary preliminary tasks:

- Remove both fog lamps, see **63 17 060 REMOVING AND INSTALLING (REPLACING) LEFT OR RIGHT FRONT FOG LAMP**
- Remove top grille, see **51 11 182 Removing and installing/replacing upper grille in bumper trim (from 09/2006)**
- Remove both middle radiator grilles, see **51 13 001 Removing and installing/replacing front radiator grille, middle left or right**

Version with headlight washer system:

- Remove both covers for headlight washer system, see **51 11 ... Removing and installing/replacing cover for headlight washer system on left or right (from 09/2006)**

Release catches (1) on back of bumper trim (2).

Remove bumper trim upper section (3).

Installation:

Catches (1) must not be damaged.

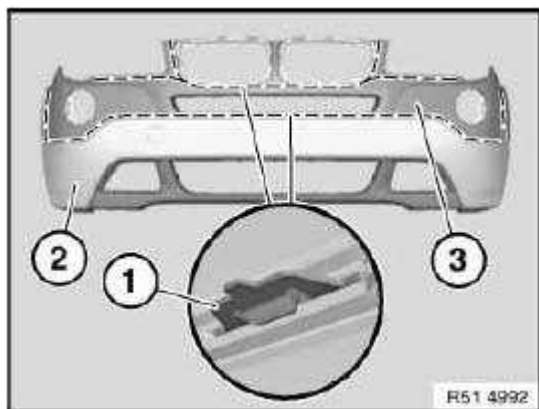


Fig. 15: Catches And Bumper Trim

Courtesy of BMW OF NORTH AMERICA, INC.

51 11 140 REMOVING AND INSTALLING/REPLACING BUMPER TRIM UPPER SECTION (UP TO 09/2006)

Necessary preliminary tasks:

- Remove front bumper trim, see **51 11 156 Removing and installing front bumper trim (up to 09/2006)**
- Remove both fog lamps, see **63 17 060 REMOVING AND INSTALLING (REPLACING) LEFT OR RIGHT FRONT FOG LAMP**
- Remove radiator grille for bumper trim, see **51 11 180 Removing and installing/replacing grille in bumper trim (M Technic aerodynamic kit)**
- Remove center insert for bumper trim, see **51 11 145 Removing and installing/replacing center insert for bumper trim**

NOTE: The operation is described on the left side; proceed in the same way for the right side.

Release screws (1).

Unhook catches (2) on bumper trim (3).

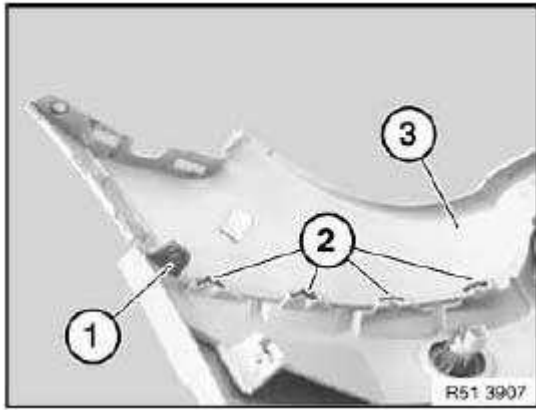


Fig. 16: Catches, Screws And Bumper Trim
Courtesy of BMW OF NORTH AMERICA, INC.

Release catches (1) and remove upper section of bumper trim (2).

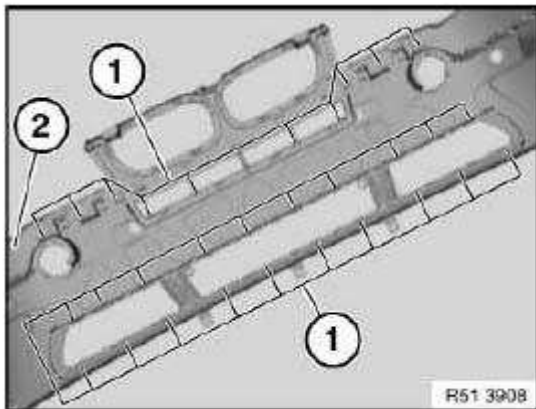


Fig. 17: Catches And Bumper Trim
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

If necessary, replace faulty metal nuts (1) on upper section of bumper trim (2).

Replacement:

Remove center radiator grille, see **51 13 001 Removing and installing/replacing front radiator grille, middle left or right**

Version with headlight washer system:

If necessary, remove spray nozzles (3), see **61 67 045 REMOVING AND INSTALLING/REPLACING SPRAY NOZZLES FOR LEFT OR RIGHT HEADLIGHT CLEANING SYSTEM**

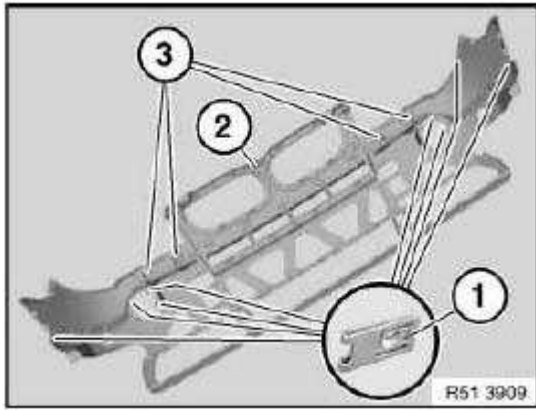


Fig. 18: Metal Nuts And Bumper Trim
 Courtesy of BMW OF NORTH AMERICA, INC.

**51 11 141 REMOVING AND INSTALLING/REPLACING BUMPER TRIM LOWER SECTION
 (FROM 09/2006)**

Necessary preliminary tasks:

- Remove middle grille, see **51 11 180 Removing and installing/replacing grille in bumper trim (M Technic aerodynamic kit)**
- Remove both side grilles, see **51 11 185 Removing and installing/replacing side grille in bumper trim (from 09/2006)**

Release catches (1) on back of bumper trim (2).

Remove bumper trim lower section (3).

Installation:

Catches (1) must not be damaged.

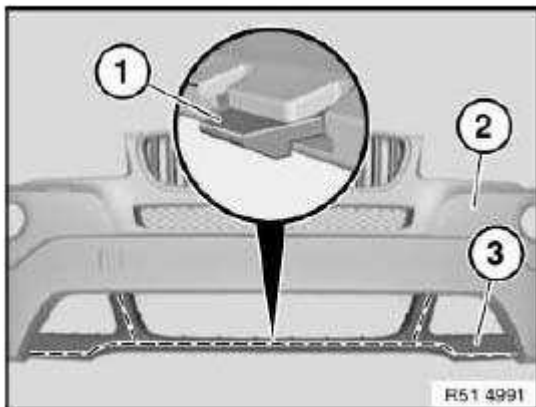


Fig. 19: Catches And Bumper Trim

Courtesy of BMW OF NORTH AMERICA, INC.

51 11 141 REMOVING AND INSTALLING/REPLACING BUMPER TRIM LOWER SECTION (UP TO 09/2006)

Necessary preliminary tasks:

- Remove front bumper trim, see **51 11 156 Removing and installing front bumper trim (up to 09/2006)**
- Remove both fog lamps, see **63 17 060 REMOVING AND INSTALLING (REPLACING) LEFT OR RIGHT FRONT FOG LAMP**
- Remove radiator grille for bumper trim, see **51 11 180 Removing and installing/replacing grille in bumper trim (M Technic aerodynamic kit)**
- Remove center insert for bumper trim, see **51 11 145 Removing and installing/replacing center insert for bumper trim**

Release screws (1) on left/right.

Unhook catches (2) on left/right from bumper trim (3).

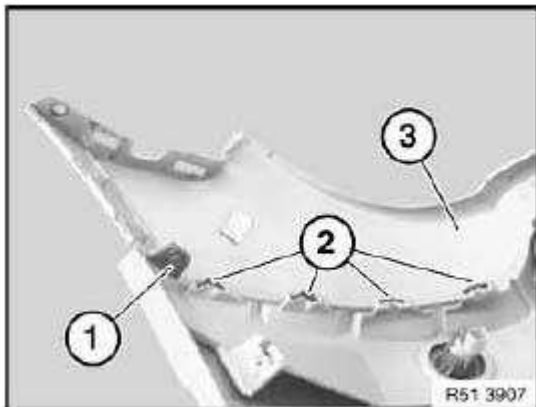


Fig. 20: Catches, Screws And Bumper Trim

Courtesy of BMW OF NORTH AMERICA, INC.

Release catches (1) and remove lower section of bumper trim (2).

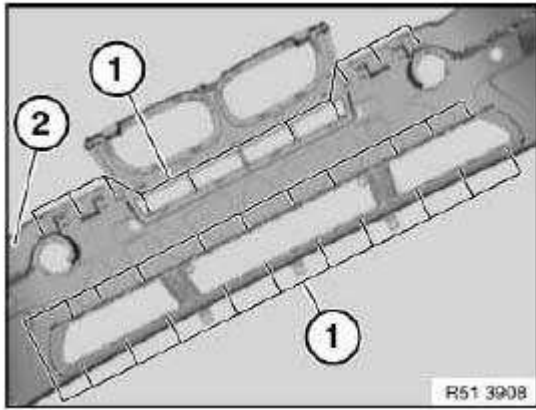


Fig. 21: Catches And Bumper Trim
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

Lever cover (1) in direction of arrow out of lower section of bumper trim (2).

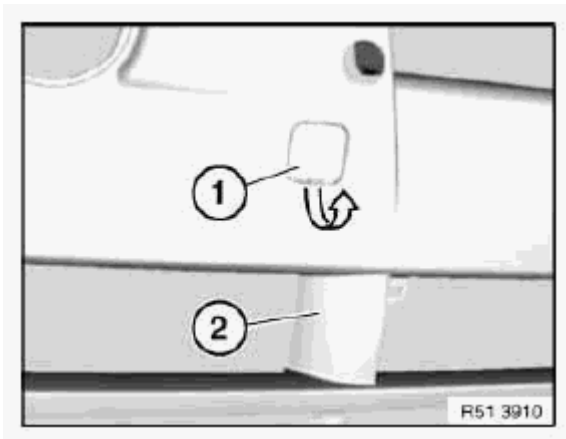


Fig. 22: Cover And Bumper Trim
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Catches (1) on lower section of bumper trim (2) must not be damaged.

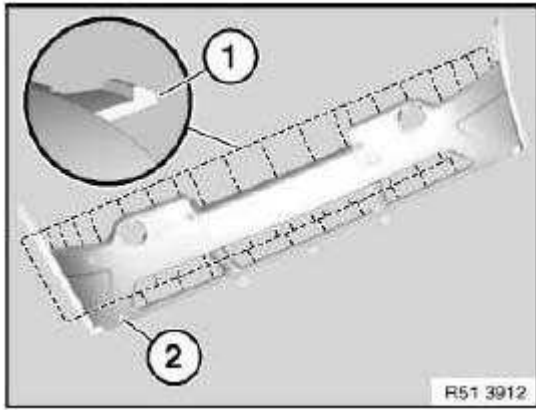


Fig. 23: Catches And Bumper Trim
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

If necessary, replace faulty metal nuts (1) on lower section of bumper trim (3).

When replacing with Park Distance Control version:

Remove ultrasonic transducer (2) from lower section of bumper trim (3).

Remove locators (4) and spacer rings (5).

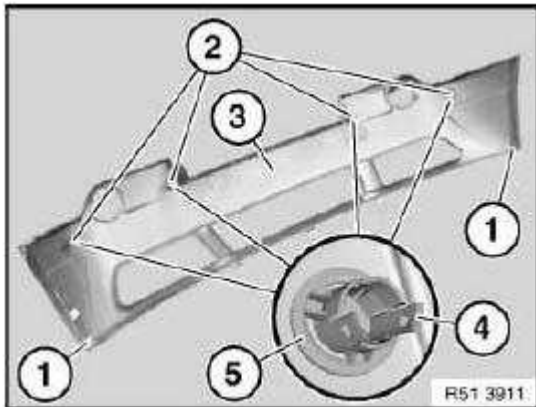


Fig. 24: Locators, Spacer Rings And Bumper Trim
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, cut out openings for ultrasonic sensors (2) on lower section of bumper trim (1) at moldings.

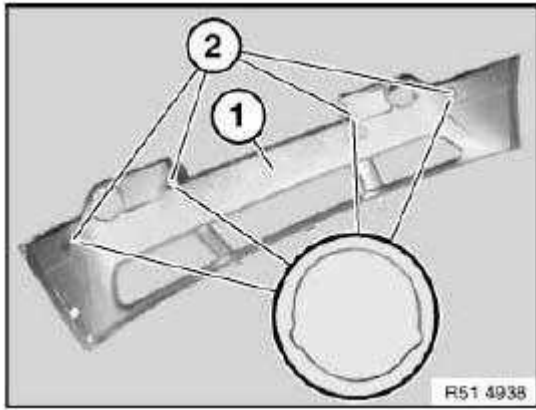


Fig. 25: Ultrasonic Sensors And Bumper Trim
 Courtesy of BMW OF NORTH AMERICA, INC.

51 11 145 REMOVING AND INSTALLING/REPLACING CENTER INSERT FOR BUMPER TRIM

Necessary preliminary tasks:

- Remove front bumper trim, see **51 11 156 Removing and installing front bumper trim (up to 09/2006)**
- Remove center radiator grille, see **51 13 001 Removing and installing/replacing front radiator grille, middle left or right**

NOTE: **The operation is described on the left side; proceed in the same way for the right side.**

Version with headlight washer system:

Release lock (1).

Feed hose (2) in direction of arrow out of holder (3).

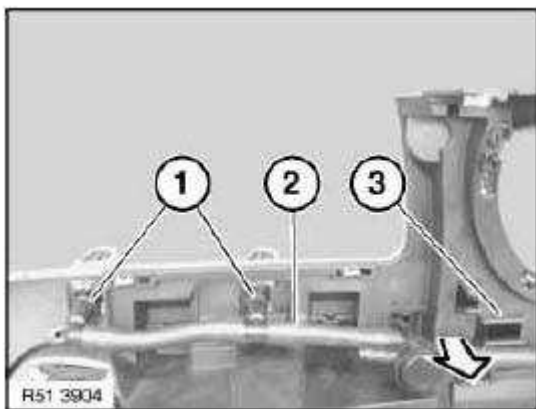


Fig. 26: Hose And Holder
 Courtesy of BMW OF NORTH AMERICA, INC.

Release catches (1) and remove center insert (2) in direction of arrow.

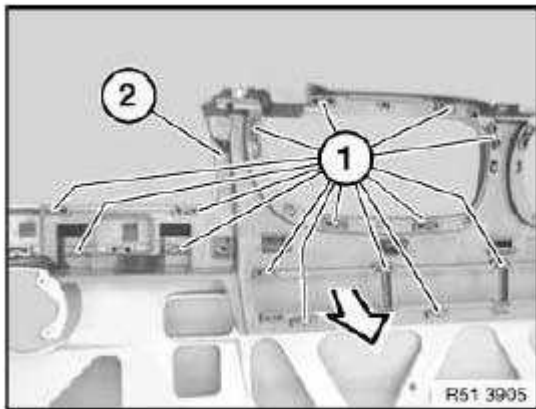


Fig. 27: Catches And Centre Insert
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Catches (1) on bumper trim (2) must not be damaged.

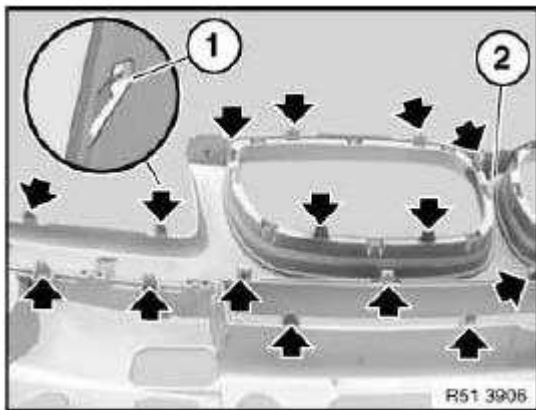


Fig. 28: Catches And Bumper Trim
Courtesy of BMW OF NORTH AMERICA, INC.

51 11 156 REMOVING AND INSTALLING FRONT BUMPER TRIM (FROM 09/2006)

Special tools required:

- **00 9 317 00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)**

Release screws (1).

Remove air duct (2).

Installation:

Make sure air duct (2) is in correct position.

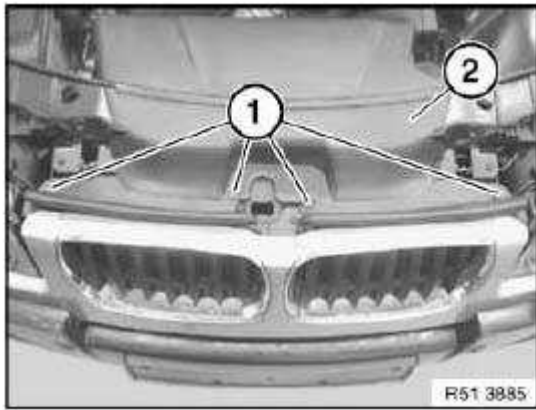


Fig. 29: Air Duct And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) on bumper trim (2).

Installation:

Height adjustment, refer to Gap dimensions, body.

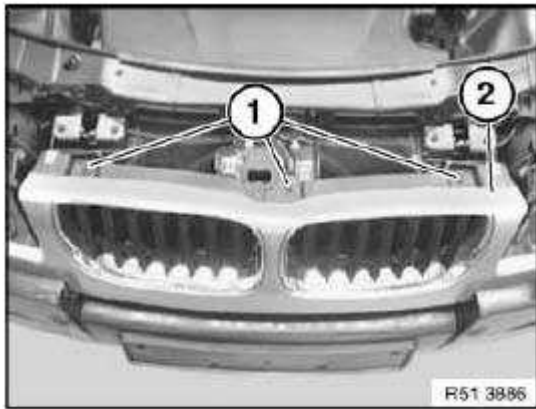


Fig. 30: Screws And Bumper Trim
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Release screws (2) on wheel arch cover.

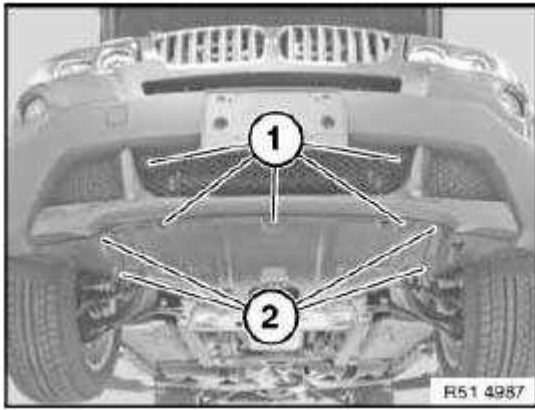


Fig. 31: Screws And Wheel Arch Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Release retaining elements (1 to 3) on wheel arch cover (4).

Lever out wheel arch cover (4) at side.

Installation:

Make sure wheel arch cover (4) is in correct position.

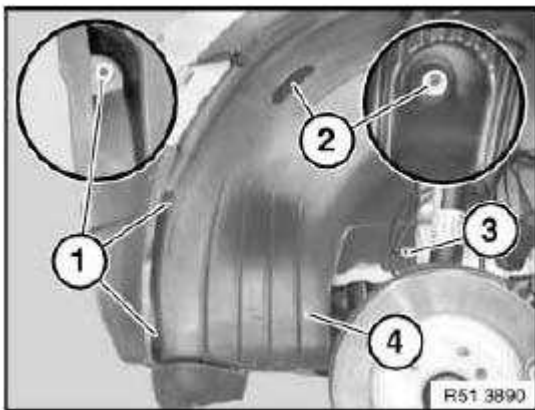


Fig. 32: Retaining Elements And Wheel Arch Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1) on bumper trim (2).

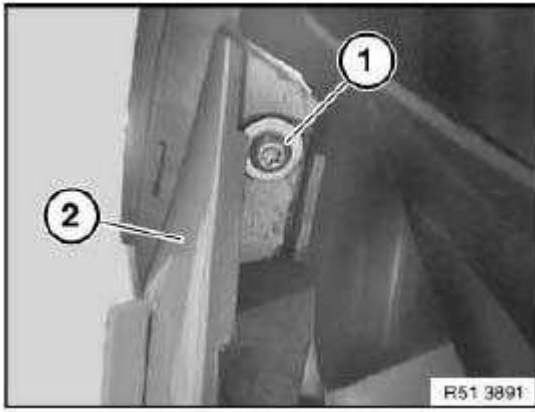


Fig. 33: Screw And Bumper Trim

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not damage bumper trim when pulling off.

Lever out bumper trim (1) with special tool 00 9 317 in direction of arrow.

Version without headlight cleaning system:

Pull bumper trim (1) forwards a little.

If necessary, disconnect plug connections on ultrasonic sensors and/or front fog lamps.

Remove bumper trim (1) towards front with aid of a 2nd person.

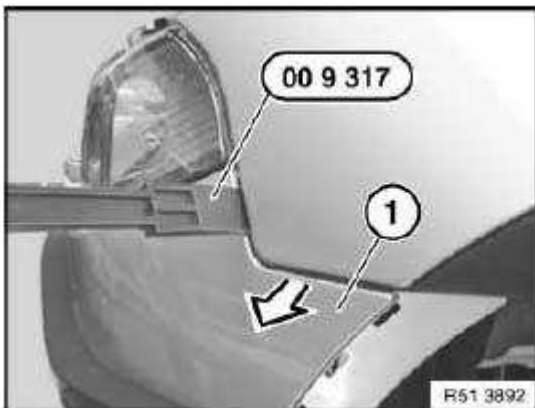


Fig. 34: Special Tool (00 9 317)

Courtesy of BMW OF NORTH AMERICA, INC.

Version with headlight washer system:

**NOTE: Have a rubber plug on hand.
Pull bumper trim (3) forwards a little.**

Unlock hose (1), detach and seal pump outlet (2).
Remove bumper trim (3) towards front with aid of a 2nd person.

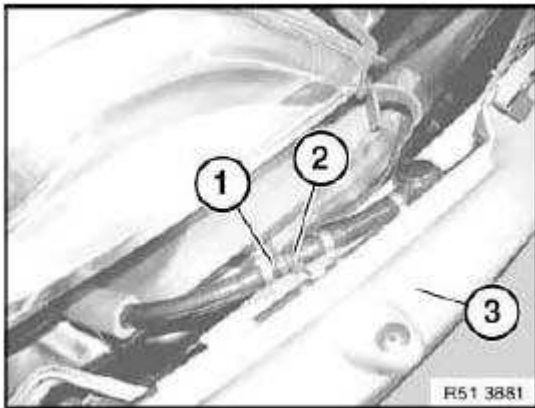


Fig. 35: Hose, Bumper Trim And Seal Pump Outlet
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Tabs (1) on bumper trim (2) must not be damaged.

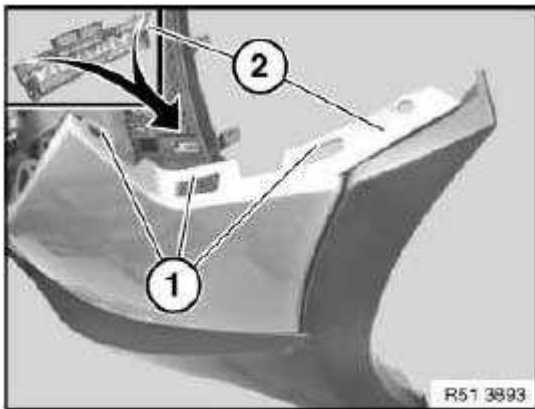


Fig. 36: Tabs And Bumper Trim
Courtesy of BMW OF NORTH AMERICA, INC.

51 11 156 REMOVING AND INSTALLING FRONT BUMPER TRIM (UP TO 09/2006)

Special tools required:

- 00 9 317 00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)

Release screws (1).

Remove air duct (2).

Installation:

Make sure air duct (2) is in correct position.

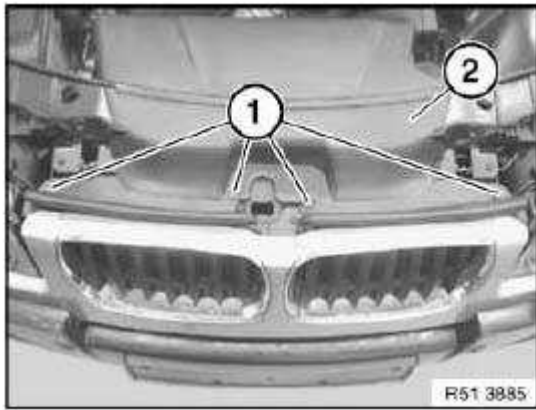


Fig. 37: Air Duct And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) on bumper trim (2).

Installation:

Height adjustment, refer to Gap dimensions, body.

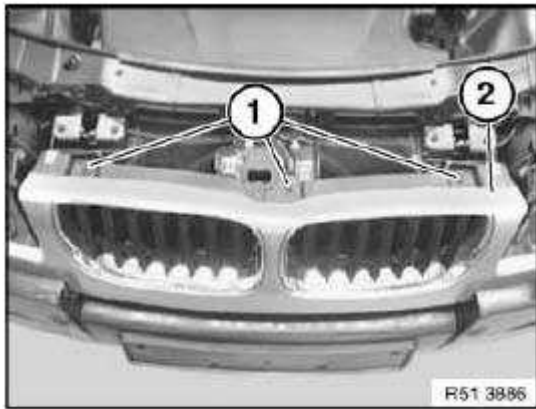


Fig. 38: Screws And Bumper Trim
Courtesy of BMW OF NORTH AMERICA, INC.

Lever trim (1) with special tool 00 9 317 out of bumper trim (2) in direction of arrow.

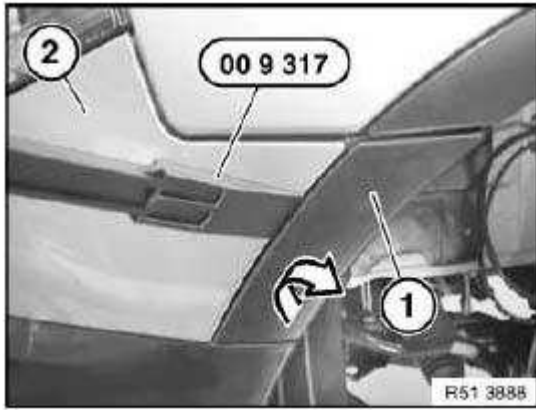


Fig. 39: Special Tool (00 9 317)
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1 and 2).

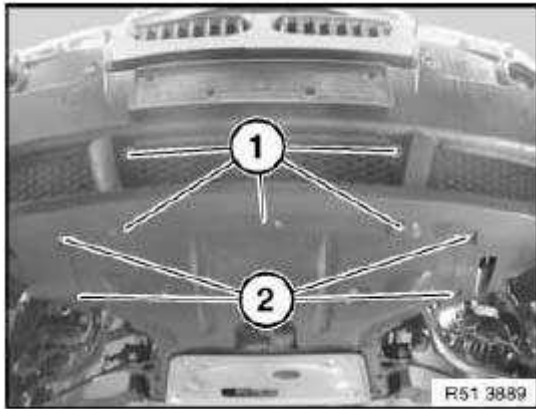


Fig. 40: Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1 to 3) on wheel arch trim (4).

Lever out wheel arch trim (4) at side.

Installation:

Make sure wheel arch trim (4) is in correct position.

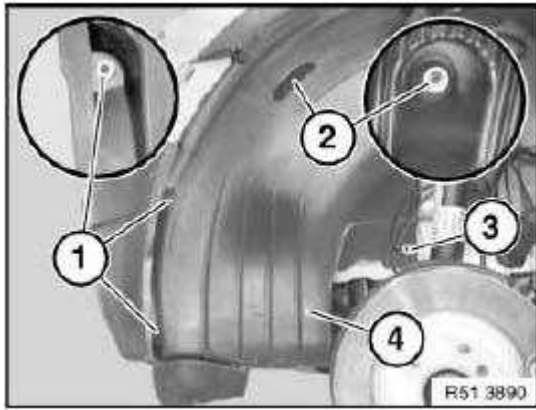


Fig. 41: Retaining Elements And Wheel Arch Cover
 Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1) on bumper trim (2).

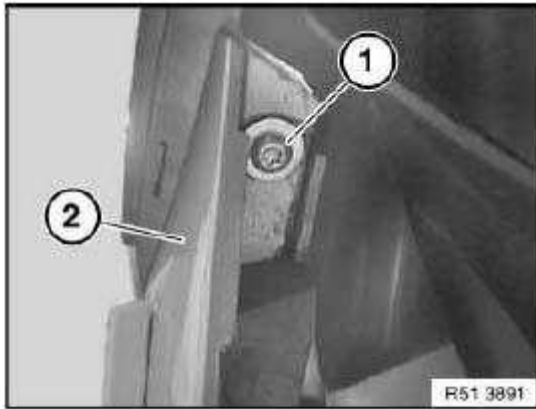


Fig. 42: Screw And Bumper Trim
 Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not damage bumper trim when pulling off.

Lever out bumper trim (1) with special tool 00 9 317 in direction of arrow.

Version without headlight cleaning system:

Pull bumper trim (1) forwards a little.

If necessary, disconnect plug connections on ultrasonic sensors and/or front fog lamps.

Remove bumper trim (1) towards front with aid of a 2nd person.

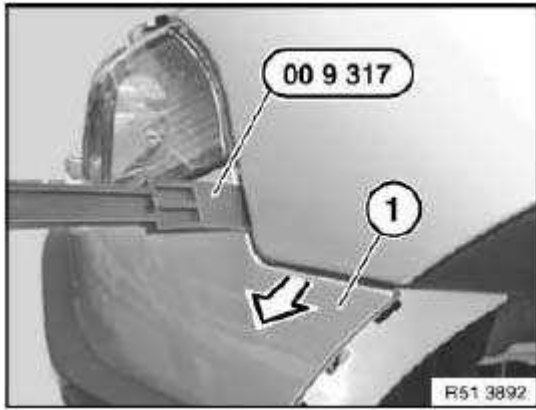


Fig. 43: Special Tool (00 9 317)
Courtesy of BMW OF NORTH AMERICA, INC.

Version with headlight washer system:

NOTE: Have a rubber plug on hand.

Pull bumper trim (3) forwards a little.

Unlock hose (1), detach and seal pump outlet (2).

Remove bumper trim (3) towards front with aid of a 2nd person.

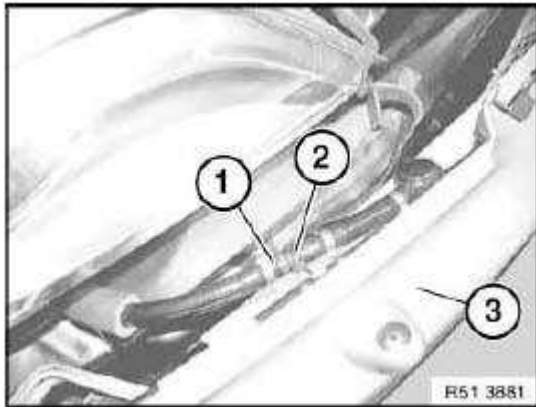


Fig. 44: Hose, Bumper Trim And Seal Pump Outlet
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Tabs (1) on bumper trim (2) must not be damaged.

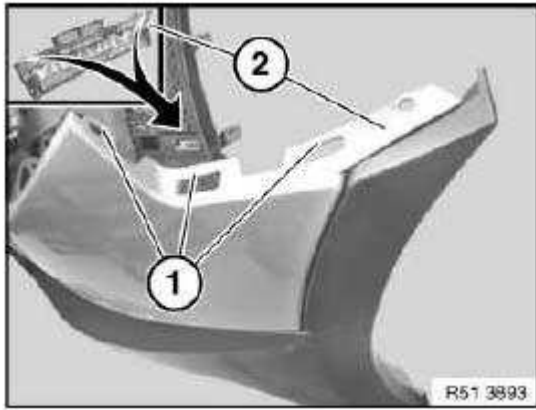


Fig. 45: Tabs And Bumper Trim

Courtesy of BMW OF NORTH AMERICA, INC.

51 11 156 REMOVING AND INSTALLING/REPLACING FRONT BUMPER TRIM (M TECHNIC AERODYNAMIC KIT)

Special tools required:

- **00 9 317 00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)**

Necessary preliminary tasks:

- Remove both fog light trims, see **51 11 ... Removing and installing/replacing left or right front fog lamp trim (M Technic aerodynamic kit)**

Version with headlight washer system:

- Remove both covers for headlight washer system, see **51 11 ... Removing and installing/replacing cover for headlight washer system on left or right (from 09/2006)**

Release screws (1).

Remove air duct (2).

Installation:

Make sure air duct (2) is in correct position.

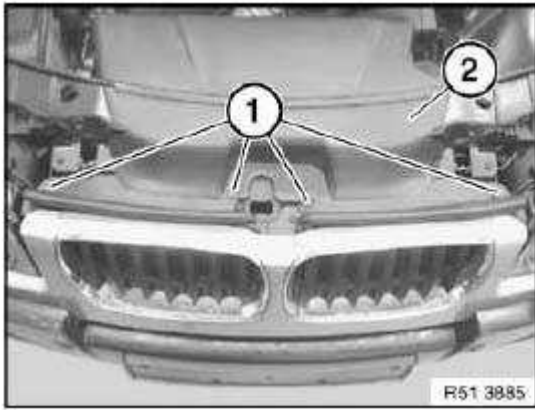


Fig. 46: Air Duct And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) on bumper trim (2).

Installation:

For adjustment, refer to Body gap dimensions.

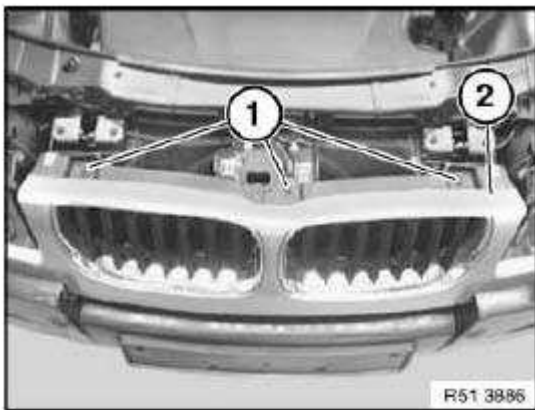


Fig. 47: Screws And Bumper Trim
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1 and 2).

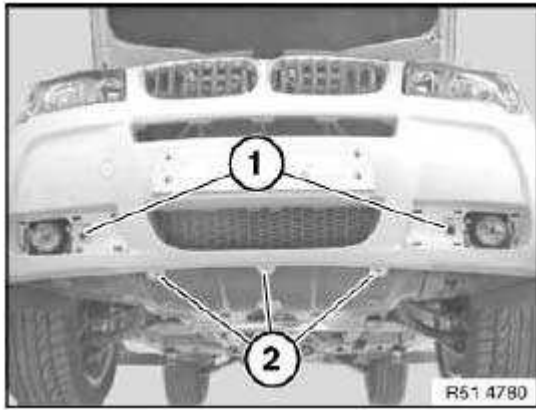


Fig. 48: Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws or rivets (1 to 3) on wheel arch trim (4).

Lever out wheel arch trim (4) at side.

Installation:

Make sure wheel arch trim (4) is in correct position.

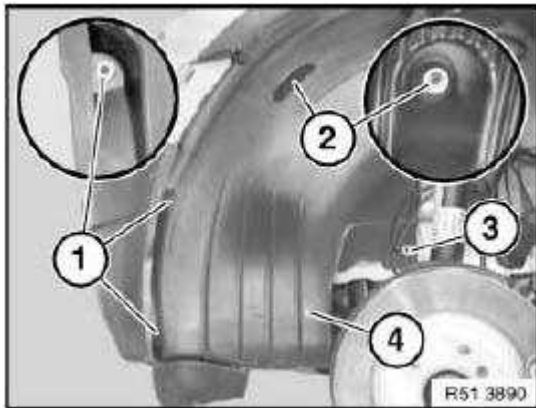


Fig. 49: Retaining Elements And Wheel Arch Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1) on bumper trim (2).

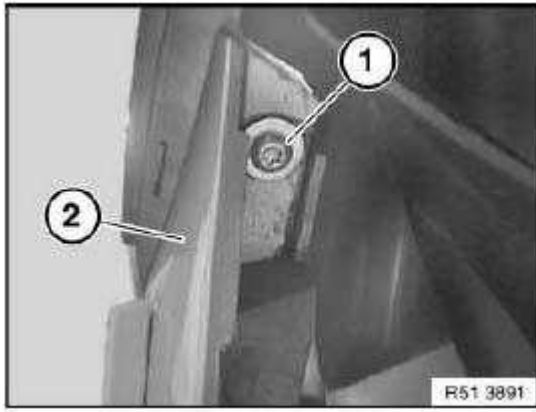


Fig. 50: Screw And Bumper Trim

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not damage bumper trim when pulling off.

Lever out bumper trim (1) with special tool 00 9 317 in direction of arrow.

Pull bumper trim (1) forwards a little.

If necessary, disconnect plug connections on ultrasonic sensors and/or front fog lamps.

Remove bumper trim (1) towards front with aid of a 2nd person.

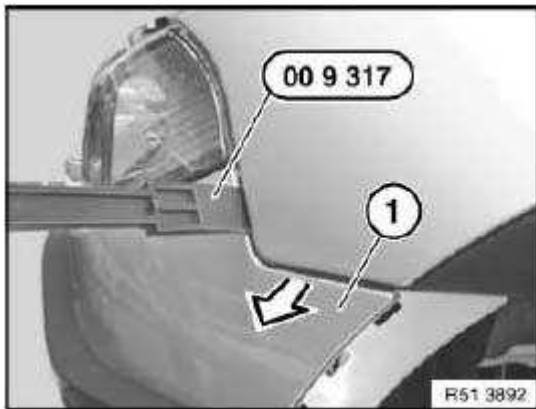


Fig. 51: Special Tool (00 9 317)

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Tabs (1) on bumper trim (2) must not be damaged.

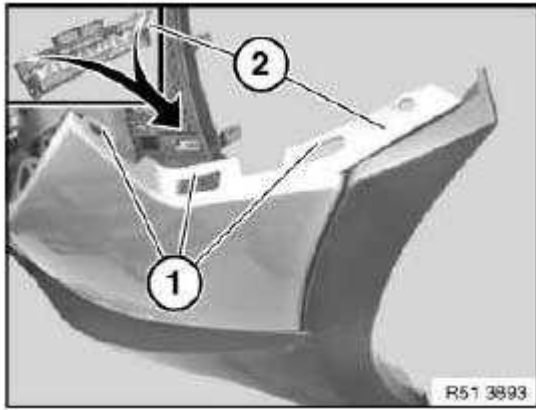


Fig. 52: Tabs And Bumper Trim

Courtesy of BMW OF NORTH AMERICA, INC.

51 11 157 REPLACING FRONT BUMPER TRIM

Necessary preliminary tasks:

- Unscrew and remove license plate
- Remove holder for license plate, see **51 11 158 Replacing baseplate for license plate**
- Remove front bumper trim, see **51 11 156 Removing and installing front bumper trim (up to 09/2006)**
- Remove upper section of bumper trim, see **51 11 140 Removing and installing/replacing bumper trim upper section (from 09/2006)**
- Remove lower section of bumper trim, see **51 11 141 Removing and installing/replacing bumper trim lower section (from 09/2006)**

Build date from 09/2006:

- If necessary, remove side marker
- If necessary, remove spray nozzles
- If necessary, remove ultrasonic transducer

51 11 158 REPLACING BASEPLATE FOR LICENSE PLATE

Unscrew and remove license plate.

Release screws (1) and remove baseplate (2) for license plate.

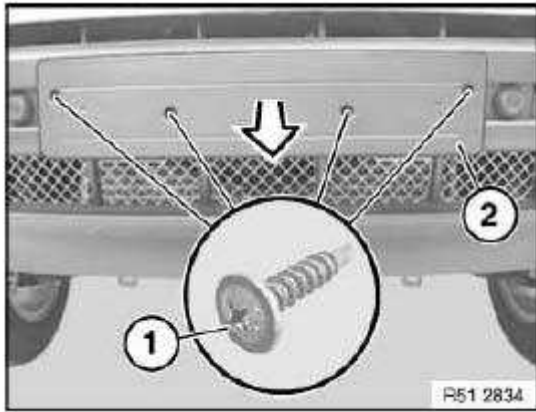


Fig. 53: Screws And Baseplate

Courtesy of BMW OF NORTH AMERICA, INC.

51 11 180 REMOVING AND INSTALLING/REPLACING GRILLE IN BUMPER TRIM (M TECHNIC AERODYNAMIC KIT)

Necessary preliminary tasks:

- Remove front bumper trim, see **51 11 156 Removing and installing front bumper trim (up to 09/2006)**

Release catches (1) and remove grille (2).

Installation:

Catches (1) on bumper trim (3) must not be damaged.

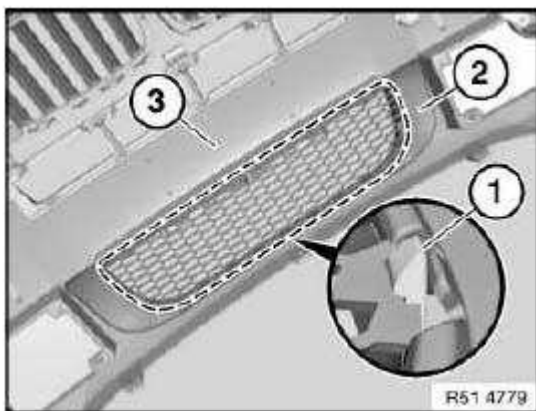


Fig. 54: Catches, Grille And Bumper Trim

Courtesy of BMW OF NORTH AMERICA, INC.

51 11 180 REMOVING AND INSTALLING/REPLACING MIDDLE TRIM GRILLE IN BUMPER TRIM (UP TO 09/2006)

Necessary preliminary tasks:

- Remove front bumper trim, see **51 11 156 Removing and installing front bumper trim (up to 09/2006)**

Release catches (1) and remove grille (2).

Installation:

Catches (1) must not be damaged.

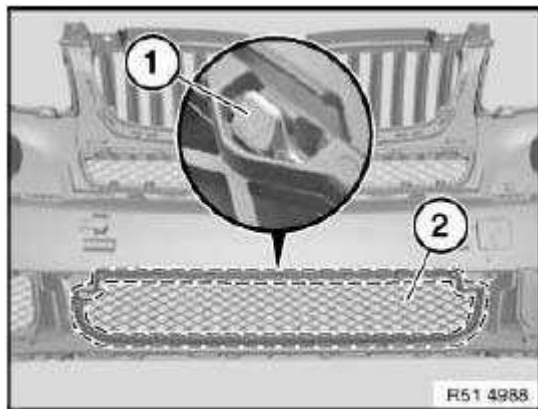


Fig. 55: Catches And Grille

Courtesy of BMW OF NORTH AMERICA, INC.

51 11 180 REMOVING AND INSTALLING/REPLACING TRIM GRILLE FOR BUMPER TRIM (UP TO 09/2006)

Special tools required:

- 00 9 317 **00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)**

Necessary preliminary tasks:

- Remove front bumper trim, see **51 11 156 Removing and installing front bumper trim (up to 09/2006)**

Unhook grille (1) from bumper trim (2) with special tool 00 9 317 in direction of arrow.

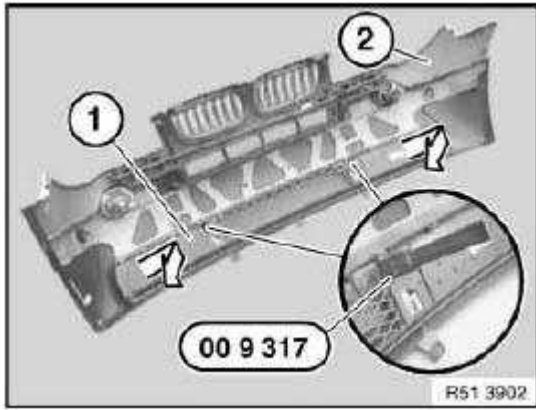


Fig. 56: Special Tool (00 9 317)
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Hooks (1) of trim (2) must not be damaged.

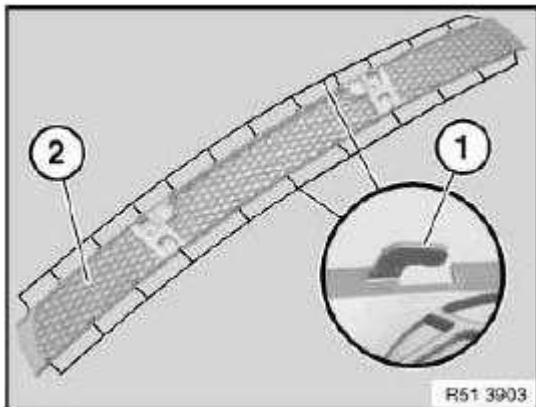


Fig. 57: Hooks And Trim
 Courtesy of BMW OF NORTH AMERICA, INC.

51 11 182 REMOVING AND INSTALLING/REPLACING UPPER GRILLE IN BUMPER TRIM (FROM 09/2006)

Necessary preliminary tasks:

- Remove front bumper trim, see **51 11 156 Removing and installing front bumper trim (up to 09/2006)**

Release catches (1) and remove grille (2).

Installation:

Catches (1) must not be damaged.

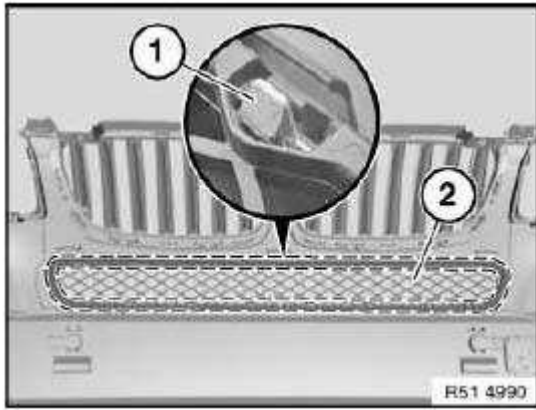


Fig. 58: Catches And Grille

Courtesy of BMW OF NORTH AMERICA, INC.

51 11 185 REMOVING AND INSTALLING/REPLACING SIDE GRILLE IN BUMPER TRIM (FROM 09/2006)

Necessary preliminary tasks:

- Remove front bumper trim, see **51 11 156 Removing and installing front bumper trim (up to 09/2006)**

Release catches (1) and remove grille (2).

Installation:

Catches (1) must not be damaged.

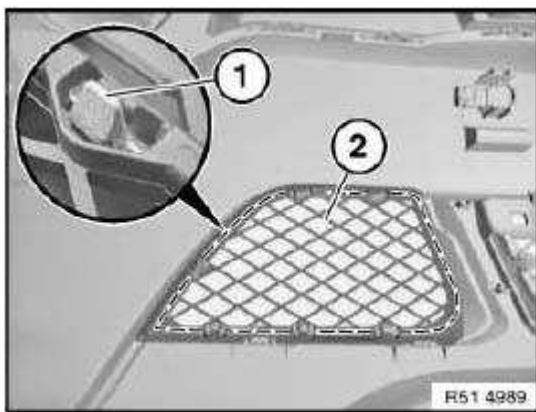


Fig. 59: Catches And Grille

Courtesy of BMW OF NORTH AMERICA, INC.

51 11 701 REPLACING LEFT OR RIGHT BRACKET FOR FRONT BUMPER

Necessary preliminary tasks:

- Remove front bumper trim, see **51 11 156 Removing and installing front bumper trim (up to 09/2006)**

Version with M Technic aerodynamic kit:

- Remove headlight bracket, see **51 11 710 Removing and installing/replacing left or right headlight bracket (M Technic aerodynamic kit)**

Release screws (1) and feed out and remove bracket (2) in direction of arrow.

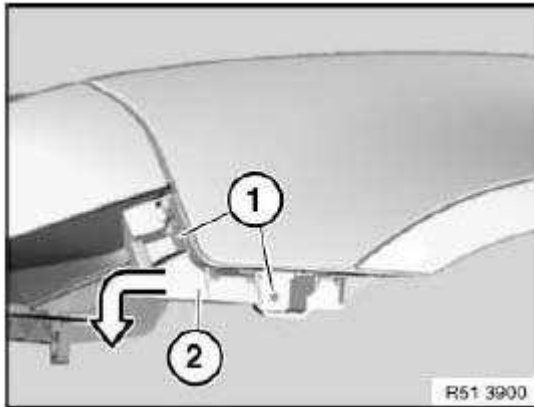


Fig. 60: Screws And Bracket

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Guides (1) on bracket (2) must not be damaged.

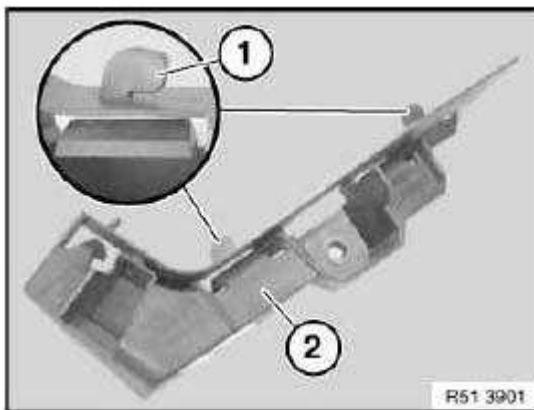


Fig. 61: Guides And Bracket

Courtesy of BMW OF NORTH AMERICA, INC.

51 11 710 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT HEADLIGHT BRACKET (M TECHNIC AERODYNAMIC KIT)

Necessary preliminary tasks:

- Remove front bumper trim, see **51 11 156 Removing and installing front bumper trim (up to 09/2006)**

Version with headlight washer system:

- Remove high-pressure nozzle, see **61 67 083 REMOVING AND INSTALLING/REPLACING HIGH - PRESSURE NOZZLE OF LEFT OR RIGHT HEADLIGHT WASHER SYSTEM (M AERODYNAMIC KIT)**

Release screws (1) and remove bracket (2).

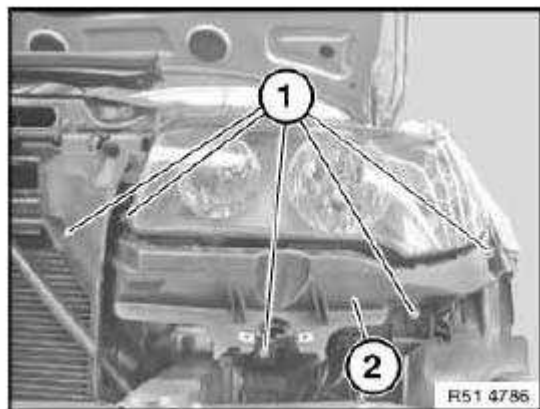


Fig. 62: Screws And Bracket

Courtesy of BMW OF NORTH AMERICA, INC.

51 11 770 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT DEFORMATION ELEMENT FOR FRONT BUMPER

Necessary preliminary tasks:

- Remove carrier for bumper trim at front, see **51 11 050 Removing and installing / replacing carrier for front bumper trim**

Release screws (1).

Feed air duct (2) out of tension strut (3).

Installation:

Make sure air duct (2) is in correct position.

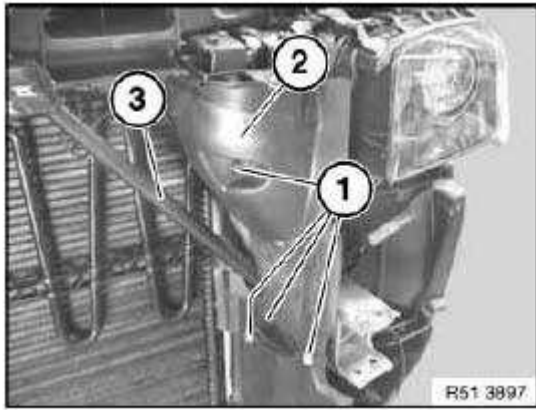


Fig. 63: Air Duct And Tension Strut
 Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1) on deformation element (2).

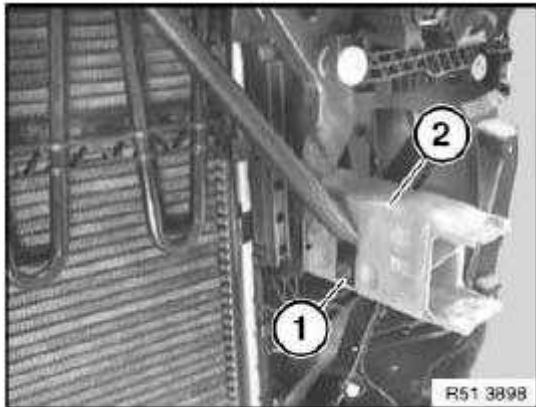


Fig. 64: Screw And Deformation Element
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: For height adjustment, mark position of deformation element (4).

Release bolts (1) on supplementary cooler bracket.

Release bolts (2).

Release nuts (3) and remove deformation element (4).

Installation:

Height adjustment, refer to Gap dimensions, body.

Tightening torque: 51 11 6AZ, see **51 11 FRONT BUMPER**

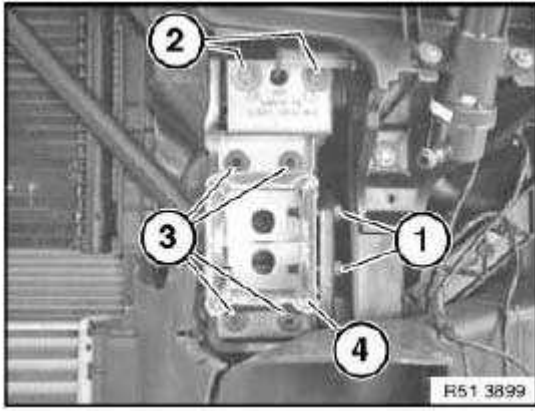
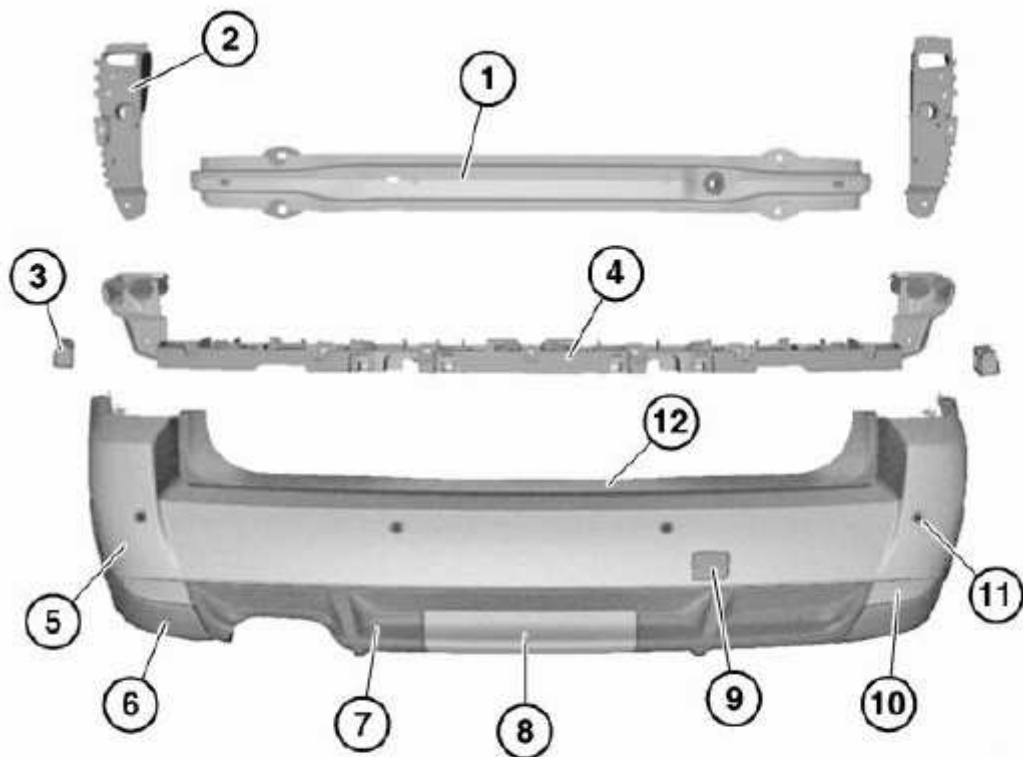


Fig. 65: Nuts, Bolts And Deformation Element
Courtesy of BMW OF NORTH AMERICA, INC.

12 REAR BUMPER

51 12 ... OVERVIEW OF REAR BUMPER (FROM 09/2006)

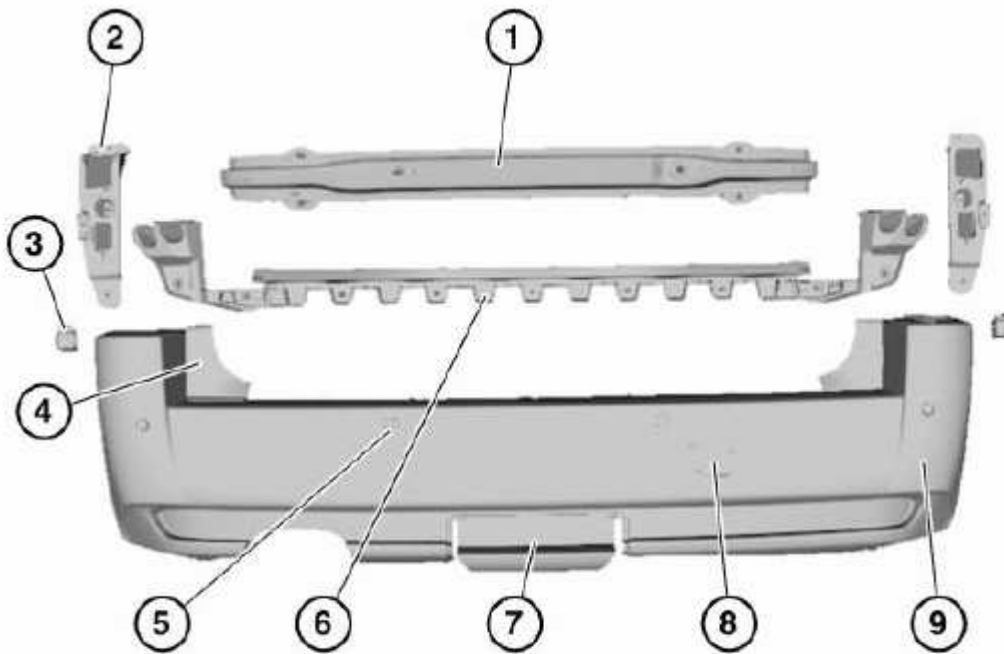


R51 4997

- | | | | |
|---|-------------------------------|----|--|
| 1 | Carrier | 7 | Trim, rear |
| 2 | Holder, side | 8 | Cover, trailer tow hitch |
| 3 | Guide, side | 9 | Cover on towing eye |
| 4 | Guide, middle | 10 | Reflector |
| 5 | Bumper trim | 11 | Ultrasonic transducer |
| 6 | Trim, side | 12 | Trim, loading sill |

Fig. 66: Rear Bumper (From 09/2006) Components
 Courtesy of BMW OF NORTH AMERICA, INC.

51 12 ... OVERVIEW OF REAR BUMPER (UP TO 09/2006)



R51 3930

- | | | | |
|---|---|---|--|
| 1 | Carrier, rear | 6 | Guide, middle |
| 2 | Holder, side | 7 | Cover, trailer tow hitch |
| 3 | Guide, side | 8 | Cover on towing eye |
| 4 | Cover/trim, loading sill | 9 | Bumper trim, rear |
| 5 | Ultrasonic transducer, rear | | |

Fig. 67: Rear Bumper (Up To 09/2006) Components
 Courtesy of BMW OF NORTH AMERICA, INC.

51 12 ... REMOVING AND INSTALLING/REPLACING DIFFUSER ON REAR BUMPER TRIM (M TECHNIC AERODYNAMIC KIT)

Special tools required:

- 00 9 317 **00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)**

Necessary preliminary tasks:

- Remove rear bumper trim, see **51 12 156 Removing and installing/replacing rear bumper trim (M Technic aerodynamic kit)**

Release catches (1) on reverse side of bumper trim (2) with special tool 00 9 317 and remove diffuser (3).

Installation:

Catches (1) must not be damaged.

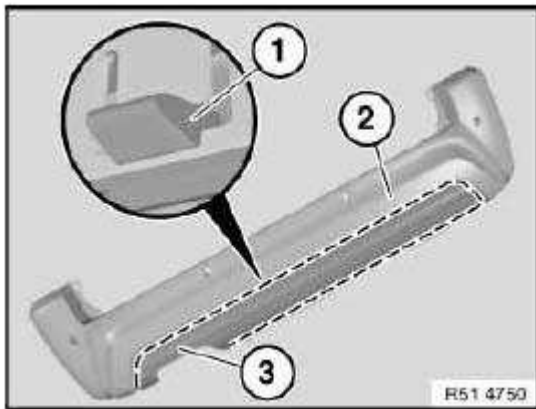


Fig. 68: Catches And Bumper Trim

Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

If necessary, remove rear reflector.

Version with trailer coupling:

Remove rib (1) from diffuser (2) with diagonal cutting pliers.

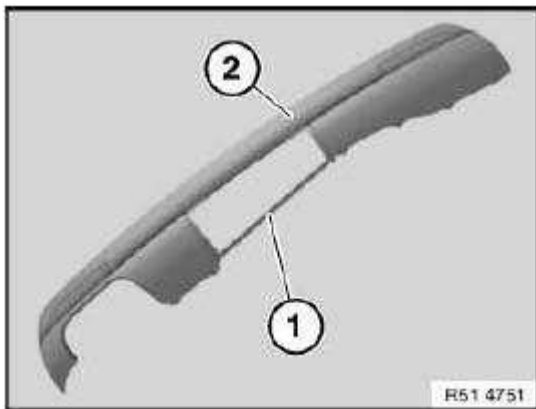


Fig. 69: Rib And Diffuser

Courtesy of BMW OF NORTH AMERICA, INC.

51 12 ... REMOVING AND INSTALLING/REPLACING TRIM FOR BUMPER TRIM AT REAR

Special tools required:

- 00 9 322 00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)

Necessary preliminary tasks:

- Remove both rear reflectors

Release clip (1) on left/right.

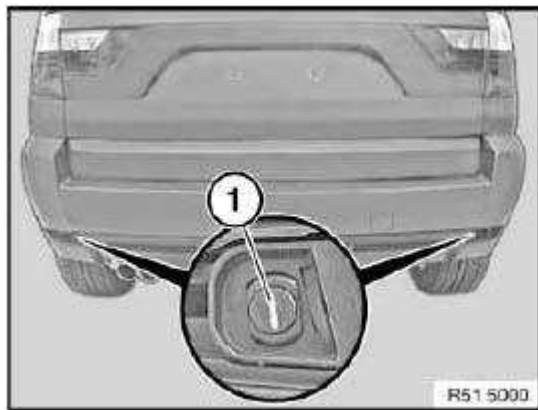


Fig. 70: Clip
Courtesy of BMW OF NORTH AMERICA, INC.

Release trim (1) at catches (2).

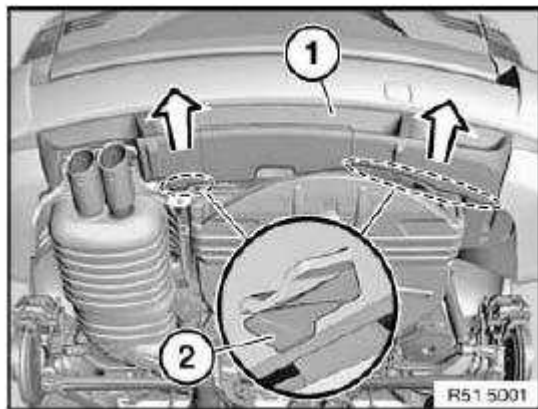


Fig. 71: Trim And Catches
Courtesy of BMW OF NORTH AMERICA, INC.

Slide special tool 00 9 322 between trim (1) and bumper trim (2) and press down catches (3).

Unclip trim (1) towards rear.

Pull trim (1) towards rear slightly and release all further catches (3) with special tool 00 9 322.

Installation:

Catches (3) must not be damaged.

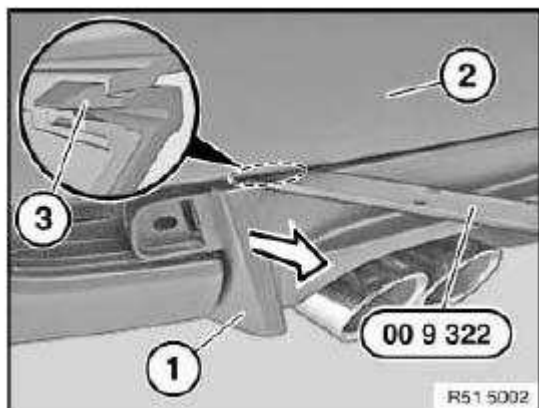


Fig. 72: Special Tool (00 9 322)

Courtesy of BMW OF NORTH AMERICA, INC.

51 12 ... REMOVING AND INSTALLING/REPLACING TRIM ON LOADING SILL FOR REAR BUMPER (M TECHNIC AERODYNAMIC KIT)

Special tools required:

- 00 9 317 **00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)**

Unclip trim (1) over entire length with special tool 00 9 317 towards top and remove towards rear.

Installation:

If necessary, replace faulty retainers (2).

Install trim (1) with fitted retainers (2).

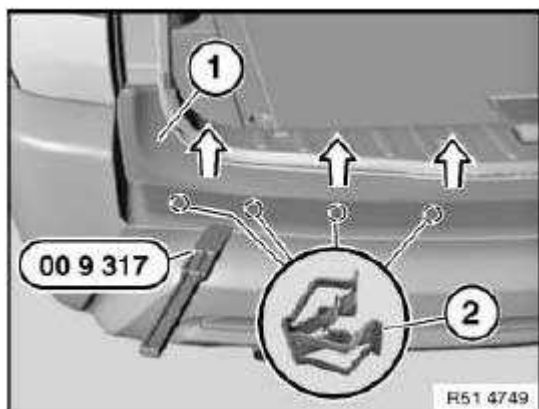


Fig. 73: Special Tool (00 9 317)

Courtesy of BMW OF NORTH AMERICA, INC.

51 12 050 REMOVING AND INSTALLING / REPLACING CARRIER FOR REAR BUMPER TRIM

Necessary preliminary tasks:

- Remove front bumper trim, see **51 11 156 Removing and installing front bumper trim (up to 09/2006)**

Release nuts (1) on left and right.

Remove carrier (2).

Tightening torque: 51 12 3AZ, see **51 12 REAR BUMPER**

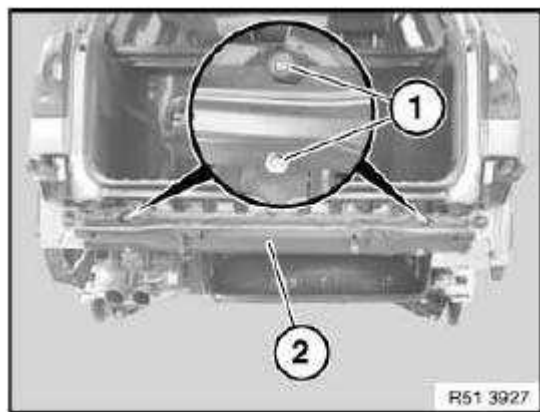


Fig. 74: Carrier And Nuts

Courtesy of BMW OF NORTH AMERICA, INC.

51 12 080 REMOVING AND INSTALLING/REPLACING TRIM ON LOADING SILL FOR REAR BUMPER (FROM 09/2006)

NOTE: Trim (1) is if necessary secured to bumper with double-sided adhesive tape (3).

Lever out trim (1) from bumper (2).

Installation:

Make sure trim (1) is correctly seated on bumper (2).

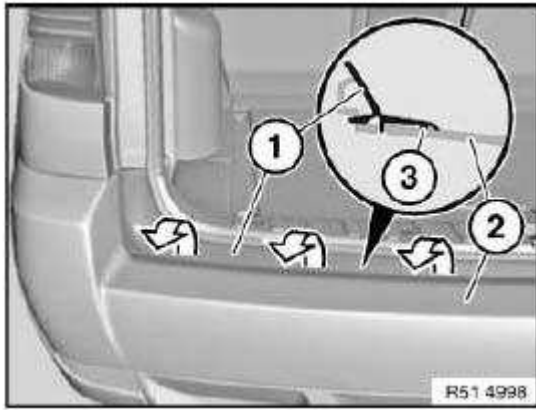


Fig. 75: Trim And Bumper
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Engage trim (1) in bumper (2).

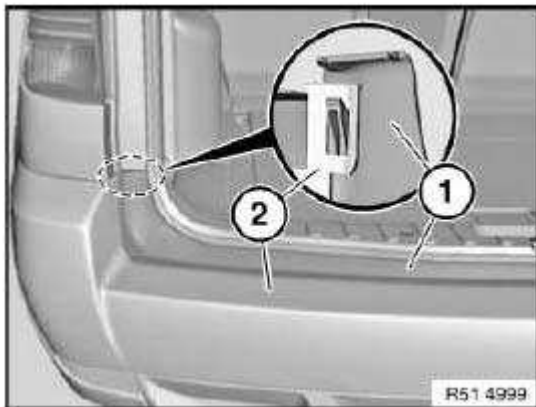


Fig. 76: Trim And Bumper
Courtesy of BMW OF NORTH AMERICA, INC.

51 12 156 REMOVING AND INSTALLING REAR BUMPER TRIM (FROM 09/2006)

Necessary preliminary tasks:

- Remove trim on loading sill, see **51 12 080 Removing and installing/replacing trim on loading sill for rear bumper (from 09/2006)**

Release screws (1) on bumper trim (2).

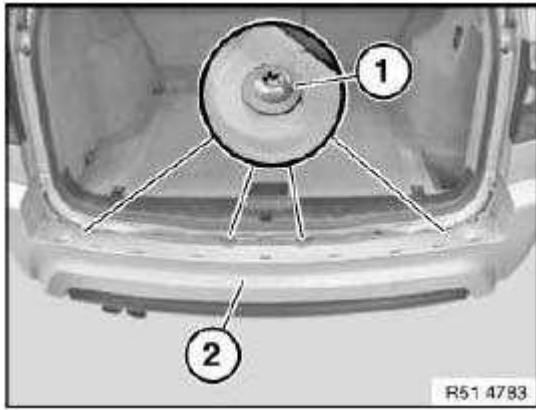


Fig. 77: Screws And Bumper Trim
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) and nut (2) on left and right.

Installation:

Make sure wheel arch trim (3) is in correct position.

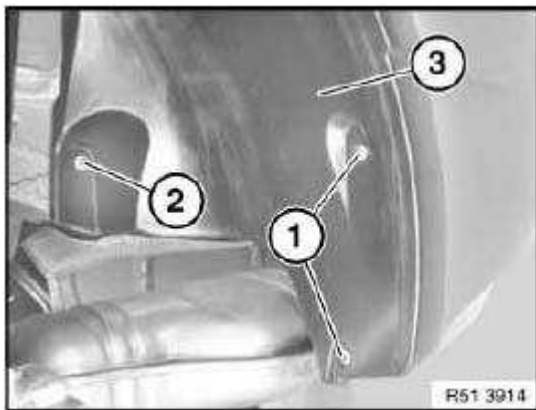


Fig. 78: Screws, Nut And Wheel Arch Trim
Courtesy of BMW OF NORTH AMERICA, INC.

Press wheel arch trim slightly to one side and release screw (1) on bumper trim (2) on left and right.

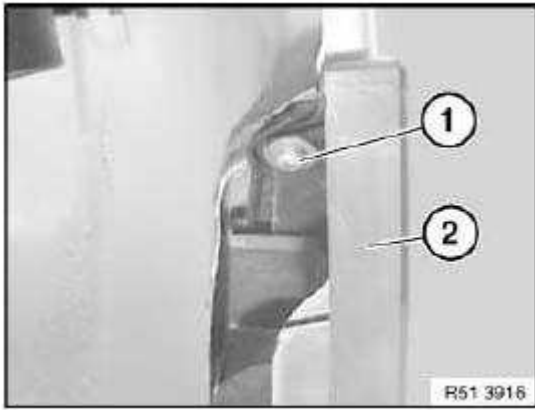


Fig. 79: Screw And Bumper Trim
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) on bracket (2).

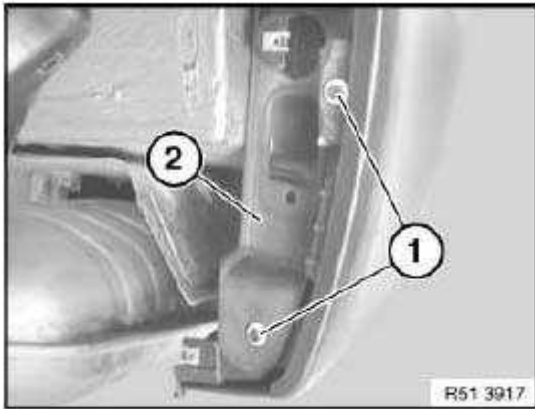


Fig. 80: Screws And Bracket
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

Release nuts (2) and feed bracket out of stud.

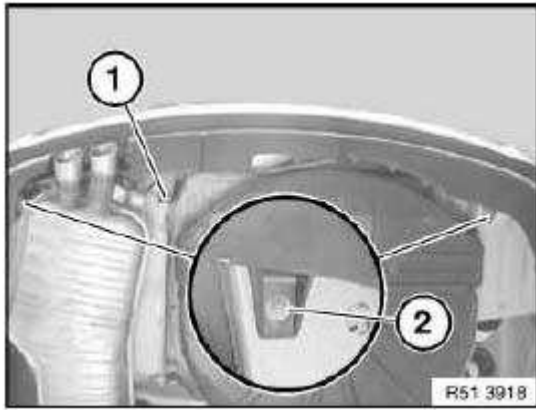


Fig. 81: Nut And Screw

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage!

Do not detach bumper trim (1) at sides in outward direction.

Pull off bumper trim (1) for side panel in direction of arrow.

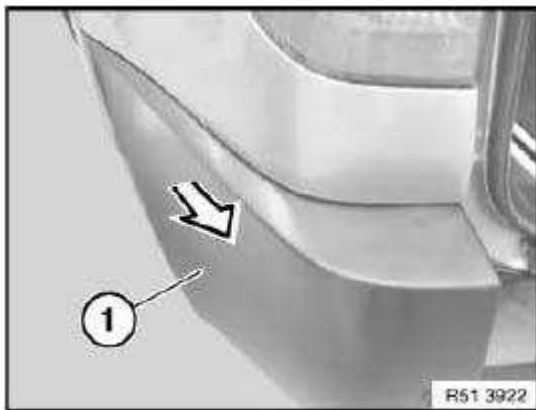


Fig. 82: Bumper Trim

Courtesy of BMW OF NORTH AMERICA, INC.

Pull out bumper trim (1) in direction of arrow and remove with aid of a 2nd person.

NOTE: Version with Park Distance Control:

If necessary, pull off bumper trim (1) a little and disconnect plug connections of ultrasonic transducers.

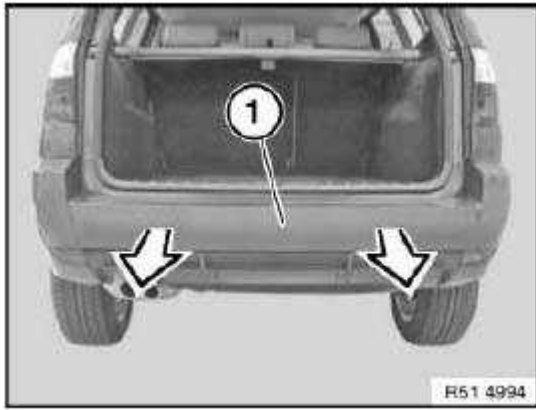


Fig. 83: Bumper Trim

Courtesy of BMW OF NORTH AMERICA, INC.

51 12 156 REMOVING AND INSTALLING REAR BUMPER TRIM (UP TO 09/2006)

Special tools required:

- 00 9 317 00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)

NOTE: The operation is described on the left side; proceed in the same way for the right side.

Release screws (1) and nuts (2).

Installation:

Make sure wheel arch trim (3) is in correct position.

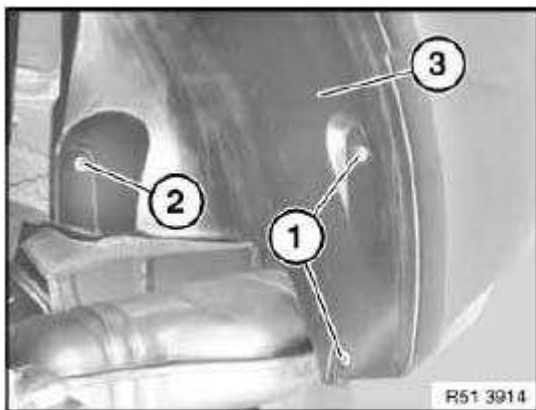


Fig. 84: Screws, Nut And Wheel Arch Trim

Courtesy of BMW OF NORTH AMERICA, INC.

Press wheel arch trim slightly to one side and release screw (1) on bumper trim (2).

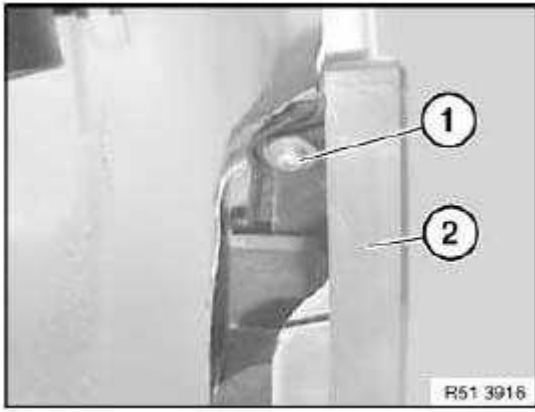


Fig. 85: Screw And Bumper Trim
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) on bracket (2).

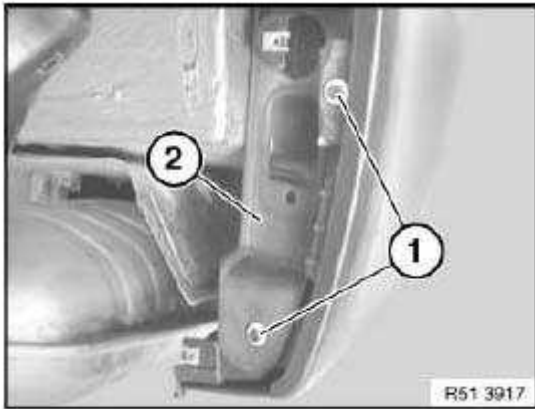


Fig. 86: Screws And Bracket
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1) and nuts (2).

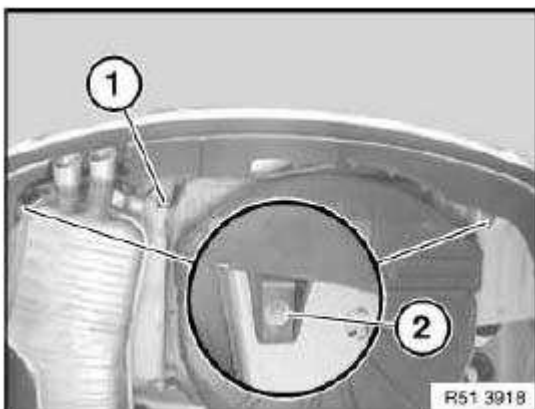


Fig. 87: Nut And Screw

Courtesy of BMW OF NORTH AMERICA, INC.

Lever out trim (1) with special tool 00 9 317 in direction of arrow.

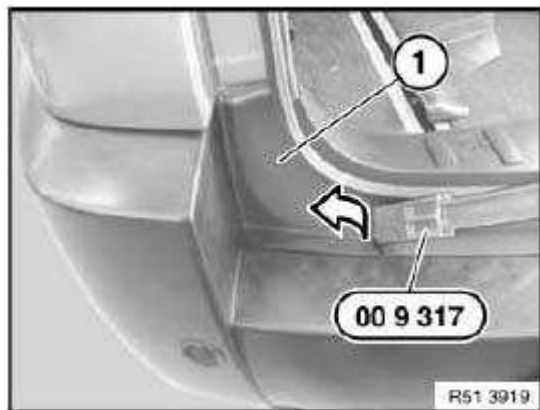


Fig. 88: Special Tool (00 9 317)

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Catch (1) and guides (2) of trim (3) must not be damaged.

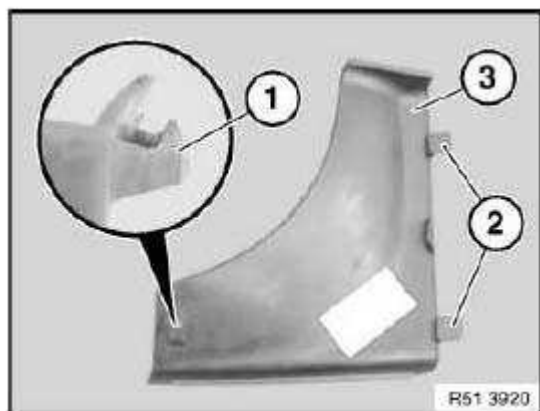


Fig. 89: Catch, Guides And Trim

Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1) on bumper trim (2) on left and right.

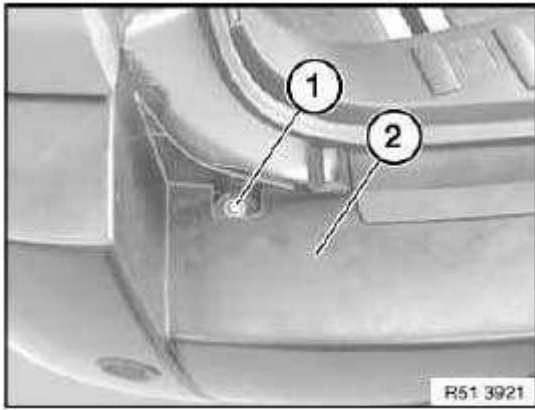


Fig. 90: Screw And Bumper Trim

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage!

Do not detach bumper trim (1) at sides in outward direction.

Pull off bumper trim (1) for side panel in direction of arrow.

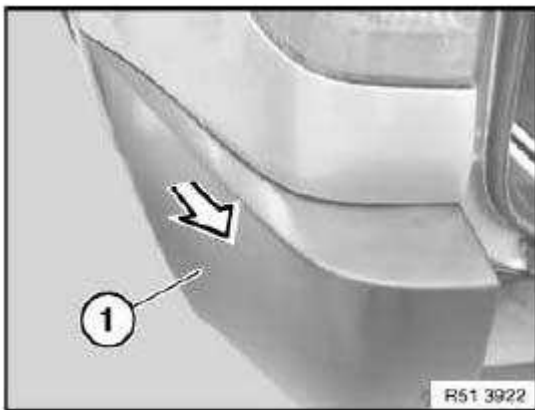


Fig. 91: Bumper Trim

Courtesy of BMW OF NORTH AMERICA, INC.

Pull out bumper trim (1) in direction of arrow and remove with aid of a 2nd person.

NOTE:

Version with Park Distance Control:

If necessary, pull bumper trim off a little and disconnect plug connections of ultrasonic transducers (2).

Remove bumper trim (1) with aid of a second person.

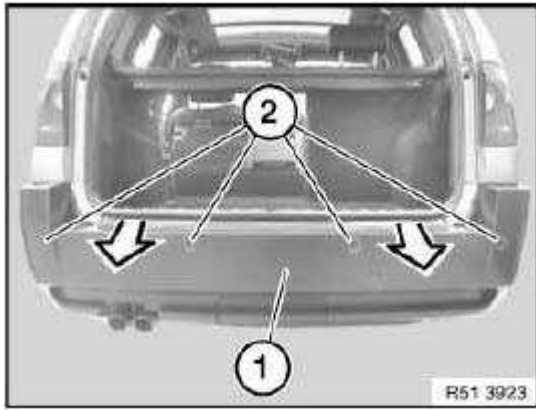


Fig. 92: Ultrasonic Transducers And Bumper Trim
 Courtesy of BMW OF NORTH AMERICA, INC.

51 12 156 REMOVING AND INSTALLING/REPLACING REAR BUMPER TRIM (M TECHNIC AERODYNAMIC KIT)

Necessary preliminary tasks:

- Remove trim on loading sill, see **51 12 080 Removing and installing/replacing trim on loading sill for rear bumper (from 09/2006)**

Release screws (1) on bumper trim (2).

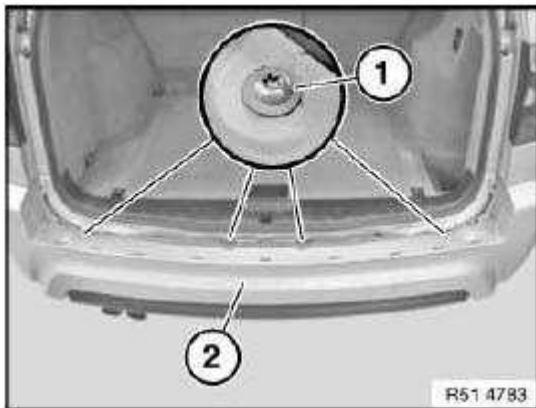


Fig. 93: Screws And Bumper Trim
 Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) and nut (2) on left and right.

Installation:

Make sure wheel arch trim (3) is in correct position.

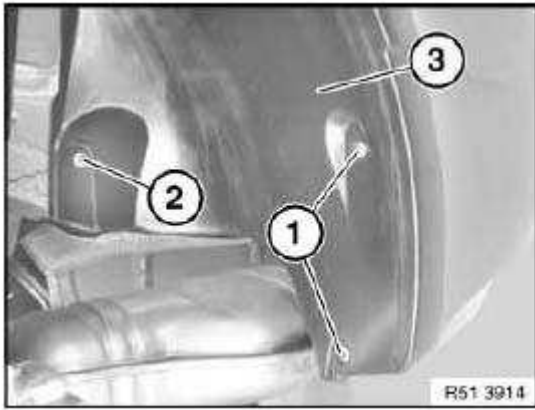


Fig. 94: Screws, Nut And Wheel Arch Trim
Courtesy of BMW OF NORTH AMERICA, INC.

Press wheel arch trim slightly to one side and release screw (1) on bumper trim (2) on left and right.

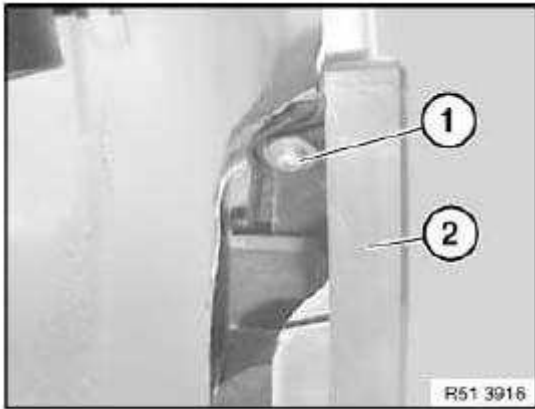


Fig. 95: Screw And Bumper Trim
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) on bracket (2).

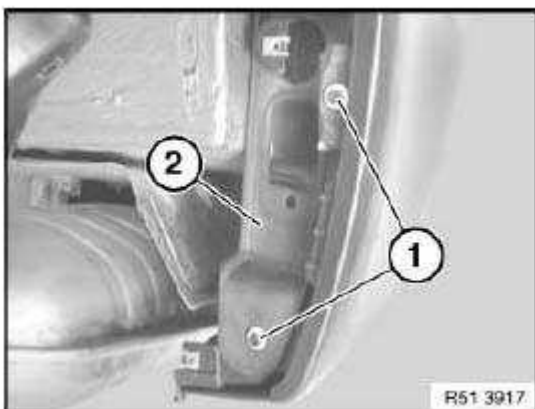


Fig. 96: Screws And Bracket

Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

Release nuts (2) and feed bracket out of stud.

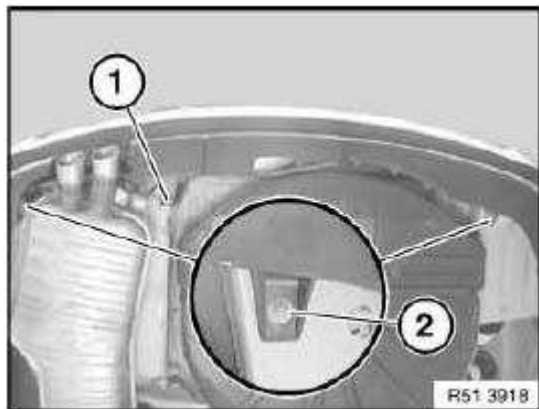


Fig. 97: Nut And Screw

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage!
Do not detach bumper trim (1) at sides in outward direction.

Pull off bumper trim (1) for side panel in direction of arrow.

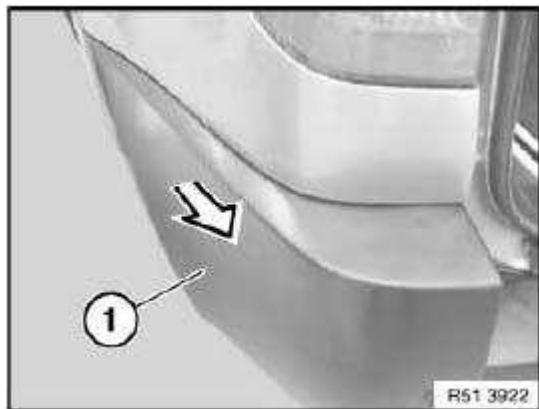


Fig. 98: Bumper Trim

Courtesy of BMW OF NORTH AMERICA, INC.

Pull out bumper trim (1) in direction of arrow and remove with aid of a 2nd person.

NOTE: Version with Park Distance Control:
If necessary, pull off bumper trim (1) a little and disconnect plug connections of

ultrasonic transducers (2).

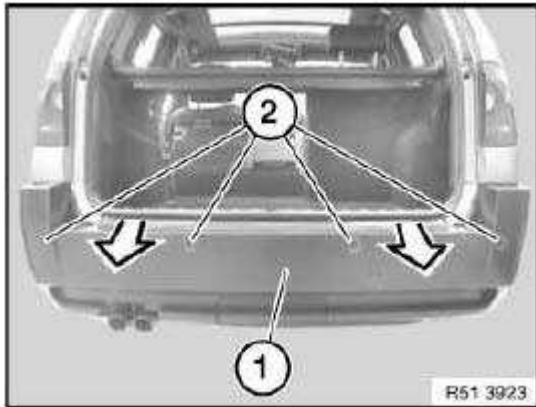


Fig. 99: Ultrasonic Transducers And Bumper Trim
Courtesy of BMW OF NORTH AMERICA, INC.

51 12 157 REPLACING REAR BUMPER TRIM

Necessary preliminary tasks:

- Remove rear bumper trim, see **51 12 156 Removing and installing rear bumper trim (from 09/2006)**

Version with M Technic aerodynamic kit:

- Remove diffuser, see **51 12 ... Removing and installing/replacing diffuser on rear bumper trim (M Technic aerodynamic kit)**

Build date from 09/2006:

- Remove trims on left and right, see **51 12 185 Removing and installing/replacing trim for bumper trim on left or right**
- Remove rear trim, see **51 12 ... Removing and installing/replacing trim for bumper trim at rear**

Remove cover cap (1) for tow lug.

If necessary, remove flap for towing hitch (2)

Version with Park Distance Control (PDC):

Remove all ultrasonic transducers (3).

Build date up to 09/2006: Remove locators (4) and spacer rings (5).

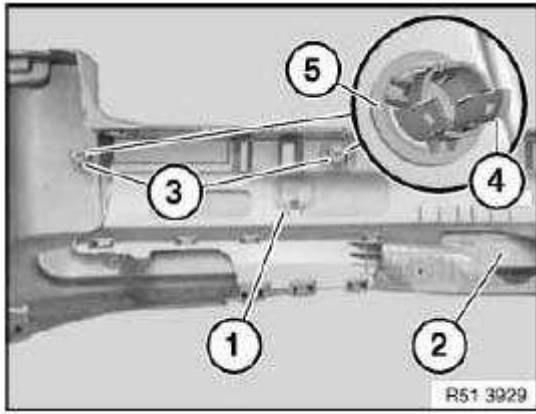


Fig. 100: Cover Cap, Towing Hitch, Locators And Spacer Rings
Courtesy of BMW OF NORTH AMERICA, INC.

Version with PDC up to build date 09/2006:

Cut out openings for ultrasonic sensors (1) on lower section of bumper trim (2) at moldings.

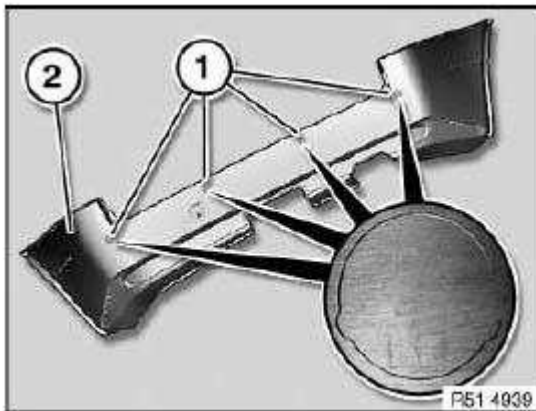


Fig. 101: Ultrasonic Sensors And Bumper Trim
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, remove impact absorber (1).

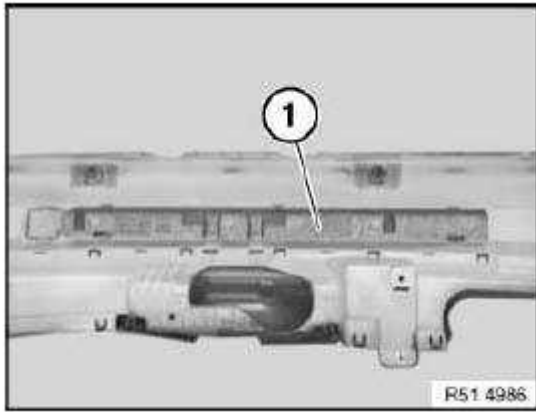


Fig. 102: Impact Absorber

Courtesy of BMW OF NORTH AMERICA, INC.

51 12 185 REMOVING AND INSTALLING/REPLACING TRIM FOR BUMPER TRIM ON LEFT OR RIGHT

Necessary preliminary tasks:

- Remove rear bumper trim, see **51 12 156 Removing and installing rear bumper trim (from 09/2006)**
- Remove rear reflector

Release clip (1).

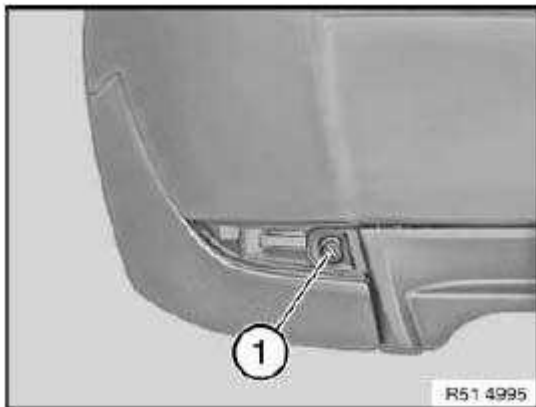


Fig. 103: Clip

Courtesy of BMW OF NORTH AMERICA, INC.

Release catches (1) and remove trim (2).

Installation:

Catches (1) must not be damaged.

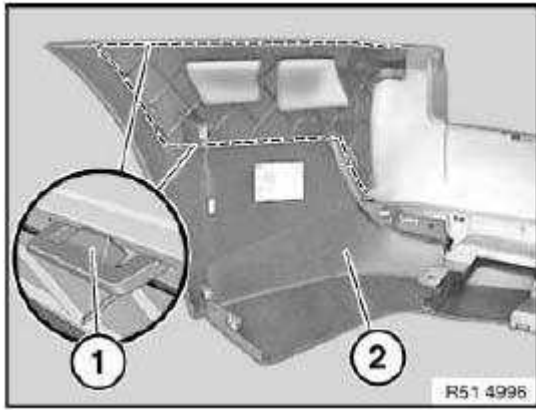


Fig. 104: Catches And Trim

Courtesy of BMW OF NORTH AMERICA, INC.

51 12 801 REPLACING BRACKET FOR REAR BUMPER AT LEFT OR RIGHT

Necessary preliminary tasks:

- Remove rear bumper trim, see **51 12 156 Removing and installing rear bumper trim (from 09/2006)**

If necessary, disconnect plug connection at RDC trigger transmitter.

Release screw (1) and remove bracket (2).

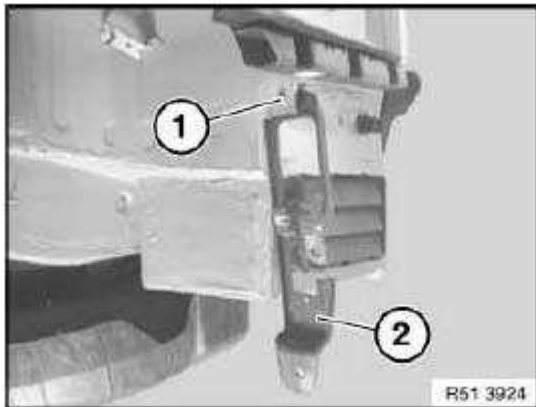


Fig. 105: Screw And Bracket

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

If necessary, replace faulty metal nuts (1) on bracket (2).

Replacement:

If necessary, remove RDC trigger transmitter.

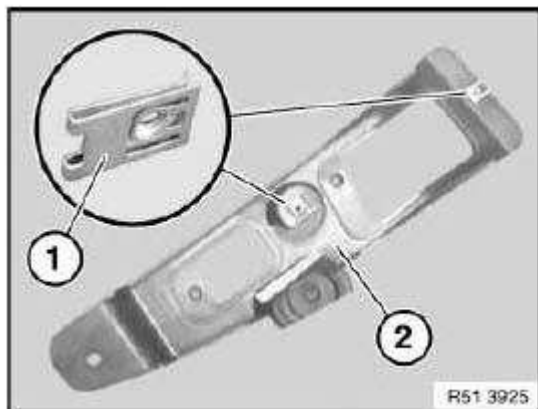


Fig. 106: Metal Nuts And Bracket

Courtesy of BMW OF NORTH AMERICA, INC.

51 12 825 REMOVING AND INSTALLING/REPLACING GUIDE FOR REAR CENTER BUMPER

Necessary preliminary tasks:

- Remove rear bumper trim, see **51 12 156 Removing and installing rear bumper trim (from 09/2006)**

Version with Park Distance Control:

If necessary, release cable holders (1) and lay cable to one side.

Unfasten screws (2).

Remove guide (3).

Installation:

If necessary, replace damaged cable straps (1).

Tightening torque: 51 12 10AZ, see **51 12 REAR BUMPER**

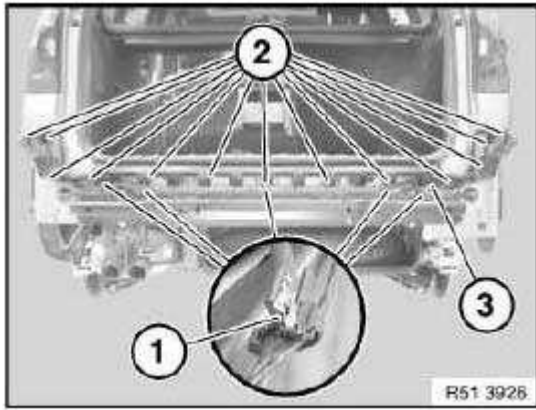


Fig. 107: Cable Straps, Guide And Screw
 Courtesy of BMW OF NORTH AMERICA, INC.

51 12 828 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT GUIDE FOR REAR BUMPER

Necessary preliminary tasks:

- Remove rear bumper trim, see **51 12 156 Removing and installing rear bumper trim (from 09/2006)**

Release screws (1).

Remove guide (2).

Tightening torque: 51 12 9AZ, see **51 12 REAR BUMPER**

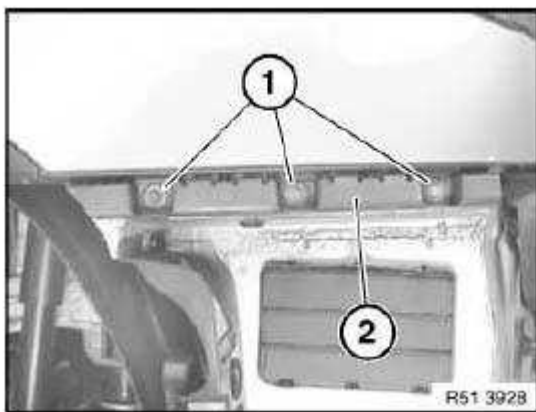


Fig. 108: Guide And Screw
 Courtesy of BMW OF NORTH AMERICA, INC.

13 TRIM, COVERS, HANDLE TRIM

51 13 ... REPLACING FRONT RADIATOR GRILL, MIDDLE LEFT OR RIGHT

NOTE: Representation created using the E85 as an example. There may be differences in detail in the case of other vehicle models.

Lever out upper catches (3) and separate inner section (2) from chrome ring (1).

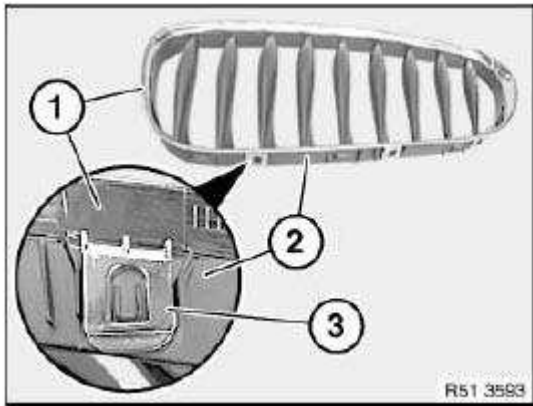


Fig. 109: Upper Catches And Chrome Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check inner section (1) for damage.

Retaining lugs (3) and (4) along line (2) must not be damaged.

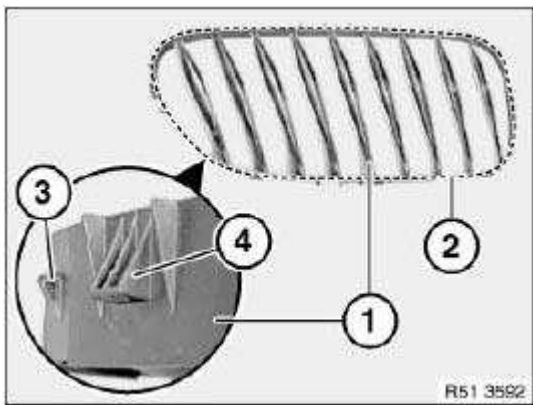


Fig. 110: Lugs And Inner Section
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check chrome ring (1) for damage.

Catches (4) and guides (3) along line (2) must not be damaged.

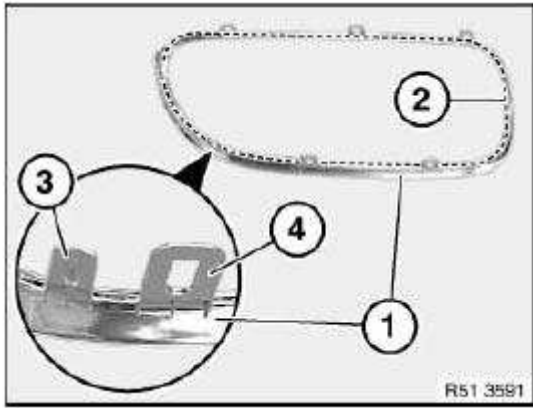


Fig. 111: Catches, Chrome Ring And Guides
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Assemble chrome ring (1) and inner section (2).

Make sure catch (3) is correctly assembled.

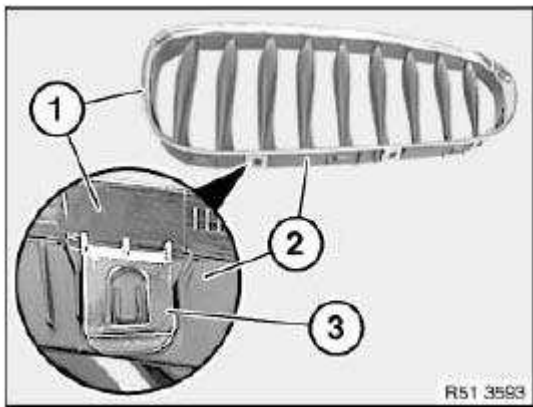


Fig. 112: Upper Catches And Chrome Ring
 Courtesy of BMW OF NORTH AMERICA, INC.

51 13 001 REMOVING AND INSTALLING/REPLACING FRONT RADIATOR GRILLE, MIDDLE LEFT OR RIGHT

Necessary preliminary tasks:

- Remove front bumper trim, see **51 11 156 Removing and installing front bumper trim (up to 09/2006)**

Lever out catches (1) and (2) and remove front grille (3) towards front.

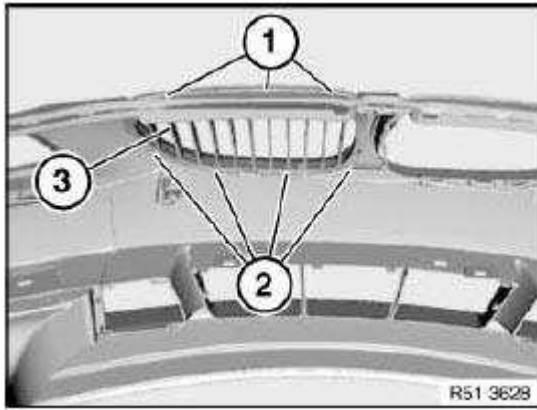


Fig. 113: Catches And Front Grille
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

All catches and guides on front grille (2) must not be damaged.

Press on chrome ring to push front radiator grille (2) into bumper trim.

Fixtures (1) must engage correctly.

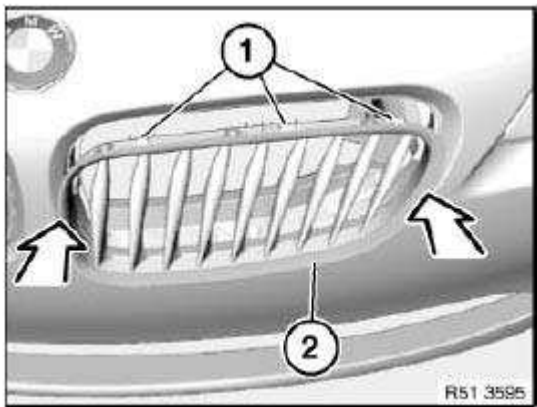


Fig. 114: Radiator Grille And Fixtures
 Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

- Replace front radiator grille, middle left or right, see **51 13 ... Replacing front radiator grill, middle left or right**

51 13 115 REMOVING AND INSTALLING/REPLACING COWL PANEL COVER

Necessary preliminary tasks:

- Remove both windscreen wiper arms, see **61 61 100 REMOVING AND INSTALLING/REPLACING BOTH WINDSCREEN WIPER ARMS**
- Remove microfilter for passenger compartment ventilation, see **64 31 010 REPLACING MICROFILTER FOR INTERIOR VENTILATION**

Unclip cover (1) on cowl panel.

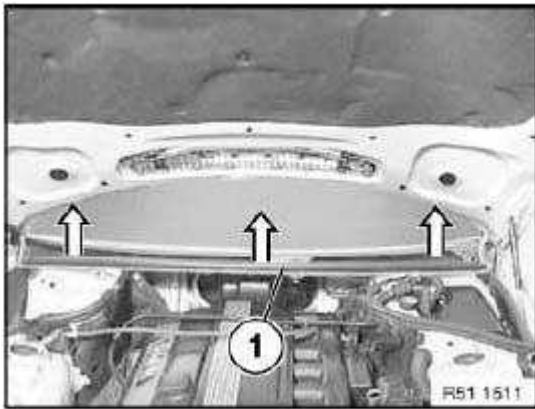


Fig. 115: Cover
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

If necessary, replace faulty clips (1) on cover (3).

Ensure retainers (2) are correctly seated.

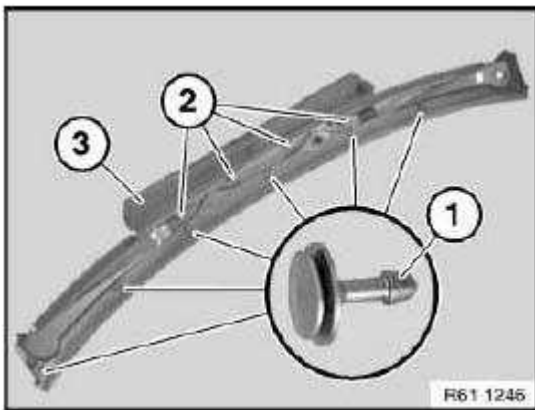


Fig. 116: Clips And Cover
 Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

If necessary, remove seal (1) from cover (2) for cowl panel.

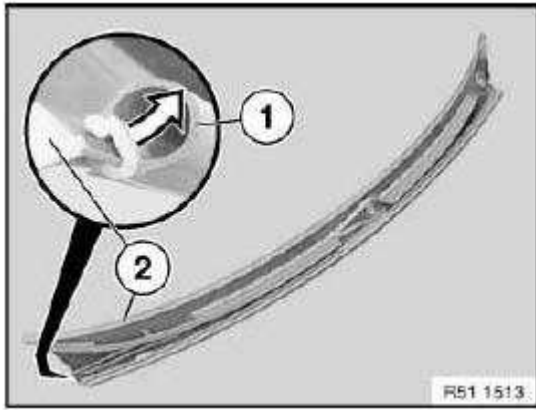


Fig. 117: Seal And Cover

Courtesy of BMW OF NORTH AMERICA, INC.

51 13 280 REMOVING AND INSTALLING/REPLACING TRIM STRIP ON ROOF FRAME AT LEFT OR RIGHT

Special tools required:

- 00 9 321 **00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)**

Necessary preliminary tasks:

- If necessary, remove railing, see **51 13 305 Removing and installing/replacing left or right rail**

Lever out trim strip (1) with special tool 00 9 321 starting at rear.

Unclip trim strip (1) up to front and if necessary pull out of seal (2) towards rear.

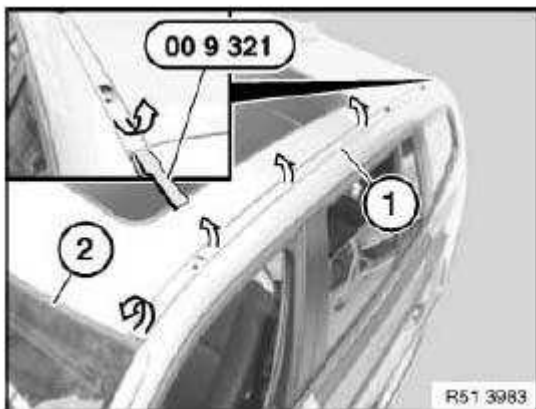


Fig. 118: Special Tool (00 9 321)

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Catches (1) of clips (2) must not be damaged.

If necessary, replace clips (2).

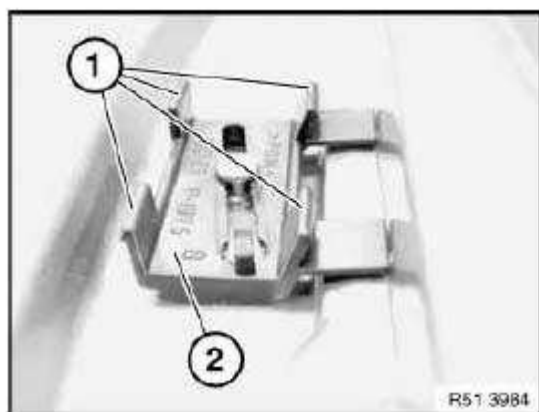


Fig. 119: Catches And Clips

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Following parts of trim strip (3) must not be damaged or missing:

1. Seals
2. End piece, front/rear

Replacement:

Moisten seals (1) with water and slide into trim strip (3).

Fit end pieces (2) at front and rear.

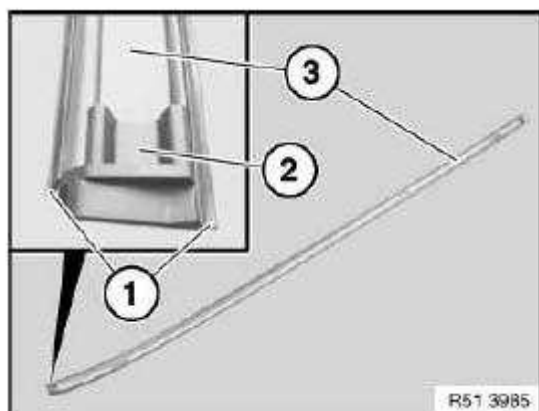


Fig. 120: Seals And Trim Strip

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

E83 only: Push trim strip (2) at front into seal (1).

Trim strip (2) must be flush with edge (3) at rear.

Clip trim strip (2) into place completely.

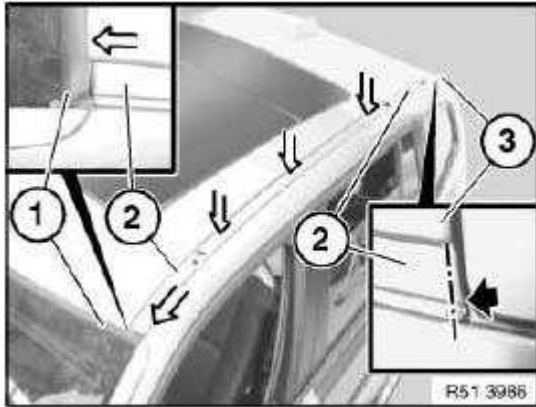


Fig. 121: Trim Strip And Seal

Courtesy of BMW OF NORTH AMERICA, INC.

51 13 305 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT RAIL

WARNING: Read and comply with safety regulations for handling airbag modules and pyrotechnical belt tensioners, see 51 00 ... Safety instructions for working on cars with airbag systems

Incorrect handling can activate airbag and cause injury.

Disconnect battery.

Necessary preliminary tasks:

- Remove roofliner, see 51 44 002 Removing and installing roofliner (on version without panorama sunroof)
- Partially remove head airbag, see 72 12 045 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT AHPS2 HEAD AIRBAG (VERSION WITHOUT SLIDE/TILT SUNROOF)

Detach water drainage hose (1 and 2).

Release screws (3) on holder (4).

Lever out cover (5) underneath.

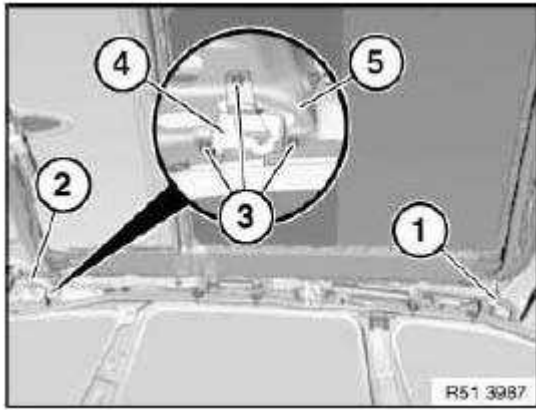


Fig. 122: Water Drainage Hose, Screws And Holder
 Courtesy of BMW OF NORTH AMERICA, INC.

Release nuts (1 and 2).

Installation:

- A. Tighten down nuts (1) to tightening torque: 51 13 3AZ, see **51 13 TRIM PARTS, COVERS, HANDLE TRIM**
- B. Adhere to settling time, refer to 51 13 3AZ, see **51 13 TRIM PARTS, COVERS, HANDLE TRIM**
- C. Tighten down nut (1) at rear and middle again to tightening torque 51 13 3AZ.
- D. Release nut (2) at front and tighten down again to tightening torque 51 13 3AZ plus angle of rotation.

IMPORTANT: Observe tightening specifications without fail (water ingress).

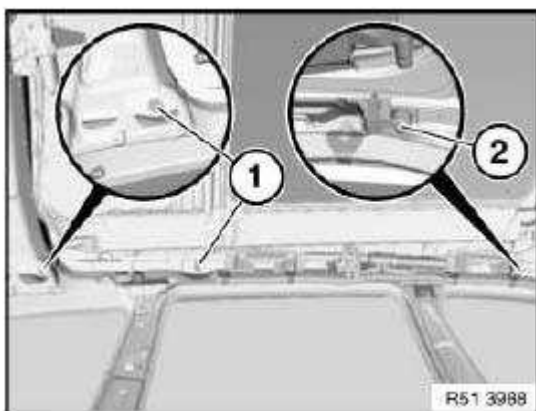


Fig. 123: Nuts
 Courtesy of BMW OF NORTH AMERICA, INC.

Remove rail (1) in direction of arrow.

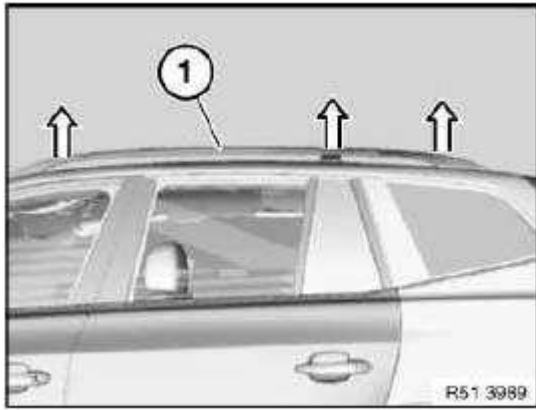


Fig. 124: Rail
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Seal (2) on rail (3) must not be damaged.

IMPORTANT: Replace foam seals (1) after each removal.

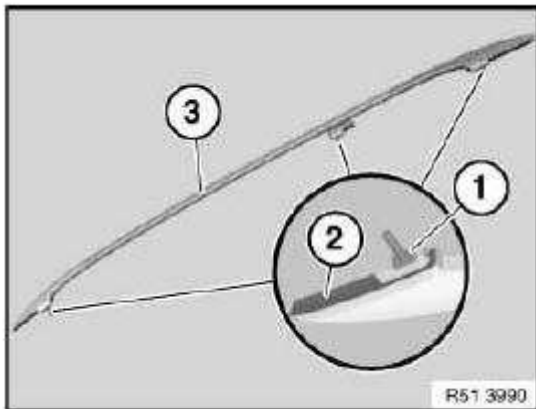


Fig. 125: Seal And Rail
Courtesy of BMW OF NORTH AMERICA, INC.

51 13 402 REMOVING AND INSTALLING/REPLACING HANDLE STRIP (ON REAR LID)

Necessary preliminary tasks:

- Remove rear finisher trim, see **51 13 420 Removing and installing/replacing center rear-end trim section**

Release catches (1 and 2) on handle strip (3).

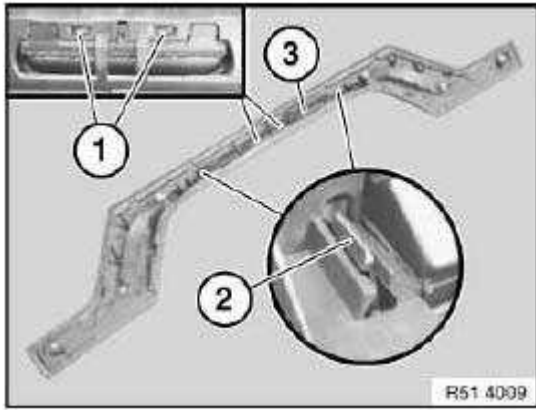


Fig. 126: Catches And Handle Strip

Courtesy of BMW OF NORTH AMERICA, INC.

Feed handle strip (1) in direction of arrow out of rear finisher (2).

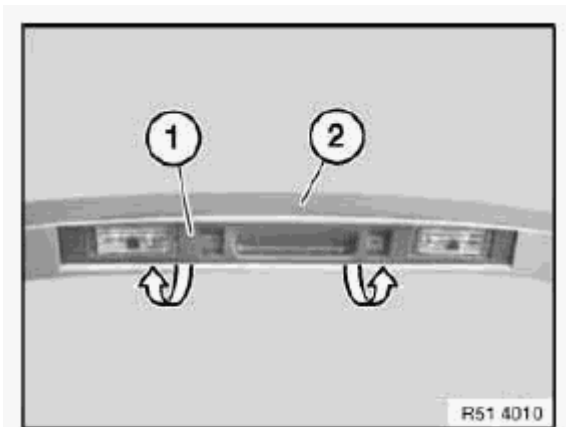


Fig. 127: Handle Strip And Rear Finisher

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Seal (1) on handle strip (2) must not be damaged.

Replacement:

If necessary, replace seal (1).

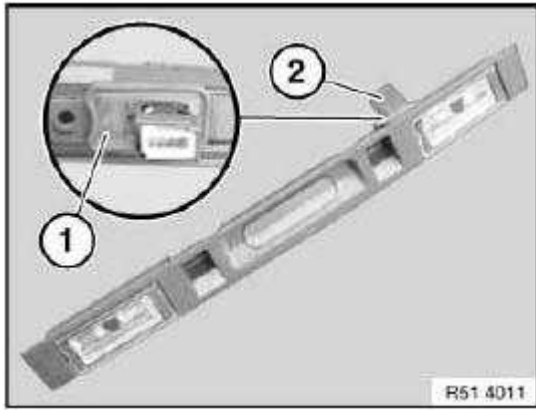


Fig. 128: Seal And Handle Strip

Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

If necessary, lever out license plate lights (1) at openings (2) in direction of arrow and remove from handle strip (3).

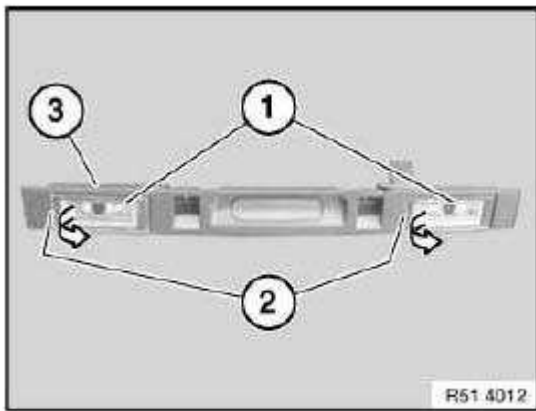


Fig. 129: License Plate Lights And Handle Strip

Courtesy of BMW OF NORTH AMERICA, INC.

51 13 412 REMOVING AND INSTALLING (REPLACING) LOWER TRIM ON REAR LID

Special tools required:

- 00 9 317 00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)

IMPORTANT: Build date from 09/2006 (painted lower trim):

Due to the risk of damage to the lower trim, the clips must be cut through from the inside.

During replacement, the lower trim can be removed from the outside (see Fig. 131).

Build date from 09/2006 (painted lower trim):

Remove panel for rear lid, see **51 49 008 Removing and installing/replacing panel for rear lid**

Cut through all clips (1) from the inside.

Unclip and remove lower trim from the outside.

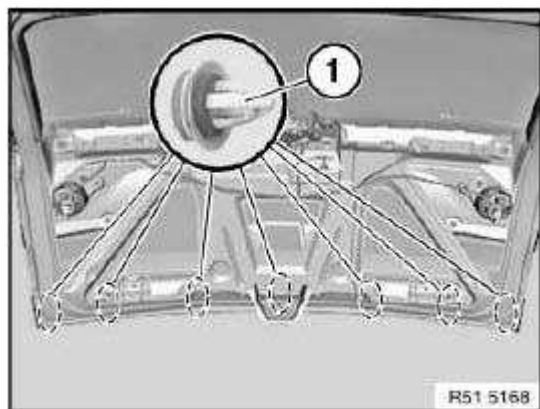


Fig. 130: Clips

Courtesy of BMW OF NORTH AMERICA, INC.

Build date up to 09/2006 or M aerodynamic kit:

Open rear lid.

Unclip clips (1) for trim (2) with special tool 00 9 317.

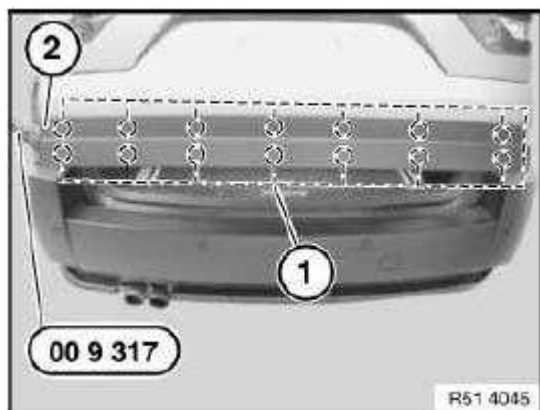


Fig. 131: Clips

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Following parts must not be damaged or missing:

- 1 Clips with seal
- 3 Seal

If necessary, replace faulty parts.

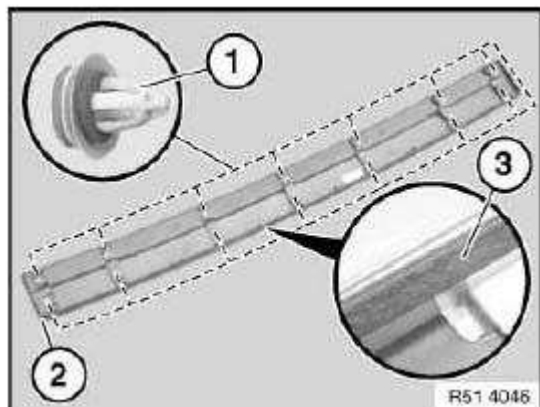


Fig. 132: Clips With Seal

Courtesy of BMW OF NORTH AMERICA, INC.

51 13 420 REMOVING AND INSTALLING/REPLACING CENTER REAR-END TRIM SECTION

Special tools required:

- 00 9 317 **00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)**

Necessary preliminary tasks:

- Remove number/license plate.

Release screws (1).

Tightening torque: 51 13 4AZ, see **51 13 TRIM PARTS, COVERS, HANDLE TRIM**

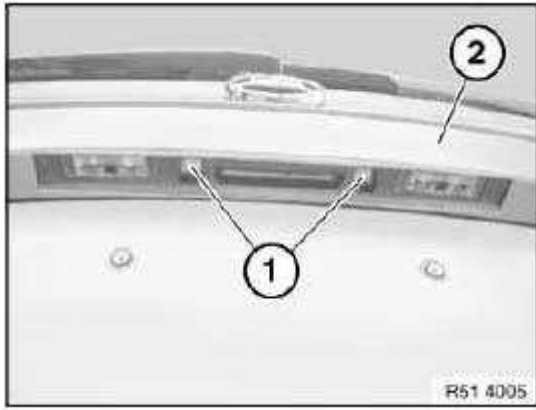


Fig. 133: Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Attach adhesive tape (1) underneath center rear-end trim section (2) (risk of damage).

Unclip clips (3) with special tool 00 9 317.

Pull off center rear-end trim section (2) in direction of arrow a little.

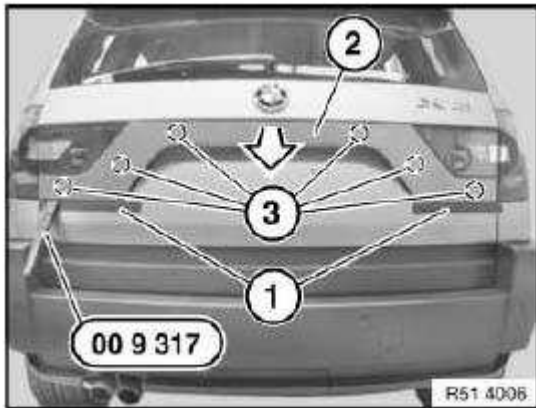


Fig. 134: Special Tool (00 9 317)

Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1) at center rear-end trim section (2).

Remove center rear-end trim section (2).

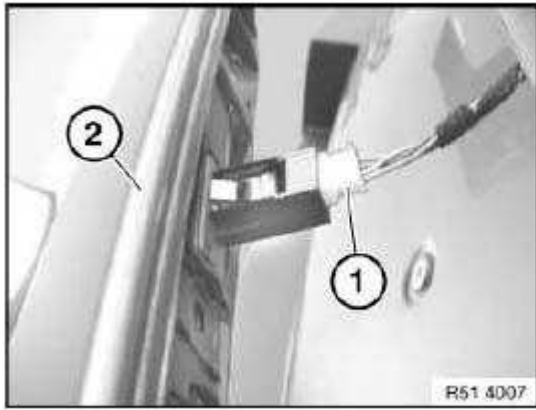


Fig. 135: Centre Rear-End Trim Section And Plug Connection
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Fit all clips (1) with sealing ring.

If necessary, replace faulty clips (1).

Replacement:

Remove handle strip (3).

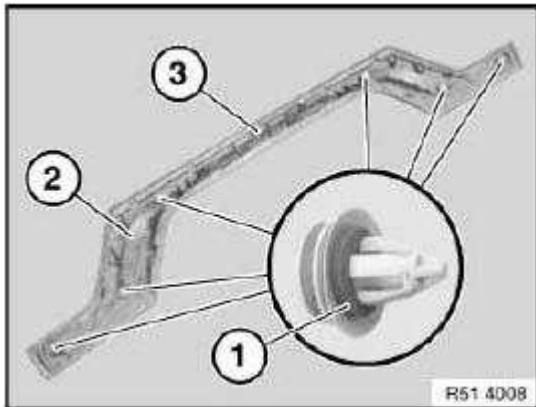


Fig. 136: Handle Strip And Clips
 Courtesy of BMW OF NORTH AMERICA, INC.

14 BMW EMBLEMS, MODEL EMBLEMS

51 14 ... INSTRUCTIONS FOR ATTACHING NUMBER/LETTER DESIGNATION COMBINATION

NOTE: The model designation is attached with adhesive and cannot be re-used.
 The model designation must be attached at room temperature.

The model designation must be removed at stove - enameling temperatures exceeding 80°C.

NOTE: The following work steps are described using the "316 i" as the example.

Removing:

Coat nylon string or strong yarn with tensides (e.g. washing-up liquid).

Cut through adhesive layer and remove model designation (1) from rear lid (2).

Remove remainder of adhesive layer with adhesive remover (sourcing reference: BMW Parts Service).

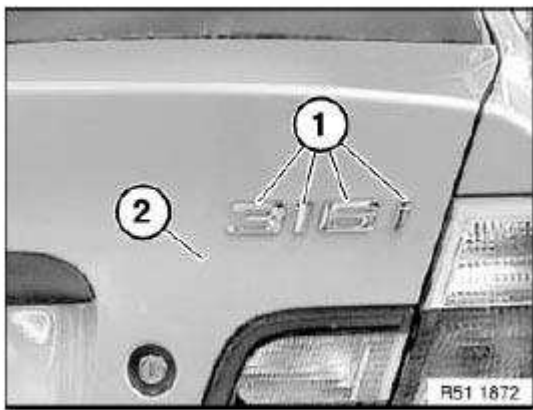


Fig. 137: Model Designation And Rear Lid
Courtesy of BMW OF NORTH AMERICA, INC.

Assembly:

Number and letter combinations (1) of the model designation are not connected to each other and are supplied on a carrier film (2).

IMPORTANT: Adhesive areas must be dry and free of dust and grease.
Once it has been cleaned, do not touch the adhesive area with bare hands.

Remove liner (3) (protective strip for adhesive surface).

Press on model designation firmly.

Remove carrier film (2).

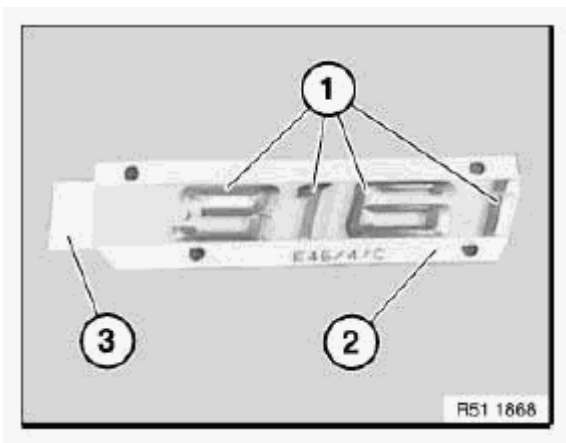


Fig. 138: Carrier Film And Liner

Courtesy of BMW OF NORTH AMERICA, INC.

51 14 000 REMOVING AND INSTALLING/REPLACING FRONT BMW BADGE

Special tools required:

- 00 9 318 **00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)**

Lever out badge with special tool 00 9 318 and remove towards top.

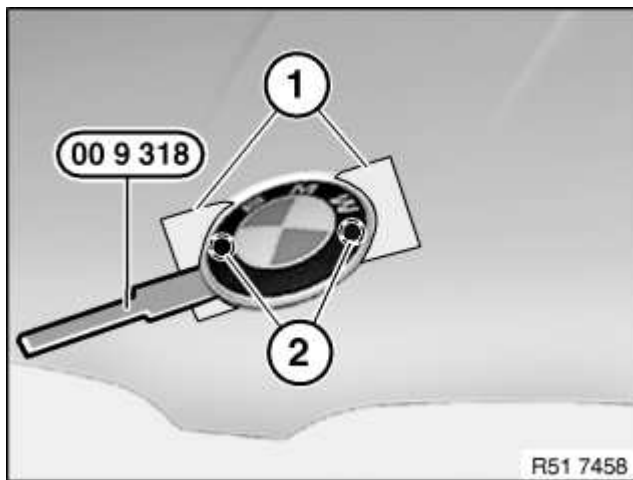


Fig. 139: Special Tool (00 9 318)

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Following parts of badge (1) must not be damaged or missing:

- 2 Guide pins
- 3 Grommets

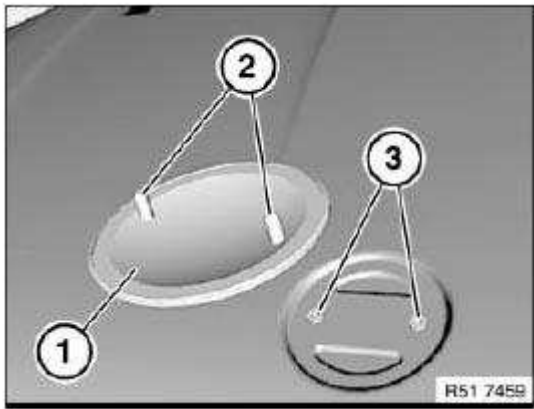


Fig. 140: Guide Pins And Grommets

Courtesy of BMW OF NORTH AMERICA, INC.

51 14 008 REPLACING (REMOVING AND INSTALLING) NUMBER/LETTER COMBINATION ON FRONT LEFT OR RIGHT SIDE PANEL

IMPORTANT: The "Instructions for number/letter combination cementing" serve as the basis for these repair instructions and must be followed without fail., see 51 14 ... Instructions for attaching number/letter designation combination

NOTE: Procedure and dimensions are also mandatory for right side, outer edge of number is then positioned.

NOTE: Number/letter combination is stuck on at a height level with turn indicator.

Stick on adhesive tape (1) for contour edge (2) to side panel up to turn indicator lamp.

Mark measurement "B" from side edge (3) on adhesive tape.

Dimensions:

A= 30 mm

B= 22 mm

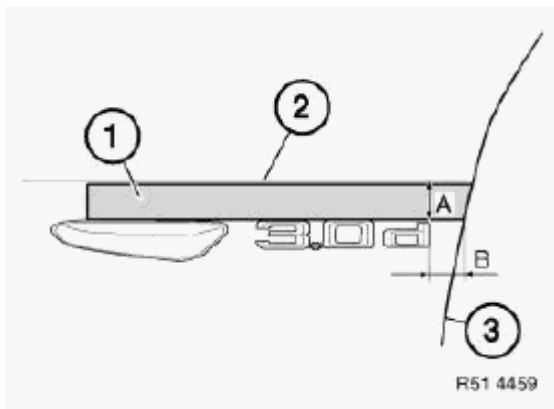


Fig. 141: Adhesive Tape And Contour Edge
Courtesy of BMW OF NORTH AMERICA, INC.

51 14 010 REMOVING AND INSTALLING/REPLACING REAR BMW BADGE

Operation is identical to:

51 14 000 Removing and installing/replacing front BMW badge

51 14 110 REMOVING AND INSTALLING/REPLACING REAR MODEL DESIGNATION

IMPORTANT: The "Instructions for number/letter combination cementing" serve as the basis for these repair instructions and must be followed without fail, see 51 14 ... Instructions for attaching number/letter designation combination

Stick on top edge of adhesive tape (1) to bottom edge of rear lid (2) at distance "A" and "B".

Mark measurement "C" from side edge (3) measured on top edge of adhesive tape.

Dimensions:

A= 50 mm

B= 55 mm

C= 77 mm

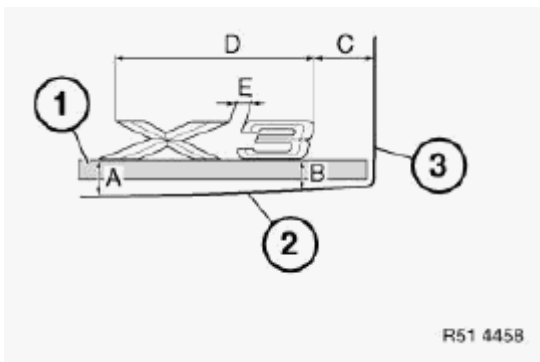


Fig. 142: Adhesive Tape And Rear Lid
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Measurements "D" and "E" are for information purposes only, as they are determined by carrier film.

D= 15.6 mm

E = 170 mm

16 MIRRORS/COVERS/ASHTRAYS/SHELVES/TRAYS

51 16 ... CALIBRATING COMPASS IN INTERIOR REARVIEW MIRROR

NOTE: It may be necessary to alter the magnetic deflection zone if the vehicle is more than two ranges away from the set deflection zone.

For numbers of magnetic deflection zone, refer to Owner's Handbook.

If may be necessary to calibrate the compass if:

- vehicle battery has been disconnected for an extended period of time
- "C" appears in compass display
- there is no compass display

Setting magnetic deflection zone:

- Switch ignition on.
- Using a suitable tool (1), press pushbutton in area (A) of mirror (2) until a number appears in compass display (B)
- Press pushbutton repeatedly until number of desired zone appears
- Wait until direction display appears
- Magnetic deflection zone is now set

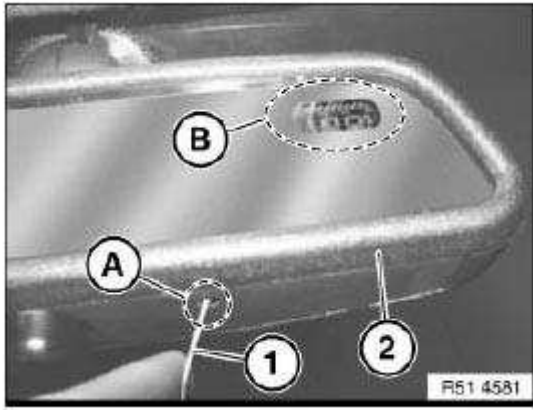


Fig. 143: Suitable Tool And Mirror
Courtesy of BMW OF NORTH AMERICA, INC.

Calibrating compass:

- Switch ignition on.
- Using a suitable tool (1), press pushbutton in area (A) of mirror (2) until "C" appears in compass display (B)
- Drive vehicle 2 to 3 times in a circle at approx. 10 mph
- Calibration process is completed when direction display appears

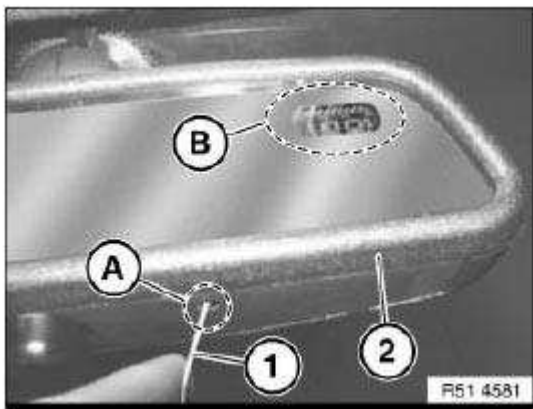


Fig. 144: Suitable Tool And Mirror
Courtesy of BMW OF NORTH AMERICA, INC.

51 16 ... CEMENTING OF MIRROR BASE

Material Requirements:

Repair set for cementing of mirror base (Sourcing Reference: BMW Parts Service)

Primer XW 775 (Sourcing Reference: BMW Parts Service)

1. Preparations

1. Cement at room temperature and make sure that, in cold weather, the window glass and base are brought to room temperature in the workshop long enough to prevent moisture forming on the surface.
2. Mark location of the mirror mount on the outside of the windshield.

Scratch off cement residue on glass and base with a sharp tool.

3. Clean cement area on window and base with clean non-fluffing cloth and alcohol/cetone and allow to dry! Never use paint thinners!

2. Primer Coat

Apply colorless, diluted primer to surface of windshield intended for cementing with help of cotton buds (Q-Tips or similar).

Specified ventilation time at least 10 minutes, maximum 1 hour

3. Cement Coat

1. Mixing Cement

Trim off sealing tips on containers of cement and hardener using a knife.

Make sure that both openings are equal in size, as otherwise there would be mistakes in mixing.

The sealing cap for subsequent plugging of the double injector is located between both pistons of the injector.

Break off sealing cap.

The required amount of cement and hardener is removed by applying light pressure on the pistons.

The mixing ratio for cement and hardener is 1 : 1 (weight and volume). It is important that the same volumes of cement and hardener are removed (increase size of openings if necessary).

Both components react chemically with each other. Thorough, intensive and homogenous mixing is a requirement for this reaction and for the quality of cementing.

Consequently both components must be mixed in such a way that there is a uniform, seam-free color mixture.

2. Application

At 20 ... 25°C the mix can be processed after approx. 5 ... 10 minutes (pot time).

Apply thin (approx. 0.5 mm), uniform coat of cement on base with spatula and press base onto glass in such a way that cement obtains good contact with windshield across the entire surface area.

NOTE: The temperature for the hardening process should not be lower than +18°C.

3. Fixing Bonded Parts

Epoxide resin cement does not have an initial strength property. It is therefore necessary to fix all bonded parts (cement tape or similar). The joining and fixing of bonded parts must be accomplished within the potlife). Check that the arresting button is located correctly on the mirror base to ensure that the mirror, when it is attached, is seated straight.

(Long side of mirror base hexagon parallel to upper edge of window).

4. Hardening of cement

Hardening speed depends on the ambient temperature.

For this reason, the mirror base must be secured with adhesive tape or similar for at least 3 ... 4 hours.

After 12 hours have elapsed, clip mirror into place as soon as possible.

4. Working Hygiene

CAUTION: Cement is dangerous for health when vapors are inhaled or through contact with the skin.

As is the case for all epoxide resins, sensitive persons might be confronted with an allergy through contact with the skin.

If the product gets on the skin, wash off with soap and water immediately.

If it gets in an eye, rinse the eye thoroughly in water and consult doctor.

Make sure that the room is well ventilated and gloves are worn for the application of cement.

51 16 ... REMOVING AND INSTALLING/REPLACING COVER FOR CENTER ARMREST (STORAGE COMPARTMENT WITH CD CHANGER)

Necessary preliminary tasks:

- Remove storage compartment, see **51 16 200 Removing and installing/replacing storage compartment (with CD changer)**

Release screws (1).

Remove cover (2) towards top.

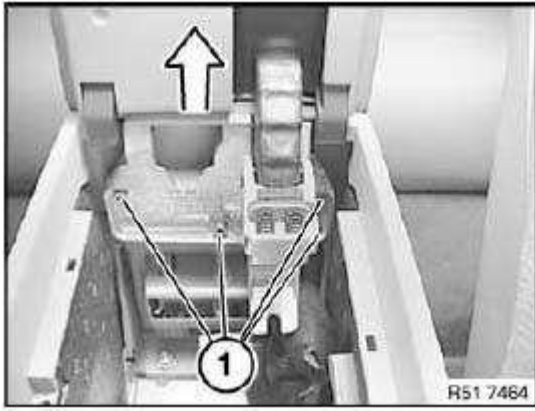


Fig. 145: Cover And Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Replacement (version without telephone):

Remove insert (1) and release screws (2) underneath.

Unclip trim (3) towards top.

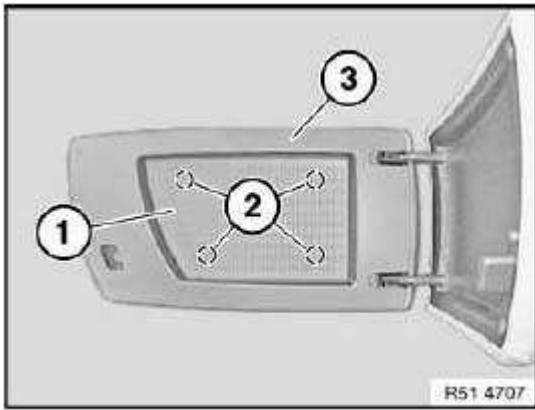


Fig. 146: Insert, Trim And Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Replacement (version with telephone):

Remove eject box.

Remove insert (1) and release screws (2).

Unclip trim (3) towards top.

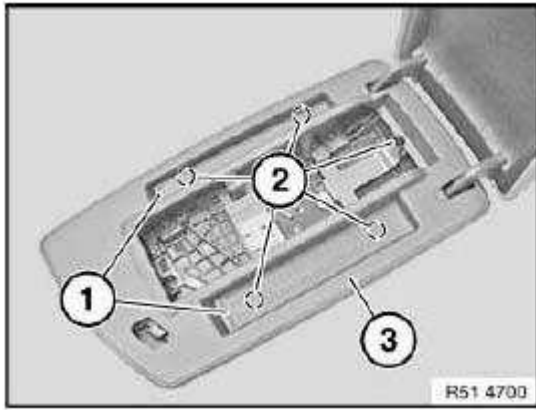


Fig. 147: Insert, Trim And Screws

Courtesy of BMW OF NORTH AMERICA, INC.

51 16 000 REMOVING AND INSTALLING/REPLACING MIRROR ON LEFT OR RIGHT FRONT DOOR

Necessary preliminary tasks:

- Remove front door trim panel, see **51 41 000 Removing and installing left or right front door trim panel**

Press cover (1) and guide rubber (2) to one side.

Disconnect plug connection (3).

Release screws (4).

Tightening torque: 51 16 1AZ, see **51 16 MIRRORS, FINISHERS, ASHTRAYS, CONSOLES**

Replacement:

Due to the self-tapping screws, the tightening torque of the new mirror is increased by 2 Nm.

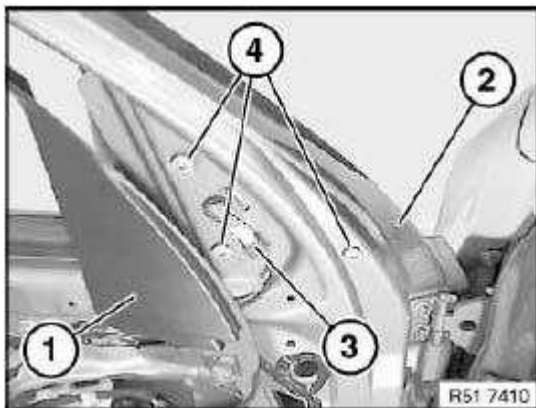


Fig. 148: Cover, Plug Connection And Guide Rubber
Courtesy of BMW OF NORTH AMERICA, INC.

Remove mirror (1) outwards.

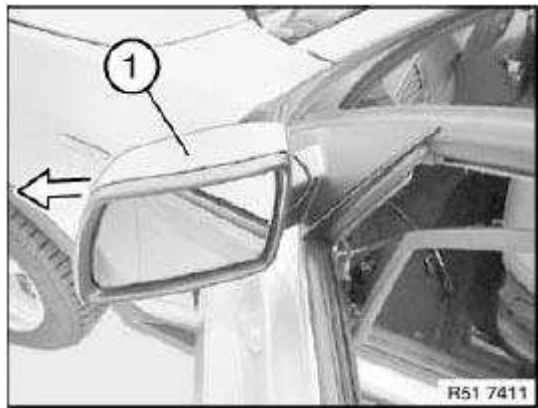


Fig. 149: Mirror
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Sound insulation (1) on mirror (2) must not be damaged.

Check function.

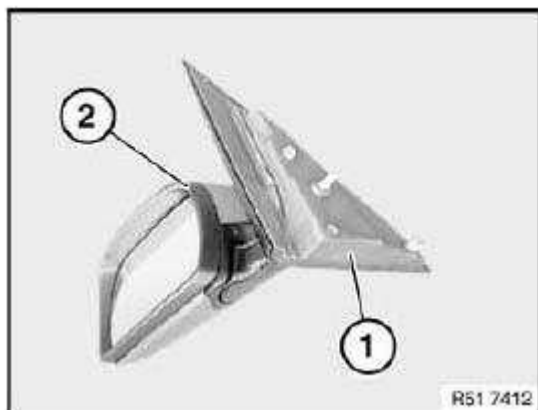


Fig. 150: Sound Insulation And Mirror
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

- If necessary, convert mirror glass, see **51 16 026 Replacing mirror glass**
- If necessary, convert housing on door mirror, see **51 16 040 Removing and installing/replacing housing on left or right door mirror**

- If necessary, convert retaining ring on door mirror, see **51 16 045 Removing and installing/replacing retaining ring on left or right door mirror**

51 16 026 REPLACING MIRROR GLASS

Special tools required:

- 00 9 317 **00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)**

WARNING: Move mirror glass with hand carefully and slowly.
If mirror glass is damaged:
Wear protective goggles and cut-proof gloves.
Risk of injury by flaking-off glass splinters.

IMPORTANT: Bring door mirror to room temperature to prevent catches from breaking off.

Press mirror glass (1) on side vehicle by hand to full extent.

NOTE: Secure mirror glass (1) against falling out.

Unclip mirror glass (1) from outer side with special tool 00 9 317 all round.

Unlock and disconnect associated plug connections, remove mirror glass (1).

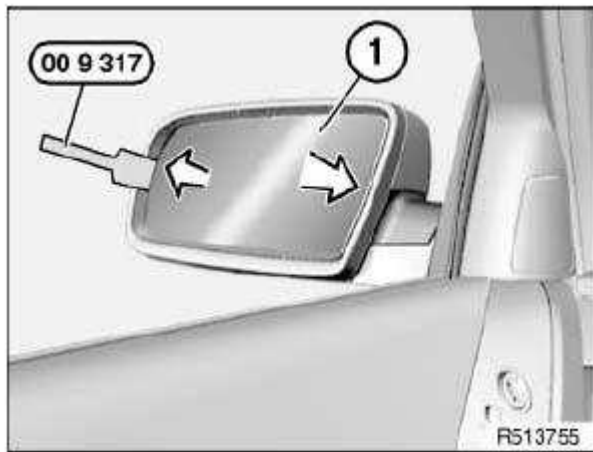


Fig. 151: Special Tool (00 9 317)

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Retaining lugs (1) must not be damaged.

Fit mirror glass (2) with retaining lugs (1) flush on mirror adjusting drive and clip into place.

Ensure correct locking.

Make sure mirror adjusting drive functions correctly.

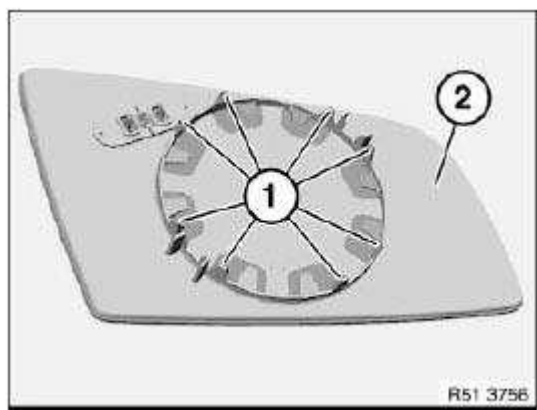


Fig. 152: Mirror Glass And Retaining Lugs

Courtesy of BMW OF NORTH AMERICA, INC.

51 16 040 REMOVING AND INSTALLING/REPLACING HOUSING ON LEFT OR RIGHT DOOR MIRROR

Special tools required:

- 00 9 317 00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)

Necessary preliminary tasks:

- Remove mirror glass, see 51 16 026 Replacing mirror glass

NOTE: Retaining ring (1) and housing (2) are engaged against each other in area (A).

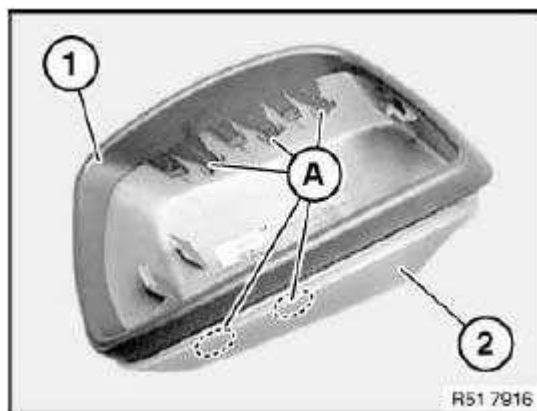


Fig. 153: Retaining Ring And Housing

Courtesy of BMW OF NORTH AMERICA, INC.

Release catch (1) and carefully snap housing (2) forwards out of retaining ring (3).

If necessary, use special tool 00 9 317 as an aid.

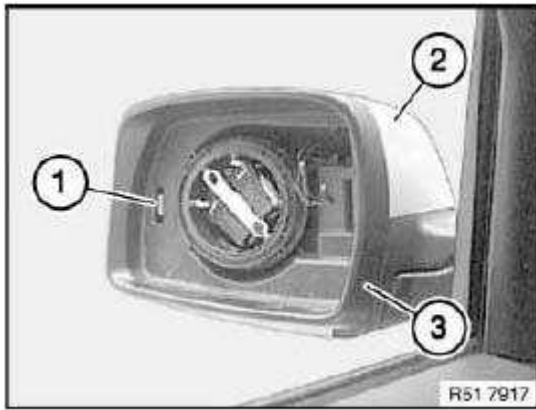


Fig. 154: Catch And Snap Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Catches (1 to 3) must not be damaged.

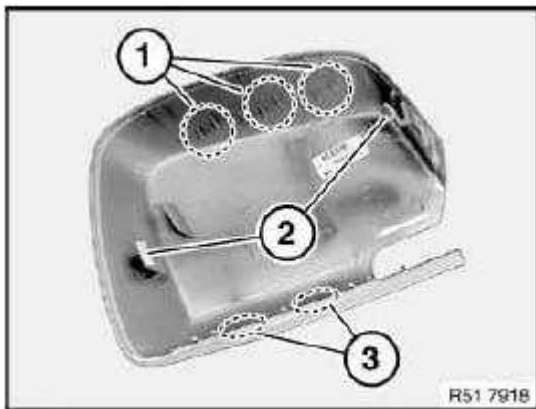


Fig. 155: Catches
Courtesy of BMW OF NORTH AMERICA, INC.

51 16 045 REMOVING AND INSTALLING/REPLACING RETAINING RING ON LEFT OR RIGHT DOOR MIRROR

Necessary preliminary tasks:

- Remove housing on door mirror, see **51 16 040 Removing and installing/replacing housing on left or right door mirror**

Release catches (1) and remove retaining ring (2) towards rear.

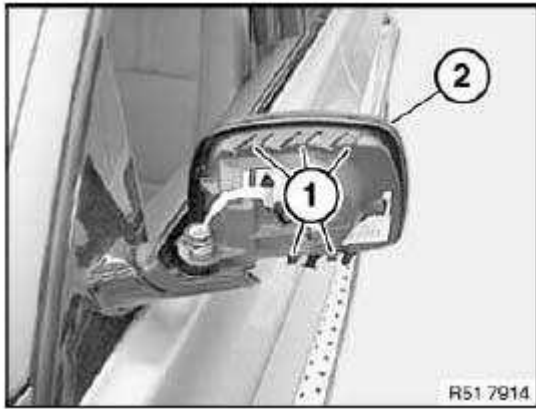


Fig. 156: Catches And Retaining Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Catches (1 and 2) must not be damaged.

1. Retaining ring catches on door mirror
2. Retaining ring catches on housing

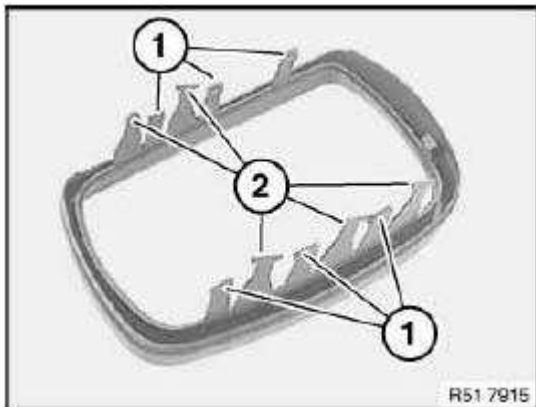


Fig. 157: Catches
Courtesy of BMW OF NORTH AMERICA, INC.

51 16 060 REMOVING AND INSTALLING/REPLACING INTERIOR REARVIEW MIRROR (OVERVIEW)

NOTE: Version with cable (X) for:

- Automatic dim action (electro-chrome technology) for interior rearview mirror
- Fogging sensor

- Remote control (infrared or radio)
- Autobeam
- Garage door opener
- Compass
- Rain sensor

Version without cable (X) with full foot (1), see **51 16 060 Removing and installing/replacing interior rearview mirror (with full foot)**

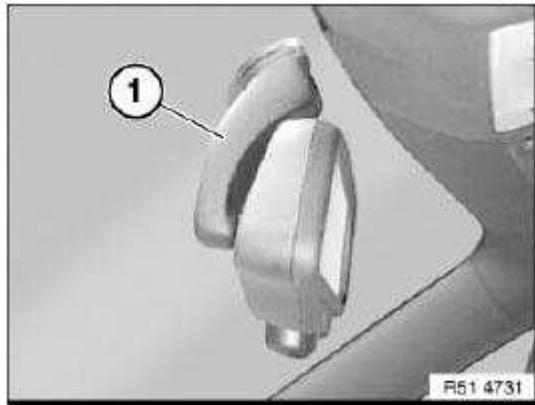


Fig. 158: Full Foot
 Courtesy of BMW OF NORTH AMERICA, INC.

Version with cable (X) and plug trim cover (1).



Fig. 159: Cable And Plug Trim Cover
 Courtesy of BMW OF NORTH AMERICA, INC.

Version with mirror arm end caps (1), see **51 16 060 Removing and installing/replacing interior rearview mirror (with mirror arm end caps)**

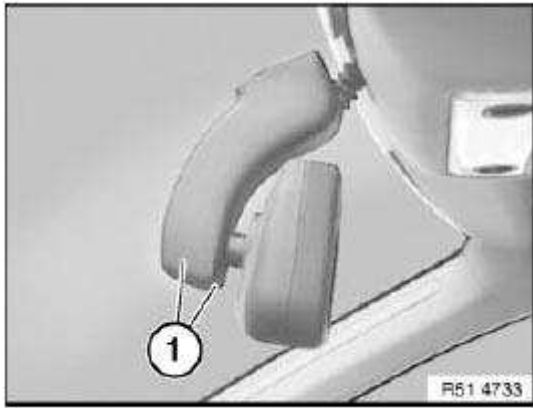


Fig. 160: Mirror Arm End Caps

Courtesy of BMW OF NORTH AMERICA, INC.

Version with rain sensor, see **51 16 060 Removing and installing/replacing interior rearview mirror (with rain sensor)**



Fig. 161: Rain Sensor

Courtesy of BMW OF NORTH AMERICA, INC.

Version with Autobeam.

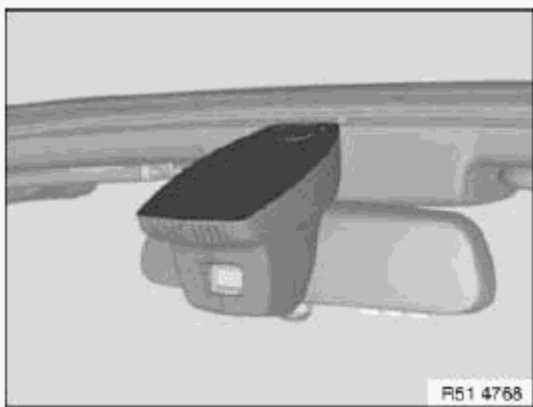


Fig. 162: Autobeam

Courtesy of BMW OF NORTH AMERICA, INC.

Version with toll mirror for Japan, see **51 16 060 Removing and installing/replacing interior rearview mirror (with Japanese toll mirror)**

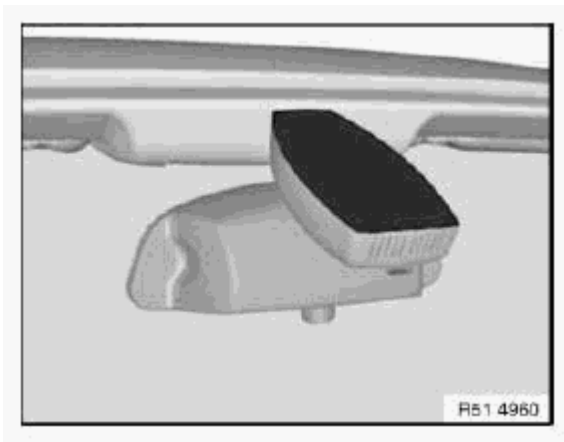


Fig. 163: Toll Mirror

Courtesy of BMW OF NORTH AMERICA, INC.

51 16 060 REMOVING AND INSTALLING/REPLACING INTERIOR REARVIEW MIRROR (WITH JAPANESE TOLL MIRROR)

IMPORTANT: Work may only be carried out at a room/object temperature of 18 ... 28°C.
If this cannot be guaranteed (cold/hot countries), it is necessary to equalize the temperature of the windscreen, mirror foot and rearview mirror (e.g. car left to stand indoors or in the shade for at least 30 minutes).

Version with remote control for central locking:

If necessary, disconnect negative lead from battery.

Version with compass:

Check compass function if replacing or after disconnecting interior mirror plug connection or battery.

If necessary, calibrate compass in interior rearview mirror, see **51 16 ... Calibrating compass in interior rearview mirror**

E60 Security version:

Rain sensor is not installed, cable connection is tied back in roofliner.

IMPORTANT: To avoid breaking windscreen:
Screw rearview mirror off mirror mount.

Mirror must not be pulled or pressed off towards front or rear.

Press on end caps (1) and at same time pull them apart; this releases clip connection of both caps (1).

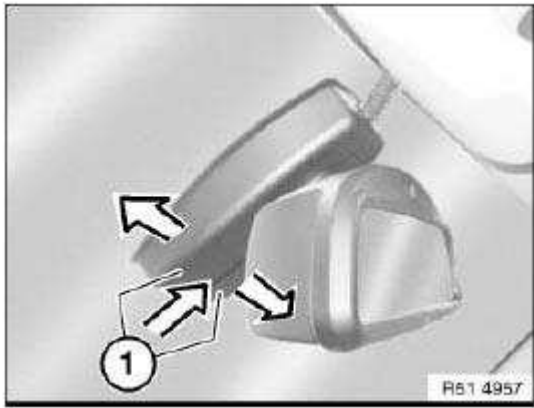


Fig. 164: Caps

Courtesy of BMW OF NORTH AMERICA, INC.

Turn mirror (1) to right and left and feed out end caps (2).

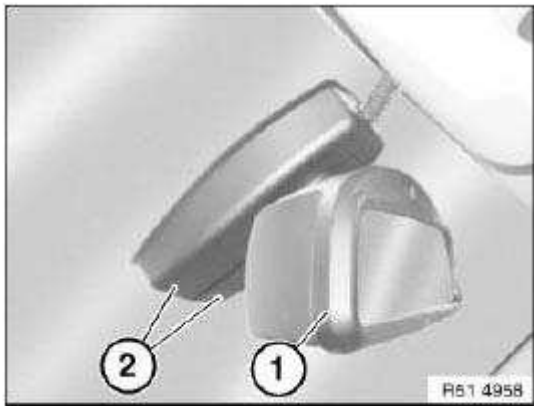


Fig. 165: Mirror And Caps

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Catches (1) and guides (2) of end caps (3) must not be damaged, replace if necessary.

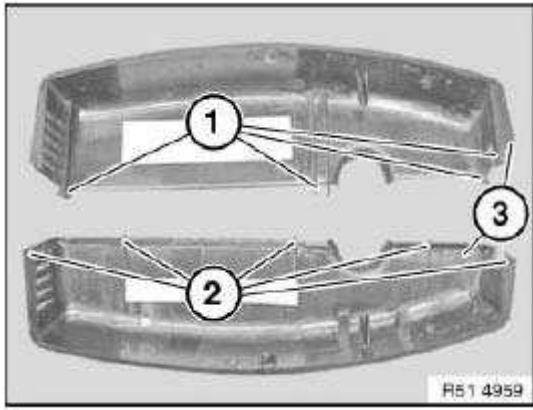


Fig. 166: Catches And Guides

Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plugs (1 and 2).

NOTE: Pay attention to cable guide for rain sensor.

E60 Security version:

Rain sensor is not installed, cable connection is tied back in roofliner.

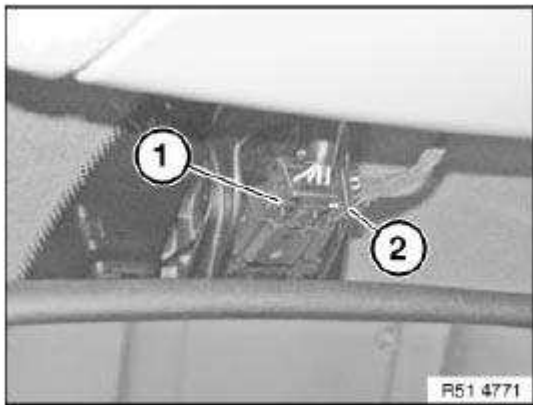


Fig. 167: Plugs

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not pull or press rearview mirror off towards front or rear.
Because of altered mirror foot, rearview mirror must be twisted off.

Twist mirror foot approx. 45° to right until mirror foot is released from mirror mount.

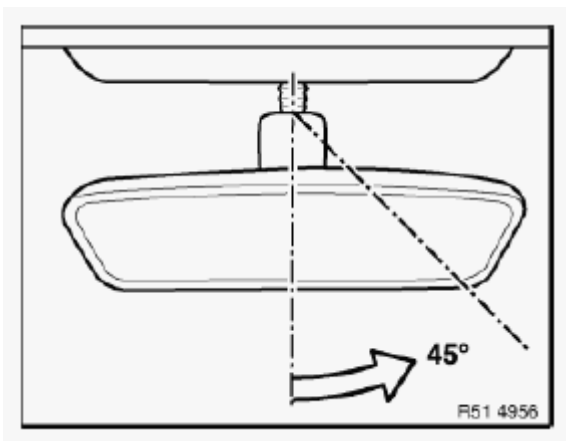


Fig. 168: Mirror Foot Angle
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

1. Twist mirror foot by approx. 45° and fit to mirror mount.
2. Turn mirror foot until it engages on mirror base.

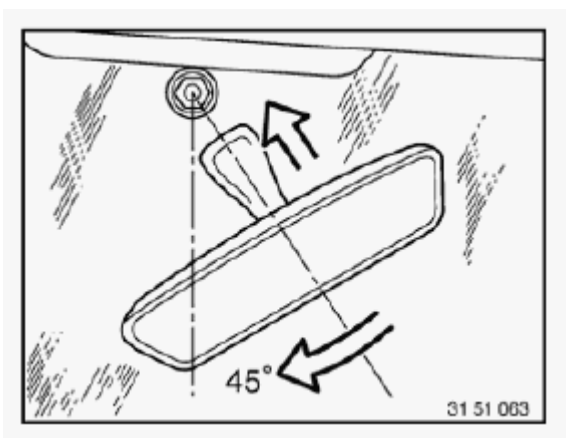


Fig. 169: Mirror Foot Angle
 Courtesy of BMW OF NORTH AMERICA, INC.

Only replace with version with remote control for central locking:

If necessary, initialize all transmitters (ignition keys), refer to Owner's Handbook.

51 16 060 REMOVING AND INSTALLING/REPLACING INTERIOR REARVIEW MIRROR (WITH FULL FOOT)

IMPORTANT: Work may only be carried out at a room/object temperature of 18 ... 28°C.
 If this cannot be guaranteed (cold/hot countries), it is necessary to equalize the temperature of the windscreen, mirror foot and rearview mirror (e.g. car left to stand indoors or in the shade for at least 30 minutes).

IMPORTANT: To avoid breaking windscreen:

Snap out (press) rearview mirror only in direction of travel towards windscreen. Do not under any circumstances twist the mirror foot when removing. Twisting the mirror off the mirror mount will damage the rear catch. If the rear catch is damaged, the mirror will be loose when installed and must be replaced.

IMPORTANT: Risk of damage!

Do not pull off rearview mirror (1) from windscreen against direction of travel and or snap out by turning.

Snap out interior mirror (1) from mirror mount (2) towards front with increasing pressure (not abruptly) and remove.

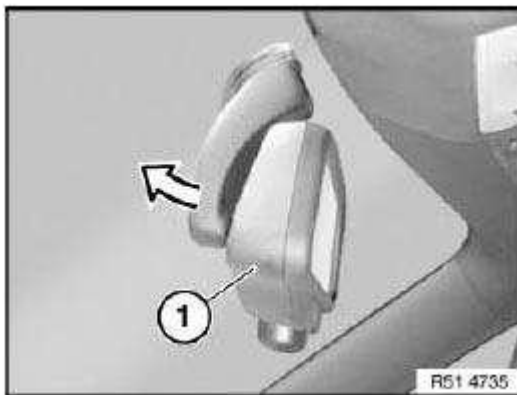


Fig. 170: Interior Mirror And Mirror Mount
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

1. Twist mirror foot by approx. 45° and fit to mirror mount.
2. Turn mirror foot until it engages on mirror base.

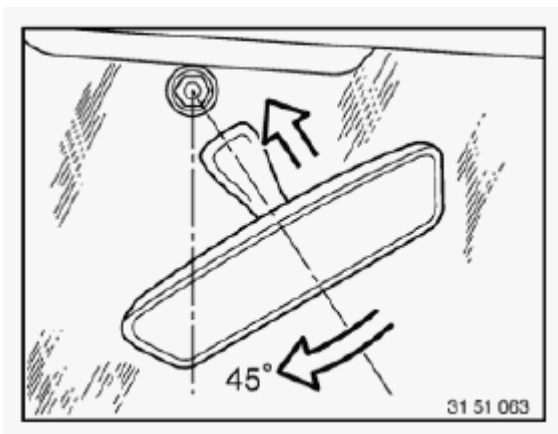


Fig. 171: Mirror Foot Angle

Courtesy of BMW OF NORTH AMERICA, INC.

51 16 060 REMOVING AND INSTALLING/REPLACING INTERIOR REARVIEW MIRROR (WITH MIRROR ARM END CAPS)

IMPORTANT: Work may only be carried out at a room/object temperature of 18 ... 28°C.
If this cannot be guaranteed (cold/hot countries), it is necessary to equalize the temperature of the windscreen, mirror foot and rearview mirror (e.g. car left to stand indoors or in the shade for at least 30 minutes).

Version with remote control for central locking:

If necessary, disconnect negative lead from battery.

Version with compass:

Check compass function if replacing or after disconnecting interior mirror plug connection or battery.

If necessary, calibrate compass in interior rearview mirror, see **51 16 ... Calibrating compass in interior rearview mirror**

IMPORTANT: To avoid breaking windscreen:
Snap out (press) rearview mirror only in direction of travel towards windscreen.
Do not under any circumstances twist the mirror foot when removing.
Twisting the mirror off the mirror mount will damage the rear catch.
If the rear catch is damaged, the mirror will be loose when installed and must be replaced.

NOTE: Do not exert any pressure on mirror foot when removing end caps (1).

Press end caps (1) towards mirror housing (2); this releases clip connection of both caps (1).

In order not to create any tension at the mirror foot, simultaneously apply counterpressure to the mirror housing when removing the end caps.

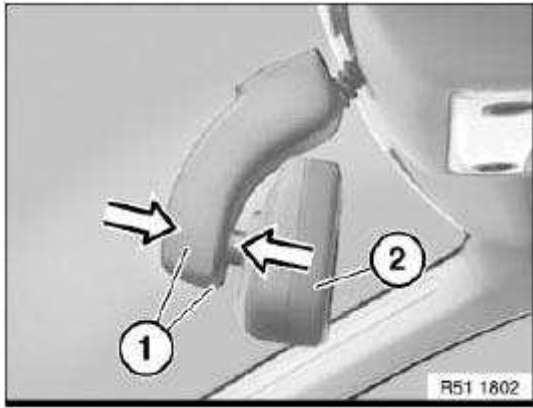


Fig. 172: End Caps And Mirror Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Twist mirror (1) at an angle towards front and right/top.

Swivel left end cap (2) off ball neck in direction of arrow; this detaches the engagement clip (3) from the metal foot.

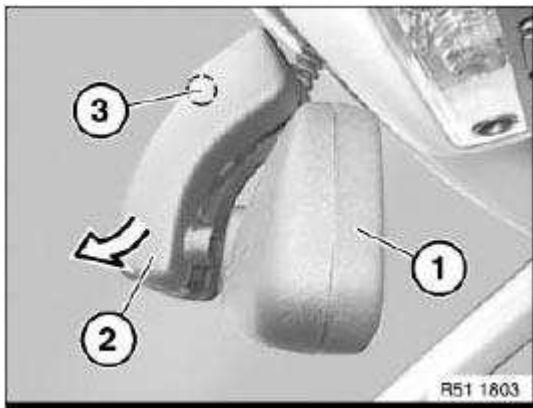


Fig. 173: Mirror And End Cap
Courtesy of BMW OF NORTH AMERICA, INC.

Twist mirror (1) at an angle towards front and left/top.

Swivel right end cap (2) off ball neck in direction of arrow; this detaches the engagement clip from the metal foot.

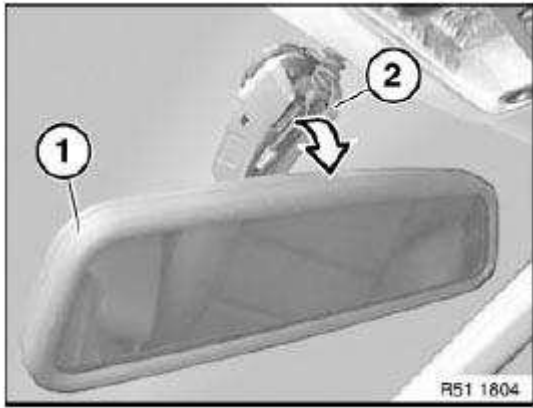


Fig. 174: Mirror And End Cap
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Clips (1) and retaining hooks (2) of end caps (3) must not be damaged, replace if necessary.

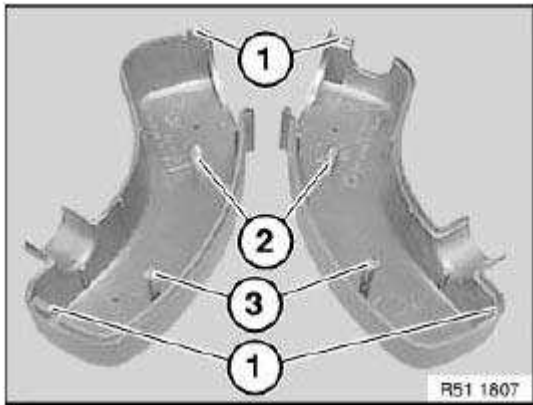


Fig. 175: Clips, Hooks And End Caps
Courtesy of BMW OF NORTH AMERICA, INC.

Version with cable (X):

Disconnect plug connection (1).

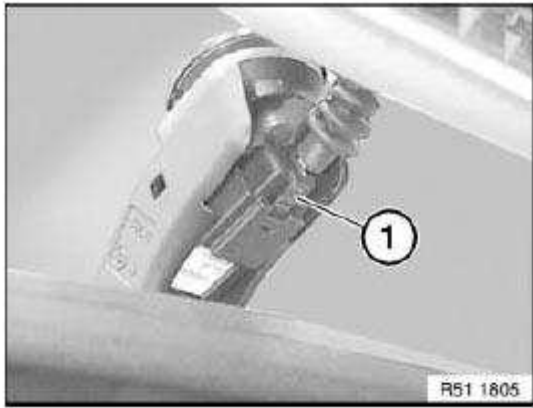


Fig. 176: Plug Connection

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage!

Do not pull off rearview mirror (1) from windscreen against direction of travel and or snap out by turning.

Snap out interior mirror (1) from mirror mount (2) towards front with increasing pressure (not abruptly) and remove.

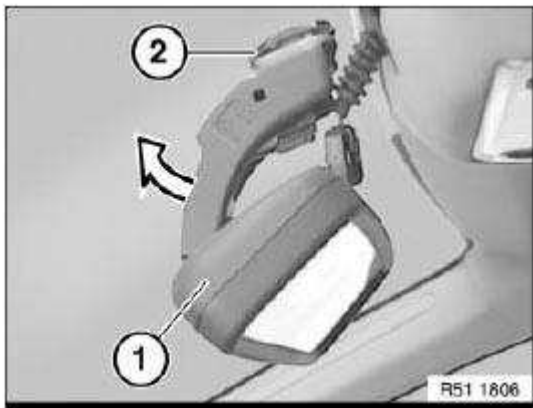


Fig. 177: Interior Mirror And Mirror Mount

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

1. Twist mirror foot by approx. 45° and fit to mirror mount.
2. Turn mirror foot until it engages on mirror base.

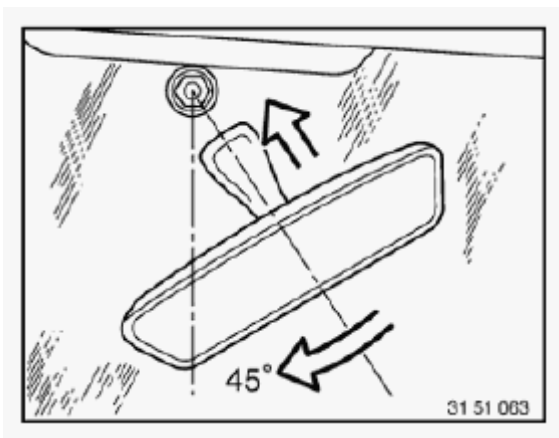


Fig. 178: Mirror Foot Angle

Courtesy of BMW OF NORTH AMERICA, INC.

Only replace with version with remote control for central locking:

Initialize all transmitters (ignition keys), refer to Owner's Handbook.

51 16 060 REMOVING AND INSTALLING/REPLACING INTERIOR REARVIEW MIRROR (WITH RAIN SENSOR)

IMPORTANT: Work may only be carried out at a room/object temperature of 18 ... 28°C.
If this cannot be guaranteed (cold/hot countries), it is necessary to equalize the temperature of the windscreen, mirror foot and rearview mirror (e.g. car left to stand indoors or in the shade for at least 30 minutes).

Version with remote control for central locking:

If necessary, disconnect negative lead from battery.

Version with compass:

Check compass function if replacing or after disconnecting interior mirror plug connection or battery.

If necessary, calibrate compass in interior rearview mirror, see **51 16 ... Calibrating compass in interior rearview mirror**

E60 Security version:

Rain sensor is not installed, cable connection is tied back in roofliner.

IMPORTANT: To avoid breaking windscreen:
Snap out (press) rearview mirror only in direction of travel towards windscreen.
Do not under any circumstances twist the mirror foot when removing.
Twisting the mirror off the mirror mount will damage the rear catch.

If the rear catch is damaged, the mirror will be loose when installed and must be replaced.

Press on end caps (1) and at same time press them apart; this releases clip connection of both caps (1).

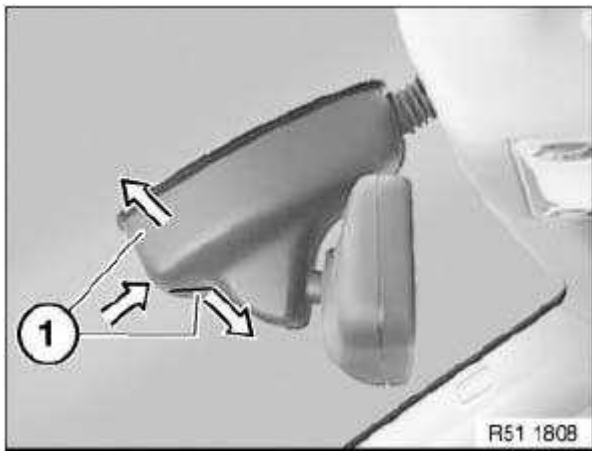


Fig. 179: End Caps

Courtesy of BMW OF NORTH AMERICA, INC.

Twist mirror (1) at an angle towards front and right/top.

Swivel left end cap (2) off ball neck in direction of arrow; this detaches the engagement clip (3) from the metal foot.

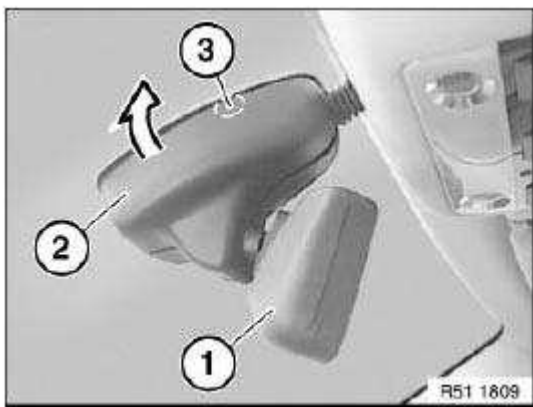


Fig. 180: Mirror And Left End Cap

Courtesy of BMW OF NORTH AMERICA, INC.

Twist mirror (1) at an angle towards front and left/top.

Swivel right end cap (2) off ball neck in direction of arrow; this detaches the engagement clip from the metal foot.

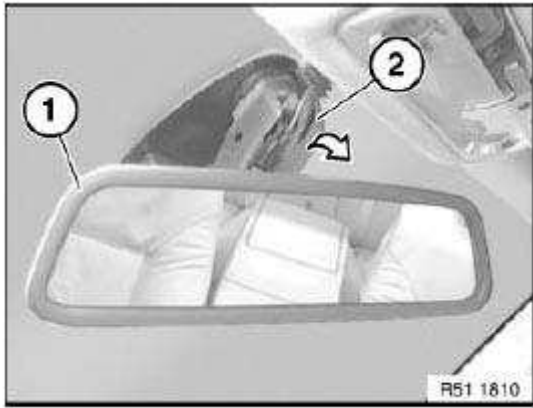


Fig. 181: Mirror And Right End Cap
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Clips (1) and retaining hooks (2) of end caps (3) must not be damaged, replace if necessary.

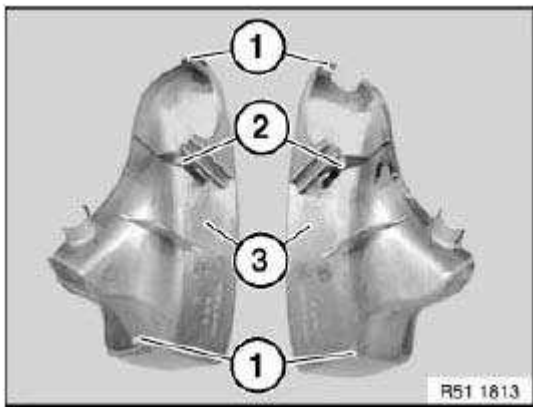


Fig. 182: Clips, Retaining Hooks And End Caps
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1).

NOTE: Pay attention to cable guide (2) for rain sensor.

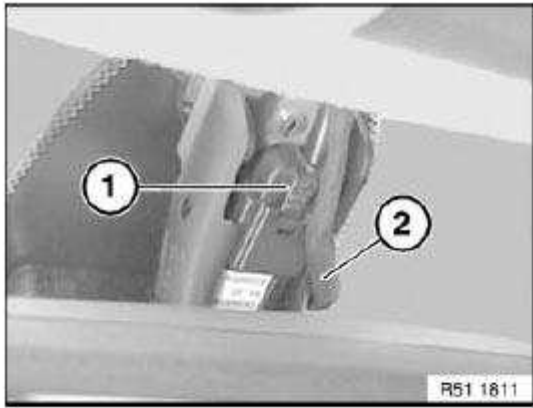


Fig. 183: Plug Connection And Cable Guide
Courtesy of BMW OF NORTH AMERICA, INC.

E60 Security version:

Rain sensor is not installed, cable connection is tied back in roofliner.

IMPORTANT: Risk of damage!

Do not pull off rearview mirror (1) from windshield against direction of travel and or snap out by turning.

When snapping out, do not damage control unit (3) for rain sensor.

E60 Security version:

Rain sensor is not installed.

Snap out interior mirror (1) from mirror mount (2) towards front with increasing pressure (not abruptly) and remove.

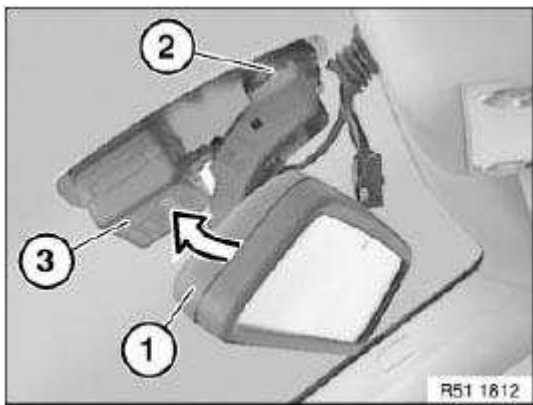


Fig. 184: Interior Mirror And Mirror Mount
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

1. Twist mirror foot by approx. 45° and fit to mirror mount.
2. Turn mirror foot until it engages on mirror base.

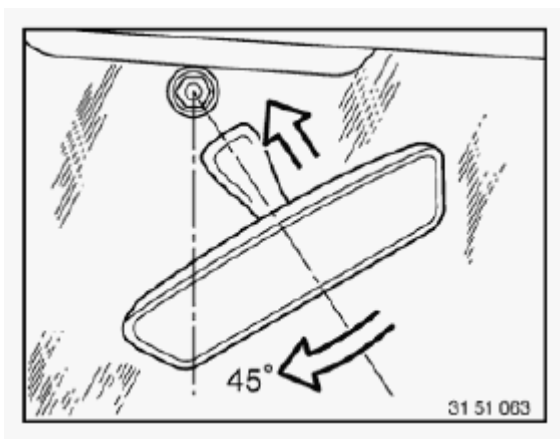


Fig. 185: Mirror Foot Angle

Courtesy of BMW OF NORTH AMERICA, INC.

Only replace with version with remote control for central locking:

If necessary, initialize all transmitters (ignition keys), refer to Owner's Handbook.

51 16 080 REMOVING AND INSTALLING OR REPLACING SUN VISOR AND LEFT OR RIGHT COUNTER SUPPORT

NOTE: The operation is shown on the left side; proceed in the same way for the right side.

Fold down sun visor (5).

Lever out trim (2) on counter support (1) and release screw underneath.

Release screws (3) on holder (4).

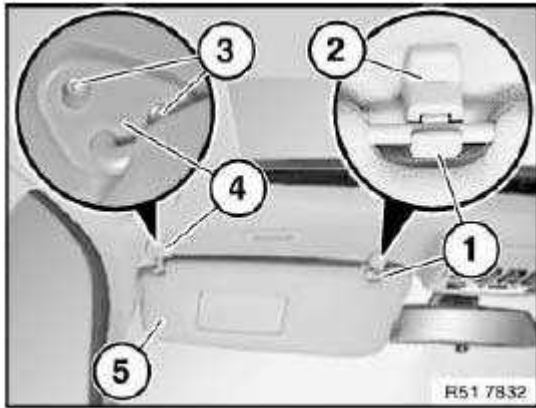


Fig. 186: Trim And Counter Support
 Courtesy of BMW OF NORTH AMERICA, INC.

Lift out sun visor (1).

If necessary, pull out cable (2) slightly and disconnect plug connection (3).

Installation:

Perform function check on lighting.

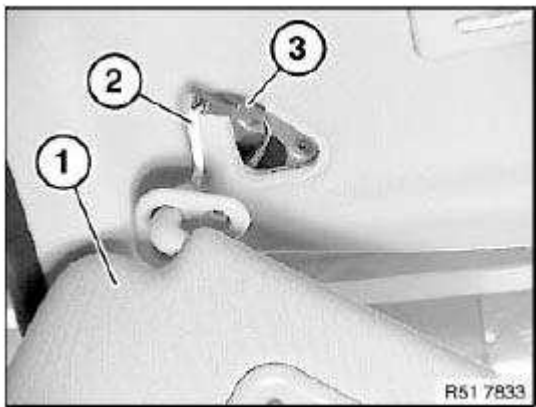


Fig. 187: Sun Visor, Cable And Plug Connection
 Courtesy of BMW OF NORTH AMERICA, INC.

51 16 194 REMOVING AND INSTALLING/REPLACING FRONT SIDE LEFT OR RIGHT CUP HOLDER

Special tools required:

- 00 9 318 **00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)**

Necessary preliminary tasks:

- Remove right glovebox, see **51 16 366 Removing and installing right glovebox with housing**
- Remove right fresh-air grill, see **64 22 136 REMOVING AND INSTALLING/REPLACING RIGHT FRESH-AIR GRILL**

Release screw (1) on instrument panel at bottom.

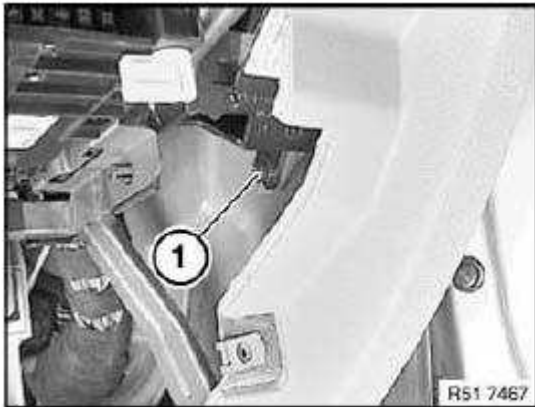


Fig. 188: Screw
 Courtesy of BMW OF NORTH AMERICA, INC.

Unclip cup holder (1) with special tool 00 9 318 all round and remove in direction of arrow.

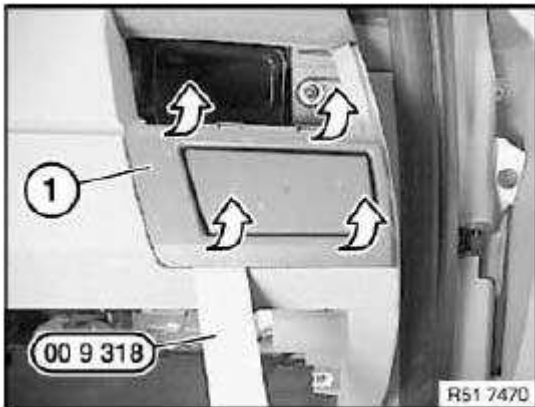


Fig. 189: Special Tool (00 9 318)
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Catches (1) on cup holder (2) must not be damaged or missing.

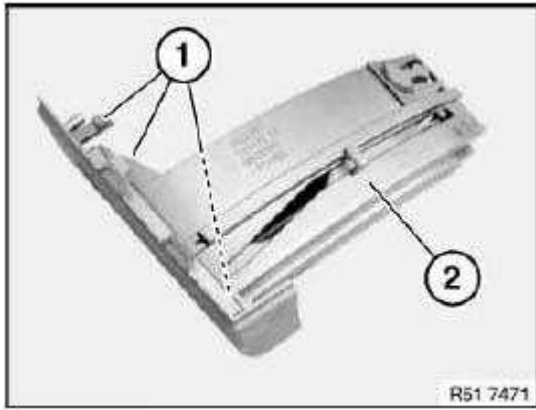


Fig. 190: Catches And Cup Holder

Courtesy of BMW OF NORTH AMERICA, INC.

51 16 196 REMOVING AND INSTALLING/REPLACING COVER FOR CENTER ARMREST

NOTE: On version with CD changer, operation is described in:
Removing and installing/replacing cover for center armrest (storage compartment with CD changer), see 51 16 ... Removing and installing/replacing cover for center armrest (storage compartment with CD changer)

Open cover for center armrest.

Lift out storage compartment (1).

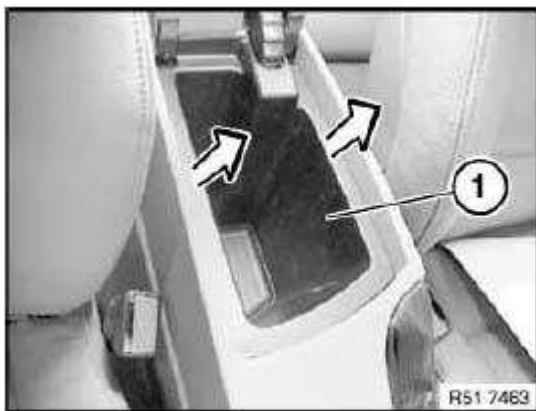


Fig. 191: Storage Compartment

Courtesy of BMW OF NORTH AMERICA, INC.

Version with telephone:

Disconnect plug connection (1).

Release protective sleeve (2) and disconnect plug connection underneath.

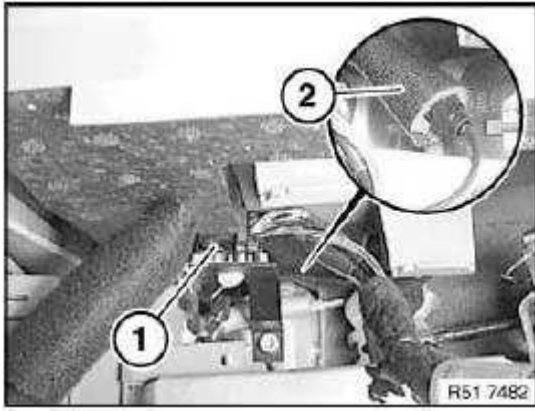


Fig. 192: Protective Sleeve And Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Remove cover (2) towards top.

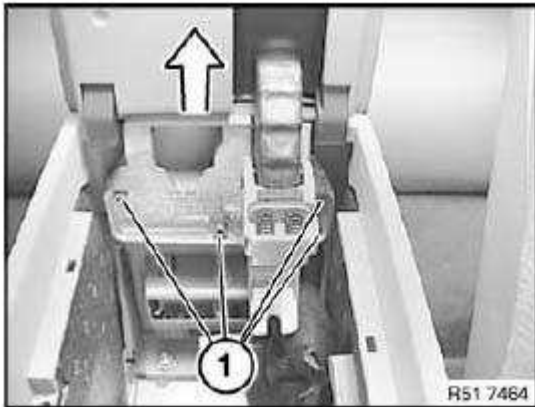


Fig. 193: Cover And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement (version without telephone):

Remove insert (1) and release screws (2) underneath.

Unclip trim (3) towards top.

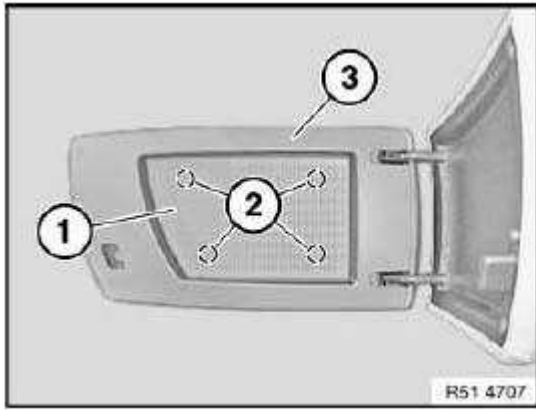


Fig. 194: Insert, Trim And Screws
 Courtesy of BMW OF NORTH AMERICA, INC.

Replacement (version with telephone):

Remove eject box.

Remove insert (1) and release screws (2).

Unclip trim (3) towards top.

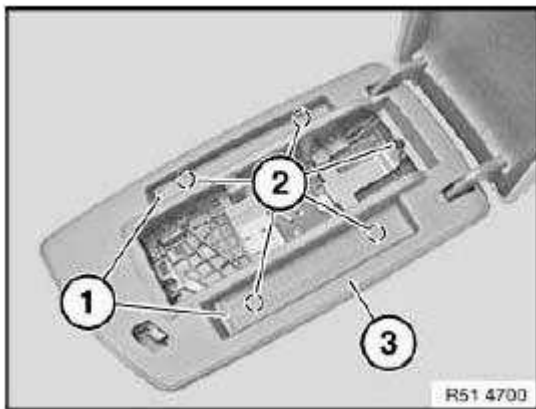


Fig. 195: Insert, Trim And Screws
 Courtesy of BMW OF NORTH AMERICA, INC.

51 16 200 REMOVING AND INSTALLING STORAGE COMPARTMENT

Special tools required:

- 00 9 317 00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)

Necessary preliminary tasks:

- Remove function carrier, see 51 45 106 Removing and installing/replacing function carrier on instrument panel trim

Open cover for center armrest.

Lift out storage compartment (1).

NOTE: For purposes of clarity, all the following operations are shown with the center armrest removed.

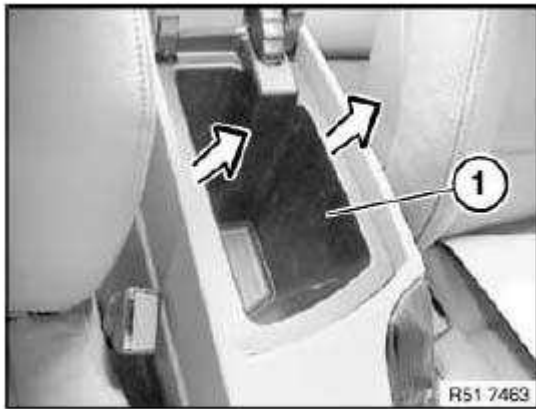


Fig. 196: Storage Compartment

Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1).

Unclip catches (2) on housing for cigarette lighter (3).

Remove housing (3) in direction of arrow.

Installation:

Catches (2) must not be damaged

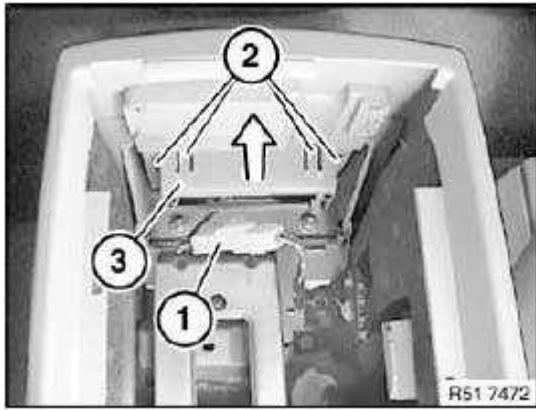


Fig. 197: Catches, Plug Connection And Cigarette Lighter
Courtesy of BMW OF NORTH AMERICA, INC.

Release nuts (1) and screws (2) on rear storage compartment.

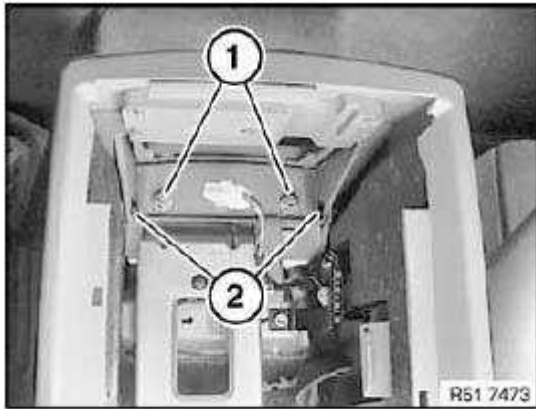


Fig. 198: Nuts And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Unclip catches (1) on gaiter (2) with special tool 00 9 317. Pull off gaiter (2) towards top.

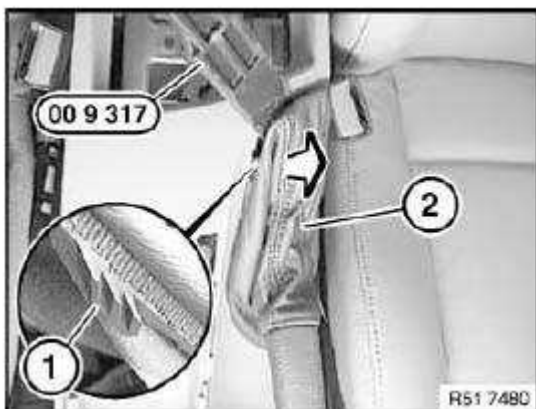


Fig. 199: Special Tool (00 9 317)

Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1 and 2).

Feed out storage compartment (3) past gaiter (4) and remove towards top rear.

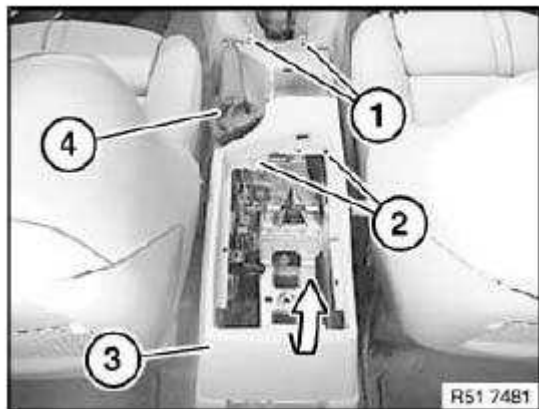


Fig. 200: Storage Compartment, Past Gaiter And Screws

Courtesy of BMW OF NORTH AMERICA, INC.

51 16 200 REMOVING AND INSTALLING/REPLACING STORAGE COMPARTMENT (WITH CD CHANGER)

Special tools required:

- 00 9 317 **00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)**

Necessary preliminary tasks:

- Remove function carrier, see **51 45 106 Removing and installing/replacing function carrier on instrument panel trim**

Unclip trim (1) towards top.

Remove compartment (2).

Installation:

Clips (3) must not be damaged.

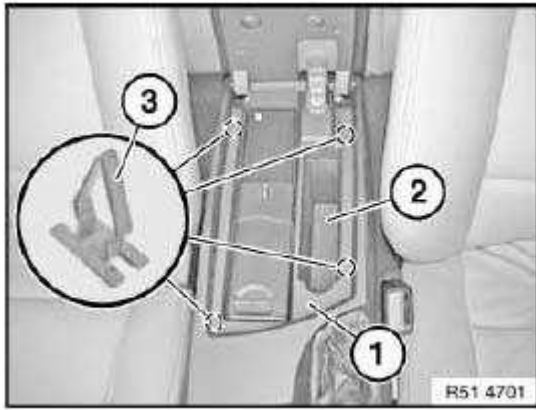


Fig. 201: Trim, Compartment And Clips
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

When installing compartment (1), make sure guides (2) are inserted into guides (3) on storage compartment (4).

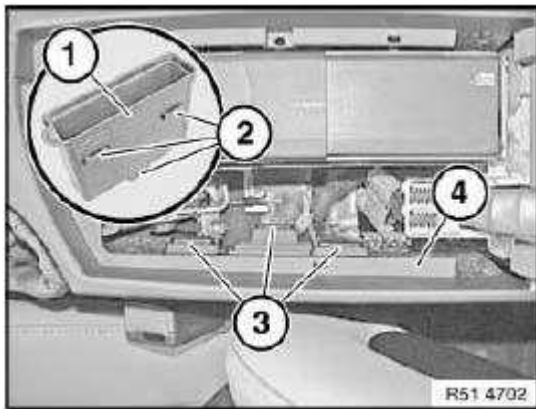


Fig. 202: Compartment, Guides And Storage Compartment
Courtesy of BMW OF NORTH AMERICA, INC.

Version with telephone:

Disconnect plug connection (1).

Release protective sleeve (2) and disconnect plug connection underneath.

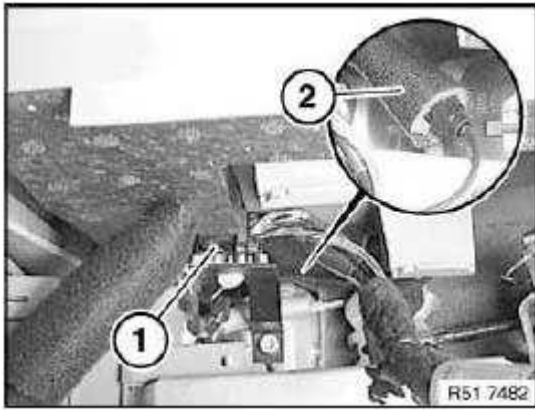


Fig. 203: Plug Connection And Protective Sleeve
Courtesy of BMW OF NORTH AMERICA, INC.

Unclip catches (1) on gaiter (2) with special tool 00 9 317.

Detach gaiter (2) with handle towards front.

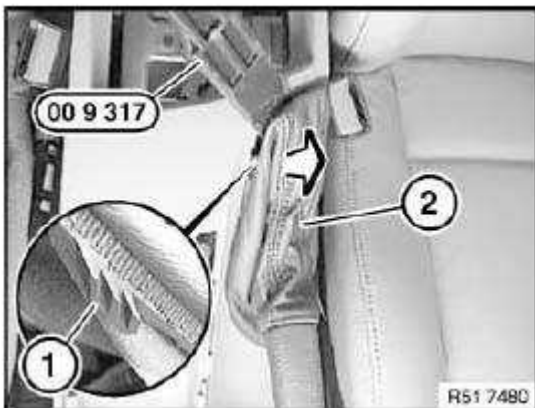


Fig. 204: Special Tool (00 9 317)
Courtesy of BMW OF NORTH AMERICA, INC.

Carefully snap out trim (1) towards rear.

Disconnect associated plug connection and remove trim light (1).

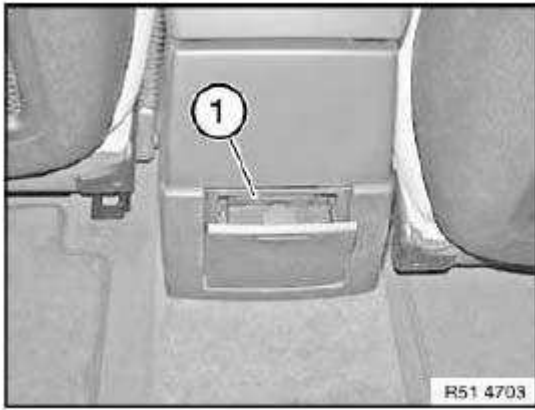


Fig. 205: Trim Light
Courtesy of BMW OF NORTH AMERICA, INC.

Release nuts (1) and screws (2) on rear storage compartment.

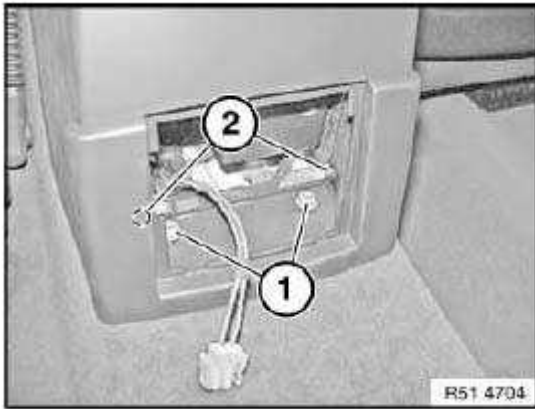


Fig. 206: Nuts And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1 and 2).

Feed out storage compartment (3) upwards over handbrake lever (4) and remove.

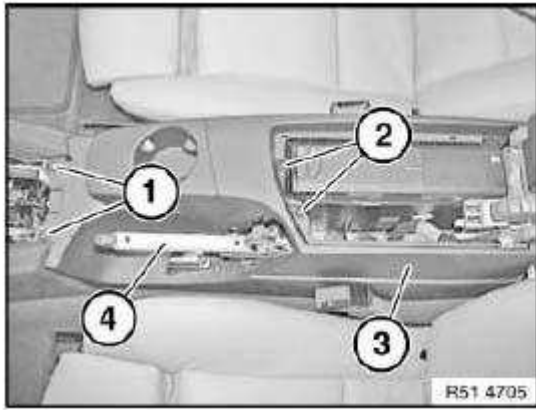


Fig. 207: Storage Compartment And Handbrake Lever
 Courtesy of BMW OF NORTH AMERICA, INC.

51 16 201 REPLACING STORAGE COMPARTMENT

Necessary preliminary tasks:

- Remove storage compartment, see **51 16 200 Removing and installing storage compartment**
- Remove drinks holder, see **51 16 202 Removing and installing/replacing front cup holder**
- Remove cover for center armrest, see **51 16 ... Removing and installing/replacing cover for center armrest (storage compartment with CD changer)**

51 16 202 REMOVING AND INSTALLING/REPLACING FRONT CUP HOLDER

Special tools required:

- 00 9 317 **00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)**

Lever out cup holder (1) with special tool 00 9 317 in direction of arrow and remove.

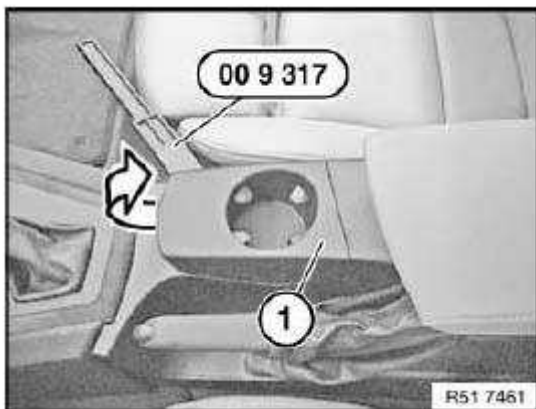


Fig. 208: Special Tool (00 9 317)
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Guides (1) and catches (2) must not be damaged.

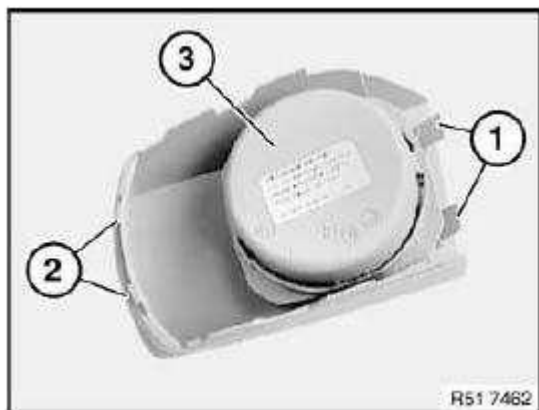


Fig. 209: Guides And Catches

Courtesy of BMW OF NORTH AMERICA, INC.

51 16 210 REMOVING AND INSTALLING/REPLACING TRIM FOR PRESELECTOR LEVER

Necessary preliminary tasks:

- Apply parking brake
- Move selector lever into N position
- Remove gaiter for shift block

Unclip trim for preselector lever (1) towards top.

Disconnect associated plug connections and remove trim for preselector lever (1).

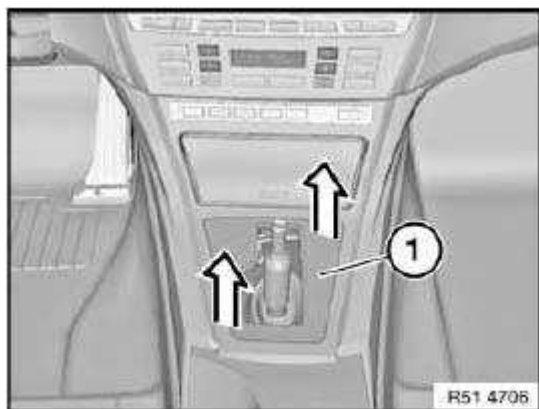


Fig. 210: Preselector Lever

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Retainers (1) must not be damaged or missing.

Make sure retainers (1) are correctly seated in appropriate mounts of trim for preselector lever (2).

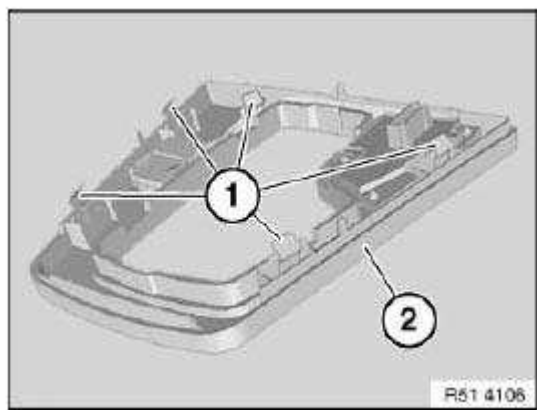


Fig. 211: Retainers And Preselector Lever
Courtesy of BMW OF NORTH AMERICA, INC.

51 16 340 REMOVING AND INSTALLING/REPLACING LOCK FOR RIGHT GLOVEBOX

Open glovebox.

Release screws (1).

Remove lower section (3) and upper section (2) of lock.

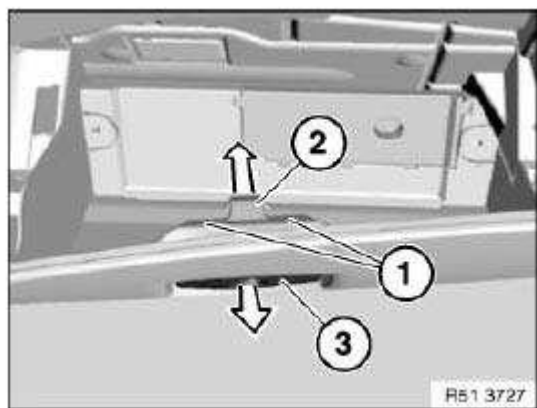


Fig. 212: Lower Section And Upper Section Of Lock
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

Insert ignition key (1) in lock cylinder (3).

Turn ignition key (1) slightly, carefully raise catches (2) and pull out lock cylinder (3) with ignition key (1) in direction of arrow.

If necessary, force catches (2) open.

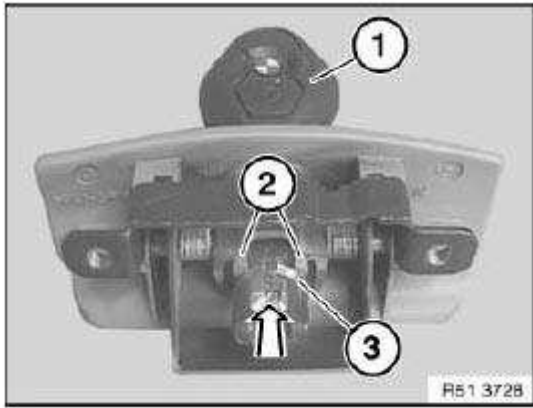
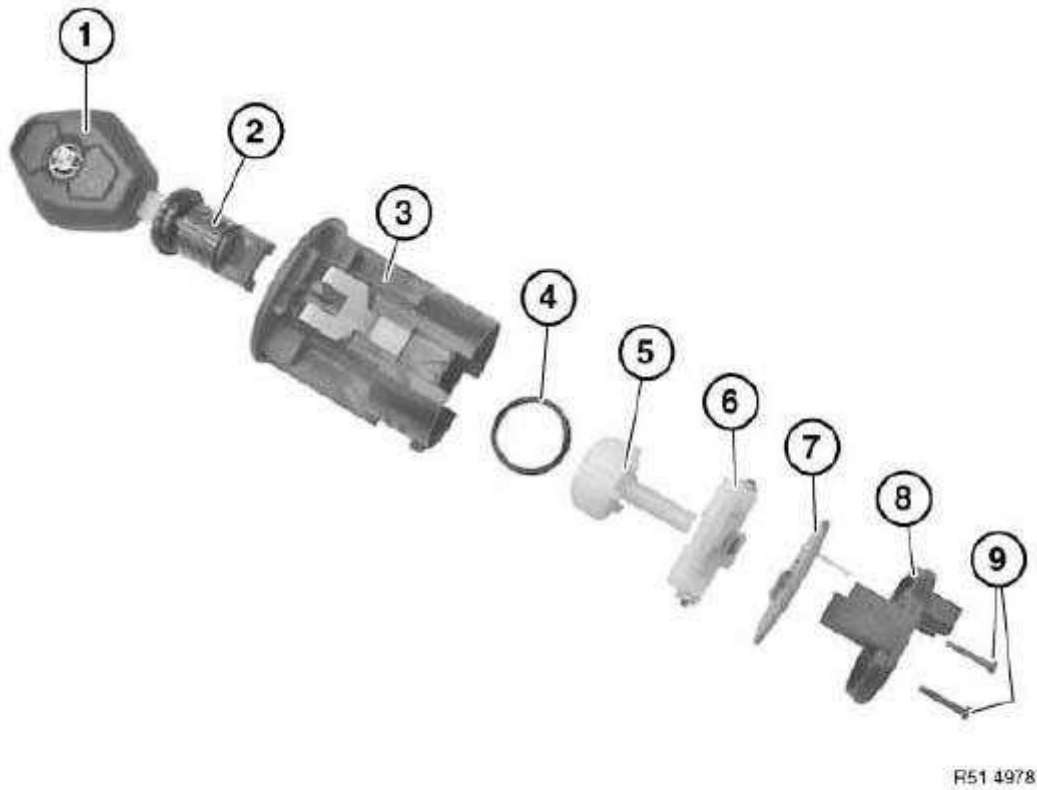


Fig. 213: Ignition Key, Catches And Lock Cylinder
Courtesy of BMW OF NORTH AMERICA, INC.

51 16 342 REMOVING AND INSTALLING/REPLACING LOCK CYLINDER FOR PASSENGER AIRBAG DEACTIVATION

Individual parts, switch for passenger airbag deactivation



R51 4978

- | | | | |
|---|----------------|---|---------------|
| 1 | Ignition key | 6 | Switch unit |
| 2 | Lock cylinder | 7 | PCB |
| 3 | Switch housing | 8 | Housing cover |
| 4 | Sealing ring | 9 | Screws |
| 5 | Guide | | |

Fig. 214: Individual Parts, Switch For Passenger Airbag Deactivation
 Courtesy of BMW OF NORTH AMERICA, INC.

Necessary preliminary tasks:

- Remove switch for passenger airbag deactivation

Release screws (1).

Remove housing cover (2) and PCB (3) underneath.

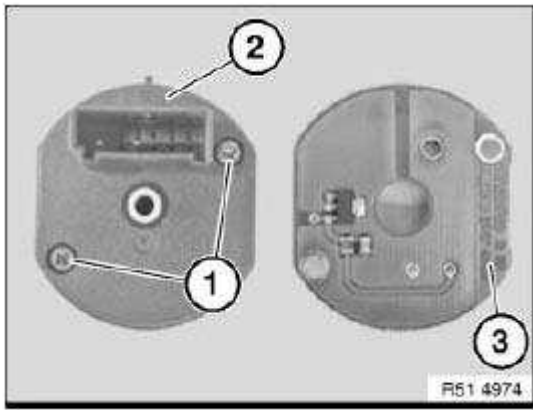


Fig. 215: Housing Cover, Screws And PCB
 Courtesy of BMW OF NORTH AMERICA, INC.

Remove switch unit (1) in upward direction.

Installation:

Switch unit (1) can only be installed in one position.

PCB (4) can be inserted turned through 180°.

Position of magnet sensor (3) of PCB (4) must match up with permanent magnet (2) of switch unit (1).

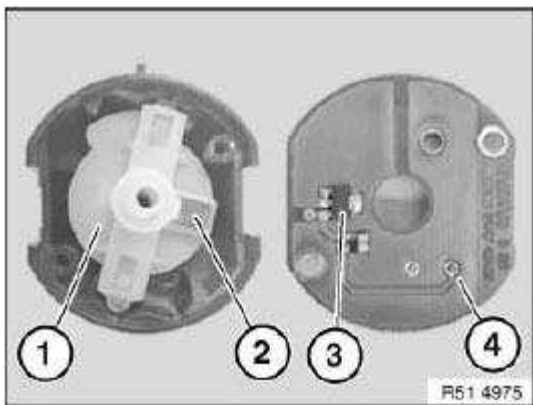


Fig. 216: Magnet Sensor, PCB And Switch Unit
 Courtesy of BMW OF NORTH AMERICA, INC.

Remove guide (1) in upward direction.

Installation:

Guide (1) can only be installed in one position.

Fit seal (2) on guide (1) and insert in switch housing.

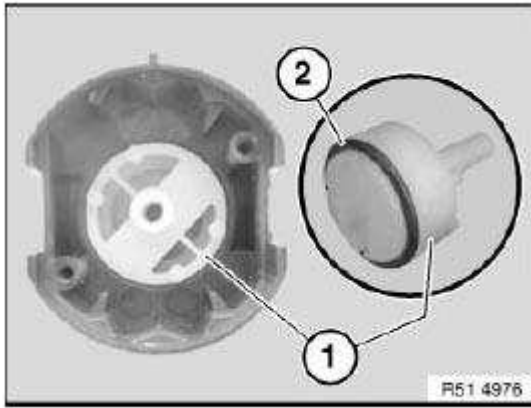


Fig. 217: Seal And Guide

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Ignition key must be inserted in lock cylinder, otherwise this will be destroyed when removed.

Insert ignition key in lock cylinder (2).

Carefully release catches (1) in outward direction and press out lock cylinder (2) with ignition key.

Installation:

Lock cylinder (2) can only be inserted in "ON" or "OFF" switch position.

Lock cylinder

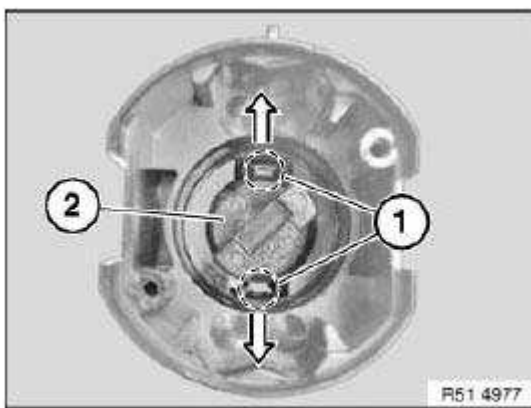


Fig. 218: Catches And Lock Cylinder

Courtesy of BMW OF NORTH AMERICA, INC.

51 16 360 REMOVING AND INSTALLING RIGHT GLOVEBOX

NOTE: Open glovebox.

Unclip pin (1) from retaining strap (2).

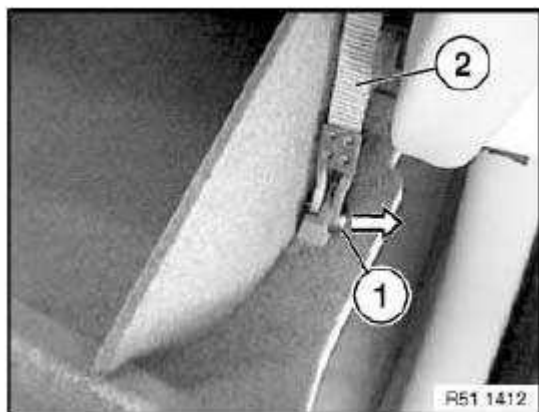


Fig. 219: Pin And Retaining Strap
Courtesy of BMW OF NORTH AMERICA, INC.

Unclip pin (1) from shock absorber (2).

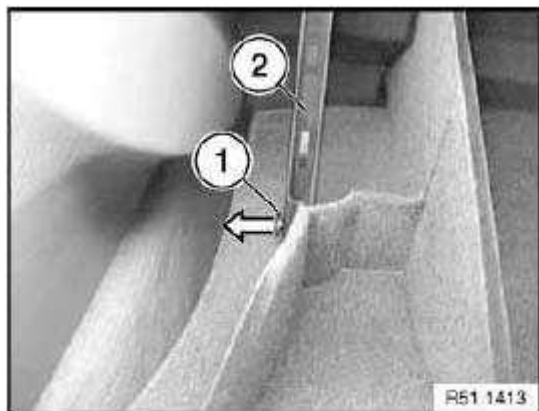


Fig. 220: Pin And Shock Absorber
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Close glovebox (3) and secure against falling out.

Release screws (1) and remove counter-support (2).

Open glovebox (3) and remove.

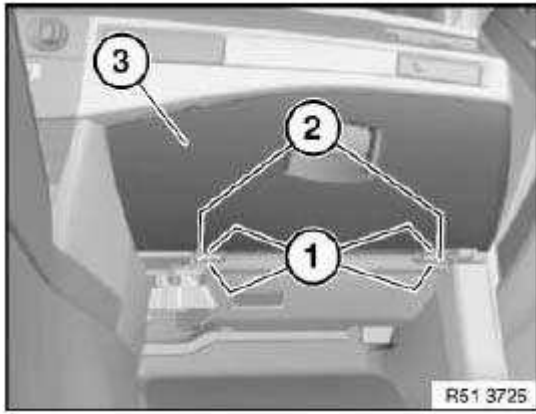


Fig. 221: Screws, Glovebox And Counter-Support
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Make sure counter-support (1) is correctly seated on chamfered faces of shaft (2).

If necessary, turn shaft (2) accordingly.

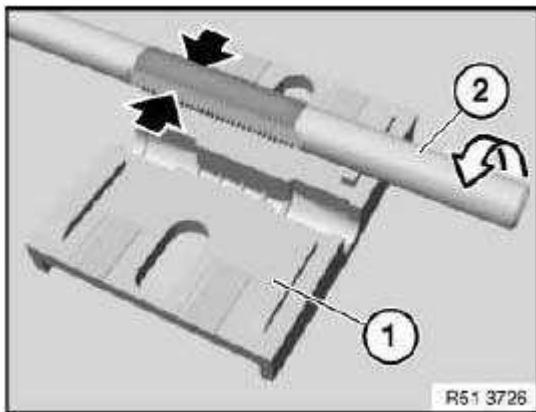


Fig. 222: Counter-Support And Shaft
 Courtesy of BMW OF NORTH AMERICA, INC.

51 16 361 REPLACING RIGHT GLOVEBOX

Necessary preliminary tasks:

- Remove right glovebox, see **51 16 366 Removing and installing right glovebox with housing**
- Remove lock for right glovebox, see **51 16 340 Removing and installing/replacing lock for right glovebox**

Release screws (1).

Remove holders (2) from glovebox (3).

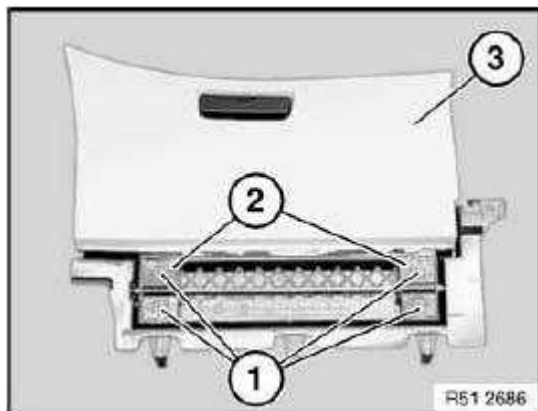


Fig. 223: Holders, Screws And Glovebox
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connections (1).

Detach adhesive tape (2).

Feed out cable (3) with glovebox (4).



Fig. 224: Plug Connections, Cable And Glovebox
Courtesy of BMW OF NORTH AMERICA, INC.

51 16 366 REMOVING AND INSTALLING RIGHT GLOVEBOX WITH HOUSING

Open glovebox.

Lever glovebox light (1) out of opening (2).

Disconnect plug connection and remove glovebox light (1).

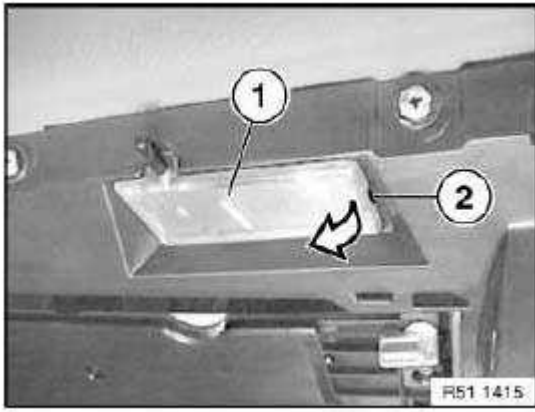


Fig. 225: Glovebox Light
Courtesy of BMW OF NORTH AMERICA, INC.

Unclip pin (1) from retaining strap (2).

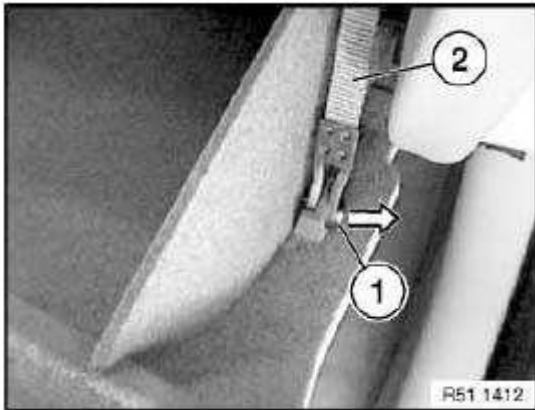


Fig. 226: Pin And Retaining Strap
Courtesy of BMW OF NORTH AMERICA, INC.

Unclip pin (1) from shock absorber (2).

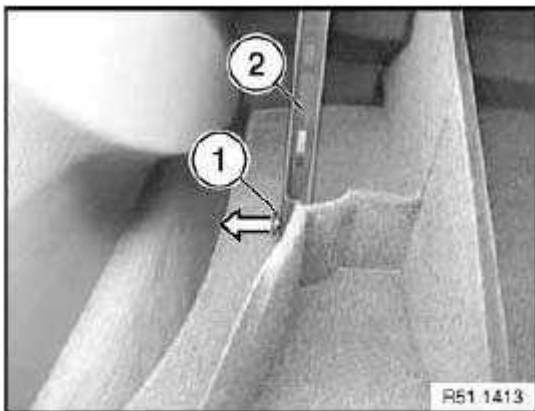


Fig. 227: Pin And Shock Absorber
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Pull off glovebox (2) with insert towards front and position downwards.

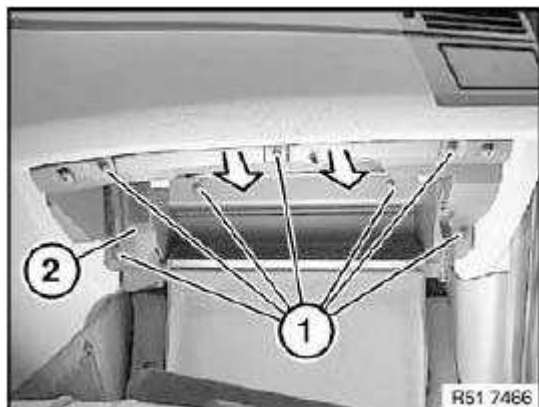


Fig. 228: Glovebox And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Feed cables (1) and (2) out of guides on glovebox carrier (3).

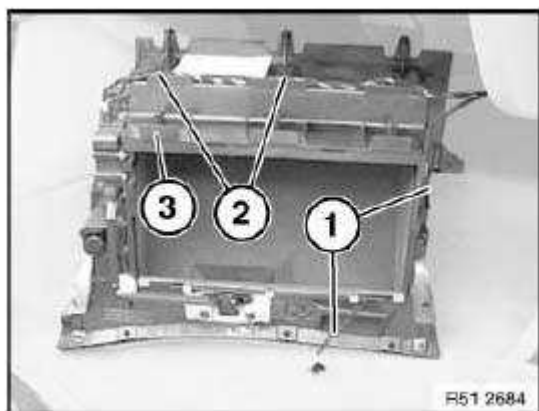


Fig. 229: Cables And Glovebox Carrier
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connections (1) and (2).

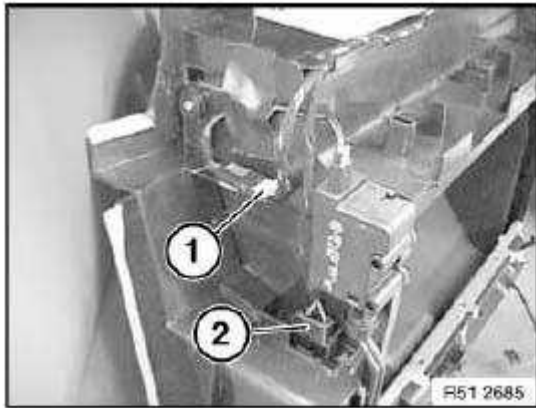


Fig. 230: Plug Connections

Courtesy of BMW OF NORTH AMERICA, INC.

51 16 450 REMOVING AND INSTALLING/REPLACING REAR LEFT/RIGHT GRAB HANDLE

Operation is identical to:

51 16 480 Removing and installing or replacing front grab handle

51 16 480 REMOVING AND INSTALLING OR REPLACING FRONT GRAB HANDLE

Carefully lever out trims (1).

Release screws underneath and remove grab handle (2).

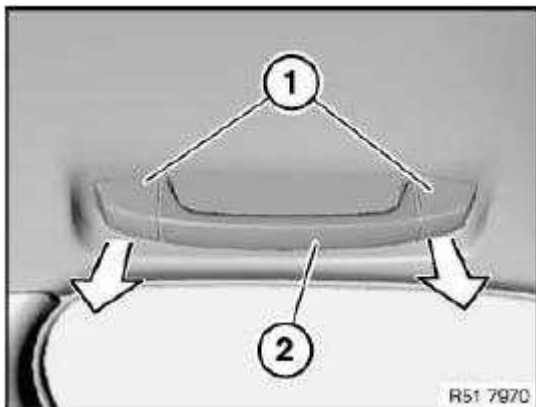


Fig. 231: Grab Handle And Trims

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: When replacing or when lowering or removing the roofliner, it is necessary to remove the intermediate plate (1) beforehand.

If necessary, pull off door seal (2) and feed out intermediate plate (1).

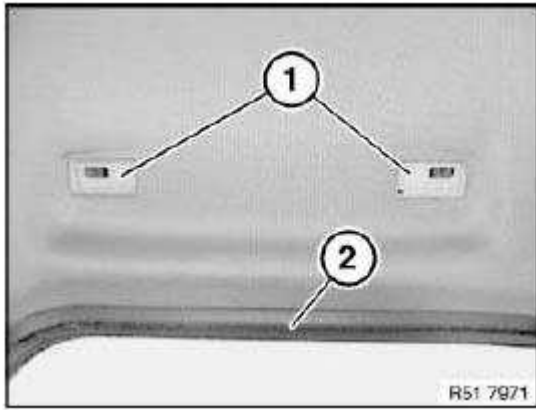


Fig. 232: Door Seal And Intermediate Plate
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Intermediate plate (2) must be installed in correct position. Guide in area (A) of grab handle (1) must fit in groove in area (B) of intermediate plate (2).

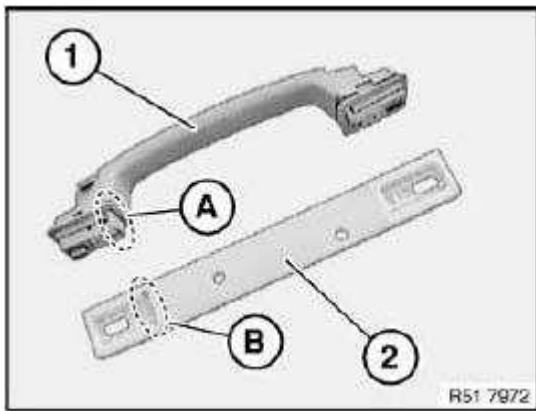
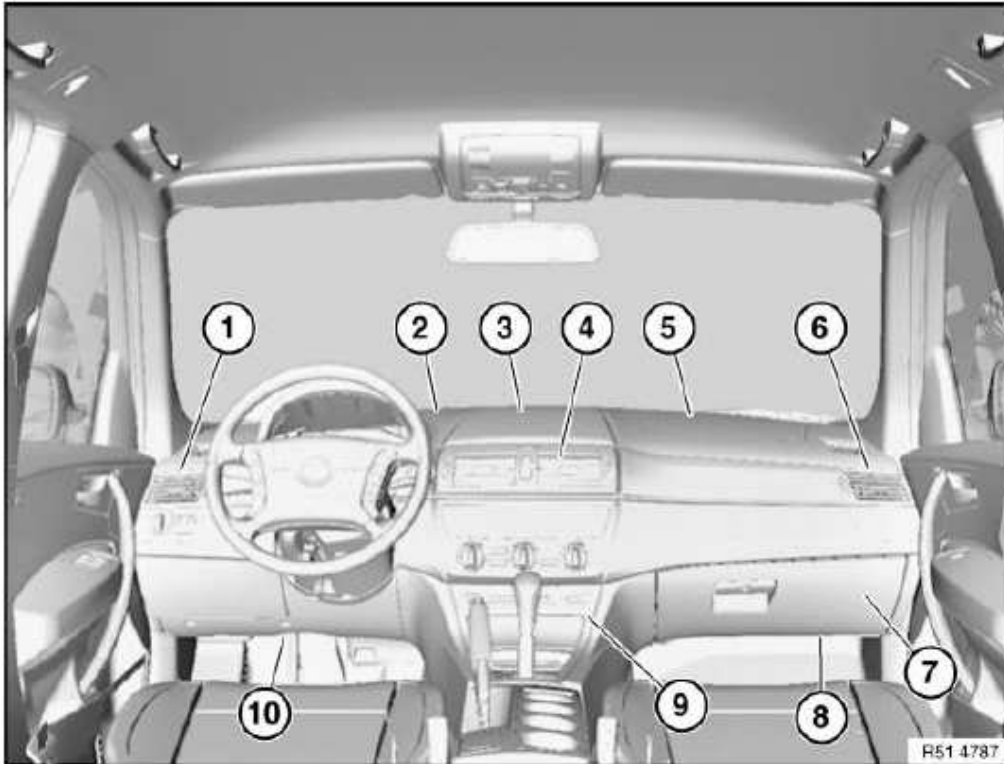


Fig. 233: Grab Handle And Intermediate Plate
Courtesy of BMW OF NORTH AMERICA, INC.

51 45 .. OVERVIEW OF INSTRUMENT PANEL



- | | | | |
|---|---|----|---|
| 1 | Fresh-air grille, left | 6 | Fresh-air grille, right |
| 2 | Dashboard trim panel | 7 | Glovebox |
| 3 | Storage compartment in instrument panel | 8 | Instrument panel trim, bottom right |
| 4 | Fresh-air grille, middle | 9 | Function carrier on instrument panel trim |
| 5 | Airbag cover, passenger side | 10 | Panel for pedals |

Fig. 234: Instrument Panel Components
Courtesy of BMW OF NORTH AMERICA, INC.

17 LIDS

51 17 400 REMOVING AND INSTALLING/REPLACING BUMP STOP WITH EJECTOR FOR FILLER FLAP

Release cover (1).

Press catches (2) together and pull out ejector (3).

Installation:

Install ejector (3) with fitted cover (1).

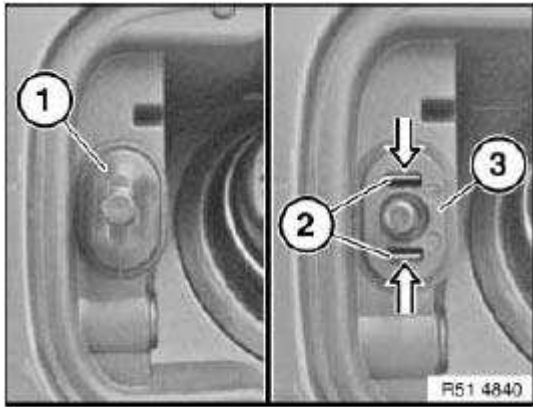


Fig. 235: Catches, Cover And Ejector
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Catches (1) on ejector (2) must not be damaged.

Make sure cover (3) is correctly seated on ejector (2).

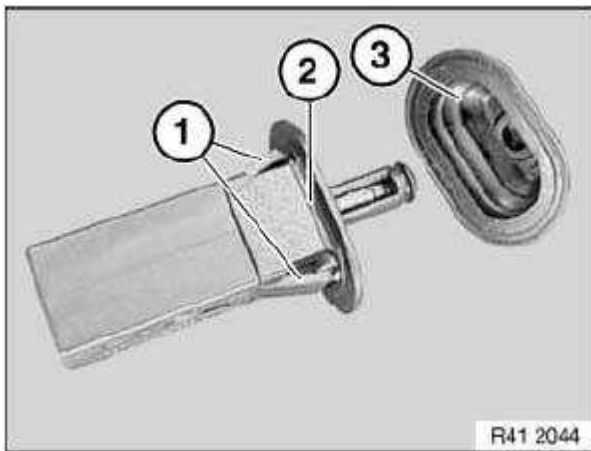


Fig. 236: Catches, Cover And Ejector
 Courtesy of BMW OF NORTH AMERICA, INC.

21 FRONT DOOR LOCKS, HANDLES, FITTINGS

51 21 ... REMOVING WINDOW CAVITY COVER STRIP WITH SPECIAL TOOL 00 9 324 AT FRONT OR REAR

Special tools required:

- 00 9 318 00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)
- 00 9 324 00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)

Open complete door window glass.

Front door:

Insert special tool 00 9 324 at front (at A-pillar) in window cavity (1) (letters TOP pointing upwards).

Rear door:

Insert special tool 00 9 324 at rear (at C-pillar) in window cavity (2) (letters TOP pointing upwards).

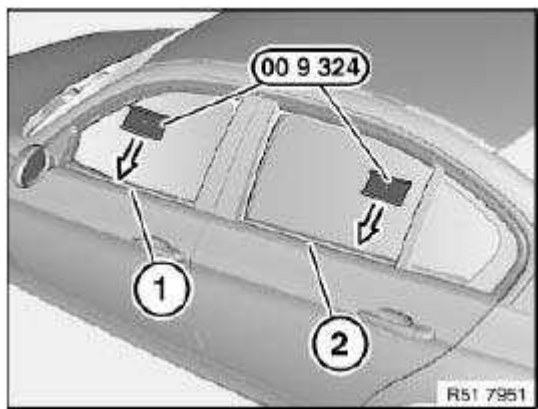


Fig. 237: Special Tool (00 9 324)

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: For purposes of clarity, picture shows inner door panel and door window glass removed.

Special tool 00 9 324 must be correctly guided under window cavity cover strip (1).

2 Short leg, bottom

3 Long leg, top (TOP)

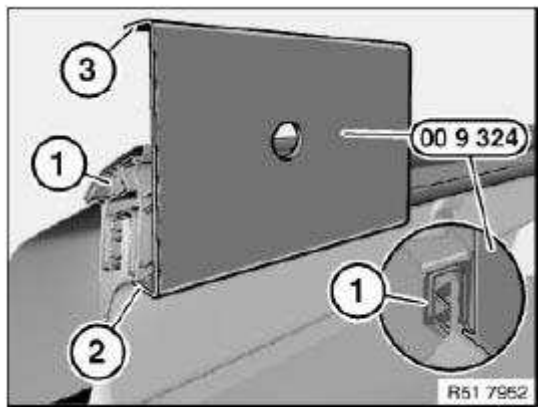


Fig. 238: Special Tool (00 9 324)

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Start at the front or rear, depending on the model.

IMPORTANT: Risk of damage!

Raise window cavity cover strip (3) no more than 5 mm in each levering operation, otherwise the strip will be bent.

Position special tool 00 9 318 on door trim panel (1).

Slide screwdriver (2) into special tool 00 9 324 and lever window cavity cover strip (3) upwards no more than 5 mm.

Guide special tools 00 9 324 and 00 9 318 towards front/rear and lever out window cavity cover strip (3) in the process.

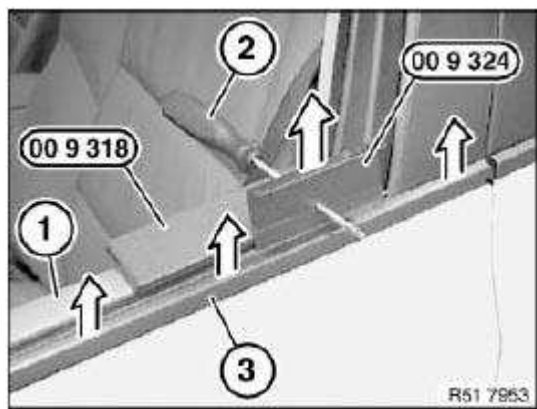


Fig. 239: Special Tool (00 9 318) And (00 9 324)
Courtesy of BMW OF NORTH AMERICA, INC.

51 21 003 REPLACING DOOR DETENT (LOCK STRIKER), FRONT LEFT OR RIGHT

Release screws (1) and remove door detent (3).

Installation:

Basic adjustment via crosswire on B-pillar (4) and notches (2) on door detent (3).

Tightening torque: 51 21 3AZ, see **51 21 FRONT DOOR LOCKS**

Adjust door detent.

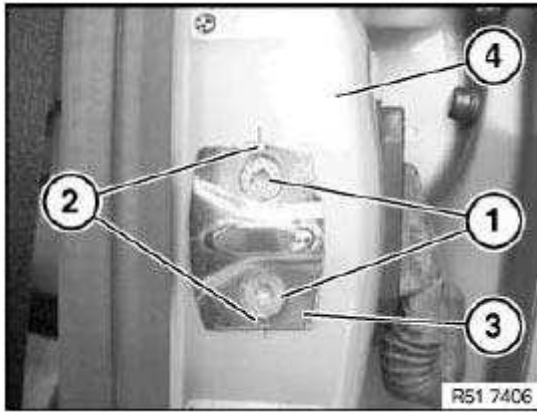


Fig. 240: B-Pillar, Notches And Door Detent
Courtesy of BMW OF NORTH AMERICA, INC.

51 21 004 ADJUSTING FRONT LEFT OR RIGHT DOOR DETENT (LOCK WEDGE)

Operation is described in:

41 51 004 ADJUSTING FRONT LEFT OR RIGHT DOOR

51 21 090 REMOVING AND INSTALLING/REPLACING DOOR LOCK IN LEFT OR RIGHT FRONT DOOR

Special tools required:

- **51 2 190 DOOR LOCK TENSIONER**

Necessary preliminary tasks:

- Close door windows
- Detach sound insulation in rear area only, see **51 48 060 Removing and installing/replacing sound insulation in left or right front door**

Security version:

- Remove complete sound insulation

Disconnect Bowden cable at bottom (1) and top (3) from door lock (2).

IMPORTANT: Bowden cable must be correctly located in mounts on door lock (2). Seal (4) must be correctly positioned on Bowden cable.

NOTE: The operations for "Removing Bowden cable from door lock" end here.

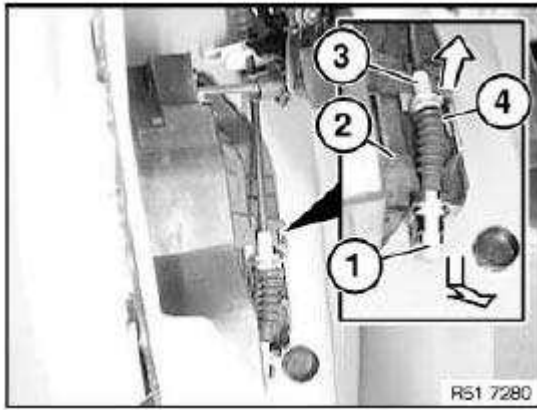


Fig. 241: Bowden Cable, Door Lock And Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock plug connection (1) at lugs (2) and detach from door lock (3).

Unclip locking rod (4) from door lock (3).

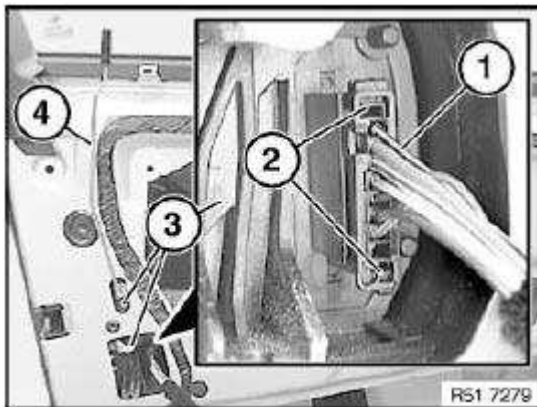


Fig. 242: Plug Connection And Door Lock
Courtesy of BMW OF NORTH AMERICA, INC.

Version with Soft Close Automatic:

Disconnect plug connection (1).

Unfasten cable tie (2).

Release screw (3) and nuts (4).

Tightening torque: 51 21 11AZ, see **51 21 FRONT DOOR LOCKS**

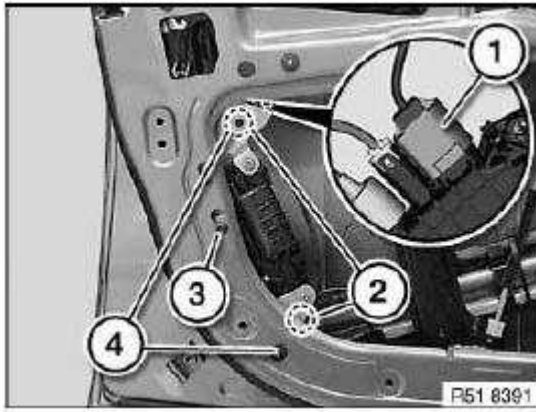


Fig. 243: Plug Connection, Cable Tie, Screw And Nuts
 Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not damage door lock seal during removal.

Release screws (1).

Feed out door lock (2) from inside.

IMPORTANT: To avoid leakage and electrical malfunction:
 Pull door lock (2) with special tool into corner (3), see [Fig. 247](#) and [Fig. 248](#).

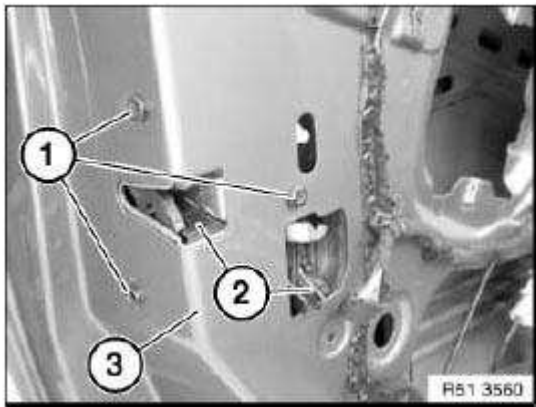


Fig. 244: Door Lock, Corner And Screw
 Courtesy of BMW OF NORTH AMERICA, INC.

Driver's door only:

Installation:

Insert inside door lock (1) correctly into paddle (2) of lock cylinder (3).

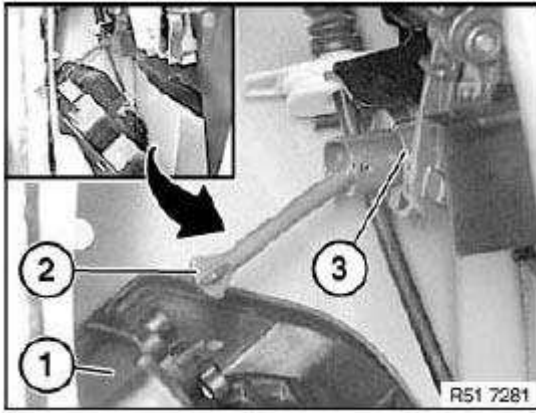


Fig. 245: Inside Door Lock, Paddle And Lock Cylinder
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Seal (1) on door lock (2) must not be damaged.

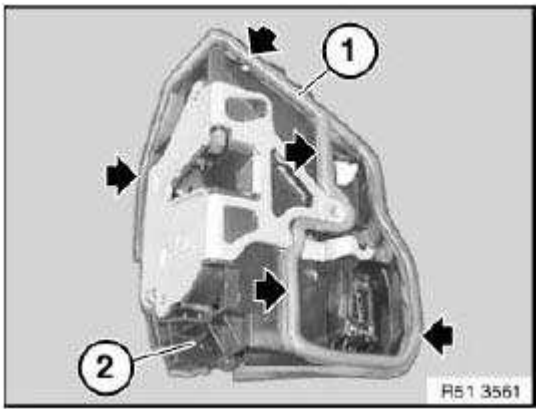


Fig. 246: Seal And Door Lock
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

- Install door lock and insert screws (1), do not tighten down.
- Slide special tool 51 2 190 into opened rotary latch until latch engages in first stage.

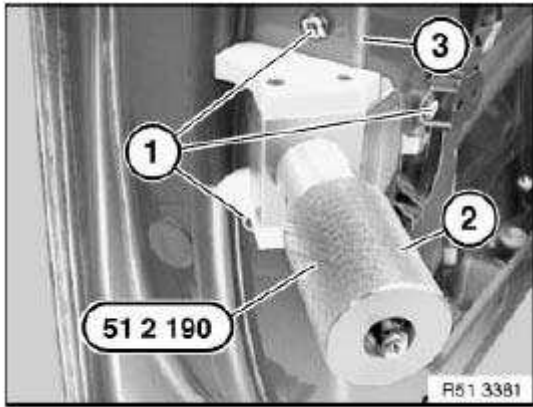


Fig. 247: Door Lock, Corner And Screw
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

- Pretension door lock (1) with knurled screw (2) until special tool 51 2 190 just contacts corner points (3).

**IMPORTANT: To tension door lock (1), it is only permitted to turn knurled screw (2) by a further 1 to 1.5 turns (max.) (risk of damage).
 Door lock seal must rest uniformly on inner door plate (water ingress).**

- Tighten down door lock screws 51 21 1AZ, see **51 21 FRONT DOOR LOCKS**

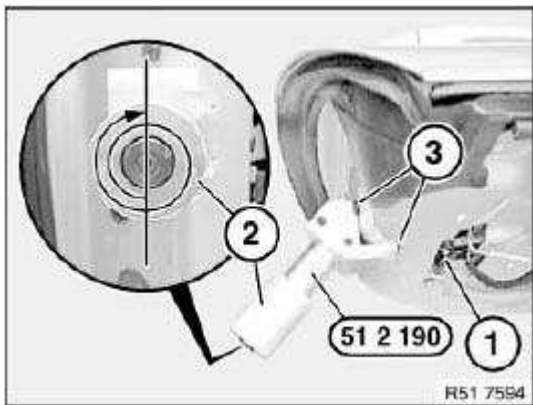


Fig. 248: Door Lock, Corner And Screw
 Courtesy of BMW OF NORTH AMERICA, INC.

Replacement with Soft Close Automatic:

Release nuts (1) and remove bracket (2).

Tightening torque: 51 21 12AZ, see **51 21 FRONT DOOR LOCKS**

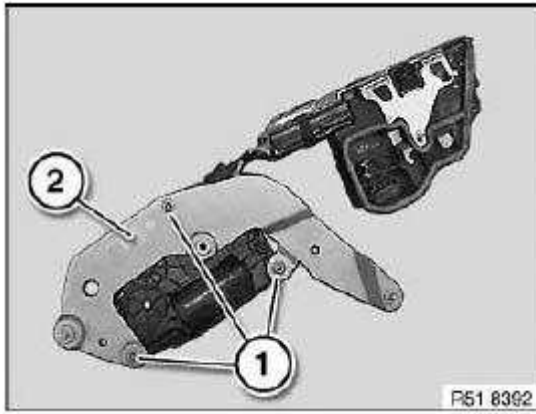


Fig. 249: Nuts And Bracket

Courtesy of BMW OF NORTH AMERICA, INC.

51 21 125 REMOVING AND INSTALLING/REPLACING CARRIER FOR LEFT OR RIGHT OUTSIDE DOOR HANDLE WITH LOCK CYLINDER

Necessary preliminary tasks:

- Remove cover on outside handle, see **51 21 180 Removing and installing/replacing cover on outside handle**
- Disconnect Bowden cable from door lock, see **51 21 090 Removing and installing/replacing door lock in left or right front door**

Driver's side only:

- Remove door lock on front door, see **51 21 090 Removing and installing/replacing door lock in left or right front door**

NOTE: **Version with Comfort Access/CA:
CA sensor (4) must not be damaged.**

Unlock catches (2) on carrier (1).

Press lock cylinder (5) behind door outer skin (3).

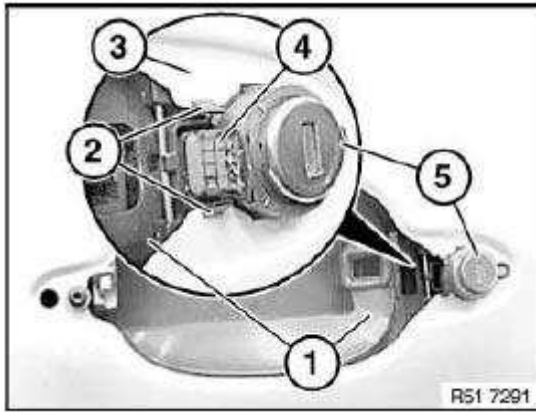


Fig. 250: Catches, Carrier, Lock Cylinder And Door Outer Skin
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, disconnect plug on CA module.

Pull carrier (3) towards rear/top until screw (1) of sheet metal slot (2) is free.

Remove carrier (3) for outside door handle.

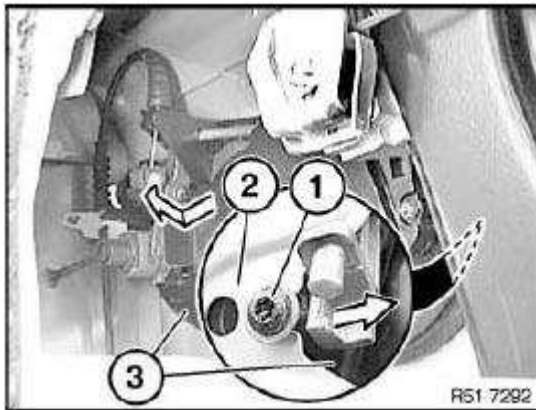


Fig. 251: Carrier, Screw And Sheet Metal Slot
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Seals (1) on carrier (3) must not be damaged.

IMPORTANT: Water drainage channel (2) must not be fouled/clogged.

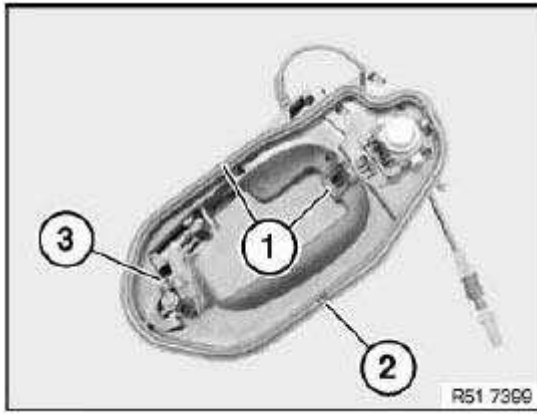


Fig. 252: Seals And Carrier

Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

- Remove Bowden cable for outside door handle on front door, see **51 21 233 Removing and installing/replacing Bowden cable for outside door handle on left or right front door**

Version with Comfort Access/CA:

- Carry out programming/coding using appropriate BMW service tool.

51 21 126 REMOVING AND INSTALLING/REPLACING CARRIER FOR LEFT OR RIGHT OUTSIDE DOOR HANDLE WITHOUT LOCK CYLINDER

NOTE: Operation is (except for tasks relating to removing door lock) identical to:

- **51 21 125 Removing and installing/replacing carrier for left or right outside door handle with lock cylinder.**

51 21 140 REMOVING AND INSTALLING/REPLACING COMPLETE LOCK CYLINDER IN LEFT OR RIGHT FRONT DOOR

Operation is identical to:

51 21 125 Removing and installing/replacing carrier for left or right outside door handle with lock cylinder

51 21 170 REMOVING AND INSTALLING OR REPLACING OUTSIDE HANDLE FROM LEFT OR RIGHT FRONT DOOR

Special tools required:

- **51 2 220 TORX**

Necessary preliminary tasks:

- Remove cover on outside handle, see **51 21 180 Removing and installing/replacing cover on outside handle**

Removal:

NOTE: Installation is described separately from removal.

Remove plate (1).

Installation:

If necessary, replace faulty trim (1).

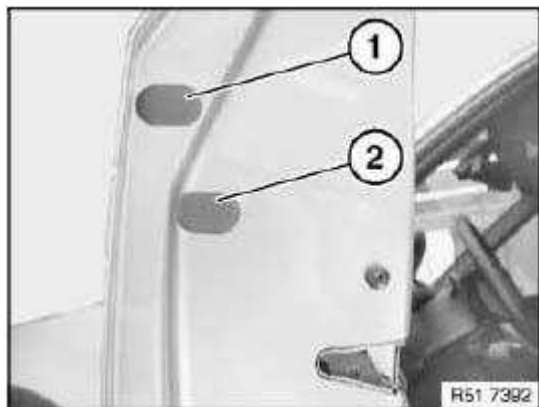


Fig. 253: Plate And Trim

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Protect bore (1) against scratching (risk of corrosion).

IMPORTANT: If screw (3) is not correctly secured, the lock mechanism can jump back and the sound insulation must be removed.

Pull outside handle (2) outwards/upwards and hold.

Using special tool 51 2 220 , turn screw (3) in counterclockwise direction and thereby secure outside handle (2).

Tightening torque: 51 21 5AZ, see **51 21 FRONT DOOR LOCKS**

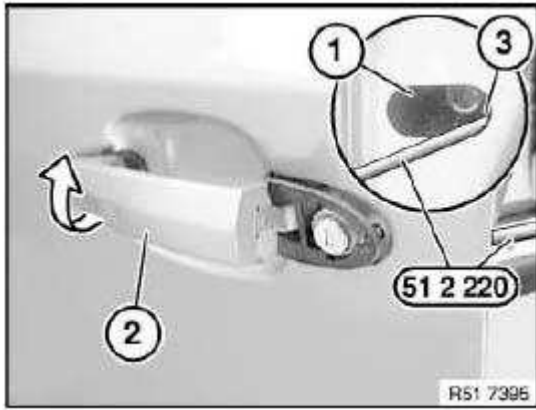


Fig. 254: Special Tool (51 2 220)

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: For removal, outside handle (1) must remain secured with a screwdriver.

- A. Pull off outside handle (1) from rear lock actuator (2).
- B. Pull off outside handle (1) downwards/outwards (in direction of arrow) from front lock actuator (3).

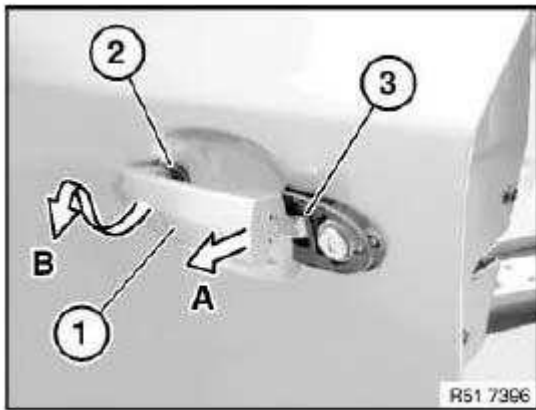


Fig. 255: Outside Handle, Front Lock Actuator And Rear Lock Actuator

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Following parts on outside handle (4) must not be damaged or missing:

1. Rear mounting
2. Front mounting
3. Felt strip (if available for refitting/replacement no longer required)

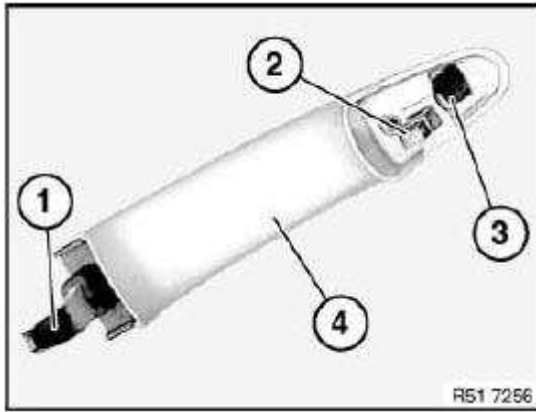


Fig. 256: Outside Handle

Courtesy of BMW OF NORTH AMERICA, INC.

Insert outside handle with bore hole correctly in mounting (1).

Snap rear mounting on outside handle correctly into lock actuator (2).

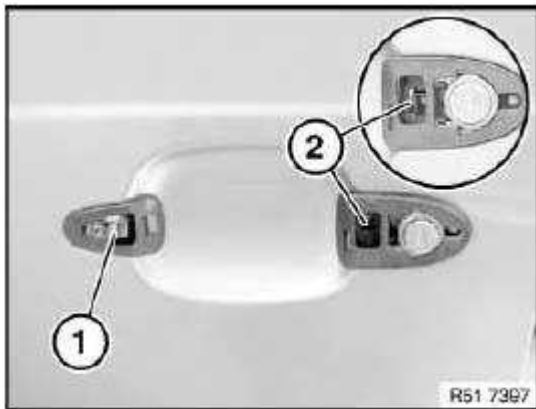


Fig. 257: Mounting And Lock Actuator

Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

Remove seals (2 and 3) in direction of arrow.

If necessary, replace faulty seals (2 and 3).

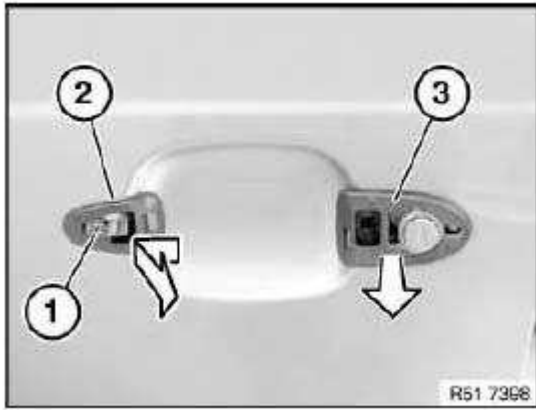


Fig. 258: Seals And Screw

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Protect bore (1) against scratching (risk of corrosion).

IMPORTANT: If screw (3) is not correctly secured, the lock mechanism can jump back and the sound insulation must be removed.

Grip outside handle (2) and, using special tool 51 2 220 , screw down screw (3) in clockwise direction.

Tightening torque: 51 21 5AZ, see **51 21 FRONT DOOR LOCKS**

Carry out function check only with door open.

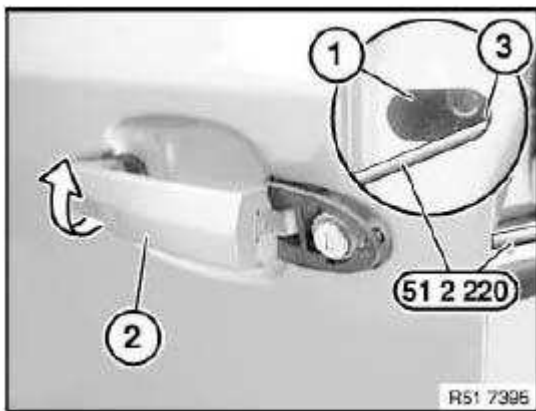


Fig. 259: Special Tool (51 2 220)

Courtesy of BMW OF NORTH AMERICA, INC.

51 21 180 REMOVING AND INSTALLING/REPLACING COVER ON OUTSIDE HANDLE

Remove trim (1).

Installation:

If necessary, replace faulty trim (1).

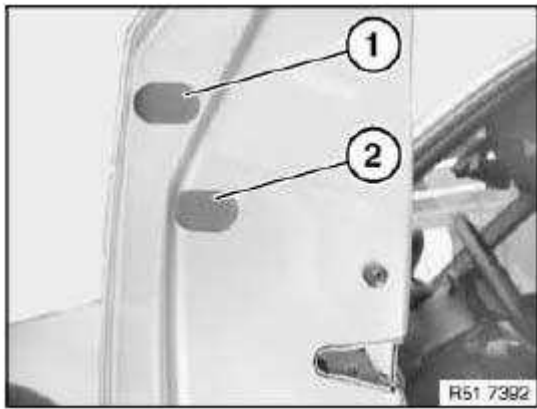


Fig. 260: Plate And Trim

Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

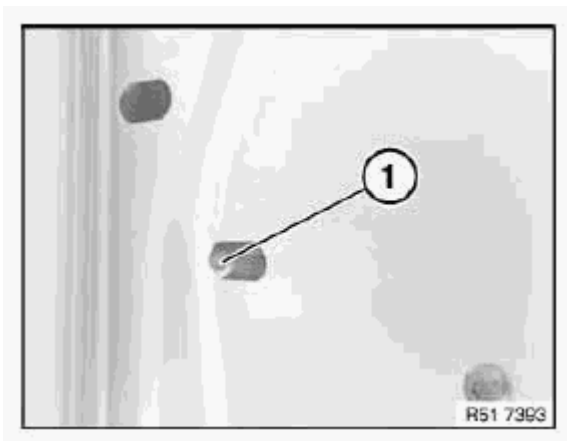


Fig. 261: Screw

Courtesy of BMW OF NORTH AMERICA, INC.

Pull off cover (1) in direction of arrow.

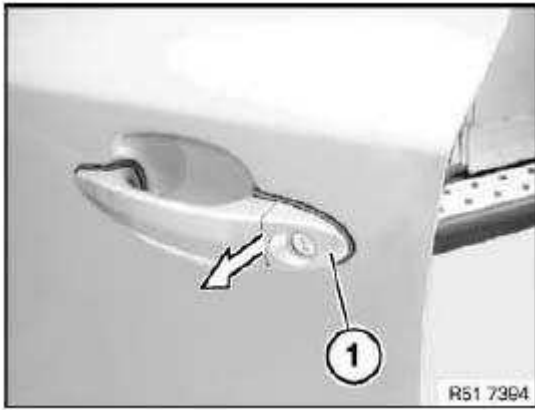


Fig. 262: Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Lever out catches (1) and detach cover (2) from filler element (3).

Installation:

Catches (1) of cover (2) must not be damaged.

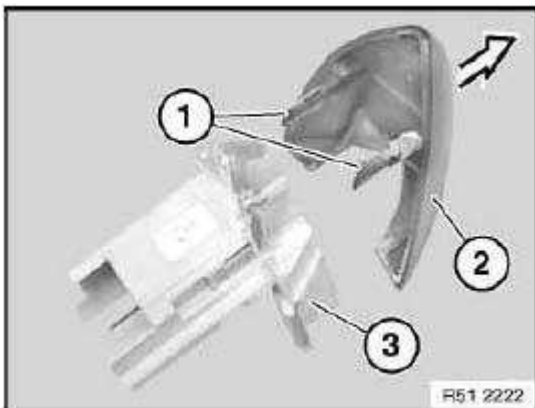


Fig. 263: Catches And Cover
Courtesy of BMW OF NORTH AMERICA, INC.

51 21 200 REMOVING AND INSTALLING/REPLACING OUTSIDE HANDLE AND LOCK ACTUATION OF LEFT OR RIGHT FRONT DOOR

NOTE: Operation is described in:

- **51 21 125 Removing and installing/replacing carrier for left or right outside door handle with lock cylinder**

51 21 225 REMOVING AND INSTALLING OR REPLACING INSIDE DOOR OPENER IN LEFT OR RIGHT FRONT DOOR

Necessary preliminary tasks:

- Remove front door trim panel, see **51 41 000 Removing and installing left or right front door trim panel**

Unhook Bowden cable for release lever:

- Tighten release lever (1).
- Lever out lock (2).
- Detach Bowden cable (3) towards rear/top.

Installation:

For fitting, press release lever (1) fully onto door trim panel.

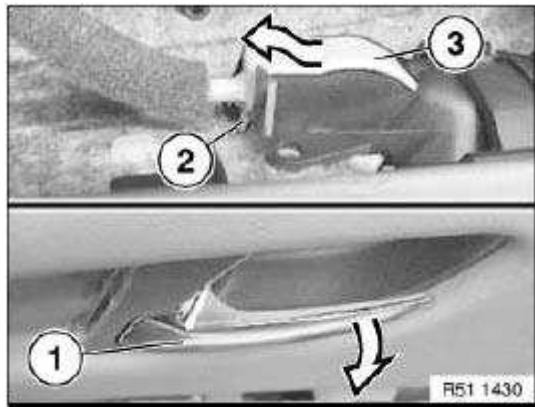


Fig. 264: Bowden Cable And Lever
Courtesy of BMW OF NORTH AMERICA, INC.

Drive out spindle (1) in upward direction.

Remove door opener (3).

Installation:

Spindle (1) must be flush with housing (2).

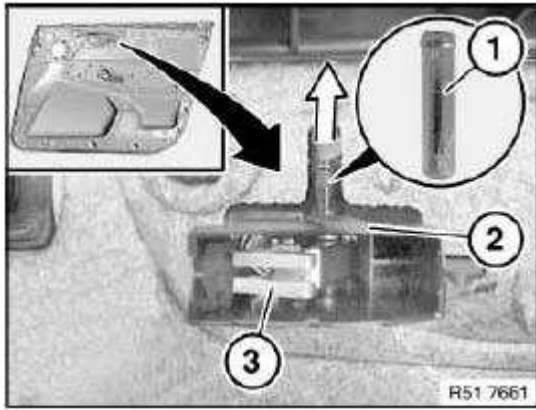


Fig. 265: Spindle, Housing And Door Opener
 Courtesy of BMW OF NORTH AMERICA, INC.

51 21 233 REMOVING AND INSTALLING/REPLACING BOWDEN CABLE FOR OUTSIDE DOOR HANDLE ON LEFT OR RIGHT FRONT DOOR

Necessary preliminary tasks:

- Remove carrier for outside door handle, see **51 21 125 Removing and installing/replacing carrier for left or right outside door handle with lock cylinder**

Lever holder (2) out of catch (3).

Disconnect Bowden cable (1) from fixtures (4 and 5) and detach from carrier (6).

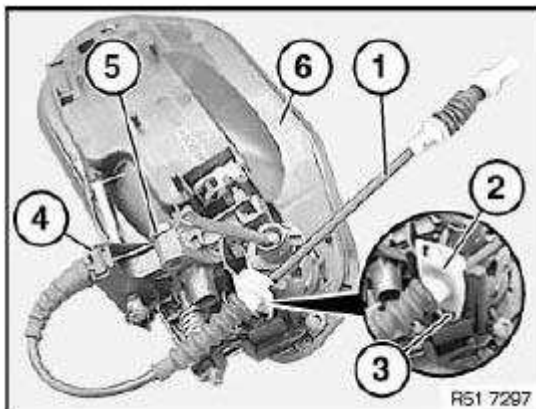


Fig. 266: Bowden Cable And Fixtures And Carrier
 Courtesy of BMW OF NORTH AMERICA, INC.

51 21 235 REMOVING AND INSTALLING/REPLACING BOWDEN CABLE FOR INSIDE DOOR OPENER ON LEFT OR RIGHT FRONT DOOR

Necessary preliminary tasks:

- Remove front door trim panel, see **51 41 000 Removing and installing left or right front door trim panel**

Unhook Bowden cable for release lever:

- Tighten release lever (1).
- Lever out lock (2).
- Detach Bowden cable (3) towards rear/top.

Installation:

For fitting, press release lever (1) fully onto door trim panel.

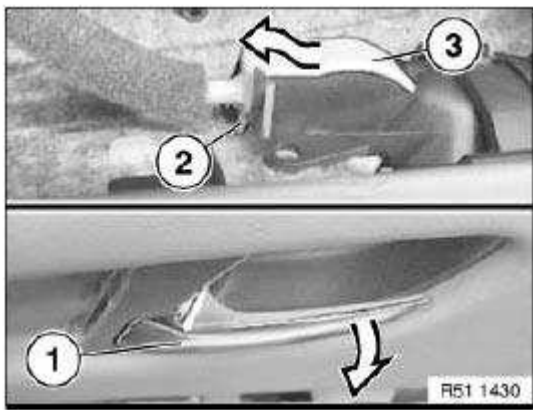


Fig. 267: Bowden Cable And Lever
 Courtesy of BMW OF NORTH AMERICA, INC.

51 21 280 REMOVING AND INSTALLING OR REPLACING DOOR BRAKE ON LEFT OR RIGHT FRONT DOOR

Necessary preliminary tasks:

- Close door windows
- Remove sound insulation in front area only, see **51 48 060 Removing and installing/replacing sound insulation in left or right front door**

Release screw (1) on door retainer (2).

Lever out seal (3) in direction of arrow.

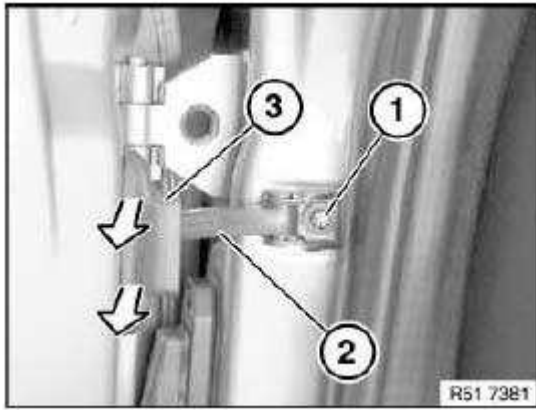


Fig. 268: Screw, Seal And Door Retainer
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Feed out seal (1) in direction of arrow.

Fold back screw plate (2) in direction of arrow.

Release screws (3) and feed out door retainer (4) to inner door panel.

Installation:

Seal (1) must not be damaged.

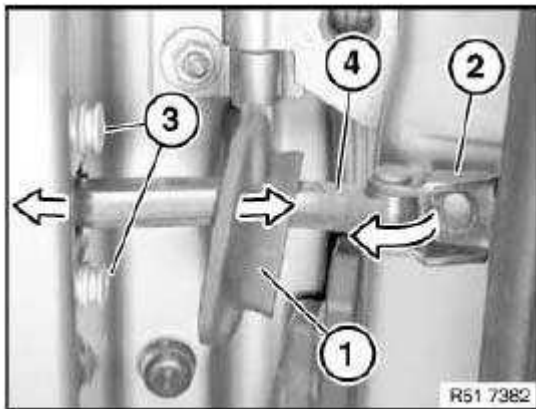


Fig. 269: Screws, Door Retainer And Screw Plate
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

To install door retainer (1), fold back screw plate (2) in direction of arrow.

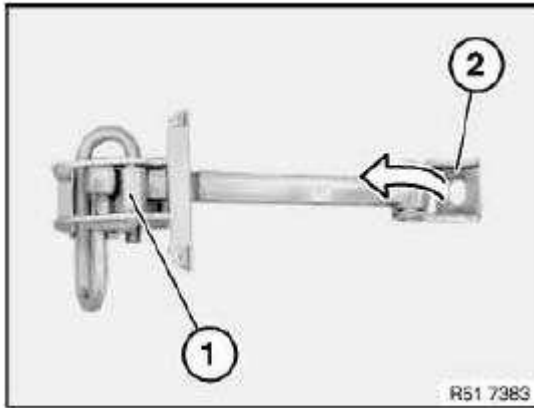


Fig. 270: Door Retainer And Screw Plate
 Courtesy of BMW OF NORTH AMERICA, INC.

51 21 300 REMOVING AND INSTALLING OR REPLACING WINDOW CAVITY COVER STRIP ON OUTSIDE OF LEFT OR RIGHT FRONT DOOR

Special tools required:

- 00 9 324 00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)

IMPORTANT: Observe procedure for using special tool 00 9 324. , see 51 21 ... Removing window cavity cover strip with special tool 00 9 324 at front or rear

IMPORTANT: If reusing the existing window cavity cover strip (1), make sure it is not bent.

Lever out window cavity cover strip (1) with special tool 00 9 324 (starting at B-pillar).

Slide window cavity cover strip (1) towards rear and feed out of guide (2) and door mirror (3).



Fig. 271: Window Cavity Cover Strip, Guide And Door Mirror
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Coat window cavity cover strip (1) with water before fitting.

Feed in window cavity cover strip (1) first at guide (2) and door mirror (3), and then press into door.

Window cavity cover strip (1) must be flush at rear to door edge.

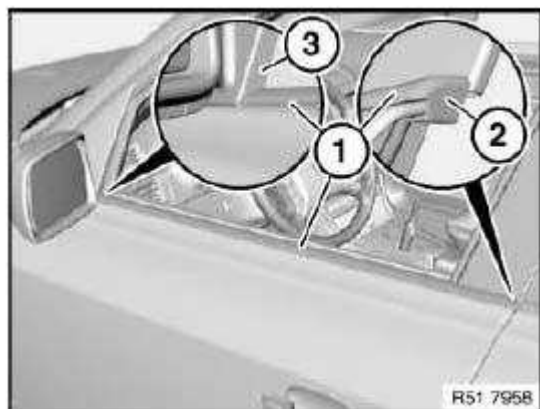


Fig. 272: Window Cavity Cover Strip, Guide And Door Mirror
Courtesy of BMW OF NORTH AMERICA, INC.

51 21 330 REMOVING AND INSTALLING/REPLACING WINDOW CAVITY COVER STRIP ON INNER FRONT DOOR

Necessary preliminary tasks:

- Remove front door trim panel, see **51 41 000 Removing and installing left or right front door trim panel**

Release expander rivet (1) on cover (2).



Fig. 273: Expander Rivet And Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Lever out cover (1) at rear slightly.

Start at rear with removal of window cavity cover strip (2).

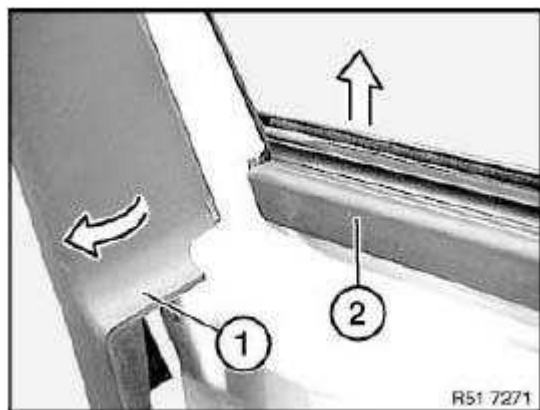


Fig. 274: Window Cavity Cover Strip And Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Pull off window cavity cover strip (1) towards top.

Installation:

If necessary, replace faulty clips (2).

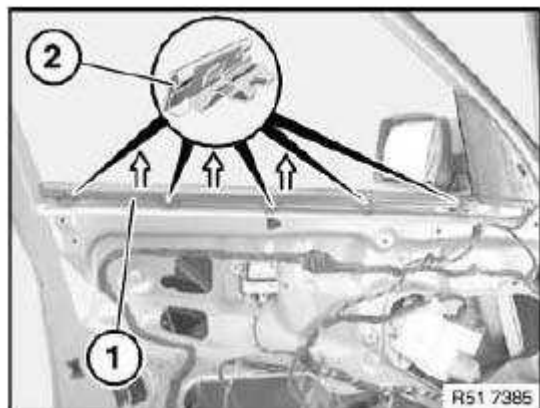


Fig. 275: Window Cavity Cover Strip And Clips
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Insert window cavity cover strip (1) below cover (2).

Foam (3) on window cavity cover strip (1) must not be damaged.

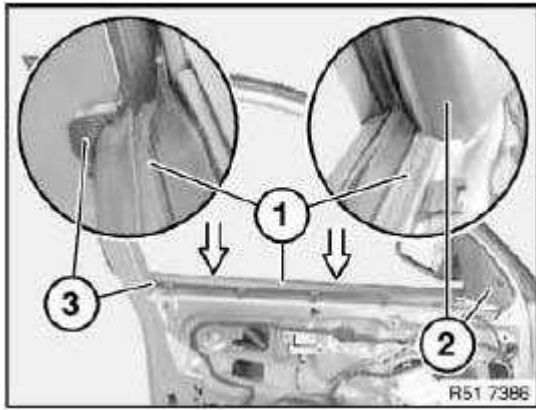


Fig. 276: Window Cavity Cover Strip And Cover
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Coat window cavity cover strip (1) with water before fitting.

Start with installation at front.

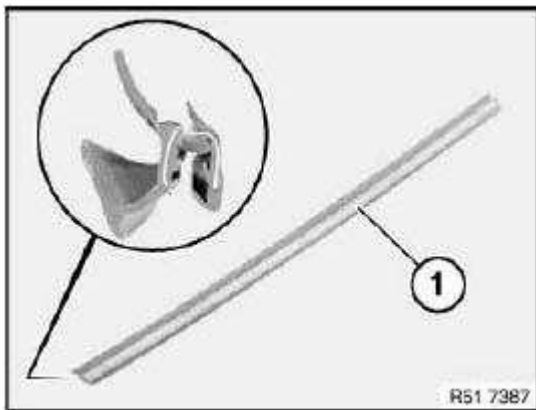


Fig. 277: Window Cavity Cover Strip
 Courtesy of BMW OF NORTH AMERICA, INC.

51 21 360 REPLACING SEAL FOR DOOR SEAM/ROOF FRAME ON LEFT OR RIGHT FRONT DOOR

Operation is identical to:

51 32 211 Replacing front left or right rubber guide for left or right door window

51 21 370 REMOVING AND INSTALLING/REPLACING COVER AT BOTTOM LEFT OR RIGHT ON FRONT DOOR

Detach cover (1) in direction of arrow from front door (2).

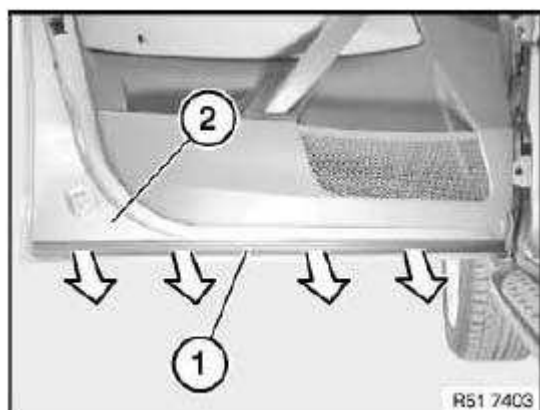


Fig. 278: Cover And Front Door

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Catches (1) of cover (2) must not be damaged.

Cover (2) has an aluminium insert (3).

Only press on catches (1) when installing otherwise cover (2) will become uneven.

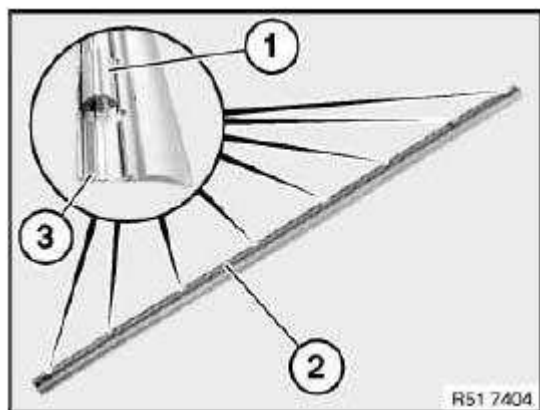


Fig. 279: Catches And Cover

Courtesy of BMW OF NORTH AMERICA, INC.

22 REAR DOOR LOCKS, HANDLES, FITTINGS

51 22 001 REPLACING DOOR DETENT (LOCK STRIKER), REAR LEFT OR RIGHT

Special tools required:

- 00 9 317 **00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)**

Operation up to "cover on rear door detent" is identical to:

Replacing front left or right door detent, see **51 21 003 Replacing door detent (lock striker), front left or right**

Unclip cover (1) with special tool 00 9 317 from door detent (2) and remove towards front.

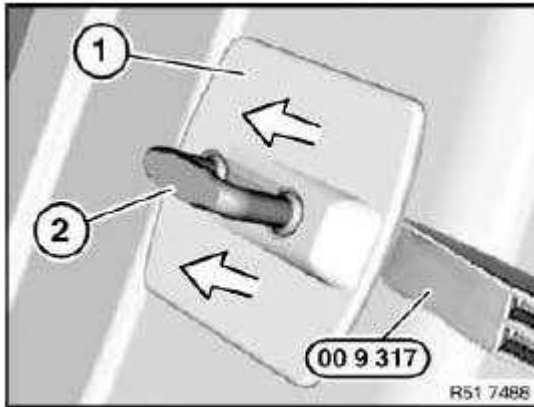


Fig. 280: Special Tool (00 9 317)

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Catches (1) on cover (2) must not be damaged.

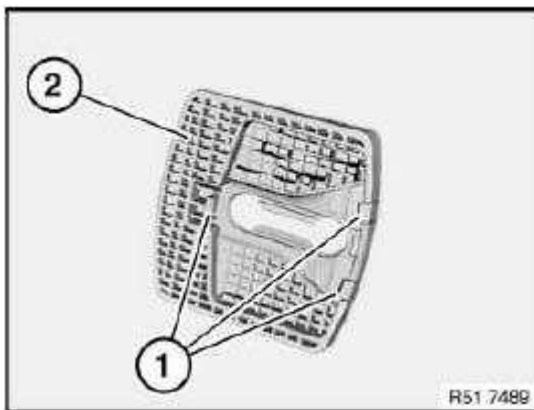


Fig. 281: Catches And Cover

Courtesy of BMW OF NORTH AMERICA, INC.

51 22 004 ADJUSTING REAR LEFT OR RIGHT DOOR DETENT (LOCK WEDGES)

Operation is described in:

41 51 004 ADJUSTING FRONT LEFT OR RIGHT DOOR

51 22 090 REMOVING AND INSTALLING/REPLACING DOOR LOCK IN LEFT OR RIGHT REAR DOOR

Special tools required:

- **51 2 190 DOOR LOCK TENSIONER**

Necessary preliminary tasks:

- Remove sound insulation in rear area only, see **51 48 070 Removing and installing/replacing sound insulation on left or right rear door**

Disconnect Bowden cable at bottom (1) and top (3) from door lock (2).

**IMPORTANT: Bowden cable must be correctly located in mounts on door lock (2).
Seal (4) must be correctly positioned on Bowden cable.**

NOTE: The operations for "Removing Bowden cable from door lock" end here.

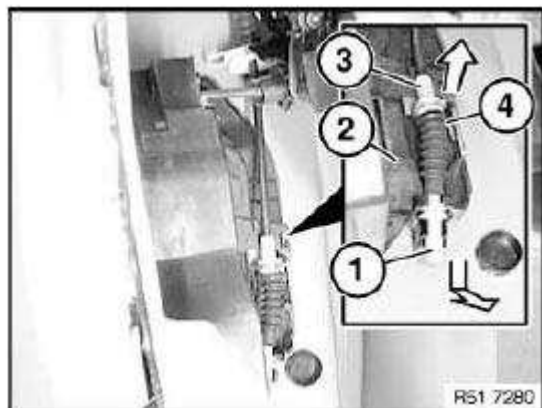


Fig. 282: Bowden Cable, Door Lock And Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock plug connection (1) at lugs (2) and detach from door lock (3).

Unclip locking rod (4) from door lock (3).

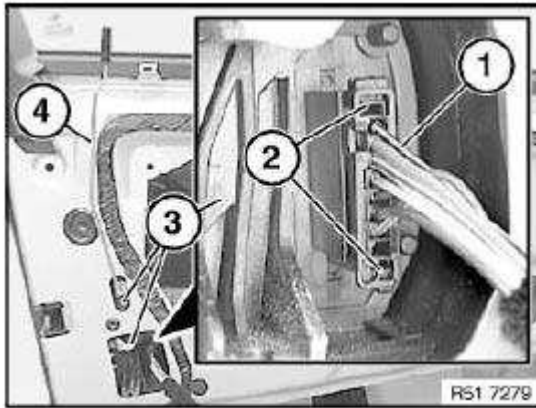


Fig. 283: Plug Connection And Door Lock

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not damage door lock seal during removal.

Release screws (1).

Remove door lock (2) from inside.

IMPORTANT: To avoid leakage and electrical malfunction:

Pull door lock (2) with special tool into corner (3), see [Fig. 286](#) and [Fig. 287](#).

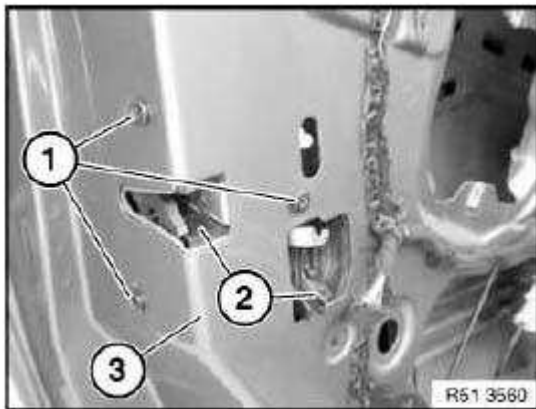


Fig. 284: Door Lock And Corner

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Seal (1) on door lock (2) must not be damaged.

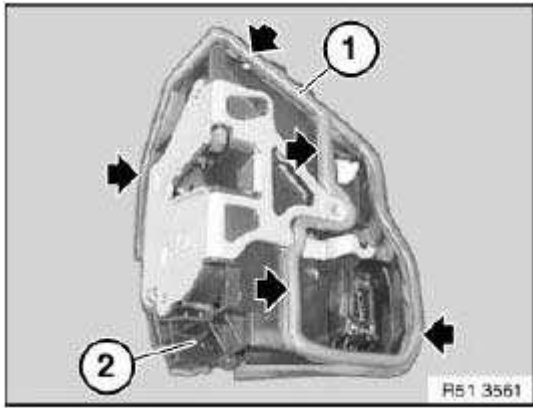


Fig. 285: Seal And Door Lock

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

- Install door lock and insert screws (1), do not tighten down.
- Slide special tool 51 2 190 into opened rotary latch until latch engages in first stage.

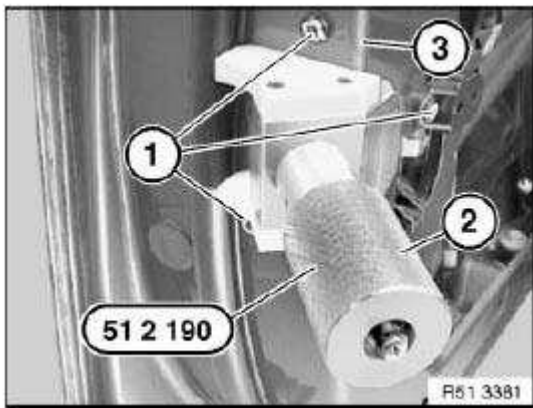


Fig. 286: Door Lock, Corner And Screw

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

- Pretension door lock (1) with knurled screw (2) until special tool 51 2 190 just contacts corner points (3).

IMPORTANT: To tension door lock (1), it is only permitted to turn knurled screw (2) by a further 1 to 1.5 turns (max.) (risk of damage).

Door lock seal must rest uniformly on inner door plate (water ingress).

- Tighten down door lock screws, tightening torque: 51 21 1AZ, see **51 21 FRONT DOOR LOCKS**

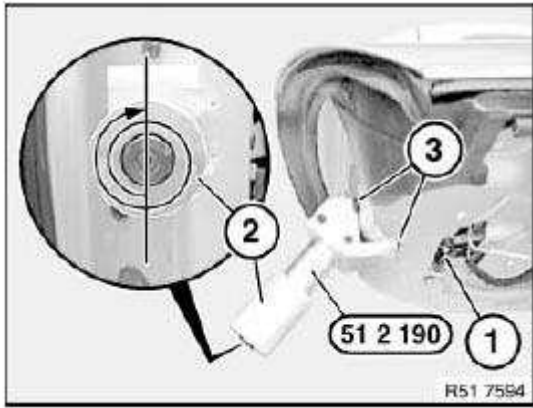


Fig. 287: Door Lock, Corner And Screw
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check function of child lock (1) on door lock (2).

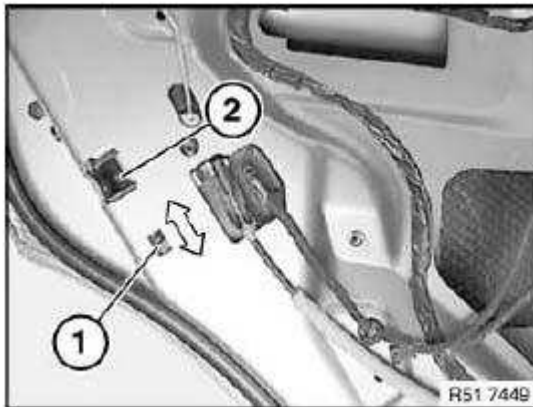


Fig. 288: Child Lock And Door Lock
 Courtesy of BMW OF NORTH AMERICA, INC.

51 22 126 REMOVING AND INSTALLING/REPLACING CARRIER FOR OUTSIDE DOOR HANDLE ON LEFT OR RIGHT REAR DOOR

Necessary preliminary tasks:

- Remove outside handle on rear door, see **51 22 170 Removing and installing / replacing outside handle on left or right back door**
- Disconnect Bowden cable from door lock, see **51 21 090 Removing and installing/replacing door lock in left or right front door**

Release screw (1) on carrier (5).

Feed out seals (2 and 3) in direction of arrow and remove.

Unlock catches (4) on carrier (5).

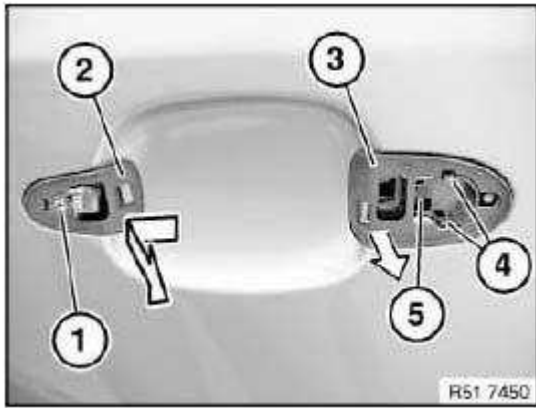


Fig. 289: Catches, Carrier, Seals And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Pull carrier (3) towards rear/top until screw (1) of sheet metal slot (2) is free.

Remove carrier (3) for outside door handle.

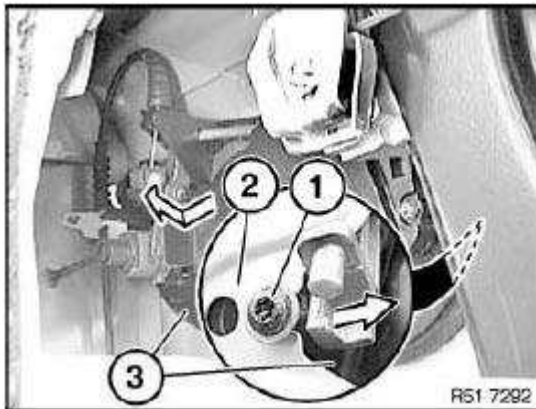


Fig. 290: Carrier, Screw And Sheet Metal Slot
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Seals (1) on carrier (3) must not be damaged.

IMPORTANT: Water drainage channel (2) must not be fouled/clogged.

Replacement:

If necessary, remove Bowden cable for outside door handle, see [51 22 233 Removing and installing/replacing Bowden cable for outside door handle on left or right rear door](#)

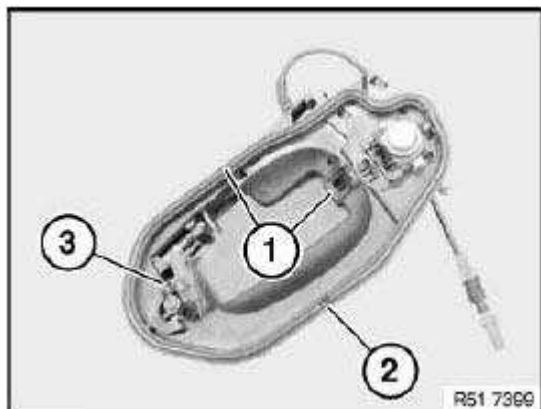


Fig. 291: Seals And Carrier

Courtesy of BMW OF NORTH AMERICA, INC.

51 22 170 REMOVING AND INSTALLING / REPLACING OUTSIDE HANDLE ON LEFT OR RIGHT BACK DOOR

Special tools required:

- **51 2 220 TORX**

Necessary preliminary tasks:

- Remove cover on front outside handle, see [51 22 180 Removing and installing/replacing cover on outside handle, left or right](#)

Removal:

NOTE: Installation is described separately from removal.

Remove plate (1).

Installation:

If necessary, replace faulty trim (1).

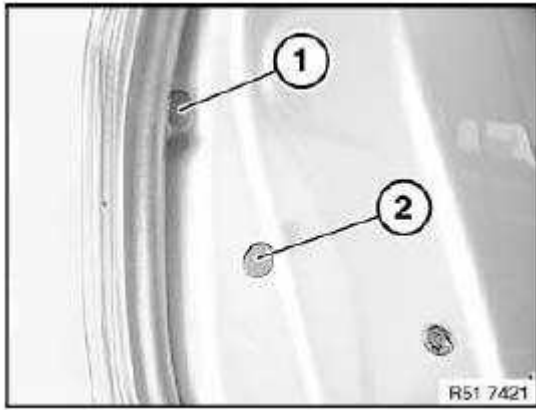


Fig. 292: Plate And Trim

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Protect bore (1) against scratching (risk of corrosion).

IMPORTANT: If screw (3) is not correctly secured, the lock mechanism can jump back and the sound insulation must be removed.

Pull outside handle (2) outwards/upwards and hold.

Using special tool 51 2 220 , turn screw (3) in counterclockwise direction and thereby secure outside handle (2).

Tightening torque: 51 22 5AZ, see **51 22 REAR DOOR LOCKS**

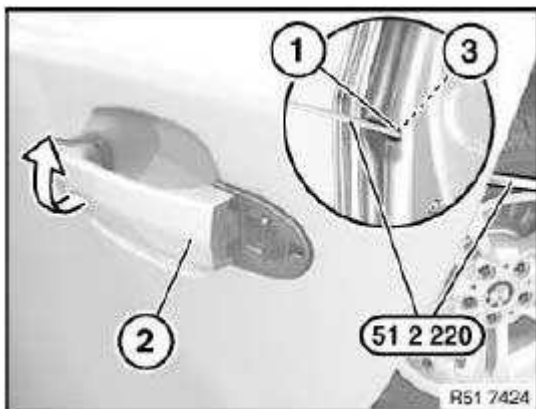


Fig. 293: Special Tool (51 2 220)

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: For removal, the outside handle (1) must remain secured with a screwdriver (4).

- A. Pull off outside handle (1) from rear lock actuator (2).
- B. Pull off outside handle (1) downwards/outwards (in direction of arrow) from front lock actuator (3).

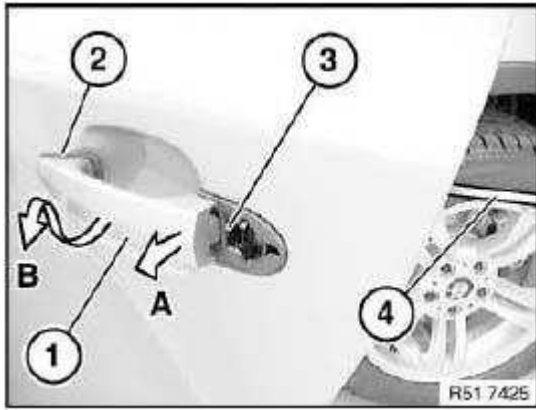


Fig. 294: Outside Handle And Rear Lock Actuator
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Following parts on outside handle (4) must not be damaged or missing:

1. Rear mounting
2. Front mounting
3. Felt strip (if available for refitting/replacement no longer required)

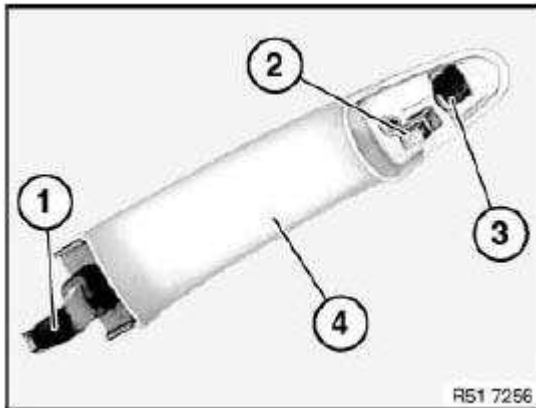


Fig. 295: Outside Handle
 Courtesy of BMW OF NORTH AMERICA, INC.

Insert outside handle with bore hole correctly in mounting (1).

Snap rear mounting on outside handle correctly into lock actuator (2).

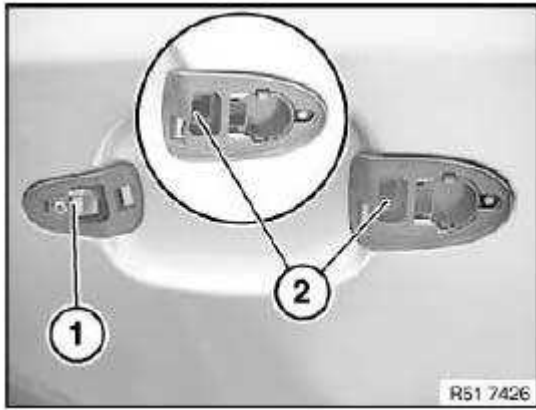


Fig. 296: Mounting And Lock Actuator
 Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

Remove seals (2 and 3) in direction of arrow.

If necessary, replace faulty seals (2 and 3).

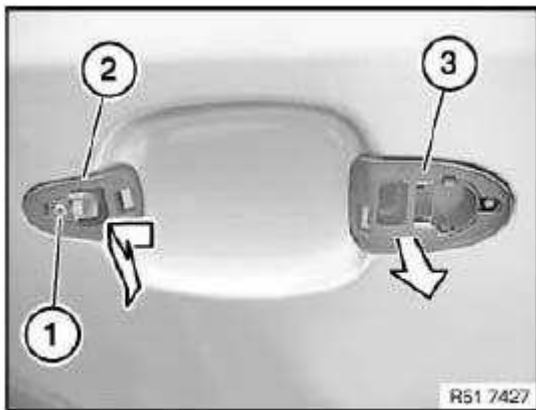


Fig. 297: Seals And Screw
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Protect bore (1) against scratching (risk of corrosion).

IMPORTANT: If screw (3) is not correctly secured, the lock mechanism can jump back and the sound insulation must be removed.

Grip outside handle (2) and, using special tool 51 2 220 , screw down screw (3) in clockwise direction.

Tightening torque: 51 22 5AZ, see **51 22 REAR DOOR LOCKS**

Carry out function check only with door open.

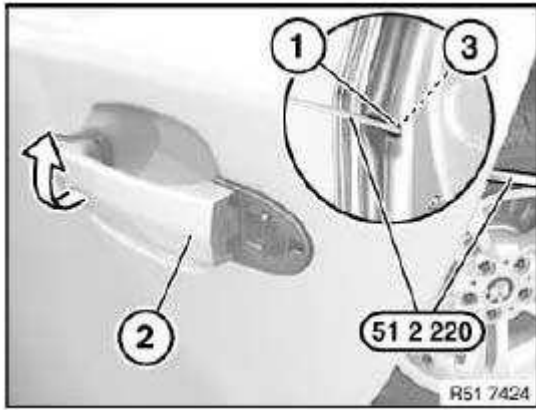


Fig. 298: Special Tool (51 2 220)

Courtesy of BMW OF NORTH AMERICA, INC.

51 22 180 REMOVING AND INSTALLING/REPLACING COVER ON OUTSIDE HANDLE, LEFT OR RIGHT

Remove trim (2).

Installation:

If necessary, replace faulty trim (2).

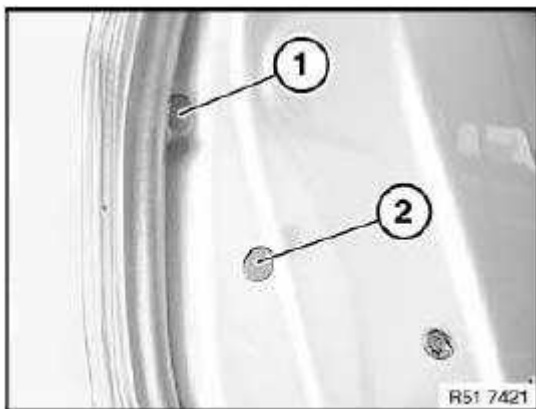


Fig. 299: Plate And Trim

Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

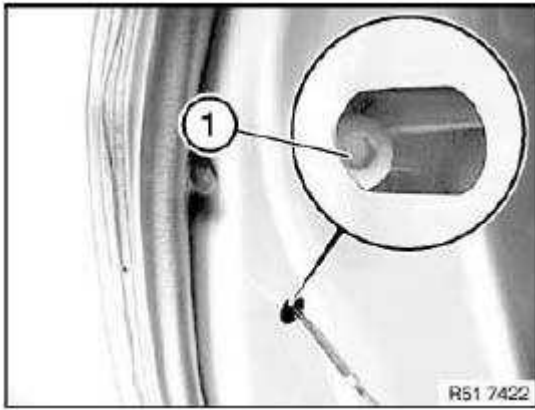


Fig. 300: Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Pull off cover (1) in direction of arrow.

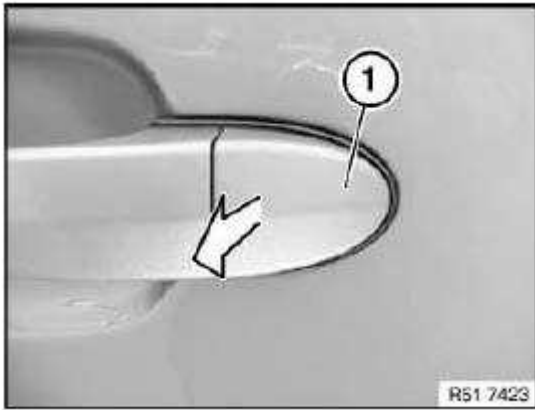


Fig. 301: Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Lever out catches (1) and detach cover (2) from filler element (3).

Installation:

Catches (1) of cover (2) must not be damaged.

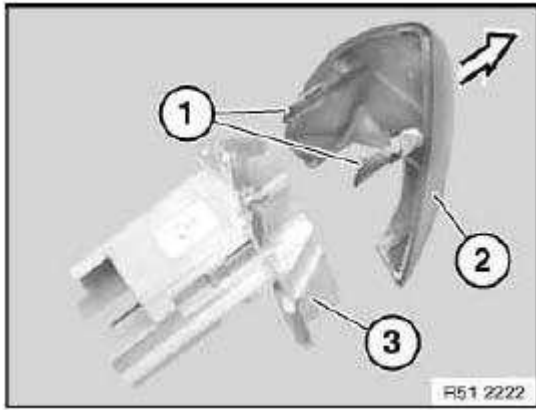


Fig. 302: Catches And Cover

Courtesy of BMW OF NORTH AMERICA, INC.

51 22 225 REMOVING AND INSTALLING/REPLACING INSIDE DOOR OPENER OF REAR LEFT OR RIGHT DOOR

Necessary preliminary tasks:

- Remove rear door trim panel, see **51 42 000 Removing and installing left or right rear door trim panel**

Unhook Bowden cable for release lever:

- Tighten release lever (1).
- Lever out lock (2).
- Detach Bowden cable (3) towards rear/top.

Installation:

For fitting, press release lever (1) fully onto door trim panel.

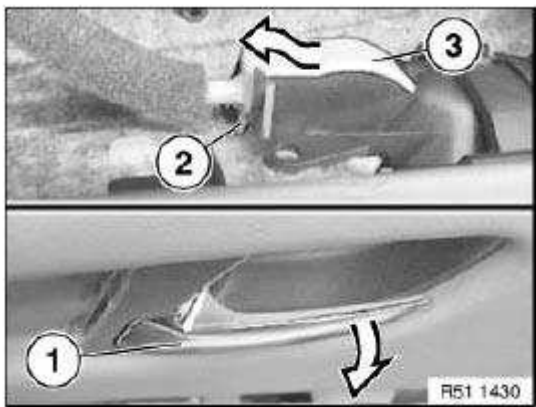


Fig. 303: Bowden Cable And Lever

Courtesy of BMW OF NORTH AMERICA, INC.

Drive out spindle (1) in upward direction.

Remove door opener (3).

Installation:

Spindle (1) must be flush with housing (2).

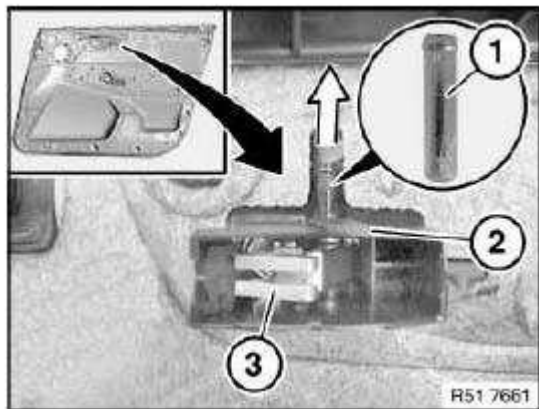


Fig. 304: Spindle, Housing And Door Opener
Courtesy of BMW OF NORTH AMERICA, INC.

51 22 233 REMOVING AND INSTALLING/REPLACING BOWDEN CABLE FOR OUTSIDE DOOR HANDLE ON LEFT OR RIGHT REAR DOOR

Necessary preliminary tasks:

- Remove carrier for outside door handle, see **51 21 125 Removing and installing/replacing carrier for left or right outside door handle with lock cylinder**

Lever holder (2) out of catch (3).

Disconnect Bowden cable (1) from fixtures (4 and 5) and detach from carrier (6).

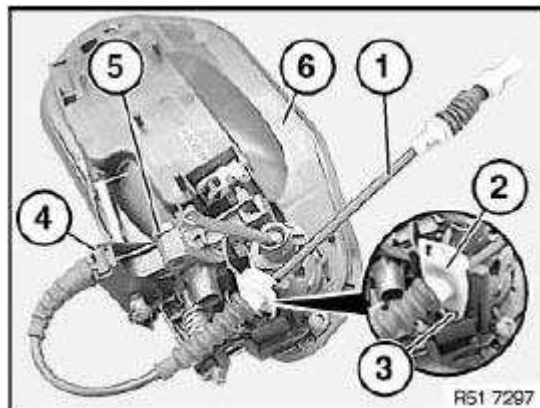


Fig. 305: Bowden Cable And Fixtures And Carrier
Courtesy of BMW OF NORTH AMERICA, INC.

51 22 235 REMOVING AND INSTALLING/REPLACING BOWDEN CABLE FOR INSIDE DOOR OPENER ON LEFT OR RIGHT REAR DOOR

Necessary preliminary tasks:

- Remove rear door trim panel, see **51 42 000 Removing and installing left or right rear door trim panel**

Unhook Bowden cable for release lever:

- Tighten release lever (1).
- Lever out lock (2).
- Detach Bowden cable (3) towards rear/top.

Installation:

For fitting, press release lever (1) fully onto door trim panel.

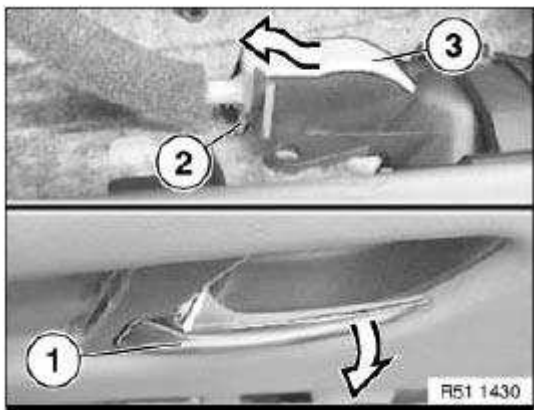


Fig. 306: Bowden Cable And Lever
Courtesy of BMW OF NORTH AMERICA, INC.

51 22 280 REMOVING AND INSTALLING/REPLACING DOOR RETAINER ON REAR LEFT OR RIGHT DOOR

Necessary preliminary tasks:

- Raise the door window.
- Remove sound insulation in front area only, see **51 48 070 Removing and installing/replacing sound insulation on left or right rear door**

Release screw (1) on door retainer (2).

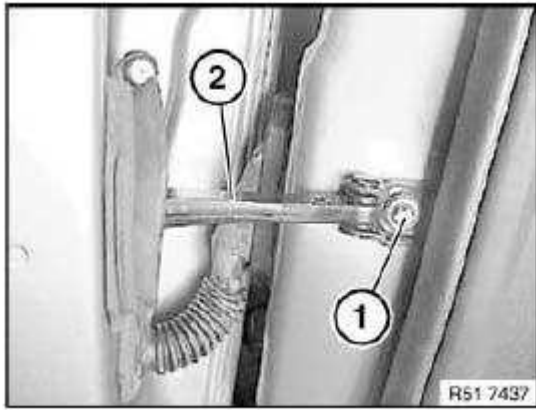


Fig. 307: Screw And Door Retainer
 Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) on inner door panel (2).

Feed out door retainer (3) to inner door panel.

If replacing seal:

If necessary, pull off seal (4) in direction of arrow.

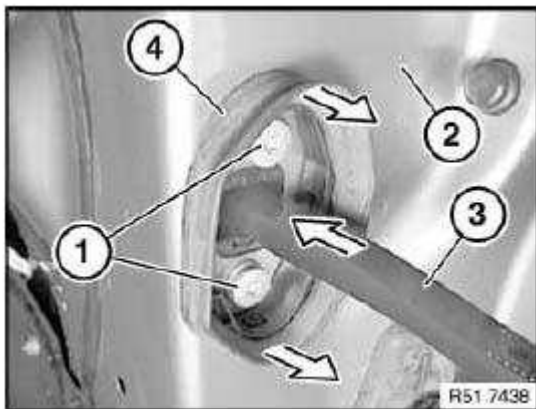


Fig. 308: Screws, Door Retainer And Inner Door Panel
 Courtesy of BMW OF NORTH AMERICA, INC.

If replacing seal:

If necessary, unclip catches (1) on cover (2) and remove in direction of arrow.

Installation:

Catches (1) on cover (2) must not be damaged.

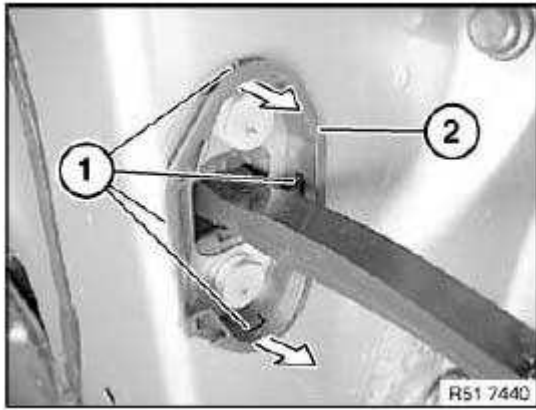


Fig. 309: Catches And Cover

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Fold back screw plate (2) in order to install door retainer (1).

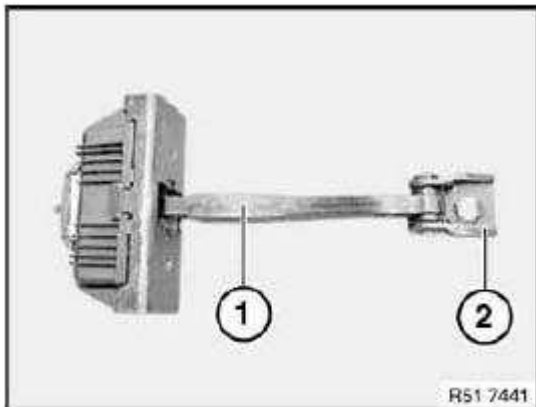


Fig. 310: Back Screw Plate And Door Retainer

Courtesy of BMW OF NORTH AMERICA, INC.

51 22 300 REMOVING AND INSTALLING/REPLACING WINDOW CAVITY COVER STRIP ON REAR DOOR ON LEFT OR RIGHT

Special tools required:

- 00 9 324 00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)

IMPORTANT: Observe procedure for using special tool 00 9 324. , see 51 21 ... Removing window cavity cover strip with special tool 00 9 324 at front or rear

IMPORTANT: If reusing the existing window cavity cover strip (1), make sure it is not bent.

Lever out window cavity cover strip (1) with special tool 00 9 324 (starting at B-pillar).

If necessary, carefully lever out window cavity cover strip (1) in area of fixed side window with assembly wedge.

NOTE: Carefully feed guides (2 and 3) of window cavity cover strip (1) out of rear door.

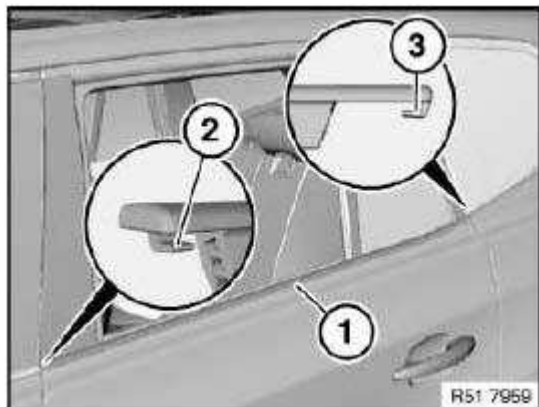


Fig. 311: Window Cavity Cover Strip
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Coat window cavity cover strip (1) with water before fitting.

Feed guides (2 and 3) of window cavity cover strip (1) into rear door first.

Window cavity cover strip (1) must be flush at front and rear with door edge.

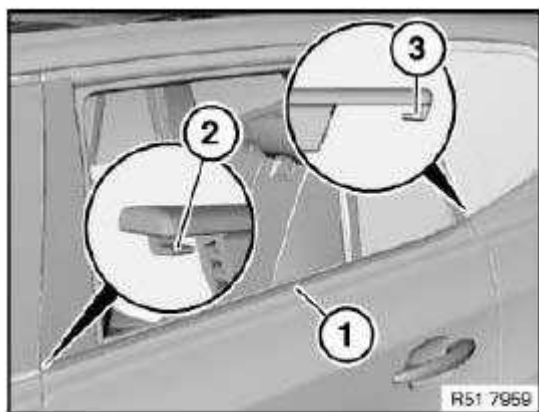


Fig. 312: Window Cavity Cover Strip
Courtesy of BMW OF NORTH AMERICA, INC.

INSIDE REAR DOOR

Necessary preliminary tasks:

- Remove rear door trim panel, see **51 42 000 Removing and installing left or right rear door trim panel**

Pull window cavity cover strip (1) off rear door.

Installation:

If necessary, replace faulty clips (2).

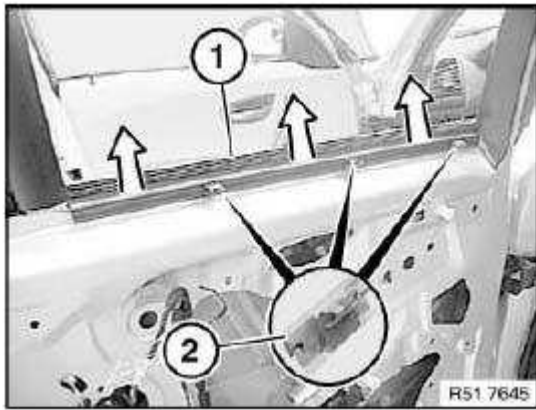


Fig. 313: Window Cavity Cover Strip And Clips
Courtesy of BMW OF NORTH AMERICA, INC.

51 22 351 REPLACING WINDOW CAVITY SEAL ON INNER LEFT OR RIGHT REAR DOOR

Necessary preliminary tasks:

- Remove rear door trim panel, see **51 42 000 Removing and installing left or right rear door trim panel**

Pull window cavity seal (1) off rear door.

Installation:

If necessary, replace faulty retainer (2).

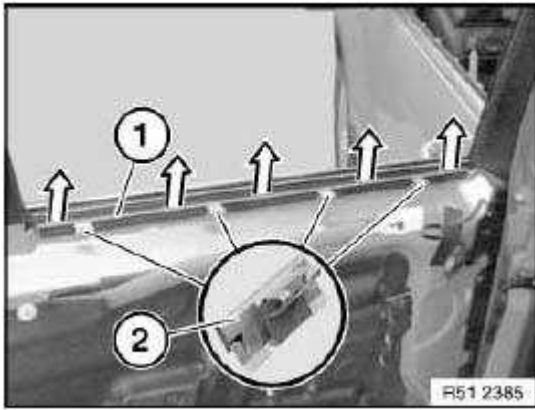


Fig. 314: Window Cavity Seal And Retainer
 Courtesy of BMW OF NORTH AMERICA, INC.

51 22 360 REPLACING SEAL FOR DOOR SEAM/ROOF FRAME ON LEFT OR RIGHT REAR DOOR

Operation is identical to:

51 34 211 Replacing rubber guide for rear left or right door window

51 22 370 REMOVING AND INSTALLING/REPLACING COVER AT BOTTOM LEFT OR RIGHT ON REAR DOOR

Detach cover (1) in direction of arrow from rear door (2).

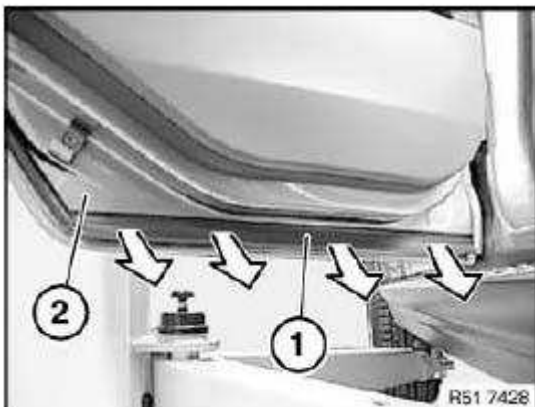


Fig. 315: Cover And Rear Door
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Catches (1) of cover (2) must not be damaged.

Cover (2) has an aluminium insert (3).

Only press on catches (1) when installing, otherwise cover (2) will become uneven.

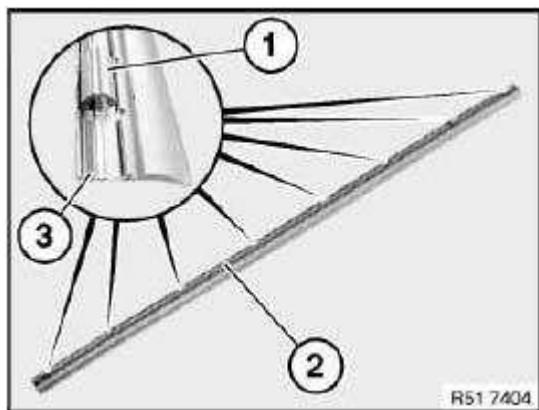


Fig. 316: Catches And Cover

Courtesy of BMW OF NORTH AMERICA, INC.

23 HOOD LATCH, LOCKS

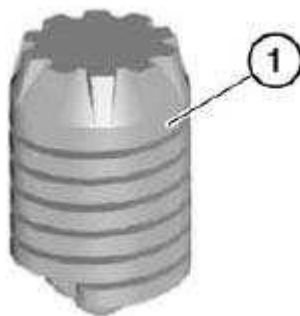
51 23 ... ADJUSTING/REPLACING BUMP STOPS

The illustrations are schematic representations and are to be applied to the relevant vehicle type.

Version 1:

Following parts must not be damaged:

- Bump stop



R41 2156

Fig. 317: Bump Stop

Courtesy of BMW OF NORTH AMERICA, INC.

Adjust bump stop (1) to correct height by turning left or right.

Version 2:

Replace damaged bump stops:

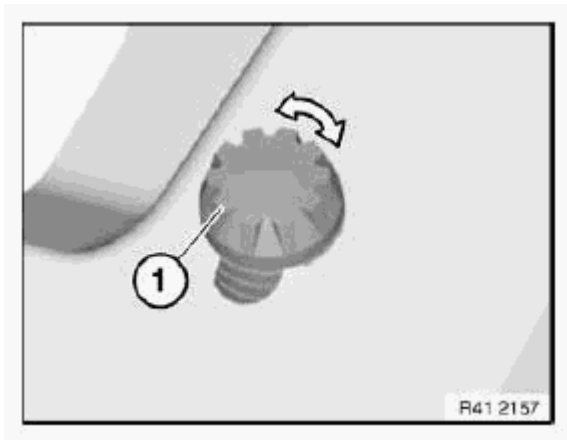


Fig. 318: Adjusting Bump Stop
Courtesy of BMW OF NORTH AMERICA, INC.

- o Bump stop with ejector



Fig. 319: Bump Stop With Ejector
Courtesy of BMW OF NORTH AMERICA, INC.

Press ejector (1) into bump stop and, in this position, twist approx. 90° counterclockwise with a Phillips screwdriver.

This locks the ejectors (1) in the bump stops.

Adjust bump stop (2) to correct height by turning left or right.

Unlock the ejector (1) again after completing adjustment.

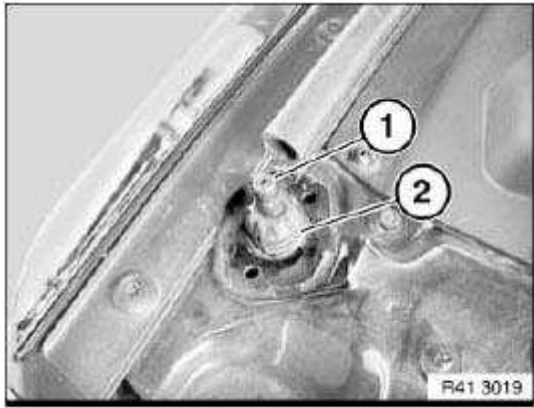


Fig. 320: Ejectors And Bump Stop
Courtesy of BMW OF NORTH AMERICA, INC.

Version 3:

Replace damaged bump stops:

- Bump stop

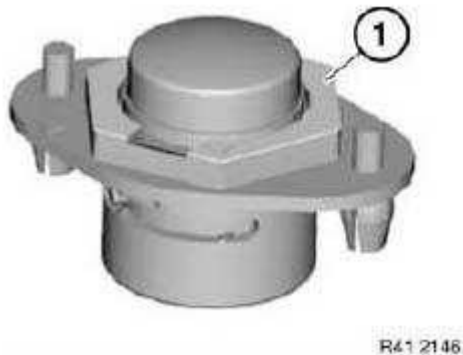


Fig. 321: Bump Stop
Courtesy of BMW OF NORTH AMERICA, INC.

Turn lock (1) 45° counterclockwise.

Pull bump stop (2) upwards.

Close lid slowly until it is at the same height as the side panel.

Open lid and turn lock (1) clockwise.

Installation:

Press bump stop into panel and drive in expanding pins (3).

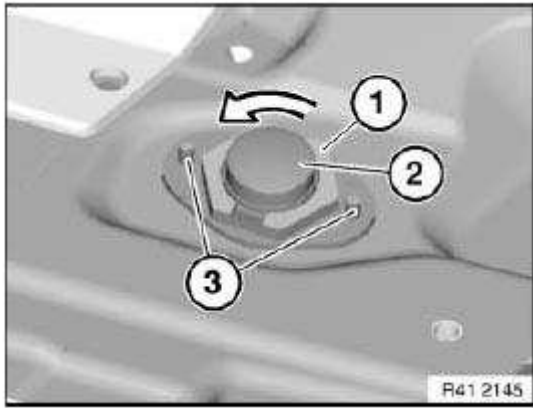


Fig. 322: Bump Stop And Lock

Courtesy of BMW OF NORTH AMERICA, INC.

51 23 ... REMOVING/INSTALLING BALL SOCKETS WITH CLIP

WARNING: Risk of injury! When installed, the gas pressurised shock absorber is under preload. Minimise preload as far as possible before removing.

IMPORTANT: Never lift off ball socket with engaged retainer.

Disassembly/assembly:

1. Push on retainer in direction of groove with screwdriver
2. Lift off ball socket from ball pin
3. Slide retainer back
4. Fit ball socket on ball stud and snap into place with force

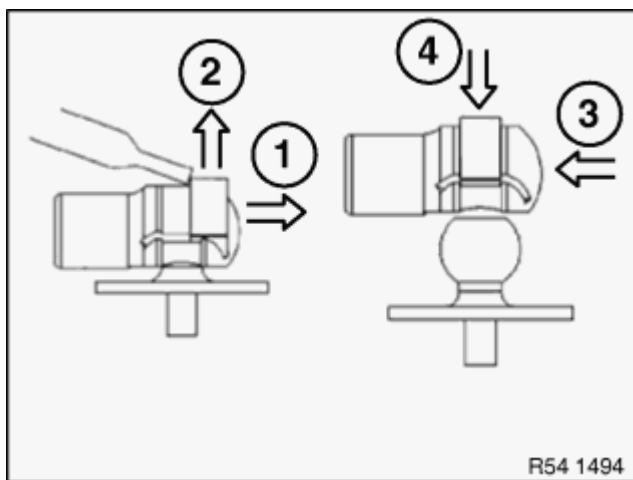


Fig. 323: Identifying Ball Socket With Clip

Courtesy of BMW OF NORTH AMERICA, INC.

Installation: Replace overstretched clips. Pack grease into two opposite positions in socket. The grease spreads after installation on the ball pin all round in the ball socket.

51 23 004 ADJUSTING HOOD/BONNET LOCK

Operation is identical to:

- **41 61 014 ADJUSTING ENGINE BONNET/HOOD**

51 23 100 REMOVING AND INSTALLING/REPLACING RIGHT ENGINE HOOD LOCK

Operation is identical to:

51 23 110 Removing and installing/replacing left engine hood lock

51 23 110 REMOVING AND INSTALLING/REPLACING LEFT ENGINE HOOD LOCK

Necessary preliminary tasks:

- Remove front bumper trim, see **51 11 156 Removing and installing front bumper trim (up to 09/2006)**
- Remove front air duct, see **51 11 770 Removing and installing/replacing left or right deformation element for front bumper**

NOTE: Engine hood lock (2) shown without attachment parts for purposes of clarity.

Disengage Bowden cable (1) in direction of arrow from engine hood lock (2).

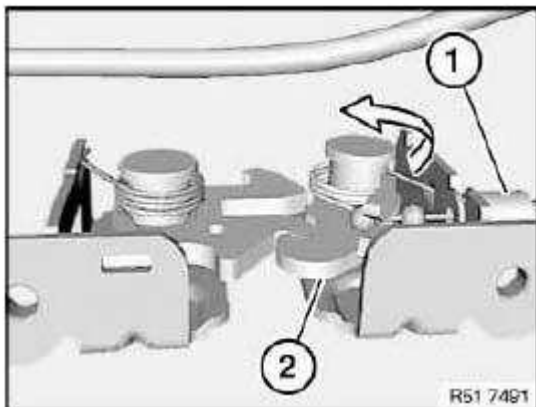


Fig. 324: Bowden Cable And Engine Hood Lock
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) and remove engine hood lock (2) at an angle towards front.

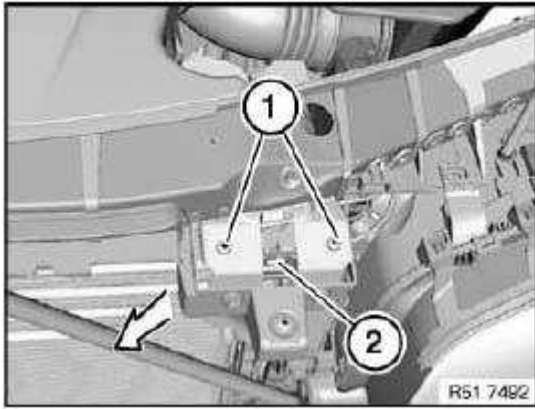


Fig. 325: Screws And Engine Hood Lock
 Courtesy of BMW OF NORTH AMERICA, INC.

51 23 131 ADJUSTING LEFT OR RIGHT STRIKER ON ENGINE HOOD

Operation is described in:

- **41 61 014 ADJUSTING ENGINE BONNET/HOOD**

51 23 160 REMOVING AND INSTALLING/REPLACING ARRESTER HOOK ON ENGINE HOOD

Raise bonnet/hood lid.

Release screws (1) and remove arrester hook (2).

Tightening torque: 51 23 1AZ, see **51 23 HOOD/BONNET LOCKS**

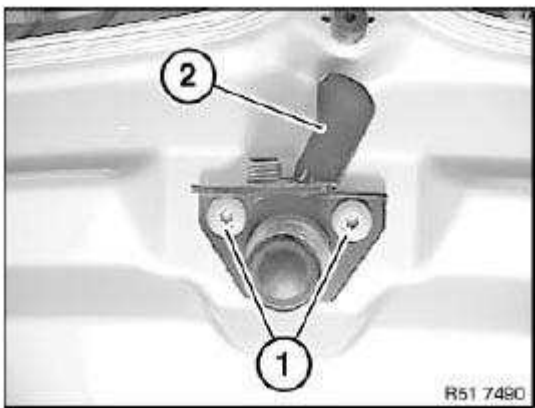


Fig. 326: Screws And Arrester Hook
 Courtesy of BMW OF NORTH AMERICA, INC.

51 23 211 REMOVING AND INSTALLING/REPLACING CABLE FOR FRONT ENGINE HOOD/BONNET LOCKS (TO PASSENGER COMPARTMENT)

Necessary preliminary tasks:

- Remove trim panel for pedal assembly, see **51 45 185 Removing and installing/replacing trim for pedal assembly**
- Remove footwell side trim panel on A-pillar, see **51 43 070 Removing and installing/replacing side trim panel, footwell, on A-pillar, left**
- Disengage cable for front engine hood/bonnet locks (to locks), see **51 23 212 Removing and installing/replacing cable for front engine hood locks (to locks)**
- Partially detach front carpet lining

Disengage Bowden cable (1) from release lever (2) and feed out in direction of arrow.

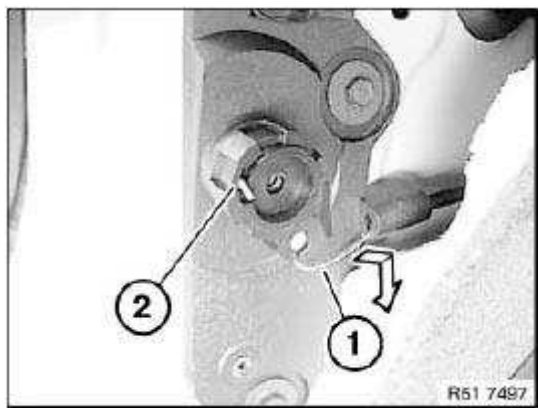


Fig. 327: Bowden Cable And Lever

Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) on equipment carrier cover (2).

Feed out equipment carrier cover (2) in direction of arrow and remove.

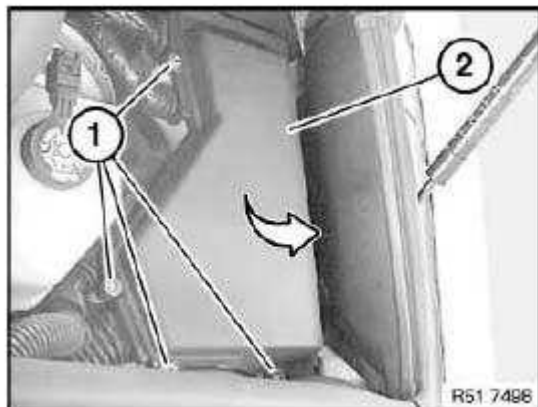


Fig. 328: Screws And Carrier Cover

Courtesy of BMW OF NORTH AMERICA, INC.

Feed Bowden cable (1) in direction of arrow out of clip (2).

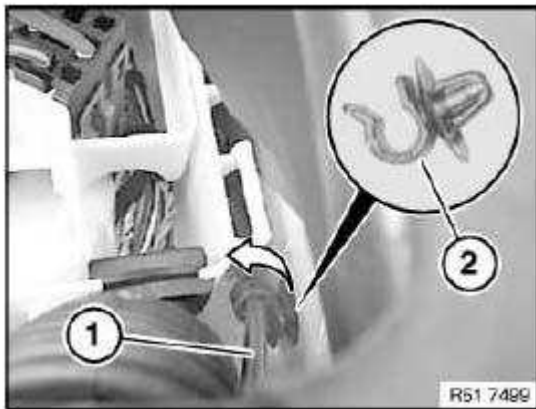


Fig. 329: Bowden Cable And Clip

Courtesy of BMW OF NORTH AMERICA, INC.

Feed out Bowden cable (1) in direction of engine compartment.

IMPORTANT: Check that grommet (2) is correctly seated (water ingress).

Installation:

Lay Bowden cable (1) without kinks.

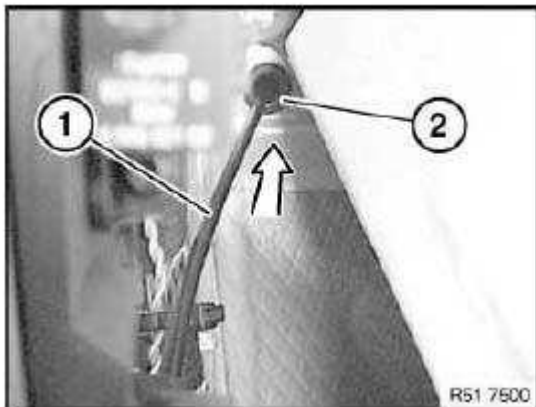


Fig. 330: Bowden Cable And Grommet

Courtesy of BMW OF NORTH AMERICA, INC.

Feed grommet (1) in direction of arrow out of bulkhead (2) and remove Bowden cable (3) towards front.

Installation:

Check that grommet (1) is correctly seated

Lay Bowden cable (3) without kinks.

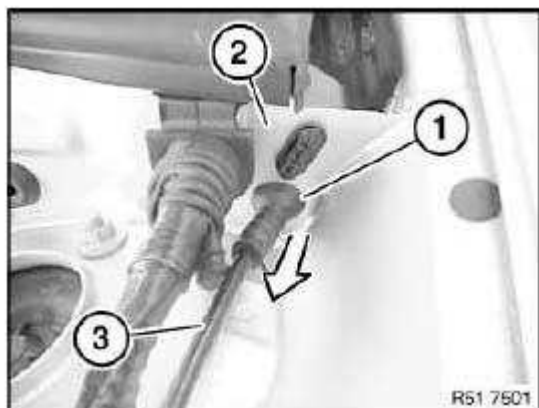


Fig. 331: Bowden Cable, Bulkhead And Grommet
Courtesy of BMW OF NORTH AMERICA, INC.

51 23 212 REMOVING AND INSTALLING/REPLACING CABLE FOR FRONT ENGINE HOOD LOCKS (TO LOCKS)

Special tools required:

- 00 9 317 **00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)**

Necessary preliminary tasks:

- Remove engine hood locks on left and right, see **51 23 100 Removing and installing/replacing right engine hood lock**

Lever out cover (1) from clutch (2) in direction of arrow and remove.

Lever out Bowden cable (3) in direction of arrow.

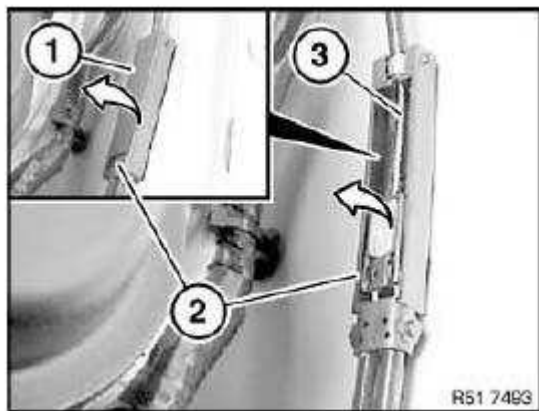


Fig. 332: Cover, Clutch And Bowden Cable

Courtesy of BMW OF NORTH AMERICA, INC.

Unclip cable for engine hood locks (1) with special tool 00 9 317 in direction of arrow and feed out of front panel.

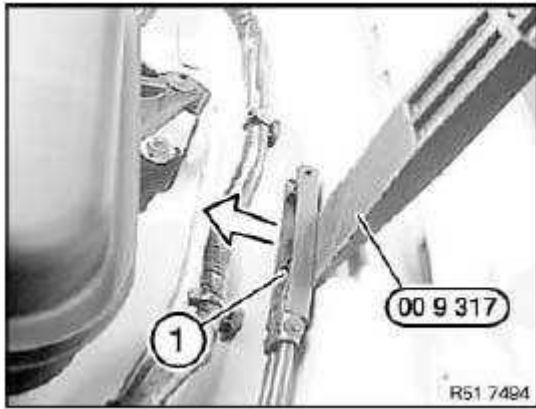


Fig. 333: Special Tool (00 9 317)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Catches (1 and 2) on cable for engine hood locks (3) must not be damaged.

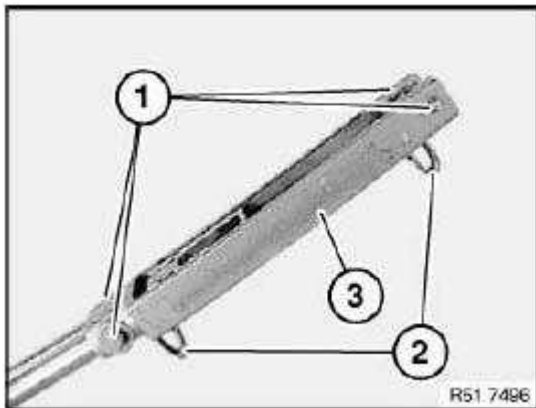


Fig. 334: Catches And Engine Hood Locks
Courtesy of BMW OF NORTH AMERICA, INC.

51 23 265 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT GAS STRUT FOR ENGINE BONNET/HOOD

WARNING: Risk of injury and damage!
For the following tasks, you must take the appropriate measures to support the engine bonnet/hood.
As an alternative, you can enlist the help of a second person to hold the

bonnet/hood.

Raise bonnet/hood lid.

Removing gas spring strut at top and bottom:

1. Push retainer spring to end of gas spring strut.
2. Remove gas spring strut from ball head.

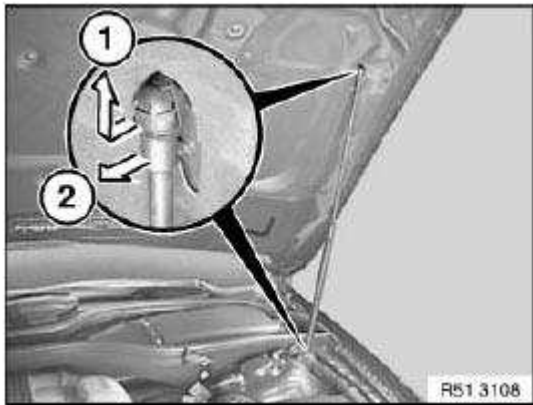


Fig. 335: Retainer Spring And Gas Spring Strut
Courtesy of BMW OF NORTH AMERICA, INC.

24 TRUNK LATCH, LOCKS

51 24 004 ADJUSTING REAR LID LOCK

Necessary preliminary tasks:

- Remove trim on tail panel at top, see **51 46 050 Removing and installing/replacing top trim on rear apron**

Prerequisite:

Rear lid must be correctly adjusted to fit; if necessary, adjust rear lid, see **41 62 014 ADJUSTING REAR LID**

For ideal adjustment, refer to Body gap dimensions.

Screw in buffer stops for rear lid on left/right completely.

NOTE: **Operation is described in:**

- **Removing and installing/replacing buffer stops on rear lid, see 51 24 165**
Removing and installing/replacing side left or right buffer stops on rear lid

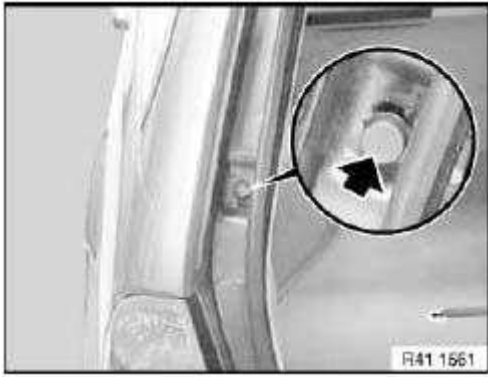


Fig. 336: Locating Buffer Stops
Courtesy of BMW OF NORTH AMERICA, INC.

Check fulcrum pads on lower section of rear lid lock for damage and replace if necessary.

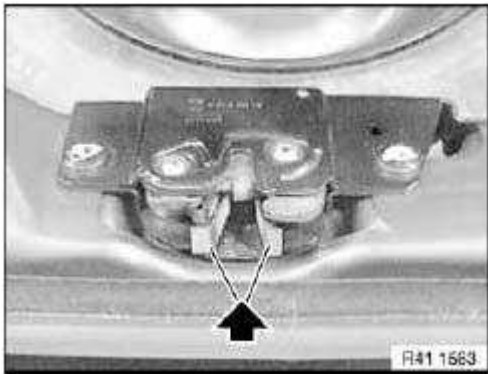


Fig. 337: Locating Fulcrum Pads
Courtesy of BMW OF NORTH AMERICA, INC.

Check striker (1) on rear lid for damage, replace if necessary.

Unclip cover (2).



Fig. 338: Locating Striker And Cover

Courtesy of BMW OF NORTH AMERICA, INC.

Loosen screws on striker until it is just able to move and centers itself.

IMPORTANT: Striker must not scrape against the lower section of the rear lid lock.

Close trunk lid.

This automatically adjusts the striker correctly.



Fig. 339: Locating Striker

Courtesy of BMW OF NORTH AMERICA, INC.

Open trunk lid.

Tighten down screws on striker.

Check adjustment of rear lid and striker, repeating adjustment if necessary.



Fig. 340: Locating Striker

Courtesy of BMW OF NORTH AMERICA, INC.

Adjust buffer stops on rear lid.

NOTE: Operation is described in:

- **Removing and installing/replacing buffer stops on rear lid, see 51 24 165 Removing and installing/replacing side left or right buffer stops on rear lid**

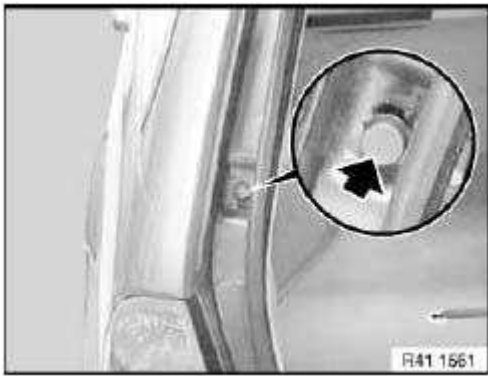


Fig. 341: Locating Buffer Stops

Courtesy of BMW OF NORTH AMERICA, INC.

51 24 105 REMOVING AND INSTALLING/REPLACING REAR LID LOCK (LOWER SECTION OF LOCK)

Necessary preliminary tasks:

- Remove trim on tail panel, see **51 46 050 Removing and installing/replacing top trim on rear apron**

Installation:

Mark position of lower section of rear lid lock on tail panel.

Release screws (1) on lower section of lock (2).

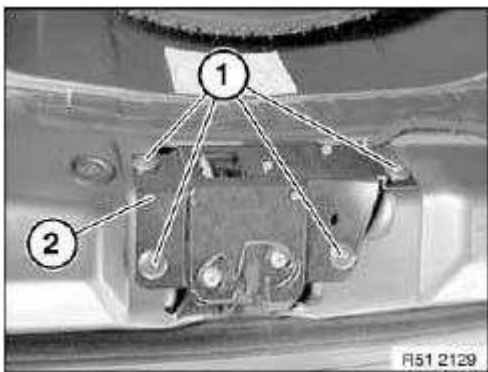


Fig. 342: Screws And Lower Section Of Lock

Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1) on actuator drive (2) and remove lower section of lock (3).

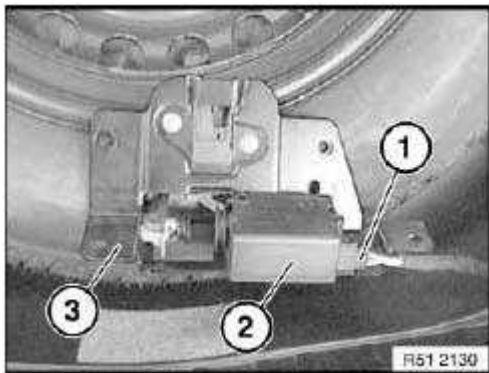


Fig. 343: Plug Connection, Actuator Drive And Lock
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

Release screws (1) for actuator drive (2).

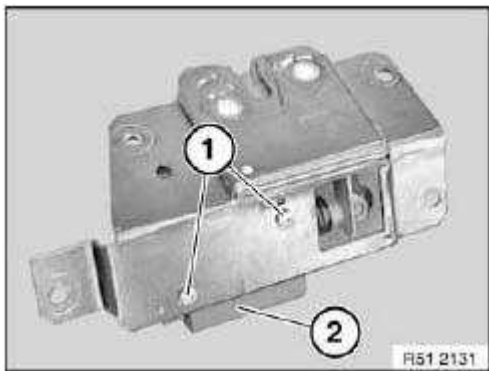


Fig. 344: Screws And Actuator Drive
Courtesy of BMW OF NORTH AMERICA, INC.

Remove emergency release mechanism (2) of actuator drive (1) from mount (3) on rear lid lock (4).

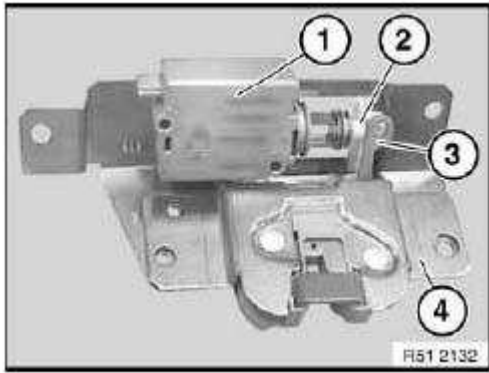


Fig. 345: Emergency Release Mechanism, Actuator Drive, Mount And Rear Lid Lock
Courtesy of BMW OF NORTH AMERICA, INC.

Only if replacing actuator drive:

Detach emergency release lever (1) from actuator drive (2).

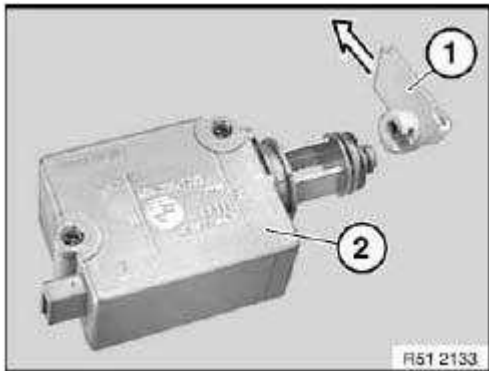


Fig. 346: Emergency Release Lever And Actuator Drive
Courtesy of BMW OF NORTH AMERICA, INC.

51 24 130 REMOVING AND INSTALLING/REPLACING STRIKER FOR REAR LID LOCK (TOURING)

Necessary preliminary tasks:

- Open rear lid.

Remove trim (1) on rear lid.

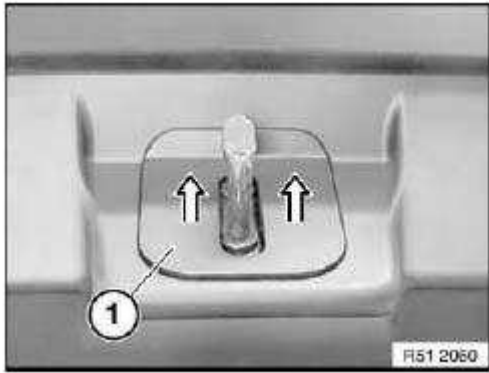


Fig. 347: Trim
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1) on striker (2).

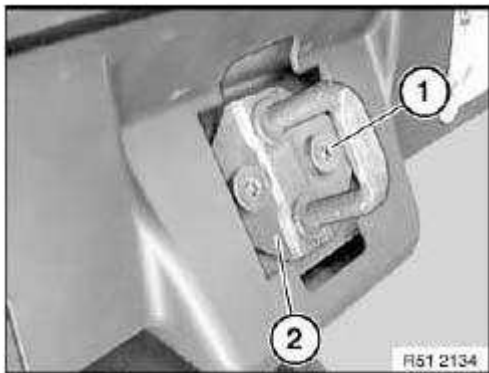


Fig. 348: Screw And Striker
Courtesy of BMW OF NORTH AMERICA, INC.

Screw threaded pin (1) into threaded plate of striker (2).

Unscrew bolt (3).

Remove striker (2) from rear lid panel (4).

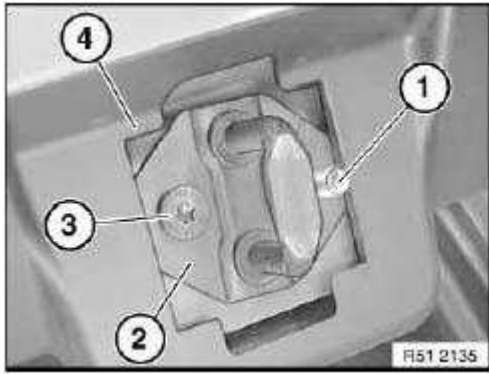


Fig. 349: Threaded Pin, Striker And Rear Lid Panel
Courtesy of BMW OF NORTH AMERICA, INC.

Threaded pin (1) remains in threaded plate (2) until striker is fitted.

IMPORTANT: Do not close trunk lid, risk of damage.

Installation:

Adjust striker to lower section of trunk lid lock.

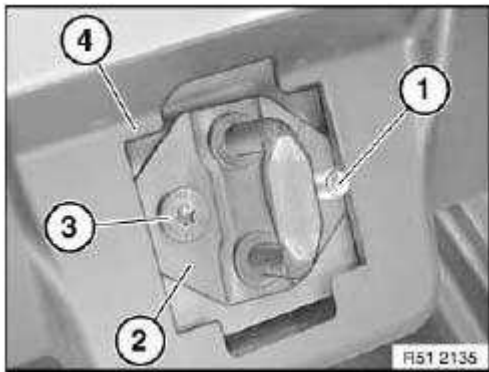


Fig. 350: Threaded Pin, Striker And Rear Lid Panel
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Striker and rear lid lock must not be greased.

51 24 145 REMOVING AND INSTALLING/REPLACING BUTTON FOR REAR LID ACTUATION

Operation is identical to:

- **51 13 402 Removing and installing/replacing handle strip (on rear lid)**

51 24 165 REMOVING AND INSTALLING/REPLACING SIDE LEFT OR RIGHT BUFFER STOPS ON REAR LID

Necessary preliminary tasks:

- Remove panel for roof pillar at rear (D-pillar), see **51 43 252 Replacing trim panel for rear left or right roof pillar (D-pillar)**

NOTE: **The operation is described on the left side; proceed in the same way for the right side.**

Adjustment, refer to:

Last 3 work steps.

Release lock nut (1) on buffer stop.

NOTE: **Grip guide in water gutter.**

Release nut (2) on buffer stop guide.

Installation:

1. Tightening torque: 41 62 4AZ, see **41 62 REAR LID**
2. Tightening torque: 41 62 3AZ, see **41 62 REAR LID**

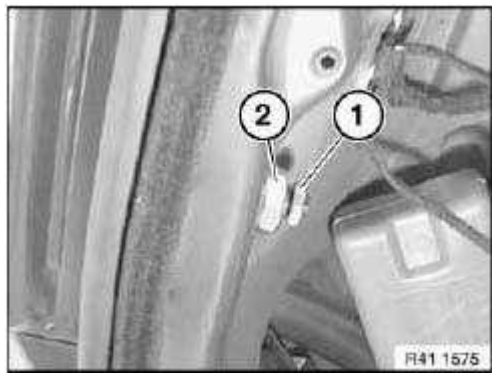


Fig. 351: Lock Nut And Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Remove buffer stops outwards.

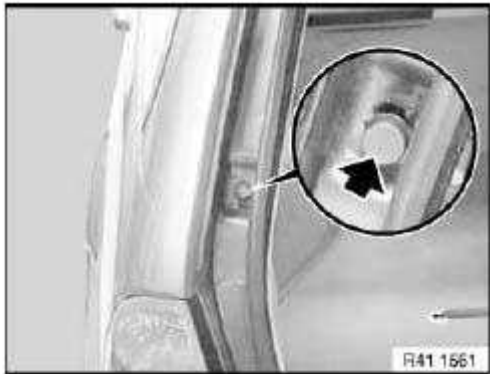


Fig. 352: Locating Buffer Stops

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Following parts of buffer stops must not be missing or damaged:

1. Adjustable buffer stop
2. O-ring
3. Guide
4. Guide O-ring
5. Guide nut
6. Lock nut

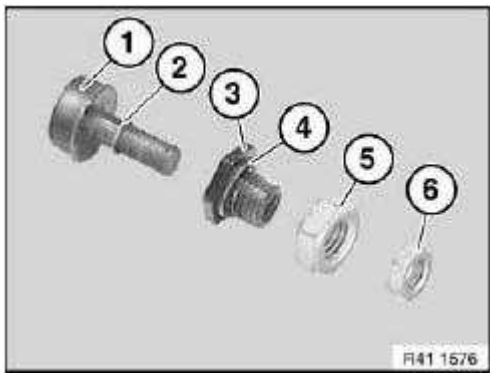


Fig. 353: Adjustable Buffer Stop, O-Ring, Guide, Guide Nut And Lock Nut

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Both O-rings must be fitted (water ingress).

Adjusting buffer stops:

If necessary, release lock nut (1) on buffer stop.

NOTE: Nut (2) on guide remains tightened down.

Use Allen key to bring adjustable buffer stop into contact with rear lid and then pretension by 1 turn.

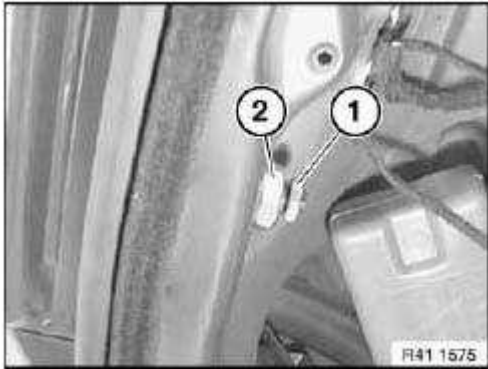


Fig. 354: Lock Nut And Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew buffer stop until closed rear lid rests on buffer stops on left/right sides.

IMPORTANT: The rear lid must not be higher than the side panels, otherwise there is preload on height adjustment!

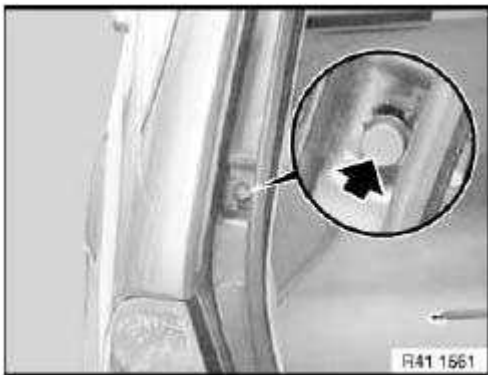


Fig. 355: Locating Buffer Stops
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: If the pretension results in poor rear lid closing comfort, the pretension can be turned back to 0.5 turns.

IMPORTANT: Rear lid must not generate any noises while engine is idling (pay particular attention to this in diesel models).

WARNING: Support rear lid in fully opened position with suitable apparatus. Risk of injury.

Make a written record of the installation position of the gas pressure support(s) before removing.

Slide stop spring (1) to end of gas pressure spring (2) and lever out gas pressure spring. Repeat the procedure at the other end of the gas strut (2) and remove.

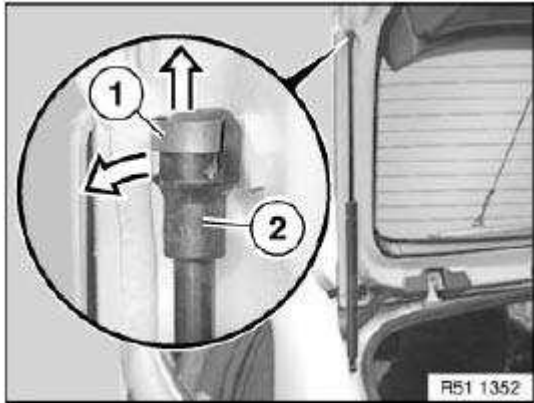


Fig. 356: Stop Spring And Gas Pressure Spring
Courtesy of BMW OF NORTH AMERICA, INC.

31 FRONT AND REAR WINDOW

51 31 ... INSTRUCTIONS ON GLUING WINDSCREEN

IMPORTANT: The following topics were included or amended in March 2005:

Storage temperature of all adhesive products of 5°C to 25°C must be observed.

Special instructions for hot processing must be observed:

- Temperature of cartridge oven must be checked every morning with DIS or GT1
- Temperature of cartridge < 80°C results in the formation of bubbles/blisters (gluing/cementing not permitted)
- Insufficient heating (< 1 hour) results in the formation of bubbles/blisters (gluing/cementing not permitted)
- Heating time of a cartridge max. 8 hours
- Mistake in mixing in event of an interruption in application >1 minute (gluing/cementing not permitted)
- A test bead of 50...70 mm must be rejected after an interruption in application
- Cartridge may only be heated up once; if the lower label is black, this adhesive may only still be used cold without accelerator while adhering to the Best before date.

These instructions are not applicable to door window cementing (door "center") on the E38/L7:

Work steps for removing and installing windscreens:

- is displayed at the end of this document by clicking on the "framed cross-reference"

General:

The windscreen and rear window (also the rear side windows if necessary) are bonded to the body. This gluing will increase the torsional strength of the vehicle. To obtain perfect bonding, comply with the installation procedure described in the following.

It is possible to tow or drive without windscreen or rear window.

The windscreen must be secured with yellow plastic adhesive tape (sourcing reference: BMW Parts Service) after being installed. The paint must be completely hardened after painting work.

- Set down window glass and process on BMW-approved X-universal stand.
- In winter, the vehicles must stand in a room with a temperature of at least 15°C.

On-the-job safety:

When working with adhesive products (adhesive, cleaning agent, bonding agent etc.):

- Wear protective goggles, protective gloves and if necessary an apron.
- Ensure rooms are well ventilated.
- Change work clothing contaminated with adhesive immediately.
- Change work clothing contaminated with solvents and swelling agents immediately (keep spare work clothing on hand).
- Take skin protection measures, provide washing facilities including hot water, use silicone-free skin creams
- Provide eye bath facilities, change water regularly (once a month).
- Comply with the relevant safety regulations
- Do not eat, drink or smoke in areas of PUR processing.

Replacement of windscreens:

Version with head-up display (HUD):

- Marking for HUD must be present on the windscreen

Version with front passenger airbag:

- Stick on reminder label

Tools for cutting through adhesive bead:

TOOLS FOR CUTTING THROUGH ADHESIVE BEAD

Type	Model	Order/part number
Special cutter (manufacturer: Fein) with oscillating blade	Pneumatically operated	81 43 9 429 183
	Electrically operated	81 43 9 427 786
BMW blade set	All required blades	81 43 9 428 596
Blade (U-shape)	19.5 mm ⁽¹⁾	6 39 03 118 01 3
	24 mm	6 39 03 076 01 6
	36 mm	6 39 03 079 01 2
	45 mm	6 39 03 154 01 0
Blade (straight with stop roller)	16 to 35 mm (adjustable)	6 39 03 143 01 3
	10 mm (fixed) ⁽¹⁾	6 39 03 189 01 0
	14 mm (fixed)	6 39 03 082 01 6
"Roll Out 2000"	Wire cutting system ⁽¹⁾	81 62 0 301 76 8
Scalpel	for heavy-duty applications (1)	
Handles for cutting wire	Self-locking ⁽¹⁾	special tool 51 3 270
(1) Not included in BMW blade set		

Storage temperature:

Storage temperature of all adhesive products of 5°C to 25°C must be observed.

Adhesive:

The BMW-approved 1-component polyurethane adhesive must be used for bonding.

- Adhesive cartridge* (part number BMW 83 19 0 152 031, MINI 83 19 0 152 032)

* Sourcing reference: BMW Parts Service

Adhesive is applied to window glass with cartridge gun (pneumatically or electrically operated, sourcing reference: BMW Workshop Equipment and Planning Documentation).

When using accelerator (hot processing):

- Temperature (min. $80 \pm 5^\circ\text{C}$) of cartridge oven must be checked every morning. Connect temperature sensor to DIS or GT1 (in conjunction with MIB (Measurement Interface Box))
- Heat adhesive for at least 1 hour in cartridge oven (sourcing reference: BMW Parts Service) to $80 \pm 5^\circ\text{C}$
 - Write date and time on adhesive when inserting into cartridge oven

- Insufficient heating (< 1 hour) results in the formation of bubbles/blisters (gluing/cementing not permitted)
- Temperature $80 \pm 5^{\circ}\text{C}$ results in the formation of bubbles/blisters (gluing/cementing not permitted)
- Remove cured adhesive prior to further processing.
- Mistake in mixing in event of an interruption in application >1 minute (gluing/cementing not permitted)
 - A test bead of 50...70 mm must be rejected after an interruption in application
- Best before dates of accelerator and adhesive must not be more than 3 months apart
 - Best before date >3 months results in the formation of bubbles/blisters (gluing/cementing not permitted)

Sealed adhesive:

- May only be stored for a maximum of 8 hours once it has been heated up to $80 \pm 5^{\circ}\text{C}$.
- The adhesive will be damaged if this time is exceeded (gluing/cementing not permitted)
- Damaged adhesive must not be used and must be disposed of in compliance with national regulations
- Cartridge may only be heated up once
 - If the lower label is black, this adhesive may only still be used cold without accelerator while adhering to the Best before date.

**IMPORTANT: Not all window glass may be bonded with accelerator (hot processing).
If hot processing is not permitted, this is described in the relevant document.**

Adhesive Best before date:

Repair kit and adhesive cartridges are marked with a date (Best before).

The adhesive cannot be used after this date.

Adhesive disposal:

Pure hardened adhesive is handled as normal waste.

The adhesive is disposed of in paper bags so that it can react with moisture.

Non-hardened adhesive, cartridges and mixtures of adhesive and solvents and the like must be disposed of as special waste.

Accelerator:

Accelerator is screwed onto the adhesive cartridge and contains a reaction paste which is mixed with the heated adhesive.

IMPORTANT: The accelerator may only be paired with the adhesive cartridge of an unopened

**package (bubbling). Adhesive and accelerator must be paired while taking into account the Best before dates.
The accelerator may no longer be used if the Best before dates are more than 3 months apart.**

Bonding agent (activator):

The BMW-approved bonding agents must be used to treat bonding areas:

- "Glass Activator 1" (on glass ceramic material)
- "Paint Activator A" (on sheet metal flange or residual adhesive bead)

Bonding agent Best before date:

Repair kit and bonding agent are marked with a date (Best before).

- The bonding agent may only be used up to this date (if not already opened previously).
- Once it has been opened (locking ring broken), use for 1 week only even if the Best before date has not been reached.

NOTE: Write the date on the bottle when opening the bonding agent for the first time.

Close the bottle immediately after extracting the bonding agent (reaction with air).

Removal of window glass:

IMPORTANT: As of E63 and E87 it will only be possible to remove the rear window with the "Roll Out 2000".

Cover side panels, roof antenna and if necessary interior trim with protective covers.

Tape off body with fabric adhesive tape (e.g. Tesa) in areas where the oscillating blade could damage the window glass or the paint.

When using cutting wire, pull cutting wire ends through special tool 51 3 270, bend and tape off with fabric adhesive tape (e.g. Tesa) (risk of injury and damage).

When removing the windscreen:

- Wear protective goggles and gloves.

Cut through adhesive bead of window glass:

- with "Roll Out 2000"* (wire cutting system); no paint is damaged here in the case of narrow gaps, see **51**
31 ... REMOVING WINDSCREEN WITH "ROLL OUT 2000"

- with special cutter* and oscillating blade*
- *Sourcing reference: BMW Workshop Equipment and Planning Documentation

Prior to each use, regrind the blade with a grinding stone while the machine is running (new blades also).

Avoid damage to paintwork on body cutout.

Guide blade carefully between body and window glass.

Run blade of knife parallel to glass.

Cut through adhesive bead as closely as possible to window glass.

To remove adhesive bead in body cutout (and on window glass if reusing):

- Use a scalpel for heavy-duty applications
- Cut off residual adhesive to a thickness of approx. 0.5 mm
- Remove residual bead only briefly before bonding

Damage to paintwork in body aperture:

To ensure long-term corrosion protection, it is absolutely essential to touch up damage to paintwork!

The "BMW Color System" painting handbook forms the basis of these repair instructions and must be observed without fail.

Touch up damage to paintwork on body cutout with BMW multibase filler.

Grind out scratches in non-visible areas and touch up with BMW multibase filler. Grind extensive areas of damage down to the bare metal and coat with BMW multibase filler.

Hardening time:

- With infrared, at least 10 minutes
- Without infrared for at least 60°C, at least 30 minutes
- Without infrared for at least 20°C, at least 24 hours

If a complete build-up of paint is required in the visible area:

- Tape off primed bonding flange before applying top coat

IMPORTANT: Observe hardening time of BMW multibase filler otherwise a perfect bond cannot be guaranteed!

Treatment of glued area in body:

TREATMENT OF GLUED AREA IN BODY

Glue	Treatment
Bonding and sealing compound for car window glass	<ol style="list-style-type: none">Clean with spirit (available in pharmacies).Observe an air drying time of at least 1 minute (at least 15 minutes when applied to residual bead)Apply "Paint Activator A" to paint and residual beadObserve an air drying time of at least 1 minute (at least 10 minutes when applied to residual bead)

IMPORTANT: Do not use Sika remover 208 for cleaning in the bonding area.

Preparation for assembly:

Prepare plastic nozzle(s) for shaping adhesive bead (when not using the standard nozzle), can be cut to size during the air drying time.

Lay a test bead of approx. 50 mm - watch out for formation of bubbles/blisters when hot cementing; if OK, apply immediately to window glass.

- Interruption must be < 5 second (incorrect mixture ratio).

Cartridge must be vertical to window glass.

Black ceramic material impermeable to UV light is located on the peripheral zone of the inside edge of the window to protect the adhesive bead.

Glass ceramic material must not be damaged and must be treated as follows.

Treatment of glass ceramic surface (inside of window):

TREATMENT OF GLASS CERAMIC SURFACE

Adhesive (with part numbers)	Treatment
Hot cementing: <ul style="list-style-type: none">○ BMW 83 19 0 147 370, MINI 83 19 0 147 372 Cold cementing: <ul style="list-style-type: none">○ BMW 83 19 0 147 369, MINI 83 19 0 147 371 Adhesive cartridge: <ul style="list-style-type: none">○ BMW 83 19 0 152 031, MINI 83 19 0 152	<ol style="list-style-type: none">Clean with spirit (available in pharmacies).Observe an air drying time of at least 1 minuteApply a thin coating of "Glass Activator 1"Observe an air drying time of at least 10 minutes

Version with inspection window for vehicle identification number in windscreen only (all except US/GB):

- Seal inspection window (bottom left) with Sika primer 206 G+P

Adhesive quantities:

Approx. 1 1/4 adhesive cartridges are needed to cement 7 Series windscreens.

In the case of hot cementing (with accelerator), the missing residual bead is applied from a second adhesive cartridge (not contained in the repair kit) but while cold and without accelerator (bubbling).

Minimum hardening period is thus not increased.

IMPORTANT: If a second cartridge is required for cementing:

- **First apply cold adhesive to cowl panel at bottom (skin formation time)**
- **Accelerator from repair kit must not be used with the second cartridge (bubbling)**

Bubbling results in leakage and insufficient bonding strength (torsional rigidity, passenger airbag).

Effect of differing adhesive quantities:

EFFECT OF DIFFERING ADHESIVE QUANTITIES

Too little adhesive:	Too much adhesive:
<ul style="list-style-type: none"> ○ Windscreen rests too low in body cutout ○ Strains/tensions may occur (windscreen breakage) ○ Insufficient squeezing of adhesive bead (leaking) 	<ul style="list-style-type: none"> ○ Windscreen rests too high in body cutout ○ Wind noise may occur ○ Strains/tensions may occur (windscreen breakage) ○ Fouling of add-on parts by emerging adhesive ○ Adhesive on uninsulated strainer pressure lines of antenna(s) (interference of reception)

Spacer buffers:

Before sticking on new spacer buffers, remove all remaining traces of old spacer buffers completely.

Position of spacer buffers must be observed exactly.

Incorrectly fitted spacer buffers will result in:

- Windscreen glass breakage
- Leakage (if the spacer buffer is in the adhesive area)
- Wind noises

Assembly:

To prevent a pressure increase in the vehicle interior when the doors are closed:

- Open a window/IT

IMPORTANT: After the adhesive bead has been applied, the window glass must be fitted within 5 to 10 minutes (depending on air humidity, temperature and use of accelerator).

After 5 to 10 minutes the adhesive bead forms a skin which can no longer guarantee a perfect bond.

To secure the windscreen, use only the yellow plastic adhesive tape (sourcing reference: BMW Parts Service, part number 83 19 9 410 979).

The glass will slip down if other adhesive tapes are used.

Windscreen slippage will result in leaks and wind noises.

Remove adhesive residue immediately with adhesive remover (Sika remover 208, sourcing reference: BMW Parts Service). Do not press out the window glass again.

Hardened adhesive can only be removed by machine.

Check height of windscreen/rear window with special tool 51 0 010 or 51 3 210. Assemble car.

Hardening:

The adhesive hardens as it reacts with air humidity (with accelerator also due to mixed-in reaction paste) at room temperature.

Minimum hardening time (table) is obtained from 22°C and 38 % relative air humidity.

At ambient temperatures above 23°C and 50 % relative air humidity (hot countries), the adhesive open time is shortened to approx. 5 minutes (skin formation time).

The adhesive hardening process is interrupted completely at ambient temperatures below 5°C. In this event, there will be no increase in the strength of the adhesive bond.

Do not subject the vehicle to load on one side during the minimum hardening time (see table, without passenger airbag), such as e.g.:

- one wheel on kerb
- lifting platform
- etc.

Maneuvering inside garage/workshop:

- only permitted on level ground
- do not under any circumstance driver over access ramps, e.g. into multi-store car parks

Remove adhesive tapes after hardening time.

If you fail to adhere to the minimum hardening times (see table, without passenger airbag):

- leaks and wind noises will occur when the windscreen is moved

Glues and their minimum hardening times:

GLUES AND THEIR MINIMUM HARDENING TIMES

Glue	Minimum hardening time "without passenger airbag" (after which vehicle can be moved)	Minimum hardening time "with passenger airbag" (countries where seatbelt use is not required by law)
Hot processing with accelerator	2 hours	3 hours ⁽¹⁾
Cold processing	9 hours	20 hours ⁽¹⁾

NOTE:
(1) Vehicles with passenger airbag:
The vehicle can be handed over to the customer after the hardening period (vehicle can be moved, adhesive-dependent) with the following warning:
Once the windscreen glass has been bonded, all occupants must travel with their seatbelts attached for "... hours"!
The time is taken from the "Minimum hardening period" table for countries where seatbelt use is not required by law.

IMPORTANT: If the minimum hardening time is not adhered to:

- the front passenger together with the windscreen may fall out of the vehicle in the event of an accident after the front passenger airbag has been triggered

Locate leaks:

- by spraying water underneath sealing lips
- with ultrasonic leak detector (sourcing reference: BMW Parts Service)

If necessary, seal leakage with appropriate nozzle.

Version with GPS navigation system 1 (up to 9/97):

After installation of rear window:

- Recalibrate magnetic field sensor

Version with rain sensor or rain/light sensor:

Removing rain sensor or rain/light sensor, refer to repair instructions.

After replacing windscreen:

- Initialize rain sensor or rain/light sensor

Version with fogging sensor:

After replacing windscreen:

Replace fogging sensor, refer to repair instructions.

Version with head-up display (HUD):

Before bonding, install windscreen with seal(s) and check HUD; if necessary, press expanding foam tape down with hand roller.

After bonding windscreen, check and if necessary adjust HUD.

Work steps for removing and installing windscreens:

refer to repair instructions.

NOTE: If no document is displayed after you have clicked on a "framed cross-reference":

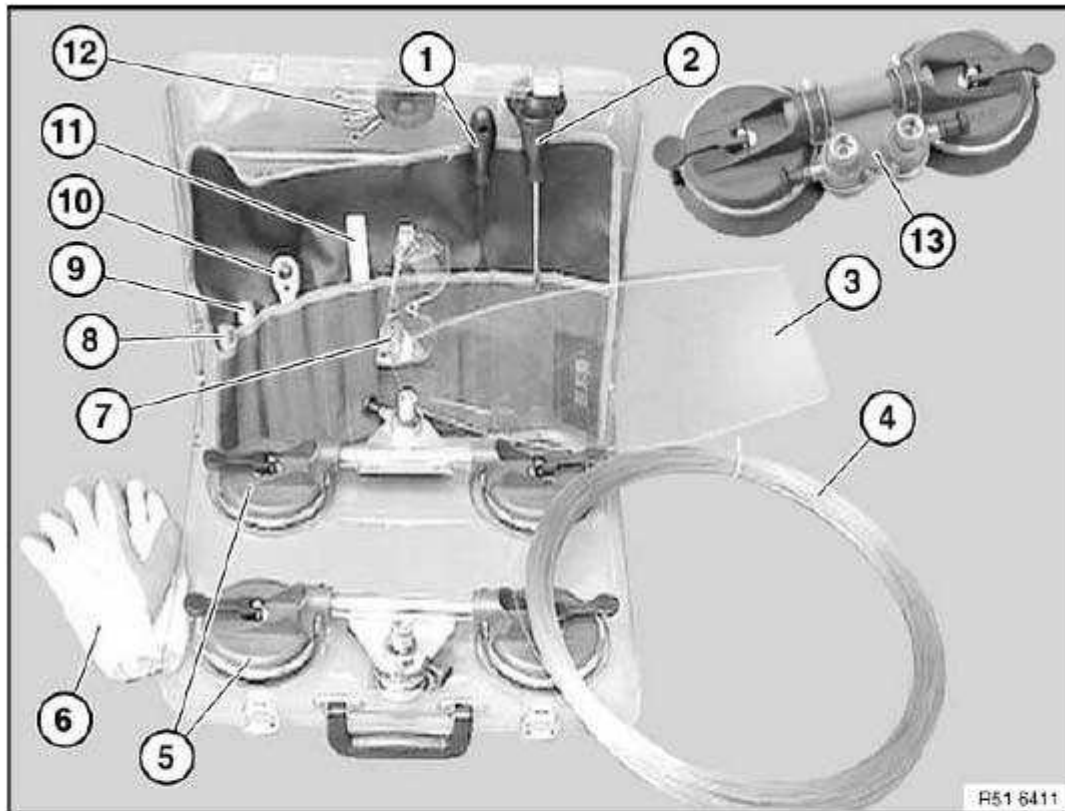
It is not necessary or permitted for the model selected in the TIS.

51 31 ... REMOVING WINDSCREEN WITH "ROLL OUT 2000"

Special tools required:

- **51 3 270 PULL HANDLES**

Windscreen removal system "Roll Out 2000"



- | | | | |
|---|---------------------|----|---------------------------|
| 1 | Wire starter | 8 | Extension (short) |
| 2 | Parabolic tool | 9 | Extension (long) |
| 3 | Plastic washer | 10 | Reversible ratchet |
| 4 | Wire cutting roller | 11 | Plastic wedge |
| 5 | Windlasses | 12 | Guide needles |
| 6 | Protective gloves | 13 | Windlass with double coil |
| 7 | Protective goggles | | |

Fig. 357: Windscreen Removal System "Roll Out 2000"

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Using the "Roll Out 2000" system (sourcing reference: BMW Workshop Equipment and Planning Documentation) minimizes paintwork and ergonomic damage as well as damage that is hazardous to health.

WARNING: Follow safety instructions for working on cars with airbag systems (risk of injury), see 51 00 ... Safety instructions for working on cars with airbag systems

IMPORTANT: Take care when handling sharp-edged tools and cutting wire (risk of damage to head airbag).

IMPORTANT: Always keep both suckers dry and clean to ensure their optimum adhesion on the windscreen.

Lubricate coil if interlock rattling becomes too loud.

Always wear protective goggles and gloves for your own safety.

Preparatory work:

- To avoid paintwork damage, tape off working area over large area at outlet of wire starter (2) with fabric adhesive tape (1)
- Cut off required length (A) from cutting wire

(A) = Window diagonal x 4

- Check whether wire can get caught on rivets or retainers; if necessary, insert guide needles in bonding joint and guide cutting wire past

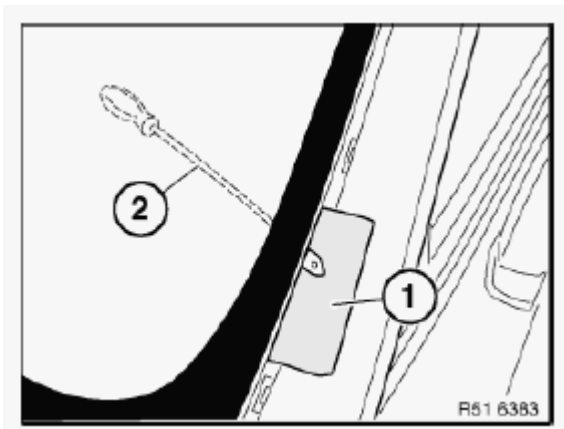


Fig. 358: Wire Starter And Fabric Adhesive Tape
Courtesy of BMW OF NORTH AMERICA, INC.

Pulling cutting wire into car:

- Push wire starter (2) from inside at a suitable point through adhesive bead
- Feed wire end (1) into hole of wire starter (2) and bend back
- Pull in both wires in succession crossways

NOTE: Crossing the wires cuts through the adhesive bead completely.

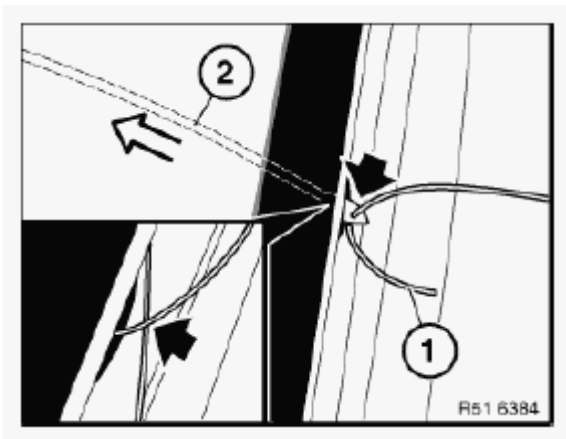


Fig. 359: Wire End And Wire Starter
 Courtesy of BMW OF NORTH AMERICA, INC.

Laying cutting wire around windscreen:

- Starting from pull-in point, lay wire eyelet created on the outside counterclockwise around the windscreen
- Pull excess wire into car interior

IMPORTANT: Make sure the cutting wire is located at all four corner points below the windscreen.

**Check that the cutting wire is not caught on retainers or body.
 Secure window on outside with adhesive tape against slipping**

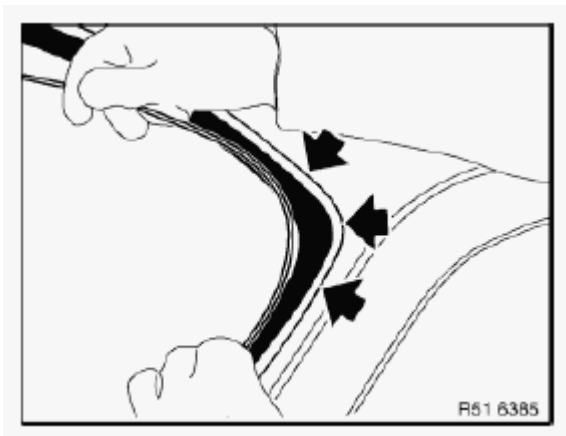


Fig. 360: Laying Cutting Wire Around Windscreen
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Windows (1) with fitted seals (3) or sprayed-on surrounds:

- Moisten cutting wire (4) and seals (3) on window (1) with water
- Insert cutting wire (4) in bend (without kinking) between window (1) and body cutout (2)

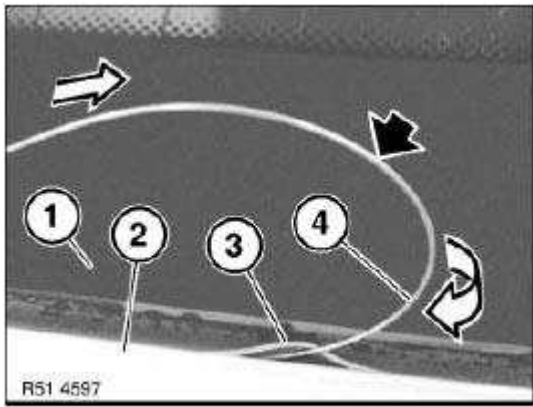


Fig. 361: Cutting Wire, Seals And Window
 Courtesy of BMW OF NORTH AMERICA, INC.

Protecting car interior:

- To avoid damage and if necessary dirt, protect A-pillars, roof and instrument panel by means of parabolic tool (1) or plastic washer (2)
- Move parabolic tool (1) during removal so that wire cannot get caught
- Always guide plastic washer (2) between wire and panel

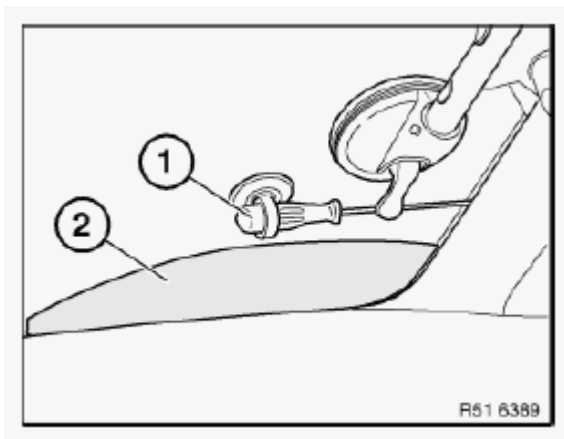


Fig. 362: Parabolic Tool And Guide Plastic Washer
 Courtesy of BMW OF NORTH AMERICA, INC.

Starting removal:

- Place windlass (1) on windscreen
- Feed wire end into coil of windlass (1)

NOTE: Coil can only be turned in one direction.

- Make sure the wire is always situated in the guide channel of the windlass (1)

- Fit reversible ratchet (2) on coil and tension wire
- Start by cutting lower adhesive bead
- Grip second wire end in special tool 51 3 270

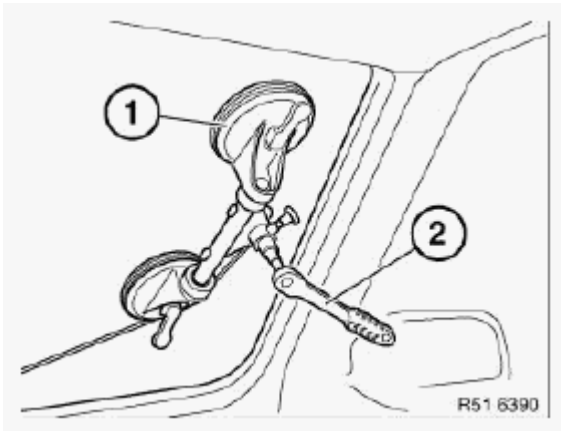


Fig. 363: Windlass And Reversible Ratchet
 Courtesy of BMW OF NORTH AMERICA, INC.

Moving windlass:

- Before moving windlass, remove reversible ratchet, extension and parabolic tool
- Release sucker on windlass
- Pull and hold black locking button (1)
- Turn windlass and move with sucker
- Refit reversible ratchet, parabolic tool and if necessary extension
- When cutting the corner points, make sure the wire is situated in the guide channel of the windlass; this makes the cutting job easier

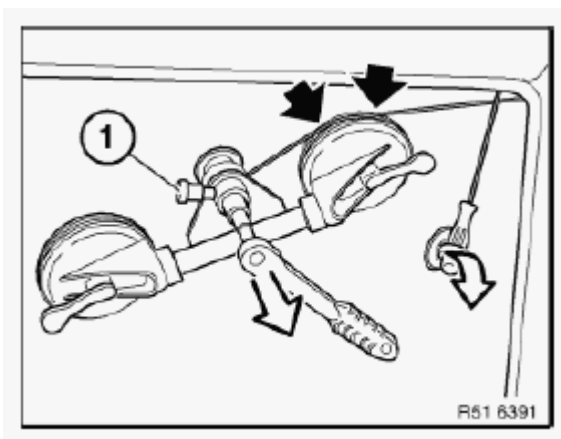


Fig. 364: Black Locking Button
 Courtesy of BMW OF NORTH AMERICA, INC.

Installing second windlass:

- Secure second windlass by suction on windscreen
- Feed second wire end into coil
- Cut left side and top left corner point, as described above
- Finish removal
- Remove "Roll Out 2000"

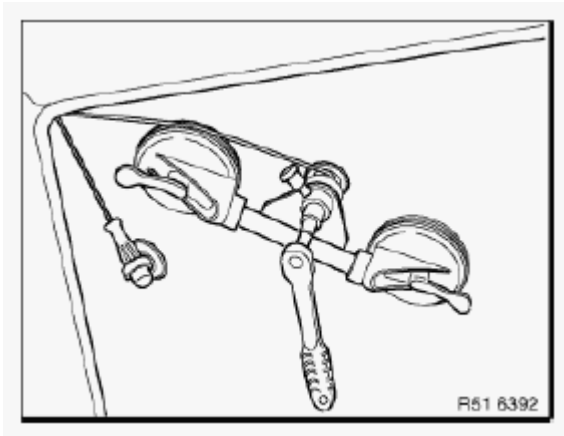


Fig. 365: Securing Second Windlass
 Courtesy of BMW OF NORTH AMERICA, INC.

Windlass with double coil:

For use with small windows.

- Attach windlass firmly to window so that both coils are turned away from application point of wire
- Feed either the upper wire end into the lower coil or the lower wire end into the upper coil
- Fit reversible ratchet on coil and tension wire
- Cut through approx. 10 cm of bonding joint

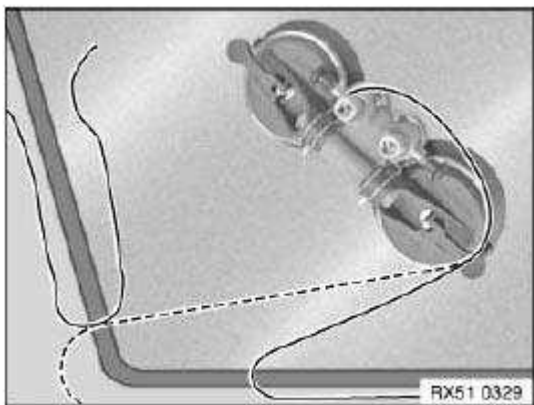


Fig. 366: Windlass With Double Coil
 Courtesy of BMW OF NORTH AMERICA, INC.

- Feed other wire end into free coil so that the wires cross
- Continue cutting bonding joint by alternately using the coils
- Both wires meet ahead of both coils when removal is completed
- Remove "Roll Out 2000"

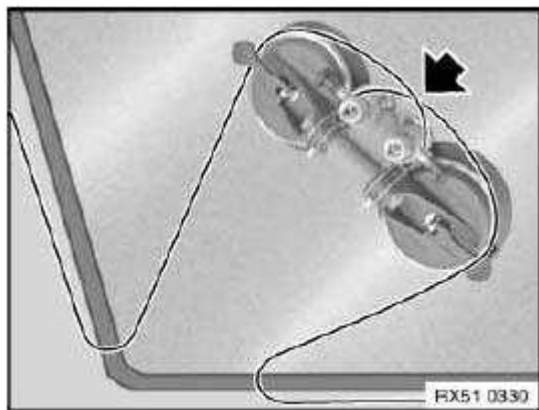


Fig. 367: Locating Cutting Bonding Joint

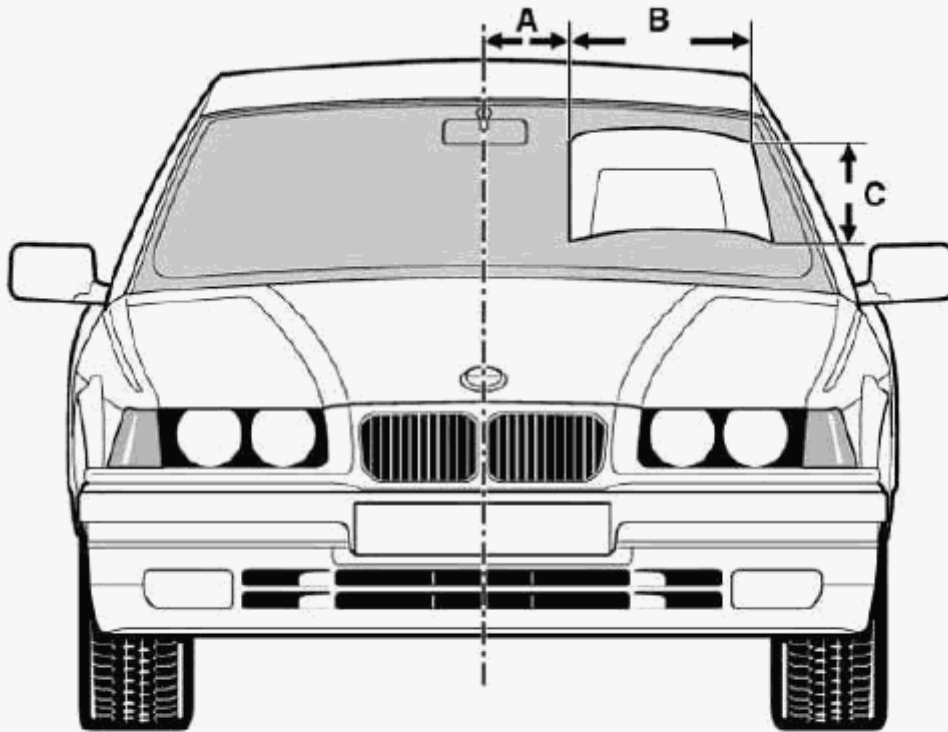
Courtesy of BMW OF NORTH AMERICA, INC.

51 31 000 REMOVING AND INSTALLING / REPLACING WINDSCREEN

IMPORTANT: The "Instructions for window cementing" serve as the basis for these repair instructions and must be followed without fail, see 51 31 ... Instructions on gluing windscreen

51 31 015 REPAIRING DAMAGE TO WINDSCREENS CAUSED BY PITTING (STONE CHIPS) (CLEAR AND TINTED LAMINATED SAFETY GLASS)

Field of vision (no repairs acceptable):



36 51 031

- A 50 mm (gap between field of view / centre of vehicle)
- B Up to end of wiper range, outside (field of view width)
- C Restriction by wiper range (height of field of view)

Fig. 368: Field Of Vision

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Repairs must only be carried out outside of the field of vision (refer to sketch).

51 31 021 REMOVING AND INSTALLING/REPLACING RUBBER FRAME FOR WINDSCREEN (TOP)

Necessary preliminary tasks:

- Remove both gutter strips on windscreen, see **51 31 030 Removing and installing or replacing left or right gutter along windshield**

**IMPORTANT: Rubber frame (1) features an aluminium section inlay (2).
Detach adhesive tape on outside from windscreen and at top from roof outer skin.
Carefully unwind rubber frame (1) (windscreen breakage).**

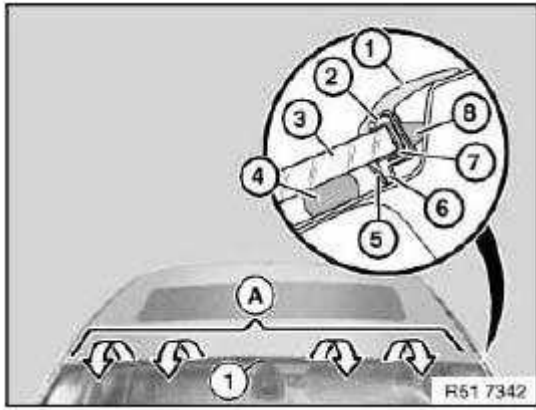


Fig. 369: Rubber Frame And Aluminium Section Inlay
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Spacers (8) are attached to rubber frame (1).

Tear-off lip (5) may be stuck to adhesive (4).

When rubber frame (1) is removed, tear-off lip (5) can tear off and remain in vehicle.

Attach adhesive tape correctly in area (A).

- 3 Windscreen
- 6 Bridge
- 7 Pinched butyl

Installation:

In area (A) on left/right:

- there is no sealing lip (5)
- there is adhesive tape (7) for windscreen (8)
- buffer stop is molded on

When replacing without removing windscreen:

Detach tear-off lip (3) from rubber frame (1).

If adhesive leaks over tear-off lip (3), this area must be cut out partially.

To facilitate installation, coat rubber frame (1) and body cutout with water.

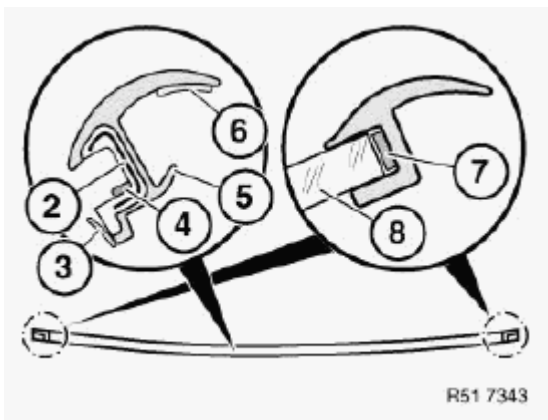


Fig. 370: Tear-Off Lip, Rubber Frame, Adhesive Tape And Windscreen
 Courtesy of BMW OF NORTH AMERICA, INC.

Replacement with removed/new windscreen:

Fit rubber frame (1) with tear-off lip (3).

- 2 Aluminum strip
- 4 Butyl
- 6 Adhesive tape (for attaching to roof at top)

51 31 030 REMOVING AND INSTALLING OR REPLACING LEFT OR RIGHT GUTTER ALONG WINDSHIELD

Unclip gutter strip (1) towards top.

**IMPORTANT: Replace clips (2) after each removal.
 Note part number.**

Installation:

Locks (3) of clips (2) must not be damaged.

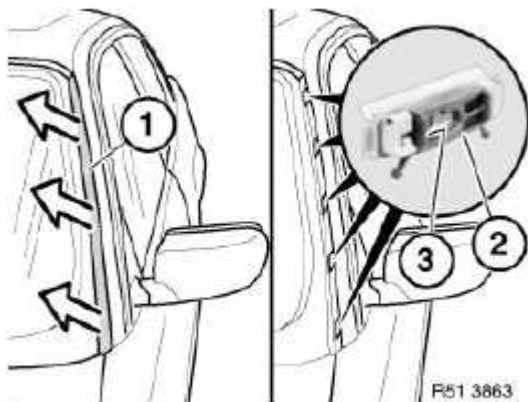


Fig. 371: Gutter Strip, Locks And Clips

Courtesy of BMW OF NORTH AMERICA, INC.

51 31 200 REMOVING AND INSTALLING/REPLACING REAR WINDOW

IMPORTANT: The "Instructions for window cementing" serve as the basis for these repair instructions and must be followed without fail, see 51 31 ... Instructions on gluing windscreen

32 FRONT MANUALLY OPERATED WINDOWS

51 32 160 REMOVING AND INSTALLING/REPLACING HOUSING COVER ON INNER LEFT OR RIGHT DOOR WINDOW FRAME

Necessary preliminary tasks:

- Remove front door trim panel, see 51 41 000 Removing and installing left or right front door trim panel

Release expansion rivets (1).

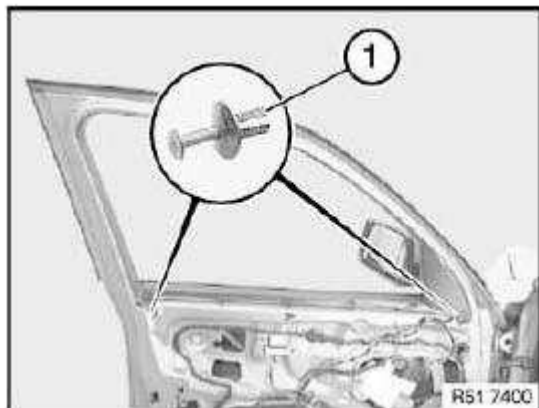


Fig. 372: Expansion Rivets

Courtesy of BMW OF NORTH AMERICA, INC.

Unclip cover (1) on front door

- A. inwards from retainer (2),
- B. lever out and remove

IMPORTANT: Cover (1) must not be kinked (risk of damage).

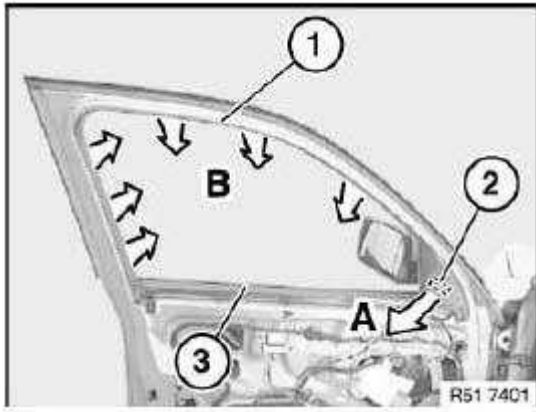


Fig. 373: Cover And Retainer

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Following parts of cover (3) must not be damaged or missing:

1. Retainer
2. Sound insulation

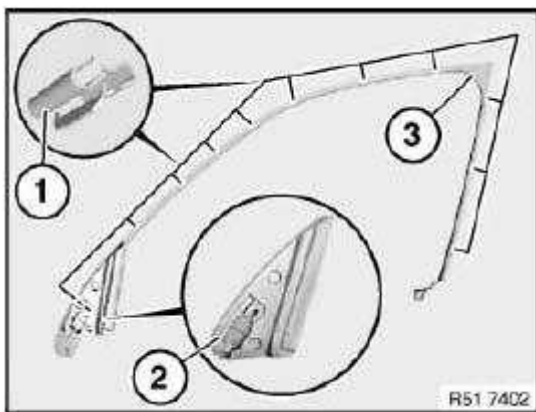


Fig. 374: Sound Insulation, Retainer And Cover

Courtesy of BMW OF NORTH AMERICA, INC.

51 32 170 REMOVING AND INSTALLING / REPLACING DOOR WINDOW GLASS, FRONT LEFT OR RIGHT

Necessary preliminary tasks:

- Open door window to 105 mm.
- Remove sound insulation in front door, see **51 48 060 Removing and installing/replacing sound insulation in left or right front door**
- Remove outer window cavity cover strip, see **51 21 300 Removing and installing or replacing window**

cavity cover strip on outside of left or right front door

Door window glass (1) must be opened to dimension (A).

A = approx. 105 mm

IMPORTANT: Disconnect plug connection (2) from power window motor (3) (risk of trapping).

Lever out catches (4) with screwdriver (5) in direction of arrow.

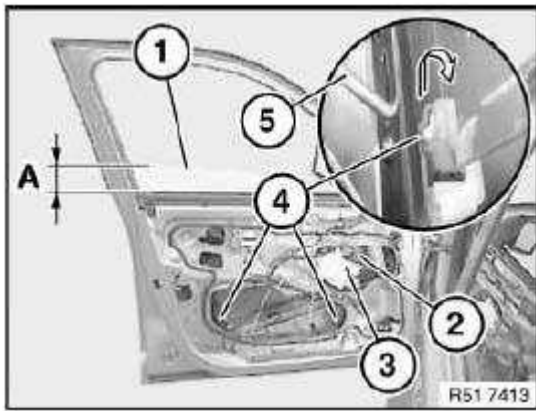


Fig. 375: Door Window Glass, Plug Connection And Power Window Motor
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Catch (4) must be correctly clipped into place.

Carry out function check on power window unit and anti - trapping protection.

If necessary, normalize power window unit.

Installation:

Following parts of window guide (3) must not be damaged or missing:

1. Catch
2. Buffer stop

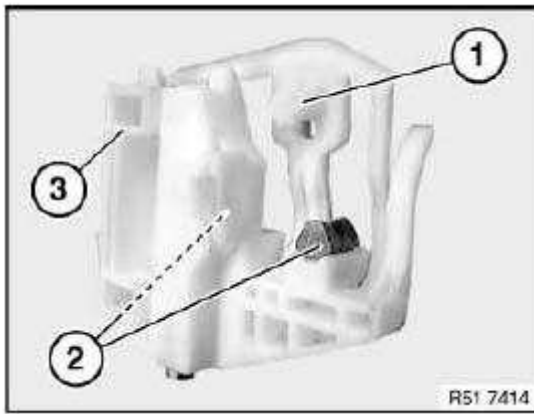


Fig. 376: Buffer Stop, Catch And Window Guide
 Courtesy of BMW OF NORTH AMERICA, INC.

Turn door window glass and lift out towards rear/top.

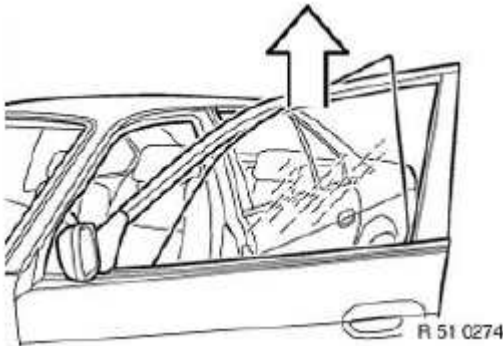


Fig. 377: Lifting Door Window Glass
 Courtesy of BMW OF NORTH AMERICA, INC.

51 32 211 REPLACING FRONT LEFT OR RIGHT RUBBER GUIDE FOR LEFT OR RIGHT DOOR WINDOW

Necessary preliminary tasks:

- Remove front door window glass, see **51 32 170 Removing and installing / replacing door window glass, front left or right**
- Remove window cavity cover strip on outside of front door, see **51 21 300 Removing and installing or replacing window cavity cover strip on outside of left or right front door**
- Remove mirror, see **51 16 000 Removing and installing/replacing mirror on left or right front door**
- Remove cover on inside of door window frame, see **51 32 160 Removing and installing/replacing housing cover on inner left or right door window frame**
- Partially detach trim on front door window frame, see **51 32 420 Removing and installing/replacing trim on front door window frame, left or right**

Detach trim (1).

Feed rubber guide (2) on front door

- A. upwards out of guide (3),
- B. feed out of window guide rails and remove.

Installation:

Insert rubber guide at front/bottom into window guide rail.

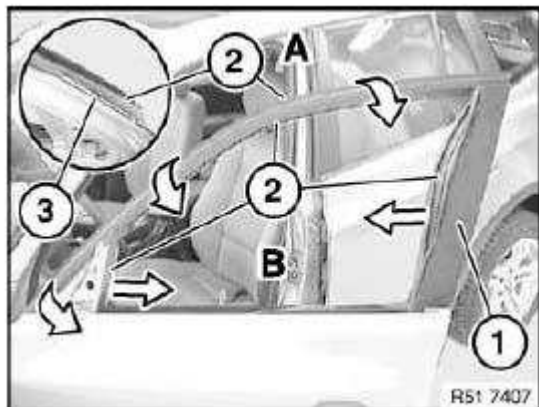


Fig. 378: Rubber Guide, Trim And Guide
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Sound insulation (1) in front door (2) must be fitted and must not be damaged.

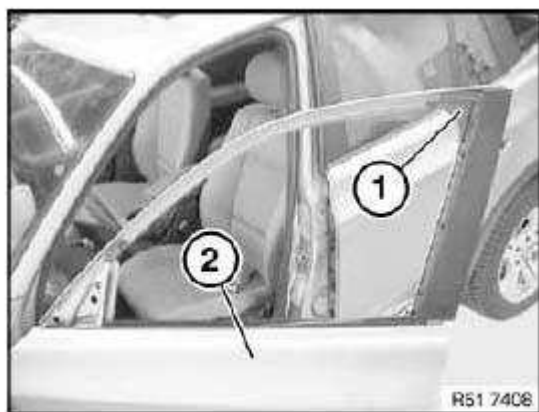


Fig. 379: Sound Insulation And Front Door
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Rubber guide (1) must not be damaged in corners (2).

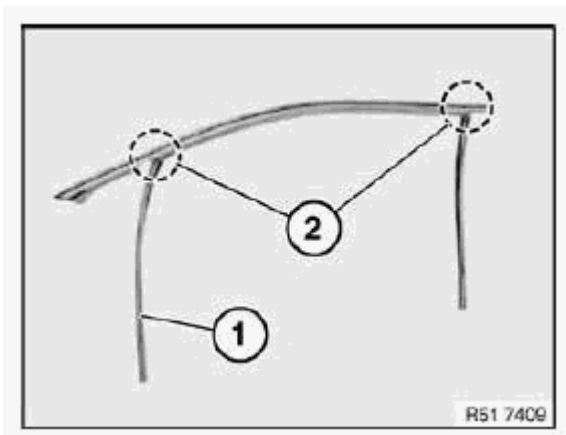


Fig. 380: Rubber Guide And Corners

Courtesy of BMW OF NORTH AMERICA, INC.

51 32 420 REMOVING AND INSTALLING/REPLACING TRIM ON FRONT DOOR WINDOW FRAME, LEFT OR RIGHT

Necessary preliminary tasks:

E83 only:

- Remove window cavity cover strip on outside of front door, see **51 21 300 Removing and installing or replacing window cavity cover strip on outside of left or right front door**

Partially detach rubber window seal (1) at rear.

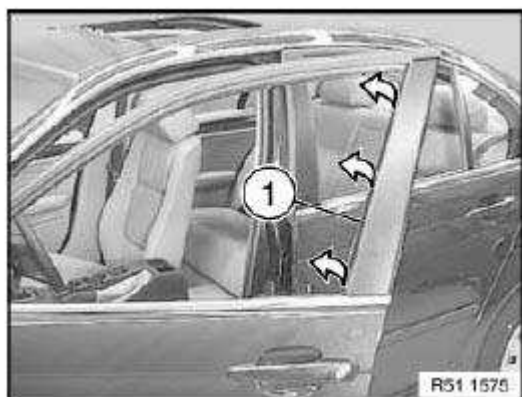


Fig. 381: Rubber Window Seal

Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Remove finisher (2) and press approx. 3 mm towards rear.

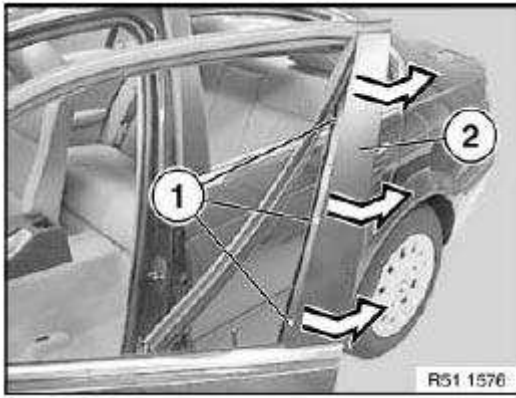


Fig. 382: Finisher And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Remove trim (1) towards top.



Fig. 383: Trim
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Following parts must not be damaged or missing:

1. Plastic nuts
2. Sound insulation
3. Seal

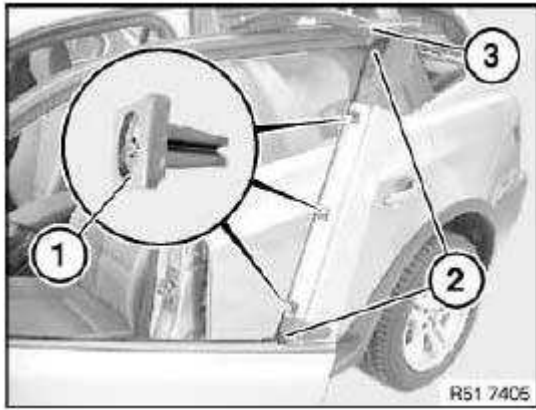


Fig. 384: Sound Insulation, Plastic Nuts And Seal
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check trim (1) for damage, replace if necessary.

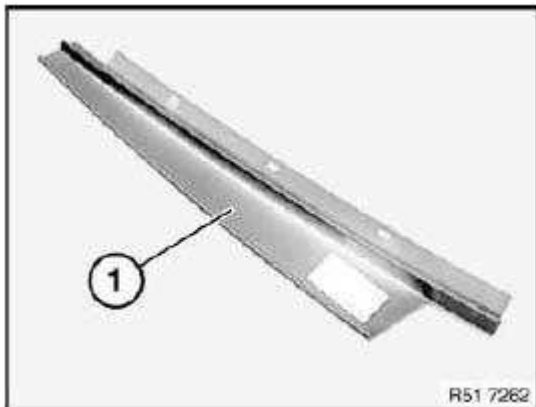


Fig. 385: Trim
 Courtesy of BMW OF NORTH AMERICA, INC.

33 FRONT ELECTRICALLY OPERATED WINDOWS

51 33 000 REMOVING AND INSTALLING (REPLACING) POWER WINDOW UNIT IN LEFT OR RIGHT FRONT DOOR

NOTE: When removing door lock, snap door window glass out only, do not remove, secure in door window frame.

Necessary preliminary tasks:

- Remove front door window glass, see **51 32 170 Removing and installing / replacing door window glass, front left or right**

Unscrew nuts (1).

Feed out rear section of power window unit (2) in direction of arrow.

Installation:

Tightening torque: 51 33 2AZ, see **51 33 POWER WINDOWS, FRONT**

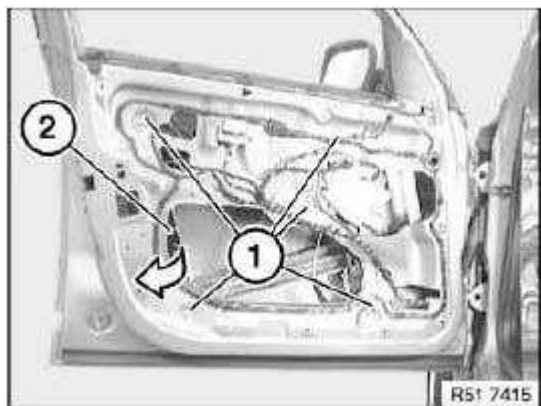


Fig. 386: Power Window Unit And Nuts

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The work step "Removing and installing/replace door lock" ends here.

Feed out front section of power window unit (1) with flat motor (2) in direction of arrow from front door.

Replacement:

Remove flat motor for power window unit, see **67 62 000 REMOVING AND INSTALLING / REPLACING FLAT MOTOR FOR FRONT LEFT OR RIGHT POWER WINDOW UNIT**

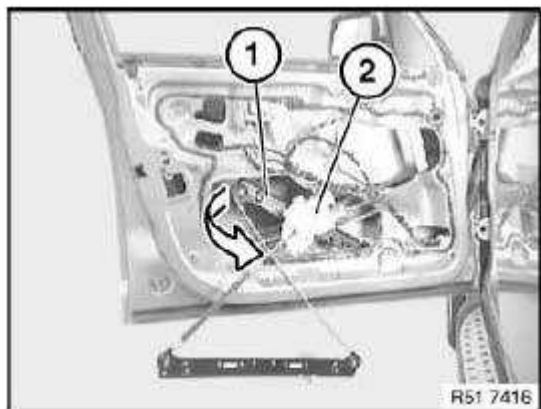


Fig. 387: Power Window Unit And Flat Motor

Courtesy of BMW OF NORTH AMERICA, INC.

34 REAR MANUALLY OPERATED WINDOWS

51 34 ... REMOVING AND INSTALLING/REPLACING TRIM ON WINDOW FRAME OF REAR DOOR (REAR), LEFT OR RIGHT

Necessary preliminary tasks:

- Remove cover on door window frame (rear door), see **51 34 160 Removing and installing/replacing housing cover on inner left or right door window frame**

Remove rubber guide (1) from trim (2).

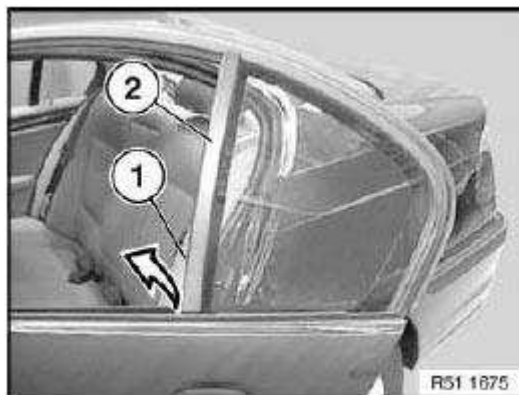


Fig. 388: Rubber Guide And Trim

Courtesy of BMW OF NORTH AMERICA, INC.

Grip trim firmly and release screws (1).

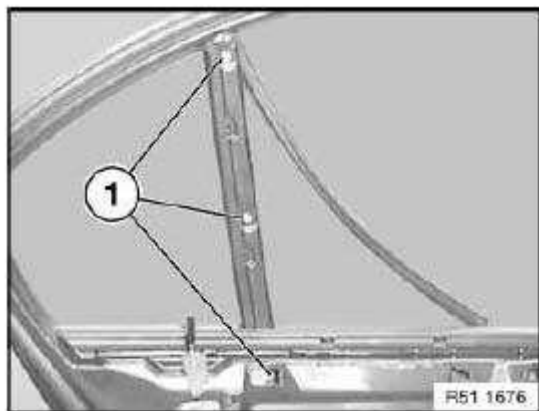


Fig. 389: Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Push trim (1) downwards from rubber guide (2) and remove towards top.

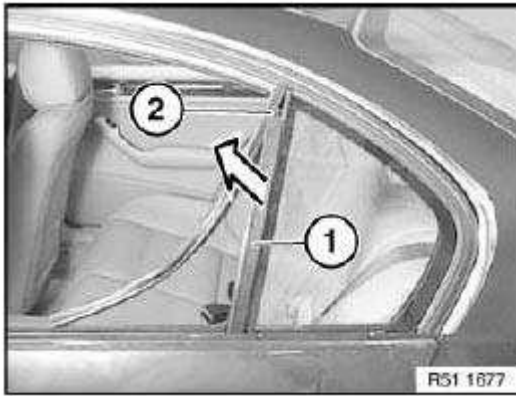


Fig. 390: Trim And Rubber Guide
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Threads (1) of trim (2) must not be damaged.

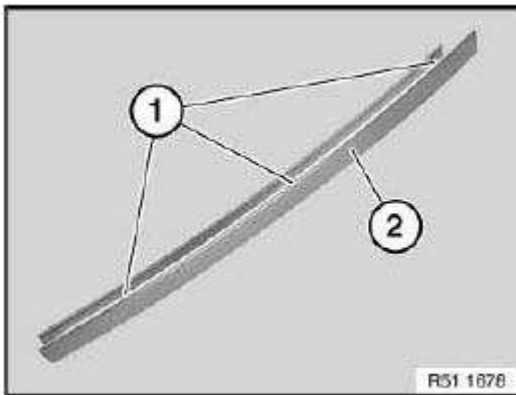


Fig. 391: Threads And Trim
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Foam section (1) must be fitted.

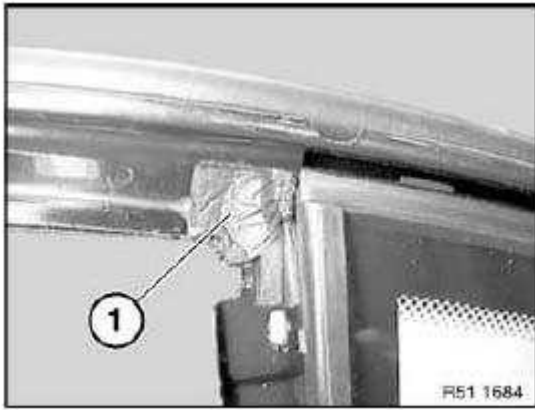


Fig. 392: Foam Section

Courtesy of BMW OF NORTH AMERICA, INC.

51 34 160 REMOVING AND INSTALLING/REPLACING HOUSING COVER ON INNER LEFT OR RIGHT DOOR WINDOW FRAME

Special tools required:

- 00 9 317 00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)

Necessary preliminary tasks:

- Open door window.
- Remove rear door trim panel, see 51 42 000 Removing and installing left or right rear door trim panel

Release expansion rivets (1).

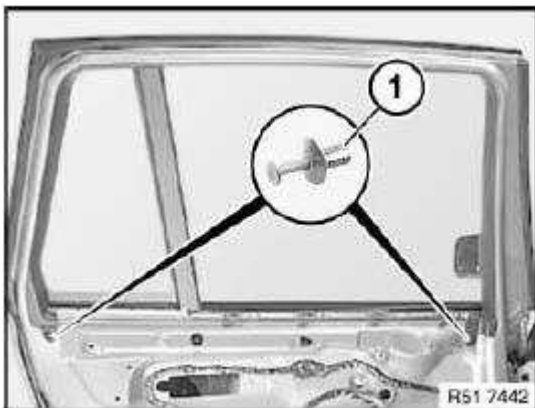


Fig. 393: Expansion Rivets

Courtesy of BMW OF NORTH AMERICA, INC.

Lever out fixed cover (1) in area of door window with special tool 00 9 317.

Unclip rest of cover (1) in direction of arrow, lever out and remove.

NOTE: Do not tear off cover (1) in area (2).

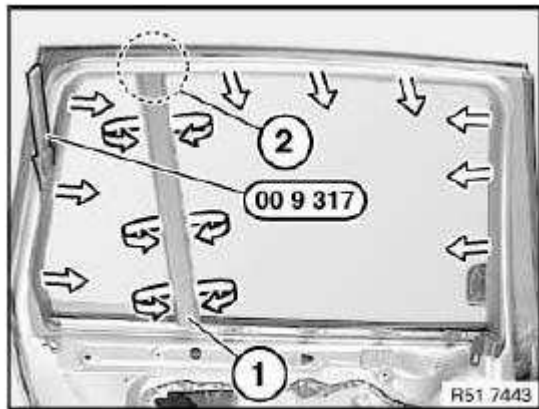


Fig. 394: Special Tool (00 9 317)

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Following parts of cover (1) must not be damaged or missing:

- 2 Connection point
- 3 Clips
- 4 Guides

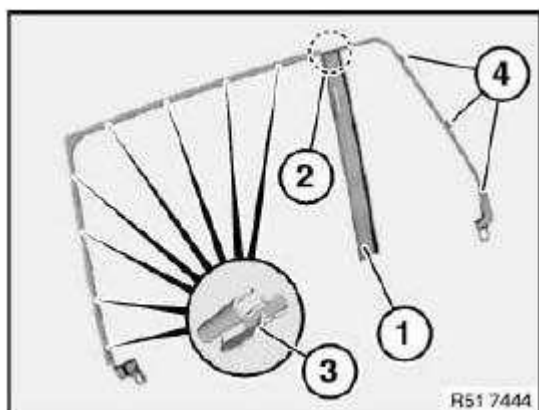


Fig. 395: Connection Point, Clips And Guides

Courtesy of BMW OF NORTH AMERICA, INC.

51 34 171 REPLACING REAR LEFT OR RIGHT DOOR WINDOW

Necessary preliminary tasks:

- Open door window to 105 mm.
- Remove sound insulation in rear door, see **51 48 070 Removing and installing/replacing sound insulation on left or right rear door**
- Remove outer window cavity cover strip, see **51 21 300 Removing and installing or replacing window cavity cover strip on outside of left or right front door**
- Remove cover on door window frame, see **51 34 160 Removing and installing/replacing housing cover on inner left or right door window frame**
- Remove trim on rear door window frame, see **51 34 ... Removing and installing/replacing trim on window frame of rear door (rear), left or right**
- Remove rubber guide for rear door window glass, see **51 34 211 Replacing rubber guide for rear left or right door window**

Open door window glass (1) down to distance (A)

A = approx. 105 mm



Fig. 396: Door Window Glass

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Disconnect plug connection (1) from power window motor (2) (risk of trapping).

Lever out catches (3) with screwdriver (4) in direction of arrow.

Installation:

Catch (3) must be correctly clipped into place.

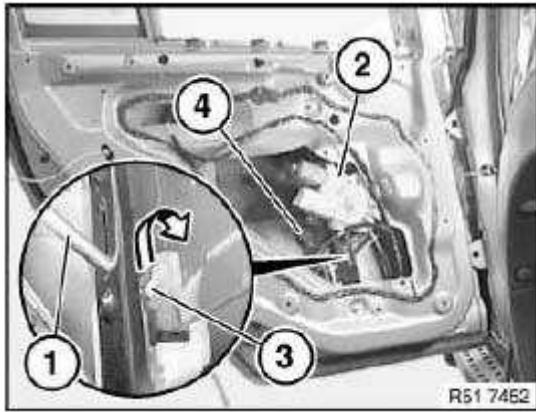


Fig. 397: Plug Connection, Catches And Power Window Motor
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Following parts of window guide (3) must not be damaged or missing:

1. Catch
2. Buffer stop

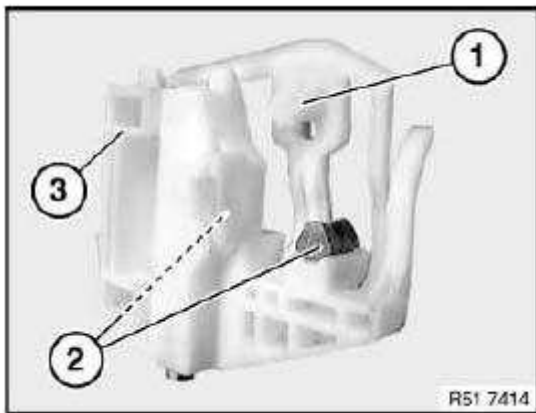


Fig. 398: Buffer Stop, Catch And Window Guide
Courtesy of BMW OF NORTH AMERICA, INC.

Remove door window glass (1) towards top.

Installation:

Door window glass does not need to be adjusted.

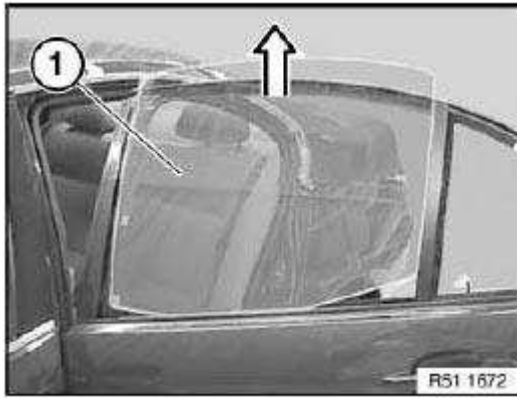


Fig. 399: Door Window Glass

Courtesy of BMW OF NORTH AMERICA, INC.

51 34 191 REPLACING LEFT OR RIGHT FIXED DOOR WINDOW IN REAR WINDOW FRAME

IMPORTANT: The "Instructions for window cementing" serve as the basis for these repair instructions and must be followed without fail, see 51 31 ... Instructions on gluing windscreen

51 34 211 REPLACING RUBBER GUIDE FOR REAR LEFT OR RIGHT DOOR WINDOW

Special tools required:

- 00 9 317 00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)

Necessary preliminary tasks:

- Remove cover on inside door window frame, see 51 34 160 Removing and installing/replacing housing cover on inner left or right door window frame

NOTE: Rubber guide must be replaced after every complete removal.

Lever out rubber guide (1) on door window frame at front (2) with special tool 00 9 317.

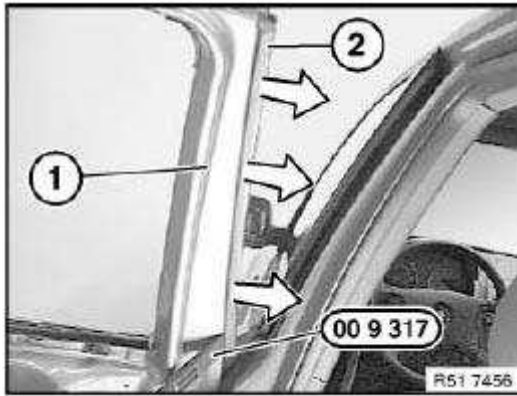


Fig. 400: Special Tool (00 9 317)
Courtesy of BMW OF NORTH AMERICA, INC.

Feed out rubber guide (1) towards top.

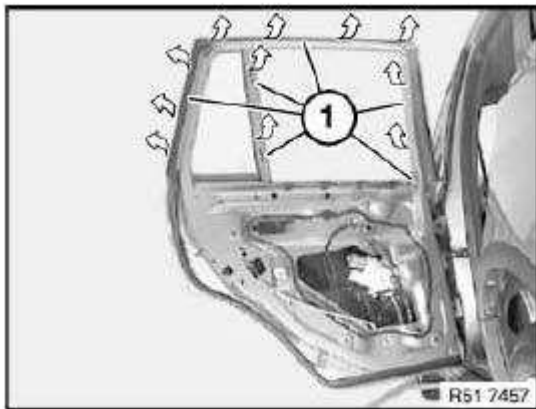


Fig. 401: Door Window Glass
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Close door window glass (1) a little.

Push rubber guide (2) onto door window glass (1) and into window guide (3).

Moisten rubber guide (2) with water.

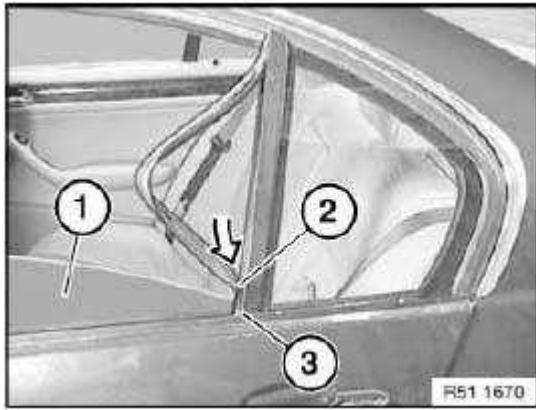


Fig. 402: Rubber Guide, Door Window Glass And Window Guide
 Courtesy of BMW OF NORTH AMERICA, INC.

51 34 420 REMOVING AND INSTALLING/REPLACING TRIM ON WINDOW FRAME OF REAR DOOR (FRONT), LEFT OR RIGHT

NOTE: For removal and installation only, not for adjustment:

Necessary preliminary tasks:

- Remove window cavity cover strip on outside of rear door
- Open door window.

Partially detach rubber seal (1) and rubber guide (2).

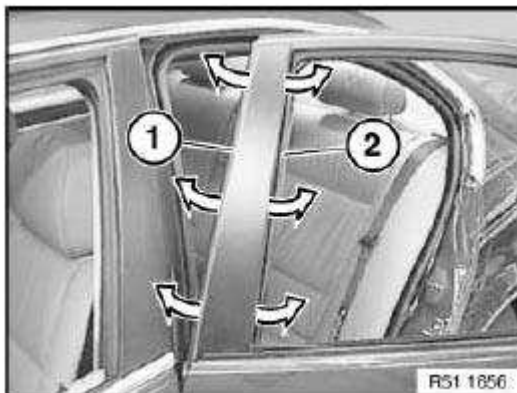


Fig. 403: Rubber Seal And Rubber Guide
 Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Detach trim (2) towards front/top.

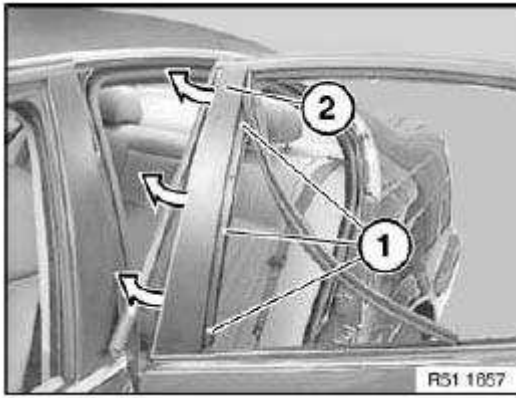


Fig. 404: Trim And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

If necessary, replace faulty plastic nuts (1).

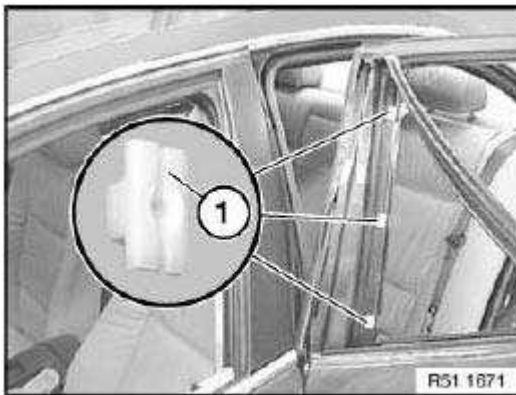


Fig. 405: Plastic Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Trim (1) must not be damaged.

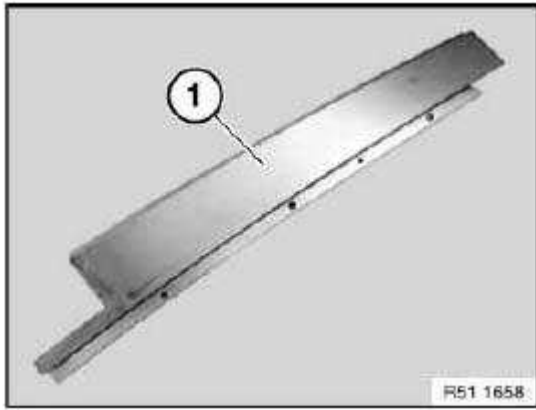


Fig. 406: Trim
Courtesy of BMW OF NORTH AMERICA, INC.

Acoustic insulation pieces (1) must be fitted on window frame (2) (rattling noises).

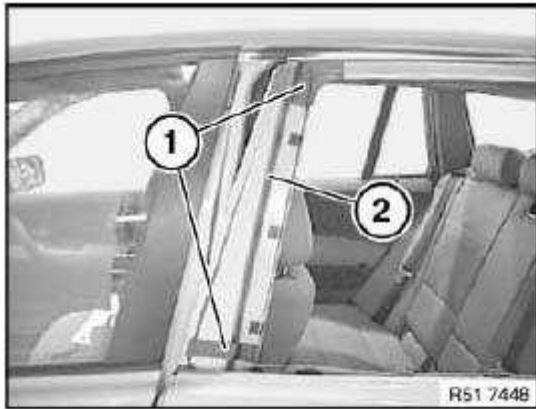


Fig. 407: Acoustic Insulation Pieces And Window Frame
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

To prevent wind noises.

Check gap with a 0.05 mm feeler gauge.

Slide feeler gauge between B-pillar trims on front and rear doors.

When the finishers are correctly adjusted, it must be possible to feel a slight suction resistance over the entire length of the finisher.

If the gap is too big, this may result in wind noises.

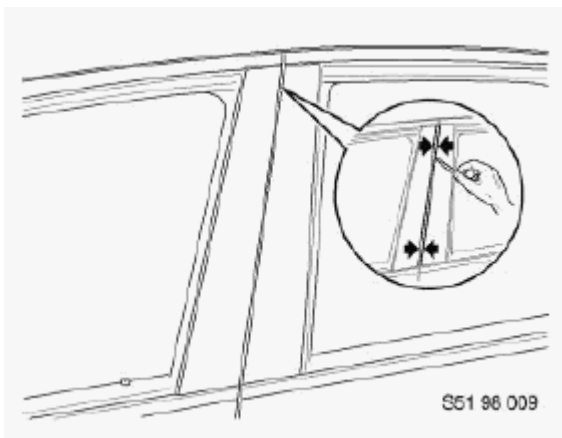


Fig. 408: Feeler Gauge Between B-Pillar Trims On Front And Rear Doors
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

If necessary, release screws (1).

Press trim (2) towards front and tighten down screws (1).

If gap is still too big, adjust trim on window frame of front door, see **51 32 420 Removing and installing/replacing trim on front door window frame, left or right**

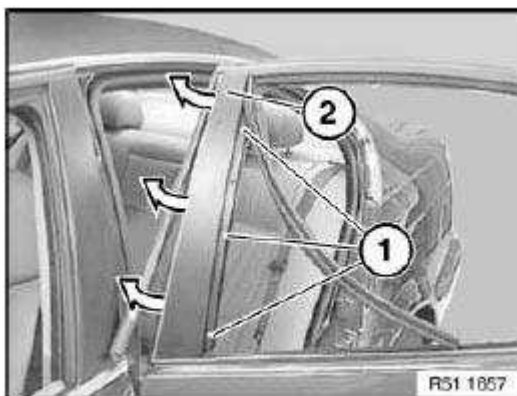


Fig. 409: Trim And Screws
 Courtesy of BMW OF NORTH AMERICA, INC.

51 34 425 REMOVING AND INSTALLING/REPLACING TRIM ON WINDOW FRAME OF REAR DOOR, REAR LEFT OR RIGHT

Necessary preliminary tasks:

- Detach rubber guide for rear door window glass in area of trim, see **51 34 211 Replacing rubber guide for rear left or right door window**

E1 and E83 only:

- Remove outer window cavity cover strip, see **51 21 300 Removing and installing or replacing window cavity cover strip on outside of left or right front door**

Release screws (1).

Remove trim (2) towards rear.

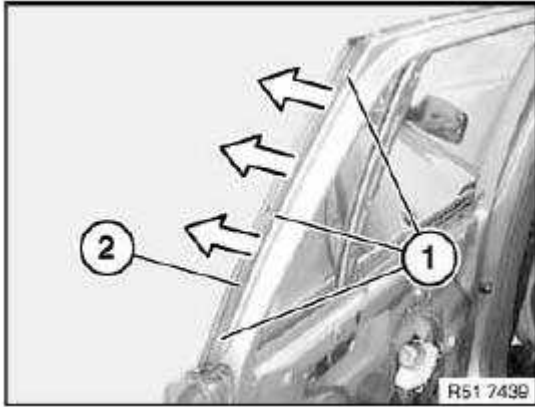


Fig. 410: Trim And Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

If necessary, replace faulty clips (1).

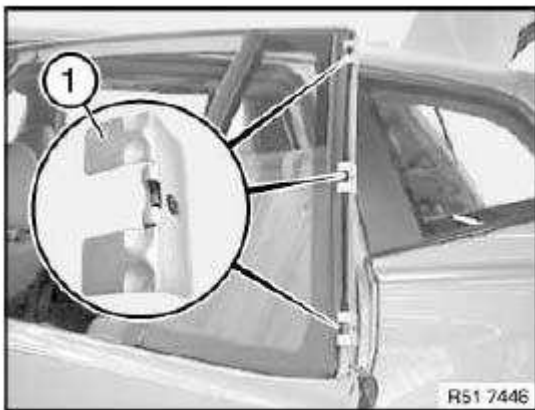


Fig. 411: Clips

Courtesy of BMW OF NORTH AMERICA, INC.

E83 and E91 only:

Installation:

Fit rubber guide (1) before screwing trim (2) into place.

Make sure trim (2) is correctly seated on rubber guide (1) (area A) and on window glass (3).

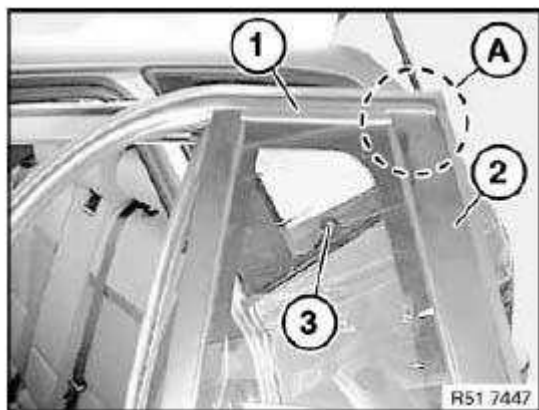


Fig. 412: Rubber Guide, Trim And Window Glass
Courtesy of BMW OF NORTH AMERICA, INC.

36 HINGED WINDOW

51 36 ... FIRMLY TENSIONING REAR LEFT OR RIGHT SIDE WINDOW

Special tools required:

- **51 3 010 SUCTION LIFT (2 X)**
- **51 3 090 CLAMPING STRAP**

Dampen down suction faces.

Fit special tool 51 3 010 to tool trolley and secure side window.

Secure special tool 51 3 010 (without joint) to inside of window.

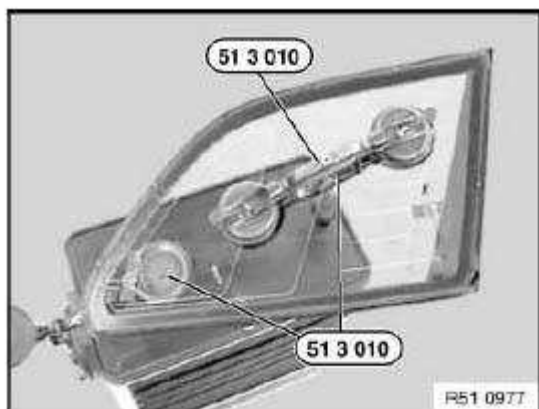


Fig. 413: Special Tool (51 3 010) And (51 3 090)
Courtesy of BMW OF NORTH AMERICA, INC.

Secure special tool 51 3 010 (without joint) opposite to inside of window.

Secure special tool 51 3 090 (tensioning belt) at top to special tool 51 3 010 (1). Hook tensioning belt at bottom diagonally in lashing eyes and pull tight (2).

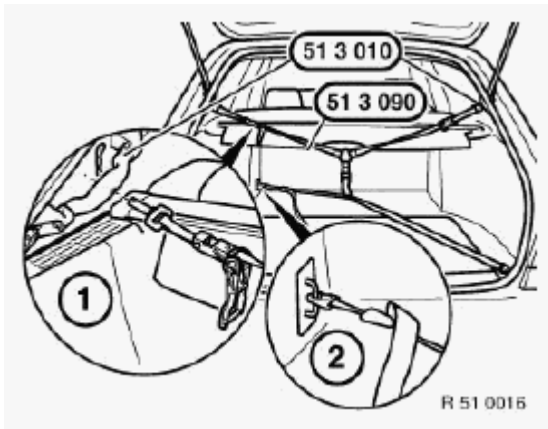


Fig. 414: Special Tool (51 3 010) And (51 3 090)
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten middle belt tensioner (4) so that special tool 51 3 090 is at a 90° angle to side window.

Tighten top belt tensioner (3) until eye can be pulled approx. 20 mm toward rear (4).

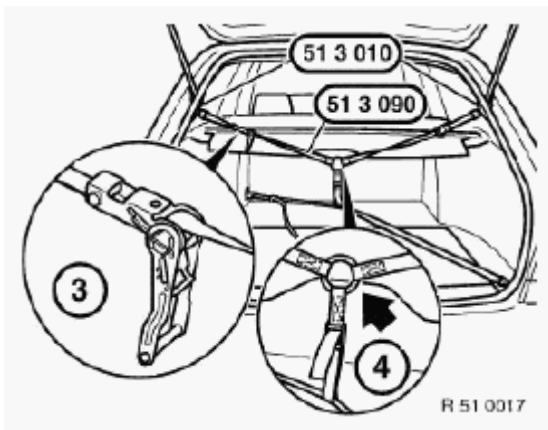


Fig. 415: Special Tool (51 3 010) And (51 3 090)
Courtesy of BMW OF NORTH AMERICA, INC.

**51 36 030 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT TRIM ON C-PILLAR
(OUTSIDE ON REAR SIDE WINDOW)**

Raise trim (1) at rear approx. 2 mm and pull off in stages by approx. 2 mm from top downwards from door window (2) in direction of arrow.

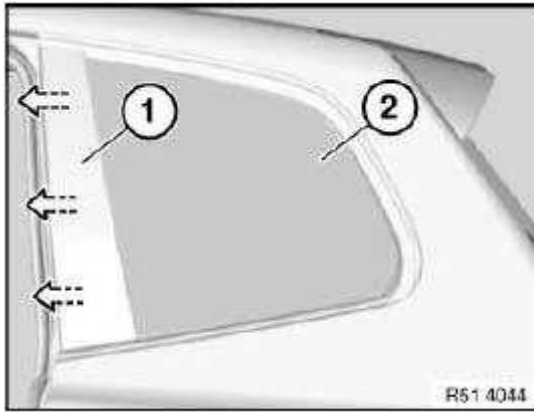


Fig. 416: Trim And Door Window

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Fold (1) and retaining lug (2) of trim (3) must not be bent up.

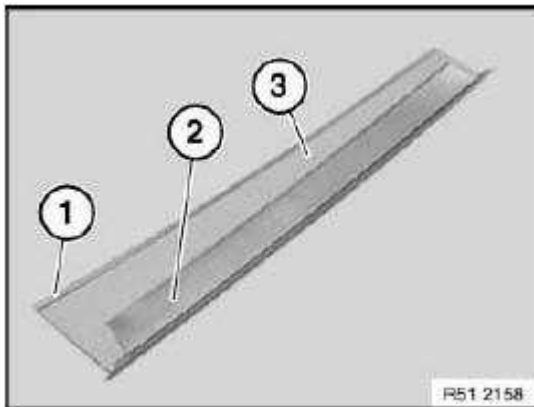


Fig. 417: Fold, Lug And Trim

Courtesy of BMW OF NORTH AMERICA, INC.

51 36 040 REMOVING AND INSTALLING/REPLACING STRIP ON SIDE WINDOW AT REAR BOTTOM LEFT OR RIGHT

Special tools required:

- 00 9 318 00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)

Carefully lever out strip (1) with special tool 00 9 318, starting at front, in direction of arrow.

Installation:

Clean bonding area with adhesive remover (sourcing reference: BMW Parts Service).

Air drying time: 1 minute

**IMPORTANT: Adhesive areas must be dry and free of dust and grease.
Once it has been cleaned, do not touch the adhesive area with bare hands.**

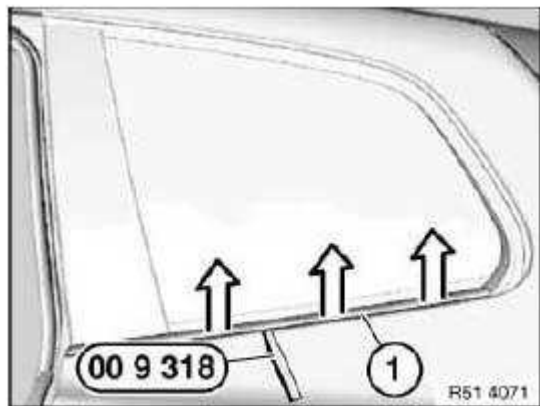


Fig. 418: Special Tool (00 9 318)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Stick double-sided adhesive tape (1) (sourcing reference: BMW Parts Service) on middle of strip (2).

Remove protective film.

Press strip (2) firmly onto body (3).

Manual contact pressure: approx. 10 N/cm²

NOTE: Firm thumb pressure creates approx. 50 Nm/cm².

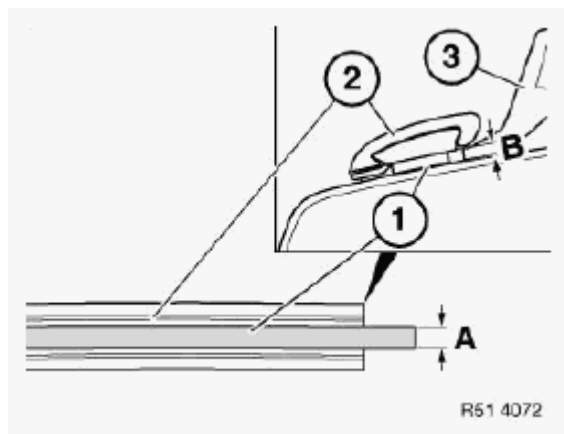


Fig. 419: Double-Sided Adhesive Tape And Strip
Courtesy of BMW OF NORTH AMERICA, INC.

Double-sided adhesive tape (1):

Measurement

a=7.0 mm

Measurement

b=0.8 mm

Replacement:

Adhesive tape (1) already attached to strip (2).

51 36 070 REMOVING AND INSTALLING / REPLACING LEFT OR RIGHT REAR SIDE WINDOW

IMPORTANT: The "Window cementing instructions" serve as the basis for this repair instruction and must be observed without fail, see 51 31 ... Instructions on gluing windscreen

37 ELECTRICAL POWER WINDOWS, BODY

51 37 000 REMOVING AND INSTALLING/REPLACING COMPLETE REAR LEFT OR RIGHT POWER WINDOW UNIT

Necessary preliminary tasks:

- Remove rear door window glass, see 51 34 171 Replacing rear left or right door window

Unclip cable holder (1) from power window motor (2).

Unscrew nuts (3).

Tightening torque: 51 35 2AZ, see 51 35 POWER WINDOWS, REAR

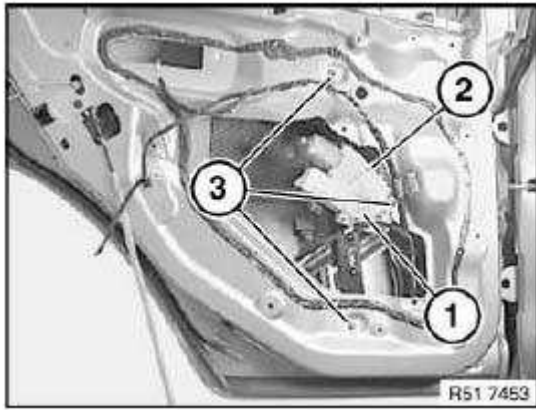


Fig. 420: Cable Holder And Power Window Motor
 Courtesy of BMW OF NORTH AMERICA, INC.

Feed power window unit (1) in direction of arrow out of rear door.

Replacement:

Remove flat motor

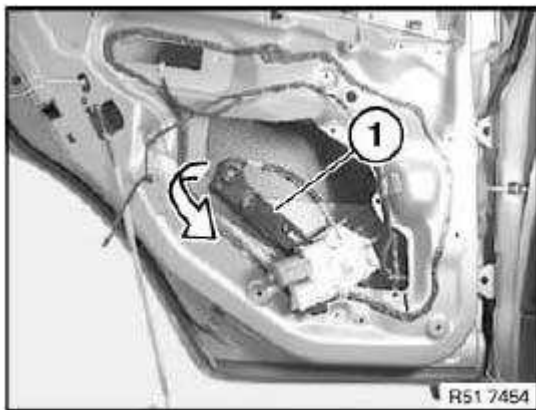


Fig. 421: Power Window Unit
 Courtesy of BMW OF NORTH AMERICA, INC.

51 37 261 REMOVING AND INSTALLING/REPLACING WINDOW CAVITY COVER STRIP FOR DOOR WINDOW, REAR LEFT OR RIGHT

Necessary preliminary tasks:

- Remove roller cover for luggage compartment, refer to Owner's Manual
- Fold rear seat backrest forwards
- Remove panel for roof pillar at rear (C-pillar), see **51 43 251 Removing and installing/replacing trim panel for rear left or right roof pillar (C - pillar)**
- Remove panel for roof pillar at rear (D-pillar), see **51 43 252 Replacing trim panel for rear left or right**

roof pillar (D-pillar)

- Release covers on seat belt at top rear, see **72 11 100 REMOVING AND INSTALLING/REPLACING REAR LEFT OR RIGHT SEAT BELTS**

Release screw (1) on window cavity cover strip (2).

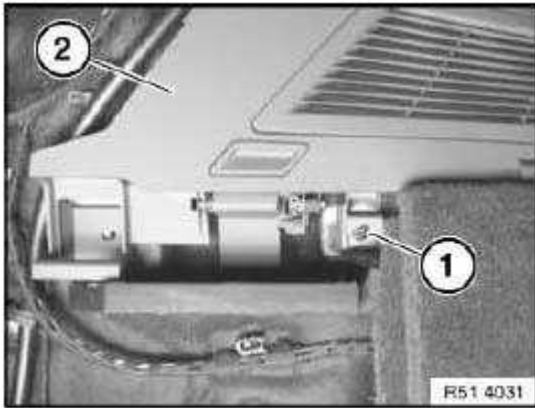


Fig. 422: Screw And Window Cavity Cover Strip
Courtesy of BMW OF NORTH AMERICA, INC.

Remove window cavity cover strip (1) towards top.

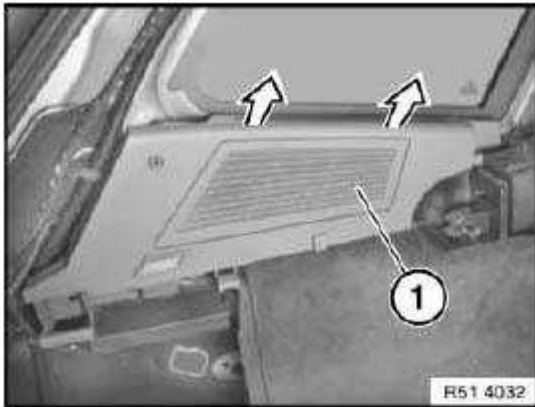


Fig. 423: Window Cavity Cover Strip
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Guides (1) on window cavity cover strip (2) must not be damaged.

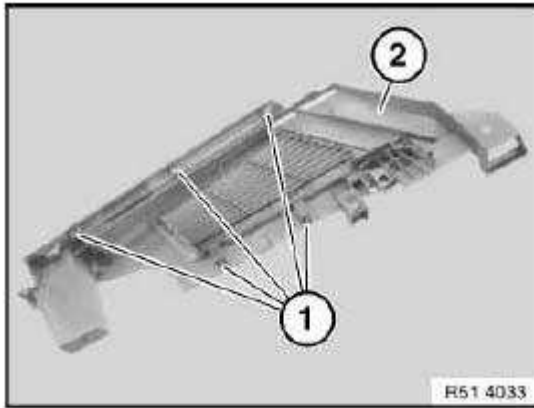


Fig. 424: Guides And Window Cavity Cover Strip
Courtesy of BMW OF NORTH AMERICA, INC.

41 FRONT DOOR TRIM PANEL WITH ARM REST

51 41 000 REMOVING AND INSTALLING LEFT OR RIGHT FRONT DOOR TRIM PANEL

Special tools required:

- **00 9 317 00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)**

WARNING: Model with side airbag:

Follow safety instructions for working on cars with airbag systems (risk of injury), see 51 00 ... Safety instructions for working on cars with airbag systems

**Side airbag is mounted on door trim panel:
Disconnect battery.**

IMPORTANT: Do not use any sharp-edged tools to remove the panel - risk of damage to airbag.

Lever out airbag emblem (1) and clip (2) with special tool 00 9 317 and release screw underneath.

Lever out clip (3) and cover on door handle (4), see **51 41 017 Removing and installing/replacing cover on door handle, front left or right**

Release screws underneath.

Tightening torque: 51 41 1AZ, see **51 41 FRONT DOOR TRIM PANEL WITH ARMRESTS**

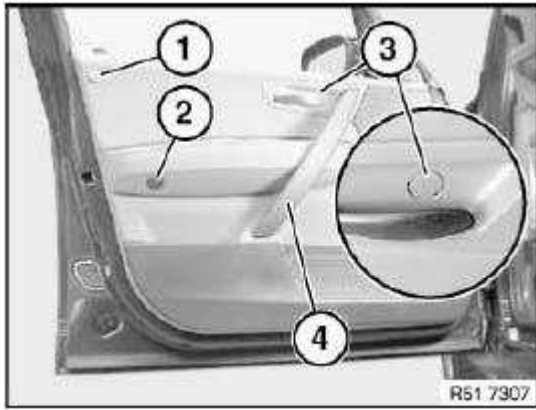


Fig. 425: Airbag Emblem And Clip

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Start by unclipping door trim panel (2) at bottom.

Unclip clips (1) of door trim panel with special tool 00 9 317 (trim panel wedge).

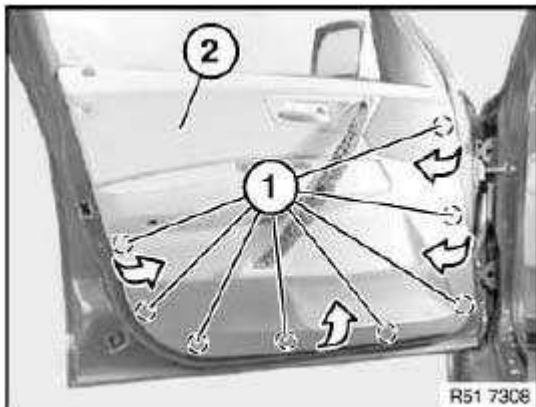


Fig. 426: Door Trim Panel And Clips

Courtesy of BMW OF NORTH AMERICA, INC.

Carefully unclip door trim panel (1) at top from retainers (2).

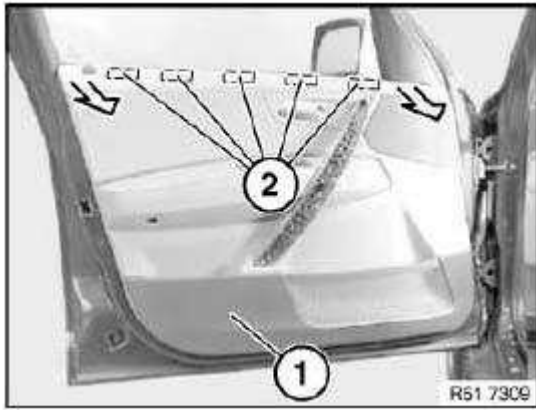


Fig. 427: Door Trim Panel And Retainers
Courtesy of BMW OF NORTH AMERICA, INC.

Unhook Bowden cable (1) from door lock (2).

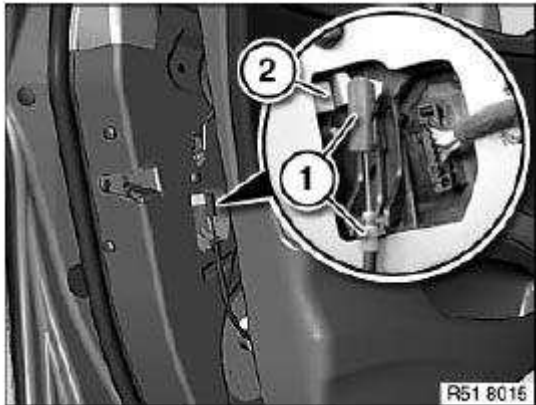


Fig. 428: Bowden Cable And Door Lock
Courtesy of BMW OF NORTH AMERICA, INC.

Model with side airbag:

WARNING: Disconnect plug connection on side airbag.

Disconnect remaining plug connections.

Version with speaker:

If necessary, disconnect plug connection (1).

Remove door trim.

Installation:

Connect all plugs to original locations.

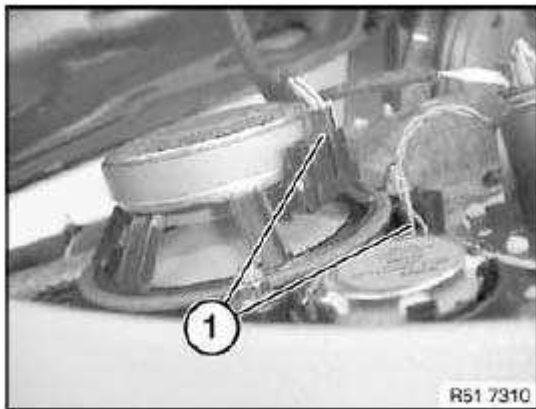


Fig. 429: Plug Connection

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Clips (1) are longer than the other clips.

Clips (1) are gray, the other clips are white.

Fit all clips with sealing ring.

If necessary, replace faulty clips.

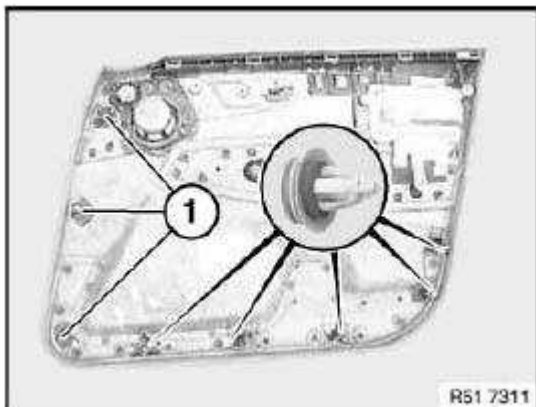


Fig. 430: Clips

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

After assembling the door trim panel proceed as follows:

- Open door window.
- Lock with vehicle key.
- Check for ease-of-movement on retaining button linkage
- If necessary, align linkages

51 41 017 REMOVING AND INSTALLING/REPLACING COVER ON DOOR HANDLE, FRONT LEFT OR RIGHT

Special tools required:

- 00 9 317 **00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)**

Lever out cover (1) with special tool 00 9 317.

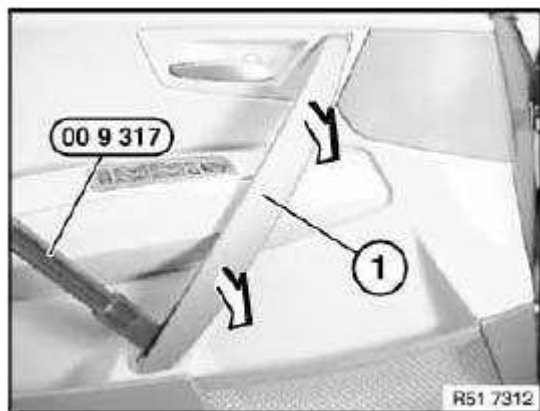


Fig. 431: Special Tool (00 9 317)

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Catches (1) and retainers (2) on cover (3) must not be damaged.

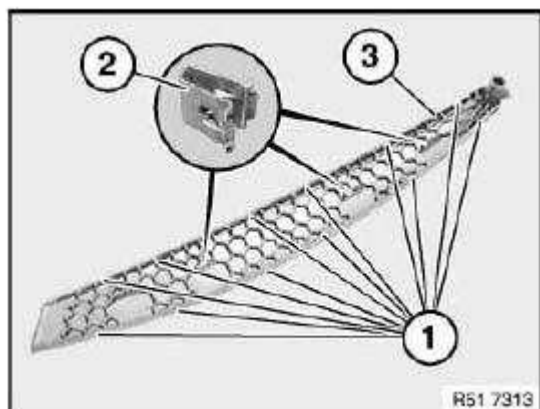


Fig. 432: Catches, Retainers And Cover
Courtesy of BMW OF NORTH AMERICA, INC.

51 41 018 REPLACING SPEAKER TRIM ON FRONT LEFT OR RIGHT DOOR TRIM PANEL

Necessary preliminary tasks:

- Remove front door trim panel, see **51 41 000 Removing and installing left or right front door trim panel**
- Remove speaker

Removal on initial fitting:

Open welding spots (1).

Release catches (2) and remove speaker trim.

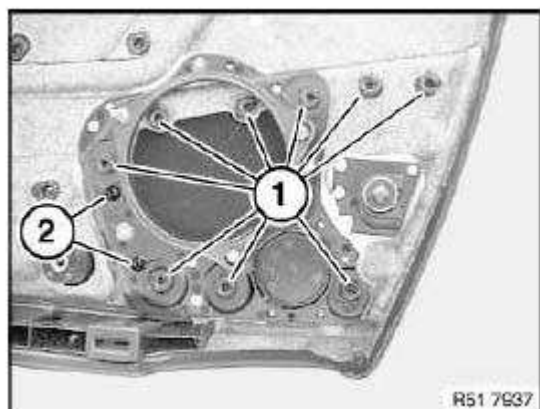


Fig. 433: Welding Spots And Catches
Courtesy of BMW OF NORTH AMERICA, INC.

Removal of repair solution:

Release locking washers (1).

Release catches (2) and remove speaker trim.

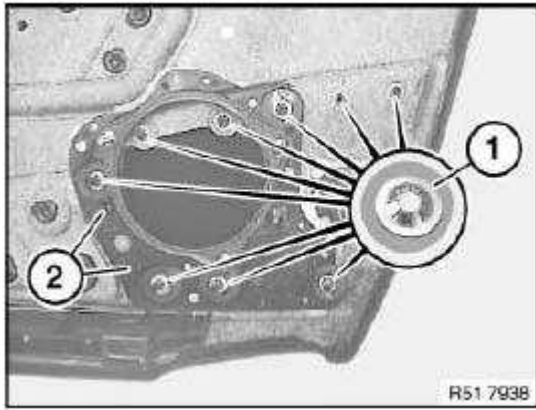


Fig. 434: Locking Washers And Catches
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Shorten plastic pins (1) by measurement (A).

A = 9 mm

Snap speaker trim (2) into door trim panel.

Push locking washers (3) onto plastic pins.

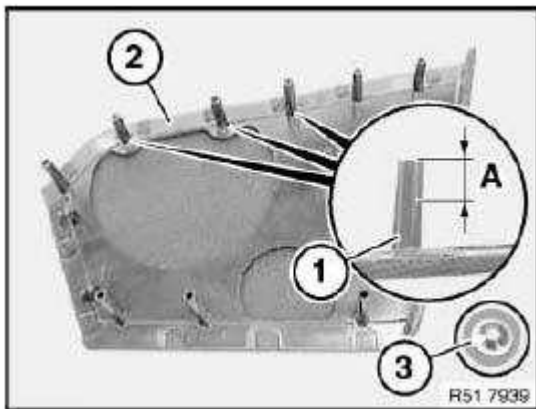


Fig. 435: Speaker Trim, Locking Washers And Plastic Pins
 Courtesy of BMW OF NORTH AMERICA, INC.

42 REAR DOOR TRIM PANEL WITH ARM REST

51 42 000 REMOVING AND INSTALLING LEFT OR RIGHT REAR DOOR TRIM PANEL

Special tools required:

- 00 9 317 00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)

WARNING: Model with side airbag:

Follow safety instructions for working on cars with airbag systems (risk of injury), see 51 00 ... Safety instructions for working on cars with airbag systems

Side airbag is mounted on door trim panel:
Disconnect battery.

IMPORTANT: Do not use any sharp-edged tools to remove the panel - risk of damage to airbag.

If necessary, lever out airbag emblem (1) and clip (2) with special tool 00 9 317 and release screw underneath.

Tightening torque: 51 42 4AZ, see 51 42 REAR DOOR TRIM PANEL WITH ARMRESTS

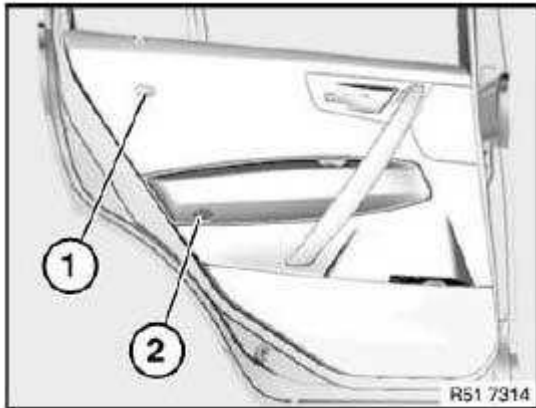


Fig. 436: Airbag Emblem And Clip

Courtesy of BMW OF NORTH AMERICA, INC.

Lever out clip (3) and cover on door handle (2), see 51 42 017 Removing and installing/replacing cover on door handle, rear left or right

Release screws underneath.

Tightening torque: 51 42 1AZ, see 51 42 REAR DOOR TRIM PANEL WITH ARMRESTS

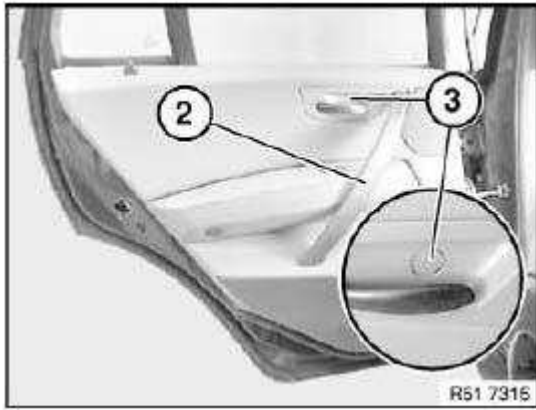


Fig. 437: Clip And Door Handle

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Start by unclipping door trim panel (2) at bottom.

Unclip clips (1) of door trim panel with special tool 00 9 317.

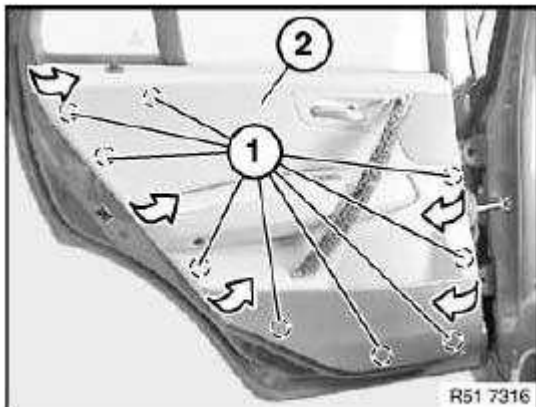


Fig. 438: Door Trim Panel And Clips

Courtesy of BMW OF NORTH AMERICA, INC.

Carefully unclip door trim panel (1) at top from retainers (2).

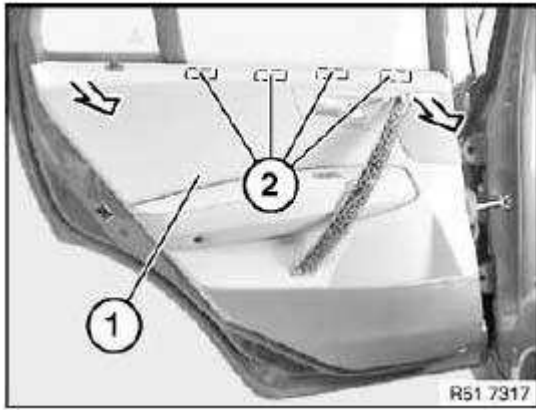


Fig. 439: Door Trim Panel And Retainers
Courtesy of BMW OF NORTH AMERICA, INC.

Unhook Bowden cable (1) from door lock (2).

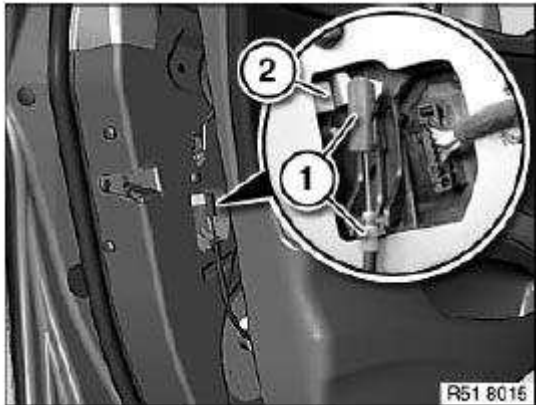


Fig. 440: Bowden Cable And Door Lock
Courtesy of BMW OF NORTH AMERICA, INC.

Model with side airbag:

WARNING: Disconnect plug connection on side airbag.

Disconnect remaining plug connections.

Version with speaker:

If necessary, disconnect plug connection (1).

Remove door trim.

Installation:

Connect all plugs to original locations.

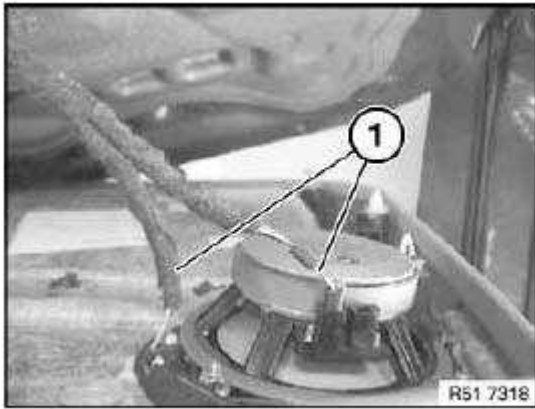


Fig. 441: Plug Connection

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

All clips (1) are white.

If necessary, replace faulty clips (1).

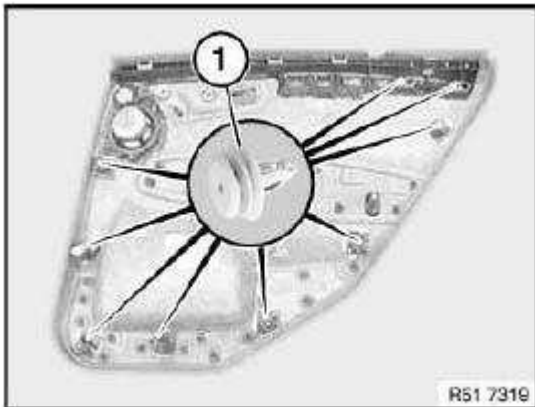


Fig. 442: Clips

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

After assembling the door trim panel proceed as follows:

- Open door window.
- Lock with vehicle key.
- Check for ease-of-movement on retaining button linkage
- If necessary, align linkages

51 42 001 REPLACING LEFT OR RIGHT REAR DOOR TRIM PANEL

Necessary preliminary tasks:

- Remove rear door trim panel, see **51 42 000 Removing and installing left or right rear door trim panel**
- Remove rear speaker
- Remove airbag module from rear door, see **72 12 015 REMOVING AND INSTALLING/REPLACING AIRBAG MODULE ON LEFT OR RIGHT REAR DOOR**

51 42 017 REMOVING AND INSTALLING/REPLACING COVER ON DOOR HANDLE, REAR LEFT OR RIGHT

Operation is identical to:

Removing cover on door handle, front left or right, see **51 41 017 Removing and installing/replacing cover on door handle, front left or right**

51 42 018 REPLACING SPEAKER TRIM ON REAR LEFT OR RIGHT DOOR TRIM PANEL

Necessary preliminary tasks:

- Remove rear door trim panel, see **51 42 000 Removing and installing left or right rear door trim panel**
- Remove speaker

Removal on initial fitting:

Open welding spots (1).

If necessary, lever out cover (2), release catch underneath and remove speaker trim.

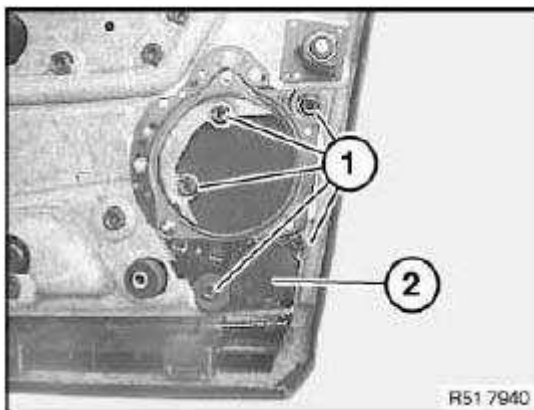


Fig. 443: Welding Spots And Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Removal of repair solution:

Release locking washers (1).

If necessary, lever out cover (2), release catch underneath and remove speaker trim.

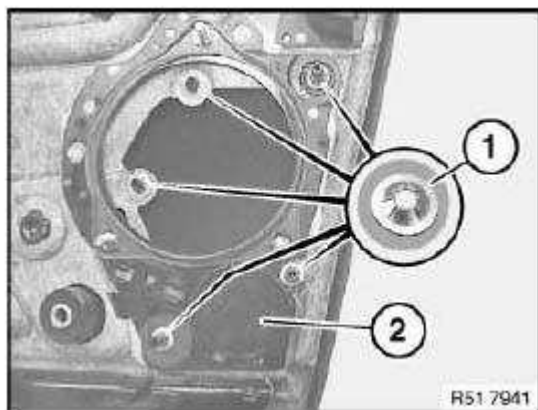


Fig. 444: Locking Washers And Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Shorten plastic pins (1) by measurement (A).

A = 9 mm

Snap speaker trim (2) into door trim panel.

Push locking washers (3) onto plastic pins.

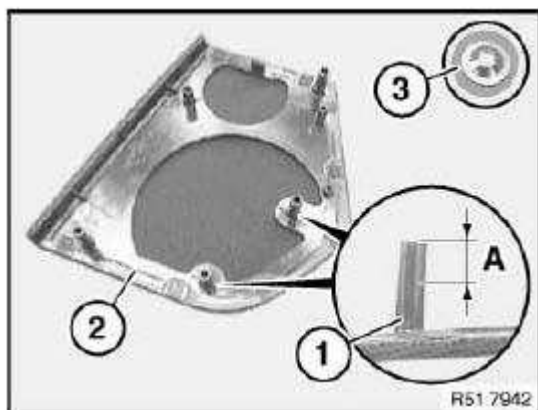


Fig. 445: Plastic Pins And Speaker Trim
Courtesy of BMW OF NORTH AMERICA, INC.

43 SIDE COVERING WITH ARMRESTS

51 43 070 REMOVING AND INSTALLING/REPLACING SIDE TRIM PANEL, FOOTWELL, ON A-PILLAR, LEFT

Special tools required:

- 00 9 317 **00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)**

Necessary preliminary tasks:

- Remove front entrance cover strip, see **51 47 000 Removing and installing/replacing front (inside) left or right entrance cover strip**
- Remove trim panel for pedal assembly, see **51 45 185 Removing and installing/replacing trim for pedal assembly**

Detach mocket (1) in area of footwell trim.

Release screw (2) and remove release lever (3).

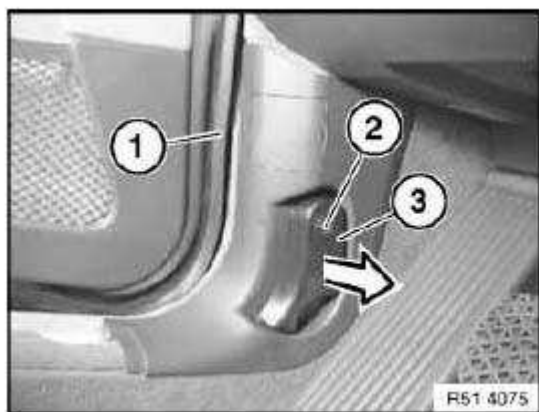


Fig. 446: Mocket, Screw And Lever
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

Unclip clips (2) with special tool 00 9 317.

Remove trim panel (3) towards inside.

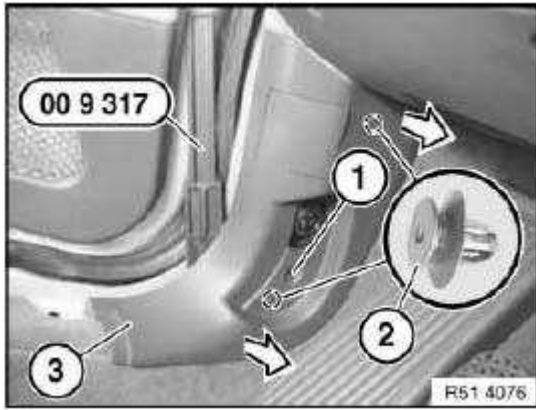


Fig. 447: Special Tool (00 9 317)
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Clips (1) on trim panel (2) must not be damaged.

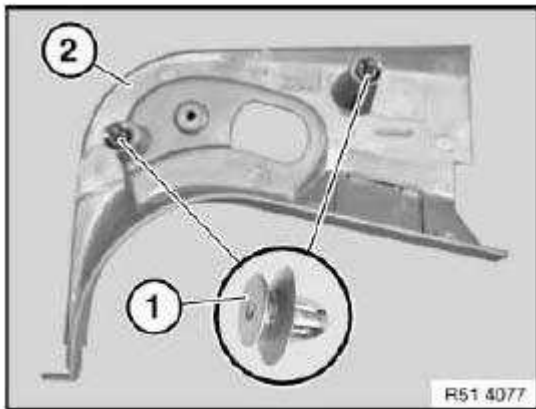


Fig. 448: Clips And Trim Panel
 Courtesy of BMW OF NORTH AMERICA, INC.

51 43 075 REMOVING AND INSTALLING/REPLACING SIDE TRIM PANEL, FOOTWELL, ON A-PILLAR, RIGHT

Necessary preliminary tasks:

- Remove front entrance cover strip, see **51 47 000 Removing and installing/replacing front (inside) left or right entrance cover strip**

Release door mocket (1) in area of footwell side trim panel on A-pillar on right (2).

Unclip footwell side trim panel on A-pillar on right (2) in direction of arrow from retaining points (3).

Remove footwell side trim panel on A-pillar on right (2).

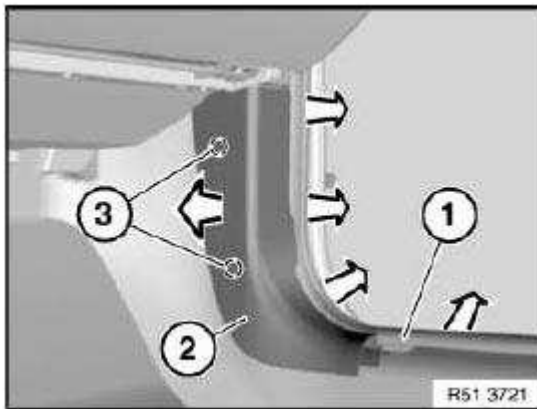


Fig. 449: Door Mocket And Footwell Side Trim Panel
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

If necessary, lever out clips (1) remaining in bores.

If necessary, replace faulty clips (1).

Place footwell side trim panel on A-pillar on right (2) preinstalled with clips (1) on associated bores and clip into place.

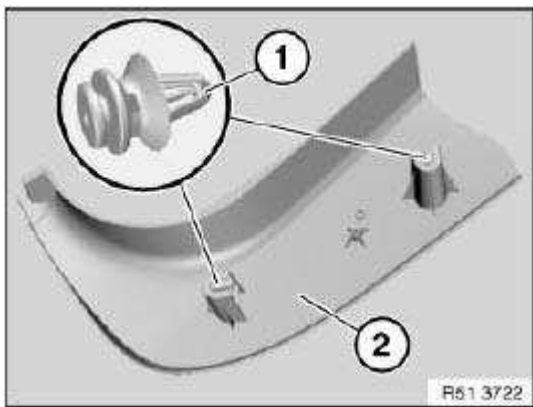


Fig. 450: Footwell Side Trim Panel And Clips
Courtesy of BMW OF NORTH AMERICA, INC.

51 43 148 REMOVING AND INSTALLING OR REPLACING TRIM ON LEFT OR RIGHT DOOR PILLAR (TOP)

Necessary preliminary tasks:

- Remove panel for door pillar (bottom), see **51 43 150 Removing and installing or replacing trim for**

left or right door pillar (bottom)

Release seatbelt screw (1) on front seat and feed out seatbelt strap (2).

Tightening torque: 72 11 1AZ, see **72 11 SEAT BELTS**

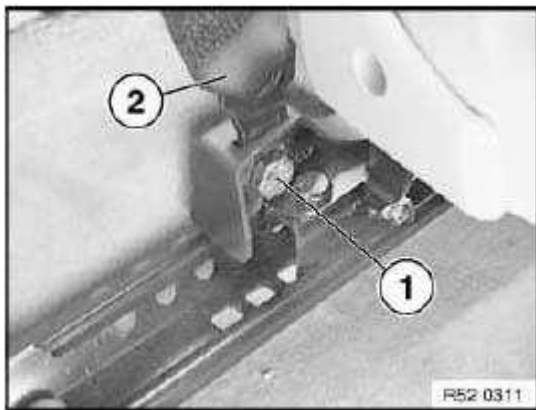


Fig. 451: Seatbelt Screw And Seatbelt Strap
Courtesy of BMW OF NORTH AMERICA, INC.

Release expansion rivets (1) on panel (2).

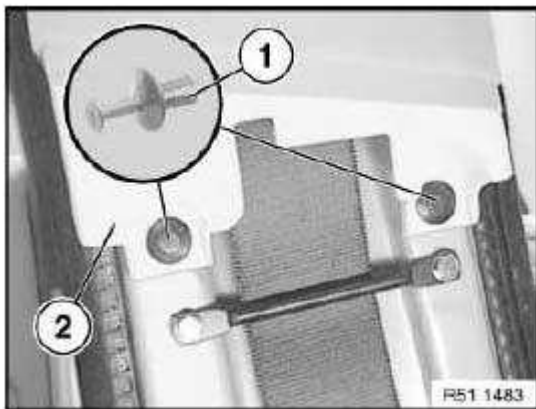


Fig. 452: Expansion Rivets And Panel
Courtesy of BMW OF NORTH AMERICA, INC.

Pull off panel (1) towards bottom.

Feed out seatbelt strap (2).

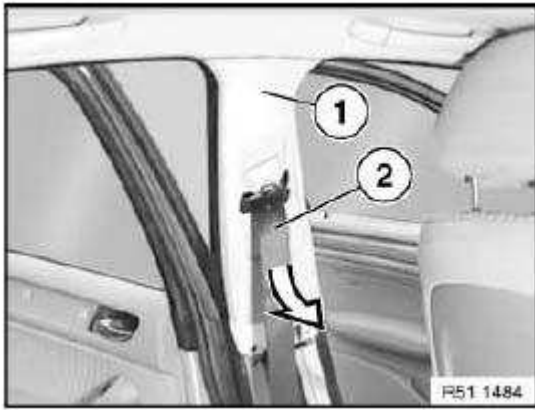


Fig. 453: Panel And Seatbelt Strap
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Locator (1) and guide (2) on trim (3) must not be damaged.

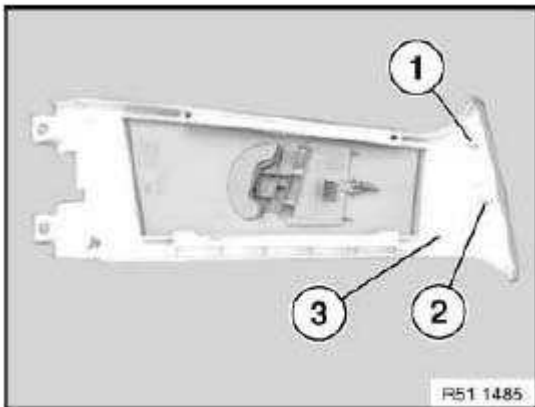


Fig. 454: Locator, Guide And Trim
 Courtesy of BMW OF NORTH AMERICA, INC.

51 43 150 REMOVING AND INSTALLING OR REPLACING TRIM FOR LEFT OR RIGHT DOOR PILLAR (BOTTOM)

Necessary preliminary tasks:

- Remove front entrance cover strip, see **51 47 000 Removing and installing/replacing front (inside) left or right entrance cover strip**

Snap trim (2) out of clips (1) at bottom.

Feed out trim (2) for door pillar from entrance cover strip (3).



Fig. 455: Trim And Clips

Courtesy of BMW OF NORTH AMERICA, INC.

Partially detach mocket in area of B-pillar panel.

Carefully feed out bottom trim (1) from top trim (2).

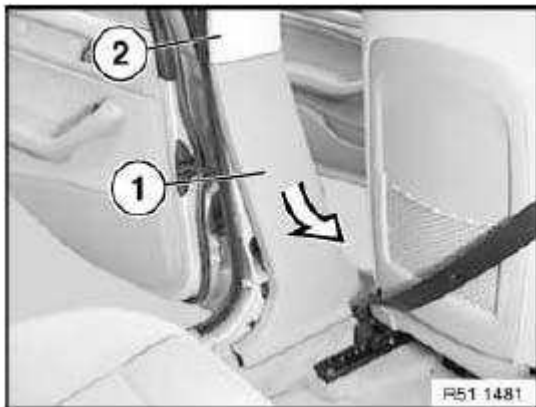


Fig. 456: Bottom Trim And Top Trim

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

If necessary, replace faulty clips (1).

Guides (2) on trim (3) must not be damaged.

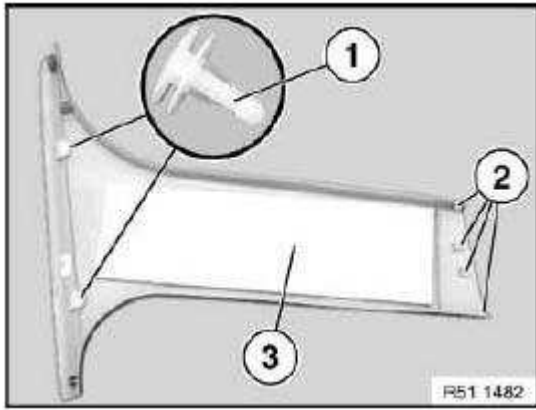


Fig. 457: Guides And Trim

Courtesy of BMW OF NORTH AMERICA, INC.

51 43 201 REMOVING AND INSTALLING/REPLACING PANEL FOR ROOF PILLAR AT FRONT (A-PILLAR), LEFT OR RIGHT

WARNING: Follow safety instructions for working on cars with airbag systems (risk of injury), see 51 00 ... Safety instructions for working on cars with airbag systems

IMPORTANT: Do not use any sharp-edged tools to remove trim (risk of damage to head airbag).

Detach mallet (1) in area of panel (6).

Unclip protective cap (2) and remove.

Release screw (3).

Tightening torque: 51 43 2AZ, see 51 43 SIDE TRIM PANEL WITH ARMRESTS

Unclip panel (6) at fastening point (4).

Feed out panel (6) from instrument panel (5) and remove.

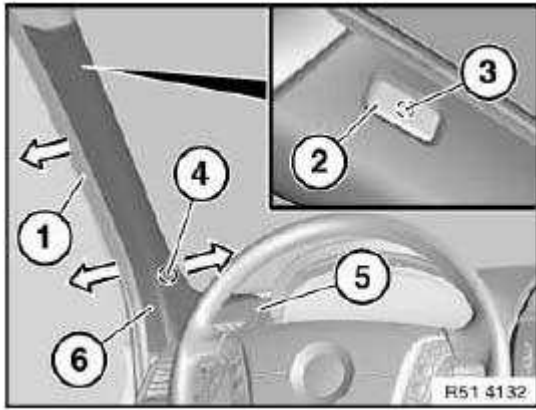


Fig. 458: Mocket, Panel, Protective Cap And Screw
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

If necessary, lever out clip (1) remaining in bore.

If necessary, replace faulty clip (1).

Make sure guides (3) of panel (2) are correctly seated in associated mountings.

Position panel (2) preinstalled with clip (1) on associated bore and clip into place.

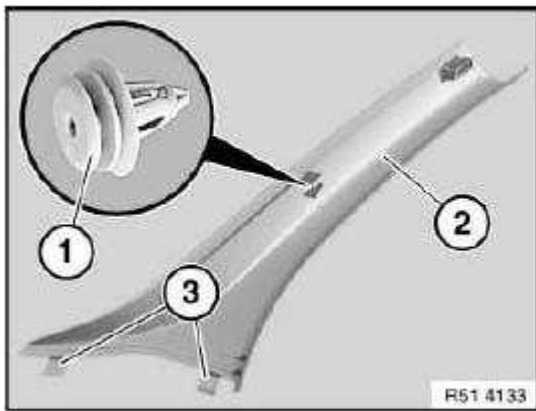


Fig. 459: Guides, Clips And Panel
 Courtesy of BMW OF NORTH AMERICA, INC.

51 43 251 REMOVING AND INSTALLING/REPLACING TRIM PANEL FOR REAR LEFT OR RIGHT ROOF PILLAR (C - PILLAR)

Detach mocket (1) in area of trim panel for roof pillar (4).

Lever out trim (3) and remove.

Release screw (2), tightening torque: 51 43 1AZ, see **51 43 SIDE TRIM PANEL WITH ARMRESTS**

Unclip trim panel for roof pillar (4) from mounting point (5) in direction of arrow.

Feed trim panel for roof pillar (4) upwards out of mounting (6) and remove.

NOTE: **Make sure trim panel for roof pillar (4) is correctly seated in mounting (6).**

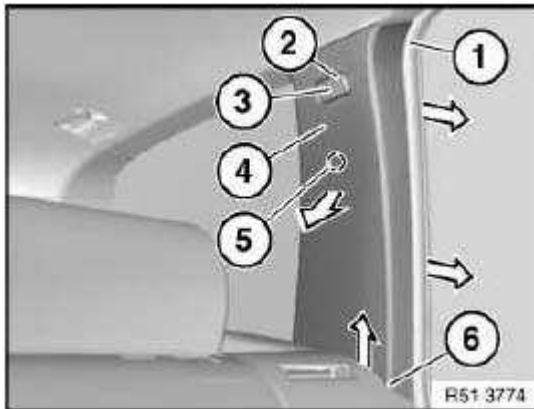


Fig. 460: Roof Pillar, Mounting Point And Trim
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

If necessary, lever out clip (1) remaining in bore.

If necessary, replace faulty clip (1).

Feed in trim panel for roof pillar (2) preassembled with clip (1) first at bottom, then position on associated bore and clip into place.

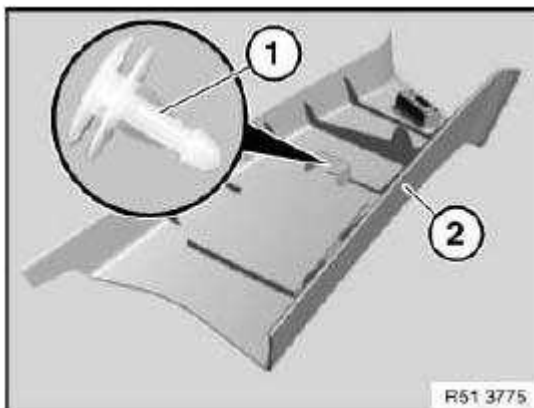


Fig. 461: Roof Pillar And Clips
Courtesy of BMW OF NORTH AMERICA, INC.

51 43 252 REPLACING TRIM PANEL FOR REAR LEFT OR RIGHT ROOF PILLAR (D-PILLAR)

Necessary preliminary tasks:

- Remove flap in luggage compartment panel, see **51 47 172 Removing and installing/replacing flap in luggage compartment trim, left or right**
- Remove luggage compartment light, see **63 31 080 REMOVING AND INSTALLING/REPLACING LUGGAGE COMPARTMENT LIGHT (D-PILLAR)**

Detach mocket (1) in area of trim panel for roof pillar (4).

Remove screws (2) and (3).

Unclip trim panel for roof pillar (4) at mounting points (5) in direction of arrow.

Feed trim panel for roof pillar (4) upwards out of trim (6) and remove.

Installation:

Make sure trim panel for roof pillar (4) is correctly seated in trim (6).

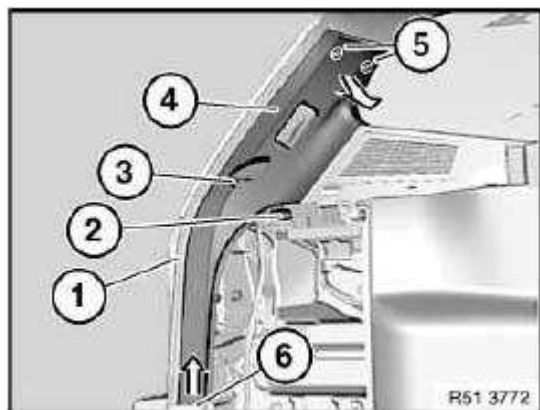


Fig. 462: Roof Pillar, Trim, Mocket And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

If necessary, lever out clips (1) remaining in bore.

If necessary, replace faulty clips (1).

Feed in trim panel for roof pillar (2) preassembled with clips (1) first at bottom, then position on associated bores and clip into place.

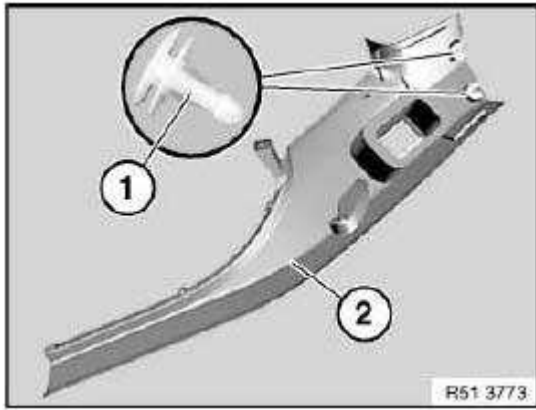


Fig. 463: Roof Pillar And Screw

Courtesy of BMW OF NORTH AMERICA, INC.

44 ROOF TRIM PANEL

51 44 ... REMOVING AND INSTALLING FRONT ROOFLINER TRIM

Special tools required:

- 00 9 317 **00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)**

Unclip trim (1) with special tool 00 9 317 in direction of arrow.

Disconnect associated plug connections and remove trim (1).

Installation:

Make sure all-round catches of trim (1) are correctly seated.

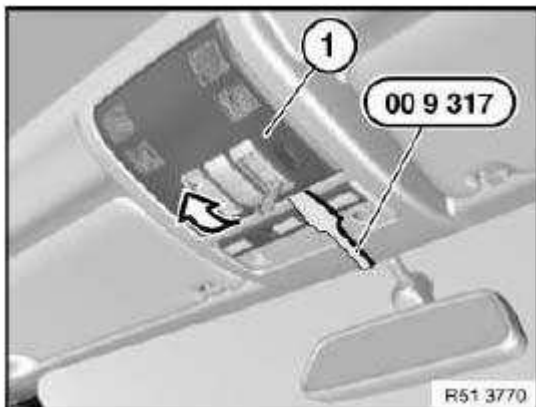


Fig. 464: Special Tool (00 9 317)

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Disconnecting the plug connection for the hands-free microphone or emergency SOS call button results in fault memory entries in the telephone control unit (limitation in the emergency SOS call system).

After fitting, read out fault memory and if necessary delete entries.

51 44 002 REMOVING AND INSTALLING ROOFLINER (ON VERSION WITHOUT PANORAMA SUNROOF)

Except for the steps relating to the panorama sunroof, the work is identical to:

51 44 013 Removing and installing roofliner (on version with panorama sunroof)

51 44 013 REMOVING AND INSTALLING ROOFLINER (ON VERSION WITH PANORAMA SUNROOF)

Necessary preliminary tasks:

- Remove both sun visors and counter supports, see **51 16 080 Removing and installing or replacing sun visor and left or right counter support**
- Remove all handles, see **51 16 450 Removing and installing/replacing rear left/right grab handle**
- Remove both trim panels for front roof pillar (A-pillar trim panel), see **51 43 201 Removing and installing/replacing panel for roof pillar at front (A-pillar), left or right**
- Remove both trim panels for top door pillar (B-pillar trim panel), see **51 43 148 Removing and installing or replacing trim on left or right door pillar (top)**
- Remove both trim panels for rear roof pillar (C-pillar trim panel), see **51 43 251 Removing and installing/replacing trim panel for rear left or right roof pillar (C - pillar)**
- Remove both trim panels for rear roof pillar (D-pillar trim panel), see **51 43 252 Replacing trim panel for rear left or right roof pillar (D-pillar)**
- Remove trim on front roofliner, see **51 44 ... Removing and installing front roofliner trim**
- Remove front and rear head restraints
- Remove all ceiling lights

Version with dividing net mounts:

If necessary, remove all dividing net mounts:

Unclip trim (1) towards bottom and remove.

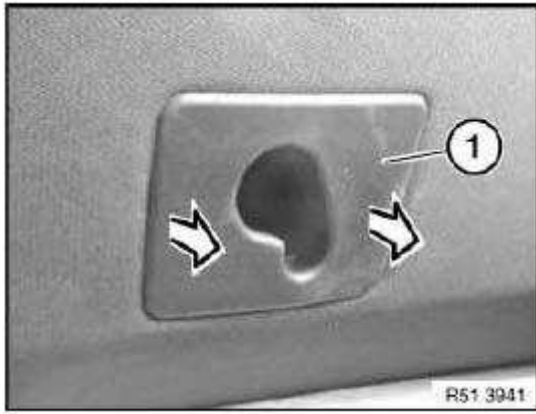


Fig. 465: Trim
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Guide (1) and catches (2) of trim (3) must not be damaged.

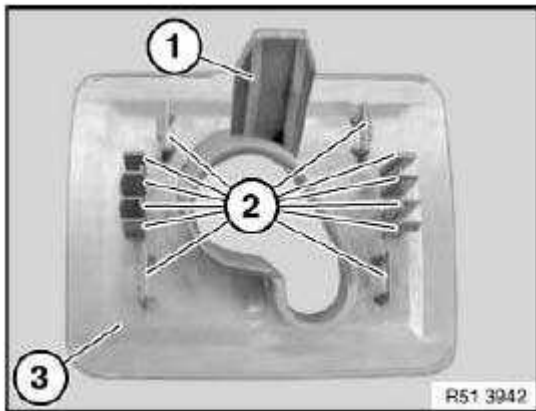


Fig. 466: Guide, Catches And Trim
 Courtesy of BMW OF NORTH AMERICA, INC.

- Move both front seat backrests as far back as possible.
- Remove roller cover from luggage compartment.
- Fold both rear-seat backrests forward.
- Pull off mucket of front and rear doors.

**IMPORTANT: The following tasks must be carried out with a second person assisting:
 Unclip clips (1) in sunroof frame area towards bottom.**

Extend rear roofliner towards bottom out of guide.

Turn headliner and remove towards rear.



Fig. 467: Clips
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Clips (1) and guide (2) must not be damaged.

If necessary, replace clips (1) and guide (2).

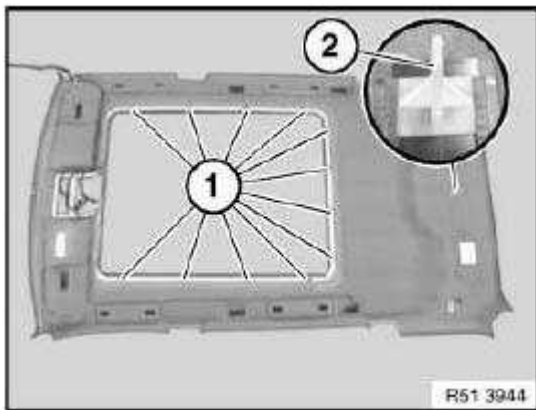
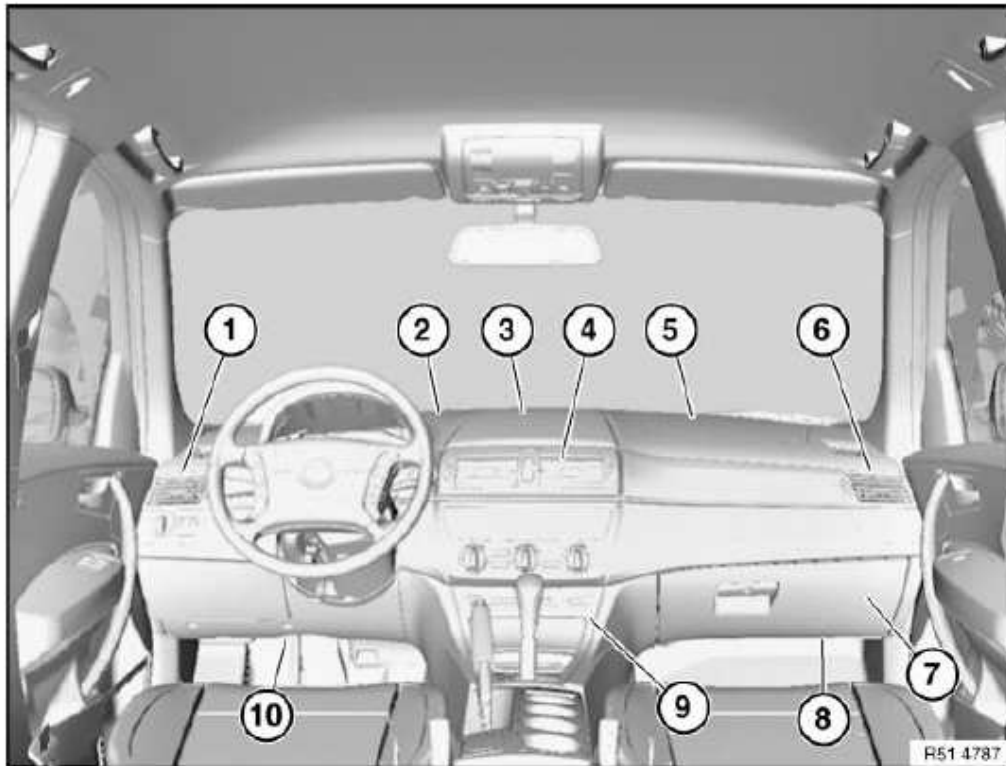


Fig. 468: Clips And Guide
Courtesy of BMW OF NORTH AMERICA, INC.

45 INSTRUMENT CLUSTER TRIM PANEL

51 45 .. OVERVIEW OF INSTRUMENT PANEL



- | | | | |
|---|---|----|---|
| 1 | Fresh-air grille, left | 6 | Fresh-air grille, right |
| 2 | Dashboard trim panel | 7 | Glovebox |
| 3 | Storage compartment in instrument panel | 8 | Instrument panel trim, bottom right |
| 4 | Fresh-air grille, middle | 9 | Function carrier on instrument panel trim |
| 5 | Airbag cover, passenger side | 10 | Panel for pedals |

Fig. 469: Instrument Panel Components

Courtesy of BMW OF NORTH AMERICA, INC.

51 45 ... REMOVING AND INSTALLING STORAGE TRAY IN INSTRUMENT PANEL

Necessary preliminary tasks:

- Remove center fresh air grill, see **64 22 162 REMOVING AND INSTALLING/REPLACING CENTER FRESH-AIR GRILL**

Release screws (1).

Feed storage tray in instrument panel (2) in direction of arrow out of upper guides (3) and remove.

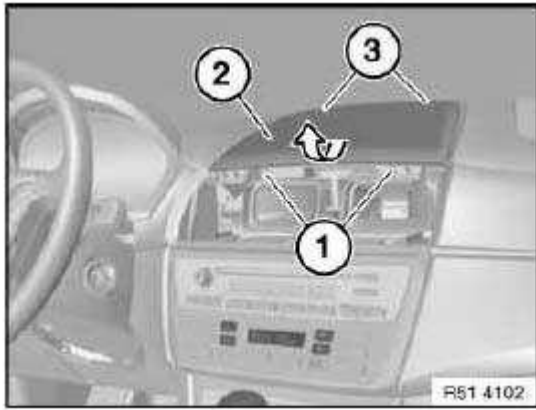


Fig. 470: Instrument Panel, Screw And Upper Guides
 Courtesy of BMW OF NORTH AMERICA, INC.

51 45 ... REMOVING AND INSTALLING/REPLACING BOTTOM RIGHT TRIM FOR INSTRUMENT PANEL

NOTE: Move front passenger seat completely towards rear.

Press bottom right instrument panel trim (1) forwards slightly and feed downwards out of guides (2).

Disconnect associated plug connection and remove bottom right instrument panel trim (1).

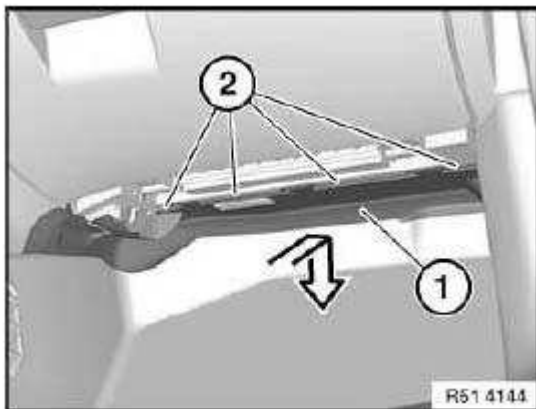


Fig. 471: Instrument Panel Trim And Guides
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Attachments (1) on bottom right instrument panel trim (2) must not be damaged.

Replacement:

Press catches (3) and remove footwell light (4).

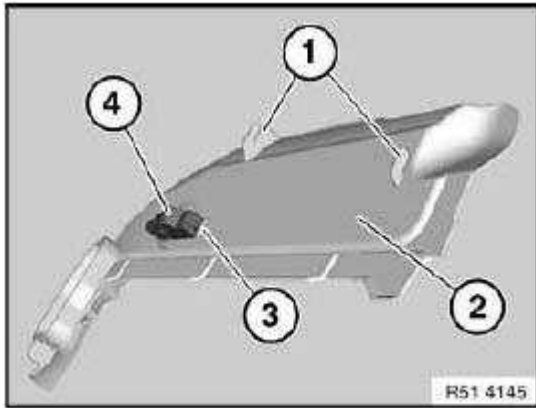


Fig. 472: Catches, Instrument Panel Trim And Footwell Light
 Courtesy of BMW OF NORTH AMERICA, INC.

51 45 030 REMOVING AND INSTALLING INSTRUMENT PANEL TRIM

NOTE: Observe the following instructions to facilitate removal of the instrument panel trim:

- Move front seats back completely and lower
- Move steering column into "lower" and "extended" position

Necessary preliminary tasks:

- Remove both trims for front roof pillar, see 51 43 201 Removing and installing/replacing panel for roof pillar at front (A-pillar), left or right
- Remove fixture for steering column stalks, see 61 31 005 REMOVING AND INSTALLING/REPLACING FIXTURE FOR STEERING COLUMN STALK
- Remove instrument cluster, see 62 11 280 REMOVING AND INSTALLING (REPLACING) INSTRUMENT CLUSTER
- Remove light operator unit, see 61 31 037 REMOVING AND INSTALLING/REPLACING LIGHT CONTROL UNIT
- Remove footwell side trim panel on A-pillar left, see 51 43 070 Removing and installing/replacing side trim panel, footwell, on A-pillar, left
- In appropriate version:
 - Remove storage compartment in instrument panel, see 51 45 ... Removing and installing storage tray in instrument panel
 - Remove Central Information Display, see 65 50 055 REMOVING AND INSTALLING/REPLACING CENTRAL INFORMATION DISPLAY
- Remove radio receiver, see 65 11 045 REMOVING AND INSTALLING/REPLACING RADIO/NAVIGATION CONTROL PANEL
- Remove finisher for preselector lever, see 51 16 210 Removing and installing/replacing trim for preselector lever

- Remove storage compartment, see [51 16 200 Removing and installing storage compartment](#)
- Remove right glovebox with housing, see [51 16 366 Removing and installing right glovebox with housing](#)
- Remove front right cup holder, see [51 16 194 Removing and installing/replacing front side left or right cup holder](#)
- Remove footwell side trim panel from right A-pillar, see [51 43 075 Removing and installing/replacing side trim panel, footwell, on A-pillar, right](#)
- Remove trim for instrument panel, bottom left, see [51 45 ... Removing and installing/replacing bottom right trim for instrument panel](#)
- Remove airbag module on front passenger side, see [72 12 000 REMOVING AND INSTALLING / REPLACING AIRBAG MODULE ON PASSENGER SIDE](#)

Open locks (1) and pull down fuse carrier (2).

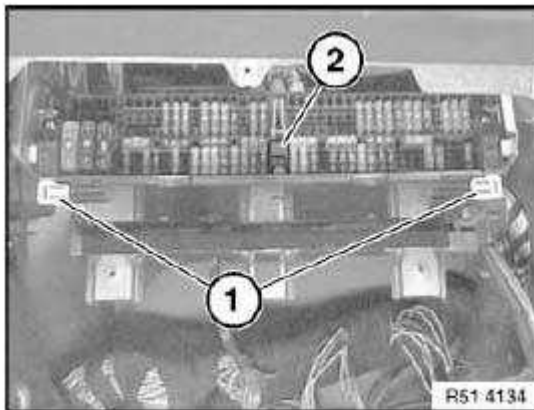


Fig. 473: Locks And Fuse Carrier
 Courtesy of BMW OF NORTH AMERICA, INC.

Open cover for passenger airbag (2).

NOTE: **The mounting plate may fall into the passenger footwell when screws (1) are released.**

Release screws (1), tightening torque: 72 12 10AZ, see [72 12 AIRBAG MODULES](#)

Remove complete passenger airbag cover (2) with associated mounting plate.

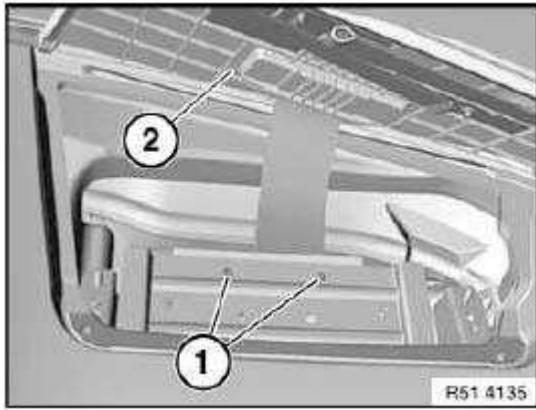


Fig. 474: Passenger Airbag Cover And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Make sure mounting plate (1) is correctly seated in retaining strap (2) of passenger airbag cover.

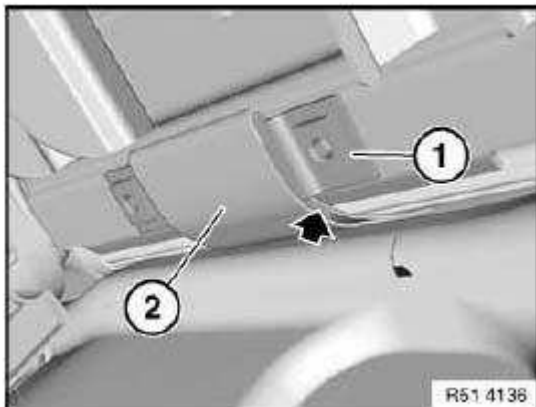


Fig. 475: Mounting Plate And Retaining Strap (1 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

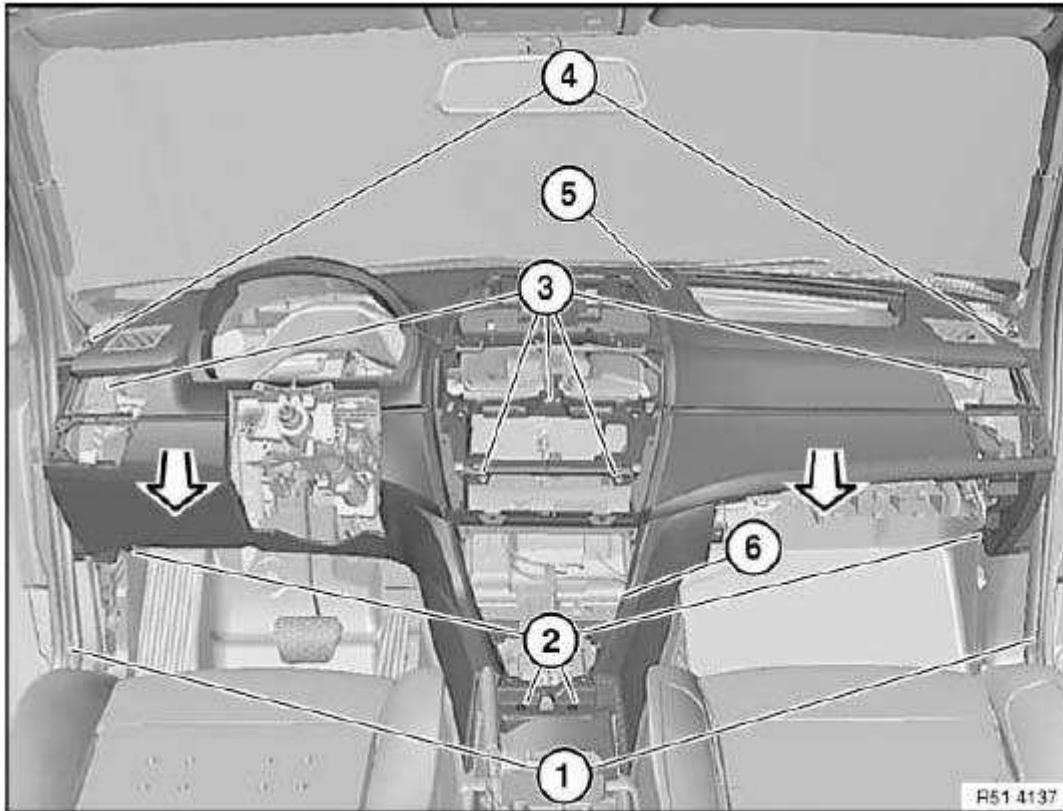


Fig. 476: Mounting Plate And Retaining Strap (2 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

Release mocket (1) in area of instrument panel trim (5).

Release screws (2).

Unscrew nuts (3).

Disconnect plug connection for solar sensor (6).

Pull back trim for instrument panel (5) and remove.

Installation:

Make sure foam insulation (4) is correctly seated before fitting instrument panel trim (5).

Installation:

Make sure guides (1) and (2) of instrument panel trim (3) are correctly seated in associated mountings.

Make sure seals are correctly seated on air ducts.

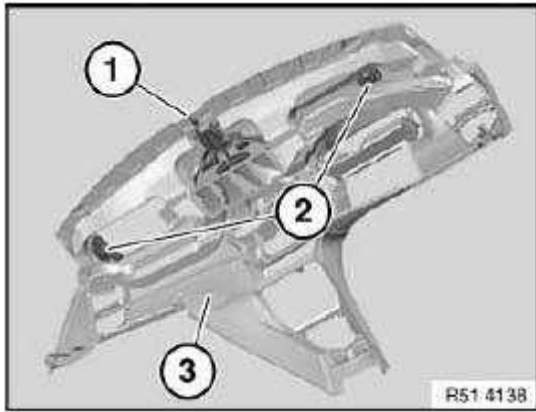


Fig. 477: Guides And Instrument Panel Trim
Courtesy of BMW OF NORTH AMERICA, INC.

51 45 031 REPLACING INSTRUMENT PANEL TRIM

Necessary preliminary tasks:

- Remove instrument panel trim, see **51 45 031 Replacing instrument panel trim**

Release screws (1) on gap cover for steering column (2).

Carefully pull off light switch wiring harness (3) secured with double-sided adhesive tape.

Installation:

Re-lay light switch wiring harness (3) in designated notch of instrument panel trim (4).

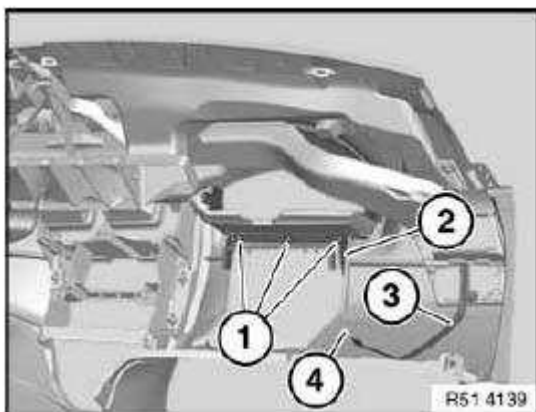


Fig. 478: Light Switch Wiring Harness And Instrument Panel Trim
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Remove trim from cutout for instrument cluster (2).

Remove gap cover for steering column (3).

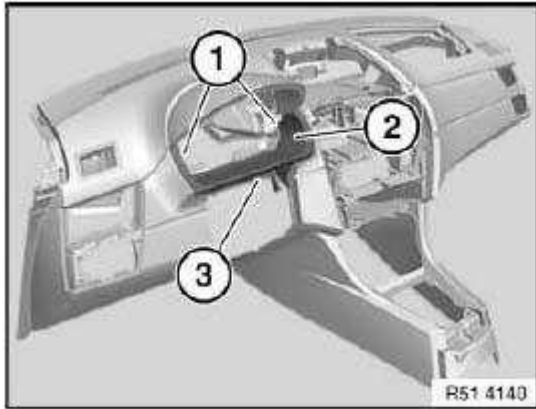


Fig. 479: Instrument Cluster And Steering Column
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, release screws (1) and remove trim (2).

Remove all metal nuts (3) from instrument panel trim (4).

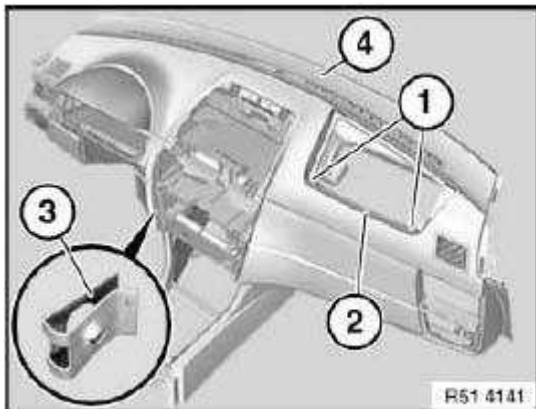


Fig. 480: Screws And Trim
Courtesy of BMW OF NORTH AMERICA, INC.

51 45 055 REMOVING AND INSTALLING/REPLACING AIRBAG COVER ON PASSENGER SIDE

Special tools required:

- **64 1 020 RELEASE HOOK**

WARNING: Each time the passenger airbag is triggered, it is necessary to replace its airbag cover.

**We cannot guarantee that the retaining straps of the airbag cover will not be damaged when the airbag is triggered.
If a damaged airbag cover is reused, we cannot guarantee that the retaining straps will work properly.**

Necessary preliminary tasks:

- Disconnect battery negative lead

Lever out airbag cover (1) with special tool 64 1 020.

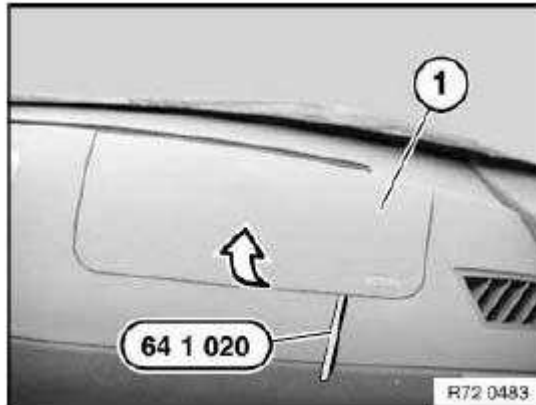


Fig. 481: Special Tool (64 1 020)

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: If necessary, remove felt.

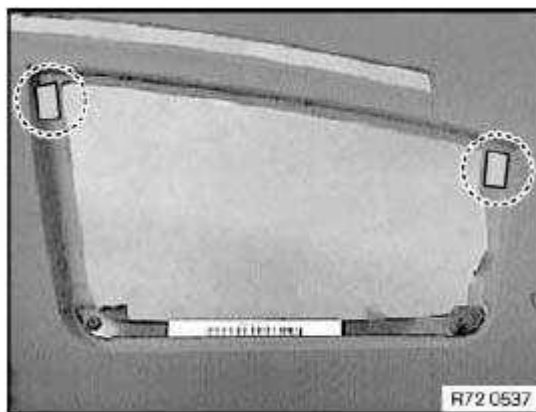


Fig. 482: Airbag Cover

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Remove adhesive residue and clean adhesive area with isopropanol.

Apply 5 mm dia. butylene tape (Terostat 2460) on left and right in groove.

$A = 30 \text{ mm} \pm 2$

$B = 15 \text{ mm} +5/-0$

$C = 40 \text{ mm} \pm 2$

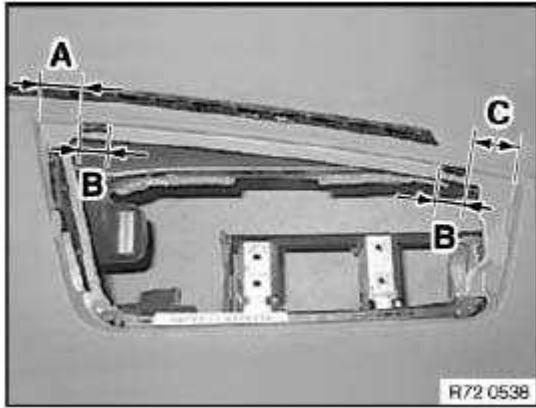


Fig. 483: Adhesive Area

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Clean adhesive area on airbag cover (3) with isopropanol.

Remove backing paper from butyl.

Lug (2) of airbag cover (3) must snap into groove (1) in instrument panel.

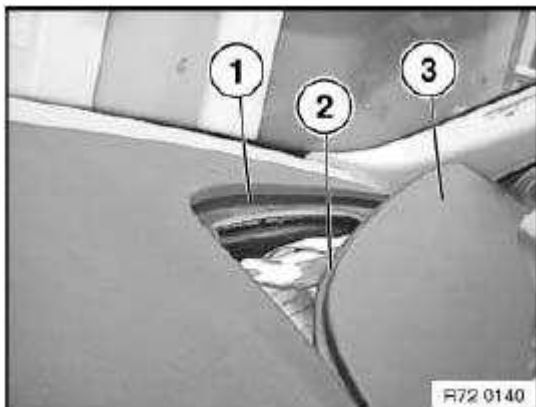


Fig. 484: Airbag Cover And Groove

Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) and remove airbag cover (2).

Tightening torque: 72 12 10AZ, see **72 12 AIRBAG MODULES**

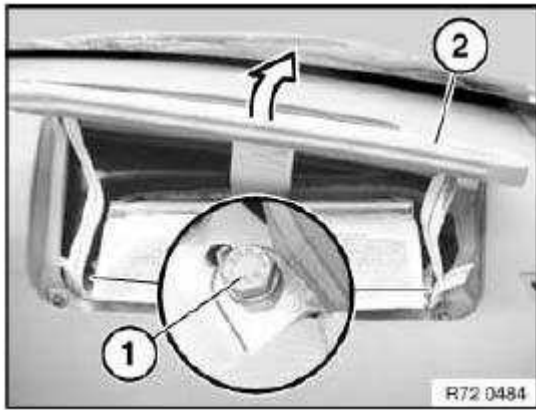


Fig. 485: Screws And Airbag Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Make sure turning lock of fitting (1) is correctly seated in bore hole.

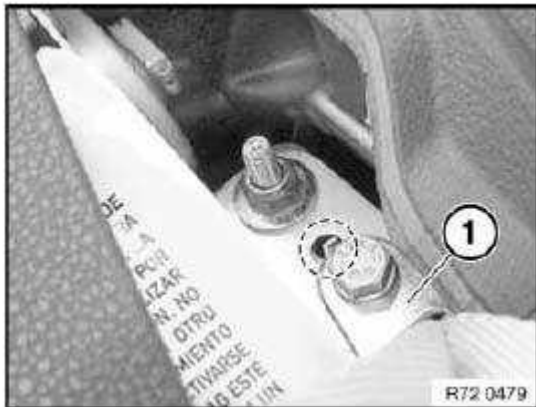


Fig. 486: Lock Of Fitting
Courtesy of BMW OF NORTH AMERICA, INC.

51 45 106 REMOVING AND INSTALLING/REPLACING FUNCTION CARRIER ON INSTRUMENT PANEL TRIM

Special tools required:

- 00 9 317 **00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)**

Necessary preliminary tasks:

Version with automatic transmission:

- Remove trim for preselector lever, see **51 16 210 Removing and installing/replacing trim for preselector lever**

Version with manual transmission:

- Remove gaiter for gear lever

Lever out retainers (1) in direction of arrow and remove.



Fig. 487: Retainers

Courtesy of BMW OF NORTH AMERICA, INC.

Unclip trim (1) with special tool 00 9 317 in lower area only.



Fig. 488: Special Tool (00 9 317)

Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) on trim (2).



Fig. 489: Screws And Trim
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) and pull trim (2) forwards slightly.

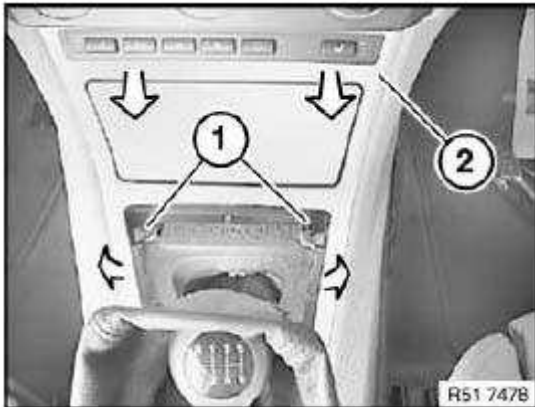


Fig. 490: Screws And Trim
Courtesy of BMW OF NORTH AMERICA, INC.

Depending on version, disconnect plug connections (1 and 2) and remove trim (3).

Replacement:

Remove switch unit in center console, see **61 31 057 REMOVING AND INSTALLING/REPLACING SWITCH UNIT IN CENTER CONSOLE**

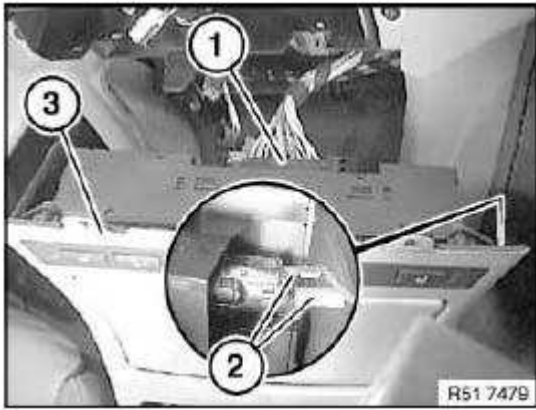


Fig. 491: Plug Connections And Trim
 Courtesy of BMW OF NORTH AMERICA, INC.

51 45 185 REMOVING AND INSTALLING/REPLACING TRIM FOR PEDAL ASSEMBLY

Release screws (1).

Unclip trim for pedal assembly (4) at retaining points (2).

Remove rotary clip (3) and pull back trim for pedal assembly (4) in direction of arrow.

Disconnect associated plug connections and remove trim for pedal assembly (3).

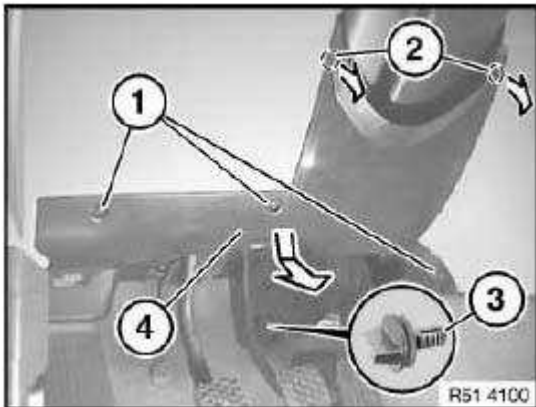


Fig. 492: Rotary Clip And Pedal Assembly
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Locator tabs (1) of trim for pedal assembly (2) must not be damaged.

Replacement:

- Unclip gong (3) and remove.
- Remove footwell light (4).

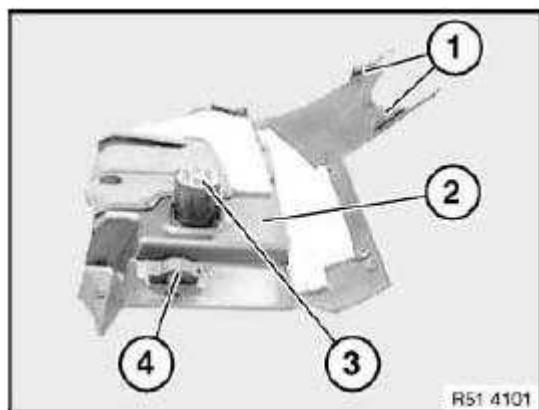


Fig. 493: Tabs, Pedal Assembly And Footwell Light
 Courtesy of BMW OF NORTH AMERICA, INC.

46 PARCEL SHELF TRIM PAN/ROLLER SUN BLIND

51 46 050 REMOVING AND INSTALLING/REPLACING TOP TRIM ON REAR APRON

Necessary preliminary tasks:

- Remove luggage compartment floor trim (luggage compartment mat), see **51 47 102 Removing and installing/replacing luggage compartment floor trim panel**
- Remove both trims for roof pillars at rear (D-pillar), see **51 43 252 Replacing trim panel for rear left or right roof pillar (D-pillar)**

Release screws (1).

Lever out protective caps (3) at openings (2), remove and release screws underneath.

Lever out trim (4) inwards/upwards.

Installation:

If necessary, replace damaged protective caps (3).

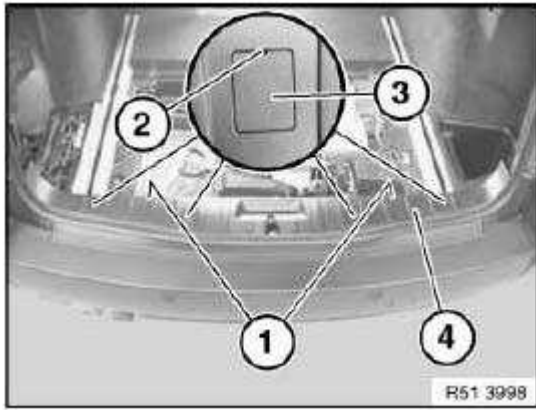


Fig. 494: Protective Caps And Trim

Courtesy of BMW OF NORTH AMERICA, INC.

47 FLOOR/LUGGAGE COMPARTMENT/ENGINE COMPARTMENT/TRIM PANELS

51 47 ... REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT UNDERBODY PANNELLING

Necessary preliminary tasks:

- Remove tension strut, see **33 32 170 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT TENSION STRUT**

Release screws (1).

Release expander rivet (2) and remove cover (3).

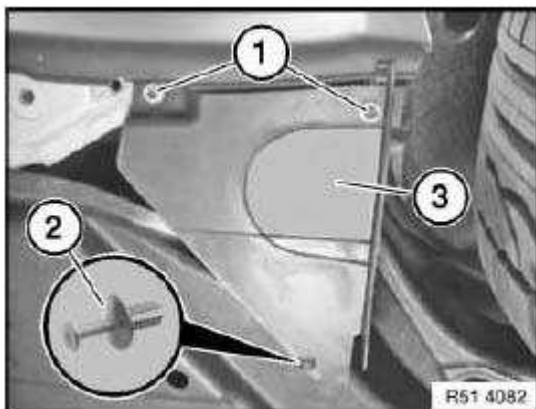


Fig. 495: Expander Rivet, Screws And Cover

Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws (1) and nuts (2).

Release expander rivets (3).

Feed out underbody panelling (4) in direction of arrow and remove.

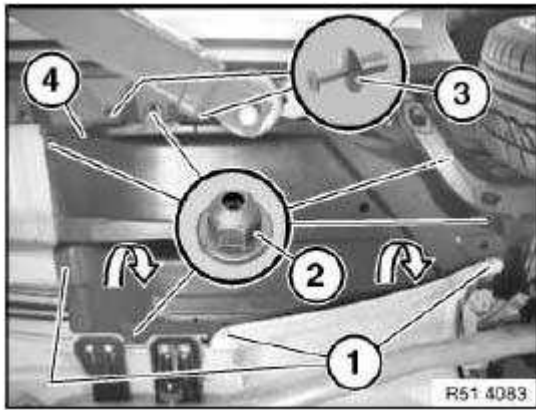


Fig. 496: Expander Rivets, Underbody Panelling And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

51 47 ... REMOVING AND INSTALLING/REPLACING STORAGE COMPARTMENT IN LUGGAGE COMPARTMENT ON RIGHT

Necessary preliminary tasks:

- Remove flap in luggage compartment panel on right, see **51 47 172 Removing and installing/replacing flap in luggage compartment trim, left or right**
- Remove right luggage compartment wheel arch trim, see **51 47 161 Removing and installing/replacing right luggage compartment wheel arch trim**

Release screws (1) and remove storage compartment (2) in direction of arrow.

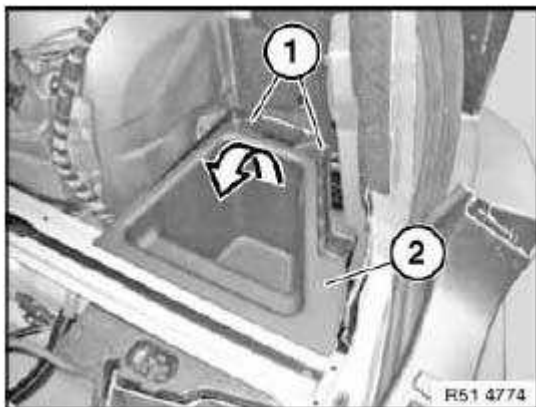


Fig. 497: Screws And Storage Compartment
Courtesy of BMW OF NORTH AMERICA, INC.

51 47 000 REMOVING AND INSTALLING/REPLACING FRONT (INSIDE) LEFT OR RIGHT ENTRANCE COVER STRIP

Remove entrance cover strip (1) with clips (2) towards top.

If necessary, lever out clips from floor plate.

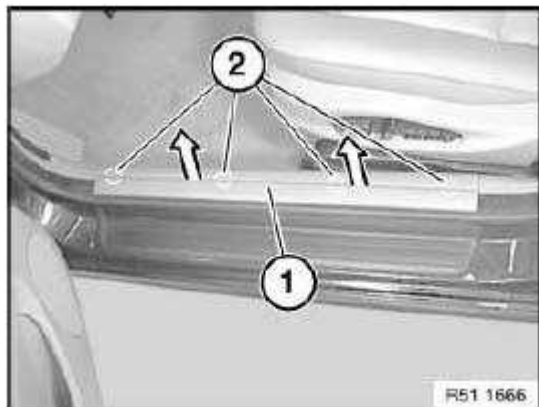


Fig. 498: Entrance Cover Strip And Clips
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Push clips (1) onto entrance cover strip (2).

If necessary, replace faulty clips (1).

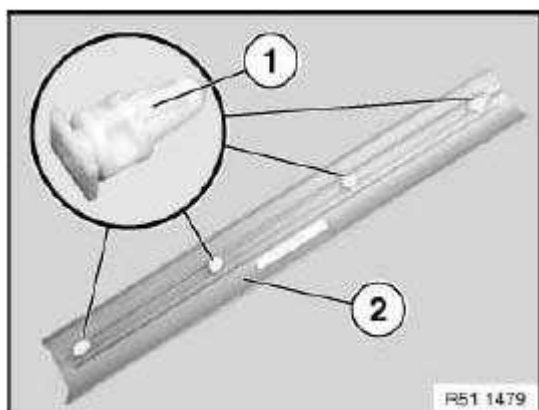


Fig. 499: Clips And Entrance Cover Strip
Courtesy of BMW OF NORTH AMERICA, INC.

51 47 030 REMOVING AND INSTALLING/REPLACING REAR (INSIDE) LEFT OR RIGHT ENTRANCE COVER STRIP

Special tools required:

- 00 9 317 **00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)**

Necessary preliminary tasks:

- Remove rear seat (through-loading system)

Unclip clips (1) on entrance cover strip (2) with special tool 00 9 317.

Remove entrance cover strip (2) towards top rear.

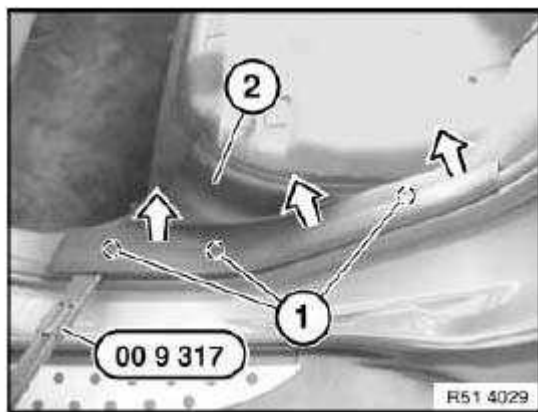


Fig. 500: Special Tool (00 9 317)

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Clips (1) and guide (2) on entrance cover strip (3) must not be damaged.

If necessary, replace faulty clips (1).

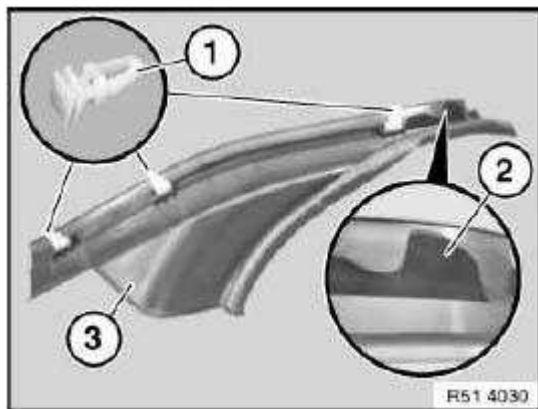


Fig. 501: Clips, Guide And Entrance Cover Strip

Courtesy of BMW OF NORTH AMERICA, INC.

51 47 102 REMOVING AND INSTALLING/REPLACING LUGGAGE COMPARTMENT FLOOR TRIM PANEL

Unlock luggage compartment floor trim panel (1) at handle (2) and remove in direction of arrow.



Fig. 502: Luggage Compartment Floor Trim Panel And Handle
Courtesy of BMW OF NORTH AMERICA, INC.

51 47 131 REPLACING FRONT TRIM FOR LUGGAGE COMPARTMENT FLOOR

Necessary preliminary tasks:

- Remove backrest for rear seat
- Remove rear luggage compartment floor trim, see **51 47 102 Removing and installing/replacing luggage compartment floor trim panel**

Release expander rivets (1) and nuts (2) and remove trim (3) in direction of arrow.

Installation:

If necessary, replace faulty expander rivets (1) and/or nuts (2).

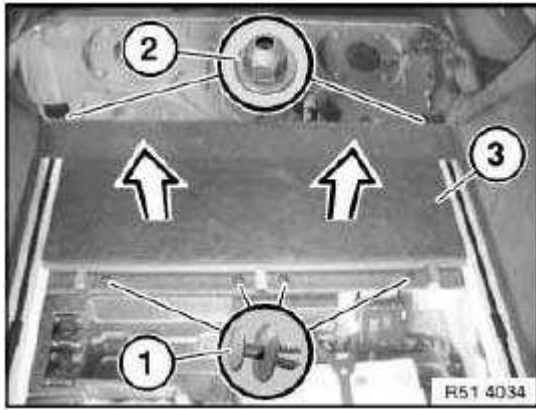


Fig. 503: Expander Rivets, Nuts And Trim
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Guides (1) and catches (2) on trim (4) must not be damaged.

Replacement:

If necessary, detach sound insulation (3) from trim (4) and fit on new part.

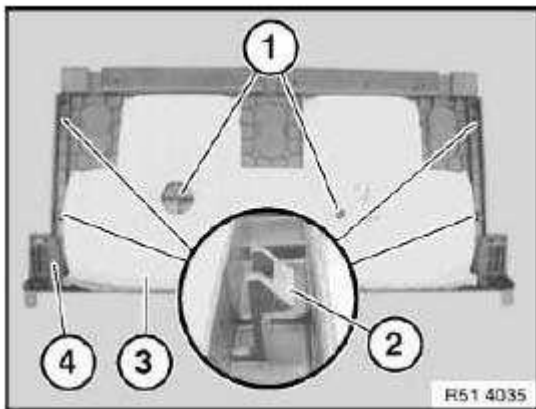


Fig. 504: Guides, Catches And Trim
 Courtesy of BMW OF NORTH AMERICA, INC.

51 47 135 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT LASHING RAIL IN LUGGAGE COMPARTMENT FLOOR

Necessary preliminary tasks:

- Remove inner window cavity cover strip, see **51 37 261 Removing and installing/replacing window cavity cover strip for door window, rear left or right**
- Remove rear luggage compartment floor trim, see **51 47 102 Removing and installing/replacing**

luggage compartment floor trim panel

- Remove front trim for luggage compartment floor, see **51 47 131 Replacing front trim for luggage compartment floor**
- Remove top trim from tail panel, see **51 46 050 Removing and installing/replacing top trim on rear apron**
- Remove luggage compartment wheel arch trim on left or right, see **51 47 151 Removing and installing / replacing left luggage compartment wheel arch trim**

Right side only:

- Remove storage compartment in luggage compartment on right, see **51 47 ... Removing and installing/replacing storage compartment in luggage compartment on right**

NOTE: The operation is described on the left side; proceed in the same way for the right side.

Release screws (1).

Lashing rail (2):

- A. Slide approx. 2 cm towards rear
- B. Feed out towards top front

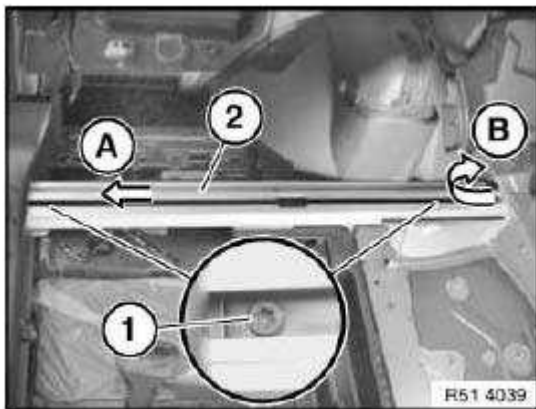


Fig. 505: Rail And Screw

Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

If necessary, remove reinforcement plate (1) with guide (2) from lashing rail (3) and fit on new part.

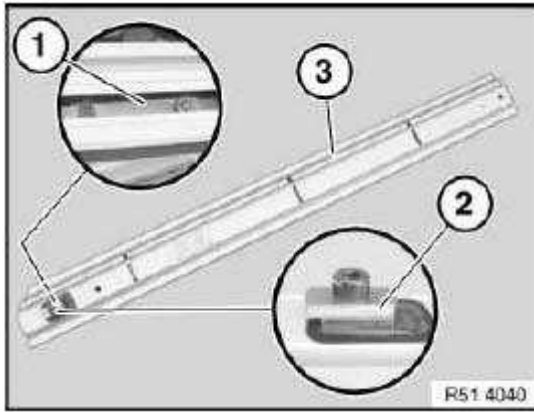


Fig. 506: Reinforcement Plate, Guide And Lashing Rail
 Courtesy of BMW OF NORTH AMERICA, INC.

51 47 151 REMOVING AND INSTALLING / REPLACING LEFT LUGGAGE COMPARTMENT WHEEL ARCH TRIM

Necessary preliminary tasks:

- Remove inner window cavity cover strip, see **51 37 261 Removing and installing/replacing window cavity cover strip for door window, rear left or right**
- Remove front trim for luggage compartment floor, see **51 47 131 Replacing front trim for luggage compartment floor**

Release screws (1).

Right side only: Release screw in area (2).

Lever out trim (3) in direction of arrow and remove.

Feed luggage compartment wheel arch trim (4) at top out of roller sun blind mounting and remove from passenger compartment in direction of arrow.

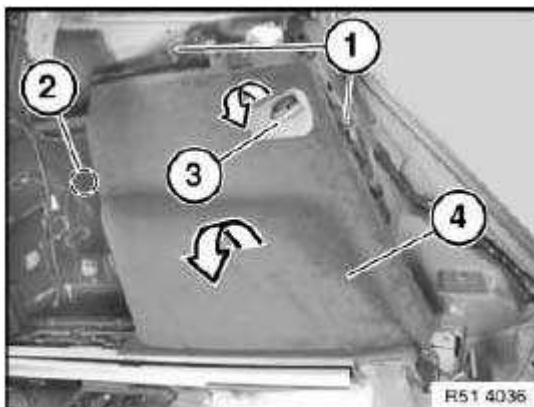


Fig. 507: Luggage Compartment Wheel Arch Trim, Trim And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Guides (1) and catches (2) on trim (3) must not be damaged.

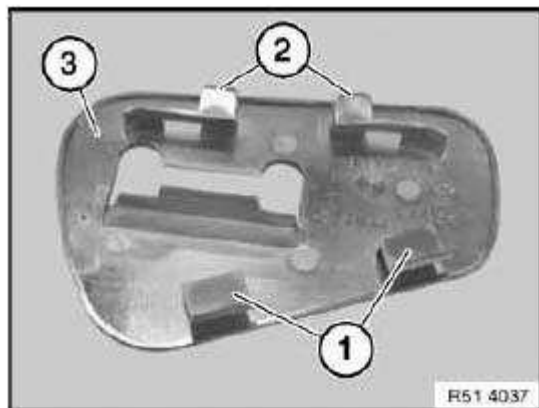


Fig. 508: Guides, Catches And Trim
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

If necessary, detach sound insulation (1) from trim (2) and fit on new part.

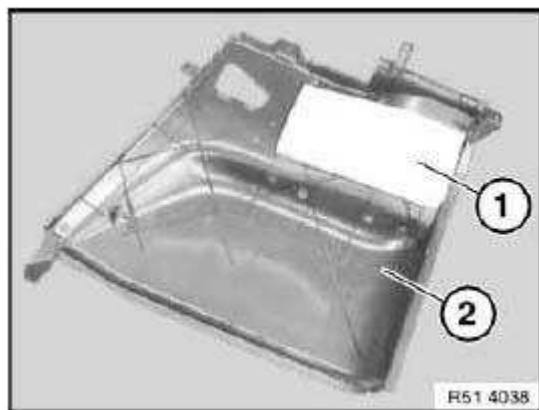


Fig. 509: Sound Insulation And Trim
Courtesy of BMW OF NORTH AMERICA, INC.

51 47 161 REMOVING AND INSTALLING/REPLACING RIGHT LUGGAGE COMPARTMENT WHEEL ARCH TRIM

Operation up to work on 12 V socket is identical to:

Removing and installing/replacing left luggage compartment wheel arch trim, see **51 47 151 Removing and installing / replacing left luggage compartment wheel arch trim**

Lever out socket (1) in direction of arrow and pull off a little.

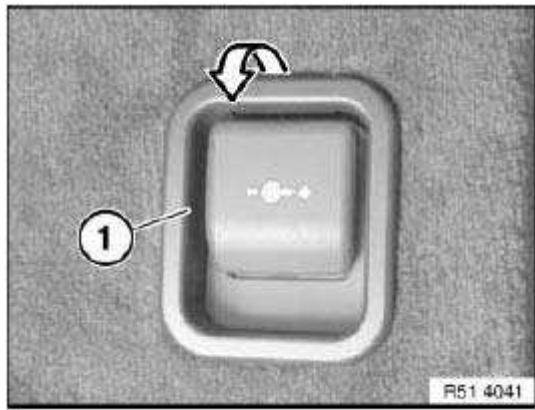


Fig. 510: Socket
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1) on socket (2).

Remove socket (2).

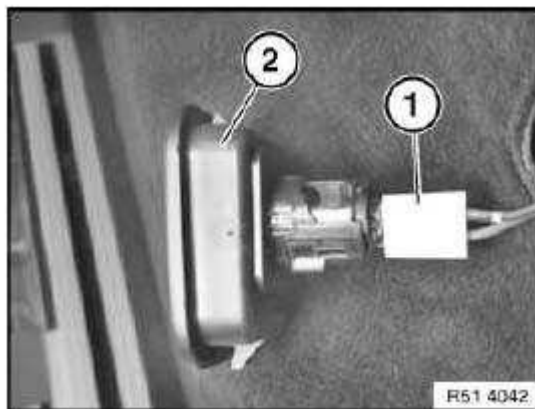


Fig. 511: Plug Connection And Socket
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Guide (1) and catches (2) on socket (3) must not be damaged.

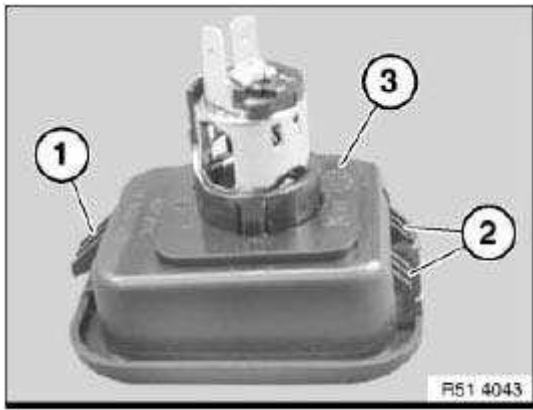


Fig. 512: Guide, Catches And Socket
Courtesy of BMW OF NORTH AMERICA, INC.

If replacing 12 V socket:

Open cover (1) of socket housing.

Turn socket insert (2) approx. 30° to right.

Turn socket insert (2) under tension back into initial position and pull out of socket housing.

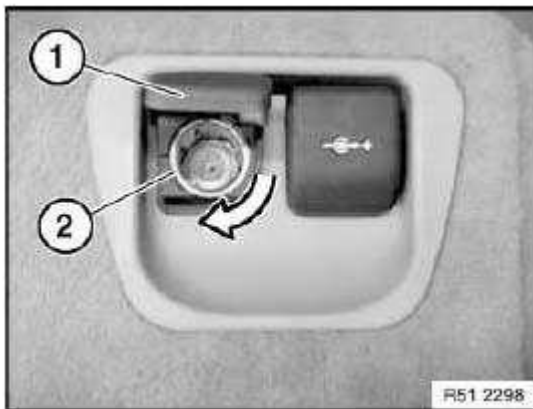


Fig. 513: Cover And Socket Insert
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Align socket insert (1) with retaining lugs (2) to groove (3) of socket housing and slide in until it is felt snapping into place.

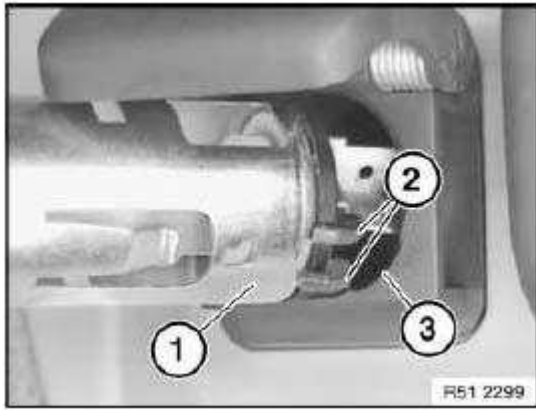


Fig. 514: Socket Insert, Retaining Lugs And Groove
 Courtesy of BMW OF NORTH AMERICA, INC.

51 47 172 REMOVING AND INSTALLING/REPLACING FLAP IN LUGGAGE COMPARTMENT TRIM, LEFT OR RIGHT

Press button (1), open flap in luggage compartment trim (2) and remove.

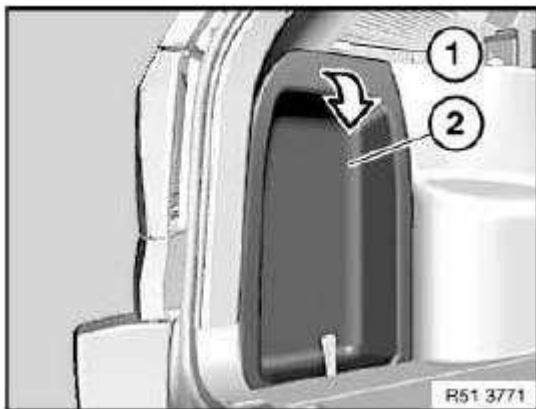


Fig. 515: Button And Luggage Compartment Trim
 Courtesy of BMW OF NORTH AMERICA, INC.

51 47 315 REMOVING AND INSTALLING/REPLACING FRONT CARPET FOR PASSENGER COMPARTMENT

Necessary preliminary tasks:

- Remove instrument panel trim, see **51 45 030 Removing and installing instrument panel trim**
- Remove left/right front seat
- Remove front left/right entrance cover strip, see **51 47 000 Removing and installing/replacing front (inside) left or right entrance cover strip**
- Remove accelerator pedal module

Cut out carpet (1) at cutting edge (2) on left/right.

**IMPORTANT: Make the cut as far as possible in the direction of the middle of the car to ensure that the cutting edges are covered by the storage compartment/instrument panel.
Pay attention to cables when cutting (risk of damage).**

If necessary, guide cable back through carpet (1).

Feed out carpet (1) towards rear/top.

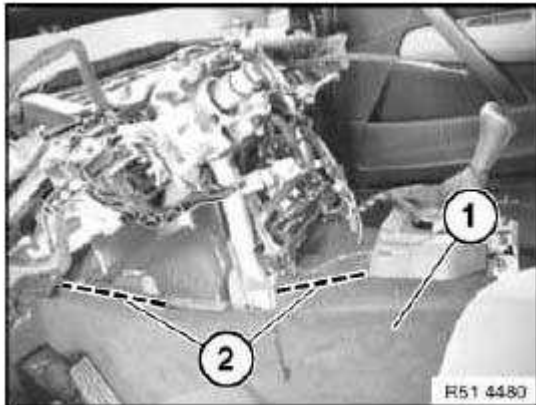


Fig. 516: Carpet And Cutting Edge
Courtesy of BMW OF NORTH AMERICA, INC.

Cutting edges (1) shown on removed carpet (2).

Replacement:

Place removed carpet on new carpet and carry over cuts to new carpet.

Installation:

Apertures (3) serve as alignment points for fitting the carpet (2).

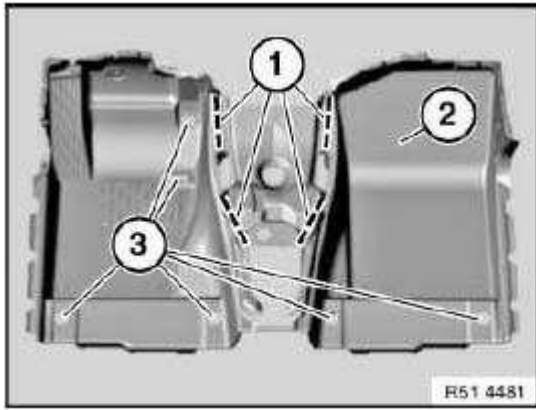


Fig. 517: Carpet, Apertures And Cutting Edge
 Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

Detach stowage net (1).

Remove clips (2) for stowage net (1).

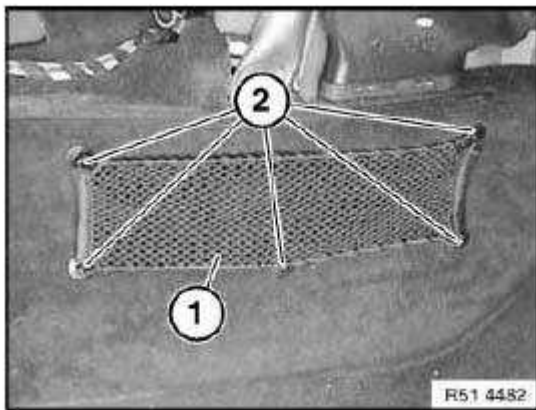


Fig. 518: Clips And Stowage Net
 Courtesy of BMW OF NORTH AMERICA, INC.

51 47 440 REMOVING AND INSTALLING/REPLACING REAR CARPET ON SEAT PAN

Necessary preliminary tasks:

- Remove left/right front seat
- Remove rear seat
- Remove handbrake lever
- Remove trim panel for door pillars on left/right, see **51 43 150 Removing and installing or replacing trim for left or right door pillar (bottom)**

- Remove front inside entrance cover strip, see **51 47 000 Removing and installing/replacing front (inside) left or right entrance cover strip**
- Remove entrance cover strip at rear inside, see **51 47 030 Removing and installing/replacing rear (inside) left or right entrance cover strip**
- Remove airbag control unit, see **65 77 016 REMOVING AND INSTALLING/REPLACING AIRBAG CONTROL UNIT**

Remove holder (1) for storage compartment.

Feed out cable (2) through carpet (3) and lay back.

Remove carpet (3).

Installation:

Make sure openings for air duct and attachment points are correctly positioned.

Make sure cable (2) is in correct position.

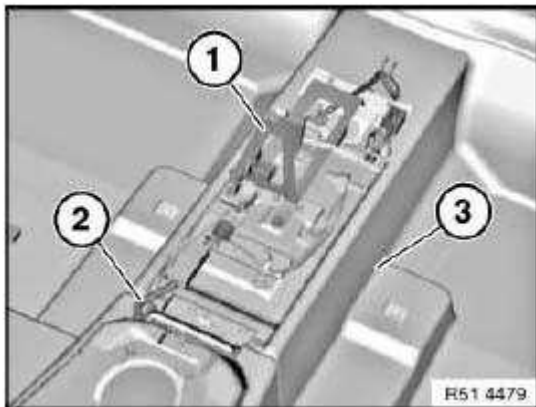


Fig. 519: Cable, Carpet And Holder
 Courtesy of BMW OF NORTH AMERICA, INC.

51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION

NOTE: Illustration created using 3.0d as an example. There may be differences in detail in the case of other models.

Release expansion rivet (1).

Unfasten screws (2).

Pull out underbody protection (3) towards rear.

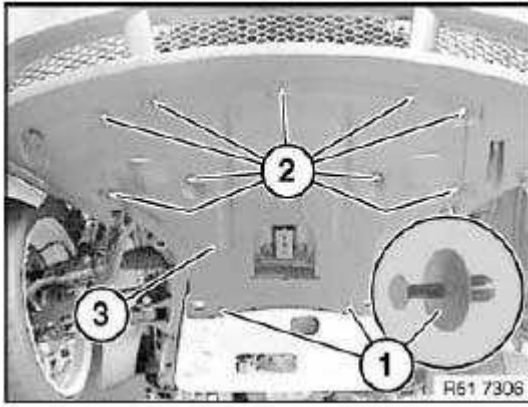


Fig. 520: Underbody Protection, Expansion Rivet And Screw
 Courtesy of BMW OF NORTH AMERICA, INC.

51 47 491 REMOVING AND INSTALLING/REPLACING REAR UNDERBODY PROTECTION

NOTE: Illustration created using 3.0d as an example. There may be differences in detail in the case of other models.

Unfasten screws (1) and nuts (2).

Feed out assembly underside protection (3) towards rear and remove.

Installation:

Ensure correct seating.

Centre assembly underside protection (3) and tighten down with screws (1) and nuts (2).

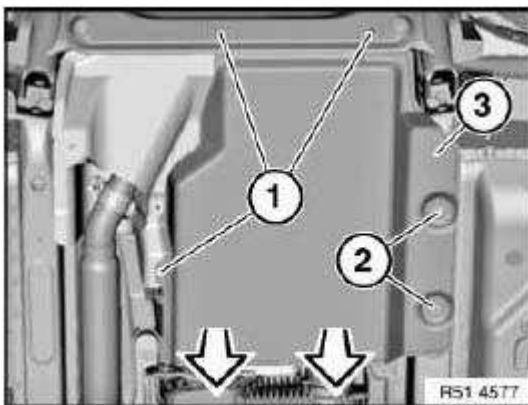


Fig. 521: Centre Assembly Underside Protection, Screws And Nuts
 Courtesy of BMW OF NORTH AMERICA, INC.

48 FRONT LID INSULATION LINING

51 48 001 REMOVING AND INSTALLING/REPLACING INSULATION LINING ON HOOD/BONNET

NOTE: Illustration created using the E87 as an example. There may be differences in detail in the case of other vehicle models.

Release threaded rivets (1) on insulation lining (2).

Remove insulation lining (2).

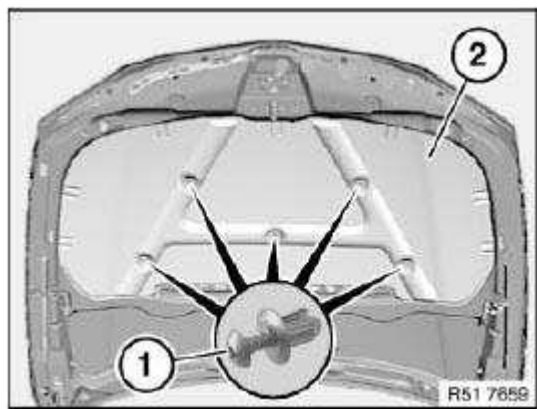


Fig. 522: Threaded Rivets And Insulation Lining
Courtesy of BMW OF NORTH AMERICA, INC.

51 48 060 REMOVING AND INSTALLING/REPLACING SOUND INSULATION IN LEFT OR RIGHT FRONT DOOR

Special tools required:

- 00 9 317 00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)

Necessary preliminary tasks:

- Remove front door trim panel, see 51 41 000 Removing and installing left or right front door trim panel

Using special tool 00 9 317, lever out sealing bead (1) of sound insulation (2) completely or if necessary partially.

Disconnect plug connection (3) at door lock.

Feed wires (4) out of sound insulation (2).

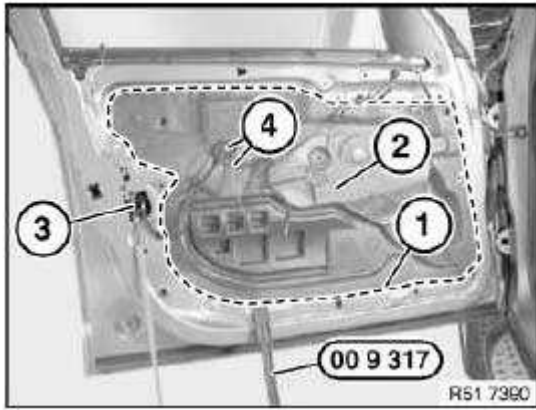


Fig. 523: Special Tool (00 9 317)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

In case of replacement or partial detachments, lay butylene tape (sourcing reference: BMW Parts Service) depending on the conditions on inner door panel or sound insulation.

Seal cable penetrations with butylene tape.

NOTE: Position of butylene tape (1) on inner door plate.

IMPORTANT: Do not damage Bowden cable (2) and lock knob control rod (3).

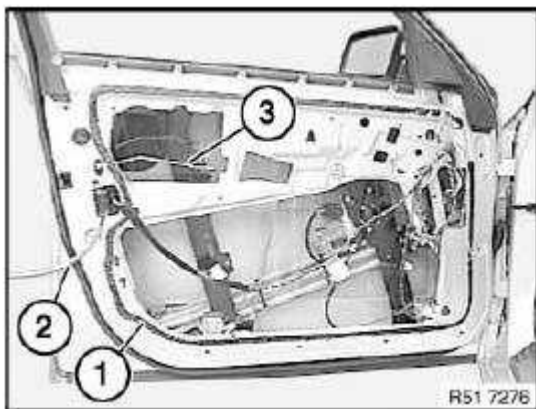


Fig. 524: Butylene Tape, Bowden Cable And Lock Knob Control Rod
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Position of butylene tape (1) on sound insulation (2).

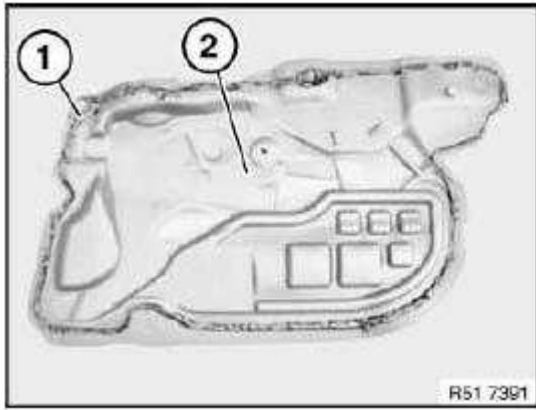


Fig. 525: Butylene Tape And Sound Insulation
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: A marking (2) is provided all round on the sound insulation (1).
Butylene tape (3) rests on or inside the marking (2).

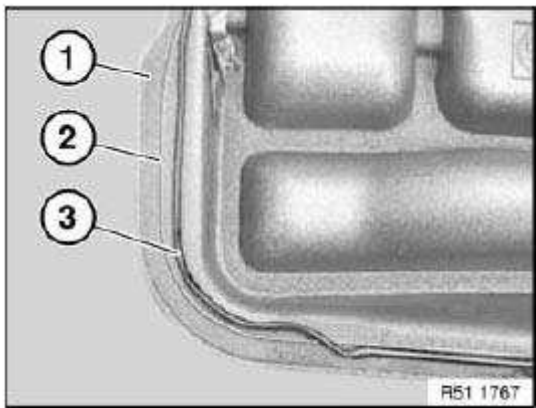


Fig. 526: Butylene Tape And Marking
Courtesy of BMW OF NORTH AMERICA, INC.

Clean bonding area with adhesive remover (sourcing reference: BMW Parts Service).

Air drying time: 1 minute

IMPORTANT: Adhesive areas must be dry and free of dust and grease.
Once it has been cleaned, do not touch the adhesive area with bare hands.

Lay single row of 6 mm dia. butylene tape or double row of 3 mm dia. tape (sourcing reference: BMW Parts Service) in specified adhesive area.

Heat butylene tape (hot air blower) and press down firmly on sound insulation all round.

Contact pressure with hand roller: approx. 30 N/cm²

Manual contact pressure: approx. 10 N/cm²

NOTE: Firm thumb pressure has approx. 50 N/cm²

51 48 070 REMOVING AND INSTALLING/REPLACING SOUND INSULATION ON LEFT OR RIGHT REAR DOOR

Special tools required:

- 00 9 317 **00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)**

Necessary preliminary tasks:

- Remove rear door trim panel, see **51 42 000 Removing and installing left or right rear door trim panel**

Disconnect plug connection (1).

Unclip clip (2).

Using special tool 00 9 317 (trim panel wedge), lever out sealing bead (3) of sound insulation (4) completely or if necessary partially.

Feed wires (5) out of sound insulation (4).

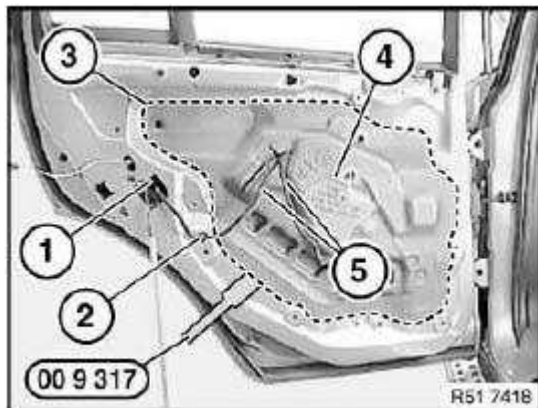


Fig. 527: Special Tool (00 9 317)

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

In case of replacement or partial detachments, lay butylene tape (sourcing reference: BMW Parts Service) depending on the conditions on inner door panel or sound insulation.

Seal cable penetrations with butylene tape.

NOTE: Position of butylene tape (1) on inner door plate.

IMPORTANT: Do not damage Bowden cable (2) and lock knob control rod (3).

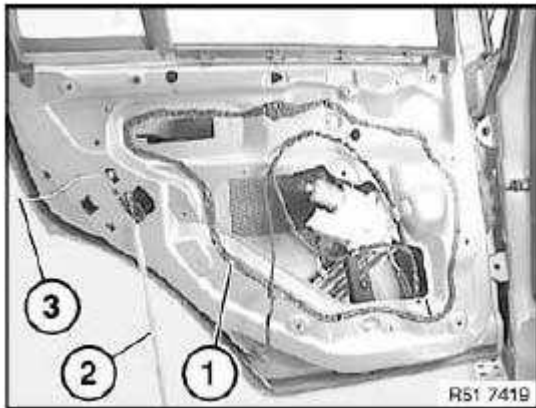


Fig. 528: Bowden Cable, Butylene Tape And Lock Knob Control Rod
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Position of butylene tape (1) on sound insulation (2).

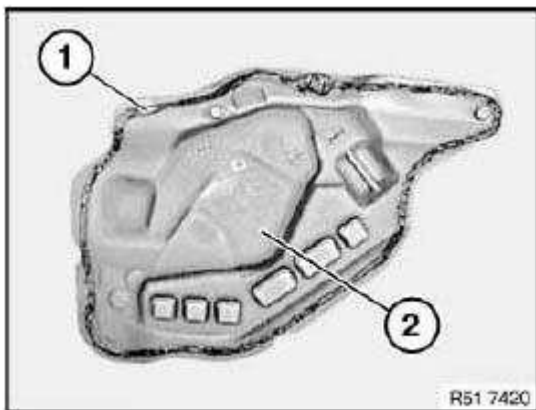


Fig. 529: Butylene Tape And Sound Insulation
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: A marking (2) is provided all round on the sound insulation (1).
Butylene tape (3) rests on or inside the marking (2).

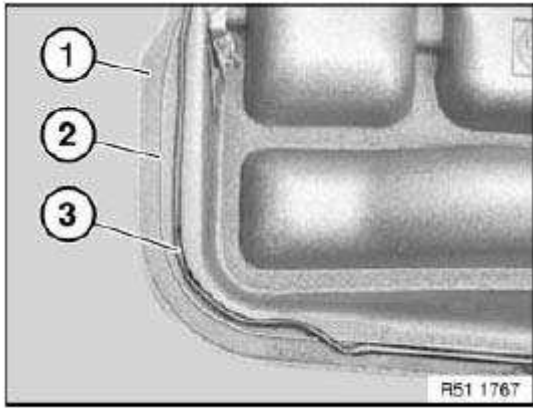


Fig. 530: Butylene Tape And Marking
Courtesy of BMW OF NORTH AMERICA, INC.

Clean bonding area with adhesive remover (sourcing reference: BMW Parts Service).

Air drying time: 1 minute

IMPORTANT: Adhesive areas must be dry and free of dust and grease.

Once it has been cleaned, do not touch the adhesive area with bare hands.

Lay single row of 6 mm dia. butylene tape or double row of 3 mm dia. tape (sourcing reference: BMW Parts Service) in specified adhesive area.

Heat butylene tape (hot air blower) and press down firmly on sound insulation all round.

Contact pressure with hand roller: approx. 30 N/cm²

Manual contact pressure: approx. 10 N/cm²

NOTE: Firm thumb pressure has approx. 50 N/cm²

49 REAR LID TRIM PANEL

51 49 003 REMOVING AND INSTALLING/REPLACING TRIM FOR REAR WINDOW FRAME ON LEFT OR RIGHT

Special tools required:

- 00 9 317 00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)

Necessary preliminary tasks:

- Remove trim for rear window frame at top, see 51 49 015 Removing and installing/replacing trim for

rear window frame at top

Unclip trim (1) with special tool 00 9 317 from retainers (2) and remove in direction of arrow.

Installation:

If necessary, detach clips (2) from trim (1) and insert in rear lid.

If necessary, replace faulty clips (2).

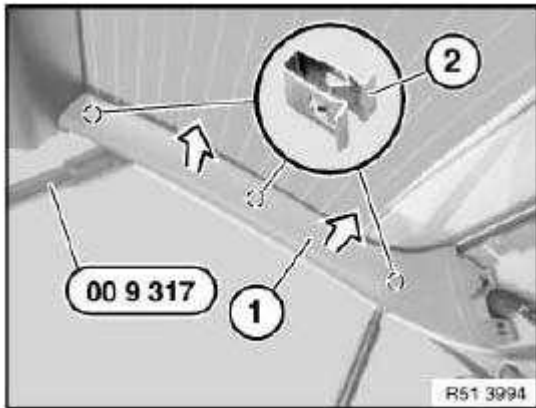


Fig. 531: Special Tool (00 9 317)

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Guides (1) on trim (2) must not be damaged.

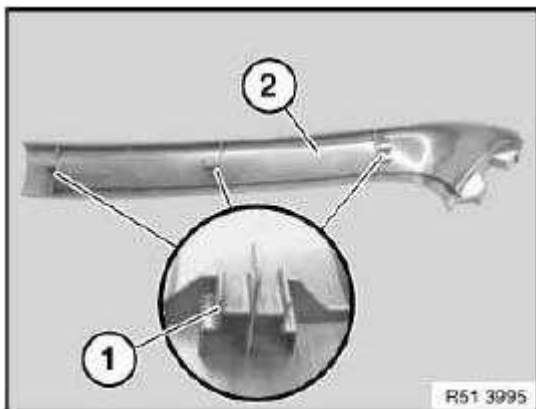


Fig. 532: Guides And Trim

Courtesy of BMW OF NORTH AMERICA, INC.

Necessary preliminary tasks:

- Remove luggage compartment light, see **63 31 080 REMOVING AND INSTALLING/REPLACING LUGGAGE COMPARTMENT LIGHT (D-PILLAR)**

Release expansion rivets (1).

Installation:

If necessary, replace faulty expander rivets (1).

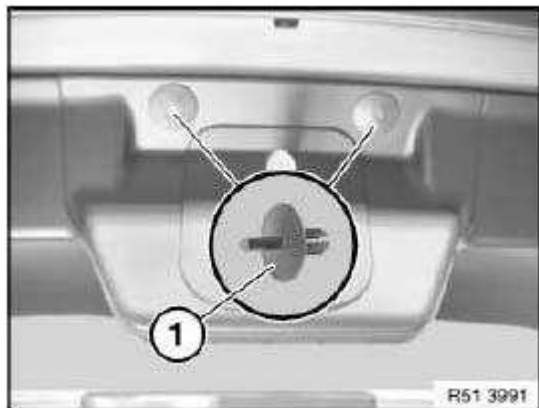


Fig. 533: Expander Rivets

Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Unclip clips (2) and remove trim (3) towards bottom.

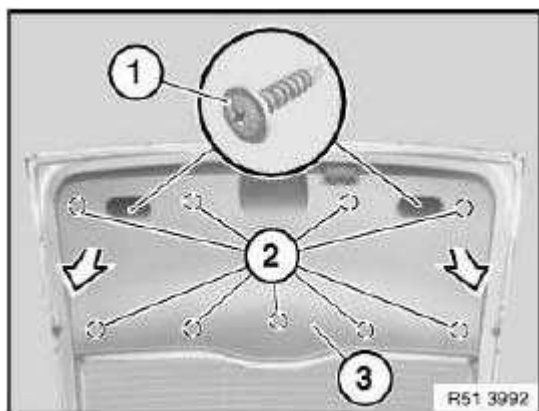


Fig. 534: Clips And Trim

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

All clips (1) are white.

If necessary, replace faulty clips (1).

Remove insulating mat (2) from old trim (3) and insert in new trim.

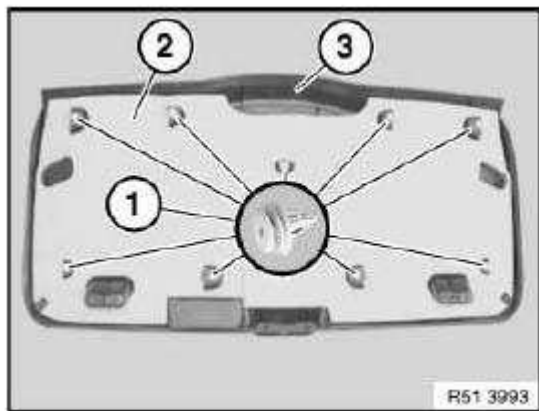


Fig. 535: Insulating Mat And Trim

Courtesy of BMW OF NORTH AMERICA, INC.

51 49 015 REMOVING AND INSTALLING/REPLACING TRIM FOR REAR WINDOW FRAME AT TOP

Special tools required:

- 00 9 317 **00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)**

Unclip trim (1) with special tool 00 9 317 from retainers (2) and remove in direction of arrow.

Installation:

If necessary, detach clips (2) from trim (1) and insert in rear lid.

If necessary, replace faulty clips (2).

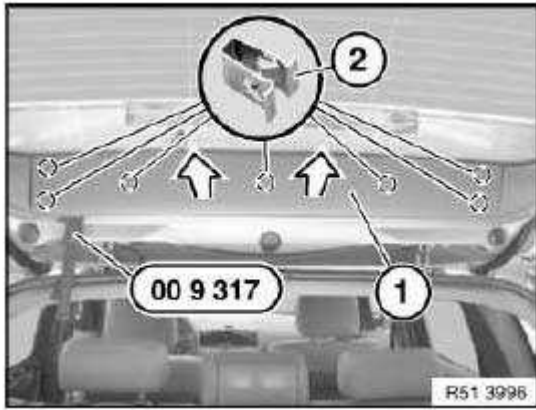


Fig. 536: Special Tool (00 9 317)
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

.Guides (1) on trim (2) must not be damaged.

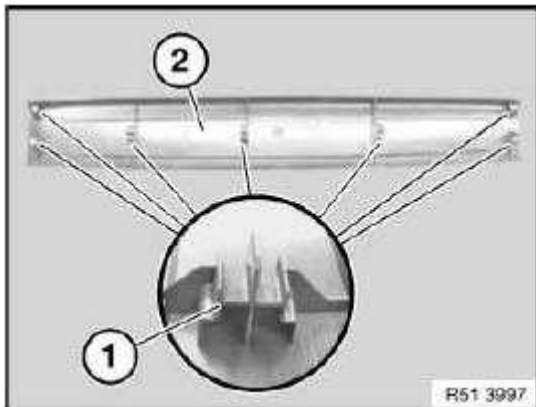


Fig. 537: Guides And Trim
 Courtesy of BMW OF NORTH AMERICA, INC.

71 GASKETS/SEALS/LOOSE BODY PARTS

51 70 ... FITTING SEALS

NOTE: All seals on the vehicle must be removed with the utmost care. Incorrect fitting may result in among other things wind noises and water ingress, and may compromise closing and opening comfort.

The following instructions always apply:

- Seals which are attached to the side frame can be removed and fitted as often as desired.
- Seals must not be damaged or cracked.

- The clamping area must be pressed together by hand to such an extent that rigid attachment to the side flange is still possible. The sides of the seal are permitted to touch each other slightly. A fully compressed seal is not permitted.

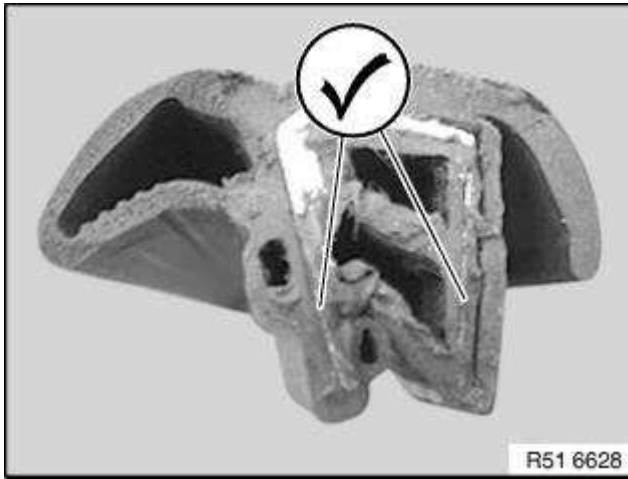


Fig. 538: Identifying Sides Of Seal (Good Seal)
 Courtesy of BMW OF NORTH AMERICA, INC.

- A special tool to press the clamping area together is not needed. Careful fitting by hand is sufficient.
- The seals must always be fitted over their full extent. There is no defined pressing force.
- If seals are repeatedly removed and fitted in the rear lid area, a new seal must be fitted (water ingress in event of sheet flaws).
- Seals must be checked after fitting for correct seating. If necessary, the seals must be lifted over the adjacent components with a suitable tool. Adjacent components must not be damaged.
- Seals must be replaced when the metal insert in the seal is visible (corrosion).

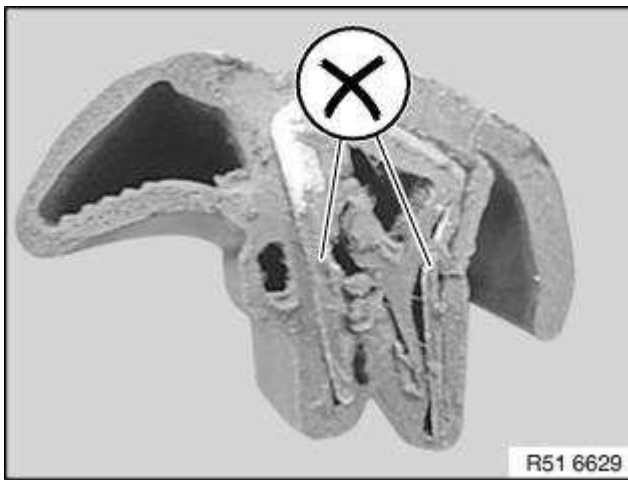


Fig. 539: Identifying Sides Of Seal (Bad Seal)
 Courtesy of BMW OF NORTH AMERICA, INC.

- The clamping area must be uniform.

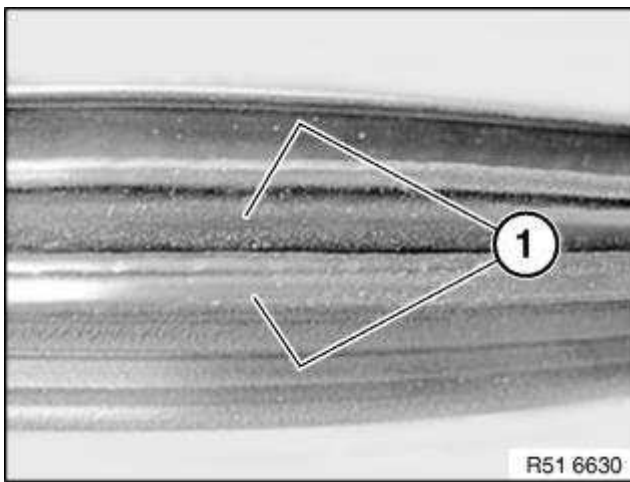


Fig. 540: Clamping Area Must Be Uniform
 Courtesy of BMW OF NORTH AMERICA, INC.

- Joint seals which are fitted with plastic clips must rest rigidly on the body. Otherwise, the clips or the joint seal must be replaced.

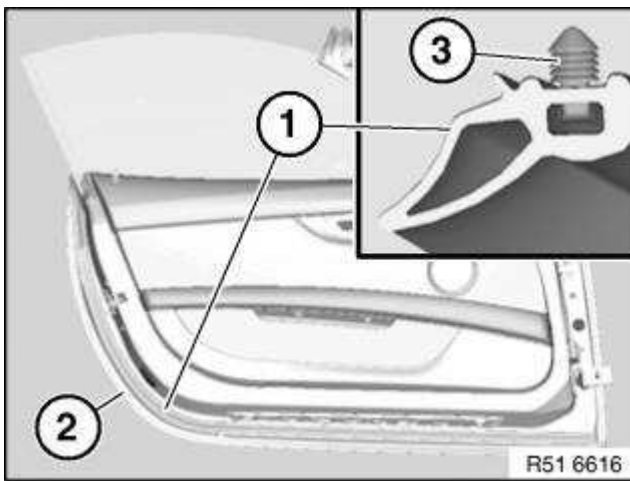


Fig. 541: Joint Seals Fitted With Plastic Clips Must Rest Rigidly On Body
 Courtesy of BMW OF NORTH AMERICA, INC.

51 71 040 REMOVING AND INSTALLING/REPLACING FRONT LEFT OR RIGHT WHEEL ARCH COVER

Necessary preliminary tasks:

- Remove front wheel

NOTE: The operation is described on the left side; proceed in the same way for the right side.

Drill off blind rivets (1).

Unfasten screws (2).

Carefully feed out wheel arch cover (3).

Installation:

Ensure wheel arch cover (3) is correctly seated.

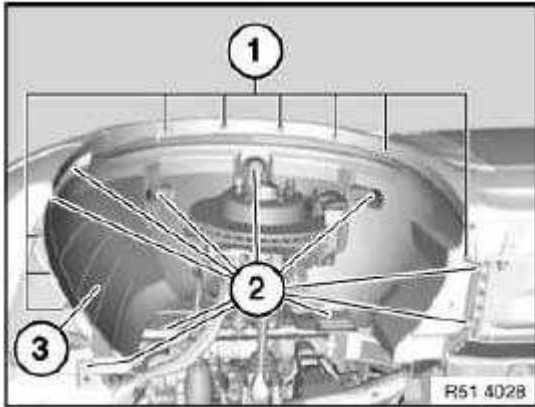


Fig. 542: Wheel Arch Cover, Rivets And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

51 71 041 REMOVING AND INSTALLING/REPLACING REAR LEFT OR RIGHT WHEEL ARCH COVER

Necessary preliminary tasks:

- Remove rear wheel

NOTE: The operation is described on the left side; proceed in the same way for the right side.

Drill off blind rivets (1).

Unfasten screws (2) and nuts (3).

Carefully feed out wheel arch cover.

Installation:

Make sure wheel arch cover is correctly seated.

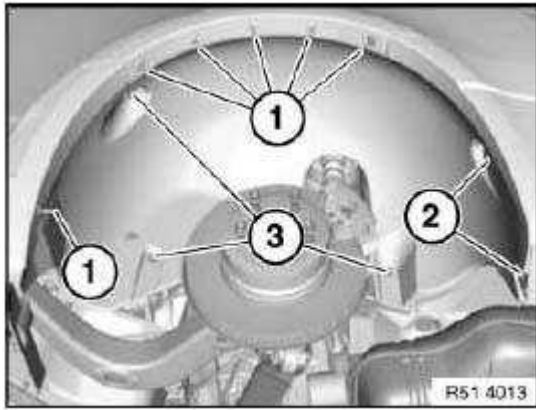


Fig. 543: Screws, Rivets And Nuts
 Courtesy of BMW OF NORTH AMERICA, INC.

51 71 080 REMOVING AND INSTALLING/REPLACING HEATER BULKHEAD

Necessary preliminary tasks:

- Remove microfilter for passenger compartment ventilation, see **64 31 010 REPLACING MICROFILTER FOR INTERIOR VENTILATION**

Unclip retainers (1) and feed cable out of cable duct.

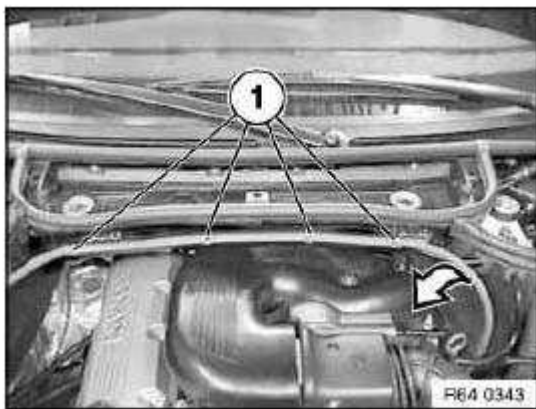


Fig. 544: Retainers
 Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) and remove microfilter housing towards front.

Installation:

Seals on microfilter housing must not be damaged or missing.

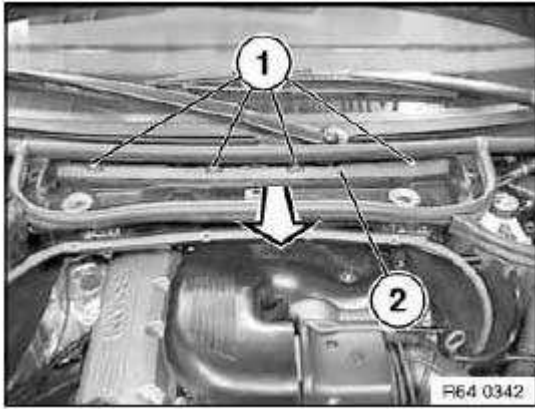


Fig. 545: Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Detach rubber strip (1).

Release locks (2) and pull side trim forwards a little.

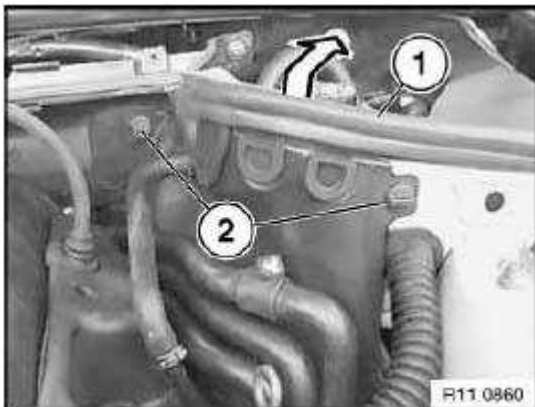


Fig. 546: Rubber Strip And Locks
Courtesy of BMW OF NORTH AMERICA, INC.

Remove screws (1) and (2).

Lift out heater bulkhead.

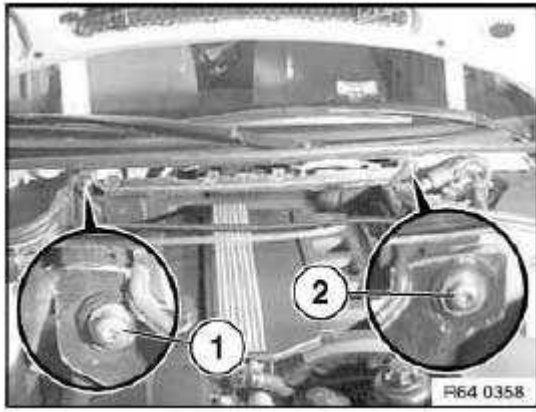


Fig. 547: Screws

Courtesy of BMW OF NORTH AMERICA, INC.

51 71 200 REMOVING AND INSTALLING / REPLACING SEAL ON REAR DOOR, LEFT OR RIGHT

NOTE: Follow repair instructions for bonded seals, see 54 0 ... REPAIR INSTRUCTIONS FOR BONDED SEALS

Detach seal (1) from rear door (2).

Clean adhesive area.

Installation:

- Pull protective film (liner) off seal to half-way point
- Feed seal at top into rubber guide (3)
- Gently press seal without stretching
- Check positioning of seal, correct if necessary and firmly press.
- Pull remaining protective film (liner) off seal.
- Press remaining seal without stretching.
- Check positioning of seal, correct if necessary and firmly press.

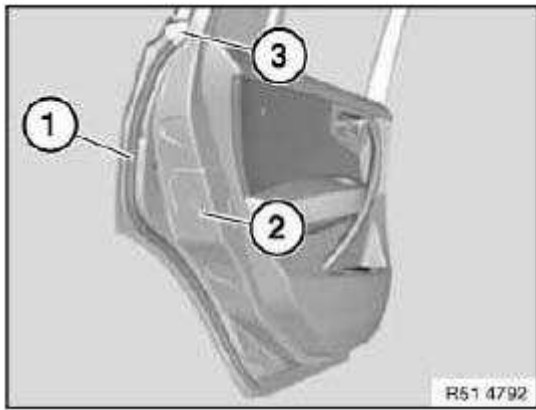


Fig. 548: Seal And Rear Door

Courtesy of BMW OF NORTH AMERICA, INC.

- IMPORTANT:**
- Do not grip bonding surface.
 - It is not the length of pressing in time but rather the level of pressing (approx. 10 ... 15 N/cm²) which is decisive here.
 - Separation of seal after pressing destroys the adhesive layer.

NOTE: After being pressed on gently, seal can be pulled off again up to 3 times. Do not dirty adhesive area.

51 71 373 REMOVING AND INSTALLING/REPLACING TENSION STRUT ON SPRING STRUT DOME

IMPORTANT: Vehicles must not be driven without tension struts.
Driving without tension struts may damage the vehicle body.

Release screws (1) and remove tension strut (2).

Tightening torque: 51 71 4AZ, see 51 71 SEALS AND LOOSE BODY PARTS

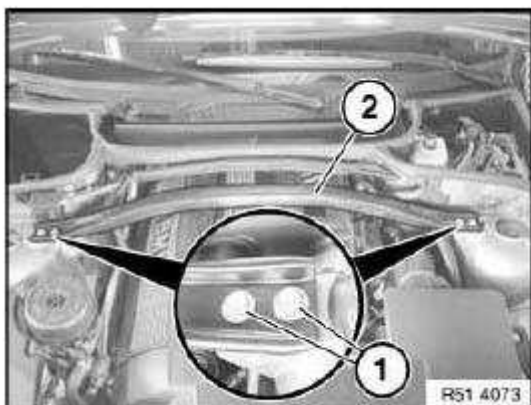


Fig. 549: Screws And Tension Strut

Courtesy of BMW OF NORTH AMERICA, INC.

51 71 407 REPLACING REAR SPOILER

Necessary preliminary tasks:

- Remove rear spoiler, see **51 71 412 Removing and installing rear spoiler**
- Remove auxiliary brake light, see **63 25 000 REMOVING AND INSTALLING/REPLACING AUXILIARY BRAKE LIGHT**
- If necessary, remove aerial/antenna
- If necessary, remove spray nozzle for rear window washer unit, see **61 62 110 REMOVING AND INSTALLING/REPLACING SPRAY NOZZLE FOR REAR WINDOW WIPER**

51 71 412 REMOVING AND INSTALLING REAR SPOILER

Necessary preliminary tasks:

- Remove trim for rear window frame at top, see **51 49 015 Removing and installing/replacing trim for rear window frame at top**

Detach hose in area (1).

Disconnect plug connection (2).

Unclip lines at points (3).

Disconnect plug connection (4).

Press rubber grommet (5) upwards out of rear lid (6).

Installation:

Make sure rubber grommet (5) is correctly seated.

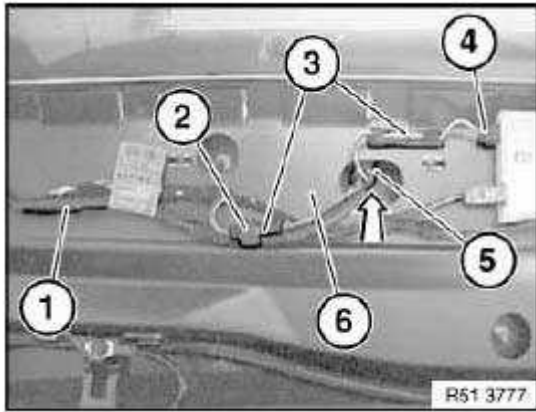


Fig. 550: Rubber Grommet, Rear Lid And Plug Connection
 Courtesy of BMW OF NORTH AMERICA, INC.

Lever out rubber plug (1).

Unscrew nuts (2).

Tightening torque: 51 71 2AZ, see **51 71 SEALS AND LOOSE BODY PARTS**

IMPORTANT: Carefully remove rear spoiler (3) in upwards direction from rear lid (4) (with aid of a 2nd person) and place on a clean surface.

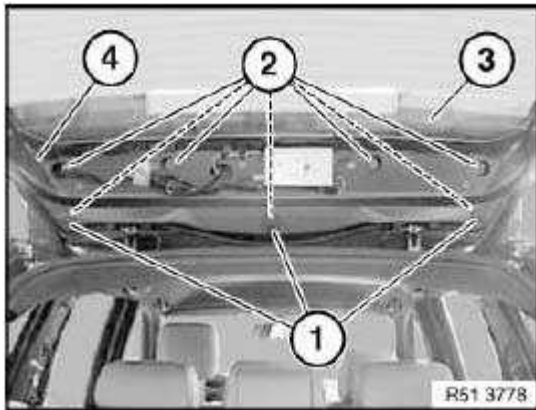


Fig. 551: Rubber Plug, Nuts And Rear Spoiler
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Lines may get caught as they are pulled out. If necessary, support lines as the are being fed out.

Installation:

Sealing washers (1) and side buffer stops must not be damaged.

Make sure there is a uniform gap all round.

If necessary, carry out height adjustment of rear spoiler (3) using adjusting screws (2).

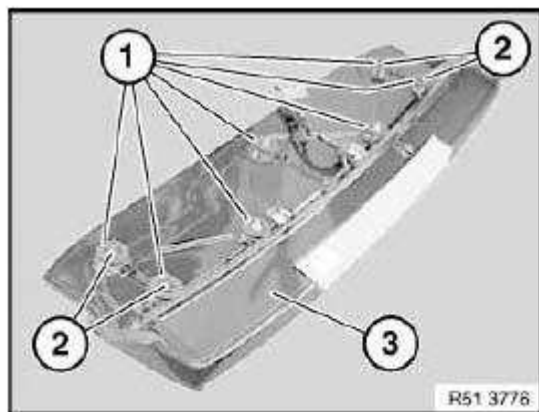


Fig. 552: Rear Spoiler, Adjusting Screws And Washers

Courtesy of BMW OF NORTH AMERICA, INC.

51 71 470 REMOVING AND INSTALLING/REPLACING TRIM ON FRONT LEFT OR RIGHT WHEEL ARCH

Necessary preliminary tasks:

- Remove cover on sill, see **51 71 472 Removing and installing/replacing cover on left or right sill**

Build date up to 09/2004:

- Remove trim on front side panel

Release blind rivets (1) and expander rivet (2).

Snap out trim (4) at clips (3) and feed out.

Installation:

If necessary, replace expander rivet (2) and/or clip (3).

Make sure trim (4) is correctly seated on underbody protection and bumper.

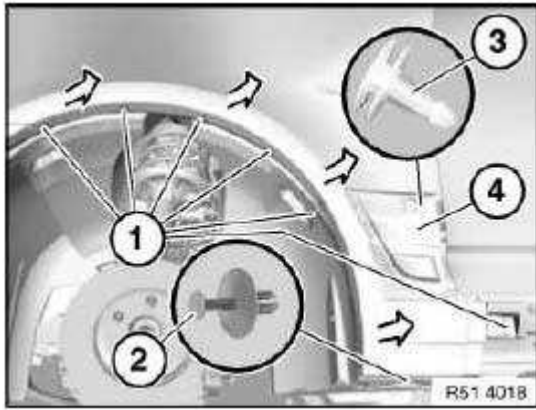


Fig. 553: Blind Rivets, Clip And Expander Rivet
 Courtesy of BMW OF NORTH AMERICA, INC.

Version with M Technic aerodynamic kit:

Release blind rivets (1) and screw (2).

Snap out trim (4) at clips (3) and feed out.

Installation:

If necessary, replace faulty clips (3).

Make sure trim (4) is correctly seated on underbody protection and bumper.

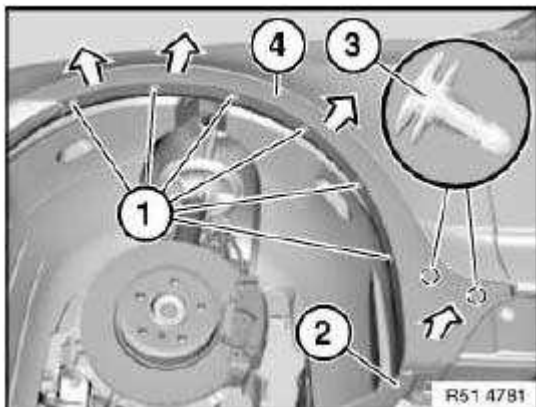


Fig. 554: Blind Rivets, Trim And Screw
 Courtesy of BMW OF NORTH AMERICA, INC.

51 71 472 REMOVING AND INSTALLING/REPLACING COVER ON LEFT OR RIGHT SILL

Necessary preliminary tasks:

- Remove trim on rear wheel arch, see 51 71 478 Removing and installing/replacing trim on rear left or right wheel arch

Release blind rivet (1) and screw (2) on cover (3).

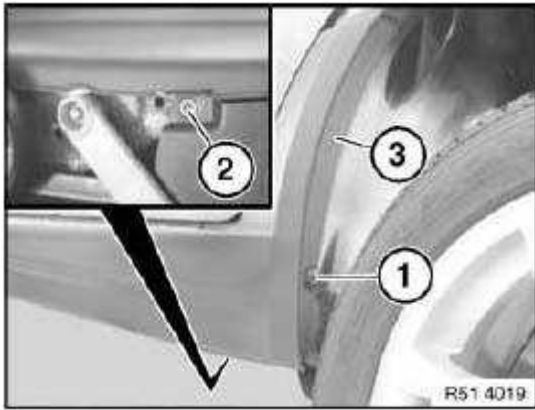


Fig. 555: Blind Rivet, Screw And Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Release all blind rivets (1) on cover (2).

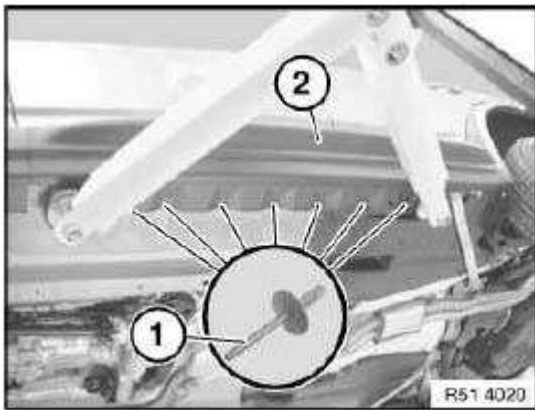


Fig. 556: Blind Rivets And Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Version without M Technic aerodynamic kit:

Unclip cover (1) from running board (2) starting at rear and remove.

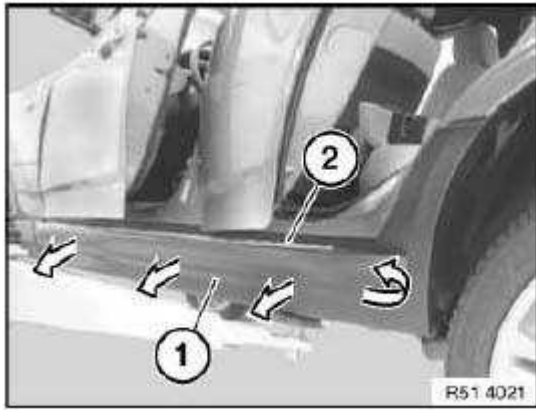


Fig. 557: Cover And Running Board
Courtesy of BMW OF NORTH AMERICA, INC.

Version with M Technic aerodynamic kit:

Snap cover (1) out of clips (2) and feed out towards bottom rear.

Installation:

If necessary, replace faulty clips (2).

Feed cover (1) correctly into trim on front wheel arch.

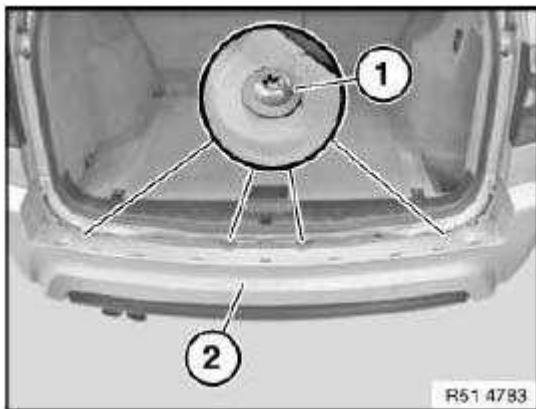


Fig. 558: Screws And Bumper Trim
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Guides (1) and clips (2) on cover (3) must not be damaged.

If necessary, replace faulty clips (2).

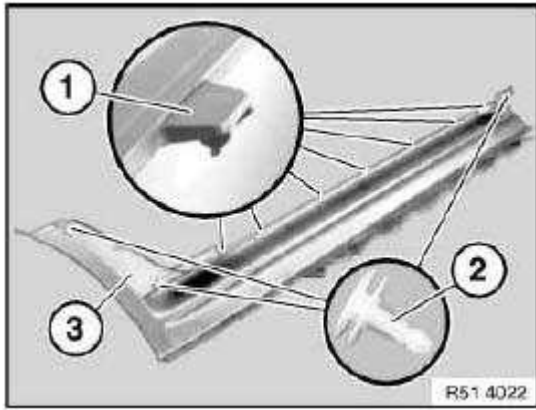


Fig. 559: Guides, Clips And Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Version with M Technic aerodynamic kit:

To avoid chafing marks on cover (2), stick protective film (1) onto cover (2).

If necessary, stick protective film (1) in a moist bonding process, see **51 00 ... Instructions on sticking film** onto cover (2).

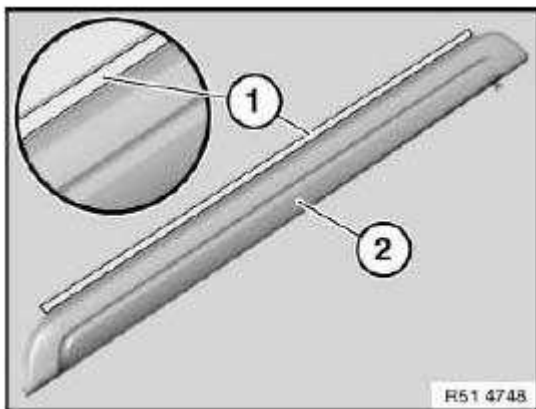


Fig. 560: Protective Film And Cover
Courtesy of BMW OF NORTH AMERICA, INC.

51 71 473 REMOVING AND INSTALLING/REPLACING TAKE-UP FOR COVER ON LEFT OR RIGHT SILL

Special tools required:

- 00 9 317 **00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)**

Necessary preliminary tasks:

- Remove cover on sill, see **51 71 472 Removing and installing/replacing cover on left or right sill**

Drill out blind rivet (1).

Loosen screws (2).

Installation:

Tightening torque: 51 71 16AZ, see **51 71 SEALS AND LOOSE BODY PARTS**

Feed take-up (4) in direction of arrow out of trim (3).

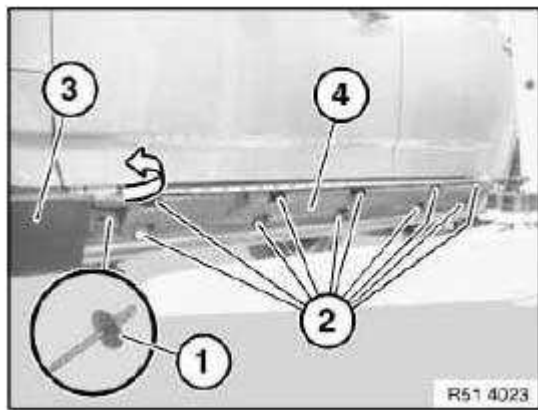


Fig. 561: Blind Rivet, Trim And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

If necessary, release screws (1) on running board (2).

Feed out running board (2) in direction of arrow.

Installation:

Guides (3) on take-up (4) must not be damaged.

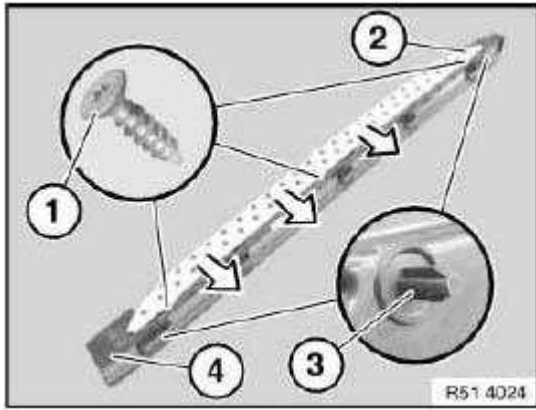


Fig. 562: Guides And Running Board
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

If necessary, replace nuts (1) on take-up (2).

Guides (3) on running board (4) must not be damaged.

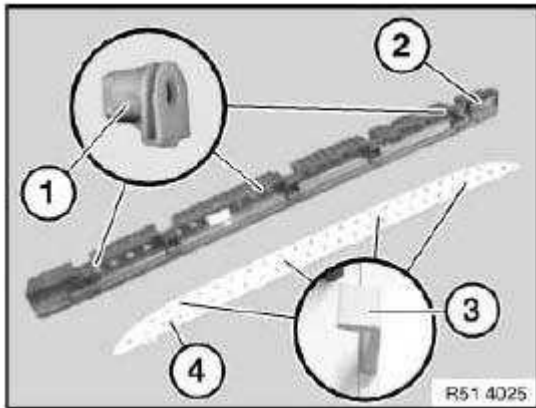


Fig. 563: Guides, Running Board And Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, unclip clips (1) on cover (2) with special tool 00 9 317.

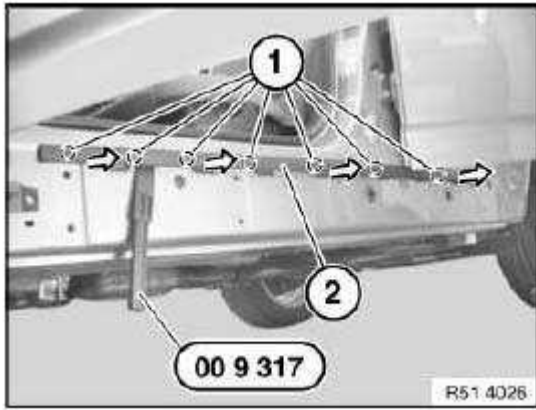


Fig. 564: Clips And Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

If necessary, replace faulty clips (1) on cover (2).

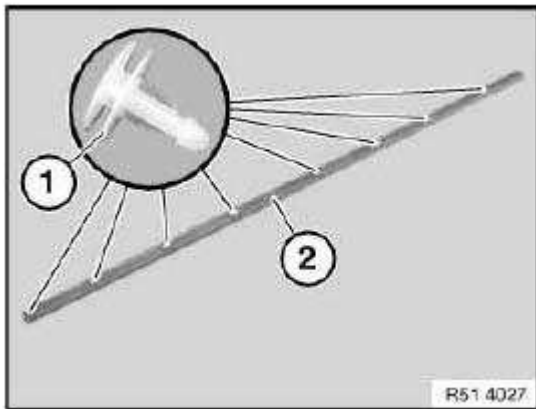


Fig. 565: Clips And Cover
Courtesy of BMW OF NORTH AMERICA, INC.

51 71 478 REMOVING AND INSTALLING/REPLACING TRIM ON REAR LEFT OR RIGHT WHEEL ARCH

Release blind rivets (1) and remove trim (2) towards top rear.

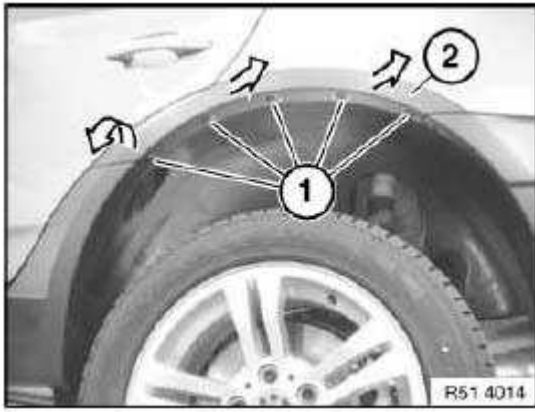


Fig. 566: Blind Rivets And Trim
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Guides (1) on trim (2) must not be damaged.

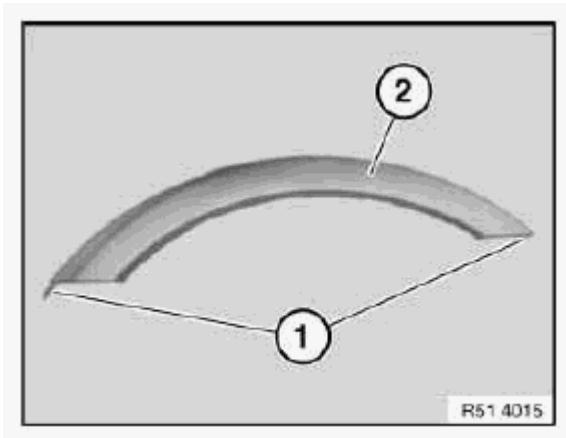


Fig. 567: Guides And Trim
Courtesy of BMW OF NORTH AMERICA, INC.

Version with M Technic aerodynamic kit:

Release blind rivets (1).

Release trim (3) from clips (2) and feed out of sill and bumper.

Installation:

If necessary, replace faulty clips (2).

Trim (3) must be correctly fed into sill trim and bumper.

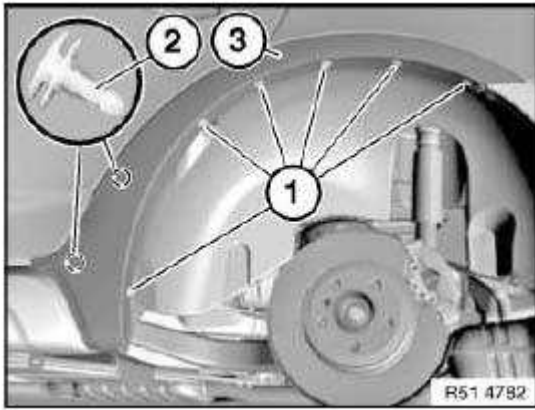


Fig. 568: Trim, Clips And Blind Rivets
 Courtesy of BMW OF NORTH AMERICA, INC.

51 71 495 REMOVING AND INSTALLING/REPLACING EMERGENCY WHEEL PAN

Necessary preliminary tasks:

- Remove emergency wheel (refer to Owner's Manual)

Pull up emergency wheel pan and secure with handle (1).

Release plastic nut (3).

Release screw (2).

Extend handle (1) sideways.

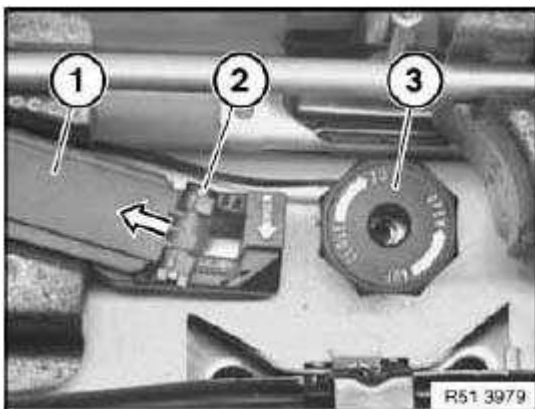


Fig. 569: Plastic Nut, Handle And Screw
 Courtesy of BMW OF NORTH AMERICA, INC.

Turn holder (1).

Grip emergency wheel pan and release plastic nut (2).

Lower emergency wheel pan onto floor.

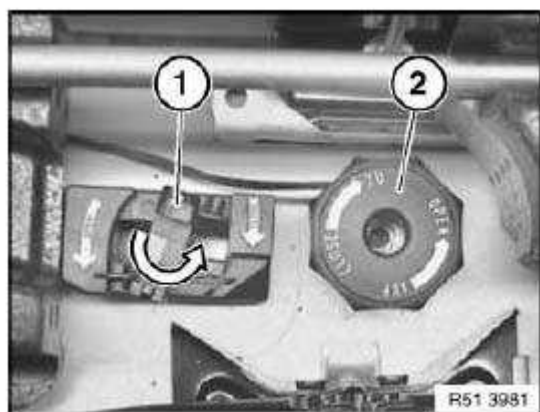


Fig. 570: Holder And Plastic Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Lift vehicle.

Release screws (1).

Remove emergency wheel pan (2) towards bottom.

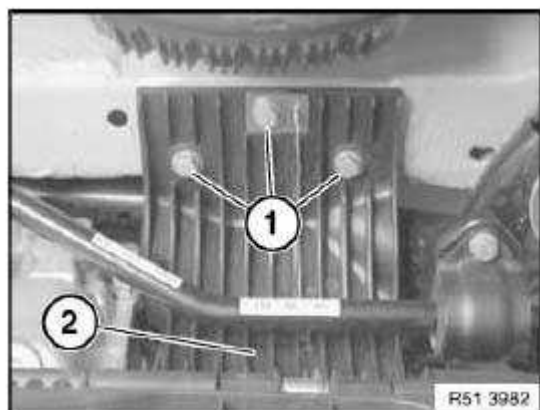


Fig. 571: Emergency Wheel Pan And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

ACCESSORIES AND EQUIPMENT

Exterior Body Panels - Repair Instructions - X3

00 BODY

41 0 CONTENTS OF BODY, GENERAL

General information -> 41 00 ... Quality standard

-> 41 00 ... Workshop equipment

Safety regulations -> 41 00 ... Safety at work

-> 41 00 ... Information on hazards

-> 41 00 ... Information on vehicle protection

Materials -> 41 00 ... Materials science

-> 41 00 ... Use of materials in outer shell

Handling electrical/electronic equipment, airbags and restraint systems -> 41 00 ... Handling electrical and electronic equipment

-> 41 00 ... Handling airbags and restraint systems

Body dimensions -> 41 00 ... Frame alignment control dimensions, body

-> Gap dimensions

Cavity bulkhead -> 41 00 ... Installation of a cavity seal with cavity foam

-> Position of shaped parts

Vehicle identification number -> 41 00 ... Vehicle identification number, general

-> 41 00 ... Stamping vehicle identification number

Repair techniques -> Straightening -> 41 00 ... Straightening steel parts

-> Grinding ->

-> 41 00 ... Grinding steel parts

-> Cutting repairs -> 41 00 ... Welding in reinforcement plate (steel plate)

-> Welding and soldering ->

-> **41 00 ... Welding and soldering steel parts**

-> **41 00 ... Opening weld joints**

-> Bonding -> **41 00 ... General cementing instructions**

-> **41 00 ... Bonding steel parts**

-> **51 31 ... INSTRUCTIONS ON GLUING WINDSCREEN**

-> **41 00 ... Spot-weld bonding steel parts**

-> **41 00 ... Opening adhesive bonds**

-> Riveting -> **41 00 ... Riveting aluminium parts**

-> **41 00 ... Riveting steel parts**

-> Repair elements -> **41 00 ... Notes on repairing threads**

Painting -> **41 00 ... Corrosion protection**

-> **41 00 ... Information / warning labels**

41 00 ... BONDING PLASTIC PARTS

IMPORTANT: Conform with safety precautions! See 41 00 ... Information on hazards

Plastic repair box:

(Sourcing reference through BMW Parts Service picture board 83-0288 Plastic repair box)

Detailed information can be found in the:

- Current painting handbook
- ASAP portal

41 00 ... BONDING STEEL PARTS

IMPORTANT: Conform with safety precautions! See 41 00 ... Information on hazards

Overview of topics:

1. Equipment

2. Expiry date of adhesive
3. Grinding and cleaning
4. Gluing coat
5. Hardening times
6. Aftertreatment of bonding surfaces
7. Disposing of adhesive

1.0 Equipment

- Emery paper
- Cleaning agent: Isopropanol, acetone or spirit
- Adhesive cartridge (sourcing reference via BMW Parts Service picture board Aluminium and steel/bonding and welding)
- Adhesive gun (standard cartridge gun)
- Spatula for applying adhesive

2.0 Expiry date of adhesive:

- The adhesive cartridge is marked with a date.
- Do not use the adhesive after this date.

3.0 Grinding and cleaning:

- For better adhesion, remove oxide film, rust, paint and scale from the adhesive areas with a wire brush or emery paper.
- Clean adhesive areas with isopropanol, acetone or spirit.
- Allow cleaned surfaces to dry for approx. 5 minutes.

Adhesive areas must be completely dry.

4.0 Adhesive application:

- Processing temperature of adhesive cartridge 15°C - 25°C.
- Insert adhesive cartridge in adhesive gun, remove cap and allow both adhesive components to emerge. Strip adhesive components uniformly and attach mixing tube.
- Allow approx. 10 cm of mixed adhesive to emerge and then apply the mixed adhesive first on one side of the adhesive area.
- After applying the adhesive, check whether an adhesive component has emerged at the back of the cartridge. If yes, break off the bonding procedure. Clean new component. Use new adhesive cartridge. Contact national hotline.
- Use a spatula to spread the adhesive over the adhesive area. Thickness of layer approx. 2 mm (dependent on adhesive gap).
- Potlife of mixed adhesive approx. 2 hours. A change of mixer is only necessary if over a period of 1 hour no material has flowed through the mixer.
- Join, secure and rivet and/or weld new parts in accordance with repair instructions.
- Remove excessive glue with paper or cloths.

5.0 Hardening times:

The hardening time is:

- Either 48 hours at a minimum of 15°C (room temperature) up to vehicle operational strength.
- Or 1 hour in the spraying booth (booth temperature 80°C/ object temperature 60°C) up to vehicle operational strength
- Do not use radiant heaters for hardening. Risk of adhesive being destroyed at temperatures of greater than 120°C.
- Do not apply load to glued parts until they have hardened!

6.0 Aftertreatment of bonding surfaces:

- Seal all bonding surfaces with cavity sealant.

7.0 Disposing of adhesive:

- Small amounts of mixed and hardened adhesive residue can be disposed of as domestic waste.

These regulations apply to the Federal Republic of Germany.

For other countries, comply with the (possibly differing) nationally applicable regulations.

41 00 ... CORROSION PROTECTION

NOTE: Following repairs, the corrosion protection work already begins with the correct removal of the PVC undercoating, antinoise compound and seam seals.

1.0 Removing sealing materials:

- IMPORTANT:**
- **Do not burn off PVC material with a gas burner or similar or heat to temperatures above 180°C. This would generate highly corrosive hydrochloric acid and release harmful fumes.**
 - **The new lining does not form a satisfactory bond with burnt PVC material which means that subsequent sub-surface rust may set in.**

Remove PVC material with a rotating steel brush, or heat PVC to maximum 180°C with a hot air blower and scrape off with a spatula.

2.0 Corrosion protection of sheet-metal parts:

All weld joints sealed off with body sealing compound in original state must be primed and sealed off again thoroughly after repairing. Replace damaged or removed antinoise compounds.

NOTE: Spray gun required for body sealing compound (order no. 81 49 0 300 887).

Concluding cavity protection is the most important part of all corrosion protection measures.

Use the cavity protection spray only for smaller-scale straightening work where the parts in question are easily accessible. Use the HRS spray gun with pressure container for all other repairs. Cavity protection agent is available in different container sizes.

Use the relevant probes with tubes for the different cavity areas.

Required tools are featured on the Workshop Equipment Planning CD (WEP).

IMPORTANT: Incorrectly performed cavity protection can, especially in the case of steel/aluminium joints, give rise to a non-calculable product liability and safety risk.

The best repair is worth nothing if the subsequent cavity protection measures are not conscientiously carried out.

2.1 Cavity protection of steel parts:

New doors and lids must be sealed with cavity protection agent after being painted.

New sheet-metal parts or cavities, weld seams and folds formed by new sheet-metal parts must be sealed with cavity protection agent after being painted.

The cavities affected must be sealed with cavity protection agent after all straightening work.

2.2 Cavity protection of aluminium parts:

New doors, lids and side panels made of aluminium are not sealed with cavity protection agent.

After all straightening work on aluminium components, the cavities affected must be sealed with cavity protection agent after being painted.

After all welding work (E52 only) on aluminium components, the cavities affected must be sealed with cavity protection agent after being painted.

Cavities, seams and folds formed from new sheet-metal parts must be sealed with cavity protection agent after being painted.

41 00 ... FRAME ALIGNMENT CONTROL DIMENSIONS, BODY

Dimensions in mm.

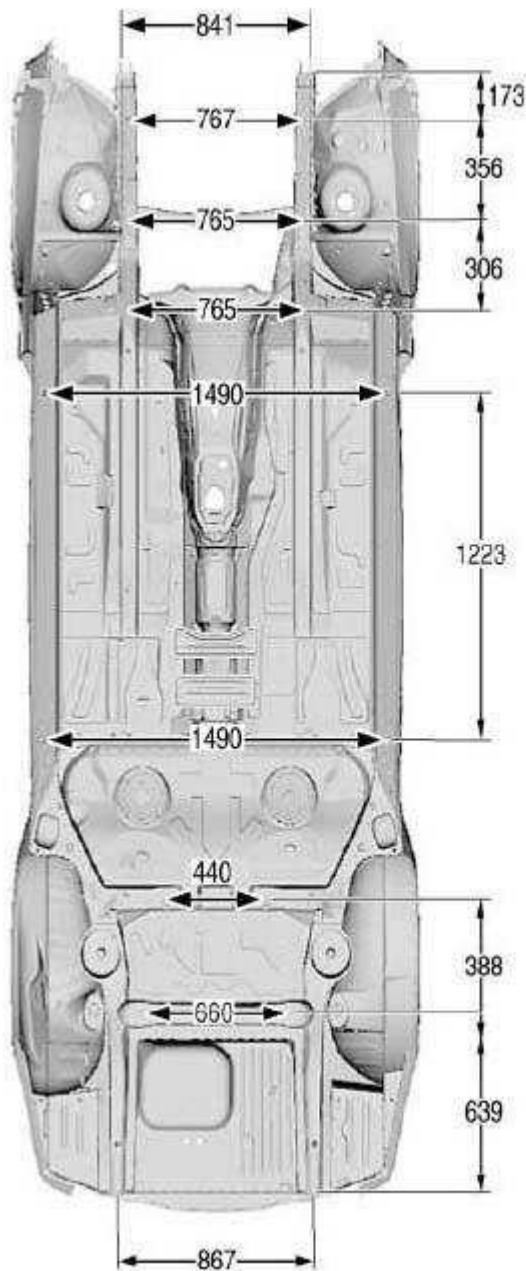
Measurement tolerances:

- less than 1000 mm \pm 1 mm
- Greater than 1000 mm \pm 2 mm

The control points shown serve to check the body and the straightening attachment.

The specified dimensions/measurements always refer to the centrepoint of the bore/screw.

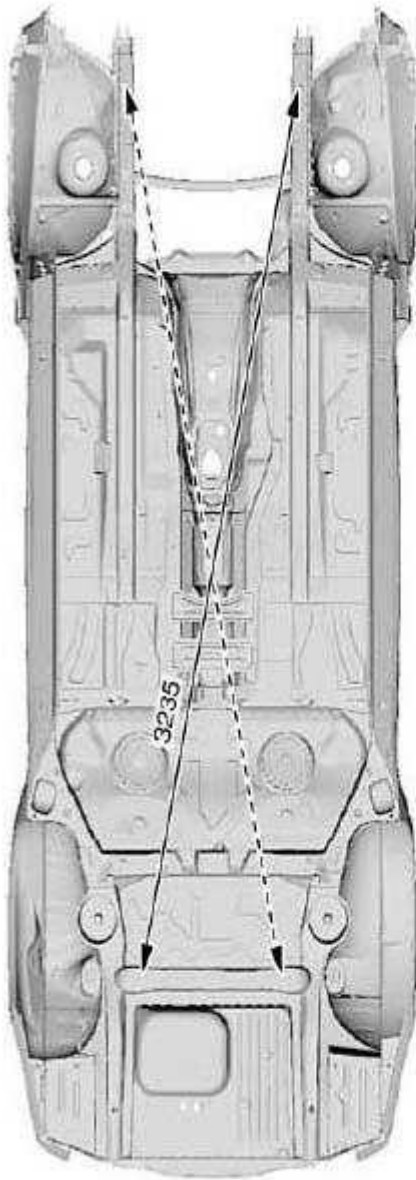
Underbody view 1



R41 2570

Fig. 1: Frame Alignment Control Dimensions - Underbody View (1 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

Underbody view 2



R41 2571

Fig. 2: Frame Alignment Control Dimensions - Underbody View (2 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

Top view, front end

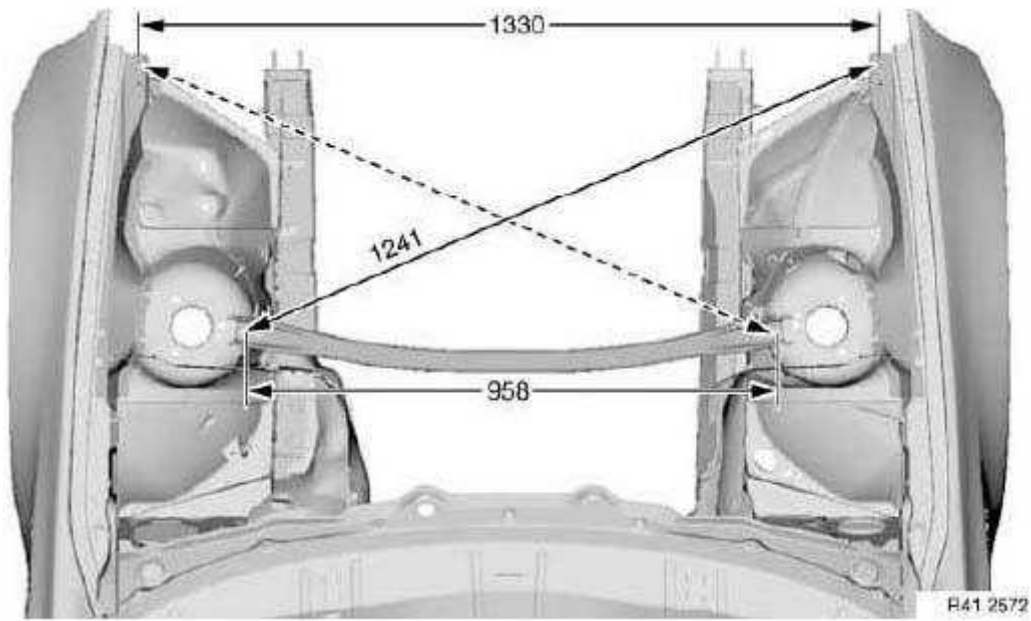


Fig. 3: Frame Alignment Control Dimensions - Top View, Front End
Courtesy of BMW OF NORTH AMERICA, INC.

View, B-pillar

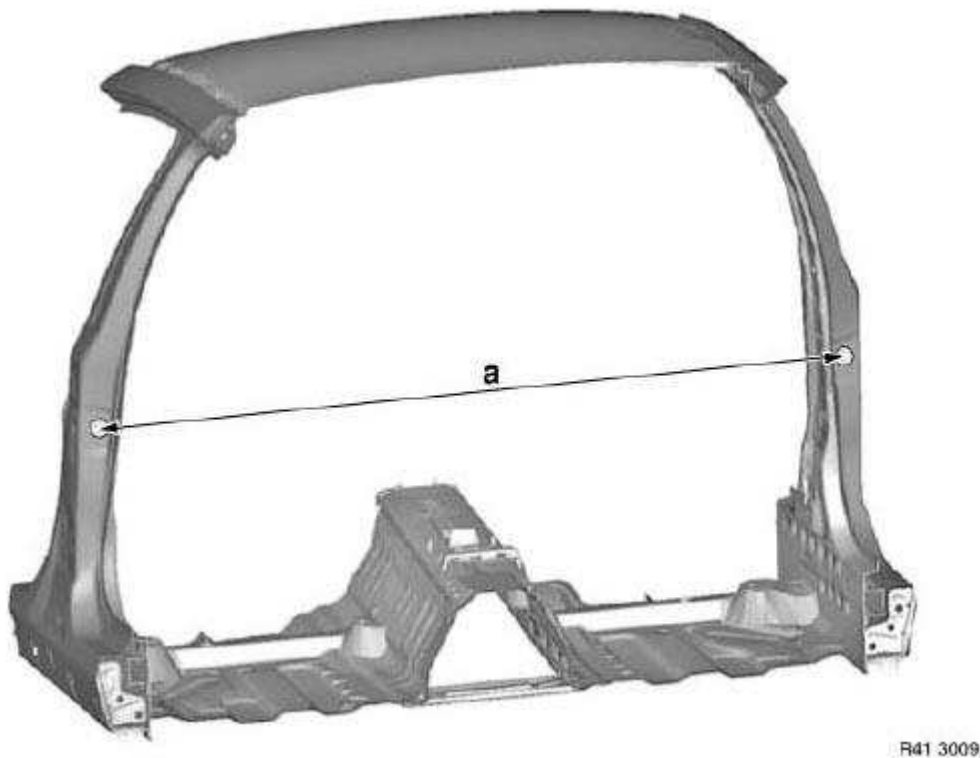


Fig. 4: Frame Alignment Control Dimensions - View, B-pillar
Courtesy of BMW OF NORTH AMERICA, INC.

Measurement a=1533 mm between screw-on points of door brakes.

41 00 ... GENERAL CEMENTING INSTRUCTIONS

IMPORTANT: Conform with safety precautions! See 41 00 ... Information on hazards

- The bonding surfaces must be kept free of all types of dirt and contamination. Avoid leaving fingerprints.
- Cleanliness is the golden rule for all bonds!
- Cleaning agent: Isopropanol, acetone or spirit

Expiry date of adhesive and primer

- The adhesive cartridge and the primer are marked with a date.
- Do not use the adhesive or primer after this date.

2-component adhesive application:

- Insert adhesive cartridge in adhesive gun, remove cap and allow some adhesive to emerge. Strip adhesive components uniformly and attach mixing tube.
- Allow approx. 1 mixer length of mixed adhesive to emerge (there must be no smearing of colours). Only then apply the mixed adhesive to one side of the bonding surface.

Adhesive disposal:

- Hardened adhesive is disposed of as normal waste.
- Empty adhesive cartridges are disposed of as normal waste.
- Non-hardened adhesives and mixtures of adhesive and solvent and the like must be disposed of as hazardous waste.

These regulations apply to the Federal Republic of Germany.

For other countries, comply with the (possibly differing) nationally applicable regulations.

41 00 ... GRINDING STEEL PARTS

1.0 Recommended tools and equipment

- Tools are recommended for manual grinding work.
- Machines/equipment are recommended for machine grinding work.

2.0 Grinding outer shell and structure

Always replace abrasives which have already been used to treat aluminum (risk of corrosion).

Do not grind the material thin.

41 00 ... HANDLING AIRBAGS AND RESTRAINT SYSTEMS

1.0 Airbags and restraint systems

- On vehicles with airbags and restraint systems, observe the relevant safety instructions, see **41 0 Contents of Body, General.**
- During straightening work on the body, you will be exposed to the risk of accidental airbag triggering when the battery is connected.

Due to this potential hazard, it is essential to disconnect the battery negative lead prior to welding and straightening work. Prior to disconnecting the negative lead, interrogate the fault memories of the control units if necessary.

41 00 ... HANDLING ELECTRICAL AND ELECTRONIC EQUIPMENT

1.0 Battery

- There is a risk of explosion when welding or grinding work is carried out in the vicinity of the battery. The battery must be removed. Prior to removing the battery, interrogate the fault memories of the control units if necessary.

2.0 Control units

- The following hazards are present when the battery is connected:
 - Damage to control units during welding work on the body.
 - Accidental triggering of airbags during straightening work on the body.

Due to these potential hazards, it is essential to disconnect the battery negative lead prior to welding and straightening work. Prior to disconnecting the negative lead, interrogate the fault memories of the control units if necessary.

- Control units are designed for a temperature of 65°C. The temperatures in a spraying booth do not pose any problems. If a vehicle is inside the spraying booth at an indicated temperature of 80°C, the actual temperature of the vehicle will be greater than 60°C (object temperature).
- Protects control units against the effects of heat at temperatures > 65°C (e.g. during welding and drying with an infrared radiator or hot air blower).

3.0 Electric cables and wiring harnesses

- Protect electric cables and wiring harnesses against damage (e.g. during straightening and grinding work).
- Protect electric cables and wiring harnesses against the effects of heat at temperatures > 65°C (e.g. during welding and drying with an infrared radiator or hot air blower).
- Do not kink electric cables.

4.0 Optical fibers

- Follow instructions for handling optical fibers.

41 00 ... INFORMATION / WARNING LABELS

Missing or damaged information/warning labels (e.g. tyre inflation pressure) must be replaced.

--> Overview of installation locations, see **00 00 ... INFORMATION/WARNING LABELS**

41 00 ... INFORMATION ON HAZARDS

1.0 Aluminum

INFORMATION ON HAZARDS CHART

Hazards / effects	Measures / regulations
Repair stage 1: (replacement of bolted parts, dent removal) Repair stage 2: (structural repairs with bonding and riveting)	<ul style="list-style-type: none">○ When a vehicle outer shell is ground, aluminum dust accumulates in small amounts. This dust can be removed with conventional extractor systems.
Repair stage 3: (structural repairs with welding) <ul style="list-style-type: none">○ Explosion hazard due to high concentration of fine aluminum dust. Arising e.g. during straight-through grinding of coated parts in the base material and large-surface grinding of bright-finish parts.○ Explosion hazard due to swirling up of fine aluminum dust in cavities. Created by the necessary, thorough cleaning of machining surfaces and tools before and after machining aluminum.	<ul style="list-style-type: none">○ Avoid high concentration of fine aluminum dust by means of continuous extraction.○ Use explosion-proof extractor systems.○ Do not use compressed air when cleaning the work bay.○ Avoid swirling up dust when cleaning the work area.
<ul style="list-style-type: none">○ Spontaneous combustion of fine aluminum dust when ignition and fire sources are drawn in. E.g.: hot splinters, grinding sparks, cigarettes etc.	<ul style="list-style-type: none">○ Do not operate ignition and fire sources in the intake area of extractor systems.

41 00 ... INFORMATION ON VEHICLE PROTECTION

- Vehicle components which are situated in the repair area or exposed to heat, flying sparks or dust must be removed or covered.

IMPORTANT: Do not use combustible or contaminated coverings.

41 00 ... INSTALLATION OF A CAVITY SEAL WITH CAVITY FOAM

IMPORTANT: The cavity foam may only be use for cavity sealing at the points at which cavity sealing is present as standard!

The following repair represents the replacement of a shaped part for the cavity seal by the use of cavity foam.

This type of cavity sealing is used at points at which shaped parts cannot be used for repairs.

This is the case when large amounts of heat occur (e.g. due to welding, soldering or tin-plating) in the direct vicinity or at the point of the standard cavity sealing.

It is not possible here to install shaped parts for the cavity seal because of the fire risk!

To replace shaped parts with cavity foam at further locations, adopt the procedure shown here and adapt it to the relevant conditions.

It must be ensured that the cavity is completely sealed off.

NOTE: Check the accessibility for the spraying pipe of the cavity foam to the affected cavity after removing the damaged part.

Properties of cavity foam:

- 2K-PUR foam, solvent-free.
- Excellent flow capacity, enabling complete sealing of cavities.
- Good strength, preventing slipping in cavities.
- Low water absorption, preventing corrosion.

IMPORTANT: Observe processing instructions and safety precautions on the spray can!

- **Use by date on can.**

Do not use the spray can after the use-by date has expired as the properties of the cavity foam would no longer meet the requirements of the BMW Group.

- **Before applying to the vehicle, fill a clearly visible cavity of corresponding size with foam on a used part.**

This enables an optimal dosage (i.e. spraying time) to be specified for filling the cavity on the vehicle with foam.

- **Backing surface must be clean and free from dust, grease, oil and stripping agent.**
- **Tape off open passages to visible areas with adhesive tape to prevent foam from escaping.**
- **Application time after mixing: within 8 minutes.**
- **Do not eat, drink or smoke during this operation.**
- **Completely empty open can after use.**

- **Cavity sealing of repair area possible after an air drying time of 1 hour.**

41 00 ... INSTALLING A CAVITY BULKHEAD (EXPANDED)

NOTE: Carry over schematic representation to the relevant vehicle type.

The following repair represents the procedure for an already expanded cavity bulkhead.

The cavity bulkhead remains on the body in this instance.

Before these work steps, prepare the new part so that it is ready to install (adapting, cutting to size, applying welding primer etc.).

Clean contact surface (1) with spirit.

Apply an approx. 15 mm high bead (2) of original BMW window adhesive to contact surface (1).

Fit, secure and weld up new part.

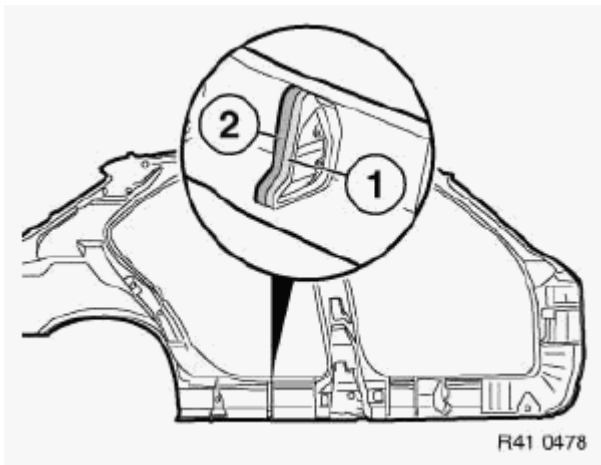


Fig. 5: High Bead And Contact Surface
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Ensure adequate ventilation over entire processing period.

41 00 ... INSTALLING A CAVITY BULKHEAD (NOT EXPANDED)

NOTE: Carry over schematic representation to the relevant vehicle type.

The following repair represents replacement of a cavity bulkhead.

Before these work steps, prepare the new part so that it is ready to install (adapting, cutting to size, applying

welding primer etc.).

Sand contact surface of cavity bulkhead (1) with coarse-grained abrasive paper (grain 50 - 100).

Clean contact surface (1) with spirit.

Apply an approx. 15 mm high bead of original BMW window adhesive to contact surface (1).

Attach cavity bulkhead in specified position (see old part).

Fit, secure and weld up new part.

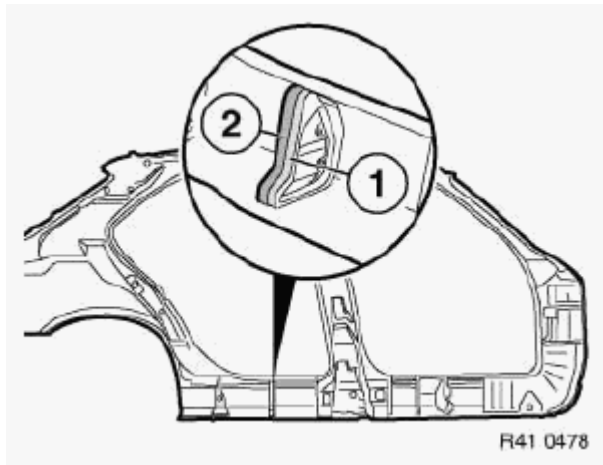


Fig. 6: High Bead And Contact Surface
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Ensure adequate ventilation over entire processing period.

41 00 ... MATERIALS SCIENCE

1. Aluminum

1. Chassis and suspension components

Read and observe the Notes on chassis and suspension components before handling aluminum.

2. Material influences

MATERIAL INFLUENCES REFERENCE

Causes	Effects / remedies
	This plating process causes aluminium to be removed from the joint. This results in surface corrosion or pitting. New parts and accessory parts which have been

A galvanic element is created under the effects of moisture by contact with materials such as copper, tin, nickel, iron and zinc.	approved by the BMW Group for aluminum (screws, washers, nuts etc.) have undergone special surface treatment. Such parts must not be replaced by conventional parts. NOTE: Damaged parts lose this protection and must be specially coated or replaced. Damage caused by contact corrosion is excluded from the warranty.
Materials also used for work on steel components can implant steel particles in the softer surface of an aluminium component.	Surface corrosion or pitting occurs. A separate tool kit is available for processing/machining aluminum.
Surfaces are attacked when fluxing agents are used.	Soldering is not permitted for joining aluminum components. Risk of corrosion from chemical factors.
Aluminum/steel grinding dust from adjoining work areas.	This results in surface corrosion. Erection of protective barriers.

3. Machining properties

MACHINING PROPERTIES CHART

Properties of aluminum compared with steel	Effects
Aluminum parts are magnetically neutral.	Attachment with magnetic tools/working aids is not possible.
Elasticity is only 1/3 as high. Elongation failure is approx. 50% slighter.	Convertibility is limited in comparison with steel. Overstretching the material results in strain-hardening and an increased tendency of cracking.
Electrical conductivity is almost 4 times higher.	Electric welding procedures require different equipment (MIG welding).
Material expansion during heating is twice as high.	The material expands more markedly. Shorter heat treatment is necessary for removing dents.
Thermal conductivity is 3 times higher.	Heat is drained more quickly. Adjoining working areas are affected more heavily e.g. during welding.
Microstructural change between 200°C and 250°C.	Elongation characteristics and thus plasticity are improved. Strength is reduced. IMPORTANT: No heat treatment when working on the vehicle structure! Temperature cannot be monitored to sufficiently exact levels in garages.
	The melting point is 650°C. Once the melting temperature has been reached, the material begins to flow without any further indications.

Aluminum shows no annealing colors.

The temperature can only be estimated by means of the paint coloring and the surface warpage.

IMPORTANT:

Do not use thermal applicators. Not suitable for garage use because the paint runs too quickly.

4. Mounting

MOUNTING REFERENCE

Characteristic features of aluminum	Special measures
Corrosion (ageing) in damp environments.	Store aluminum parts in a dry place.
Contact corrosion in event of contact e.g. with steel parts.	Always store aluminum parts separately or in isolation from steel parts.
Susceptibility to paint infiltration.	Do not damage protective surface layer since this would cause oxidation. Failure to comply with this requirement would result in more painting work.

41 00 ... NOTES ON REPAIRING THREADS

IMPORTANT: Install Helicoil thread inserts so that they are flush with the original thread.

NOTE: Damaged threads may be repaired with Helicoil thread inserts. Comply with the procedure described in the example.

SCREW/BOLT SPECIFICATION

Screw/bolt connection	Vehicle	Screw/bolt fastening point(s)	Helicoil thread insert
Front axle carrier to engine carrier	E46	All	M12x1.5x18
	E53	All	M12x1.5x18
	E60, E61, E63, E64	Front, middle	
		Rear	M12x1.5x18
	E65, E66, E67	All	M12x1.5x18
	E70	All	M14x1.5x21
	E83	All	M12x1.5x18
	E85, E86	All	M12x1.5x18
	E81, E87	All	M12x1.5x18
	E90, E91, E92, E93	All	M12x1.5x18
Bracket, control arm, to engine carrier	E46, E85, E86	All	M10x1.5x15
	E46	All	M12x1.5x18

Rear axle carrier to frame side member	E53	All	M14x1.5x21
	E60, E61	All	M14x1.5x21
	E63, E64	All	M14x1.5x21
	E65, E66, E67	All	M14x1.5x21
	E70	All	M14x1.5x21
	E83	All	M12x1.5x18
	E85, E86	All	M12x1.5x18
	E81, E87	All	M12x1.5x18
	E90, E91, E92, E93	All	M12x1.5x18
Bearing block, trailing arm to side member	E46, E83, E85, E86	All	M12x1.5x18

41 00 ... OPENING ADHESIVE BONDS

1. Opening spot-weld bonds

- Set punch mark in centre of weld spot. Set 8 mm dia. weld spot drill bit on punch mark and drill through top metal sheet.

Or open weld spot with Vario Drill spot welding cutter.

NOTE: Because the weld spots may have surface-hardened, grind them if necessary with an angle grinder and paper grinding disk.

- Heat connecting flange with a hot air blower.

CAUTION: Extract vapours and gases.

- Release connection flange with chisel.
- Grind off residual adhesive from connecting flange.

CAUTION: Wear a grinding dust mask.

2. Opening adhesive bonds on aluminium parts

- Remove punch rivets or blind rivets, see **41 00 ... Riveting aluminium parts.**
- Roughly cut out damaged component. The component can be peeled with the aid of pliers. If necessary, heat bonding flange with hot air blower.

**CAUTION: Heat only the damaged component with a hot air blower.
Extract vapours and gases.**

-

- Grind off residual adhesive from connecting flange.

CAUTION: Wear a grinding dust mask.

- If engine carrier part replacement on the GRAV is carried out repeatedly, cut the damaged part at the existing cutting line. Heat bonding flanges with a hot air blower. Peel off remnants of expander elements with pliers.

3. Opening adhesive bonds on carbon-fibre-reinforced plastic parts

Procedure is described in detailed in the relevant repair instructions.

41 00 ... OPENING WELD JOINTS

1. **Opening weld spots (resistance pressure spot welding):**

- Set punch mark in center of weld spot. Set 8 mm dia. weld spot drill bit on punch mark and drill through top metal sheet.

Or open weld spot with Vario Drill spot welding cutter.

NOTE: Because the weld spots may have surface-hardened, grind them if necessary with an angle grinder and paper grinding disk.

2. **Opening laser weld seams:**

- Place angle grinder with grinding disk on laser weld seam and grind through top metal sheet. Be careful not to cut through and damage sheet metal underneath.

41 00 ... QUALITY STANDARD

- The overall requirements relating to a vehicle can only be implemented by including "all" components. This applies in particular to the body. With regard to an optimum crash result, it is necessary to maintain the structural measures.

It is absolutely essential to observe the procedures set out in the repair instructions. Any deviation from these procedures will only be permitted after prior consultation with and approval by BMW. Should you have any questions, please contact the country-specific Hotline.

The use of non-approved repair steps or tools may have serious consequences for the structure of the vehicle (e.g. in the event of a crash). In the end, this can result in safety and product liability risks which cannot be calculated.

Corrosion protection measures during and after repairs are absolutely essential to maintain the value of the vehicle.

- Use only genuine BMW parts and approved auxiliary devices, materials and operating fluids when

carrying out repairs.

41 00 ... RIVETING ALUMINIUM PARTS

1.0 Recommended tools and equipment

- Stud welding apparatus with gas bottle containing inert gas (82 % argon, 18 % CO₂)
- Stainless steel stud
- Universal riveting tool
- Hand riveting tool for blind rivet nuts and blind rivet bolts

2.1 Extracting punch rivets:

- Grind off paint and dark grey coating of punch rivets.
- Position bolt centrally on the rivet and weld on vertically. The area in which the bolts are welded on should be between the two grounding terminals. Position both terminals, if possible, on the top side of the metal plate on which the rivet is located.
- Extract bolt with welded-on rivet using universal riveting tool. Use a large plastic nose piece if not otherwise specified in the repair instructions. Check plastic nose piece prior to use for wear.
- Plastic nose piece must rest on sheet metal all round; if necessary, grind off plastic nose piece in collision area.

Do not push riveting tool forcefully onto special-steel bolts.

Do not use riveting tool to bend special-steel bolts.

- Pay particular attention to central positioning of the bolt when using the small plastic mouthpiece.
- Follow the equipment manufacturer's instructions for use.

2.2 Drilling out punch rivets:

Only if extraction proves repeatedly unsuccessful or the rivet cannot be accessed with the universal riveting tool.

- Drill out rivets with a 6 mm dia. carbide drill bit.
- Punch rivets can be drilled out on both sides. When drilling from the protruding rear side, spot-drill the rivet shank only and remove the rest with a rivet punch.
- Use a drift punch to remove all punch rivet remnants in the aluminium (risk of corrosion).
- Clean vehicle to remove all traces of chips (risk of corrosion).

2.3 Drilling out blind rivets:

Only when a part is repeatedly replaced.

- Drill out **rivet head only** with 6 mm dia. metal drill bit. Knock out rivet remnants with a drift. Use existing 6.7 mm hole for blind rivet.
- Clean vehicle to remove all traces of chips and rivet remnants (risk of corrosion).

3.0 Blind riveting in conjunction with bonding

- The standard punch rivets are always replaced by blind rivets in conjunction with bonding.
- The required strength of the connection is only achieved through a combination of bonding and riveting.

4.0 Setting blind rivets:

- Refer to repair instructions for rivet size (size 13 or size 15 with 6.5 mm dia. or 4.0 mm dia.).
- Position blind rivets in the same locations as the extracted punch rivets. Exceptions are described in the relevant repair instruction. If necessary, carry over the positions of the rivets to the new component.
- Drill holes (4.2 mm dia. for 4 mm rivet and 6.7 mm dia. for 6.5 mm rivet).
- Apply adhesive.
- Insert blind rivet. The riveting direction is the same as the line of vision in the picture shown in the repair instruction (e.g. from wheel arch into engine carrier).
- Universally rivet blind rivet with riveting tongs.
- Seal blind rivet with PU sealing material (risk of corrosion).
- Seal cavities with preserving agent (risk of corrosion).

5.0 Setting blind rivet nuts and blind rivet bolts:

- Standard stud welding is always replaced by blind rivet bolts.
- Drill holes (0.2 mm larger than the outside diameter of the blind rivet nuts or blind rivet bolts).
- For corrosion reasons, blind rivet nuts and bolts must have a special coating.

Use the blind rivet nuts and bolts supplied in the case of the manual riveting tool for steel only!

- Insert blind rivet nuts or bolts and tighten down with the riveting tool.
- It will no longer be possible to set a blind rivet nut if the drilled hole is too big. In this case, set a clip nut. This nut tightens itself automatically when screwed to the component.
- Seal blind rivet nuts and bolts with PU sealing material (risk of corrosion).

41 00 ... RIVETING STEEL PARTS

1.0 Recommended tools and equipment

- Manual riveting tool for blind rivet nuts and bolts.

2.0 Setting blind rivet nuts and blind rivet bolts:

- Drill holes (0.2 mm larger than the outside diameter of the blind rivet nuts or blind rivet bolts).
- Blind rivet nuts and bolts must have a special coating for corrosion reasons.

Use the blind rivet nuts and bolts supplied in the case of the manual riveting tool for steel only!

- Insert blind rivet nuts or bolts and tighten down with the riveting tool.

41 00 ... SAFETY AT WORK

1.1 Working with aluminum dust:

- Wear a fine dust mask.
- E52 only: Use an explosion-proof extractor system.
- Note national regulations.

1.2 Removing sealing materials

- Hydrochloric acid is created when PVC sealing material is heated to temperatures in excess of 180° C.
- Remove PVC sealing material with a rotating wire brush only or heat material with a hot air blower to max. 180°C and remove with a spatula.
- Ensure that all enclosed areas are well ventilated or are provided with direct extractor facilities.

1.3 Arc welding and brazing:

IMPORTANT: The extremely bright arc during welding may cause serious injury to the eyes if appropriate protective measures are not taken.

- Use a special welding screen* for the relevant welding process (MAG or MIG).
- Partition off the work bays with beam protection screens*.
- Use a welding-emissions extractor facility*.
- The welder must wear protective clothing* and gloves* which are suitable for welding (i.e. flameproof).
- A fire extinguisher must be located within reach of the welding area.
- Do not carry out any welding work in the proximity of a fuel tank e.g. when it is installed.
- Note national regulations.

1.4 Working with adhesive products (adhesives, cleaning agents, primers etc.):

IMPORTANT: Handling adhesives can trigger off allergic skin and breathing reactions.

- Do not eat, drink or smoke during this operation.
- Avoid direct contact with eyes and skin.
- Wear protective goggles, protective gloves and if necessary an apron.
- Ensure that all enclosed areas are well ventilated or are provided with direct adhesive fume extractor facilities.
- Work clothing which has been contaminated with adhesive or solvent must be changed immediately.
- After finishing work, wash your hands and apply protective skin cream.
- Always keep an eye bath on hand, change the water regularly (once a month).
- Store adhesive products in a secure cabinet only.
- Keep adhesive products away from naked flames and other ignition sources.
- Protect adhesive products against strong heat sources and direct sunlight.
- Note national regulations.

First Aid:

In the event of eye contact, flush immediately with running water for approx. 10-15 minutes and, if necessary, visit eye specialist.

In the event of skin contact and where applicable an allergic skin reaction, clean the affected areas immediately with soap and water and then apply silicone-free skin cream. If necessary, consult a doctor.

If an adhesive product is swallowed, rinse mouth/parts of mouth thoroughly with running water. Drink 1-2 glasses of water. Do not induce vomiting. Consult a doctor.

If adhesive fumes are inhaled, ensure a constant supply of fresh air, keep calm, keep respiratory tracts unobstructed and consult a doctor.

41 00 ... SPOT-WELD BONDING STEEL PARTS

IMPORTANT: Comply with the following topics from "Body, General":

Safety regulations, see 41 00 ... Information on hazards.

Handling electrical/electronic equipment, airbags and restraint systems, see 41 00 ... Handling airbags and restraint systems.

Welding steel parts, see 41 00 ... Welding and soldering steel parts.

- The spot-weld bonding process is used starting from the E65 to increase vehicle rigidity. In partial bodywork areas, a 1-component adhesive is applied to the spot flanges and this is followed by resistance pressure spot welding. The adhesive is hardened only after the paint drying process (at approx. 180°C).
- In the case of repairs, adhesive is not applied to the spot flanges. The number of welding spots is doubled as a substitute for the omitted adhesive.
- The following processes are used as a substitute for spot-weld bonding:
 - MAG welding (**M**etal **A**ctive **G**as welding)
 - Resistance pressure spot welding (referred to in the following and in the repair instructions as spot welding).
- Adhesive is not applied between the spot flanges on new parts in the case of 2 - or multi-sheet joints. Areas which cannot be reached by the spot-welding tongs can be joined by MAG spot welding. The number of welding spots is doubled as a substitute for the omitted adhesive.

Exceptions (e.g. E65) are described in the relevant repair instructions. Apply welding spots to existing welding spots on new part. This is necessary because the adhesive between the spot flanges of the new part acts as an insulator.

CAUTION: Extract smoke and fumes during welding work.

○

41 00 ... STAMPING VEHICLE IDENTIFICATION NUMBER

Special tools required:

- **41 0 000 PUNCH NUMBERS/LETTERS/SPECIAL CHARACTERS**
- **41 1 130 FIXTURE**
- 41 1 131 **41 1 130 FIXTURE**
- 41 1 132 **41 1 130 FIXTURE**
- 41 1 133 **41 1 130 FIXTURE**

NOTE: If the stamped vehicle identification number is removed during repair work, it must be stamped in again.

Read and comply with General Information .

Necessary preliminary tasks:

- Remove battery positive terminal

Special tool kit 41 1 130 for stamping vehicle identification number consists of:

Basic body 41 1 131

Die-plate 41 1 132

Spindle 41 1 133

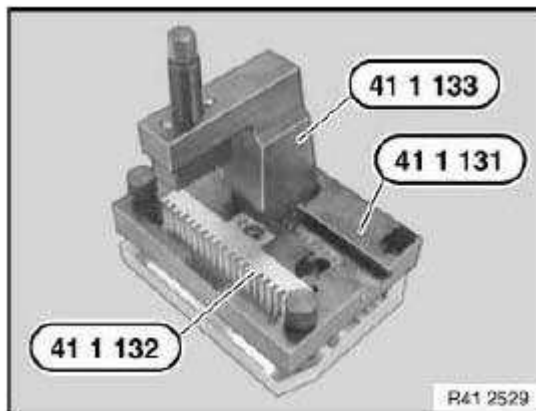


Fig. 7: Special Tool

Courtesy of BMW OF NORTH AMERICA, INC.

Slide special tool 41 1 130 over assembly compartment partition wall (1).

Tighten screws (2).

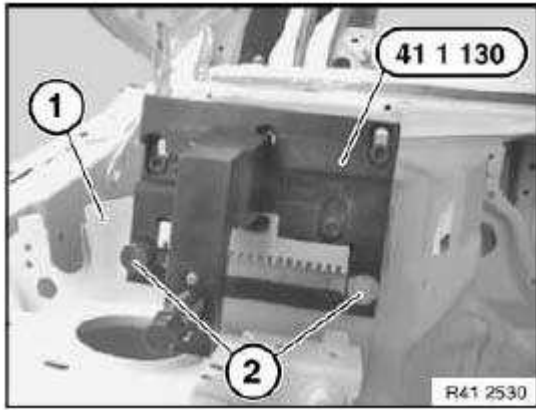


Fig. 8: Compartment Partition Wall And Screws
 Courtesy of BMW OF NORTH AMERICA, INC.

Insert stamp numbers 41 0 000 individually into die-plate.

Position spindle 41 1 133 centrally over stamp number 41 0 000 and tighten spindle to 20 Nm.

Repeat procedure for each number.

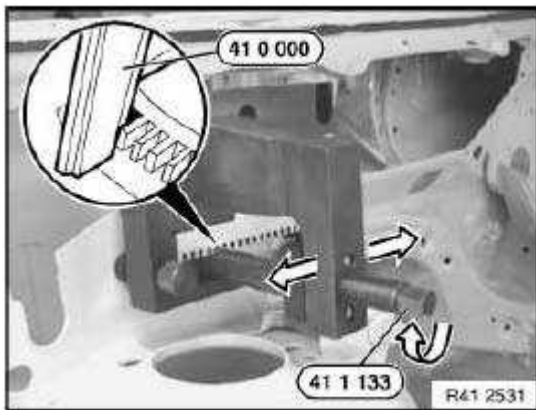


Fig. 9: Special Tool (41 0 000 And 41 1 133)
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: In the event of component or body replacement by the workshops/garages, clearly delimit the vehicle identification number at front and rear by stamping a "+" in place of the BMW emblem.

Note national regulations.

41 00 ... STRAIGHTENING STEEL PARTS

1.0 Recommended tools

Only use those tools designed for steel repairs.

2.0 Straightening outer shell

- "Cold" straightening: Press dents out from their centre and smooth in an inwards direction with gentle taps.

In the case of small, soft dents (hail and parking damage), this is also possible without damaging the paintwork. This work requires a special tool and a trained worker.

- "Hot" straightening: Heat dents in their central point only with a gas flame until bright red hot. Then quench the material with a wet cloth.
- Stud welding can be used in the case of damage where access is only possible from one side. Weld on the stud in the middle of the damaged area. The steel pin or shim is driven out using a hammer until the depression is removed. The stud, pin or shim is then ground or twisted off.
- Avoid cracking.
- Avoid hardening and overstretching.
- Avoid heating and overheating the outer shell over large areas.
- If, after steel parts have been straightened, the surface shows no dents larger than 2 mm, these dents may be touched up with knifing filler.

Dents larger than 2 mm must be treated with filling solder.

NOTE: Only applicable within the European Union!

European used-car regulations prohibit the use of tin containing lead in motor vehicles introduced after 01.07.2003!

- For safety vehicles, follow the special notes and information in the repair instructions.

3.0 Straightening structure

- Repairs affecting the mounting points of assemblies and chassis/suspension components must be carried out on the straightening bench with the matching straightening attachment set or specification sheet for the vehicle.

Straightening attachments and specification sheets are also available for the top section, e.g.: door pillars, convertible top mounts, cowl, rear lid hinges, etc.

- Check windshield and rear window apertures for curvature by inserting the original glass.
- Take the gap dimensions for doors, engine hood and rear lid from the vehicle-specific gap dimension diagram.
- Bearing body components such as e.g. engine carriers, door pillars, frame side members etc. with deformations which can no longer be returned to their original shape by "cold straightening" must be replaced.

Heating bearing body components for better reshaping is not permitted!

Failure to comply with this requirement would result in a loss of original strength of up to 40 %.

- High-strength and super-high-strength steel plates as a rule cannot be reshaped. Reshaping only serves as a preparatory measure to replacing the component in order to achieve optimal joining of the connection points.
- **The body must be anchored as follows for reshaping:**

If using vehicle-specific/universal straightening attachment sets (Carbench/ Celette), it is necessary to secure the body **additionally** with 4 retaining clips to the spot flange of entrance or to the 4 jacking points. The spot flange (if available) is to be preferred.

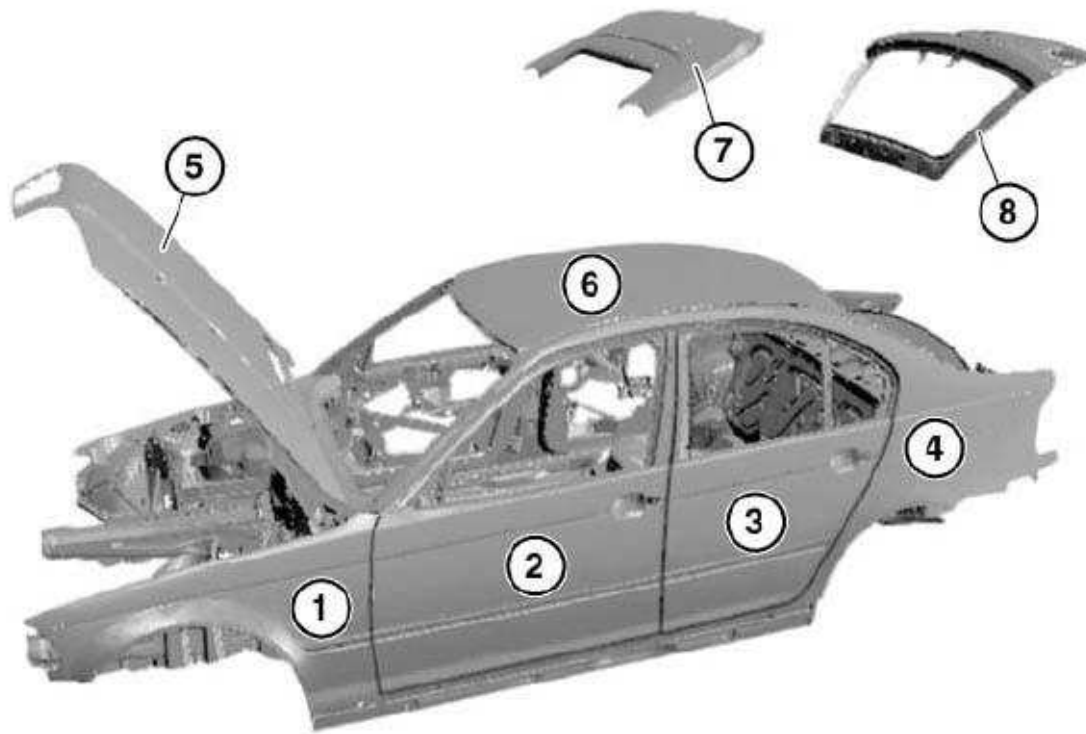
If using universal electronic or mechanical straightening systems (Car-O-liner/ Celette), it is necessary to secure the body with 4 retaining clips to the spot flange of entrance or to the 4 jacking points. The spot flange (if available) is to be preferred. **In addition** anchor at least 2 points with the securing set.

Failure to comply with these instructions will result in damage to the body during reshaping in non-damaged areas. Vehicle-specific straightening attachments and universal mounts may be damaged.

41 00 ... USE OF MATERIALS IN OUTER SHELL

The following illustration is a schematic representation of all the body variants.

Apply this illustration to the relevant vehicle.



R41 1959

Fig. 10: Side Panel, Front Panel And Engine Hood
 Courtesy of BMW OF NORTH AMERICA, INC.

All components not listed in the table below are composed of established sheet steel qualities.

COMPONENTS MATERIALS CHART

Component	Vehicle	Material
(1) Side panel, front	E52 (Z8)	Aluminium
	E60, E61	Aluminium
	E63, E64	Plastic (thermoplastic)
	E65, E66:	Aluminium
	E70, E92, E93	Plastic (thermoplastic)
(2) Front door	E36/C (M3)	Aluminium or steel
	E36/2 (M3)	Aluminium or steel
	E52 (Z8)	Aluminium
	E63, E64	Aluminium
(4) Side panel, rear	E52 (Z8)	Aluminium
(5) Engine hood	E38 (750i)	Aluminium or steel
	E46/C (M3)	Aluminium
	E46/2 (M3)	Aluminium
	E52 (Z8)	Aluminium
	E60, E61, E63, E64	Aluminium

	E65, E66, E70	Aluminium
	E85 (Z4)	Aluminium
(6) Hardtop/ roof	E36/C	Aluminium
	E36/7 (Z3)	Plastic (glass fibre / epoxy resin)
	E46/C	Aluminium
	E46/2 (M3 CSL)	Plastic (CFK)
	E52 (Z8)	Plastic (PU)
	E85 (Z4)	Plastic (SMC)
	E63 (M6)	Plastic (CFK)
(7) Soft top lid	E46/C	Magnesium
	E64	Plastic (SMC)
(8) Rear lid	E46/2 (M3 CSL)	Plastic (SMC)
	E52 (Z8)	Aluminium
	E63, E64	Plastic (SMC)

41 00 ... VEHICLE IDENTIFICATION NUMBER, GENERAL

The vehicle identification number must be stamped with a special tool. There are different special tool numbers and stamping procedures for the various vehicles. Refer to the relevant repair instructions.

In repair work, the vehicle identification number is always stamped into a replacement vehicle identification number surface. The replacement surface is usually situated under the original VIN surface.

The IGEF number (bodyshe'll number) is omitted when the wheel arch is replaced.

In the event of component or body replacement by the BMW garages/workshops, clearly delimit the vehicle identification number at front and rear by stamping a + in place of the BMW emblem.

If a VIN is stamped into the replacement surface in addition to the original VIN (e.g. if the original VIN has been tampered with), the following applies: The original VIN must be crossed out. To do so, stamp the letter I from the punch digits lengthways through the original VIN.

IMPORTANT: Do not use an angle grinder in conjunction with a cutting disk!

The protective film used as standard is omitted after the VIN has been manually stamped in. Paint area in accordance with BMW Painting Handbook. Ensure that layer thicknesses are small.

Observe country-specific regulations.

41 00 ... WELDING AND SOLDERING STEEL PARTS

IMPORTANT: Comply with the following topics from "Body, General":

Safety regulations, see 41 00 ... Information on hazards.

Handling electrical/electronic equipment, airbags and restraint systems, see 41

00 ... Handling airbags and restraint systems.

A. Welding steel parts:

1. General information

- The following procedures are used for repairs:
 - MAG welding (**M**etal **A**ctive **G**as welding)
 - Resistance pressure spot welding (referred to in the following and in the repair instructions as spot welding).
- Take the number and location of weld spots and MAG weld seams from the separated part. Replace areas inaccessible to spot-welding tongs with MAG plug/spot welds at the same distance. Diameter of bores for plug/spot welds 8 mm.
- In the case of emissions extraction, observe a minimum distance of 30 cm for MAG welding during the welding process. Otherwise the inert gas would be drawn off.
- Follow the equipment manufacturer's instructions for use.

2. Work materials

- MAG welding:
 - Steel welding apparatus.
 - Steel welding wire - G3SI1 (SG2) or alternatively G4SI1 (SG3)
 - Welding mask
 - Gas bottle containing inert gas (82 % argon, 18 % CO₂)
- Resistance pressure spot welding:
 - Spot-welding apparatus.
 - Protective goggles

3. Preparations for MAG and spot-welding

- Remove the paint coating in an area of approx. 30 mm around the weld seam or spot.
 - The zinc coating underneath must be removed during the MAG welding operation.
 - It is not necessary to remove the zinc coating underneath during spot-welding.
- Remove the paint coating on the reverse side of the weld seam or spot.
 - Contaminants will otherwise enter the weld pool via the root of the weld seam.
 - An insufficient electron flow prevents an optimum spot-weld joint.
- Coat all metal overlaps and weld spot flanges with welding primer.
- To determine the optimum electrode contact force for spot-welding, carry out spot-weld shear tests on sample metal sheets.
- In order to keep the electron flow short during MAG welding on the body, you must if possible attach the ground terminal directly to the component to be welded.

4. Welding

- During MAG welding, the weld gap must be kept as small as possible. The larger the weld gap, the lower will be the strength of the joint.
- During spot-welding, the metal flanges to be joined must be placed as close together as possible without gaps.

The larger the gap, the lower will be the strength of the joint.

Minimum gap between welding spots 25 mm.

5. Subsequent treatment of weld joints:

- When grinding a weld seam, do not grind thin the base material next to the seam.
- After joining, clean all weld seams and spots with a stainless steel wire brush.
- Remove burnt paint with a stainless steel wire brush.
- All weld joints sealed off with body sealing compound in original state must be primed and sealed off again thoroughly after repairing. Replace damaged or removed antinoise compounds.

B. Soldering steel parts:

1. General information

- The following procedures are used for repairs:
 - Gas brazing
 - Tinning
- The MIG soldering procedure is not used in repairs for strength reasons. MIG soldered/brazed seams used in series production are replaced in repairs by MAG weld seams.
- Areas brazed in vehicle production are joined during repairs with the same procedure.
- It is possible when straightening steel parts to correct irregularities smaller than 2 mm with filler.

If in exceptional cases the irregularities are in excess of 2 mm, these areas must be tinned.

Only visible areas of the outer skin and on the support carrier must be tinned.

All areas which have covers on the vehicle are not to be tinned.

**NOTE: Only applicable within the European Union!
European used-car regulations prohibit the use of tin containing lead in motor vehicles introduced after 01.07.2003!**

2. Work materials

- Gas brazing:
 - Tube pack and torch (gas torch)
 - Brazing solder
 - Gas bottles (oxygen and acetylene)
 - Welding goggles
- Tinning:
 - Tube pack and torch (torch for tinning)
 - Tinning paste
 - Tin

- Gas bottle (acetylene)
- Protective goggles

3. Preparations for brazing/tinning

- Heat brazed joints to be opened with an autogenous flame. Lift off remaining metal and remove remaining brazing solder with a wire brush.
- Remove the paint and zinc coating in an area of approx. 30 mm around the seam to be soldered.
- Remove the paint and zinc coating in the tin-plating area and approx. 30 mm beyond.

4. Brazing/tinning

- Execute brazed seam without overheating the solder and with low heat dissipation. If necessary, use heat protecting paste.

5. Subsequent treatment of brazed joints:

- Remove burnt residual zinc completely. Straighten, grind and tin visible connection points.
- Remove burnt paint with a stainless steel wire brush.

41 00 ... WELDING IN REINFORCEMENT PLATE (STEEL PLATE)

In the case of a partial replacement piece, a body component is cut at a point described in the repair instructions.

A reinforcement plate is welded in to ensure sufficient strength.

Follow notes for welding steel parts, see [41 00 ... Welding and soldering steel parts](#).

NOTE: The following illustrations serve as general illustrations of reinforcement plate repair work. They are applicable to all cutting repairs.

Mark component in accordance with distance A and cut.

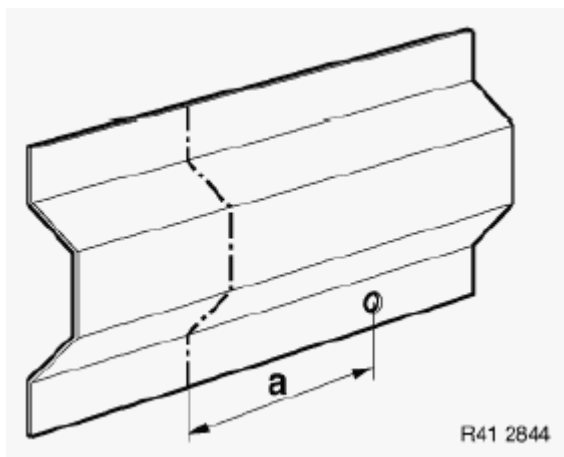


Fig. 11: Welding In Reinforcement Plate - Mark Component In Accordance With Distance And Cut
 Courtesy of BMW OF NORTH AMERICA, INC.

Cut new part (1) in accordance with cut and if necessary adjust to fit with straightening attachment or universal mount.

Installation:

Adhere to a gap at severance cut of approx. one to max. two material thicknesses in order to ensure welding with the reinforcement plate and to facilitate a more tolerant fit.

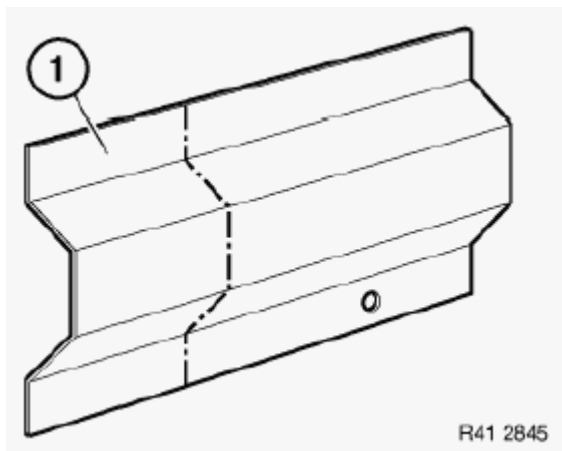


Fig. 12: Welding In Reinforcement Plate - Cut Part
Courtesy of BMW OF NORTH AMERICA, INC.

Clean inner and outer sides of connecting areas (1) on new part and (2) on body.

Coat inner sides with welding primer.

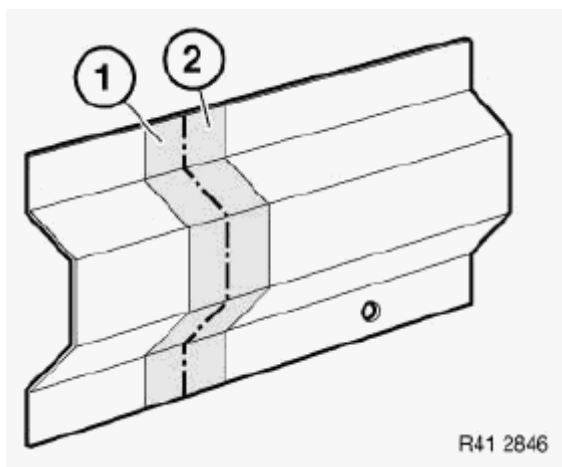


Fig. 13: Welding In Reinforcement Plate - Areas Part And Body
Courtesy of BMW OF NORTH AMERICA, INC.

Drill holes (1) and (2) at distance of 25 mm to each other.

Hole diameter approx. 8 mm.

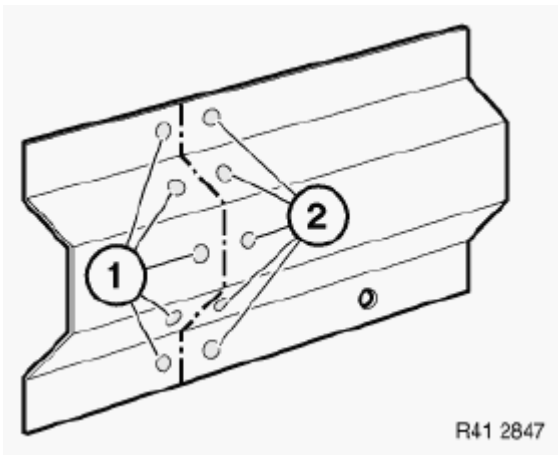


Fig. 14: Welding In Reinforcement Plate - Drill Holes
 Courtesy of BMW OF NORTH AMERICA, INC.

Make reinforcement plate (1) from trim of new part.

If necessary, make further reinforcement plates.

Length of reinforcement plates is min. 40 mm.

Coat reinforcement plates (1) and (2) on both sides with welding primer.

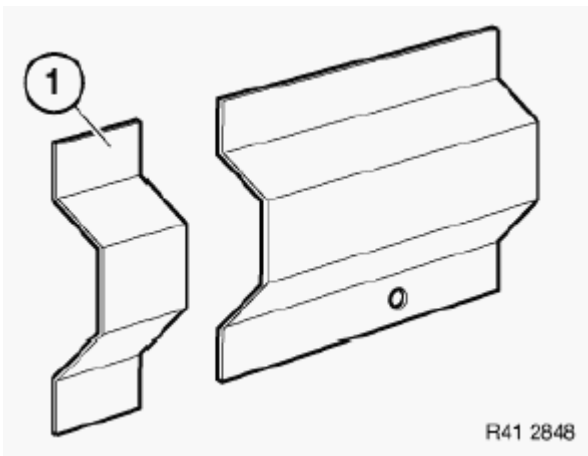


Fig. 15: Welding In Reinforcement Plate
 Courtesy of BMW OF NORTH AMERICA, INC.

Push reinforcement plate (1) into component on body up to half way and plug-weld (3).

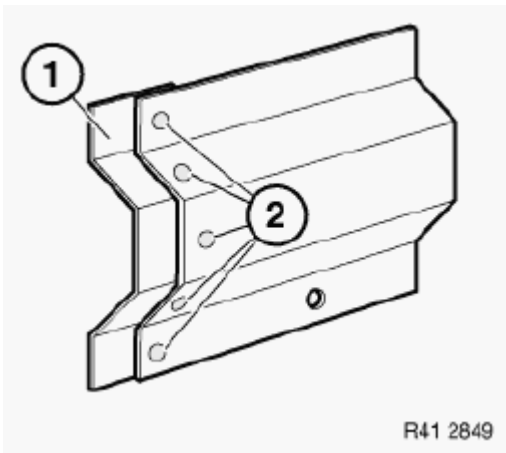


Fig. 16: Reinforcement Plate And Welding Primer
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, adjust new part (1) to fit with straightening attachment or universal mount and plug-weld (2).
 MAG weld joint (3).

Grind and clean weld seam and plug weld spots.

Only visible areas of the outer skin and worn areas on the support carrier must be tinned.

All areas which have covers on the vehicle are not to be tinned.

NOTE: Only applicable within the European Union!

European used-car regulations prohibit the use of tin containing lead in motor vehicles introduced after 01.07.2003!

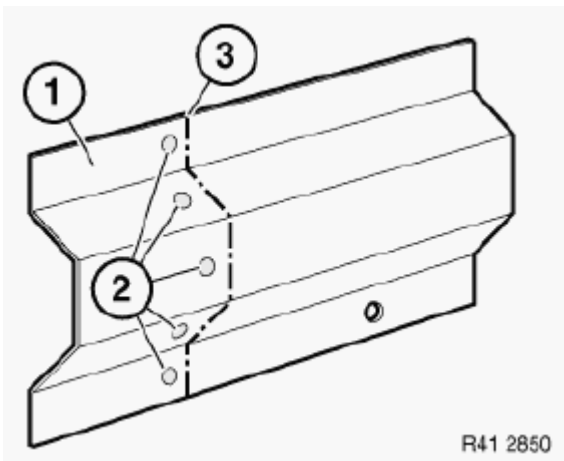


Fig. 17: MAG Weld Joint And Plug-weld
Courtesy of BMW OF NORTH AMERICA, INC.

41 00 ... WORKSHOP EQUIPMENT

Minimum workshop equipment requirements in order to ensure the correct and expert performance of body repairs:

The tools listed below **must be used** .

TOOLS MATERIALS SPECIFICATION

Tool ⁽¹⁾	Steel		Aluminium	
	Structure	Outer skin	Structure	Outer skin
Bodywork tool assortment	x	x		
Aluminium bodywork tool assortment			x	x
Bodywork saw	x	x		
Single-handed grinder	x	x	x	x
Welding spot remover	x	x		
MAG welding apparatus	x	x		
MIG welding apparatus			(E52 only)	
Spot welding apparatus	x	x		
Gas welder		x		
Straightening system	x		x	
Stud welding apparatus			x	
Flame coating set			x	
Universal riveting tool			x	

(1) See Aftersales Assistance Portal (ASAP) - Service/Technical - Workshop equipment (Start BMW) - Shop Workshop equipment or under www.bmwgroup-wep.com

IMPORTANT: In vehicles from model year 2001, higher-tensile and high-tensile steels are used in certain areas.

It is essential to check whether the spot-welding apparatus used conforms to the technical requirements of the currently recommended welding sets. Should you have any questions, please contact the country - specific Hotline.

The use of technically obsolete equipment may have serious consequences for the structure of the vehicle (e.g. in the event of a crash). In the end, this can result in safety and product liability risks which cannot be calculated.

Use and restrictions:

Definition of Recommendation:

All currently recommended spot welding sets comply with the requirements relating to reliable welding of today's and future BMW Group vehicles. A spot welding unit will lose its recommendation as soon as tests with materials and material combinations designated for future use in BMW Group vehicles return negative results. All previous application before the withdrawal of the recommendation shall remain unaffected.

DEVICE DESIGNATION MANUFACTURER CHART

	Device designation	Manufacturer
Group 1 Devices currently no longer recommended	CR500	Car-O-Liner
	Spot9000	Tecna
	ATL 400V	Wielander & Schill
Group 2 Devices currently recommended (March 2007)	MIDIspot QSVM9000	Celette
	MIDIspot QSVM9000	Elmatech
	CR600	Car-O-Liner
	Multispot MI-100 Control	Elektron

Application options and restrictions of above devices.

VEHICLE GROUP REFERENCE

Vehicle	Group 1	Group 2
E93	x Except A-pillar, B-pillar, sill	x
E70	x Except B-pillar	x
E64	x Except A-pillar, B-pillar, sill	x

NOTE: (March 2007)

All models not listed can be repaired using the Group 1 and Group 2 devices.

99 00 ... GENERAL INSTRUCTIONS ON PAINTING

General instructions and classification of paint stages are described on the KSD-CD (notes-general information on flat rate unit data, passenger car explanation for FR specifications for painting).

The marked area serves as the starting point for painting. This area may differ from the illustration for technical painting reasons.

Touching-up areas are taken into account.

11 SUPPORT MEMBERS

41 11 005 REPLACING LEFT CROSS-MEMBER MOUNTING

Read contents of Body, General, see **41 0 Contents of Body, General**.

Place vehicle on straightening bench.

Following new body parts are required:

- o (1) Mounting, cross-member



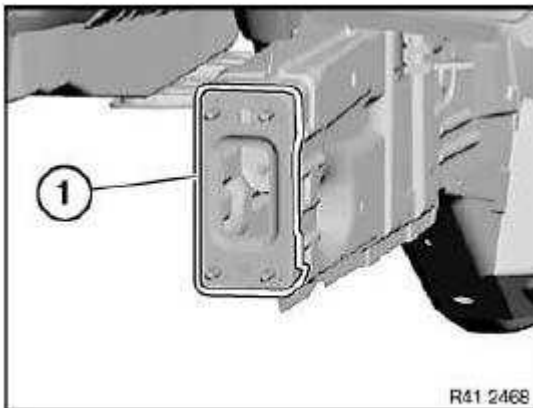
R41 2467

Fig. 18: Mounting, Cross-Member
Courtesy of BMW OF NORTH AMERICA, INC.

Open weld joints in area (1).

Installation:

Adjust new part to fit with straightening attachment or universal mount.



R41 2468

Fig. 19: Weld Joints In Area
Courtesy of BMW OF NORTH AMERICA, INC.

41 11 028 REPLACING FRONT LEFT ENGINE CARRIER (PARTIAL REPLACEMENT BETWEEN FRONT AXLE TAKE-UPS)

Read contents of Body, General, see **41 0 Contents of Body, General**.

Place vehicle on straightening bench.

Following new body parts are required:

- (1) Engine carrier, front
- (2) Mounting, cross-member

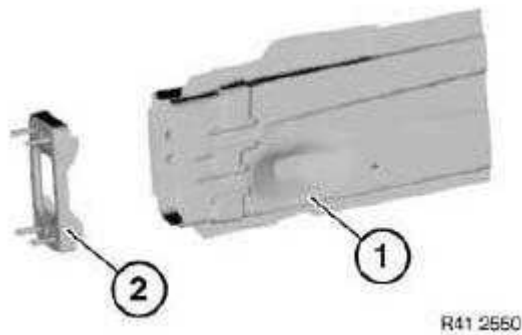


Fig. 20: Engine Carrier, Front And Mounting, Cross-Member
 Courtesy of BMW OF NORTH AMERICA, INC.

Mark severance cut (1) in accordance with specified measurements and cut.

NOTE: Reuse metal section (3) if it is undamaged.

Measurement a=60 mm from center of 12 mm dia. bore

Measurement b=215 mm

Open weld joints in area (2).

Remove metal section (3).

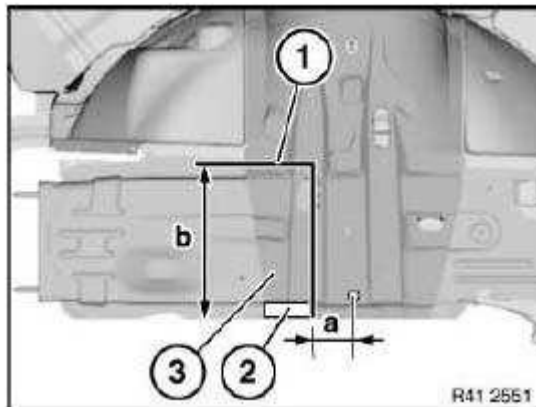


Fig. 21: Mark Severance Cut Measurement
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Weld in reinforcement plate, see **41 00 ... Welding in reinforcement plate (steel plate)** at severance cut (1).

Plug weld, see **41 00 ... Welding and soldering steel parts** in area (2) additionally.

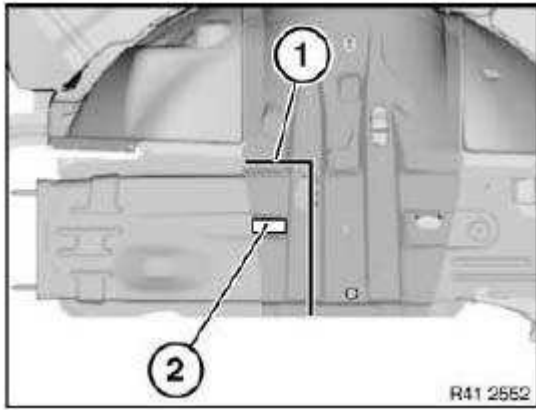


Fig. 22: Severance Cut And Plug Weld In Area
Courtesy of BMW OF NORTH AMERICA, INC.

Open weld joints in area (1).

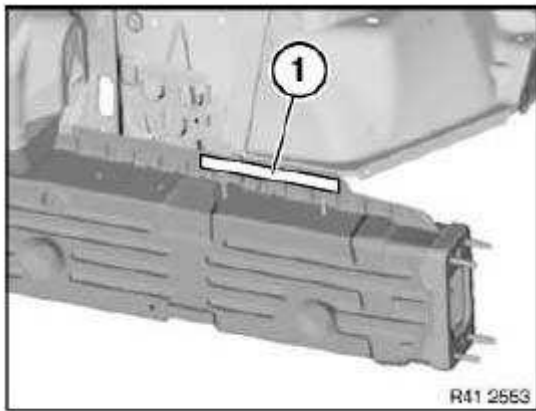


Fig. 23: Weld Joints In Area
Courtesy of BMW OF NORTH AMERICA, INC.

Mark severance cut (1) in accordance with measurement and cut.

Measurement a=190 mm

NOTE: Right side only:

Measurement a=180 mm

Installation:

Weld in reinforcement plate, see **41 00 ... Welding in reinforcement plate (steel plate)** at severance cut (1).

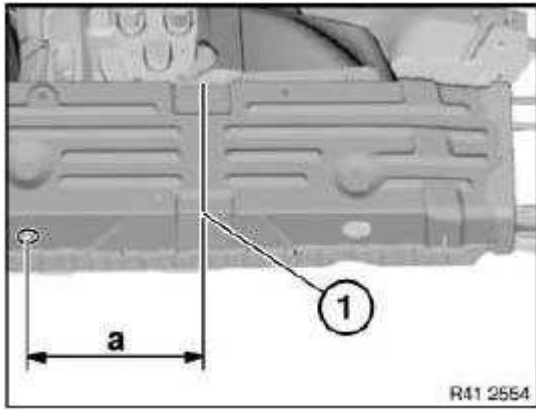


Fig. 24: Mark Severance Cut Measurement
Courtesy of BMW OF NORTH AMERICA, INC.

Preparation of new part:

Mark severance cut (1) in accordance with vehicle and cut.

Installation:

Adjust all new parts to fit with straightening attachment or universal mount.

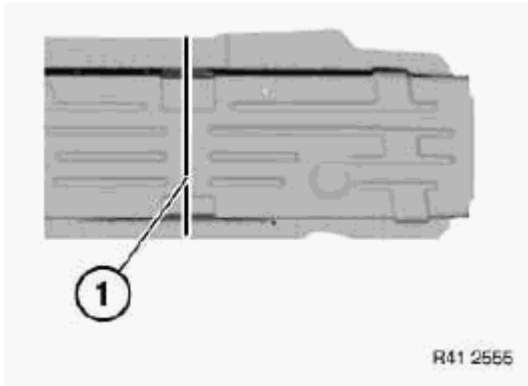


Fig. 25: Mark Severance Cut
Courtesy of BMW OF NORTH AMERICA, INC.

Weld new component in area (1).

Installation:

Adjust new part to fit with straightening attachment or universal mount.

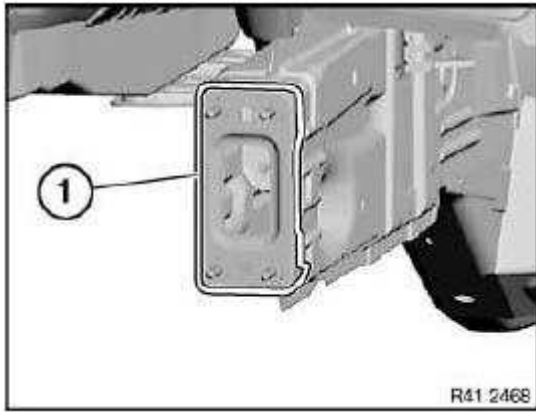


Fig. 26: Weld Joints In Area

Courtesy of BMW OF NORTH AMERICA, INC.

41 11 048 REPLACING FRONT LEFT ENGINE CARRIER

Read contents of Body, General, see **41 0 Contents of Body, General**.

Use only approved spot-welding apparatus for repairs, see **41 00 ... Workshop equipment**

Remove or cover those vehicle components in the repair area which are susceptible to heat or dust.

Place vehicle on straightening bench.

Following new body parts are required:

- (1) Engine carrier, complete
- (2) Mounting, cross-member
- (3) Connection, outer
- (4) Reinforcement, bulkhead
- (5) Support carrier, bulkhead
- (6) Partition wall, assembly compartment
- (7) Reinforcement, partition wall (right side only - not shown)

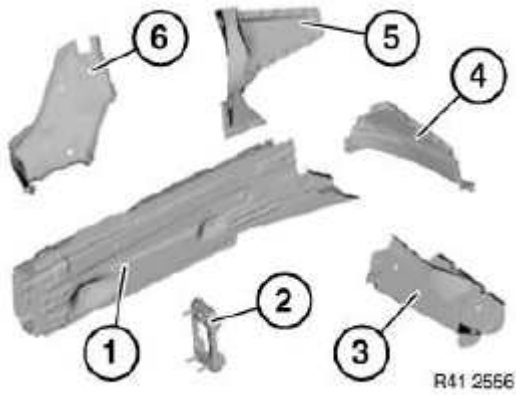


Fig. 27: Engine Carrier, Complete And Partition Wall, Assembly Compartment
 Courtesy of BMW OF NORTH AMERICA, INC.

Open weld joints in areas (1).

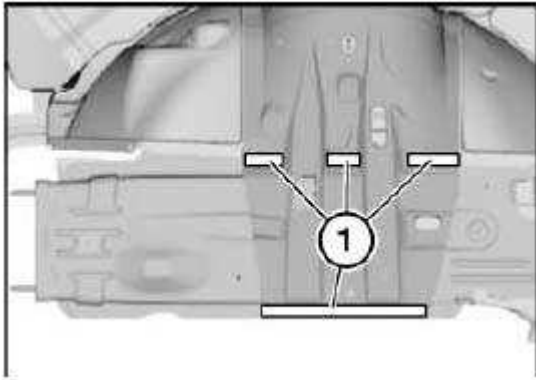


Fig. 28: Weld Joints In Areas
 Courtesy of BMW OF NORTH AMERICA, INC.

Open weld joints in areas (1).

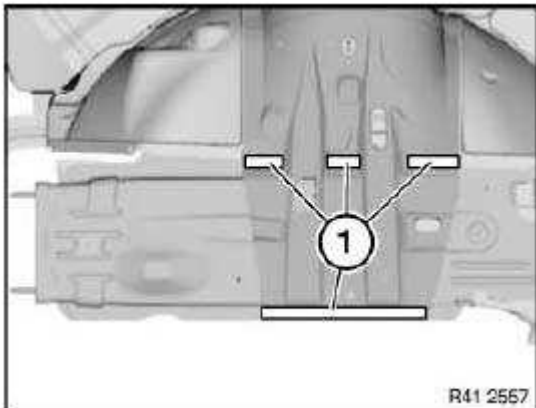


Fig. 29: Weld Joints In Areas

Courtesy of BMW OF NORTH AMERICA, INC.

Open weld joints in areas (1).

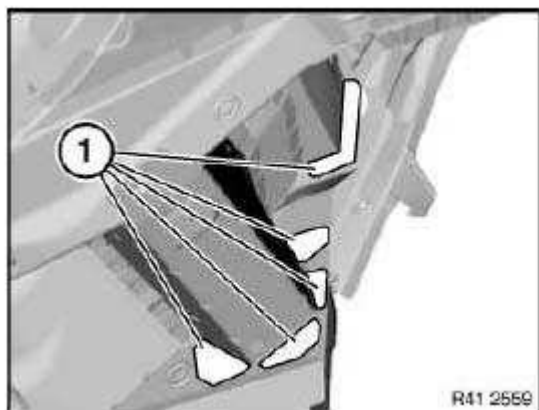


Fig. 30: Weld Joints In Areas
Courtesy of BMW OF NORTH AMERICA, INC.

Open weld joints in areas (1).

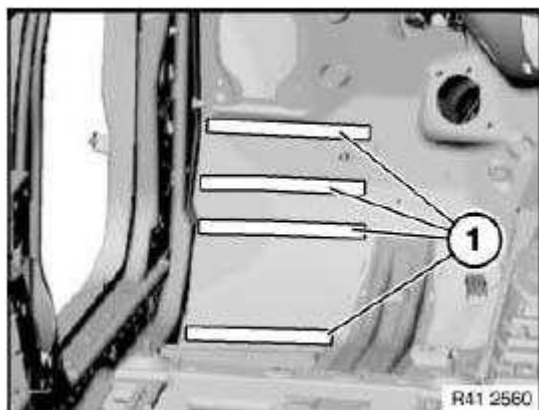


Fig. 31: Weld Joints In Areas
Courtesy of BMW OF NORTH AMERICA, INC.

Open weld joints in areas (1).

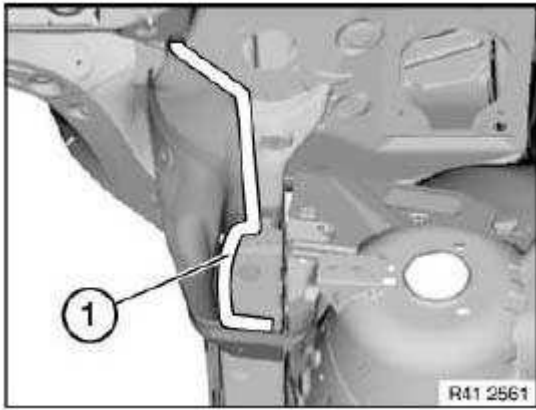


Fig. 32: Weld Joints In Areas
Courtesy of BMW OF NORTH AMERICA, INC.

Mark severance cut (1) in accordance with measurements a and b and cut bulkhead support carrier.

Measurement a=95 mm

Measurement b=120 mm

Open weld joints in area (2).

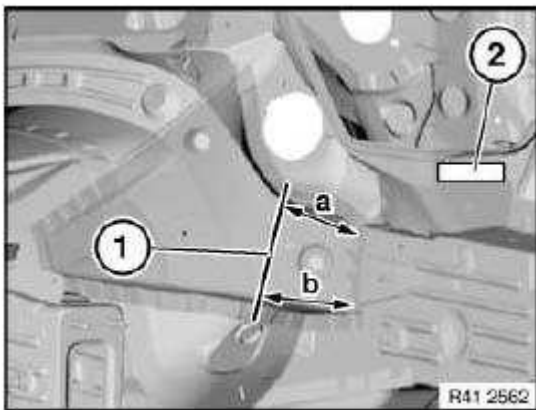


Fig. 33: Mark Severance Cut Measurement
Courtesy of BMW OF NORTH AMERICA, INC.

Open weld joints in area (1).

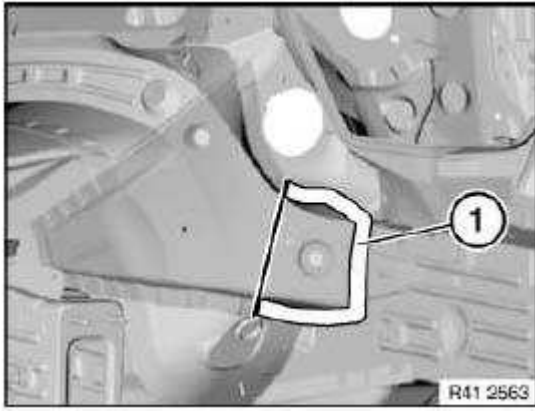


Fig. 34: Weld Joints In Area
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Right side only:

Open weld joint in area (1).

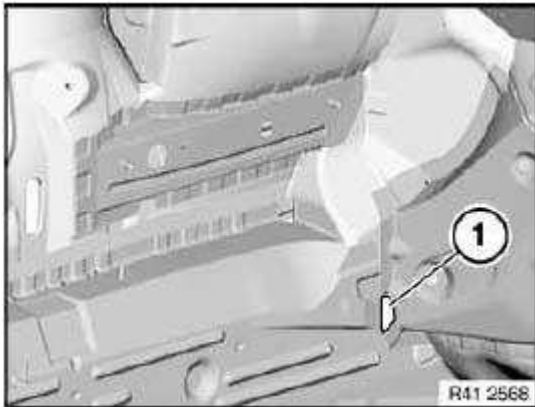


Fig. 35: Weld Joints In Area
Courtesy of BMW OF NORTH AMERICA, INC.

Open weld joints in areas (1).

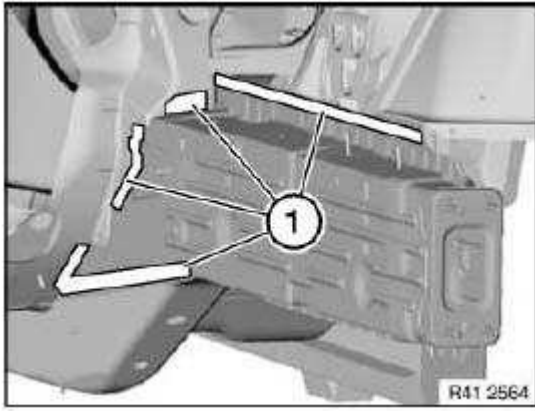


Fig. 36: Weld Joints In Area
Courtesy of BMW OF NORTH AMERICA, INC.

Open weld joints in areas (1).

Installation:

Adjust new part to fit with straightening attachment or universal mount.

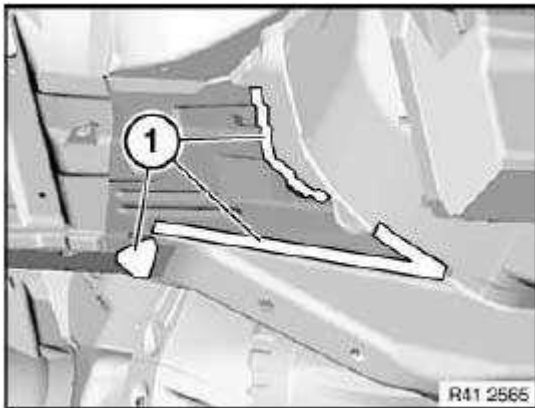


Fig. 37: Weld Joints In Area
Courtesy of BMW OF NORTH AMERICA, INC.

Weld new component in area (1).

Installation:

Adjust new part to fit with straightening attachment or universal mount.

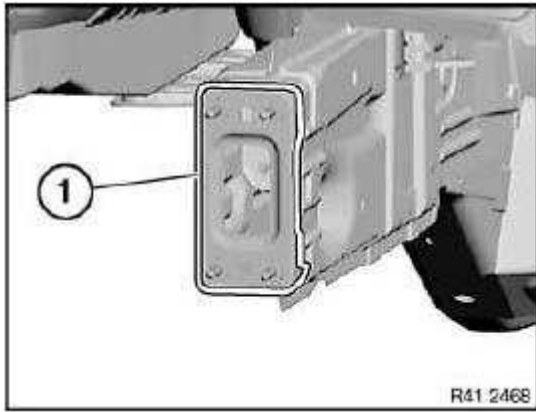


Fig. 38: Weld Joints In Area

Courtesy of BMW OF NORTH AMERICA, INC.

**41 11 301 REPLACING COVER FOR LONGITUDINAL MEMBER WITH LEFT DOOR PILLAR
(PARTIAL REPLACEMENT B - PILLAR)**

Read contents of Body, General, see **41 0 Contents of Body, General.**

Place vehicle on straightening bench.

Following new body parts are required:

- (1) B-pillar with entrance
- (2) Shaped part, B-pillar, inner

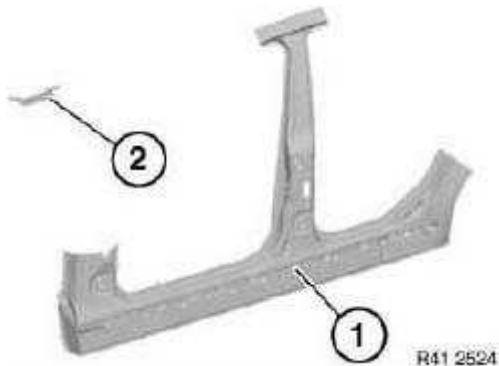


Fig. 39: B-Pillar With Entrance And Shaped Part, B-Pillar, Inner

Courtesy of BMW OF NORTH AMERICA, INC.

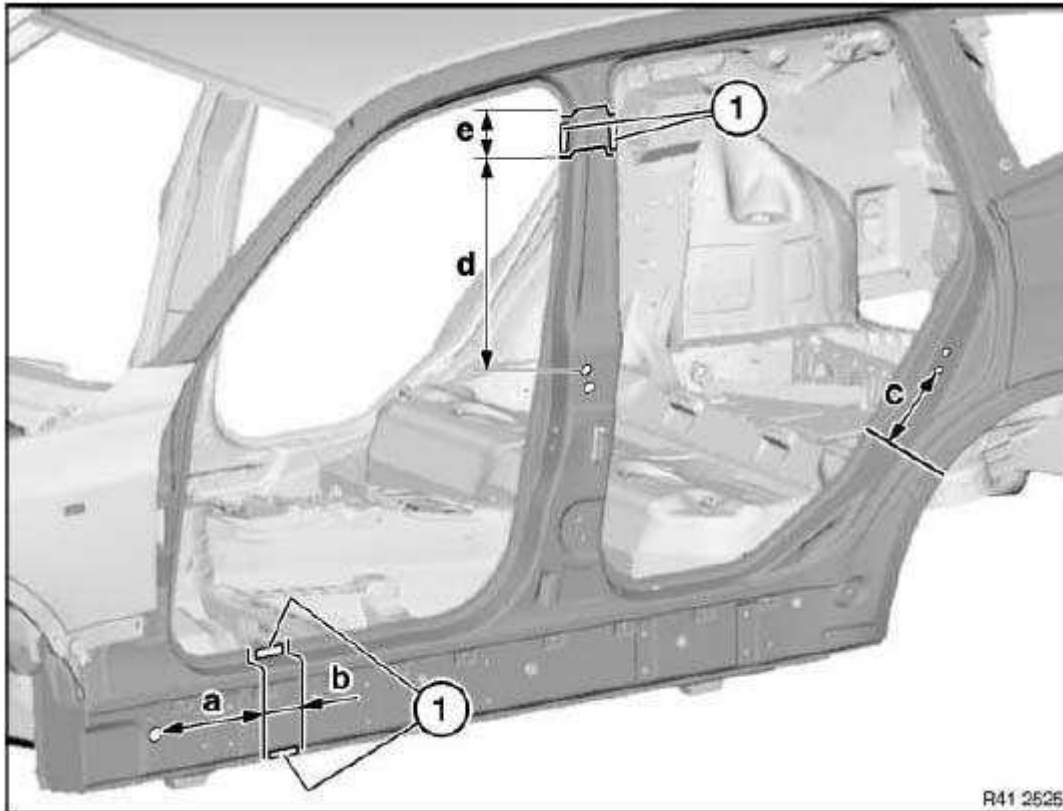


Fig. 40: Weld Joints In Areas Dimension
 Courtesy of BMW OF NORTH AMERICA, INC.

Mark severance cuts in accordance with specified measurements and cut.

IMPORTANT: Cut outer plate only for following severance cuts.

Measurement a = approx. 220 mm behind hole dia. 20 mm.

Measurement b = approx. 60 mm behind cut a.

Measurement c = approx. 200 mm from middle of lower lock striker screw point.

Measurement d = approx. 450 mm above upper door hinge mounting.

Measurement e = approx. 80 mm above cut d.

Open weld joints in areas (1).

Installation:

Weld in reinforcing panels, see **41 00 ... Welding in reinforcement plate (steel plate)** at all severance cuts.

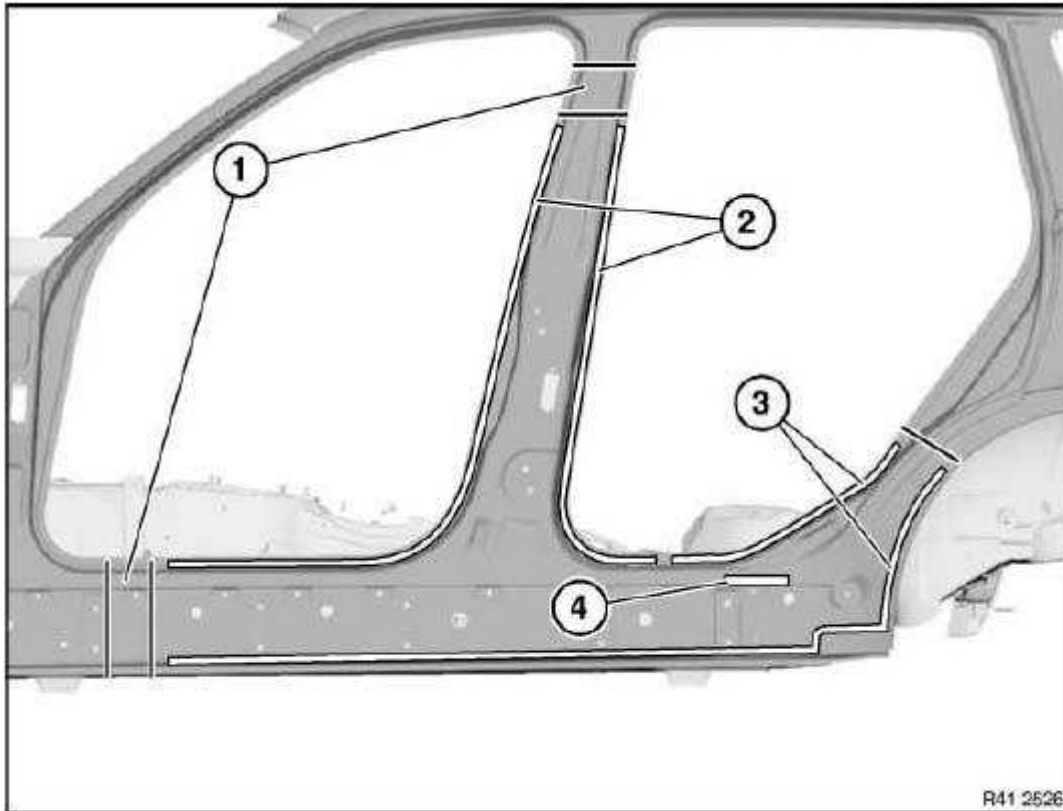


Fig. 41: Metal Sections And Weld Joints In Areas Dimension
Courtesy of BMW OF NORTH AMERICA, INC.

Remove metal sections (1).

Open weld joints in areas (2) and (3).

Longitudinal member cover is bonded to inner frame in area (4).

**IMPORTANT: Cut two metal plates in areas (2).
Cut outer metal plate only in areas (3).**

Installation:

Cut-out metal sections (1) are required again for sealing.

Mark severance cut in accordance with specified measurement and cut.

IMPORTANT: Cut outer metal plate only for following severance cut.

Measurement a = 490 mm above upper door hinge mounting.

Installation:

Weld in reinforcement plate at severance cut, see **41 00 ... Welding in reinforcement plate (steel plate)**.

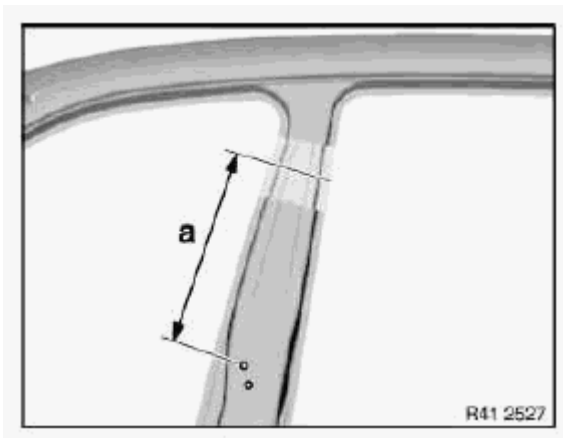


Fig. 42: Reinforcement Plate At Severance Cut Dimension
Courtesy of BMW OF NORTH AMERICA, INC.

Mark severance cut in accordance with specified measurement and cut.

Measurement a = 250 mm behind hole dia. 20 mm.

Installation:

Weld in reinforcement plate at severance cut, see **41 00 ... Welding in reinforcement plate (steel plate)**.

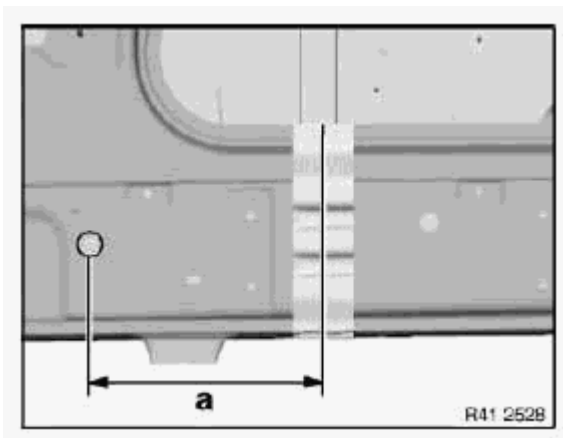


Fig. 43: Reinforcement Plate At Severance Cut Dimension (Behind Hole)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: View from inside

Open weld joints in areas (1).

Open adhesive bond in area (2).

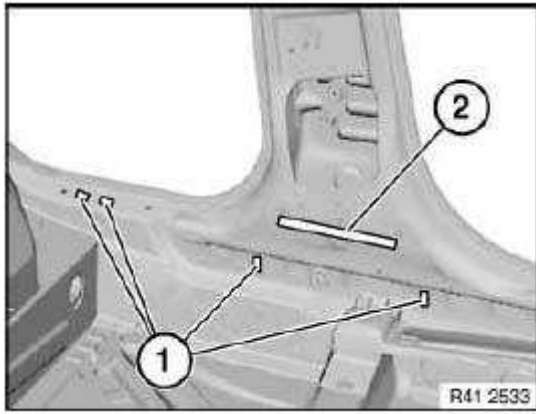


Fig. 44: Weld Joints And Adhesive Bond In Areas
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: View from below

Open weld joints in areas (1).

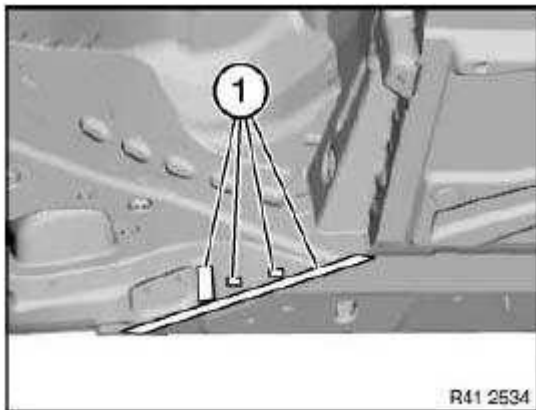
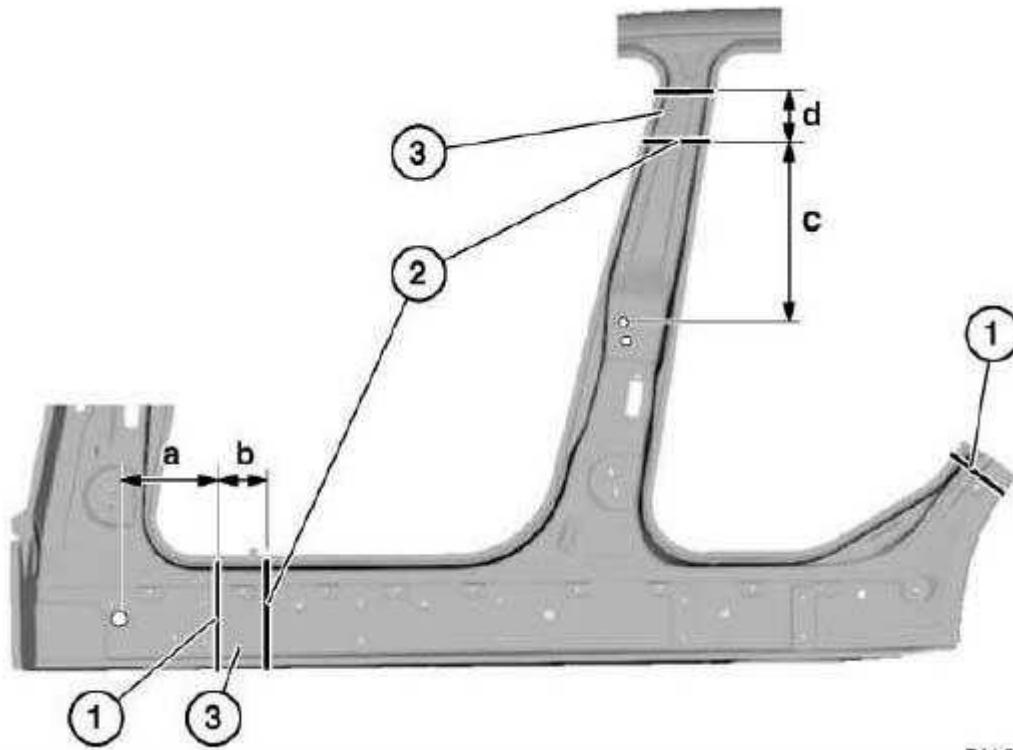


Fig. 45: Weld Joints In Areas
Courtesy of BMW OF NORTH AMERICA, INC.



R41 2535

Fig. 46: Sheet Panel On Weld Joints Dimension
 Courtesy of BMW OF NORTH AMERICA, INC.

Preparation of new part:

Mark severance cuts (1) on new part in accordance with previous severance cuts and cut.

IMPORTANT: Cut outer plate only for severance cuts (2).

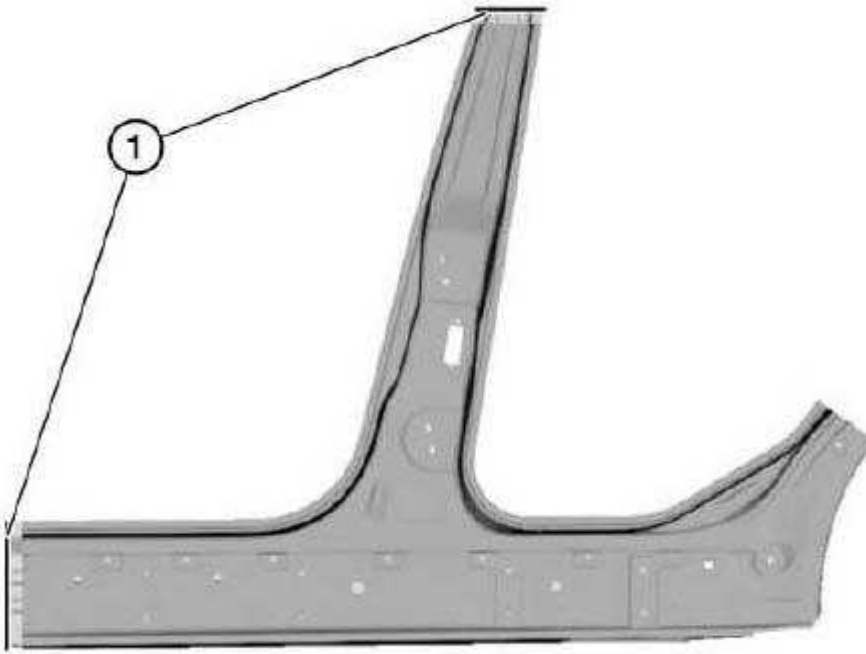
Measurement a = approx. 220 mm behind hole dia. 20 mm.

Measurement b = approx. 60 mm behind cut a.

Measurement c = approx. 450 mm above upper door hinge mounting.

Measurement d = approx. 80 mm above cut d.

Open weld joints on sheet panel (3) and remove component.



R41 2536

Fig. 47: Mark Severance Cuts
Courtesy of BMW OF NORTH AMERICA, INC.

Preparation of new part:

Mark severance cuts (1) on new part in accordance with severance cuts on vehicle and cut.

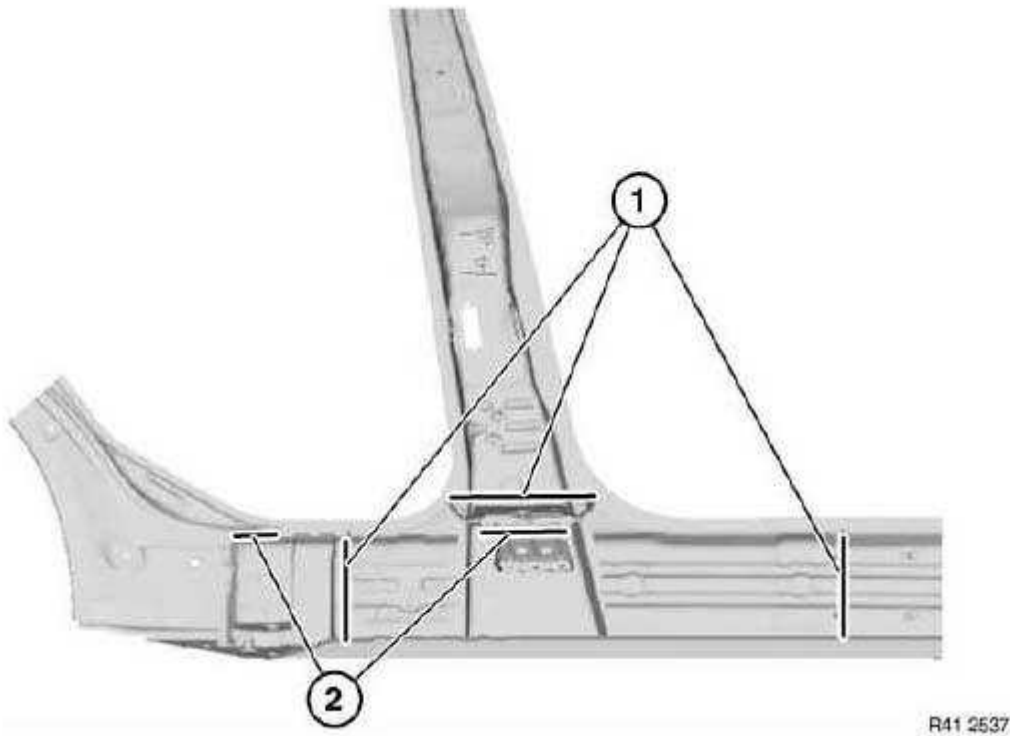


Fig. 48: Mark Severance Cuts And Adhesive In Areas
Courtesy of BMW OF NORTH AMERICA, INC.

Apply window glass adhesive, see **41 00 ... Installing a cavity bulkhead (expanded)** to cavity acoustic baffles (1).

Apply adhesive, see **41 00 ... Bonding steel parts** in areas (2).

Installation information:

Adjust new part to fit with straightening attachment or universal mount.

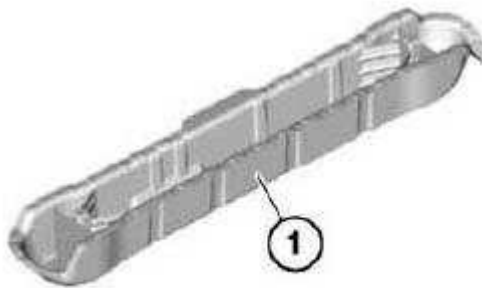
41 11 620 REPLACING REAR AXLE TAKE-UP CROSS-MEMBER AT REAR (LUGGAGE COMPARTMENT FLOOR COMPLETELY REMOVED)

Read contents of Body, General, see **41 0 Contents of Body, General**.

Place vehicle on straightening bench.

Following new body parts are required:

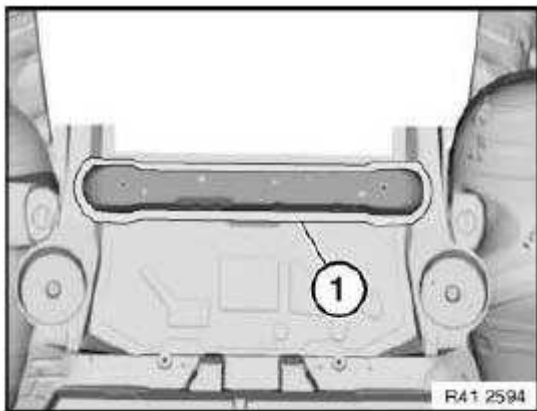
- (1) Cross-member, rear axle take-up, rear



R41 2593

Fig. 49: Cross-Member, Rear Axle Take-Up, Rear
Courtesy of BMW OF NORTH AMERICA, INC.

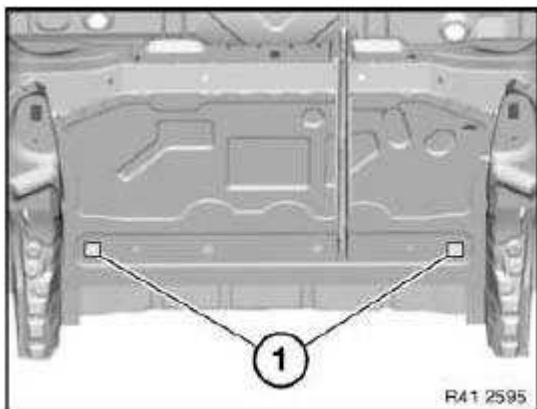
Open weld joints in area (1).



R41 2594

Fig. 50: Weld Joints In Area
Courtesy of BMW OF NORTH AMERICA, INC.

Open weld joints in areas (1).



R41 2595

Fig. 51: Weld Joints In Area
Courtesy of BMW OF NORTH AMERICA, INC.

12 LUGGAGE COMPARTMENT FLOOR

41 12 535 FOR DETAILS OF STRIPPING-DOWN AND RIGGING WORK. PLACE VEHICLE ON STRAIGHTENING BENCH.

Read contents of Body, General, see 41 0 Contents of Body, General.

compartment floor (tail panel removed)

Following new body parts are required:

- (1) Luggage compartment floor
- (2) Luggage compartment floor, right
- (3) Rear axle carrier, upper section, right
- (4) Rear axle carrier, lower section, right
- (5) Cross-member, rear axle take-up, rear
- (6) Rear axle carrier, upper section, left
- (7) Rear axle carrier, lower section, left
- (8) Luggage compartment floor, left

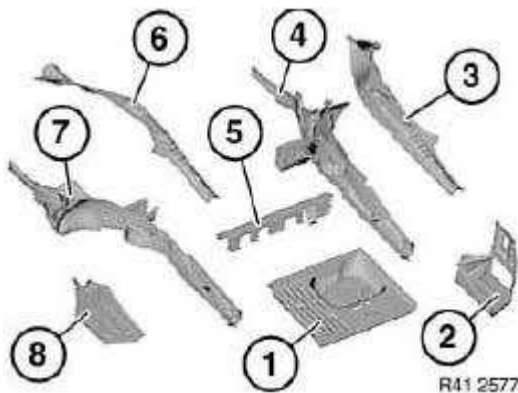


Fig. 52: Luggage Compartment Floor And Rear Axle Carrier, Section
Courtesy of BMW OF NORTH AMERICA, INC.

Open weld joints in areas (1).

Installation:

Adjust new component (2) to fit to body in accordance with paint impressions.

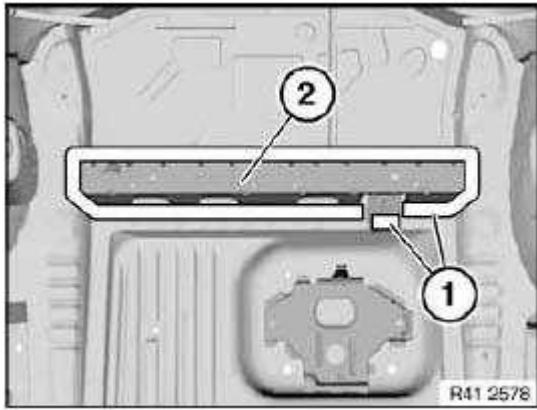


Fig. 53: Weld Joints In Area
Courtesy of BMW OF NORTH AMERICA, INC.

Open weld joints in area (1).

Installation:

Weld in area (2) additionally.

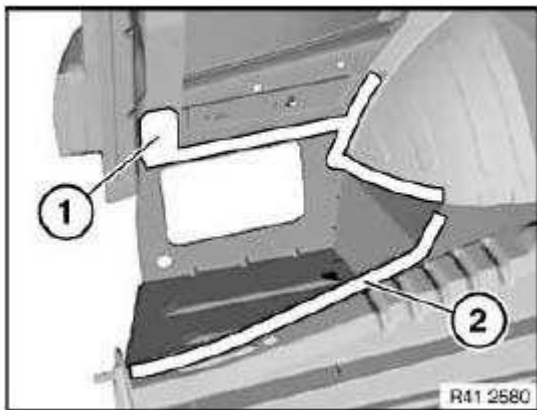


Fig. 54: Weld Joints In Area
Courtesy of BMW OF NORTH AMERICA, INC.

Open weld joints in area (1).

Installation:

Weld new component in area (2) additionally.

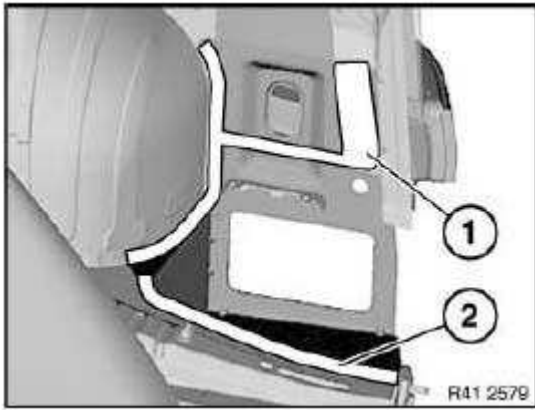


Fig. 55: Weld Joints In Area
 Courtesy of BMW OF NORTH AMERICA, INC.

Open weld joints in area (1).

Installation:

Weld new component in areas (2) additionally.

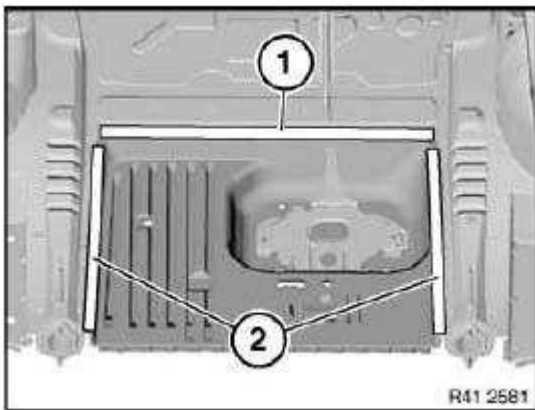


Fig. 56: Weld Joints In Area
 Courtesy of BMW OF NORTH AMERICA, INC.

Mark severance cut in accordance with measurement a and cut rear axle carrier upper section (1) on both sides of vehicle.

Measurement a=220 mm from edge of square hole.

Installation:

Weld in reinforcement plate at severance cut, see **41 00 ... Welding in reinforcement plate (steel plate)**.

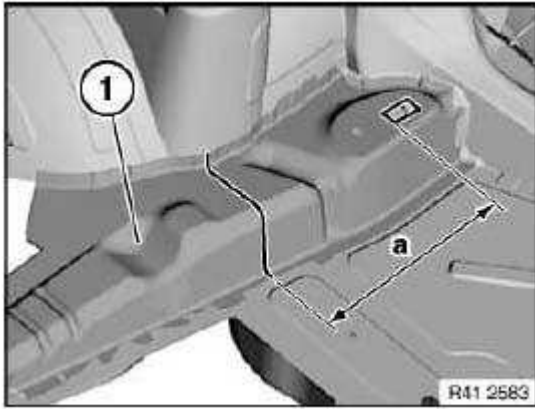


Fig. 57: Cut Rear Axle Carrier Upper Section Measurement
Courtesy of BMW OF NORTH AMERICA, INC.

Open weld joints in areas (1) on both sides of vehicle.

Installation:

Weld new component in areas (2) additionally.

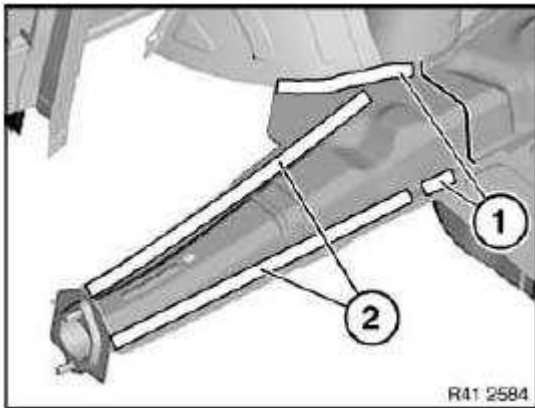


Fig. 58: Weld Joints And New Component In Area
Courtesy of BMW OF NORTH AMERICA, INC.

Mark severance cut in accordance with measurement a and cut rear axle carrier lower section (1) on both sides of vehicle.

Measurement a=140 mm from center point of bore with dia.

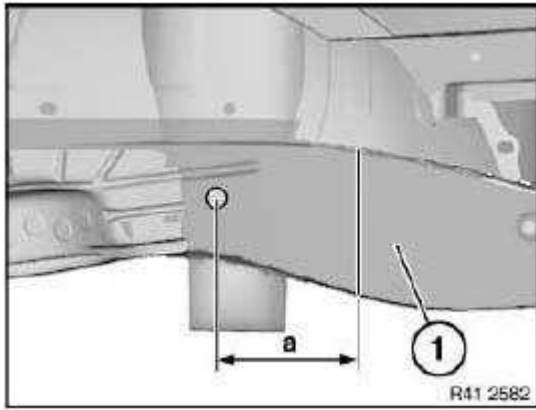


Fig. 59: Cut Rear Axle Carrier Lower Section Measurement
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Adjust new parts to fit with straightening attachment or universal mount.

Before welding in, also adjust tail panel, rear lid and rear lights to fit.

Weld reinforcement (1) in area (2) from inside additionally.

Weld in reinforcement plate, see **41 00 ... Welding in reinforcement plate (steel plate)** in area (3).

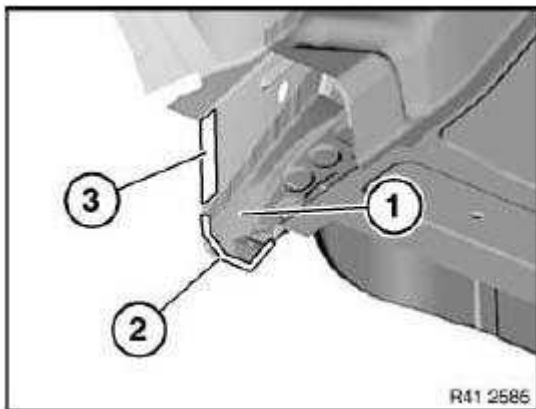


Fig. 60: Weld Reinforcement In Area
 Courtesy of BMW OF NORTH AMERICA, INC.

14 WHEEL WELLS

41 14 015 REPLACING ENGINE CARRIER WITH WHEEL ARCH, LEFT

Read contents of Body, General, see **41 0 Contents of Body, General**.

Use only approved spot-welding apparatus, see **41 00 ... Workshop equipment** for repairs.

Remove or cover those vehicle components in the repair area which are susceptible to heat or dust.

Place vehicle on straightening bench.

Following new body parts are required:

- (1) Wheel arch, front left
- (2) Reinforcement, bulkhead
- (3) Partition wall, assembly compartment
- (4) Support carrier, bulkhead
- (5) Support, engine carrier, rear
- (6) Reinforcement, partition wall, right (not shown)

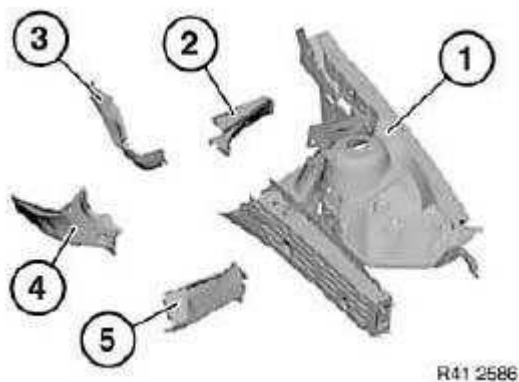


Fig. 61: Wheel Arch, Front Left And Partition Wall, Assembly Compartment
Courtesy of BMW OF NORTH AMERICA, INC.

Open weld joints in area (1).

NOTE: **Cut outer metal sheet only.**

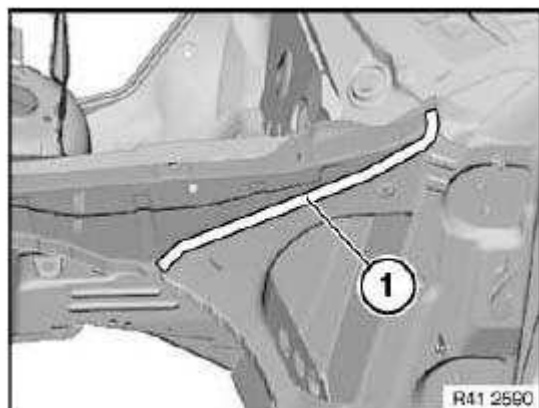


Fig. 62: Weld Joints In Area

Courtesy of BMW OF NORTH AMERICA, INC.

Open weld joints in area (1).

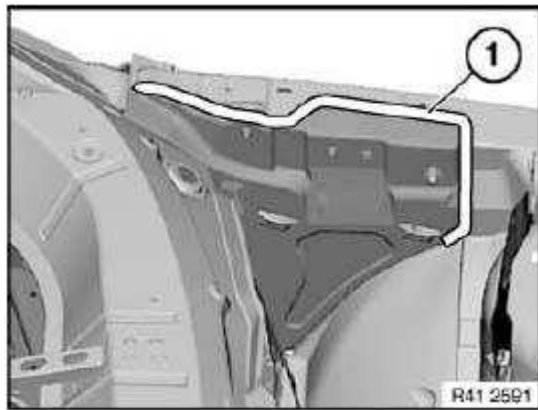


Fig. 63: Weld Joints In Area

Courtesy of BMW OF NORTH AMERICA, INC.

Open weld joints in areas (1).

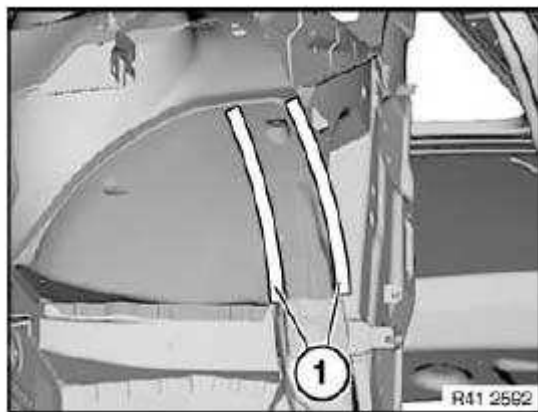


Fig. 64: Weld Joints In Area

Courtesy of BMW OF NORTH AMERICA, INC.

Open weld joints in areas (1).

Installation:

Weld new component in area (2) additionally.

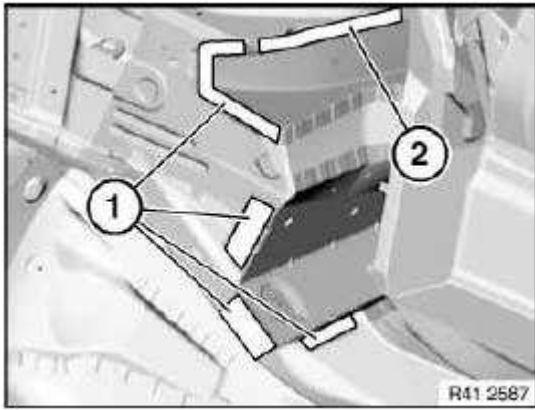


Fig. 65: Weld Joints And New Component In Area
Courtesy of BMW OF NORTH AMERICA, INC.

Open weld joints in areas (1).

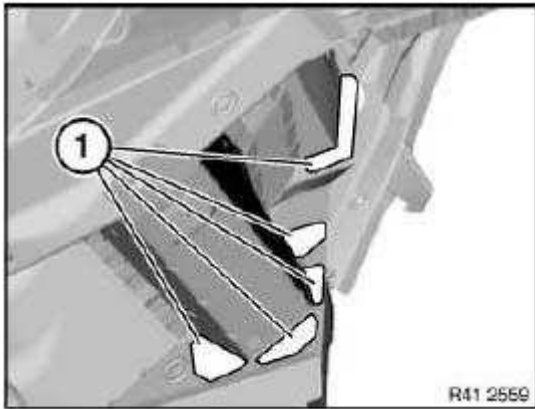


Fig. 66: Weld Joints In Areas
Courtesy of BMW OF NORTH AMERICA, INC.

Open weld joints in areas (1).

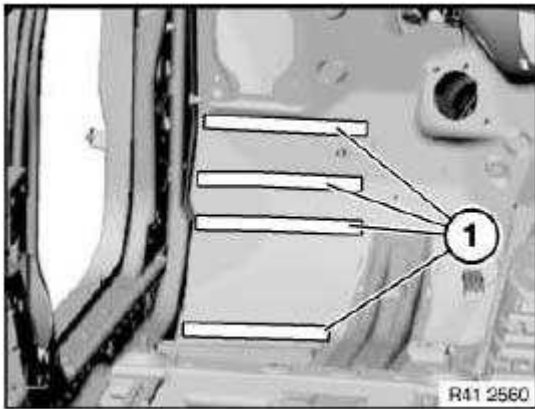


Fig. 67: Weld Joints In Areas
Courtesy of BMW OF NORTH AMERICA, INC.

Open weld joints in area (1).

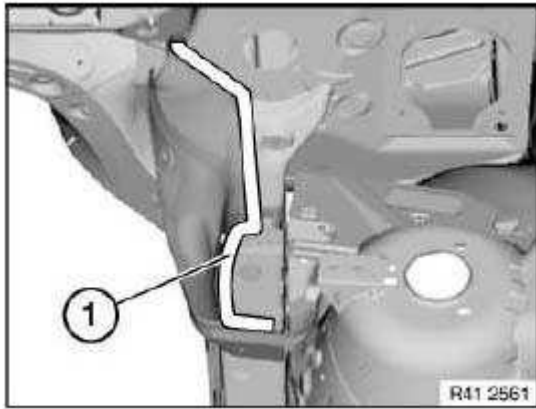


Fig. 68: Weld Joints In Areas
Courtesy of BMW OF NORTH AMERICA, INC.

Mark severance cut (1) in accordance with measurements a and b and cut bulkhead support carrier.

Measurement a=95 mm

Measurement a=120 mm

Open weld joints in area (2).

Installation:

Weld in reinforcing panel, see **41 00 ... Welding in reinforcement plate (steel plate)** at severance cut (1).

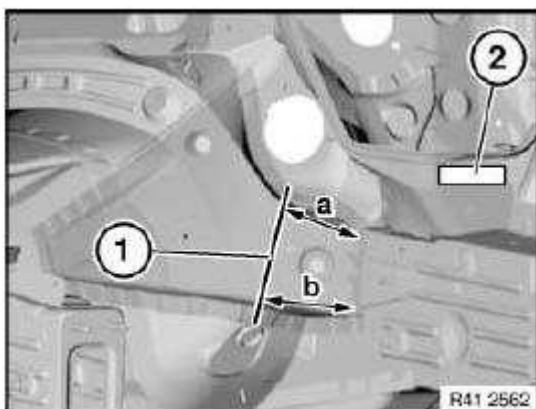


Fig. 69: Mark Severance Cut Measurement
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Right side only:

Open weld joints in areas (1) and (2).

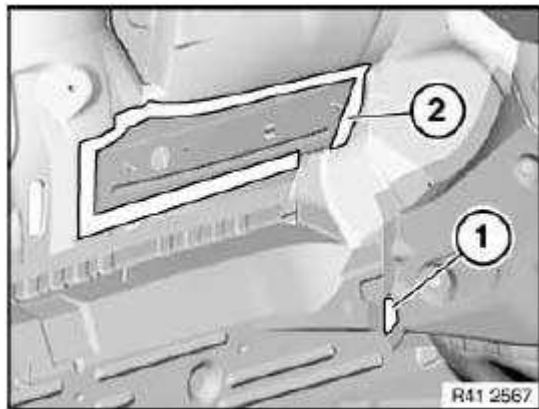


Fig. 70: Weld Joints In Area

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Right side only:

Open weld joints in area (1).

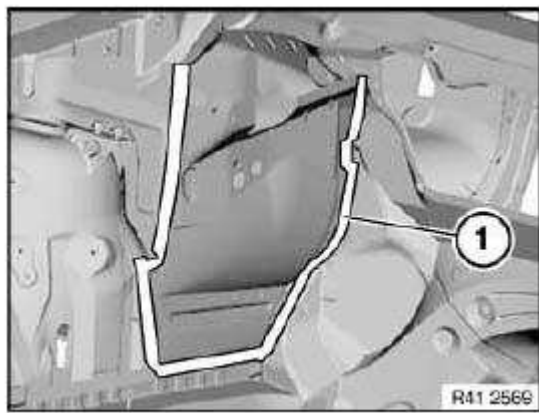


Fig. 71: Weld Joints In Area

Courtesy of BMW OF NORTH AMERICA, INC.

Open weld joints in area (1).

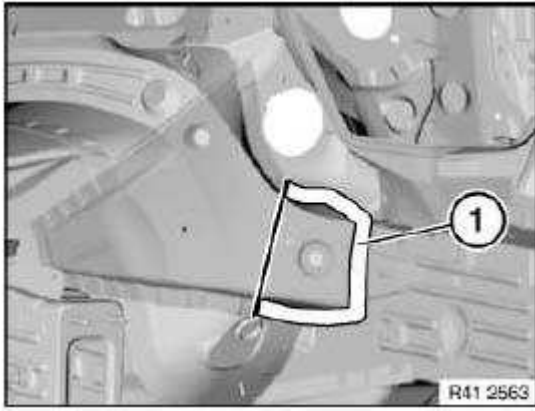


Fig. 72: Weld Joints In Area
Courtesy of BMW OF NORTH AMERICA, INC.

Open weld joints in areas (1).

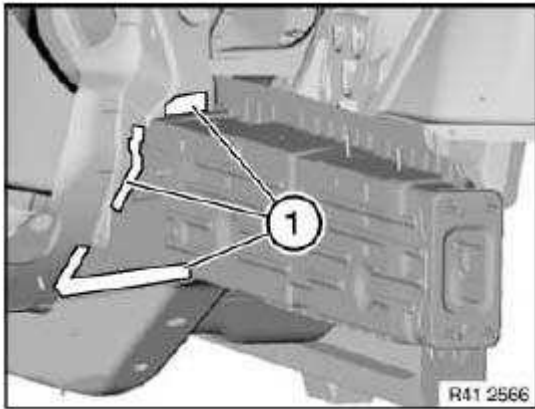


Fig. 73: Weld Joints In Area
Courtesy of BMW OF NORTH AMERICA, INC.

Open weld joints in areas (1).

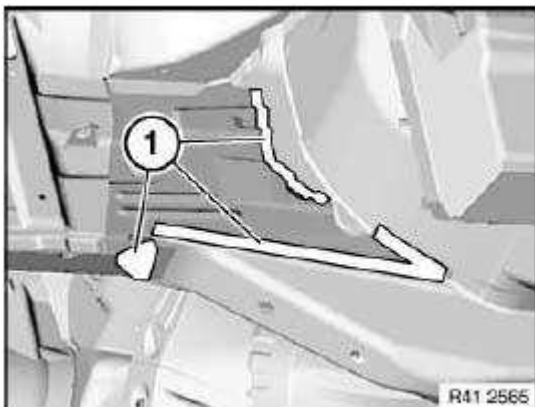


Fig. 74: Weld Joints In Area

Courtesy of BMW OF NORTH AMERICA, INC.

Preparation of new part:

Open weld joints in areas (1).

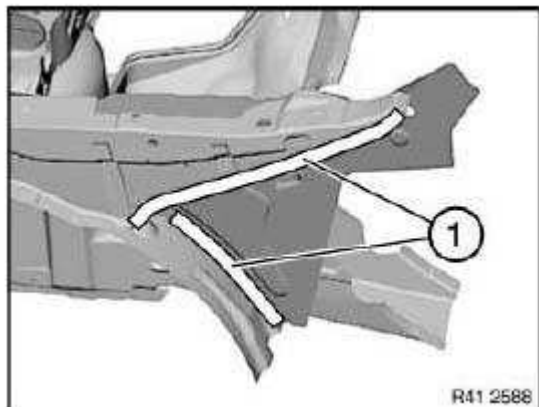


Fig. 75: Weld Joints In Area

Courtesy of BMW OF NORTH AMERICA, INC.

Preparation of new part:

Open weld joints in area (1).

Remove plate (2).

Installation:

Adjust new parts to fit with straightening attachment or universal mount.

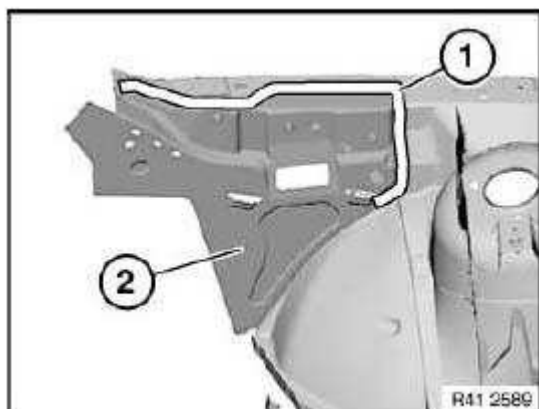


Fig. 76: Weld Joints In Area And Plate

Courtesy of BMW OF NORTH AMERICA, INC.

Weld new component in area (1).

Installation:

Adjust new part to fit with straightening attachment or universal mount.

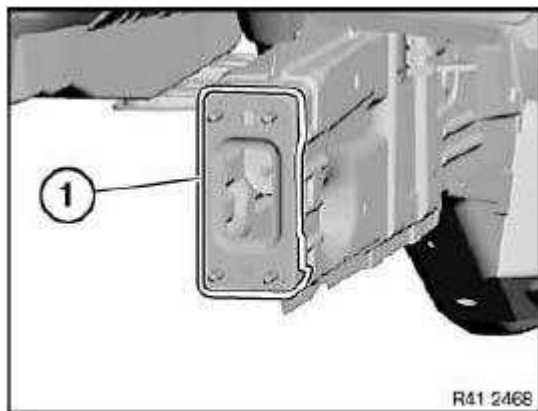


Fig. 77: Weld Joints In Area

Courtesy of BMW OF NORTH AMERICA, INC.

41 14 502 REPLACING REAR LEFT OUTER WHEEL ARCH SECTION (REAR LEFT SIDE PANEL REMOVED)

Read contents of Body, General, see **41 0 Contents of Body, General**.

Following new body parts are required:

- (1) C-pillar reinforcement
- (2) Inner side frame
- (3) Rear outer entrance shaped part
- (4) Rear entrance shaped part

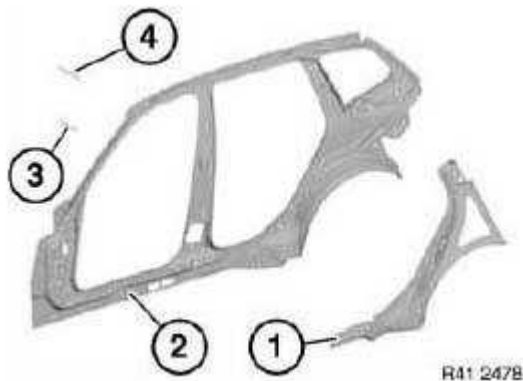


Fig. 78: C-Pillar Reinforcement, Inner Side Frame And Rear Outer Entrance Shaped Part

Courtesy of BMW OF NORTH AMERICA, INC.

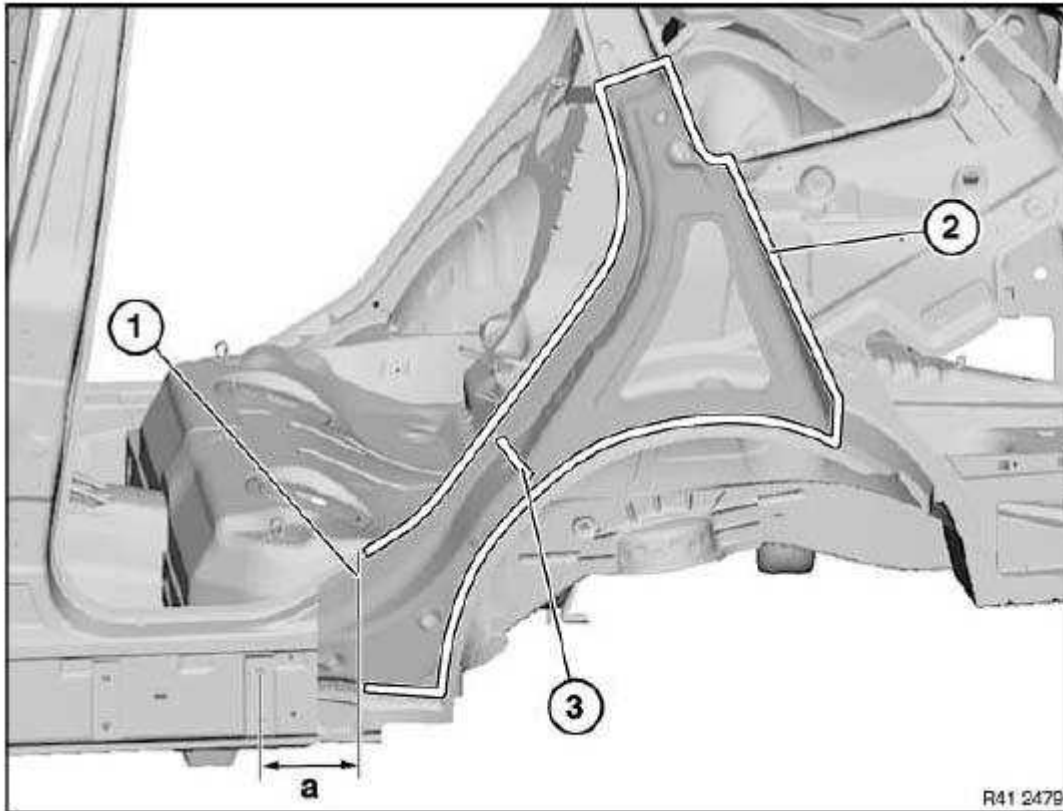


Fig. 79: Mark Severance Cut And Weld Joints In Areas Dimension
Courtesy of BMW OF NORTH AMERICA, INC.

Mark severance cut (1) in accordance with measurement and cut.

IMPORTANT: Cut outer metal sheet only.

Measurement a = approx. 160 mm from M8 threaded hole

Open weld joints in area (2).

Remove inner and outer cavity acoustic baffles (3).

Installation information:

- Apply window glass adhesive to cavity acoustic baffles in area (3), see **41 00 ... Installing a cavity bulkhead (expanded)**

Weld in reinforcing panels at all severance cuts., see **41 00 ... Welding in reinforcement plate (steel plate)**.

Open weld joints in areas (1).

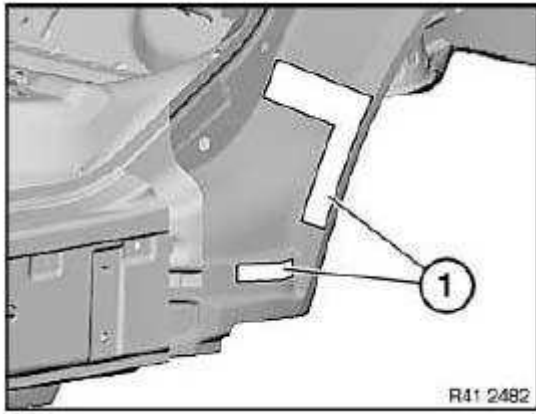


Fig. 80: Weld Joints In Area
Courtesy of BMW OF NORTH AMERICA, INC.

Cut wheel arch along line (1).

Installation:

Adjust new part in conjunction with side panel to fit.

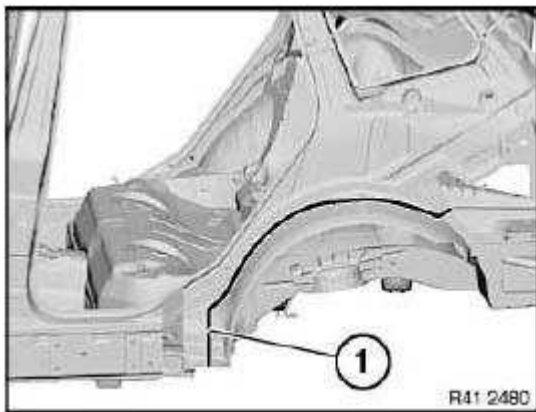


Fig. 81: Cut Wheel Arch Along Line
Courtesy of BMW OF NORTH AMERICA, INC.

Preparation of new part:

Mark new part in accordance with severance cut on vehicle + 20 mm extra material and cut (1).

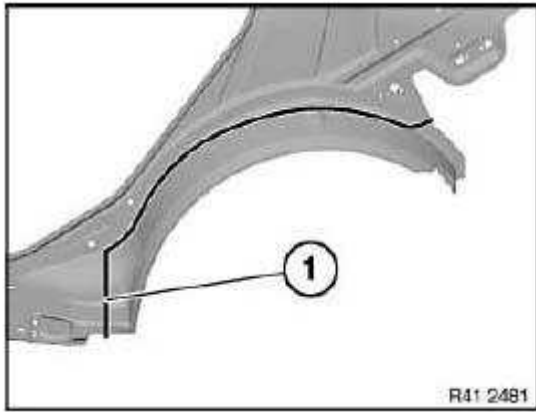


Fig. 82: Extra Material And Cut
Courtesy of BMW OF NORTH AMERICA, INC.

41 14 511 REPLACING COMPLETE REAR LEFT WHEEL ARCH (REAR LEFT SIDE PANEL REMOVED)

Read contents of Body, General, see **41 0 Contents of Body, General.**

Place vehicle on straightening bench.

Following new body parts are required:

- (1) C-pillar reinforcement
- (2) Inner side frame
- (3) Rear wheel arch
- (4) Rear outer entrance shaped part (not shown)
- (5) Rear entrance shaped part (not shown)
- (6) D-pillar shaped part (not shown)

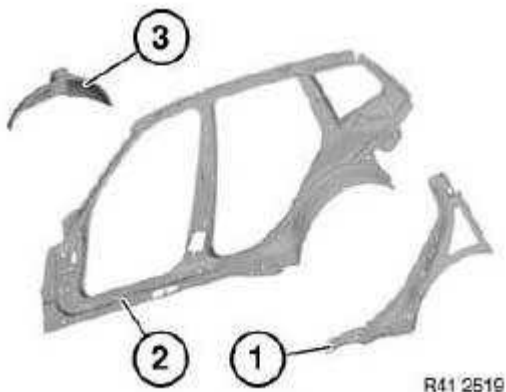


Fig. 83: C-Pillar Reinforcement, Inner Side Frame And Rear Wheel Arch
Courtesy of BMW OF NORTH AMERICA, INC.

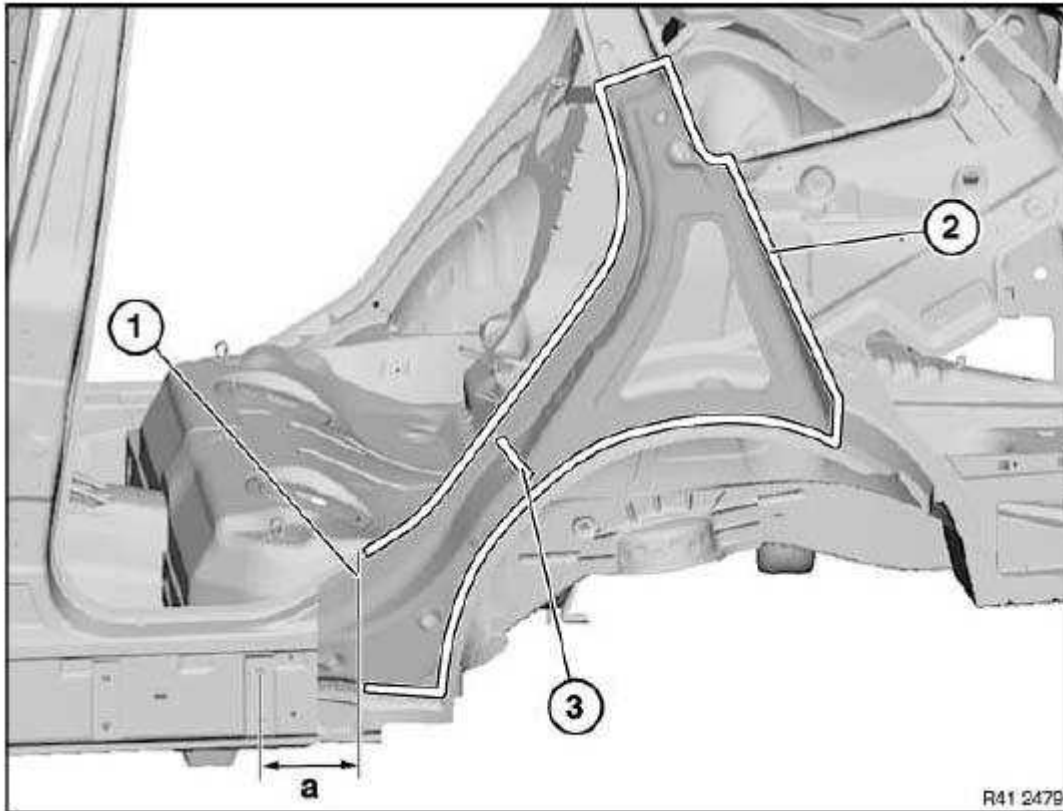


Fig. 84: Mark Severance Cut And Weld Joints In Areas Dimension
Courtesy of BMW OF NORTH AMERICA, INC.

Mark severance cut (1) in accordance with measurement and cut.

IMPORTANT: Cut outer metal sheet only.

Measurement a = approx. 160 mm from M8 threaded hole

Open weld joints in area (2).

Remove inner and outer cavity acoustic baffles (3).

Installation information:

- Apply window glass adhesive to cavity acoustic baffles in area (3), see **41 00 ... Installing a cavity bulkhead (expanded)**.

Weld in reinforcement plate at severance cut, see **41 00 ... Welding in reinforcement plate (steel plate)**.

Open weld joints in areas (1).

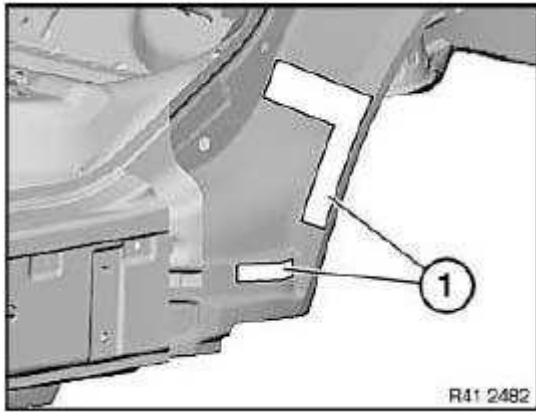


Fig. 85: Weld Joints In Area
 Courtesy of BMW OF NORTH AMERICA, INC.

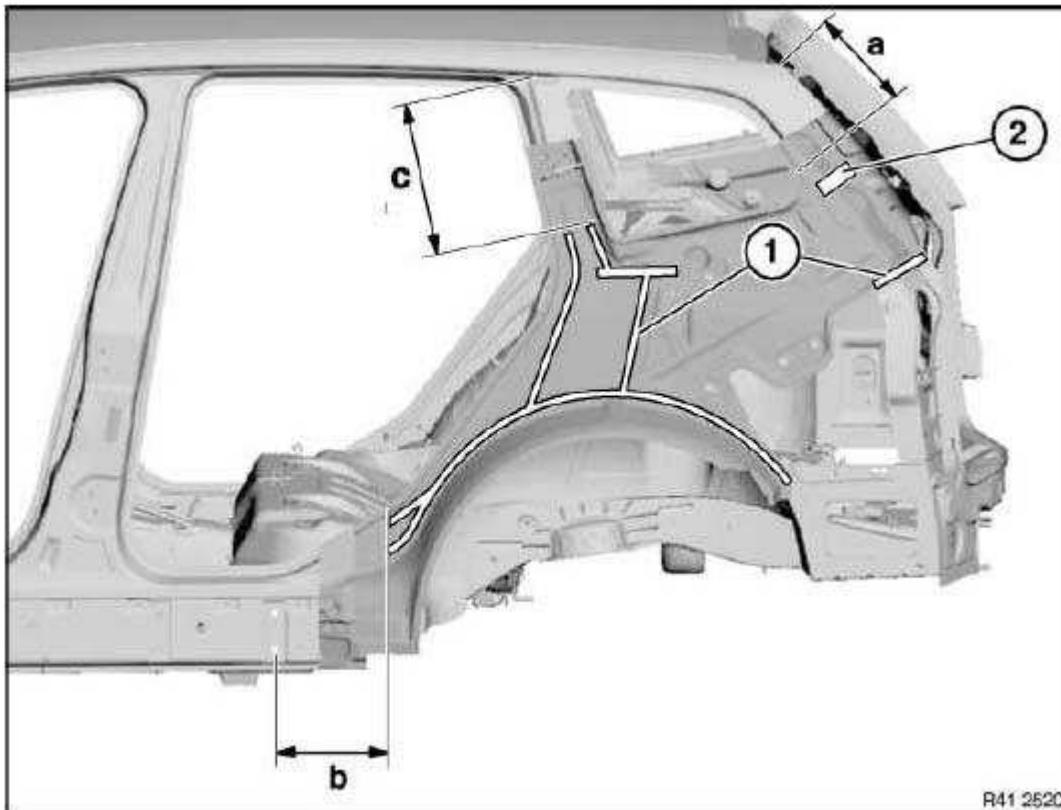


Fig. 86: Cavity Acoustic Baffles And Weld Joints In Areas Dimension
 Courtesy of BMW OF NORTH AMERICA, INC.

Mark severance cuts in accordance with specified measurements and cut.

IMPORTANT: Cut outer metal sheet only.

Measurement a = approx. 210 mm from roof frame

Measurement b = approx. 160 mm from M8 threaded hole

Measurement c = approx. 330 mm

Open weld joints in areas (1).

Remove cavity acoustic baffles (2).

Installation information:

- Apply window glass adhesive to cavity acoustic baffles in area (3), see **41 00 ... Installing a cavity bulkhead (expanded)**.

Weld in reinforcing panels at all severance cuts., see **41 00 ... Welding in reinforcement plate (steel plate)**.

Adjust new part in conjunction with side panel to fit.

Open weld joints in area (1).

Installation:

Adjust new part to fit with straightening attachment or universal mount.

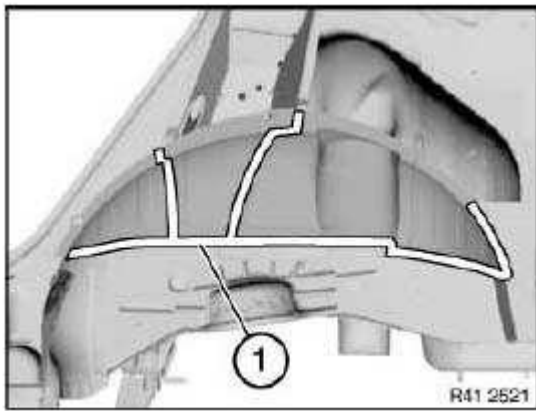


Fig. 87: Weld Joints In Area

Courtesy of BMW OF NORTH AMERICA, INC.

21 SIDE FRAME AND DOOR PILLARS

41 21 510 REPLACING FRONT LEFT DOOR PILLAR (FRONT SIDE PANEL REMOVED)

Read contents of Body, General, see **41 0 Contents of Body, General**.

Spot-weld bonding is used on the E83. Observe specific procedure, see **41 00 ... Opening adhesive bonds**.

Place vehicle on straightening bench.

Following new body parts are required:

- (1) A-pillar, outer
- (2) Connecting plate, side frame

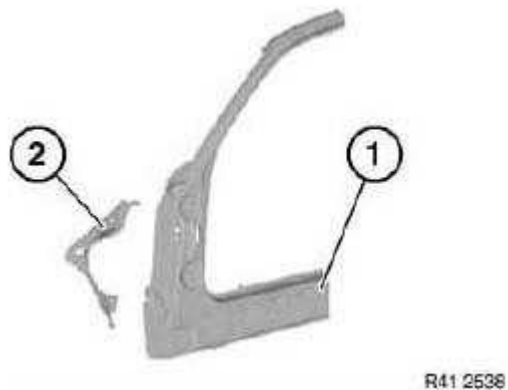


Fig. 88: A-Pillar, Outer And Connecting Plate, Side Frame
Courtesy of BMW OF NORTH AMERICA, INC.

Open weld joints in areas (1).

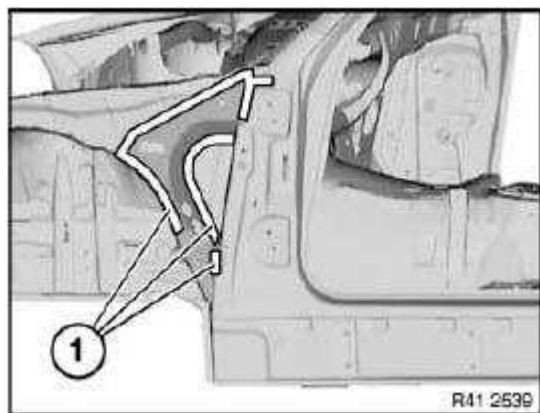


Fig. 89: Weld Joints In Area
Courtesy of BMW OF NORTH AMERICA, INC.

Open weld joints in areas (1).

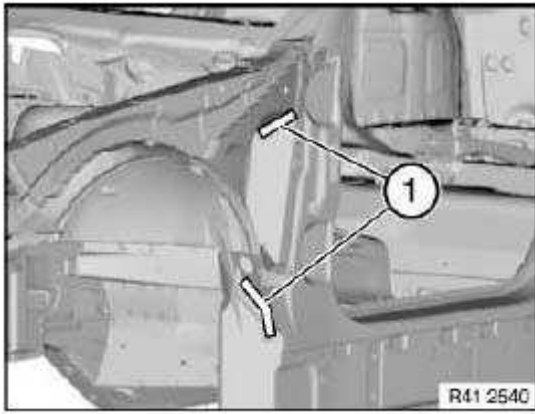


Fig. 90: Weld Joints In Area
 Courtesy of BMW OF NORTH AMERICA, INC.

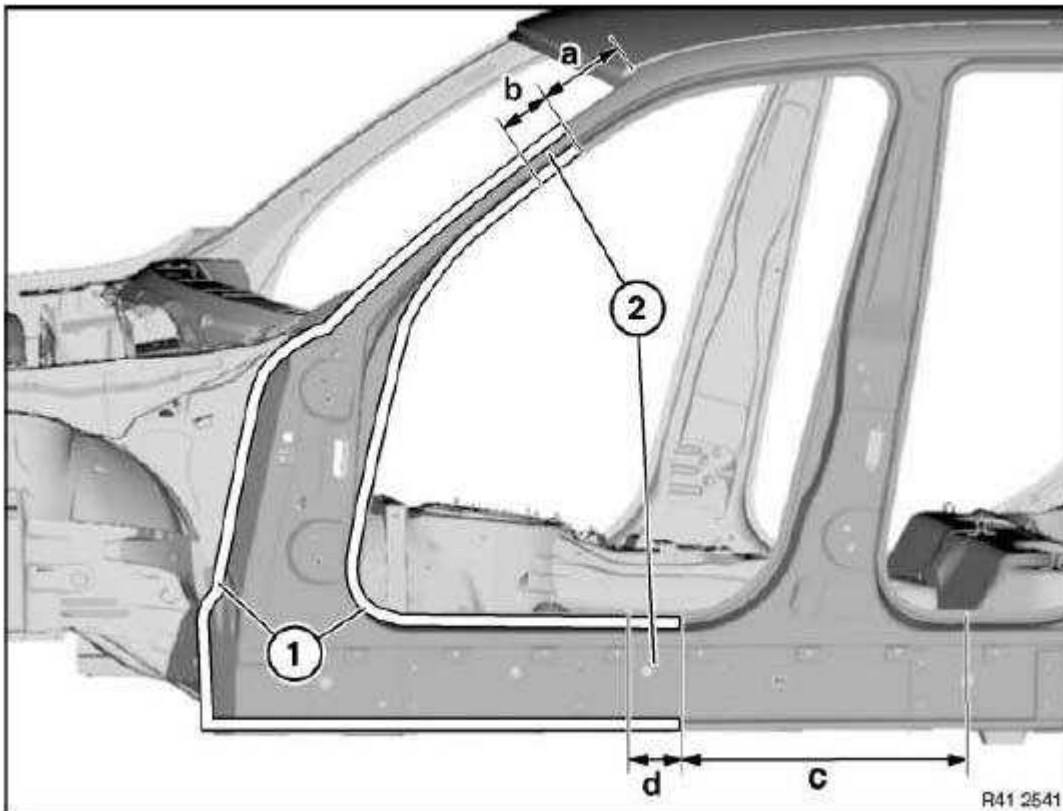


Fig. 91: Metal Section And Weld Joints In Areas Dimension
 Courtesy of BMW OF NORTH AMERICA, INC.

Mark severance cuts in accordance with specified measurements and cut.

IMPORTANT: Cut outer plate only for following severance cuts.

Measurement a = approx. 150 mm from roof edge.

Measurement b = approx. 80 mm below severance cut a.

Measurement c = approx. 560 mm before hole dia. 20 mm.

Measurement d = approx. 80 mm before severance cut c.

Open weld joints in areas (1).

Installation:

Metal sections (2) are needed again to seal cowl.

IMPORTANT: For following severance cut, do not damage sunroof water drain hose.

Mark severance cut (1) in accordance with measurement and cut.

Measurement a = approx. 190 mm from roof edge.

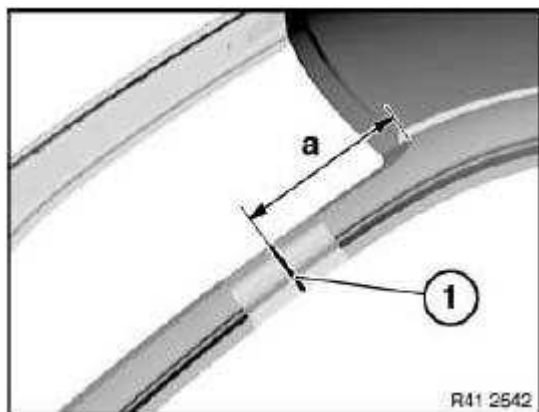


Fig. 92: Mark Severance Cut Dimension
Courtesy of BMW OF NORTH AMERICA, INC.

Mark severance cut (1) in accordance with measurement and cut.

Measurement a = approx. 600 mm before hole dia. 20 mm.

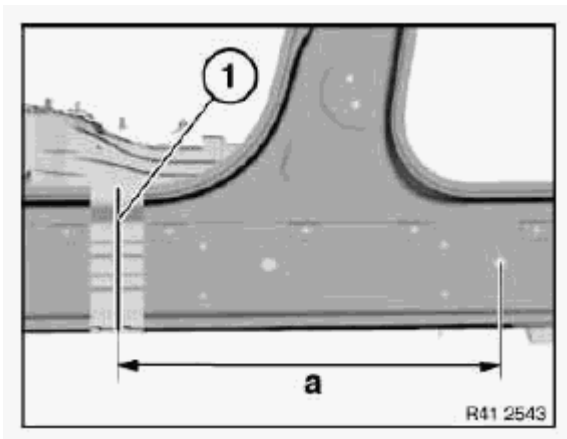


Fig. 93: Mark Severance Cut Dimension (Before Hole Dia)
Courtesy of BMW OF NORTH AMERICA, INC.

Open weld joints in areas (1).

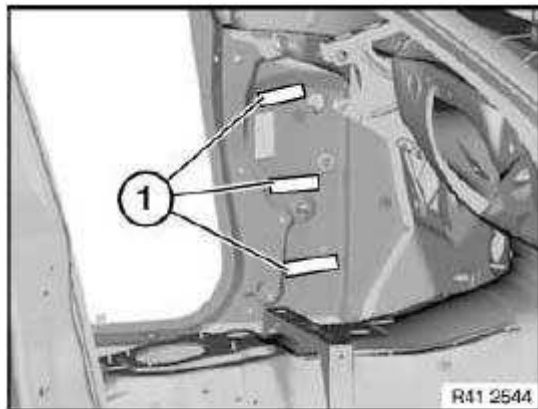


Fig. 94: Weld Joints In Area
Courtesy of BMW OF NORTH AMERICA, INC.

Open weld joints in areas (1).

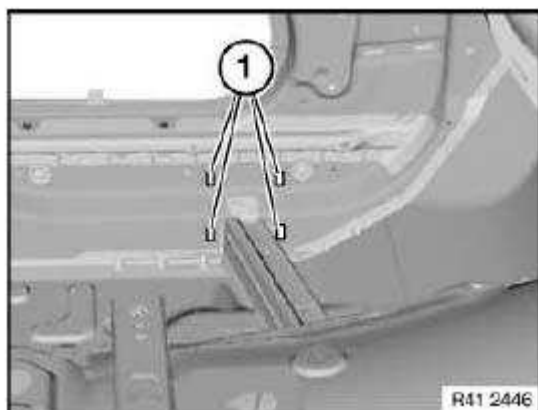


Fig. 95: Weld Joints In Area

Courtesy of BMW OF NORTH AMERICA, INC.

Preparation of new part:

Mark new part in accordance with severance cuts above and cut.

Installation:

Weld in reinforcing panels at all severance cuts., see **41 00 ... Welding in reinforcement plate (steel plate)**.

Apply window glass adhesive to cavity acoustic baffles (1), see **41 00 ... Installing a cavity bulkhead (expanded)**

Adjust new part to fit with straightening attachment or universal mount.

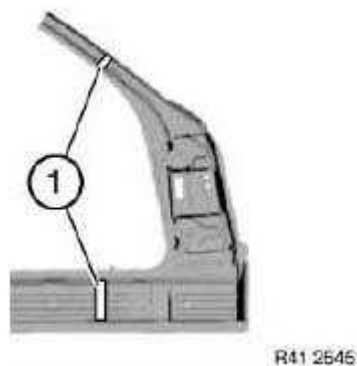


Fig. 96: Cavity Acoustic Baffles

Courtesy of BMW OF NORTH AMERICA, INC.

31 ROOF OUTER SKIN

41 31 010 REPLACING ROOF OUTER SKIN (VERSION WITH SLIDE/TILT SUNROOF)

Read contents of Body, General, see **41 0 Contents of Body, General**.

Following new body parts are required:

- (1) Roof outer skin, slide/tilt sunroof

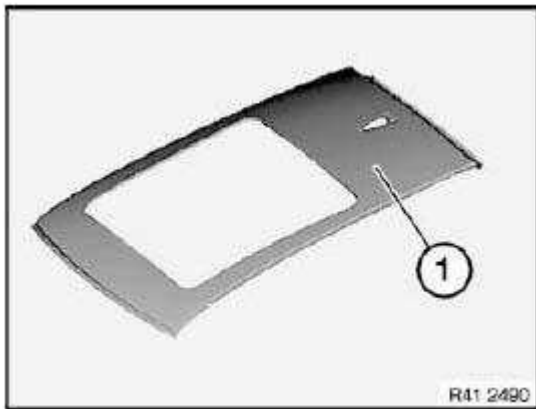


Fig. 97: Roof Outer Skin, Slide/Tilt Sunroof
Courtesy of BMW OF NORTH AMERICA, INC.

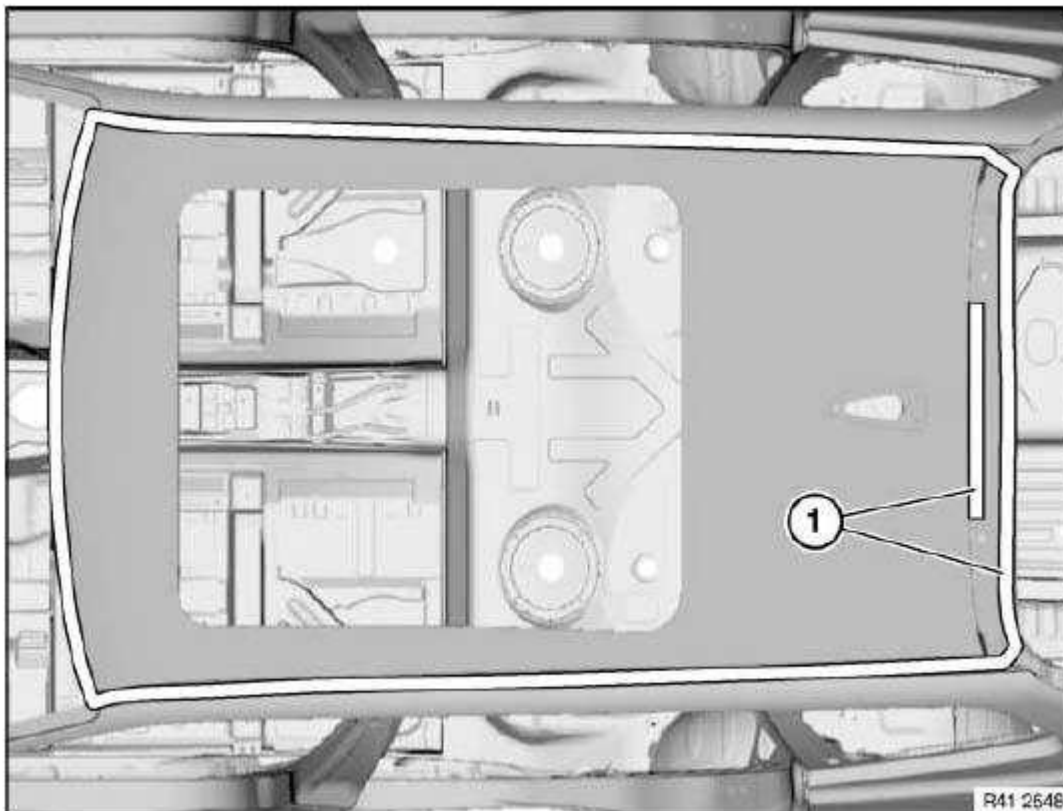


Fig. 98: Weld Joints In Area
Courtesy of BMW OF NORTH AMERICA, INC.

Open weld joints in areas (1).

Release adhesive areas (layout, see next operation) and remove roof outer skin, see **41 00 ... Bonding steel parts.**

Installation:

Fit new part on body. Fit windshield for positioning.

Seal weld seams with sealing compound.

Apply sealing compound in areas (1).

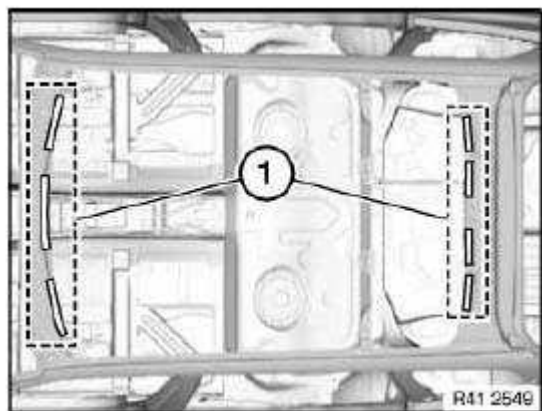


Fig. 99: Sealing Compound In Areas

Courtesy of BMW OF NORTH AMERICA, INC.

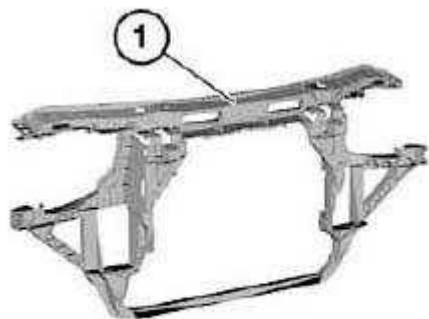
33 FRONT TRIM PANEL

41 33 040 REPLACING FRONT PANEL

Read contents of Body, General, see **41 0 Contents of Body, General**.

Following new body parts are required:

- (1) Front panel



R41 2462

Fig. 100: Front Panel

Courtesy of BMW OF NORTH AMERICA, INC.

Open screws (1) and (2).

Remove tension strut (3) with retaining hook counter support holder.

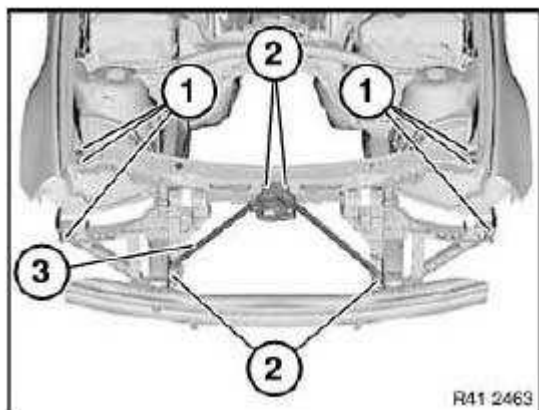


Fig. 101: Screws And Tension Strut
Courtesy of BMW OF NORTH AMERICA, INC.

Open screws in areas (1).

Remove bumper trim carrier (2) with deformation elements and front panel (3).

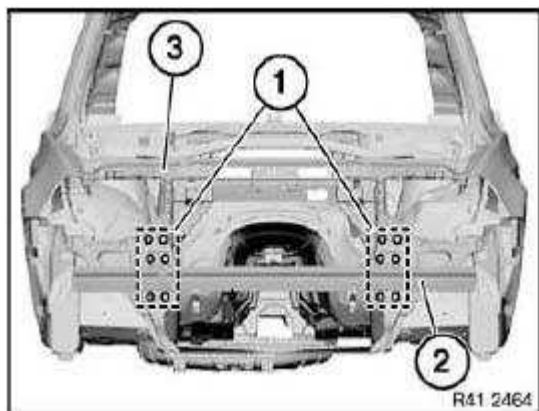


Fig. 102: Screws, Bumper Trim Carrier And Front Panel
Courtesy of BMW OF NORTH AMERICA, INC.

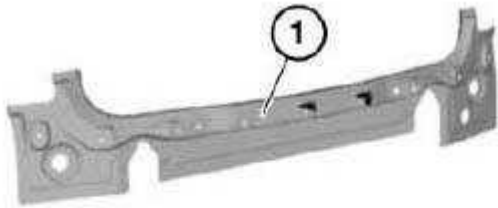
34 REAR TRIM PANEL

41 34 038 REPLACING OUTER SECTION OF TAIL PANEL

Read contents of Body, General, see **41 0 Contents of Body, General**.

Following new body parts are required:

- Rear trim

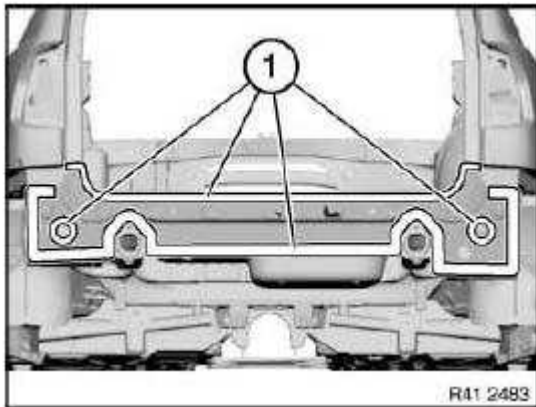


R41 2473

Fig. 103: Rear Trim

Courtesy of BMW OF NORTH AMERICA, INC.

Open weld joints in area (1).



R41 2483

Fig. 104: Weld Joints In Area

Courtesy of BMW OF NORTH AMERICA, INC.

41 34 041 REPLACING COMPLETE TAIL PANEL

Read contents of Body, General, see **41 0 Contents of Body, General**.

Following new body parts are required:

- (1) Rear trim
- (2) Rear trim, inner

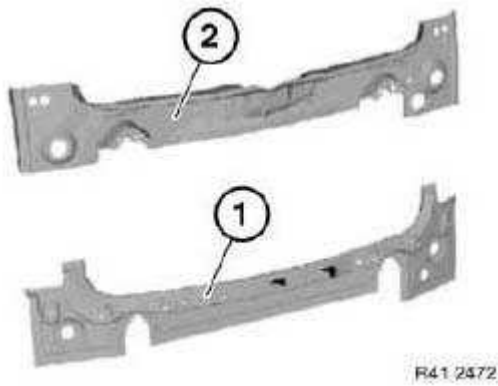


Fig. 105: Rear Trim And Rear Trim, Inner
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Carry over the following work steps symmetrically to the other side of the car.

Open weld joints in areas (1).

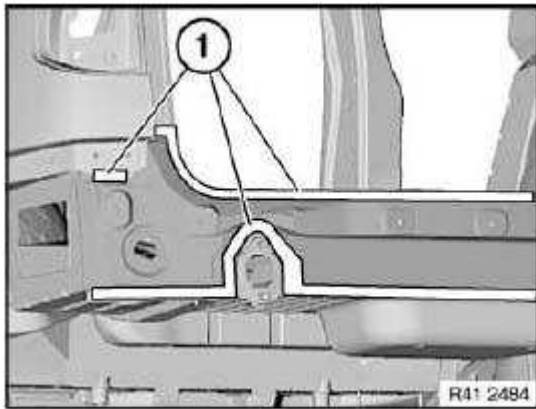


Fig. 106: Weld Joints In Area
Courtesy of BMW OF NORTH AMERICA, INC.

Open weld joints in area (1).

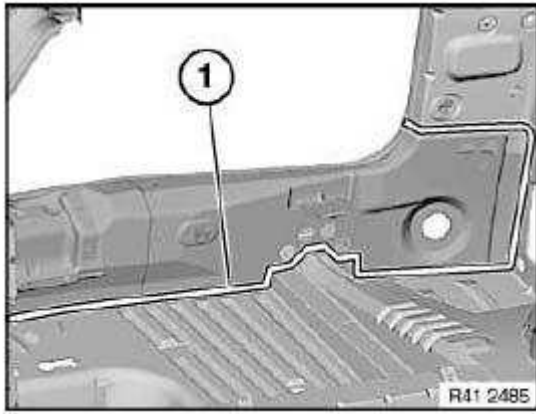


Fig. 107: Weld Joints In Area
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

The two new components are fitted individually.

Slide in inner rear trim (2).

Bend open metal plate slightly in areas (1).

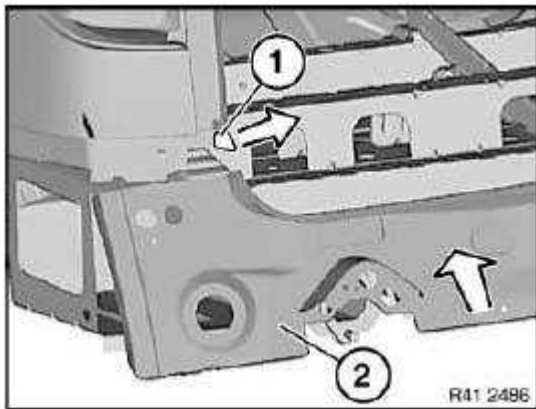


Fig. 108: Inner Rear Trim And Metal Plate Slightly In Areas
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Also weld rear trim (2) in areas (1).

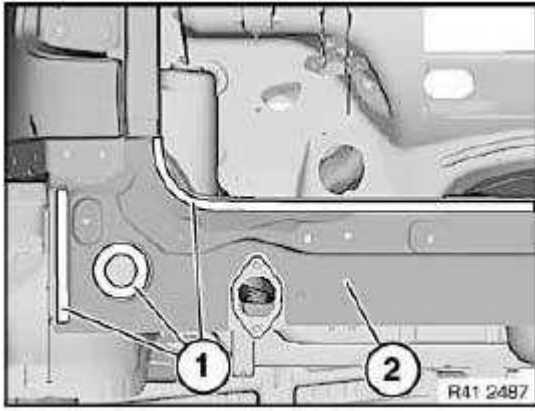


Fig. 109: Weld Rear Trim In Areas
Courtesy of BMW OF NORTH AMERICA, INC.

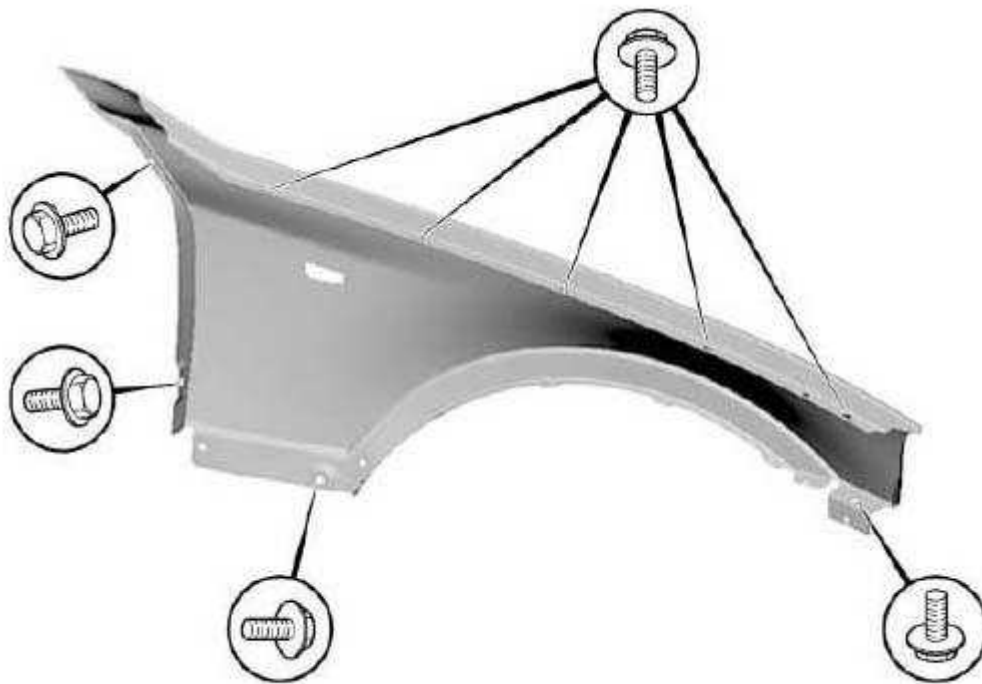
35 SIDE PANELS

41 35 000 REMOVING AND INSTALLING/REPLACING SIDE PANEL, FRONT LEFT OR RIGHT

CAUTION: Do not damage adjoining body parts.

Installation information:

E83 gap dimensions serve as basis for adjustment tasks.



R41 2465

Fig. 110: Front Side Panel Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Interior view of front side panel

Open screws.

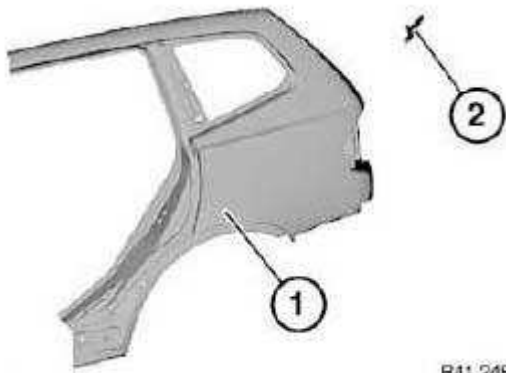
41 35 101 REPLACING REAR LEFT SIDE PANEL (PARTIAL REPLACEMENT, LONGITUDINAL MEMBER COVER BEFORE B-PILLAR)

Read contents of Body, General, see **41 0 Contents of Body, General**.

Use only approved spot-welding apparatus for repairs, see **41 00 ... Workshop equipment**

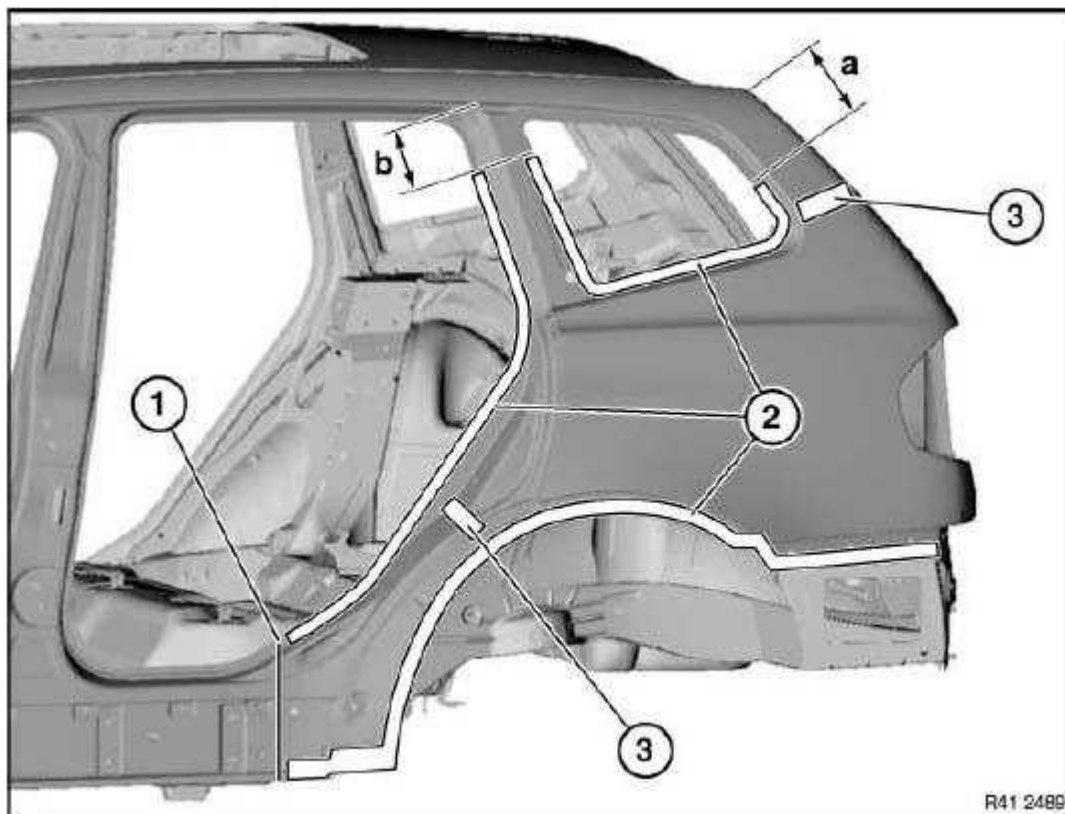
Following new body parts are required:

- (1) Side panel, rear
- (2) D-pillar shaped part



R41 2488

Fig. 111: Side Panel, Rear And D-Pillar Shaped Part
 Courtesy of BMW OF NORTH AMERICA, INC.



R41 2489

Fig. 112: Mark Severance Cut And Weld Joints In Areas Dimension
 Courtesy of BMW OF NORTH AMERICA, INC.

Mark severance cuts in accordance with specified measurements and cut.

Mark severance cut (1) in accordance with new part on vehicle.

IMPORTANT: Cut outer metal sheet only.

Measurement a = approx. 120 mm from roof frame

Measurement b = approx. 140 mm

Open weld joints in areas (2).

Installation information:

- Apply window glass adhesive to cavity acoustic baffles in area (3), see **41 00 ... Installing a cavity bulkhead (expanded)**.
- Weld in reinforcing panels at all severance cuts., see **41 00 ... Welding in reinforcement plate (steel plate)**.

Open weld joints in areas (1).

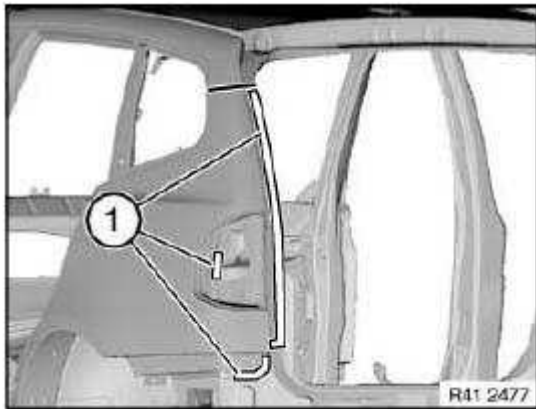


Fig. 113: Weld Joints In Area

Courtesy of BMW OF NORTH AMERICA, INC.

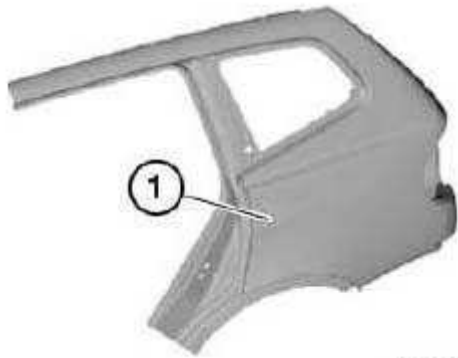
41 35 105 REPLACING REAR LEFT SIDE PANEL (PARTIAL REPLACEMENT BEFORE LONGITUDINAL MEMBER COVER)

Read contents of Body, General, see **41 0 Contents of Body, General**.

Use only approved spot-welding apparatus for repairs, see **41 00 ... Workshop equipment**

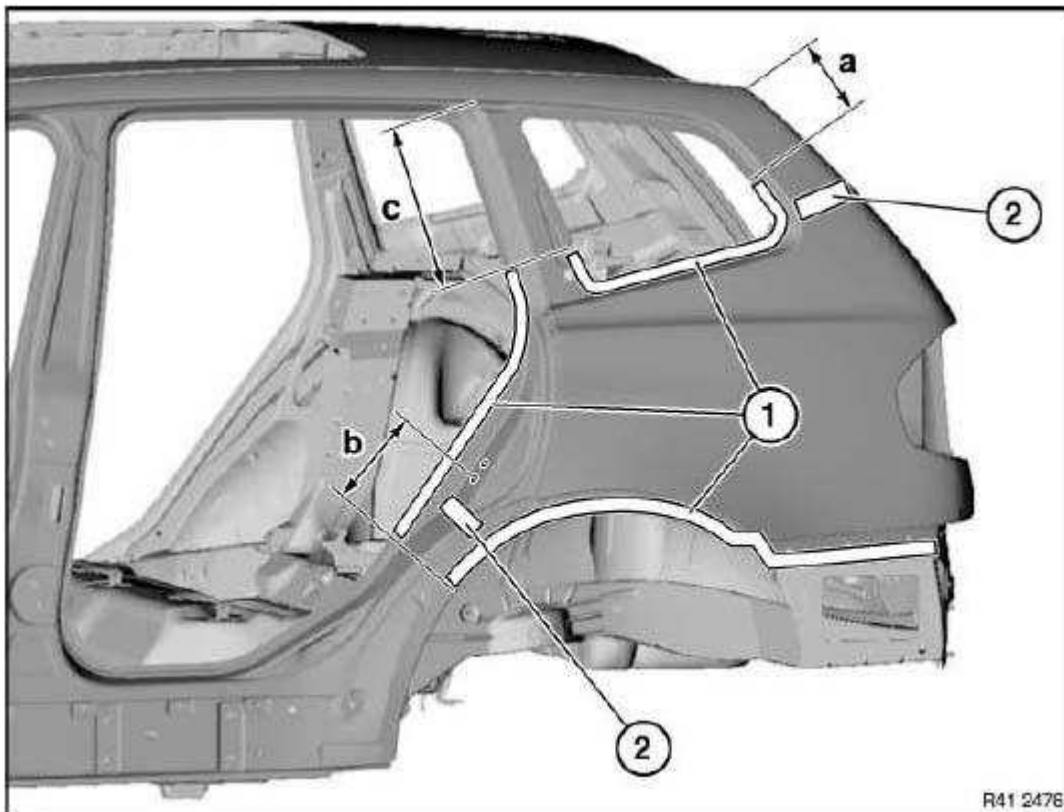
Following new body parts are required:

- (1) Side panel, rear
- (2) D-pillar shaped part (not shown)



R41 2475

Fig. 114: Side Panel, Rear And D-Pillar Shaped Part (Not Shown)
 Courtesy of BMW OF NORTH AMERICA, INC.



R41 2476

Fig. 115: Cavity Acoustic Baffles And Weld Joints In Areas Dimension
 Courtesy of BMW OF NORTH AMERICA, INC.

Mark severance cuts in accordance with specified measurements and cut.

IMPORTANT: Cut outer metal sheet only.

Measurement a = approx. 120 mm from roof frame

Measurement b = approx. 190 mm from middle of lower lock striker screw point.

Measurement c = approx. 290 mm

Open weld joints in areas (1).

Installation information:

- Apply window glass adhesive to cavity acoustic baffles (2).
- Weld in reinforcement plate at severance cut, see **41 00 ... Welding in reinforcement plate (steel plate)**.

Open weld joints in areas (1).

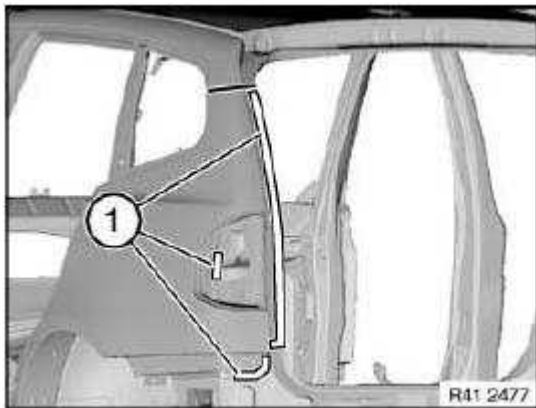


Fig. 116: Weld Joints In Area

Courtesy of BMW OF NORTH AMERICA, INC.

41 35 401 REPLACING REAR LEFT SIDE PANEL (PARTIAL REPLACEMENT, DOOR OPENING)

Read contents of Body, General, see **41 0 Contents of Body, General**.

Use only approved spot-welding apparatus for repairs, see **41 00 ... Workshop equipment**

Following new body parts are required:

- (1) Side panel, rear

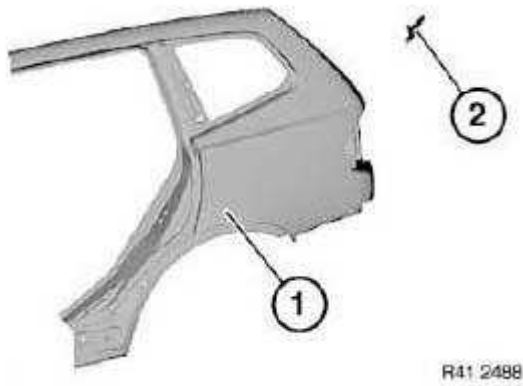


Fig. 117: Side Panel, Rear And D-Pillar Shaped Part
 Courtesy of BMW OF NORTH AMERICA, INC.

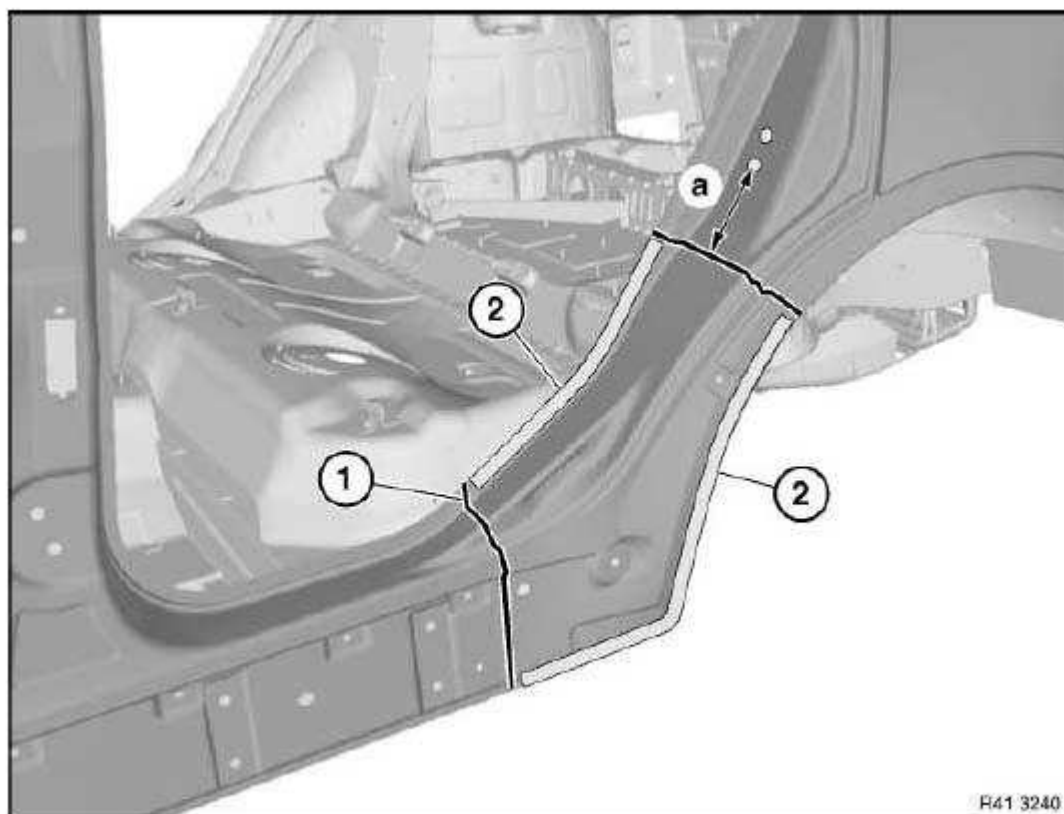


Fig. 118: Mark Severance Cut And Weld Joints In Areas Dimension
 Courtesy of BMW OF NORTH AMERICA, INC.

Mark severance cuts in accordance with specified measurements and cut.

Mark severance cut (1) in accordance with new part on vehicle.

IMPORTANT: Cut outer metal sheet only.

Measurement a = approx. 200 mm from middle of lower lock striker screw point.

Open weld joints in areas (2).

Installation information:

- Apply window glass adhesive to cavity acoustic baffle (3), see **41 00 ... Installing a cavity bulkhead (expanded)**.
- Weld in reinforcing panels at all severance cuts., see **41 00 ... Welding in reinforcement plate (steel plate)**.

51 FRONT SIDE DOORS

41 51 004 ADJUSTING FRONT LEFT OR RIGHT DOOR

NOTE: The gap dimensions serve as the basis for adjustment work.
Adjust screwed body parts from rear to front.
Make unpainted surfaces visible by also moving the hinges.
Touch these up in the appropriate color.

CAUTION: Do not damage adjoining body parts.
Minor corrections (realignment work) are permitted if the existing adjustment options are not sufficient.

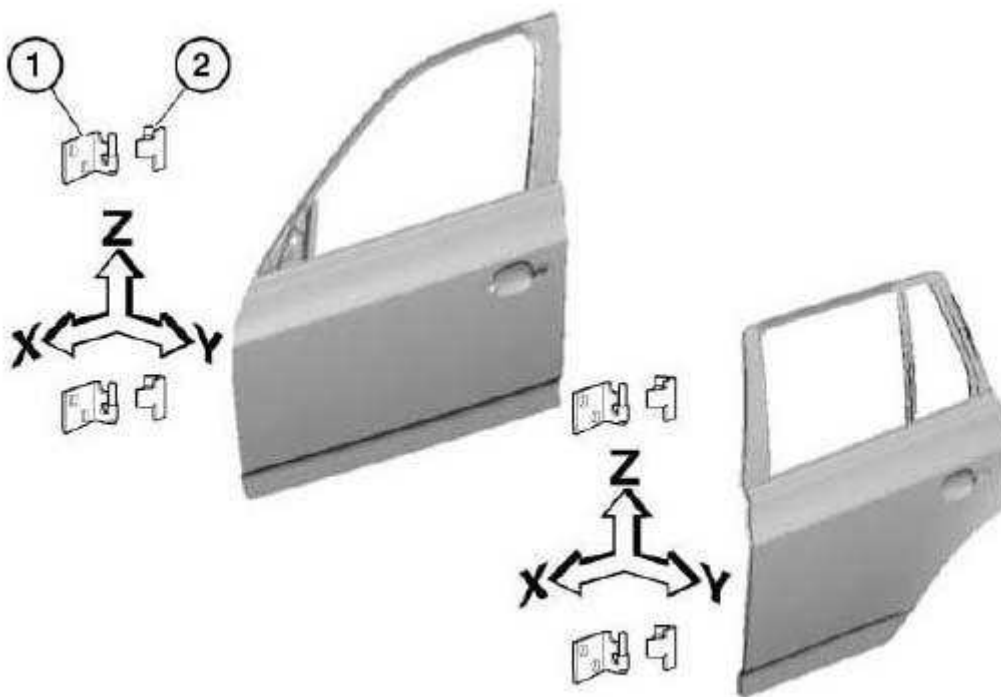


Fig. 119: Gap Dimension

Courtesy of BMW OF NORTH AMERICA, INC.

Slacken screws (1) and (2) on door hinges to be adjusted at top and bottom.

Adjust door according to specified gap dimension.

Check that adjoining body parts are flush in terms of height and correct if necessary.

After adjustment, tighten hinge screws and nuts.

Tightening torque: 41 51 2AZ, see **41 51 FRONT DOORS** .

Tightening torque: 41 51 3AZ, see **41 51 FRONT DOORS** .

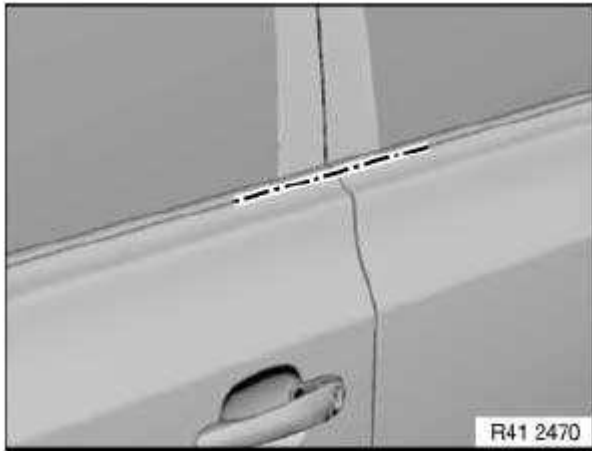


Fig. 120: Adjoining Body

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: **If necessary, adjust lock striker.**

Slacken screws (1), adjust lock striker and tighten screws.

NOTE: **After slackening, lock striker should be positioned approx. 90° to door frame inner edge (2) and be movable. When the door is closed, the lock striker must not touch or scrape against the door lock. Look out for scratches.**

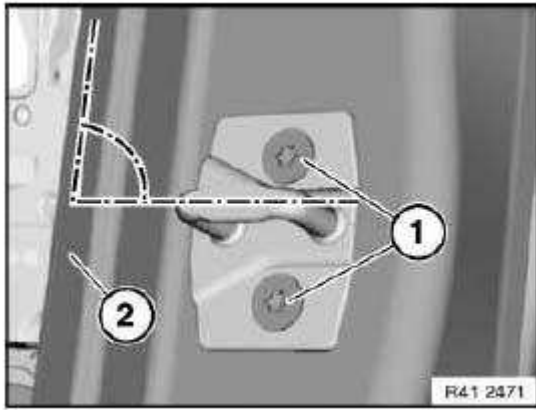


Fig. 121: Slacken Screws

Courtesy of BMW OF NORTH AMERICA, INC.

41 51 080 REMOVING AND INSTALLING FRONT LEFT OR RIGHT DOOR

IMPORTANT: Do not damage adjoining body parts.

Cars with side airbags:

Observe airbag safety regulations, see 41 00 ... Handling airbags and restraint systems.

The illustrations are schematic representations and are to be applied to the relevant vehicle type.

Open door.

WARNING: Side airbag is installed in door trim panel: Disconnect battery.

Release screw on connector frame.

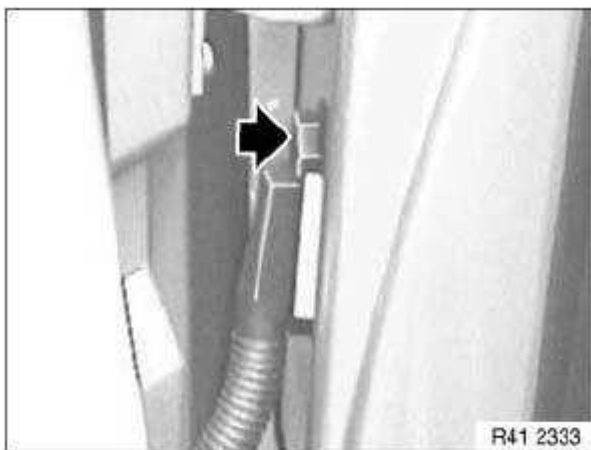


Fig. 122: Locating Screw On Connector Frame

Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1) on door retainer.

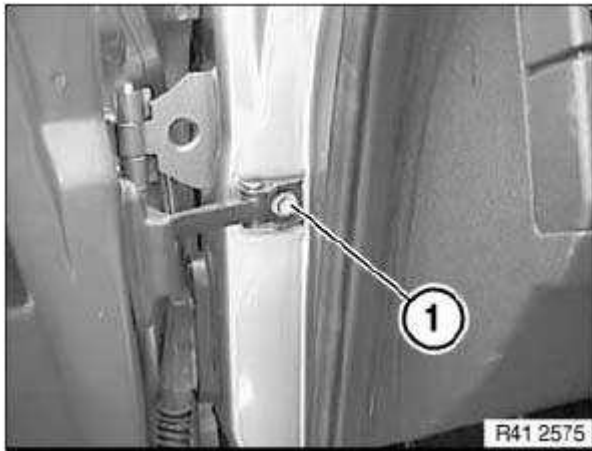


Fig. 123: Door Retainer Screw

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Secure door against falling out.

Release screws between both hinge elements at top and bottom.

Pull both screws out of hinges.

Tightening torque: 41 51 1AZ, see **41 51 FRONT DOORS** .

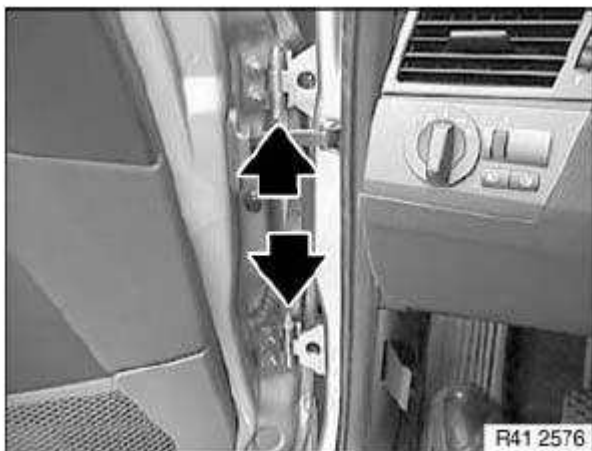


Fig. 124: Locating Screws Between Both Hinge Elements At Top And Bottom

Courtesy of BMW OF NORTH AMERICA, INC.

Pull out door sideways and place it on a suitable surface.

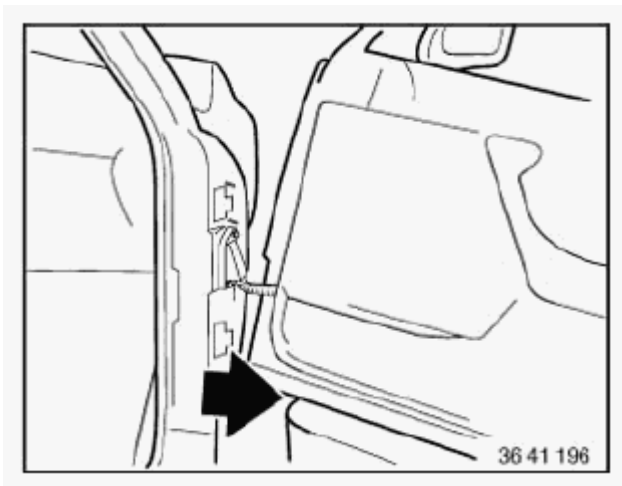


Fig. 125: Pulling Out Door Sideways
Courtesy of BMW OF NORTH AMERICA, INC.

Pull plug connection from door pillar, unlock by pulling out bar and detach.

Installation:

If necessary, adjust front door, see **41 51 004 Adjusting front left or right door.**

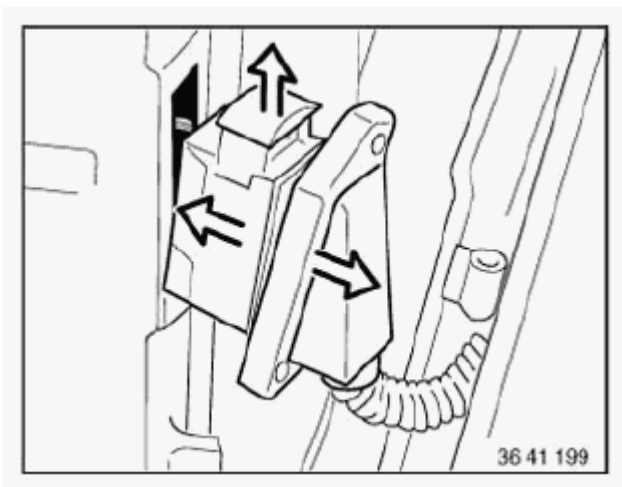


Fig. 126: Pulling Plug Connection From Door Pillar
Courtesy of BMW OF NORTH AMERICA, INC.

52 REAR SIDE DOORS

41 52 004 ADJUSTING REAR LEFT OR RIGHT DOOR

Procedure is identical to Adjusting front left or right door, see **41 51 004 Adjusting front left or right door.**

Door to hinge, tightening torque: 41 52 2AZ, see **41 52 REAR SIDE DOORS** .

Hinge to body, tightening torque: 41 52 3AZ, see **41 52 REAR SIDE DOORS** .

41 52 080 REMOVING AND INSTALLING REAR LEFT OR RIGHT DOOR

Operation is identical to Removing and installing front left or right door, see **41 51 004 Adjusting front left or right door**.

Hinge pin, tightening torque: 41 52 1AZ, see **41 52 REAR SIDE DOORS** .

Door to hinge, tightening torque: 41 52 2AZ, see **41 52 REAR SIDE DOORS** .

Hinge to body, tightening torque: 41 52 3AZ, see **41 52 REAR SIDE DOORS** .

61 FRONT LID

41 61 000 REMOVING AND INSTALLING ENGINE HOOD

**WARNING: Support engine hood in fully opened position with suitable apparatus.
Risk of injury.**

NOTE: Carry over schematic representation to the relevant vehicle type.

Loosen screws (1).

Unfasten screws (2).

Remove hood lid.

Installation:

Install engine hood at screw locations to on hinge. This dispenses with the need for adjustment after installation.

If this is not possible, adjust engine hood, see **41 61 014 Adjusting engine bonnet/hood**.

Tightening torque: 41 61 1AZ, see **41 61 ENGINE BONNET/HOOD** .

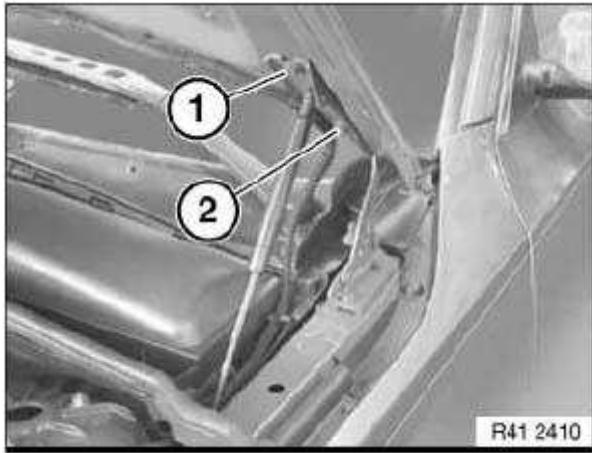


Fig. 127: Screws

Courtesy of BMW OF NORTH AMERICA, INC.

41 61 014 ADJUSTING ENGINE BONNET/HOOD

Read contents of Body, General, see **41 0 Contents of Body, General**.

The specified gap dimensions serve as the basis for adjustment tasks.

Make unpainted surfaces visible by also moving the hinges.

Touch these up in the appropriate colour.

NOTE: Carry over schematic representation to the relevant vehicle type.

Loosen screws (1) and (2) on left and right hinges.

Hood lid must be able to be moved.

NOTE: If the adjustment range is not sufficient, release retaining screws of engine hood hinge on body and move hinge.

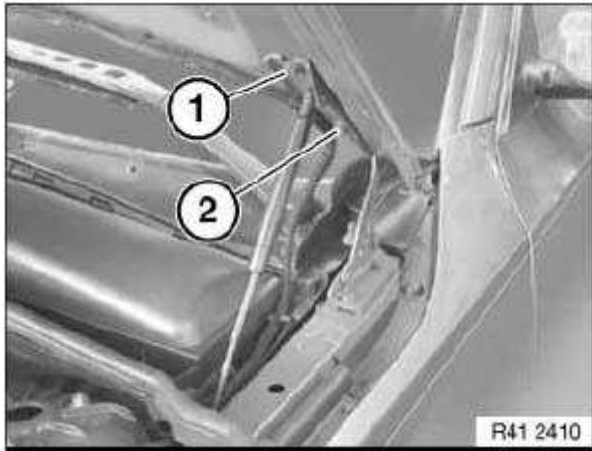


Fig. 128: Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Locks and retaining hook must snap correctly into place.

Adjust engine hood.

NOTE: Vertical adjustment, see 51 23 ... ADJUSTING/REPLACING BUMP STOPS of engine hood to side panel by means of stop pads.



Fig. 129: Locating Engine Hood

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Height adjustment of hood lid to front wall:
 Release screw (1) and remove cover (2).
 Height adjustment by turning at closing hooks (3).

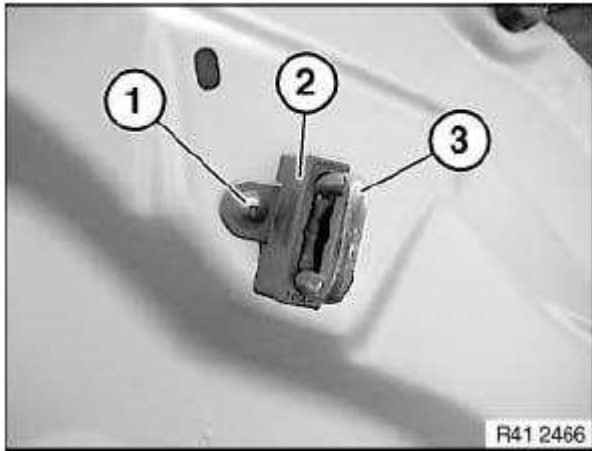


Fig. 130: Screws, Cover And Hooks

Courtesy of BMW OF NORTH AMERICA, INC.

Tighten down all screw connections again.

Tightening torque: 41 61 1AZ, see **41 61 ENGINE BONNET/HOOD** .

IMPORTANT: Check function of retaining hook.

62 REAR LID

41 62 000 REMOVING AND INSTALLING REAR LID

Read contents of Body, General, see **41 0 Contents of Body, General**.

Necessary preliminary tasks:

- Remove trim for rear lid, see **51 49 008 REMOVING AND INSTALLING/REPLACING PANEL FOR REAR LID** .
- Disconnect all plug and socket cable connections on rear lid.

Open screws (1) on rear lid hinge to rear lid.

Remove trunk lid.

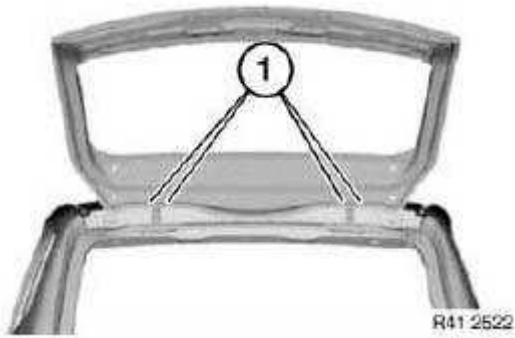


Fig. 131: Screws On Rear Lid Hinge To Rear Lid
Courtesy of BMW OF NORTH AMERICA, INC.

41 62 014 ADJUSTING REAR LID

Read contents of Body, General, see **41 0 Contents of Body, General**.

The E83 gap dimensions serve as the basis for adjustment work.

Make unpainted surfaces visible by also moving the hinges. Touch these up in the appropriate color.

Release screws (1) on rear lid hinge to rear lid so that rear lid can still be moved.

If adjustment range is not enough, also slacken screws (2).

Adjust rear lid.

Adjust rear lid lock, see **51 24 004 ADJUSTING REAR LID LOCK**.

Retighten all screws.

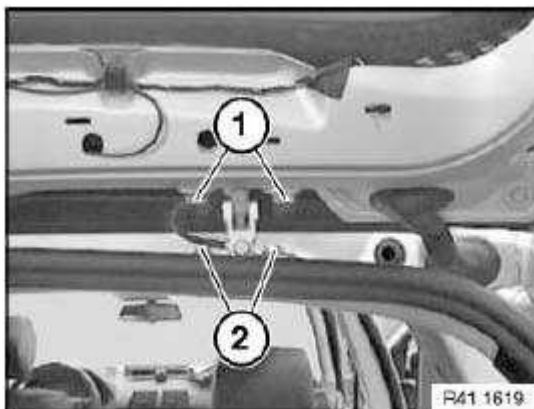


Fig. 132: Release And Slacken Screws
Courtesy of BMW OF NORTH AMERICA, INC.

41 62 519 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT HINGE FOR REAR LID

Read contents of Body, General, see **41 0 Contents of Body, General.**

Necessary preliminary tasks:

- Remove rear lid, see **41 62 000 Removing and installing rear lid**

Open screw connections (1) on car.

Remove hinge.

Installation:

Adjust rear lid on basis of E83 body gap dimensions.

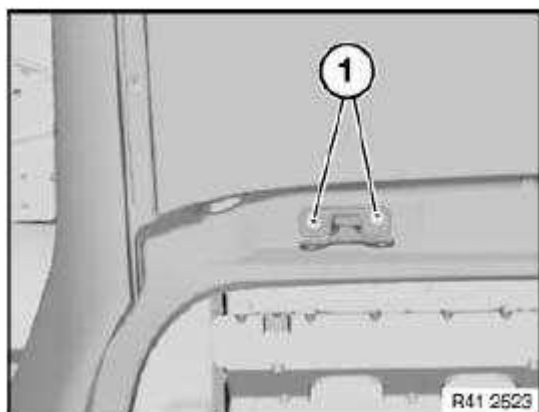


Fig. 133: Screw Connections On Car
Courtesy of BMW OF NORTH AMERICA, INC.

63 OTHER FLAPS

41 63 000 REMOVING AND INSTALLING FLAP FOR FUEL FILLER NECK

NOTE: The illustration is a schematic representation and is to be applied to the relevant vehicle type.

Open fuel filler flap.

Lever out lock (2) and detach fuel filler flap (1) in direction of arrow.

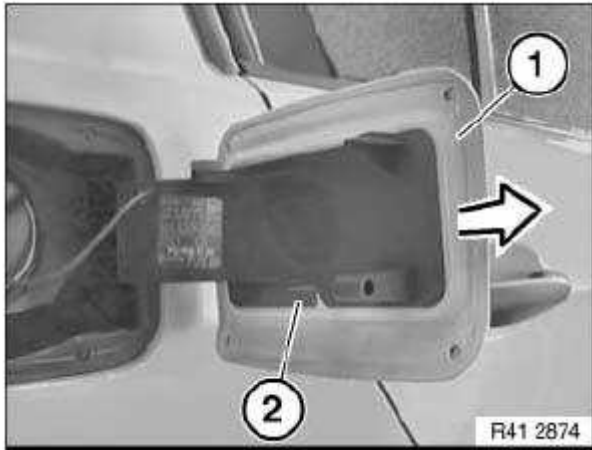


Fig. 134: Removing Lever Out Lock And Fuel Filler Flap
 Courtesy of BMW OF NORTH AMERICA, INC.

41 63 003 REPLACING COVER BOWL

Necessary preliminary tasks:

- Remove flap for fuel filler neck, see **41 63 000 Removing and installing flap for fuel filler neck**
- Remove servodrive for tank filler flap, see **67 11 555 REMOVING AND INSTALLING/REPLACING SERVODRIVE FOR TANK FILLER FLAP** .

Turn cover (1) through approx. 45° and lever out in direction of arrow.

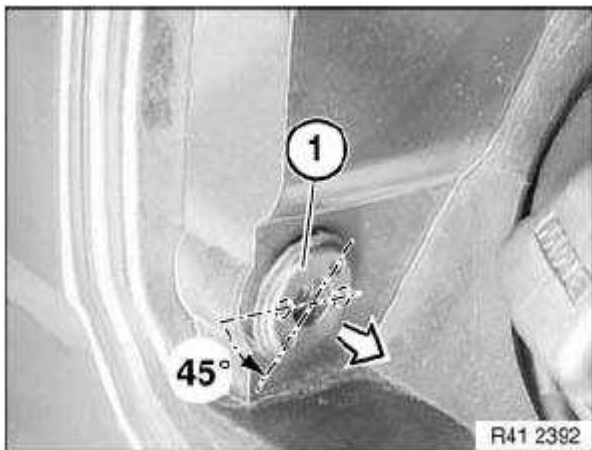


Fig. 135: Turning Cover
 Courtesy of BMW OF NORTH AMERICA, INC.

Press retaining strap (1) inwards and remove.

Remove cover (2).

Remove rubber pad (3).

Insert a suitable tool through bores (3) and release catches.

Installation:

Make sure seal (4) is correctly seated.

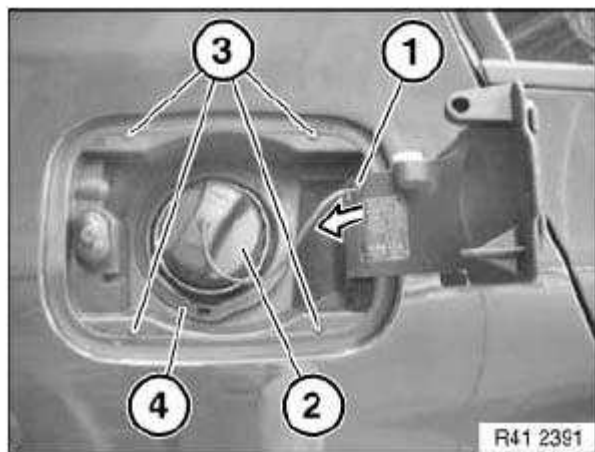


Fig. 136: Retaining Strap, Cover, Rubber Pad And Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Catches (1) on ejector (2) must not be damaged.

Check protective cap (3) for correct seating.

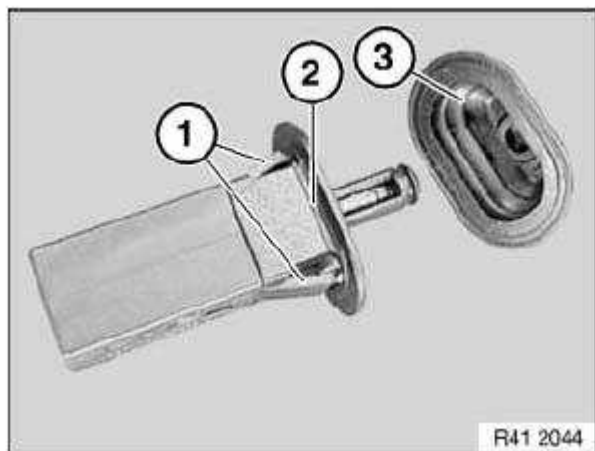


Fig. 137: Catches, Ejector And Protective Cap
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Locks (1) on left/right of cover (2) must not be damaged.

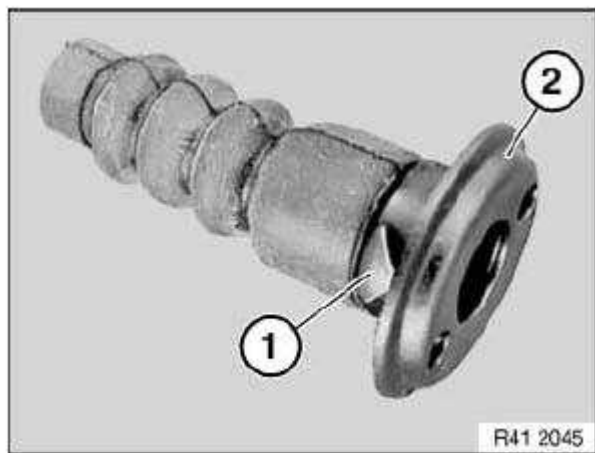


Fig. 138: Locks And Left/Right Of Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Close flap (1).

Twist cover bowl (2) in direction of arrow out of side panel and remove.

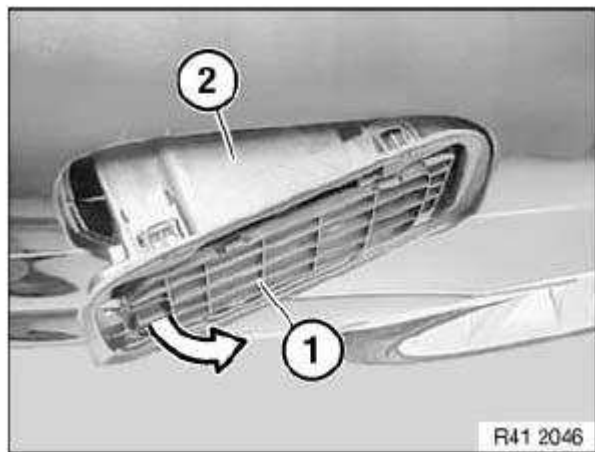


Fig. 139: Twisting Cover Bowl
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Following parts on cover bowl (6) must not be damaged or missing:

1. Rubber pad
2. Catches, top/bottom

3. Spring
4. Catch
5. Guide

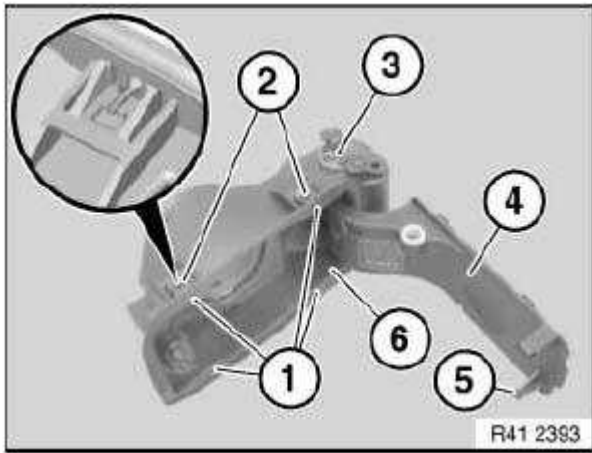


Fig. 140: Rubber Pad, Catches, Spring And Guide
Courtesy of BMW OF NORTH AMERICA, INC.

2000-06 ACCESSORIES & BODY, CAB

Panorama Glass Sunroof - SI Techniques - E53, E61, E83, E91

PANORAMA GLASS SUNROOF



G03356890

Fig. 1: Identifying Panorama Glass Sunroof
Courtesy of BMW OF NORTH AMERICA, INC.

INTRODUCTION

The fully automatic Panorama glass sunroof consists of 2 glass sunroofs and a 2-piece sliding visor. The front glass sunroof works like a sliding/tilting sunroof, the rear glass sunroof is a tilting glass sunroof. The Panorama glass sunroof is actuated in the usual way by its own control unit.

E53, E83

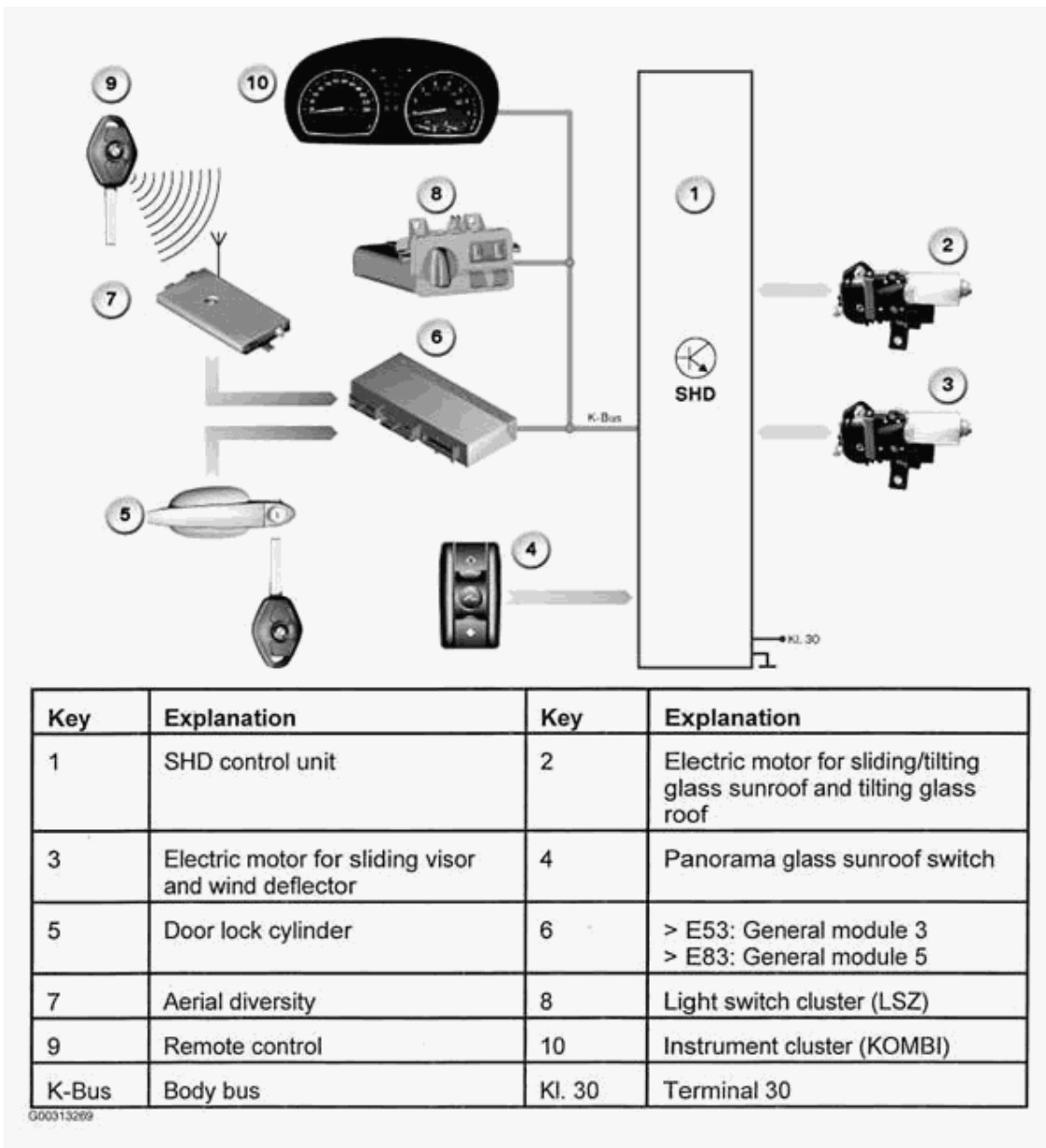
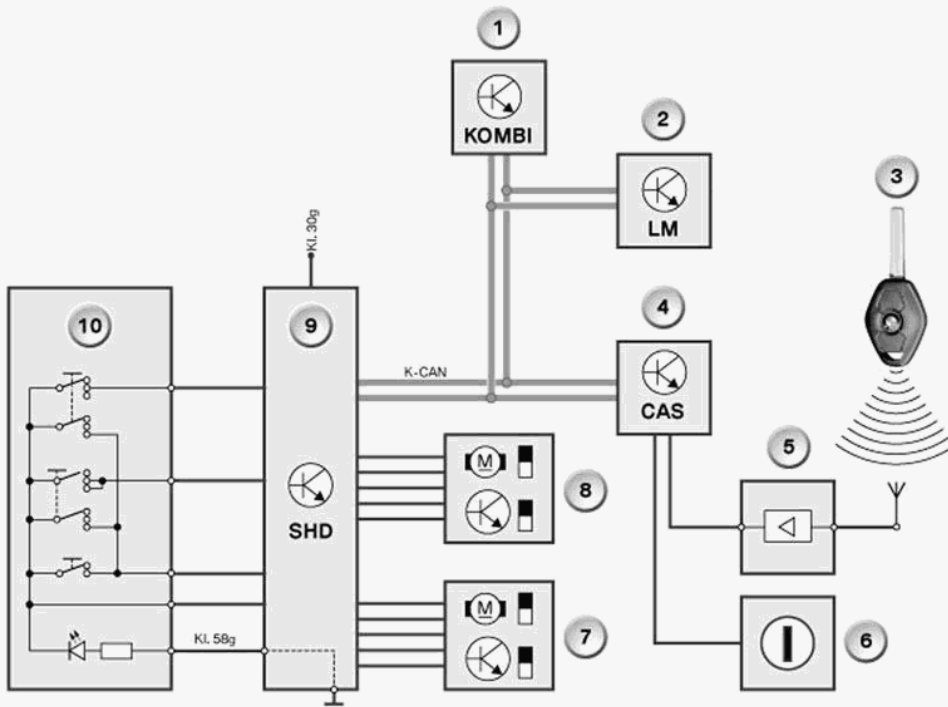


Fig. 2: Identifying Panorama Glass Sunroof Components (E53 & E83)
 Courtesy of BMW OF NORTH AMERICA, INC.



Key	Explanation	Key	Explanation
1	Instrument cluster (KOMBI)	2	Light switch cluster (LSZ)
3	Remote control	4	> E53: General module 3 (GM) > E83: General module 5 (GM)
5	Aerial diversity	6	Door lock cylinder
7	Electric motor for sliding visor and wind deflector	8	Electric motor for sliding/tilting glass sunroof and tilting glass roof
9	SHD control unit	10	Panorama glass sunroof switch
K-Bus	Body bus	Kl. 30	Terminal 30
Kl. 58g	Locating light in switch for Panorama glass sunroof		

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Fig. 3: Panorama Glass Sunroof Circuit Flow Diagram (E53 & E83)
 Courtesy of BMW OF NORTH AMERICA, INC.

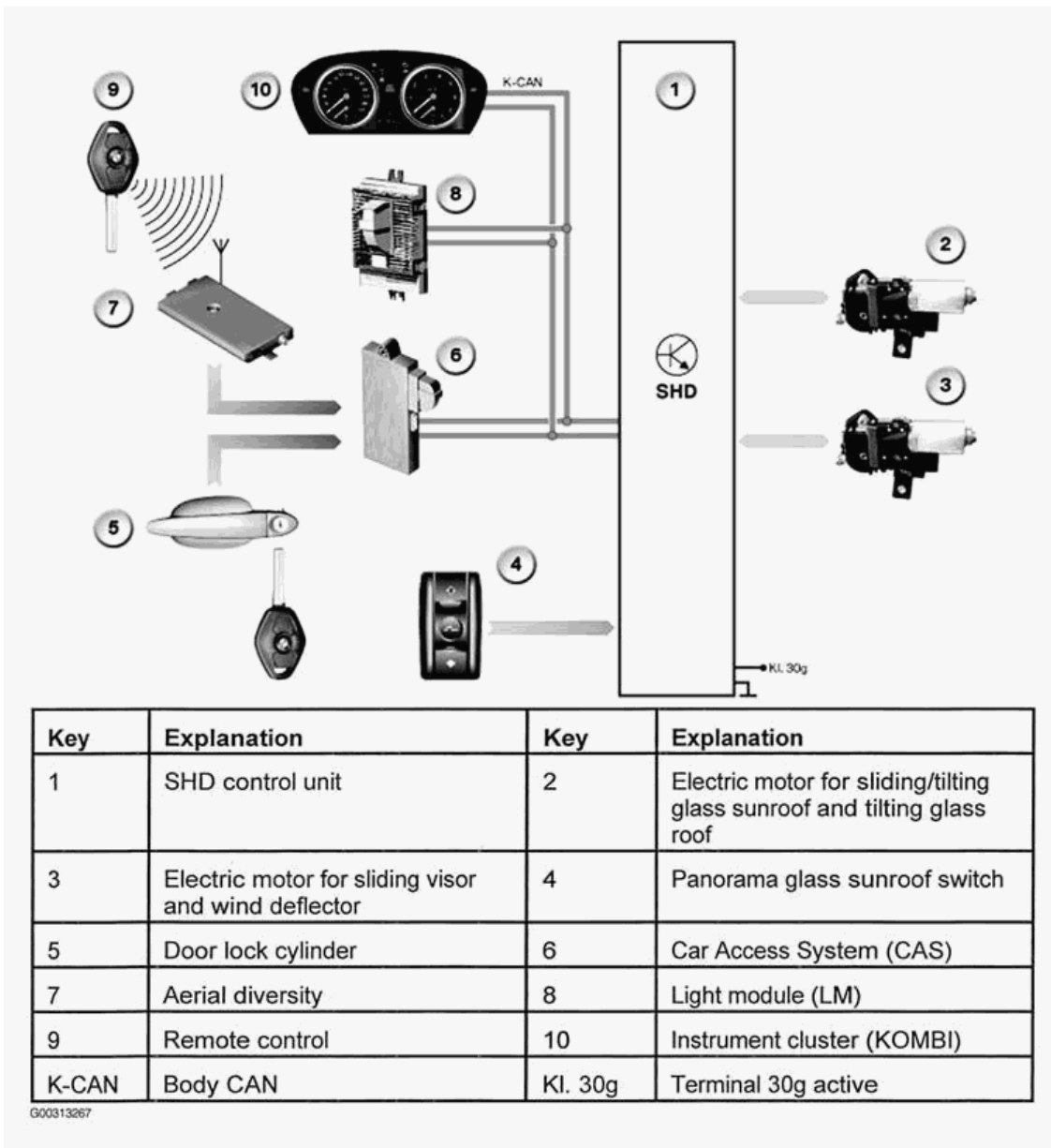
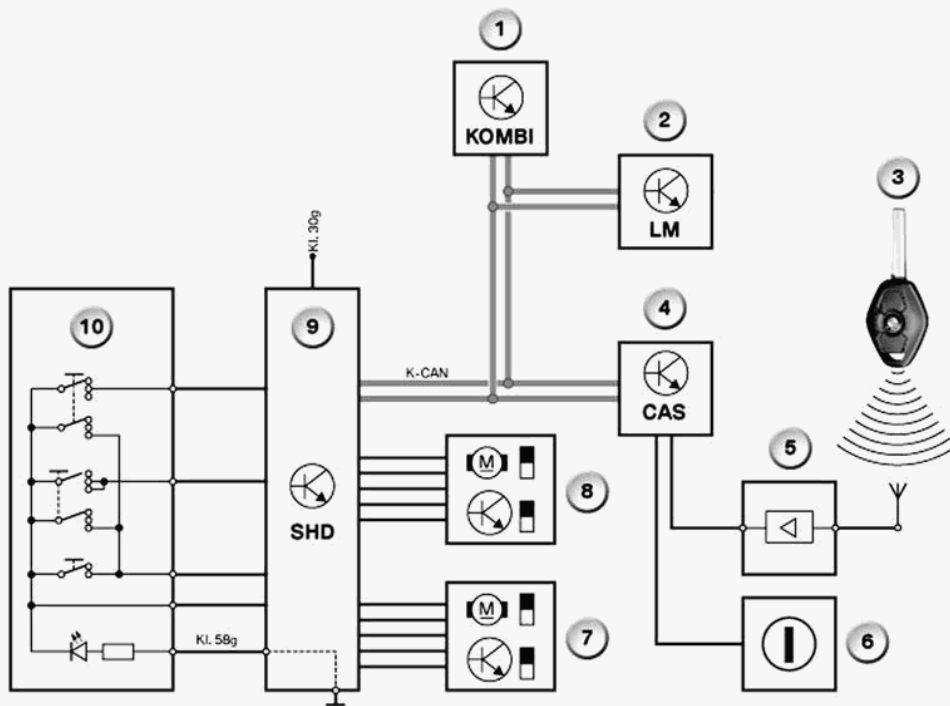


Fig. 4: Identifying Panorama Glass Sunroof Components (E61)
 Courtesy of BMW OF NORTH AMERICA, INC.



Key	Explanation	Key	Explanation
1	Instrument cluster (KOMBI)	2	Light module (LM)
3	Remote control	4	Car Access System (CAS)
5	Aerial diversity	6	Door lock cylinder
7	Electric motor for sliding visor and wind deflector	8	Electric motor for sliding/tilting glass sunroof and tilting glass roof
9	SHD control unit	10	Panorama glass sunroof switch
K-CAN	Body CAN	Kl. 30g	Terminal 30g active
Kl. 58g	Locating light in switch for Panorama glass sunroof		

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Fig. 5: Panorama Glass Sunroof Circuit Flow Diagram (E61)
 Courtesy of BMW OF NORTH AMERICA, INC.

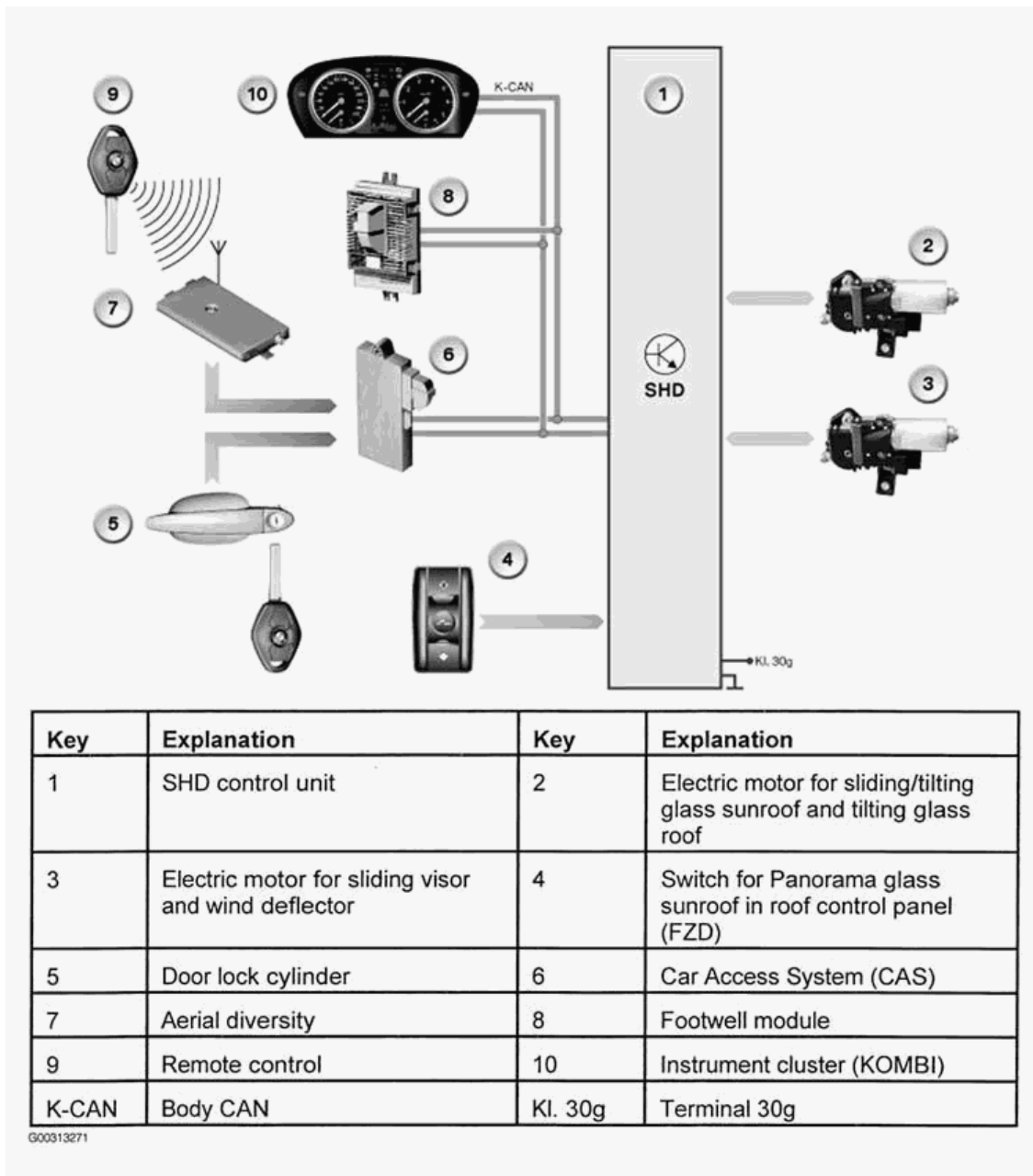


Fig. 6: Identifying Panorama Glass Sunroof Components (E91)
 Courtesy of BMW OF NORTH AMERICA, INC.

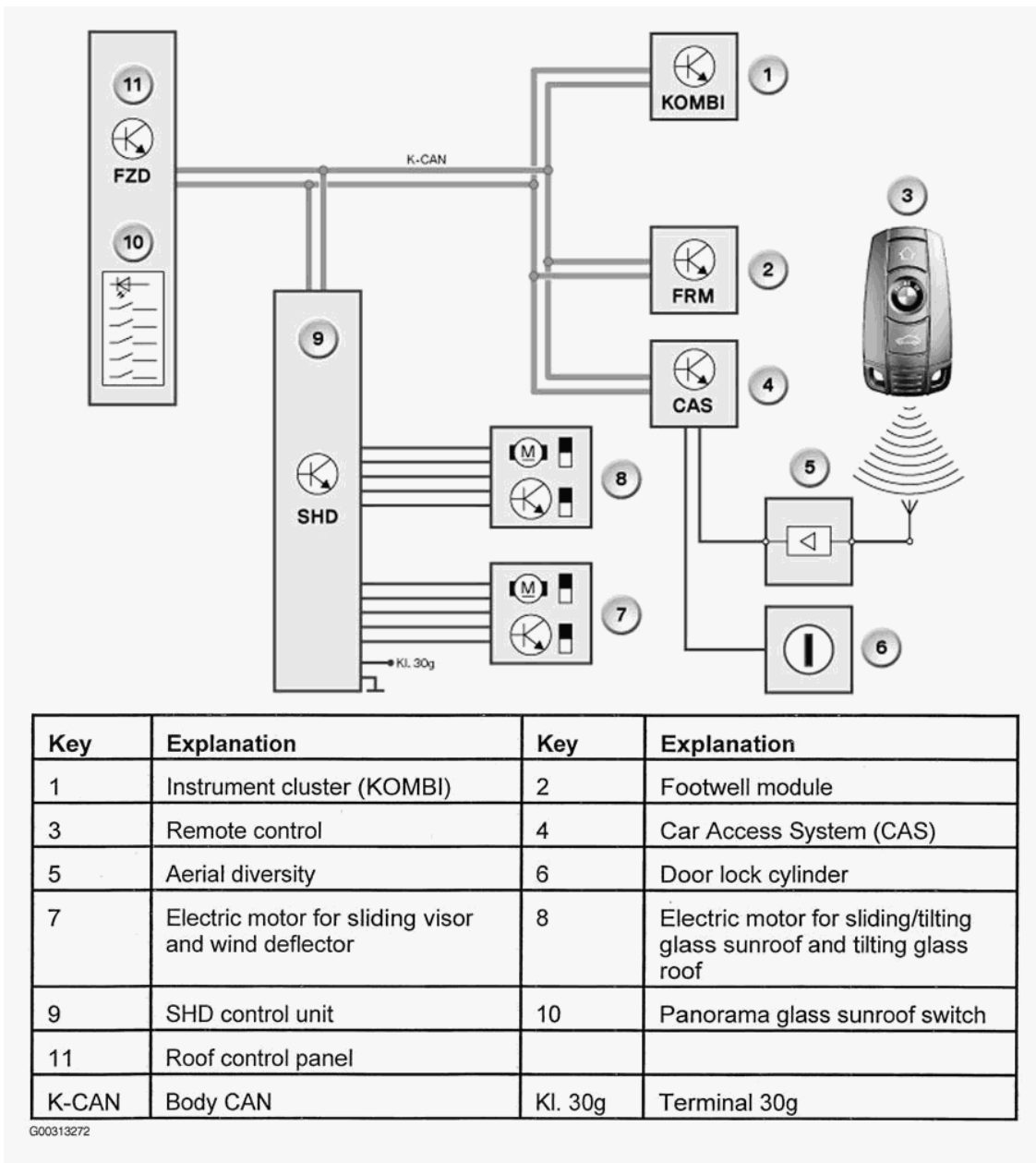


Fig. 7: Panorama Glass Sunroof Circuit Flow Diagram (E91)
 Courtesy of BMW OF NORTH AMERICA, INC.

The Panorama glass sunroof is available as special equipment (option 402).

BRIEF DESCRIPTION OF COMPONENTS

The following components supply the input signals for the Panorama glass sunroof:

Panorama Glass Sunroof Switch

The switch is located in the control unit in the roof console.

The switch can be moved in 3 directions (pushed forwards, pushed backwards, pushed upwards).

Installation Location

E53, E61, E83: The switch is integrated in the control panel in the roof console.

E91: The switch is integrated into the roof control panel (FZD).

How It Works

The switch for the Panorama glass sunroof does not engage. The switch has three operating directions:

- Open
- Close
- Tilt

NOTE: The "open" or "close" process for the sliding/tilting glass sunroof is interrupted when the comfort position is reached.

When the comfort position is reached as the sliding/tilting glass sunroof is opened or closed (sliding/tilting glass sunroof approx. 3/4 open), the "open" or "close" process is interrupted. The switch for the Panorama glass sunroof must be pushed again to continue the process.

The switch for the Panorama glass sunroof has a locating light (terminal 58g).

E53, E83 - The SHD control unit receives the information terminal 58g from the light switch cluster (LSZ) via the body bus. The control unit activates the LEDs (Light-Emitting Diodes) in the Panorama glass sunroof switch.

E61 - The SHD control unit receives the information terminal 58g from the light module (LM) via the Body CAN.

E91 - The SHD control unit receives the information terminal 58g from the footwell module (FRM) via the Body CAN.

Hall Sensors In Panorama Glass Sunroof Drive

There are 2 Hall sensors integrated in each of the two electric motors for the Panorama glass sunroof. The Hall sensors detect the motor speed. The signals are forwarded to the SHD control unit. These signals enable the control unit to recognize the position of the two glass sunroofs and of the 2-piece sliding visor. Moreover, the closing speed of each electric motor is used to calculate the closing force for the two glass sunroofs and for the sliding visor.

SHD Control Unit (Control Unit For Panorama Glass Sunroof)

NOTE: The control units involved in the functions of the Panorama glass sunroof are as follows:

The SHD control unit controls all the electrical functions of the Panorama glass sunroof.

Installation Location

E53, E83 - The SHD control unit is located next to the electric motor for the two glass sunroofs. The control unit is secured at the bottom to the Panorama glass sunroof frame.

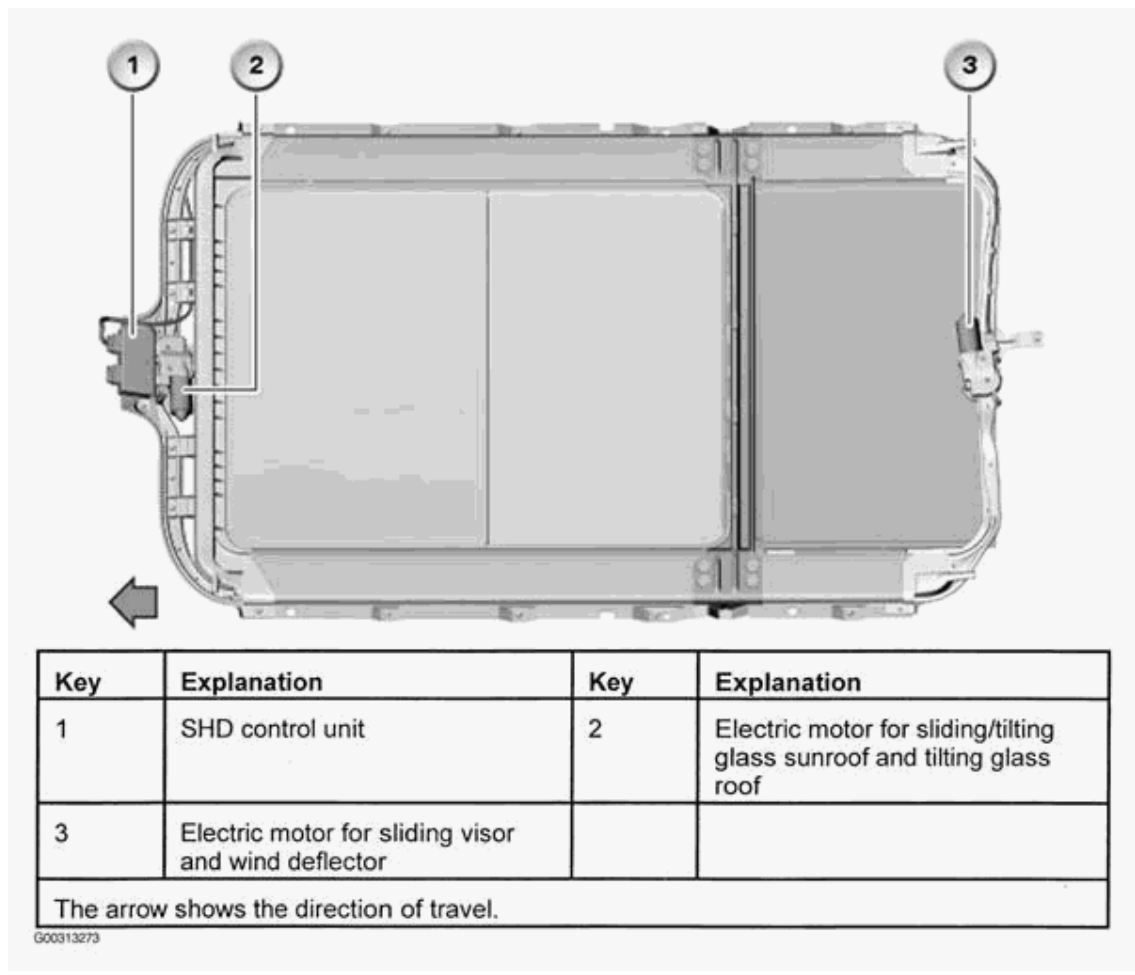
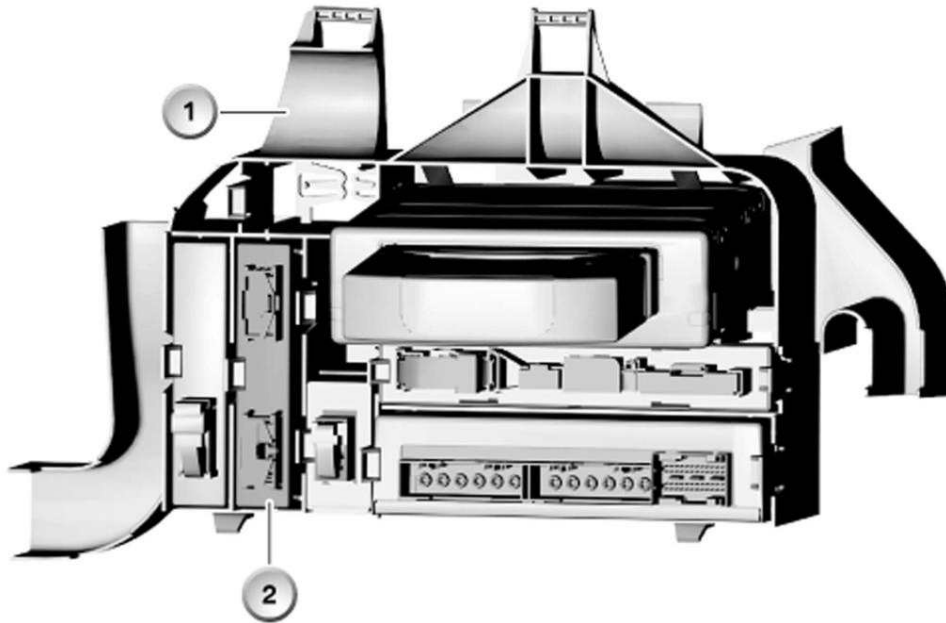


Fig. 8: Identifying SHD Control Module (E53 & E83)
Courtesy of BMW OF NORTH AMERICA, INC.

E61 - The SHD control unit is installed in the carrier behind the glove compartment.

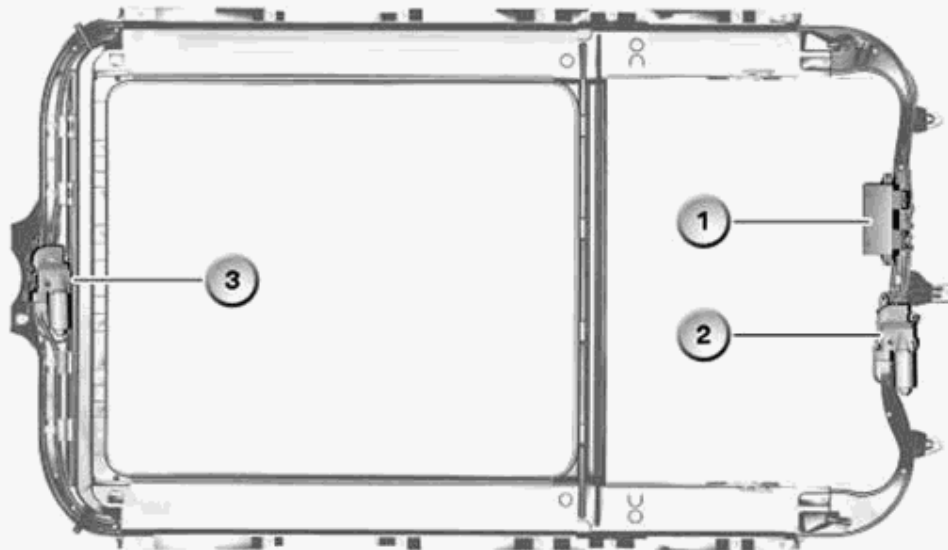


Key	Explanation	Key	Explanation
1	Device holder	2	SHD control unit

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Fig. 9: Locating SHD Control Module (E61)
Courtesy of BMW OF NORTH AMERICA, INC.

E91 - The SHD control unit is located next to the electric motor for the sliding visor. The control unit is secured at the bottom to the Panorama glass sunroof frame.



Key	Explanation	Key	Explanation
1	SHD control unit	2	Electric motor for sliding visor and wind deflector
3	Electric motor for sliding/tilting glass sunroof and tilting glass roof		
The arrow shows the direction of travel.			

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Fig. 10: Identifying SHD Control Module (E91)
 Courtesy of BMW OF NORTH AMERICA, INC.

Construction

The SHD control unit has a 16-pin plug connector to the vehicle electrical system and a 10-pin plug connector to the DC motors.

Pin Assignment For Connector X14044, 16-Pin

PIN ASSIGNMENT FOR CONNECTOR X14044, 16-PIN

Pin	Type	Explanation
1	V	Power supply (terminal 30)
2	M	Earth (terminal 31)
3	E/A	E61, E91: K-CAN High connection (Body CAN)
4	E/A	E61, E91: K-CAN Low connection (Body CAN)
5	E/A	E53, E83: Body bus
6	-	-

7	-	-
8	-	-
9	-	-
10	-	-
11	-	-
12	E	Negative wire for the Panorama glass sunroof switch and the LEDs
13	E	"Close" signal from the switch of the Panorama glass sunroof
14	E	"Open" signal from the switch of the Panorama glass sunroof
15	E	"Lift" signal from the switch of the Panorama glass sunroof
16	E	Positive wire for the LEDs in the Panorama glass sunroof switch
A = Output E = Input E/A = Input and output M = Earth V = Supply For current specifications regarding pin assignment, please refer to BMW diagnosis system.		

Pin Assignment For Connector X14103, 10-Pin

PIN ASSIGNMENT FOR CONNECTOR X14103, 10-PIN

Pin	Type	Explanation
1	E	Motor contact for sliding/tilting glass sunroof and tilting glass sunroof
2	E	Motor contact for sliding/tilting glass sunroof and tilting glass sunroof
3	E	Motor contact for sliding visor
4	E	Motor contact for sliding visor
5	A	Negative wire (terminal 31) for the glass sliding/tilting sunroof and for the tilting glass sunroof
6	A	Hall sensor in electric motor for sliding/tilting glass sunroof and for tilting glass sunroof
7	A	Hall sensor in electric motor for sliding/tilting glass sunroof and for tilting glass sunroof
8	A	Negative wire (terminal 31) for the sliding visor
9	A	Hall sensor in the sliding visor motor
10	A	Hall sensor in the sliding visor motor
A = Output E = Input For current specifications regarding pin assignment, please refer to BMW diagnosis system.		

GM: General Module 3 (E53) Or General Module 5 (E83)

The general module controls the convenience opening or closing function of the Panorama glass sunroof. The general module forwards the request (from the remote control, for example) to the SHD control unit via the body bus.

CAS: Car Access System (E61, E91)

The CAS controls the convenience opening or closing function of the Panorama glass sunroof. The CAS forwards the request (from the remote control, for example) to the SHD control unit via the Body CAN.

CA: Comfort Access

Option 322 "Comfort Access" allows convenience closing of the Panorama glass sunroof without actively using the ID transmitter.

For further information, please refer to SI Technology (SBT) 66 04 04 093.

LSZ: Light Switch Cluster (E53, E83)

The light switch cluster sends the SHD control unit the request to switch on the locating light via the body bus (terminal 58g).

LM: Light Module (E61)

The light module sends the SHD control unit the request to switch on the locating light via the Body CAN (terminal 58g).

FRM: Footwell Module (E91)

The footwell module sends the SHD control unit the request to switch on the locating light via the Body CAN (terminal 58g).

FZD: Roof Control Panel (E91)

The roof control panel picks up the signals from the switch for the Panorama glass sunroof. In addition, the FZD control unit also converts the signal into a CAN message. The CAN message is forwarded to the SHD control unit via the K-CAN.

KOMBI: Instrument Cluster

The instrument cluster sends the road speed signal to the SHD control unit:

via the K-bus (body bus) on the **E53, E83**

via the K-CAN (Body CAN) on the **E61, E91**

The signal is needed to extend and retract the wind deflector and to adjust the closing force limitation.

Panorama Glass Sunroof Drive

NOTE: The following components are actuated for the purposes of the functions of the Panorama glass sunroof:

The drive consists of 2 DC motors with reduction gearing. One motor operates the two glass sunroofs, the other

motor the sliding visor and the wind deflector.

Installation Location

The electric motors for the Panorama glass sunroof are installed from below on the Panorama glass sunroof frame. See **Fig. 8** .

Construction

The Panorama glass sunroof drive and the sliding visor and wind deflector drive consist of 2 technically identical DC motors with reduction gearing.

How It Works

Both electric motors are actuated by the SHD control unit. Two Hall sensors are integrated in the electric motor for each of the two glass sunroofs in the sliding visor motor. This allows the control unit to recognise the position of the glass sunroofs and of the sliding visor. The closing speed is used by the SHD control unit to calculate the closing force needed for the glass sunroofs and the sliding visor.

Wind Deflector

The wind deflector is extended to reduce noises inside the vehicle when the sliding/tilting glass sunroof is open. The wind deflector automatically extends depending on the road speed.

How It Works

The wind deflector is extended, depending on the road speed.

Signal path:

E53, E83: Instrument cluster -> Body bus -> SHD control unit

E61, E91: Instrument cluster -> Body CAN -> SHD control unit

The wind deflector has 2 positions:

- Wind Deflector Completely Extended
- Intermediate Position

When the sliding visor is fully open, the wind deflector extends fully with a net if the sliding/tilting glass sunroof is more than approx. 1/3 open. For this to happen, the sliding visor is disengaged from the sliding visor motor. The wind deflector is extended by the sliding visor motor. When a road speed of approx. 140 km/h is reached, the wind deflector is retracted to the intermediate position. When the speed drops below approx. 100 km/h again, the wind deflector is fully extended again. To prevent the wind deflector from extending and retracting in a haphazard manner, the wind deflector is actuated with a time lag.



Wind deflector completely extended

- 1) Wind deflector
- 2) Net



Wind deflector in intermediate position

- 1) Wind deflector

G00313276

Fig. 11: Identifying Wind Deflector Positions
 Courtesy of BMW OF NORTH AMERICA, INC.

2-Piece Sliding Visor

E53, E61, E83: When driving with the Panorama glass sunroof tilted ("vent" position), a suction effect develops on the 2-piece sliding visor. This suction effect can lead to noise disturbance.

To minimize the suction effect, the rear piece of the 2-piece sliding visor is opened approximately 3 cm.

E91: The 2-piece sliding visor moves back approx.5 cm and forms an opening at the front.

SYSTEM FUNCTIONS

The Panorama glass sunroof comprises the following functions:

- Opening And Closing
- Convenience Opening And Closing
- Emergency Closing
- Anti-Trap Function (Limits Closing Force)
- Safety Functions

Opening And Closing

The functions for opening and closing are as follows:

- Manual opening or closing

Push the switch for the Panorama glass sunroof backwards to the first resistance point to open it, or forwards to close it.

The glass sliding/tilting sunroof (front glass sunroof) keeps moving as long as the switch remains pushed.

- Automatic opening or closing

- Automatic opening:

Press the switch for the Panorama glass sunroof beyond the pressure point. The Panorama glass sunroof is partially opened automatically. That means: Depending on the initial position of the Panorama glass sunroof, the sliding visor is first opened fully. Then, if the switch is again pressed beyond the pressure point, the glass sliding/tilting sunroof is opened. When it is opened, the sliding/tilting glass sunroof automatically moves to the comfort position (sliding/tilting glass sunroof approx. 3/4 open). The switch must be pushed again to completely open the glass sliding/tilting sunroof.

- Automatic closing:

The closing procedure is a reverse of the above. When the comfort position is reached during closing, the closing operation is interrupted and must be restarted.

- Automatic opening or closing with a double click

Press the button for the Panorama glass sunroof beyond the pressure point to "Open" or "Close" twice within the space of 2 seconds. The Panorama glass sunroof completely opens or closes automatically. When this happens, the sliding visor and the sliding/tilting glass sunroof open or close together. However, the sliding visor always moves out-of-line with the sliding/tilting glass sunroof. This ensures that the sliding visor is always slightly more open than the sliding/tilting glass sunroof as the sliding/tilting glass sunroof is opened or closed.

- Tilt

- Push the switch for the Panorama glass sunroof upwards until it reaches its mechanical stop. The front glass sliding/tilting sunroof and the rear tilting glass sunroof are automatically lifted from every other position as long as the switch remains pushed.

- Press the switch for the Panorama glass sunroof up twice within the space of 2 seconds. The Panorama glass sunroof moves to the "Vent" position, regardless of the starting position. ("Vent" position means: both glass sunroofs are fully tilted, the rear section of the 2-piece sliding visor is opened approx.3 cm.)

NOTE: **Automatic closing is not possible if the anti-trap function fails.**
Automatic closing is not possible if the anti-trap function fails (on account of defective Hall sensor, for example). Closing is then only possible with the mechanical emergency mode.
Any fault data is then stored in the SHD control unit.

Convenience Opening And Closing

The controls that can be used for this purpose are as follows:

- Button on remote control (radio-control key)

Press the button on the remote control to "unlock" or "lock" and hold it in this position until the Panorama glass sunroof reaches the desired position.

- Door lock on driver's door

Use the mechanical key to turn the lock in the driver's door to the position for unlocking or locking, and hold it in this position until the Panorama glass sunroof reaches the desired position.

- Driver-side outside door handle and passenger-side outside door handle

If the vehicle is equipped with Comfort Access (CA), **convenience closing** can be started using the outside door handle electronics in the bow handle.

The convenience opening/convenience closing function is stopped if the command is cancelled.

Emergency Closing

Emergency closing is a function for deliberate closure of the Panorama glass sunroof without anti-trap function (closing-force limitation). Emergency closing may be necessary if someone attempts to reach into the interior of the car or if mechanical difficulty is experienced in closing the Panorama glass sunroof.

Emergency closing can be activated when the car is stopped or travelling at a speed up to 16 km/h.

To activate emergency closing:

Push the switch for the Panorama glass sunroof in the "close" direction until it reaches its mechanical stop and hold it there. The Panorama glass sunroof is closed with maximum force and maximum speed without anti-trap function.

If the Panorama glass sunroof is blocked, the electric motor continues to run until the overheating protection is

activated.

Anti-Trap Function (Closing-Force Limitation)

WARNING: Note Initialization

The Panorama glass sunroof has to be initialized in order for the anti-trap function to work correctly. The Panorama glass sunroof has to be initialized by service staff.

The anti-trap function is active over the entire range of movement in the closing direction.

The anti-trap function works as follows:

- The sliding/tilting glass sunroof and/or the sliding visor is opened approx.20 cm.
- When closing from the "tilt" position, the sunroof will return to the "tilt" position.

Anti-trap function does not in principle prevent trapping; instead, it limits the maximum permissible force applied to the trapped object (by limiting the closing force).

To prevent impermissibly high closing forces, there are 2 Hall sensors integrated in each of the electric motors. The speed of closure can be measured on the basis of the signals from these two Hall sensors. The closing force is calculated from the speed of closure.

The mechanical forces involved change with ambient temperature and as a result of ageing. For this reason, the closing forces required are adapted during the closing process.

Automatic closing is not possible if the anti-trap function fails (on account of defective Hall sensor, for example). Closing is then only possible with the mechanical emergency mode.

Safety Functions

- **Maximum Motor ON Time**

If a motor runs in a single direction for longer than 15 seconds, the SHD control unit will deactivate the drive.

- **Overheating Protection**

The heating up of the electric motors is computed in the SHD control unit. The outside temperature is available as a temperature signal (via the body bus or CAN). Moreover, there is a temperature sensor on the board of the SHD control unit. After a certain temperature threshold is reached the overheating protection is activated. The drive is switched off.

- **Emergency Operation**

In emergency mode, the Panorama glass sunroof can only be moved in small steps.

Emergency mode is possible in the following conditions:

- Encoding of the SHD control unit incorrect
- Implausible signal from a Hall sensor
- Initialization incomplete

NOTE: **Mechanical emergency mode is possible**
In case of an electrical defect, emergency mode of the Panorama glass
sunroof is available.
There is no emergency mode for the sliding visor.

Notes For Service Staff

Service staff should note the following points:

- General information: Refer to **E53, E61, E83, E91 - GENERAL INFORMATION FOR SERVICE STAFF ON THE PANORAMA GLASS SUNROOF** .
- Diagnosis:
- Encoding/programming: Refer to **E53, E61, E83, E91 - ENCODING/PROGRAMMING THE PANORAMA GLASS SUNROOF** .
- Car and Key Memory:

E53, E61, E83, E91 - General Information For Service Staff On The Panorama Glass Sunroof

Initialising The Panorama Glass Sunroof The Panorama glass sunroof must be initialised after the following service operations:

- Replacement of SHD control unit
- Repair of the Panorama glass sunroof mechanics (e.g. if the Panorama glass sunroof has been mechanically moved using emergency mode or if a Panorama glass sunroof electric motor has been replaced)
- Other repairs to the Panorama glass sunroof (e.g. if the glass sunroof or sliding visor has been replaced)

Initialisation will calibrate the anti-trap function to the Panorama glass sunroof.

IMPORTANT: Anti-Trap Function Not Active The anti-trap function is not active during initialisation.

Initialisation is divided into the steps "normalisation" and "characteristic curve teach-in":

- During normalisation, the end stop for the Panorama glass sunroof and sliding visor in the "tilt" direction is learnt. The SHD control unit uses this information to calculate the end stops for opening and closing.
- When it is taught the characteristic map, the processor registers the mechanical forces required to close the Panorama glass sunroof.

Comply With The Following Procedure For Initialisation:

- Terminal 15 ON
- Push the switch for the Panorama glass sunroof upwards in the "tilt" direction and hold it there.

NOTE: Hold the switch for the Panorama glass sunroof depressed during the initialisation. If the switch for the Panorama glass sunroof is released during initialisation, the procedure must be repeated.

- The process will start automatically after approx. 15 seconds. All positions for the Panorama glass sunroof are selected.
- The Panorama glass sunroof will be closed when initialisation is complete.
- Once the Panorama glass sunroof is again closed, the switch for the Panorama glass sunroof can be released. After a delay of approx. 5 seconds, which is needed to store data, the switch can again be used to operate the Panorama glass sunroof.

E53, E61, E83, E91 - Encoding/Programming The Panorama Glass Sunroof

The following step should be performed if the SHD control unit has been replaced:

- Encode the electronic control unit

IMPORTANT: Perform encoding after replacing the control unit. If encoding is not performed, there is risk of malfunction (e.g.. anti-trap circuit) or of the battery becoming permanently discharged.

ACCESSORIES AND EQUIPMENT

Slide/Tilt Roof and Convertible Top - SI Techniques - X3

PANORAMA GLASS SUNROOF

E53, E61, E83, E91



Fig. 1: Panorama Glass Sunroof
Courtesy of BMW OF NORTH AMERICA, INC.

INTRODUCTION

The fully automatic Panorama glass sunroof consists of 2 glass sunroofs and a 2 -piece sliding visor. The front glass sunroof works like a sliding/tilting sunroof, the rear glass sunroof is a tilting glass sunroof. The Panorama glass sunroof is actuated in the usual way by its own control unit.

- > E53, E83
- > E61
- > E91

The Panorama glass sunroof is available as special equipment (option 402).

BRIEF DESCRIPTION OF COMPONENTS

The following components supply the input signals for the Panorama glass sunroof:

- **Panorama glass sunroof switch**

The switch is located in the control unit in the roof console.

The switch can be moved in 3 directions (pushed forwards, pushed backwards, pushed upwards).

- **Hall sensors in Panorama glass sunroof drive**

There are 2 Hall sensors integrated in each of the two electric motors for the Panorama glass sunroof. The Hall sensors detect the motor speed. The signals are forwarded to the SHD control unit. These signals enable the control unit to recognize the position of the two glass sunroofs and of the 2 -piece sliding visor. Moreover, the closing speed of each electric motor is used to calculate the closing force for the two glass sunroofs and for the sliding visor.

The control units involved in the functions of the Panorama glass sunroof are as follows:

- **SHD control unit (control unit for Panorama glass sunroof)**

The SHD control unit controls all the electrical functions of the Panorama glass sunroof.

- **GM: General module 3 (E53) or general module 5 (E83)**

The general module controls the convenience opening or closing function of the Panorama glass sunroof. The general module forwards the request (from the remote control, for example) to the SHD control unit via the body bus.

- **CAS: Car Access System (E61, E91)**

The CAS controls the convenience opening or closing function of the Panorama glass sunroof. The CAS forwards the request (from the remote control, for example) to the SHD control unit via the Body CAN.

- **CA: Comfort Access**

Option 322 "Comfort Access" allows convenience closing of the Panorama glass sunroof without actively using the ID transmitter.

- **LSZ: Light switch cluster (E53, E83)**

The light switch cluster sends the SHD control unit the request to switch on the locating light via the body bus (terminal 58g).

- **LM: Light module (E61)**

The light module sends the SHD control unit the request to switch on the locating light via the Body CAN (terminal 58g).

- **FRM: Footwell module (E91)**

The footwell module sends the SHD control unit the request to switch on the locating light via the Body CAN (terminal 58g).

- **FZD: Roof control panel (E91)**

The roof control panel picks up the signals from the switch for the Panorama glass sunroof. In addition, the FZD control unit also converts the signal into a CAN message. The CAN message is forwarded to the SHD control unit via the K-CAN.

- **KOMBI: Instrument cluster**

The instrument cluster sends the road speed signal to the SHD control unit.

- > via the K-bus (body bus) on the **E53, E83**
- > via the K-CAN (Body CAN) on the **E61, E91**

The signal is needed to extend and retract the wind deflector and to adjust the closing force limitation.

The following components are actuated for the purposes of the functions of the Panorama glass sunroof:

- **Panorama glass sunroof drive**

The drive consists of 2 DC motors with reduction gearing. One motor operates the two glass sunroofs, the other motor the sliding visor and the wind deflector.

- **Wind deflector**

The wind deflector is extended to reduce noises inside the vehicle when the sliding/tilting glass sunroof is open. The wind deflector automatically extends depending on the road speed.

- **2-piece sliding visor**

When driving with the Panorama glass sunroof tilted ("vent" position), a suction effect develops on the 2-piece sliding visor. This suction effect can lead to noise disturbance.

- E53, E61, E83:

To minimize the suction effect, the rear piece of the 2-piece sliding visor is opened approximately 3 cm.

- E91 : The 2-piece sliding visor moves back approx. 5 cm and forms an opening at the front.

SYSTEM FUNCTIONS

The Panorama glass sunroof comprises the following functions:

- Opening and closing
- Convenience opening and closing

- Emergency closing
- Anti-trap function (limits closing force)
- Safety functions

Opening and closing

The functions for opening and closing are as follows:

- Manual opening or closing

Push the switch for the Panorama glass sunroof backwards to the first resistance point to open it, or forwards to close it.

The glass sliding/tilting sunroof (front glass sunroof) keeps moving as long as the switch remains pushed.

- Automatic opening or closing

- Automatic opening:

Press the switch for the Panorama glass sunroof beyond the pressure point. The Panorama glass sunroof is partially opened automatically. That means: Depending on the initial position of the Panorama glass sunroof, the sliding visor is first opened fully. Then, if the switch is again pressed beyond the pressure point, the glass sliding/tilting sunroof is opened. When it is opened, the sliding/tilting glass sunroof automatically moves to the comfort position (sliding/tilting glass sunroof approx. 3/4 open). The switch must be pushed again to completely open the glass sliding/tilting sunroof.

- Automatic closing:

The closing procedure is a reverse of the above. When the comfort position is reached during closing, the closing operation is interrupted and must be restarted.

- Automatic opening or closing with a double click

Press the button for the Panorama glass sunroof beyond the pressure point to "Open" or "Close" twice within the space of 2 seconds. The Panorama glass sunroof completely opens or closes automatically. When this happens, the sliding visor and the sliding/tilting glass sunroof open or close together. However, the sliding visor always moves out-of-line with the sliding/tilting glass sunroof. This ensures that the sliding visor is always slightly more open than the sliding/tilting glass sunroof as the sliding/tilting glass sunroof is opened or closed.

- Tilt

- Push the switch for the Panorama glass sunroof upwards until it reaches its mechanical stop. The front glass sliding/tilting sunroof and the rear tilting glass sunroof are automatically lifted from every other position as long as the switch remains pushed.
- Press the switch for the Panorama glass sunroof up twice within the space of 2 seconds. The Panorama glass sunroof moves to the "Vent" position, regardless of the starting position. ("Vent"

position means: both glass sunroofs are fully tilted, the rear section of the 2-piece sliding visor is opened approx. 3 cm.)

NOTE: Automatic closing is not possible if the anti-trap function fails.

Automatic closing is not possible if the anti-trap function fails (on account of defective Hall sensor, for example). Closing is then only possible with the mechanical emergency mode.

Any fault data is then stored in the SHD control unit.

Convenience opening and closing

The controls that can be used for this purpose are as follows:

- Button on remote control (radio-control key)

Press the button on the remote control to "unlock" or "lock" and hold it in this position until the Panorama glass sunroof reaches the desired position.

- Door lock on driver's door

Use the mechanical key to turn the lock in the driver's door to the position for unlocking or locking, and hold it in this position until the Panorama glass sunroof reaches the desired position.

- Driver-side outside door handle and passenger-side outside door handle

If the vehicle is equipped with Comfort Access (CA), **convenience closing** can be started using the outside door handle electronics in the bow handle.

The convenience opening/convenience closing function is stopped if the command is cancelled.

Emergency closing

Emergency closing is a function for deliberate closure of the Panorama glass sunroof without anti-trap function (closing-force limitation). Emergency closing may be necessary if someone attempts to reach into the interior of the car or if mechanical difficulty is experienced in closing the Panorama glass sunroof.

Emergency closing can be activated when the car is stopped or travelling at a speed up to 16 km/h.

To activate emergency closing:

Push the switch for the Panorama glass sunroof in the "close" direction until it reaches its mechanical stop and hold it there. The Panorama glass sunroof is closed with maximum force and maximum speed without anti-trap function.

If the Panorama glass sunroof is blocked, the electric motor continues to run until the overheating protection is activated.

Anti-trap function (closing-force limitation)

WARNING: Note initialization

The Panorama glass sunroof has to be initialized in order for the anti-trap function to work correctly. The Panorama glass sunroof has to be initialized by service staff.

The anti-trap function is active over the entire range of movement in the closing direction.

The anti-trap function works as follows:

- The sliding/tilting glass sunroof and/or the sliding visor is opened approx. 20 cm.
- When closing from the "tilt" position, the sunroof will return to the "tilt" position.

Anti-trap function does not in principle prevent trapping; instead, it limits the maximum permissible force applied to the trapped object (by limiting the closing force).

To prevent impermissibly high closing forces, there are 2 Hall sensors integrated in each of the electric motors. The speed of closure can be measured on the basis of the signals from these two Hall sensors. The closing force is calculated from the speed of closure.

The mechanical forces involved change with ambient temperature and as a result of ageing. For this reason, the closing forces required are adapted during the closing process.

Automatic closing is not possible if the anti-trap function fails (on account of defective Hall sensor, for example). Closing is then only possible with the mechanical emergency mode.

Safety functions

- **Maximum motor ON time**

If a motor runs in a single direction for longer than 15 seconds, the SHD control unit will deactivate the drive.

- **Overheating protection**

The heating up of the electric motors is computed in the SHD control unit. The outside temperature is available as a temperature signal (via the body bus or CAN). Moreover, there is a temperature sensor on the board of the SHD control unit. After a certain temperature threshold is reached the overheating protection is activated. The drive is switched off.

- **Emergency operation**

In emergency mode, the Panorama glass sunroof can only be moved in small steps. Emergency mode is possible in the following conditions:

- Encoding of the SHD control unit incorrect
- Implausible signal from a Hall sensor
- Initialisation incomplete

NOTE: Mechanical emergency mode is possible

In case of an electrical defect, emergency mode of the Panorama glass sunroof is available.

There is no emergency mode for the sliding visor.

ACCESSORIES AND EQUIPMENT

Slide/Tilt Roof and Convertible Top - Tightening Torques - X3

12 MECHANICAL SUN ROOF COMPONENTS

54 12 MECHANICAL SUN ROOF COMPONENTS

MECHANICAL SUN ROOF COMPONENTS - TIGHTENING TORQUES

Thread	Tightening specification	measure
1AZ Glass lid to gate	Always use new nuts and bolts.	4 +/- 0.5 Nm
2AZ Cassette to body	M6 Self-tapping screw	5.4 +/- 0.5 Nm
	3AZ Cover, cross-member	3.5 +/- 0.5 Nm
4AZ	Front floating roofliner to detent element	1.5 +/- 0.2 Nm
	5AZ Rear floating roofliner to detent element	1 +/- 0.2 Nm

13 ELECTRICAL SUN ROOF COMPONENTS

54 13 ELECTRIC SUN ROOF COMPONENTS

ELECTRIC SUN ROOF COMPONENTS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Drive to cassette	E31, E32, E34, E36, E38, E39, E46, E53, E83			2.8 Nm
	E34 Touring, E60, E61, E63, E65, E66, E81, E87			3.5 Nm
	E90, E92			3.8 Nm
	E91			2.5 Nm

ACCESSORIES AND EQUIPMENT

Slide/Tilt Sunroof - Special Tools - X3

54 SLIDE-TILT SUNROOF AND CONVERTIBLE TOP

54 1 100 PRESSING FIXTURE FOR PANORAMA SUNROOF GUIDE RAIL

Note: Is only supplied by Cartool in the event of a customer complaint - see PuMA measure. No special storage location is assigned to the special tool.

Series: E83

Order number: 54 1 100

Pressing fixture for panorama sunroof guide rail

54 1 110 CENTERING PINS

Note: Contents: 2 x For installing (centering) glass slide/tilt sunroof.

Series: E53, E61, E83, E91

SI number: 01 15 06 281

Order number: 54 1 110

Centering pins



Fig. 1: Centering Pins (54 1 110)

Courtesy of BMW OF NORTH AMERICA, INC.

ACCESSORIES AND BODY, CAB

Sliding/Tilt Sunroof - Repair Instructions - X3

10 SUNROOF

54 0 ... REPAIR INSTRUCTIONS FOR BONDED SEALS

1. General information on handling rubber seal profiles:

- If seals reveal partly detached protective film on delivery, they must not be bonded.
- Store seals at 15°C to 25°C.
- If, during the handling, the protective film has come off before bonding, it can still be bonded.
- Bonding at room and object temperature >20°C. Temperatures between 40 and 50°C significantly increase initial adhesion.
- Seals, which are subjected to temperatures above 80°C after gluing, will be very difficult to remove.

2. Damage pattern and repair

2.1 Partially detached bond (rubber-adhesive tape or adhesive tape-paint)

- Up to 120 mm for retouching without auxiliary resources
- Up to 200 mm repaired with pressing-on tools on straight surfaces
- a. Cleaning damaged areas:
 - Degrease bonded area with adhesive cleaner and remove other residues.

NOTE: Use necessary cotton-or fluff-free paper towel once only.
When using solvent:
expose repair area to air for at least 2 minutes.

b. Applying adhesive:

- With a fine nozzle, apply a wafer-thin bead to adhesive tape.

NOTE: Use contact adhesive (e.g. Terokal 2444)

CAUTION: Avoid contact to skin!
Do not apply adhesive to visible painted surfaces.

c. Pressing on rubber seal:

- Press down seal using contact pressure (forced pressure not necessary) for at least 1 minute.

CAUTION: Load can only be applied to the bond after a period of 2 minutes. This waiting time is absolutely essential.

2.2 Larger defects (mechanical damage and larger separations of seal)

- A complete replacement of the rubber seal is necessary, see **54 13 050 Replacing seal for slide/tilt sunroof lid at rear.**
- a. Peeling off damaged rubber seal:
 - Pull off rubber seal slowly at an angle up to 20° under uniformly strong tension.

NOTE: **Make sure the connection between adhesive tape and seal is retained.**
If the connection between adhesive tape and seal is detached: Carefully and slowly detach adhesive tape at an angle of 20° from roof opening or lid.
If, in the case of older seals, you are peeling off using a hot air blower: Do not damage paintwork.
Do not detach rubber-adhesive tape connection if at all possible.

- b. Cleaning bonded area:
 - Degrease bonded area with adhesive cleaner and remove other residues.

NOTE: **Use necessary cotton-or fluff-free paper towel once only.**
When using solvent: expose repair area to air for at least 2 minutes.

- c. Detaching protective film from bonded area:
 - Detach protective film from rubber seal in sections.

CAUTION: Once the protective film has been removed, do not under any circumstances touch the exposed bonded area.

- d. Applying rubber seal:
 - Apply rubber seal on roof opening edge beginning at rear center. Use upper lip as application edge. Press on seal continuously by hand. Carefully unwrap seal at radii without tension and press down (critical area).

NOTE: **If positioned incorrectly, the seal can still be pulled off, repositioned and pressed on again.**

- e. Establishing seal joint:
 - Mark contact point at joint by pressing down loose end on seal of already bonded end. Then cut and press down loose end at same height.
- f. Pressing on seal:
 - Press on seal using a roller
 - Adhesive tape width up to 5 mm Application pressure approx. 5 N

- Adhesive tape width up to 10 mm Application pressure approx. 10 N

Sliding sunroof seal only:

- Press against seal strongly with a roller. Application pressure approx. 70 N.

E36 sliding sunroof seal only:

- Application pressure approx. 30 N.
- Tear off tear-off lip at rear and side in area of narrower flange.

NOTE: Firm thumb pressure has approx. 35 N/cm 2

Checking rubber seal

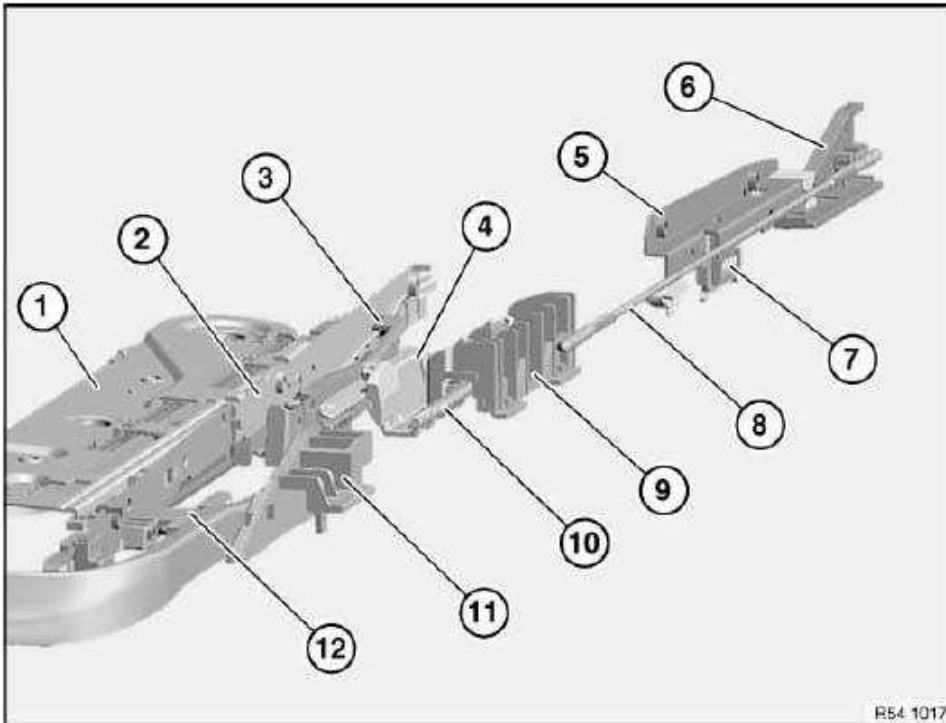
- Check the bonded seals for correct positioning and perfect adhesion. The bonding can be checked by pressing back the sealing lip.
- The force required to peel off the seal immediately after gluing must be greater than 10 N/cm.

54 10 ... REMOVING AND INSTALLING/REPLACING DRIVE CABLE PLATE

Necessary preliminary tasks:

- Remove mechanism for glass cover at front, see **54 10 020 Removing and installing mechanism for front glass lid.**

Overview of glass lid mechanism:



R54 1017

- | | | | |
|---|----------------------------------|----|--|
| 1 | Floating roofline mechanism | 7 | Spring retainer |
| 2 | Mechanism, front glass lid | 8 | Drive cable, rear glass lid (connecting link) |
| 3 | Drive wedge | 9 | Drive cable plate |
| 4 | Drive plate | 10 | Drive cable, front glass lid (connecting link) |
| 5 | Mechanism, rear glass lid | 11 | Control carriage, wind deflector |
| 6 | Control carriage, rear glass lid | 12 | Slide element |

Fig. 1: Identifying Glass Lid Mechanism Components
 Courtesy of BMW OF NORTH AMERICA, INC.

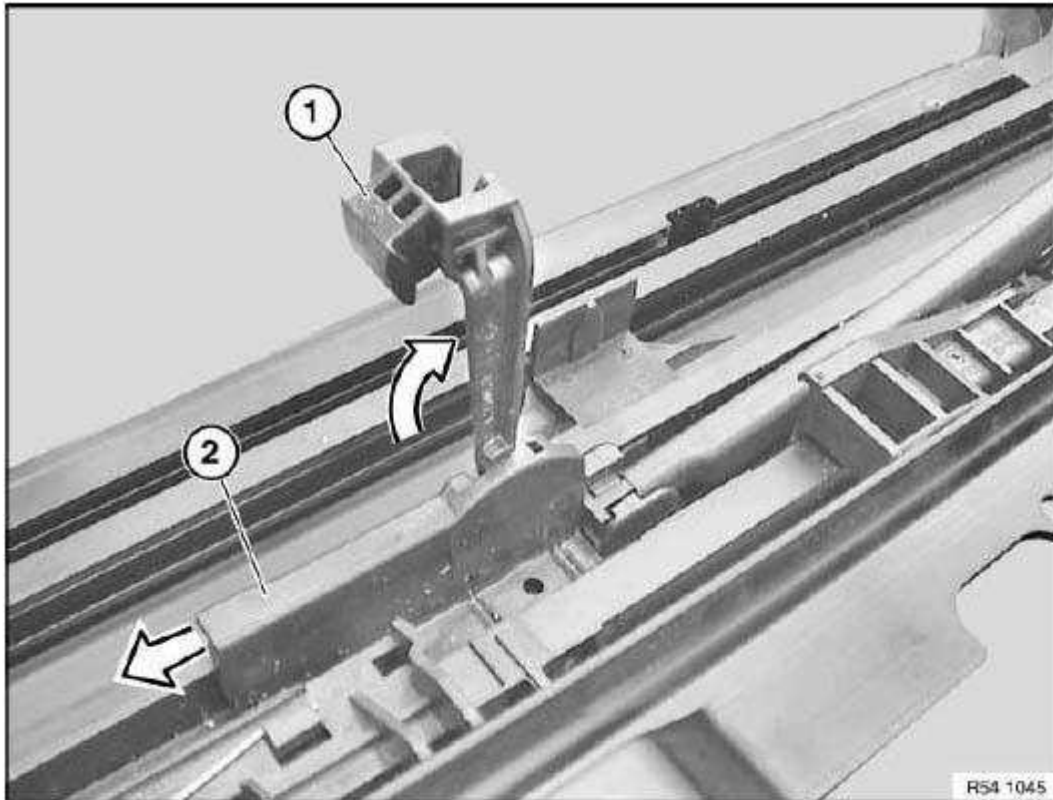


Fig. 2: Removing Drive Wedge

Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, remove drive wedge (1).

If necessary, slide drive cable plate (2) towards rear and remove from guide rail.

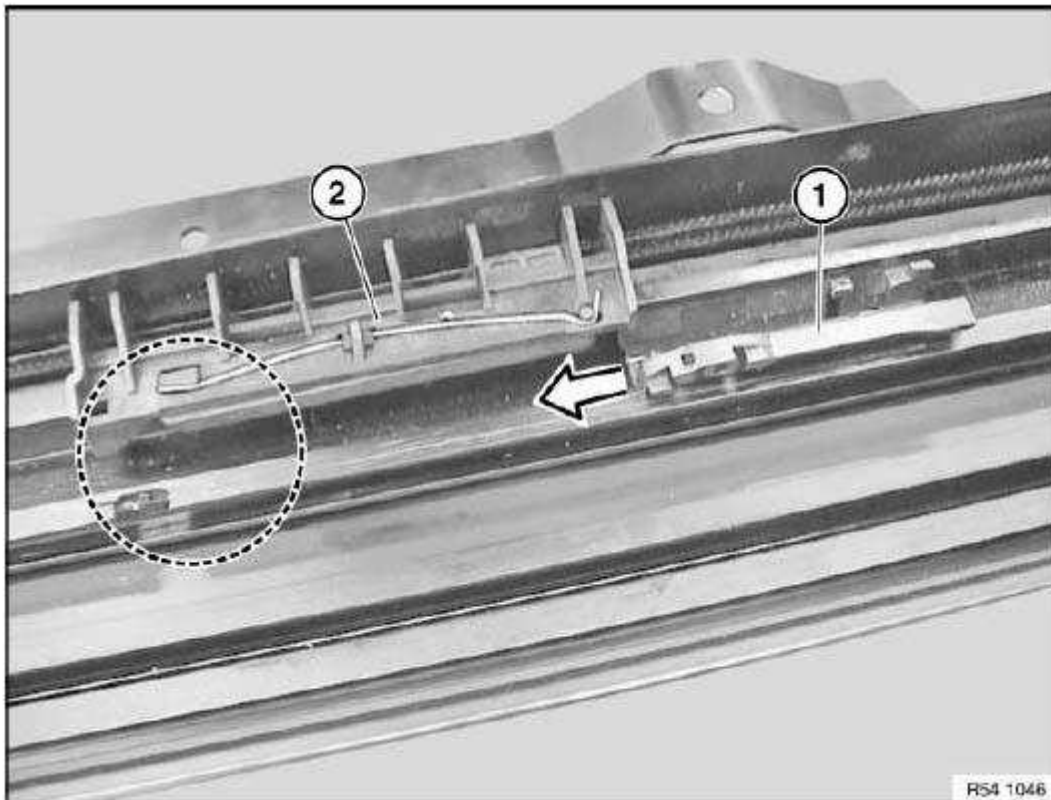


Fig. 3: Sliding Drive Cable Plate And Drive Wedge
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage when installing drive cable plate

The rear drive cable plate (2) must be engaged before the front drive cable plate (1) is installed.

Incorrect setting can be identified from spring position and lever position (marked area).

Check engagement of rear drive cable plate (2) in guide rail.

Slide in drive cable plate (1).

54 10 ... ELIMINATING FLOATING ROOFLINER CLICKING NOISES

Special tools required:

- **54 1 100**

IMPORTANT: The following measures describe how to eliminate clearly audible clicking noises when closing the floating roofliner. Only vehicles from the production period 10.12.05 to 10.02.06 may be affected.

Necessary preliminary tasks:

- Remove glass slide/tilt sunroof lid.
- Close floating roofliner fully.

The following special tool is required: Pressing fixture 54 1 100 for panorama glass roof guide rail, comprising:

- Special tool 54 1 101 Pressing fixture
- Special tools 54 1 102 Flexible shaft

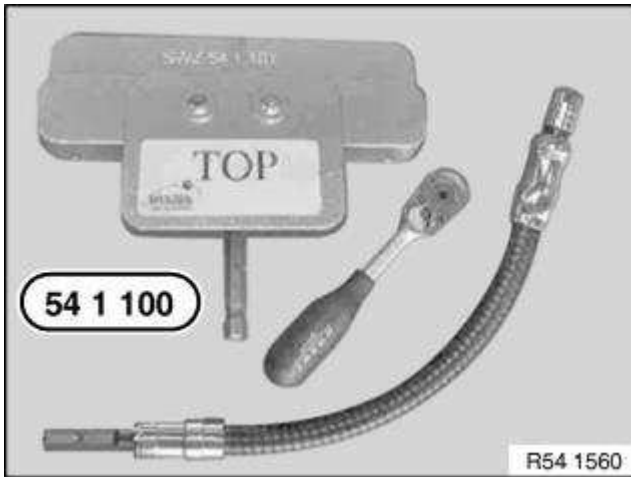


Fig. 4: Pressing Fixture 54 1 100 For Panorama Glass Roof Guide Rail
 Courtesy of BMW OF NORTH AMERICA, INC.

Approximate position of end fittings between floating roofliner and roof outer skin.

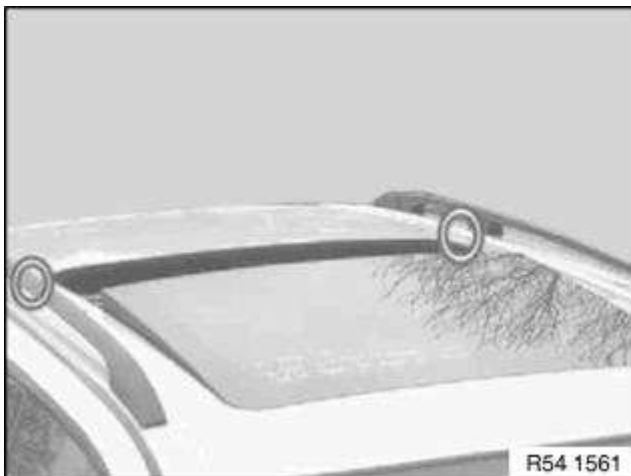


Fig. 5: Approximate Position Of End Fittings Between Floating Roofliner And Roof Outer Skin
 Courtesy of BMW OF NORTH AMERICA, INC.

Place pressing fixture in guide rail and snap into guide rail opening by gently sliding forwards and back.

IMPORTANT: Do not engage in rear position (measure ineffective).

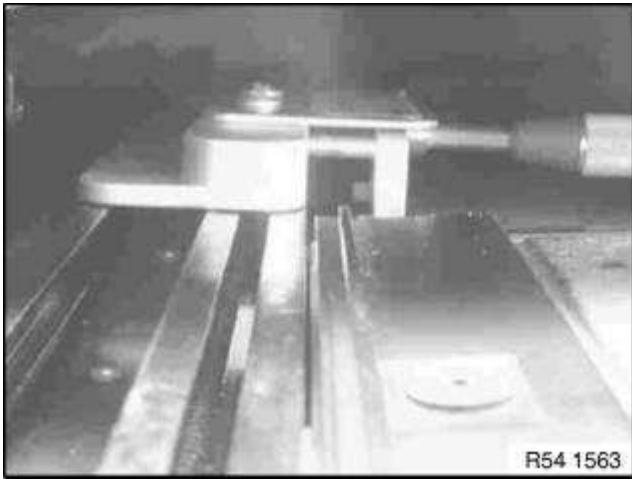


Fig. 6: Place Pressing Fixture In Guide Rail And Snap Into Guide Rail
Courtesy of BMW OF NORTH AMERICA, INC.

Screw pressing fixture by means of reversible ratchet down to stop. End stop is thereby pressed into the guide rail.

IMPORTANT: A helper must press into the pressing fixture during the entire screwing process vertically onto the guide rail so that the pressing fixture does not jam.

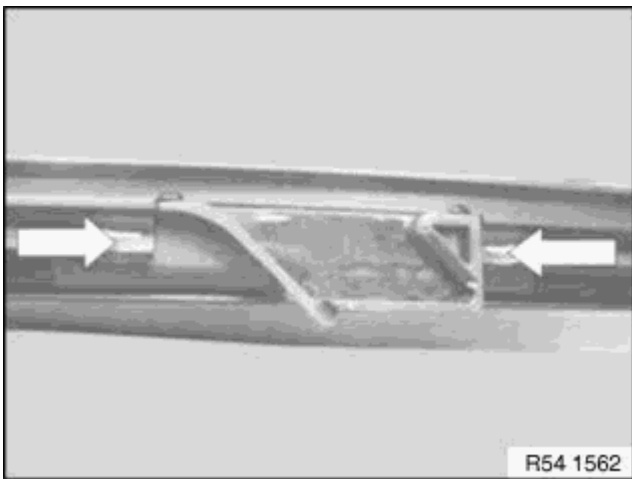


Fig. 7: Screw Pressing Fixture By Means Of Reversible Ratchet Down To Stop
Courtesy of BMW OF NORTH AMERICA, INC.

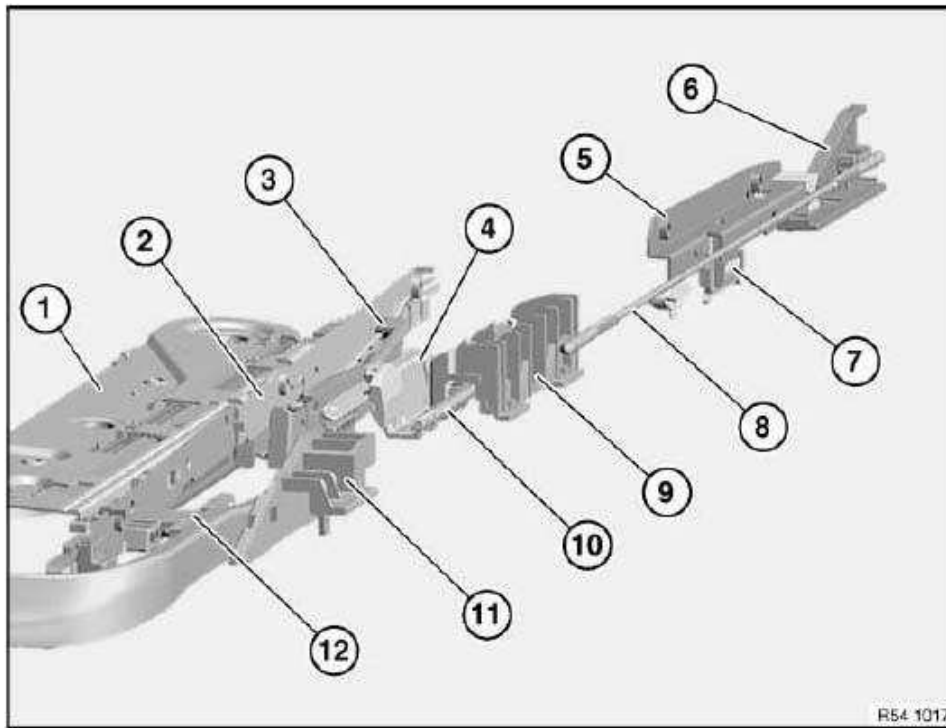
Repeat the entire procedure on the other side.

54 10 020 REMOVING AND INSTALLING MECHANISM FOR FRONT GLASS LID

Necessary preliminary tasks:

- Remove glass slide/tilt sunroof **54 13 080 Removing and installing complete glass slide/tilt sunroof.**
- Remove glass slide/tilt sunroof lid at front, see **54 10 170 Removing and installing front glass slide/tilt sunroof cover.**
- Remove glass slide/tilt sunroof lid at rear **54 10 175 Removing and installing rear glass slide/tilt sunroof cover.**
- Remove front drip molding, see **54 13 100 Removing and installing/replacing drip molding.**
- Remove drive for slide/tilt sunroof actuation, see **67 61 515 REPLACING DRIVE WITH GEAR (FRONT) FOR ACTUATING SLIDE/TILT SUNROOF (PANORAMA GLASS SUNROOF) .**

Overview of glass lid mechanism:



R54 1017

- | | | | |
|---|----------------------------------|----|--|
| 1 | Floating roof liner mechanism | 7 | Spring retainer |
| 2 | Mechanism, front glass lid | 8 | Drive cable, rear glass lid (connecting link) |
| 3 | Drive wedge | 9 | Drive cable plate |
| 4 | Drive plate | 10 | Drive cable, front glass lid (connecting link) |
| 5 | Mechanism, rear glass lid | 11 | Control carriage, wind deflector |
| 6 | Control carriage, rear glass lid | 12 | Slide element |

Fig. 8: Identifying Glass Lid Mechanism Components

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Always replace mechanism for glass slide/tilt sunroof in pairs.
If necessary, lightly grease guide channel.

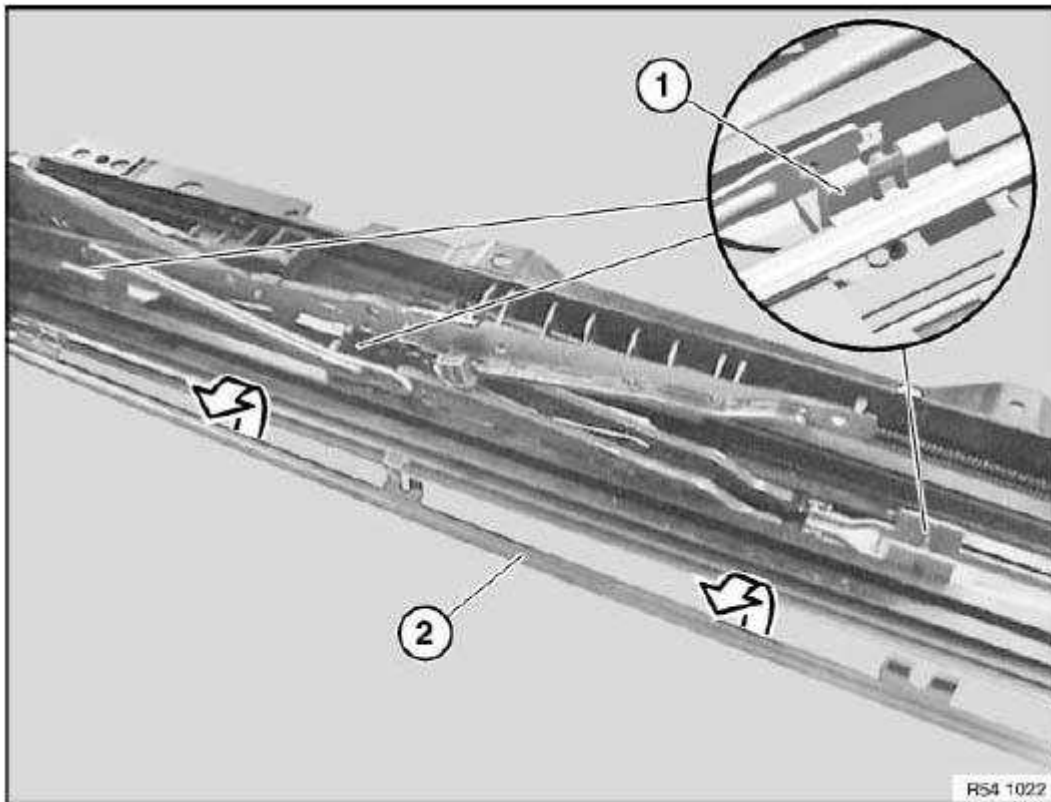


Fig. 9: Tabs Of Cover Strip

Courtesy of BMW OF NORTH AMERICA, INC.

Removing upper connecting link (return linkage):

Bend open tabs (1) of cover strip (2).

Remove cover strip (2).

Installation:

Cover strip determines alignment of mechanism.

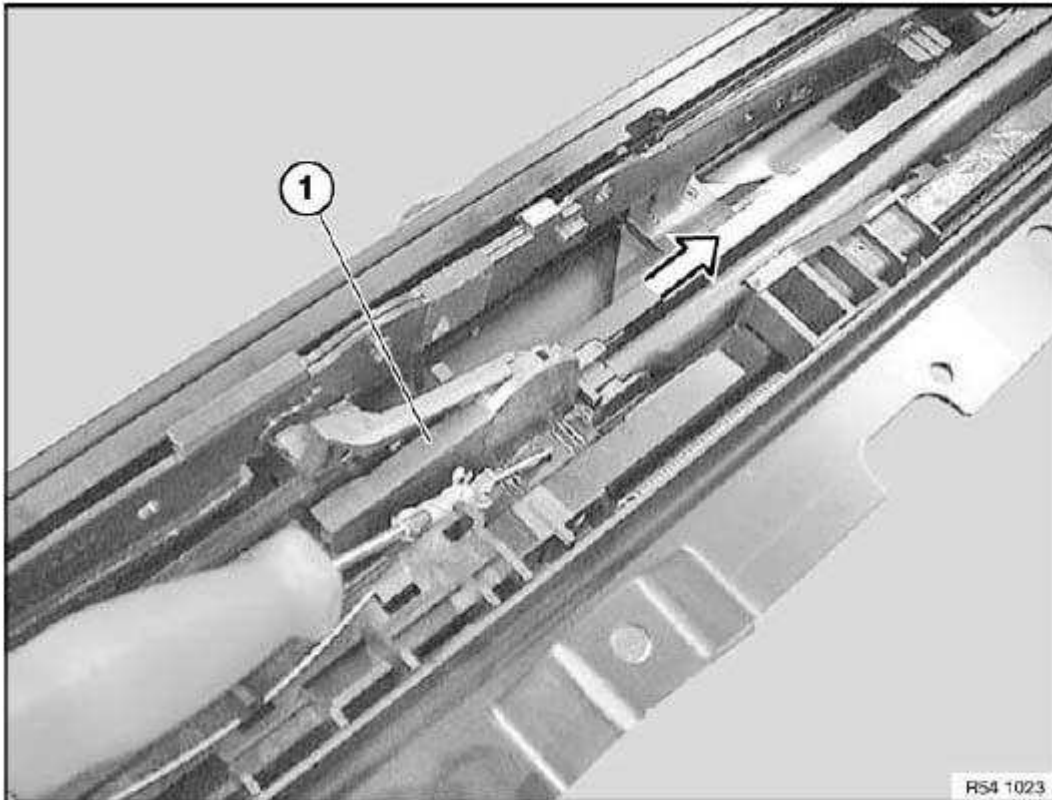


Fig. 10: Sliding Drive Cable Plate
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, slide drive cable plate (1) fully forwards with a screwdriver (stop).

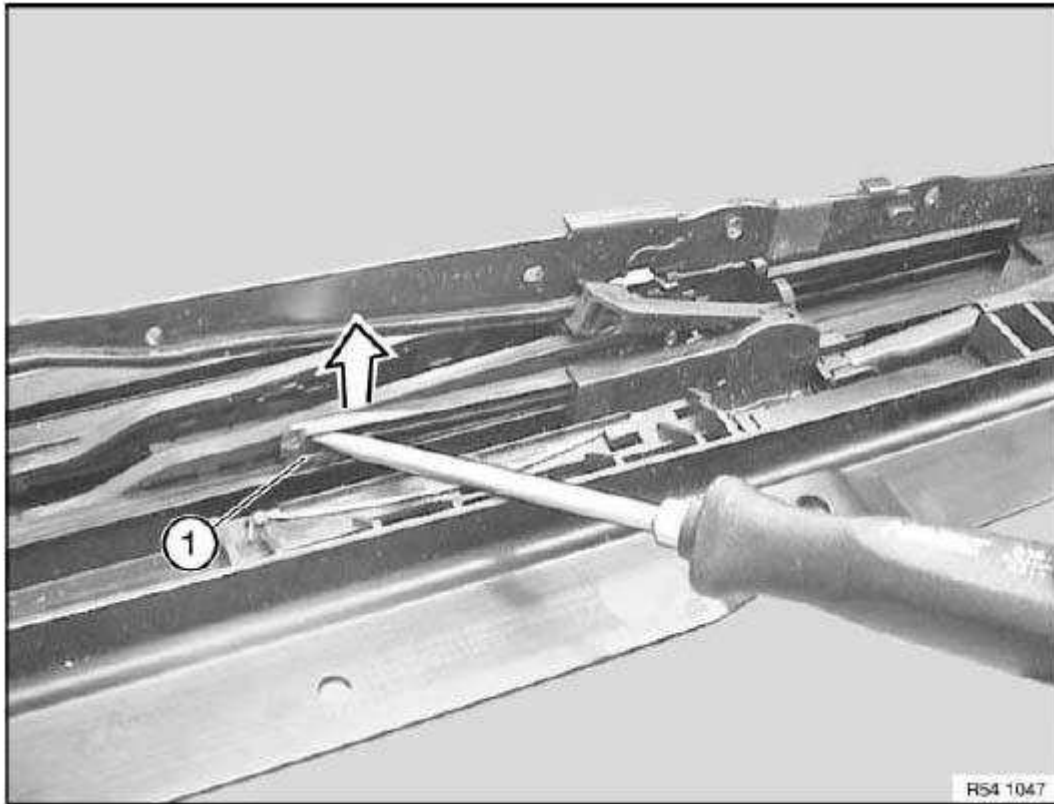


Fig. 11: Prying Out Locking Lever Of Detent Element
Courtesy of BMW OF NORTH AMERICA, INC.

Pry out locking lever (1) of detent element at front from guide rail (unlock).

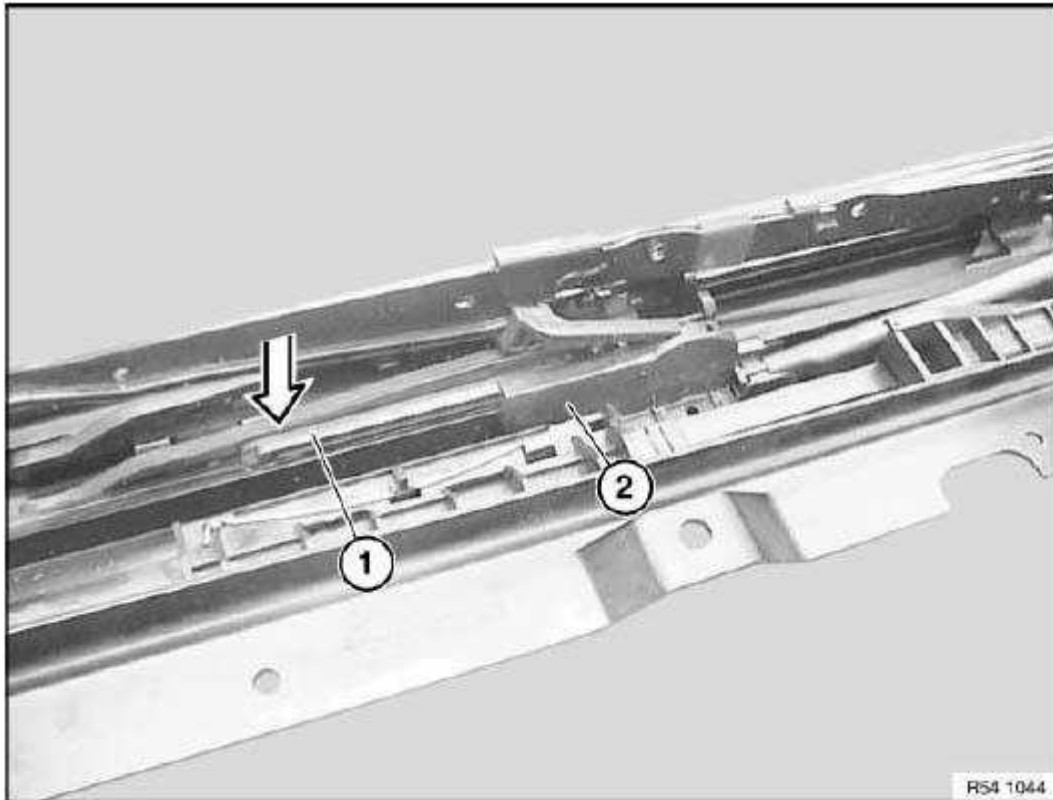


Fig. 12: Drive Cable Plate

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Do not move drive cable plate (2) before locking lever (1) is engaged (risk of damage).

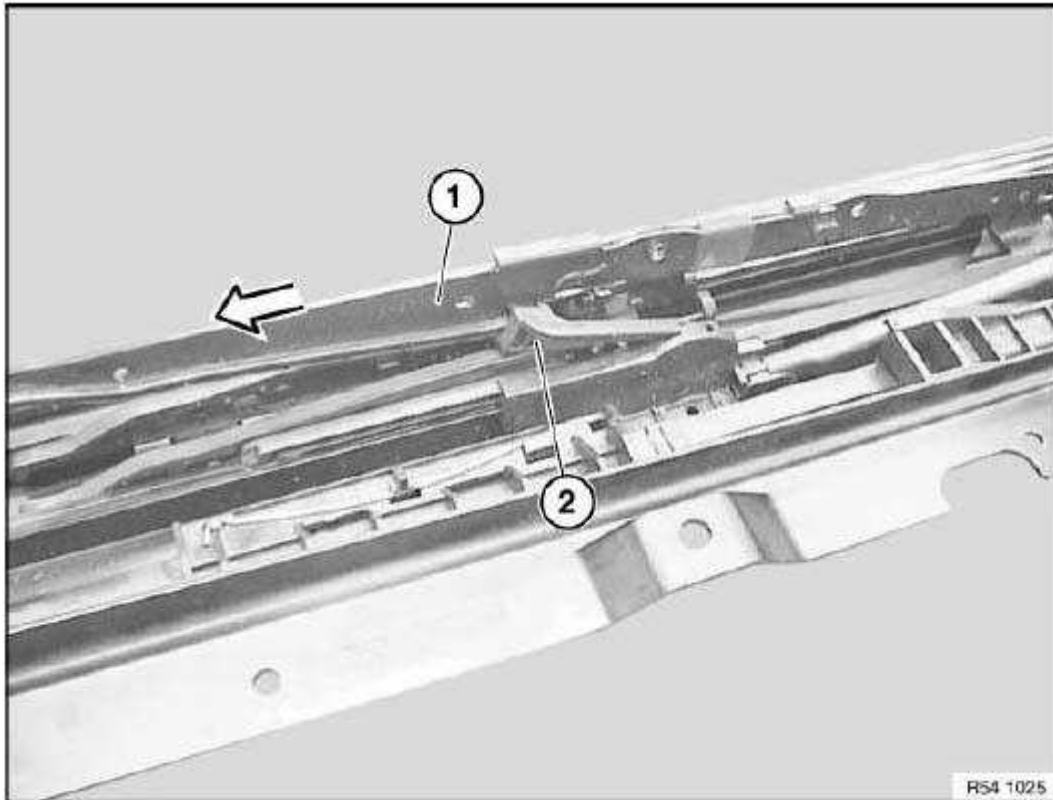


Fig. 13: Pulling Upper Connecting Link Towards Rear Out Of Drive Wedge
Courtesy of BMW OF NORTH AMERICA, INC.

Pull upper connecting link (1) towards rear out of drive wedge (2).

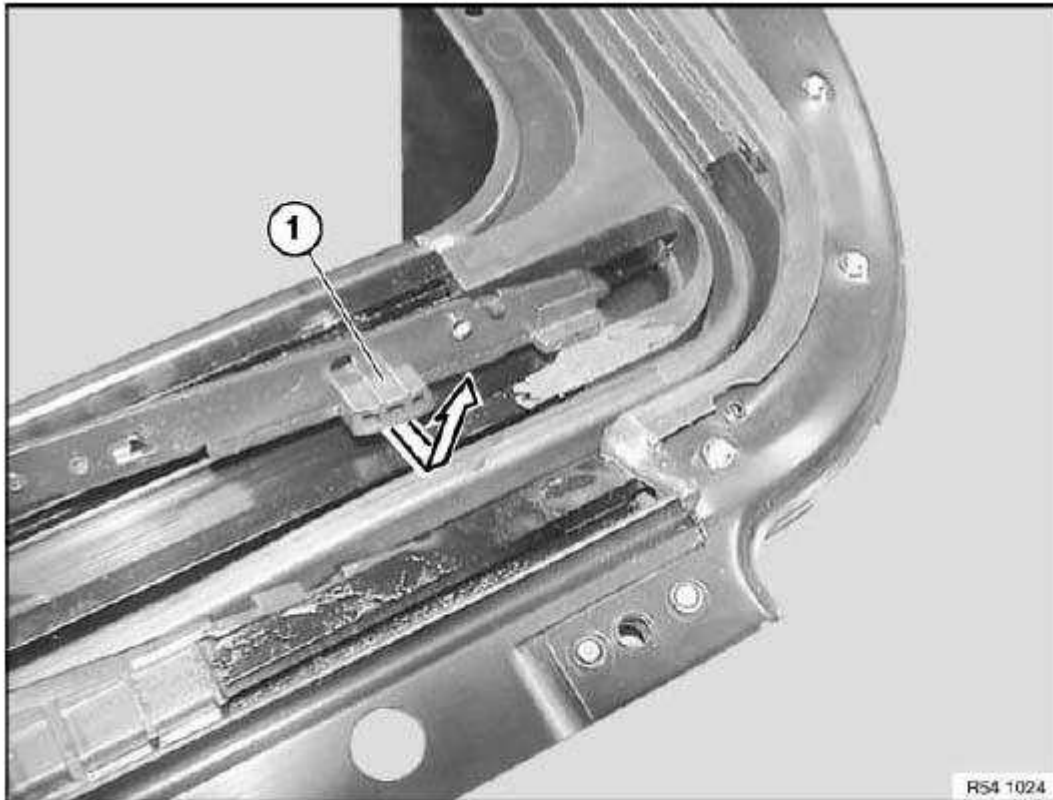


Fig. 14: Pulling Upper Connecting Link
Courtesy of BMW OF NORTH AMERICA, INC.

Feed upper connecting link (1) out of guide rail.

NOTE: If necessary, move mechanism (drive cable plate) approx. 2 cm towards rear.
Upper detent element can be fed out and in more easily.

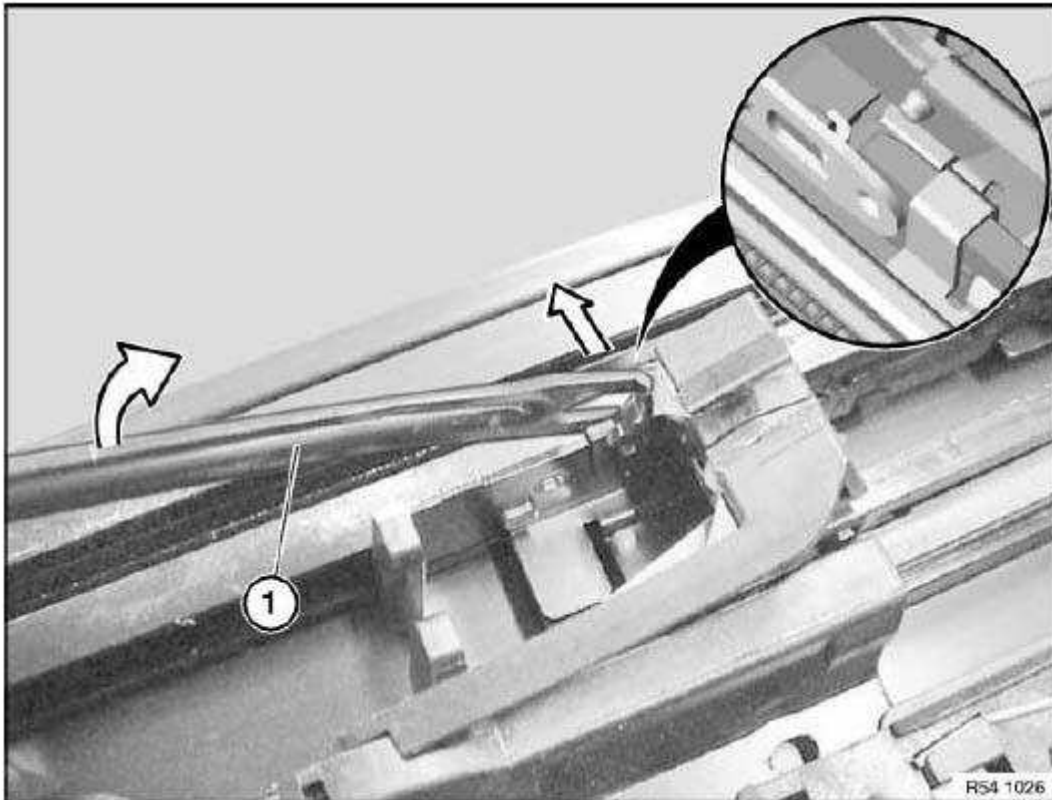


Fig. 15: Removing Upper Connecting Link

Courtesy of BMW OF NORTH AMERICA, INC.

Remove upper connecting link (1) in direction of arrow from lower connecting link.

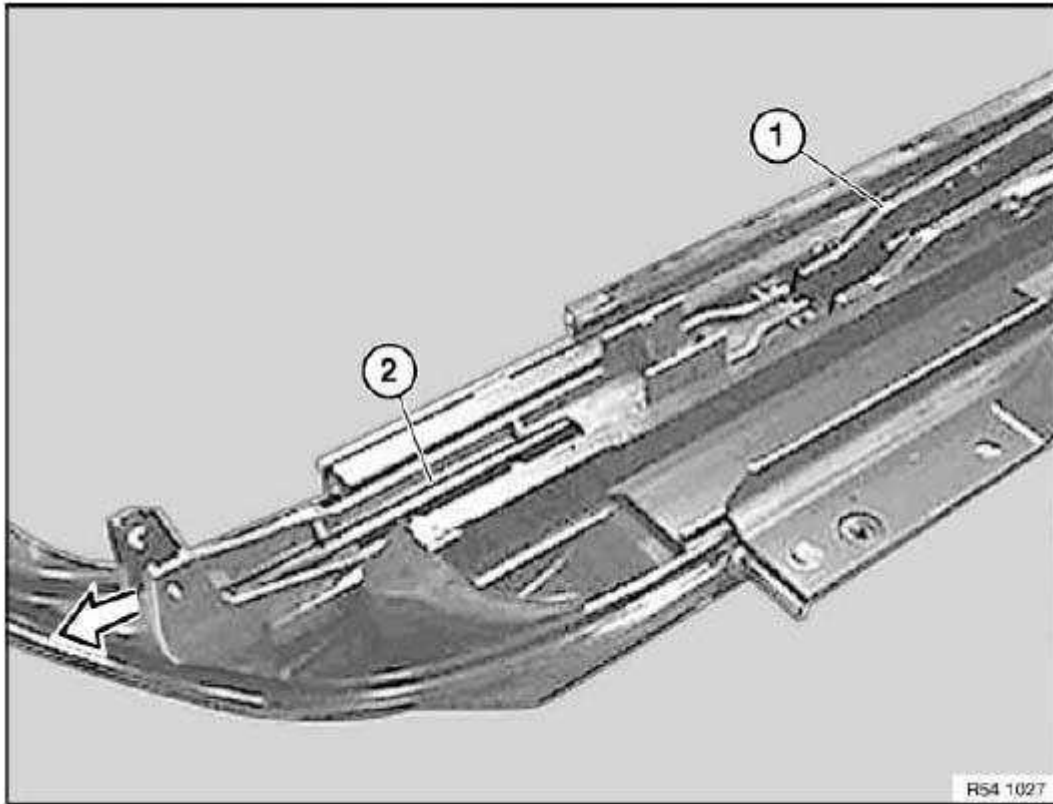


Fig. 16: Sliding Drip Molding Carrier With Lower Connecting Link
Courtesy of BMW OF NORTH AMERICA, INC.

Removing drip molding carrier and lower connecting link:

Slide drip molding carrier (2) with lower connecting link (1) towards rear and remove from guide rail.

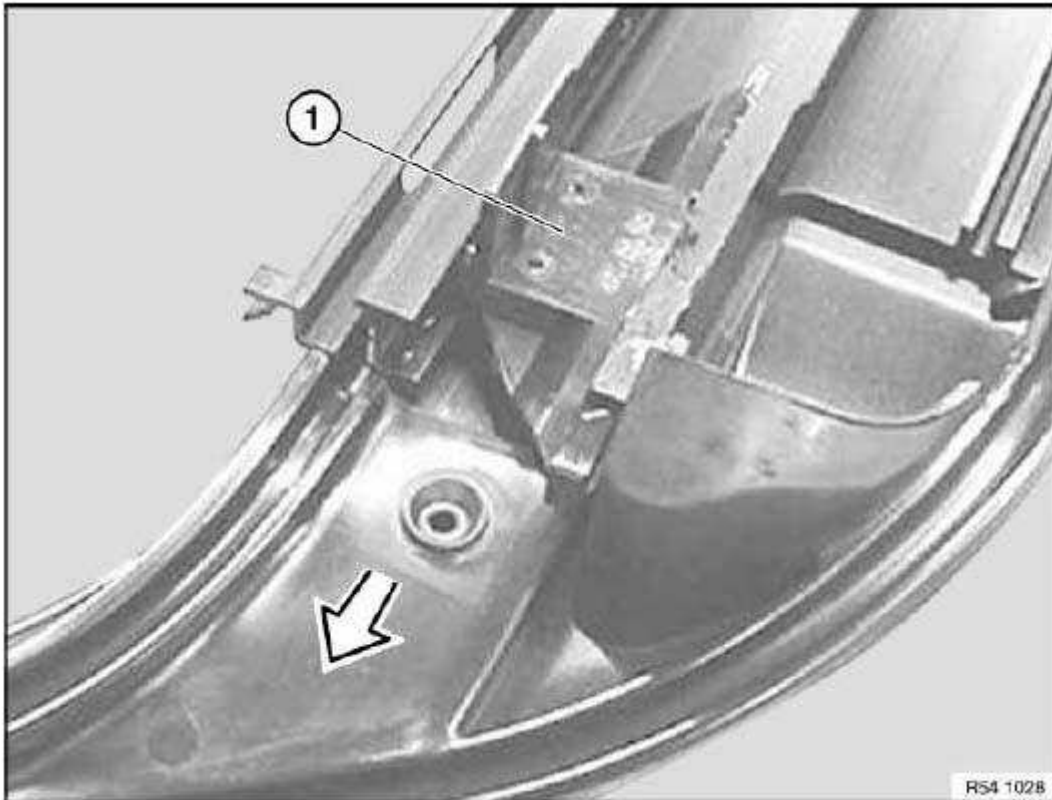


Fig. 17: Pushing Slide Element

Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, push slide element (1) towards rear and remove from guide rail.

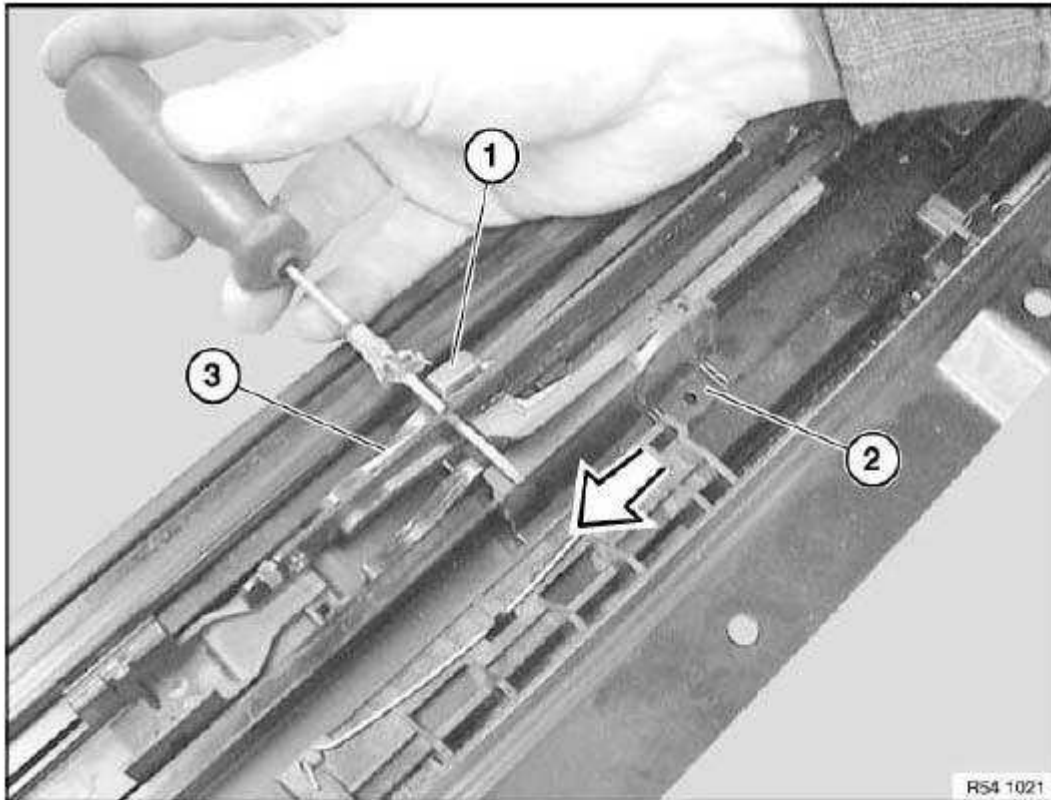


Fig. 18: Inserting Screwdriver Into Upper Connecting Link
 Courtesy of BMW OF NORTH AMERICA, INC.

Adjusting mechanism before installing glass lid:

Insert screwdriver into upper connecting link (3).

Slide drive plate (2) towards rear until drive wedge (1) runs against screwdriver.

NOTE: Check that mechanical components on left and right sides have same status.

NOTE: Check smooth and noise-free running of kinematics.
 Check function.

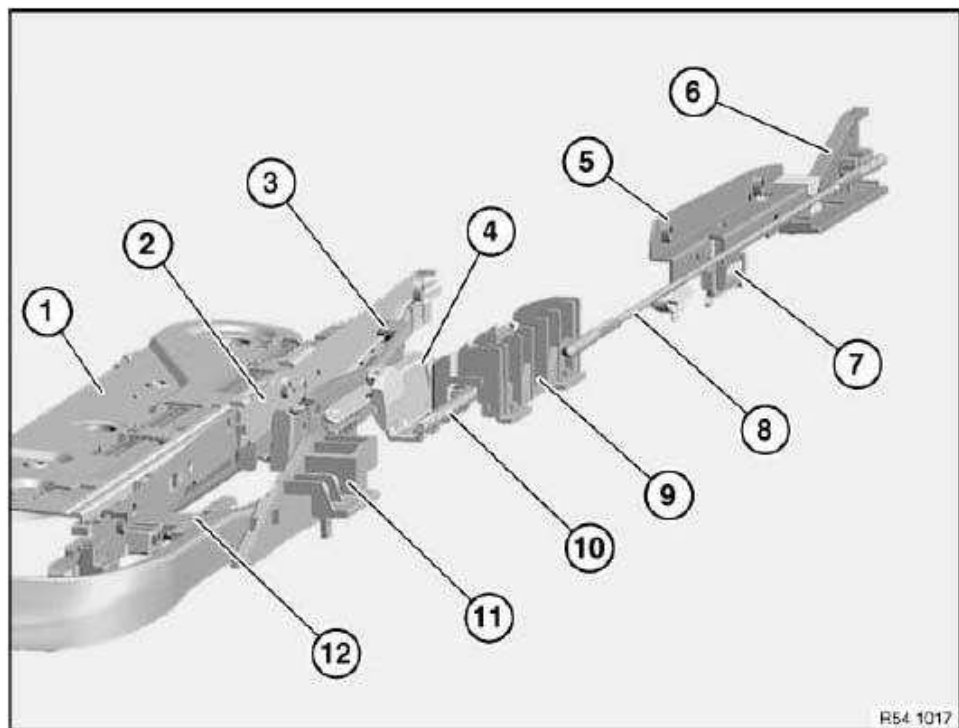
54 10 030 REMOVING AND INSTALLING MECHANISM FOR REAR GLASS LID

Necessary preliminary tasks:

- Remove glass slide/tilt sunroof **54 13 080 Removing and installing complete glass slide/tilt sunroof.**
- Remove glass slide/tilt sunroof lid at rear **54 10 175 Removing and installing rear glass slide/tilt sunroof cover.**
- Remove rear drip molding, see **54 13 105 Removing and installing/replacing rear drip molding.**
- Remove drive units with gearing, see **67 61 515 REPLACING DRIVE WITH GEAR (FRONT) FOR**

ACTUATING SLIDE/TILT SUNROOF (PANORAMA GLASS SUNROOF) .

Overview of glass lid mechanism:



- | | | | |
|---|----------------------------------|----|--|
| 1 | Floating roofiner mechanism | 7 | Spring retainer |
| 2 | Mechanism, front glass lid | 8 | Drive cable, rear glass lid (connecting link) |
| 3 | Drive wedge | 9 | Drive cable plate |
| 4 | Drive plate | 10 | Drive cable, front glass lid (connecting link) |
| 5 | Mechanism, rear glass lid | 11 | Control carriage, wind deflector |
| 6 | Control carriage, rear glass lid | 12 | Slide element |

Fig. 19: Identifying Glass Lid Mechanism Components

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Always replace mechanism for glass slide/tilt sunroof in pairs.
If necessary, lightly grease guide channel.

NOTE: Drip molding carrier cannot be removed without incurring damage.
Break out tabs with a screwdriver and lever out carrier.

Installation:

Replace drip molding carrier and hook into place.

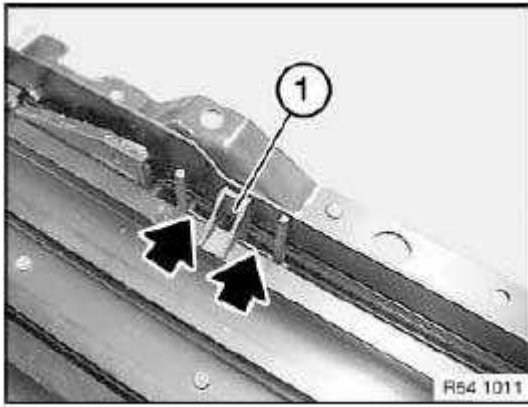


Fig. 20: [Tabs]
Courtesy of BMW OF NORTH AMERICA, INC.

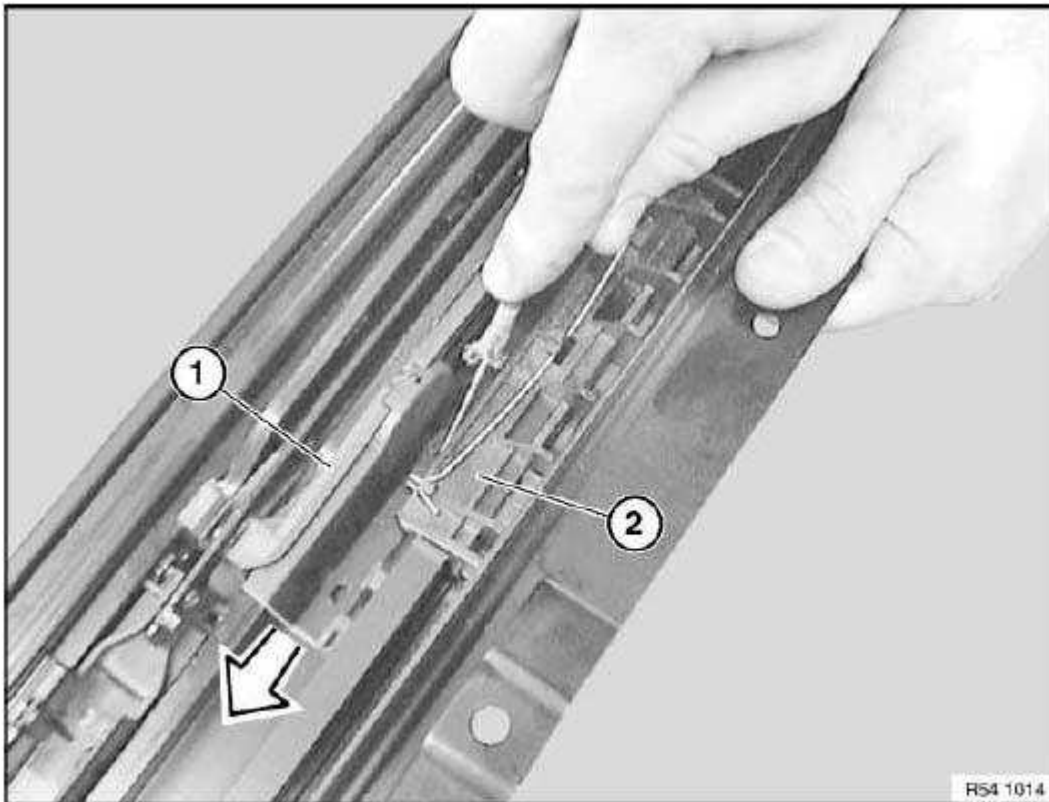


Fig. 21: Sliding Front Connecting Link
Courtesy of BMW OF NORTH AMERICA, INC.

Slide front connecting link (1) towards rear past drive cable plate (2).

If front glass lid is installed, move mechanism with lid.

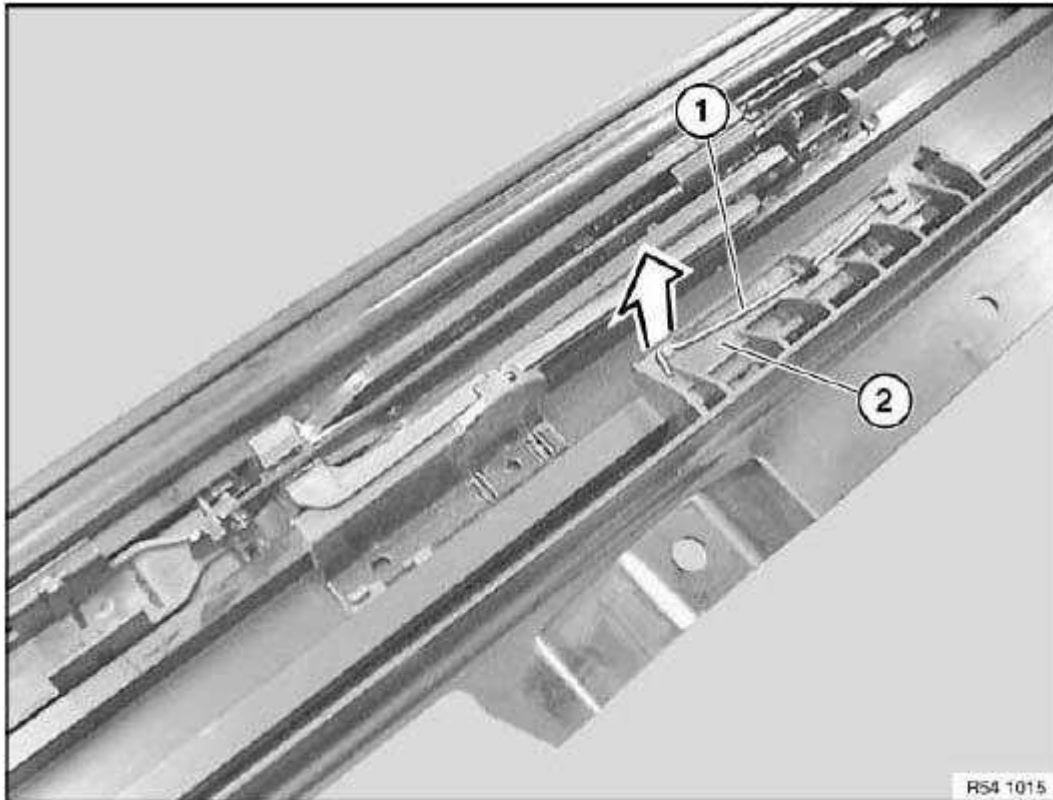


Fig. 22: Sliding Rear Connecting Line With Drive Cable Plate
Courtesy of BMW OF NORTH AMERICA, INC.

Lever out retaining bracket (1) from drive cable plate (2).

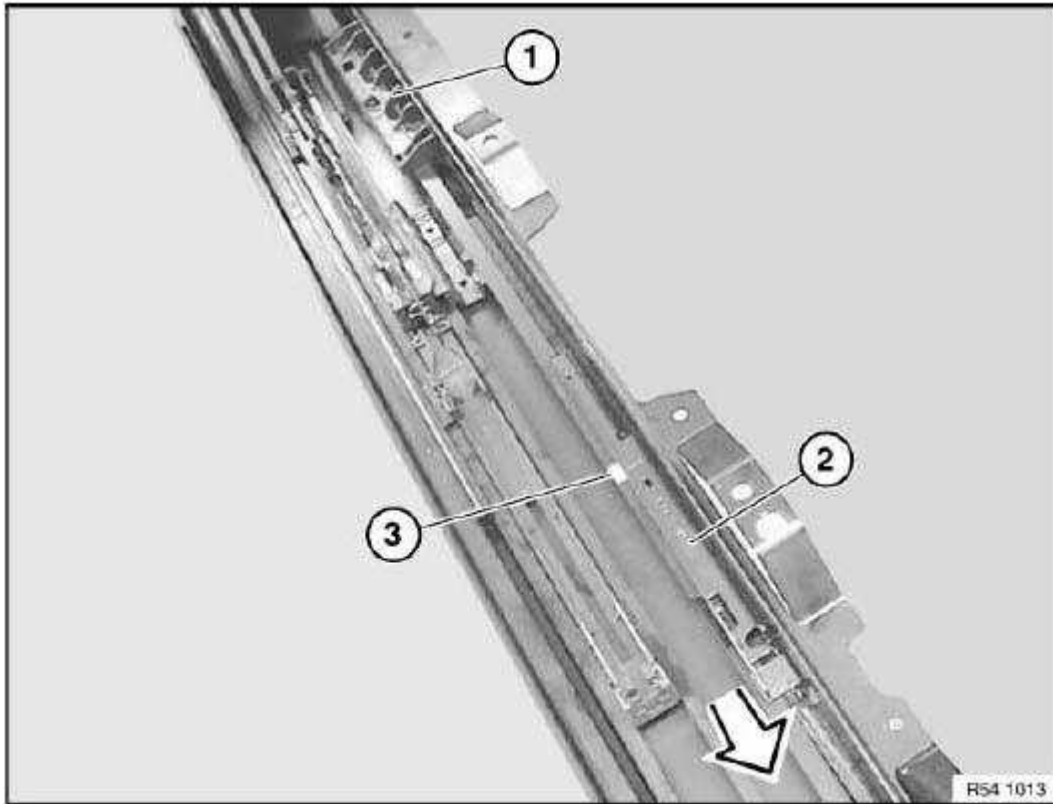


Fig. 23: Sliding Rear Connecting Line With Drive Cable Plate
Courtesy of BMW OF NORTH AMERICA, INC.

Slide rear connecting line (2) with drive cable plate (1) towards rear until spring retainer (3) is exposed.

NOTE: Spring retainer (3) cannot be removed without incurring damage.

Lever out spring retainer (3) with screwdriver.

Installation:

Replace faulty spring retainer.

Continue sliding rear connecting link (2) with drive cable plate (1) towards rear out of guide channel and remove in succession.

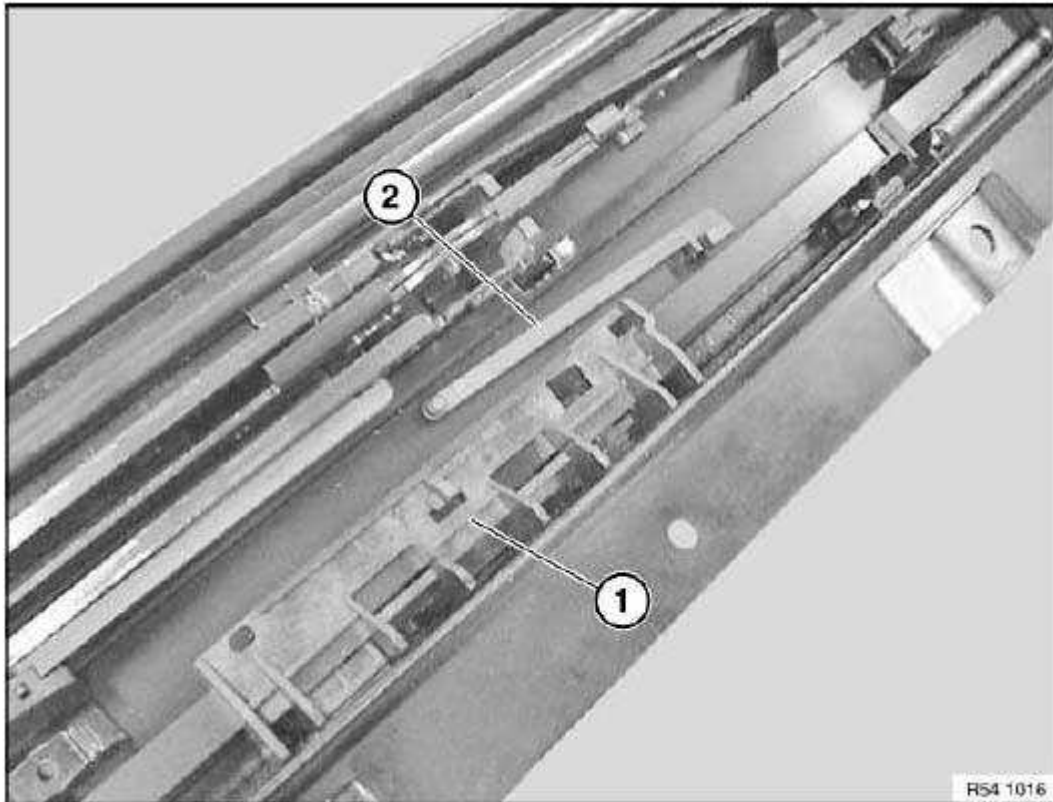


Fig. 24: Drive Cable Plate And Locking Lever
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Slide drive cable plate (1) up against drive cable.

Install locking lever (2) and lock retaining bracket.

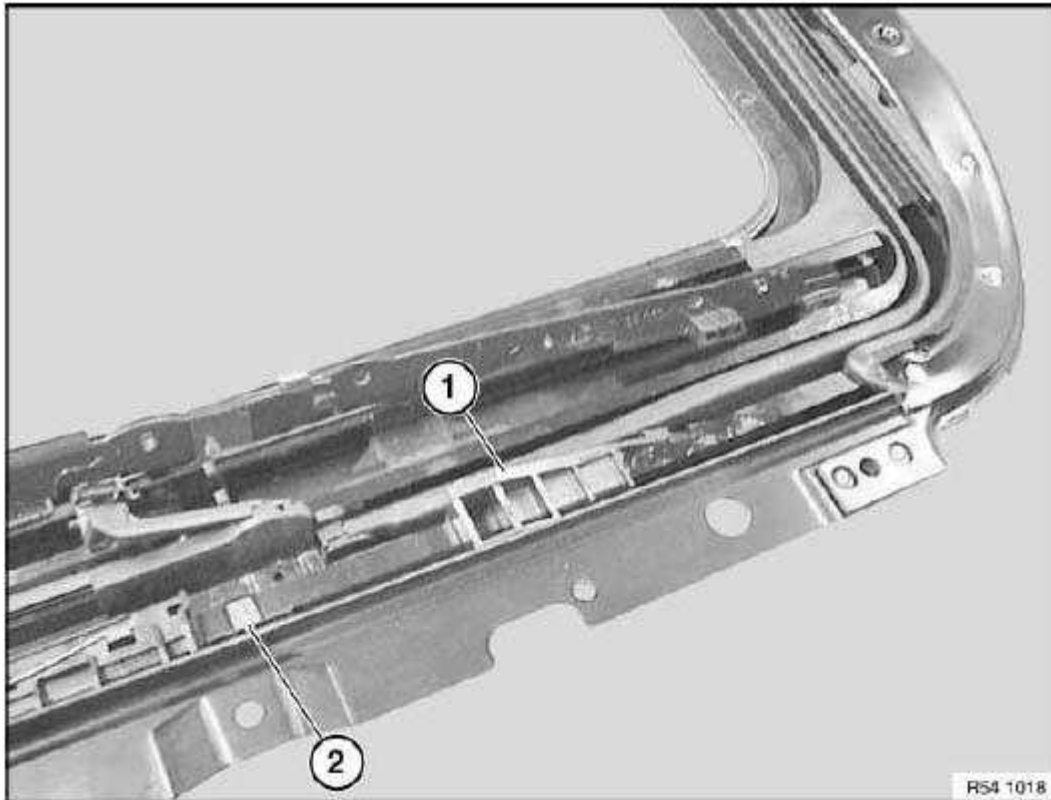


Fig. 25: Spring Retainer

Courtesy of BMW OF NORTH AMERICA, INC.

Removing control carriage for wind deflector:

NOTE: Spring retainer (2) cannot be removed without incurring damage.

Lever out spring retainer (2) with screwdriver.

Installation:

Replace faulty spring retainer.

Pull control carriage (1) for wind deflector towards rear out of rail and remove.

NOTE: Check smooth and noise-free running of kinematics.
Check function.

54 10 050 REMOVING AND INSTALLING/REPLACING MECHANISM FOR FLOATING ROOFLINER

Necessary preliminary tasks:

- Remove glass slide/tilt sunroof **54 13 080 Removing and installing complete glass slide/tilt sunroof.**
- Remove slider set for floating roofliner, see **54 10 070 Removing and installing/replacing slider set for floating roofliner.**
- Remove rear cross-member, see **54 13 150 Removing and installing rear cross - member.**

Unclip end stops (1) on left and right from guide channel.

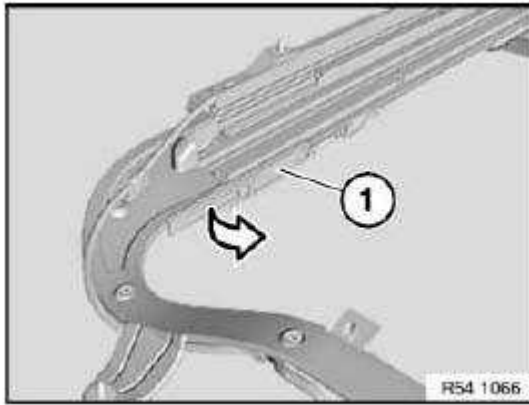


Fig. 26: Unclipping End Stops

Courtesy of BMW OF NORTH AMERICA, INC.

Unclip floating roofliner cover plate (1) from slider for front sun shield.

Remove floating roofliner cover plate (1) upwards from locking lever (2).

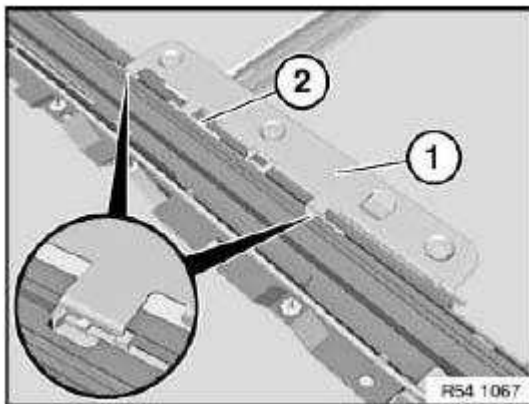


Fig. 27: Floating Roofliner Cover Plate

Courtesy of BMW OF NORTH AMERICA, INC.

Pull mechanism for floating roofliner towards rear out of guide channel:

1. Sliders for floating roofliner
2. Locking lever for floating roofliner

3. Rear drive cable plate with drive cable

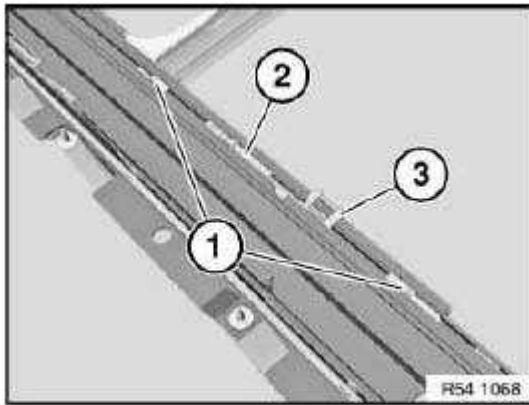


Fig. 28: Locking Lever For Floating Roofliner
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Ensure correct installation sequence:

1. Sliders for floating roofliner
2. Locking lever for floating roofliner
3. Rear drive cable plate with drive cable

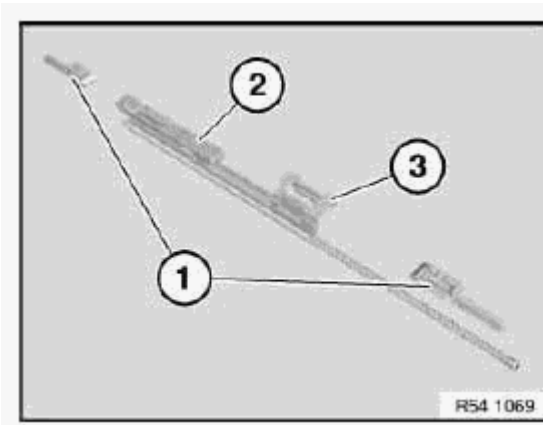


Fig. 29: Sliders For Floating Roofliner
Courtesy of BMW OF NORTH AMERICA, INC.

Slide in locking lever for floating roofliner (3) and slide up to recess in guide frame.

Open locking lever (1) with screwdriver.

Slide rear drive cable plate (2) into locking lever.

NOTE: Correct insertion can be checked by pulling back the drive cable plate (2): Drive cable plate (2) and locking lever for floating roofliner (3) must execute a joint movement. In addition, the correct spacing of locking lever (3) and drive cable plate (2) is determined by the floating roofliner cover plate.

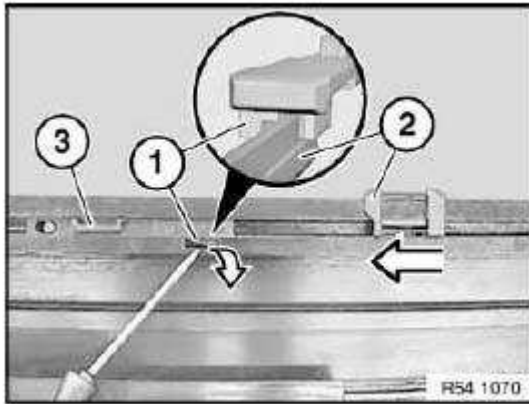


Fig. 30: Sliding In Locking Lever For Floating Roofliner
Courtesy of BMW OF NORTH AMERICA, INC.

54 10 070 REMOVING AND INSTALLING/REPLACING SLIDER SET FOR FLOATING ROOFLINER

Necessary preliminary tasks:

- Remove glass slide/tilt sunroof **54 13 080 Removing and installing complete glass slide/tilt sunroof.**
- Remove rear floating roofliner, see **54 13 070 Removing and installing/replacing both floating roofliners for glass slide/tilt sunroof.**
- Remove fan grille, see **54 13 070 Removing and installing/replacing both floating roofliners for glass slide/tilt sunroof.**
- Remove drive unit with gearing, see **67 61 517 REPLACING DRIVE WITH GEAR (REAR) FOR ACTUATING SLIDE/TILT SUNROOF .**

Unclip end stops (1) on left and right from guide channel.

Installation:

Engage end stops at front and clip into place by applying pressure.

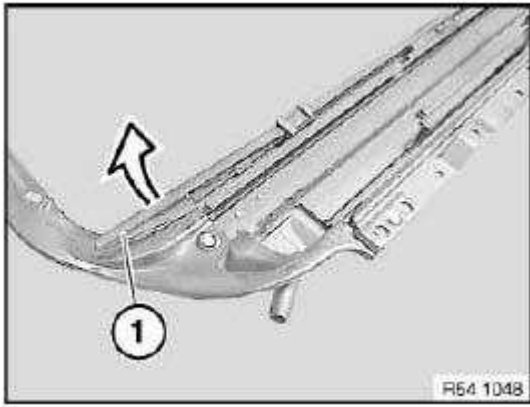


Fig. 31: Unclipping End Stops

Courtesy of BMW OF NORTH AMERICA, INC.

Carefully unclip slide block (1) on left and right (risk of damage).

Pull driver for rear floating roofliner (2) and slider set (3) towards rear out of guide.

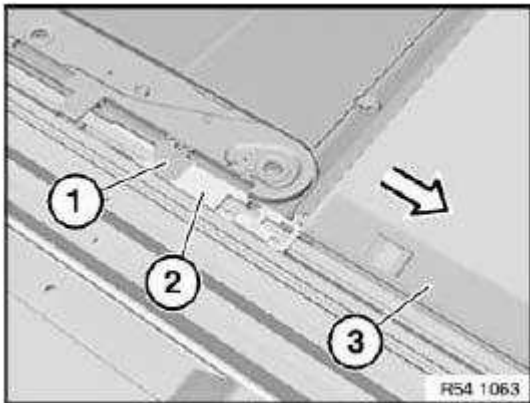


Fig. 32: Pulling Driver For Rear Floating Roofliner

Courtesy of BMW OF NORTH AMERICA, INC.

Disengage rocker arm (1) from driver for rear floating roofliner (2).

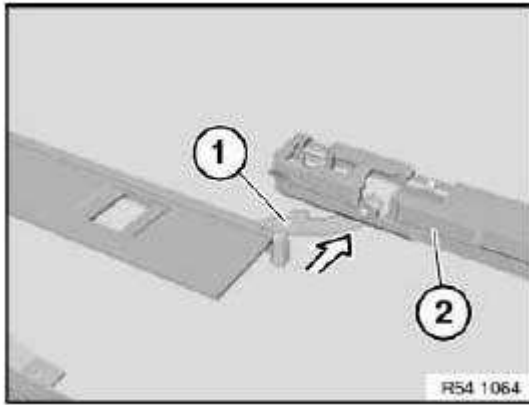


Fig. 33: Disengaging Rocker Arm From Driver For Rear Floating Roofliner
Courtesy of BMW OF NORTH AMERICA, INC.

Remove rocker arm (1) from rail and replace if necessary.

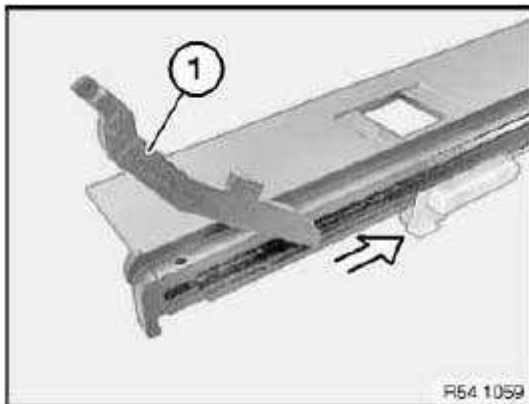


Fig. 34: Removing Rocker Arm From Rail
Courtesy of BMW OF NORTH AMERICA, INC.

54 10 160 REPLACING LEFT OR RIGHT GAITER FOR GLASS SLIDE/TILT SUNROOF

Necessary preliminary tasks:

- Close glass slide/tilt sunroof

Detach gaiter (1) from guide.

Installation:

Gaiter cannot be removed without incurring damage.

Replace gaiter.

Check that aluminium section inlay is firmly seated on guide.

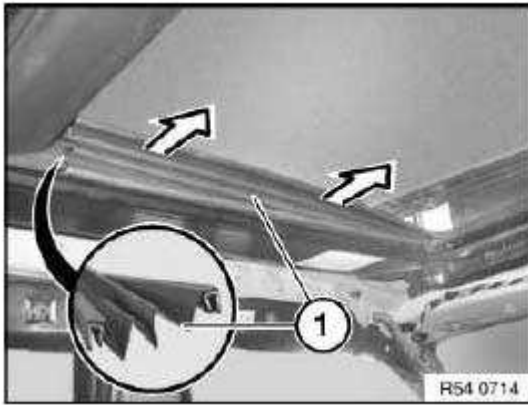


Fig. 35: Detaching Gaiter From Guide
Courtesy of BMW OF NORTH AMERICA, INC.

54 10 170 REMOVING AND INSTALLING FRONT GLASS SLIDE/TILT SUNROOF COVER

Necessary preliminary tasks:

- Remove gaiter, see **54 10 160 Replacing left or right gaiter for glass slide/tilt sunroof.**

NOTE: **The following steps can be carried out inside the vehicle with the glass roof panel fully closed.**
 Open floating roofliner fully.
 Make sure that grease at the ends of the rail do not come into contact with the roofliner.
 Not necessary for replacement:
 Before removing the Torx screws, make a mark around the washers in order to ensure correct alignment during installation.

Remove and dispose of the Torx screws (1) securing the glass panel to the mechanism.

Installation:

Insert new Torx screws with Loctite and align washers to markings.

Tightening torque: 54 12 2AZ, see **54 12 MECHANICAL SUN ROOF COMPONENTS** .

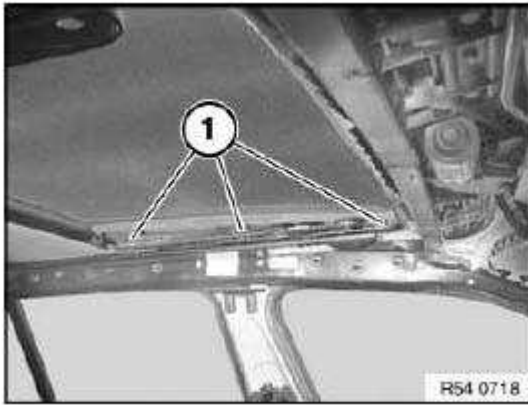


Fig. 36: Torx Screws

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: A second person is required to help in removing and installing the glass slide/tilt sunroof lid!

Lift out glass slide/tilt sunroof cover (1).

Installation:

Tape off installation area on left and right at roof aperture with fabric adhesive tape.

Install glass slide/tilt sunroof cover carefully (twist in) as seal can be damaged during installation.

Check glass slide/tilt sunroof cover for correct alignment and adjust if necessary, see **54 13 003 Adjusting glass slide/tilt sunroof lid.**

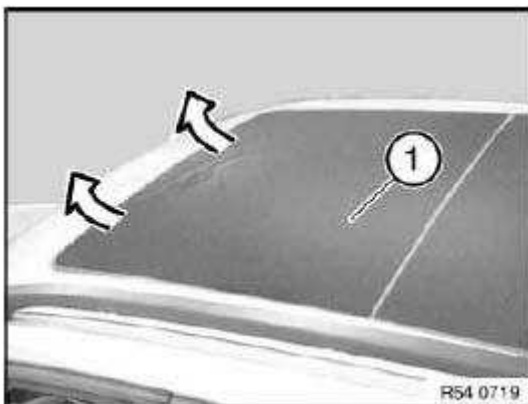


Fig. 37: Lifting Out Glass Slide/Tilt Sunroof Cover

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The following steps can be carried out inside the vehicle with the glass roof panel fully closed.
Open floating roofliner fully.
Make sure that grease at the ends of the rail do not come into contact with the roofliner.
Not necessary for replacement:
Before removing the Torx screws, make a mark around the washers in order to ensure correct alignment during installation.

Remove and dispose of the Torx screws (1) securing the glass panel to the mechanism.

Installation:

Insert new Torx screws with Loctite and align washers to markings.

Tightening torque: 54 12 2AZ, see **54 12 MECHANICAL SUN ROOF COMPONENTS** .

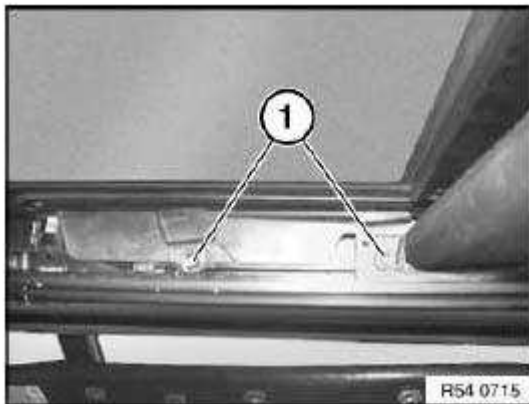


Fig. 38: Torx Screws

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: A second person is required to help in removing and installing the glass slide/tilt sunroof lid!

Lift out glass slide/tilt sunroof cover (1).

Installation:

Tape off complete edge area at roof aperture with fabric adhesive tape (risk of damage).

Install glass slide/tilt sunroof cover carefully (twist in) as seal can be damaged during installation.

Check glass slide/tilt sunroof cover for correct alignment and adjust if necessary, see **54 13 003 Adjusting glass slide/tilt sunroof lid.**

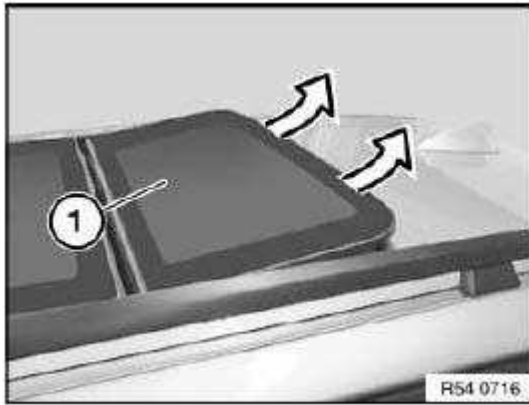


Fig. 39: Lifting Out Glass Slide/Tilt Sunroof Cover
Courtesy of BMW OF NORTH AMERICA, INC.

54 13 130 REMOVING AND INSTALLING FRONT CROSS - MEMBER

Necessary preliminary tasks:

- Remove glass slide/tilt sunroof **54 13 080 Removing and installing complete glass slide/tilt sunroof.**
- Remove control unit for glass slide/tilt sunroof, see **61 35 714 REMOVING AND INSTALLING/REPLACING CONTROL UNIT FOR SLIDE/TILT SUNROOF .**
- Remove drive, see **67 61 515 REPLACING DRIVE WITH GEAR (FRONT) FOR ACTUATING SLIDE/TILT SUNROOF (PANORAMA GLASS SUNROOF) .**

Release screws in marked area.

Feed cross-member (2) out of wiring harness (1) during removal.

If necessary, release fabric adhesive tape and replace.

Installation:

Pitch cables must be correctly located in guide

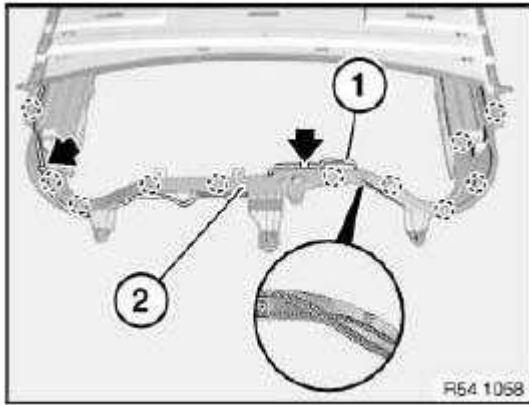


Fig. 40: Cross-Member And Wiring Harness
 Courtesy of BMW OF NORTH AMERICA, INC.

54 13 150 REMOVING AND INSTALLING REAR CROSS - MEMBER

Necessary preliminary tasks:

- Remove glass slide/tilt sunroof **54 13 080 Removing and installing complete glass slide/tilt sunroof.**
- Remove control unit for glass slide/tilt sunroof, see **61 35 714 REMOVING AND INSTALLING/REPLACING CONTROL UNIT FOR SLIDE/TILT SUNROOF .**
- Remove drive, see **67 61 515 REPLACING DRIVE WITH GEAR (FRONT) FOR ACTUATING SLIDE/TILT SUNROOF (PANORAMA GLASS SUNROOF) .**

Release screws in marked area.

Feed cross-member (2) out of wiring harness (1) during removal.

Installation:

Pitch cables must be correctly laid diagonally in guide.

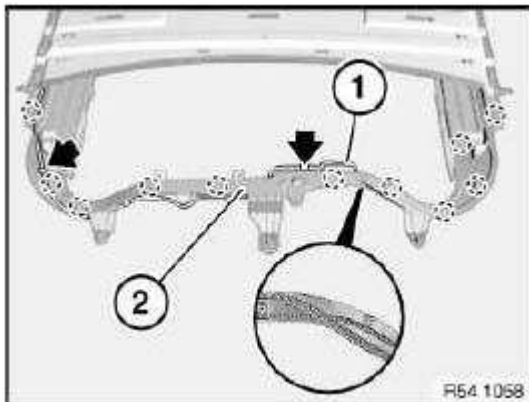


Fig. 41: Cross-Member And Wiring Harness

13 ELECTRICAL SUN ROOF COMPONENTS

54 0 ... NOTES ON PANORAMA GLASS ROOF (INITIALIZATION/NORMALIZATION/LEARNING OF CHARACTERISTIC CURVE)

NOTE: Initialization comprises:

- Normalization
- Learning characteristic curve

The mechanical end positions are recorded and stored during normalization. The characteristic curve is learnt immediately after normalization. When the characteristic curve is learnt, the mechanical closing forces of the panorama glass roof are recorded and stored for correct operation of the anti-trapping mechanism.

NOTE: Then carry out an initialization :

- if the panorama glass roof has been mechanically moved by means of the emergency actuator
- in the event of malfunctions, e.g. no one-touch function, no opening or no comfort function possible
- after disengagement of the drive unit
- after work is carried out on the mechanism of the panorama glass roof
- after the control unit has been replaced

WARNING: There is no anti-trapping protection during initialization.

NOTE: Starting situation in accordance with following description:

- Panorama glass sunroof closed
- Floating roofliner completely open

Normalization:

- Press and hold the switch in the "Lift" direction
- In the event of delayed starting or sudden stopping of the panorama glass roof, continue pressing the switch in the "Lift" direction

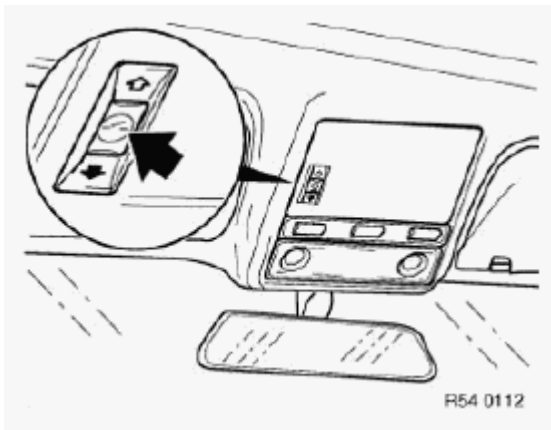


Fig. 42: Pressing Switch
 Courtesy of BMW OF NORTH AMERICA, INC.

- After reaching the lift end position (A), keep the switch pressed for approx. 15 seconds further
- Normalization is completed when the panorama glass roof in lift end position (A) presses again briefly in the direction of position (B).

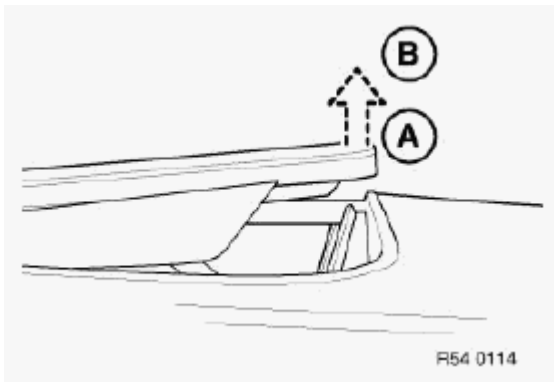


Fig. 43: Panorama Glass Roof In Lift End Position
 Courtesy of BMW OF NORTH AMERICA, INC.

Learning characteristic curve:

E53/E61/E83 only:

The curve is learnt manually in the following steps:

- After normalization, keep switch pressed in "Lift" direction.
- The panorama glass roof stops for 5 seconds in the final raise position after normalization.
- Floating roofliner closes completely.
- Floating roofliner opens completely.
- The panorama glass roof then moves into the "Closed" position (learning of the "Closing from raising" curve)
- The panorama glass roof then moves into the "Open" end position and immediately back into the

"Closed" position (learning of the "Closing" curve).

- Floating roofliner closes completely.
- Release switch.

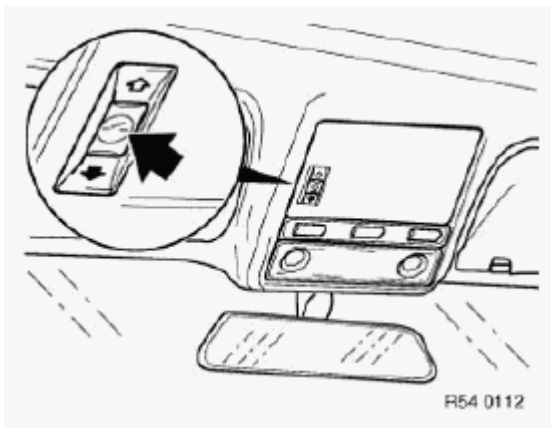


Fig. 44: Pressing Switch

Courtesy of BMW OF NORTH AMERICA, INC.

E63 only:

The curve is learnt manually in the following steps:

- After normalization, keep switch pressed in "Lift" direction.
- The panorama glass roof stops for 5 seconds in the final raise position after normalization.
- Floating roofliner closes completely.
- Floating roofliner opens completely.
- The panorama glass roof then moves into the "Closed" position (learning of the "Closing from raising" curve)
- Floating roofliner closes completely.
- Release switch.

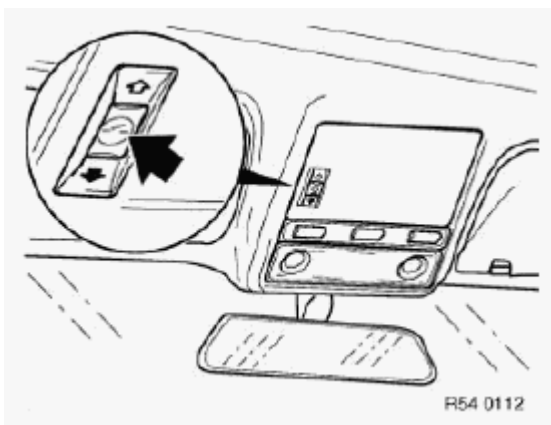


Fig. 45: Pressing Switch

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE:

- The entire operation lasts approx. 75 seconds
- Learning of the curve is terminated when the switch is released
- If the switch is released in the meantime, the entire procedure must be repeated
- On completion of successful initialization, the corresponding messages in the check control and the control display go out
- Carry out function check (tip function, anti-trapping protection and, if necessary, comfort function)

54 13 003 ADJUSTING GLASS SLIDE/TILT SUNROOF LID

Special tools required:

See **MAINTENANCE AND GENERAL INFORMATION - SPECIAL TOOLS** .

- 00 9 315
- 00 9 340

Necessary preliminary tasks:

- Remove gaiter, see **54 10 160 Replacing left or right gaiter for glass slide/tilt sunroof.**
- Close glass slide/tilt sunroof completely

If the glass slide/tilt sunroof is outside the adjustment tolerances, adjust as follows:

Adjusting glass slide/tilt sunroof unit:

Carry out the following step on one side first and then the other (first left, then right or vice versa):

- Insert Torx screws (1) on left/right so that glass roof panel can still just be adjusted
- Move glass slide/tilt sunroof lid as required
- Make sure all screws are tightened down.
- Tightening torque: 54 12 2AZ, see **54 12 MECHANICAL SUN ROOF COMPONENTS** .
- Repeat procedure on other side.

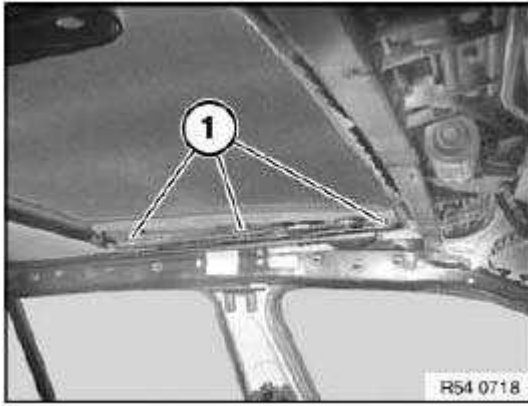


Fig. 46: Torx Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Distance setting:

Distance A between body and glass lid (without seal):

$$A = 5.8 \pm 0.3 \text{ mm all round}$$

Check same gap of glass lid and body with special tool 00 9 340.

Slide special tool 00 9 340 or similar between seal and insert. It must be possible to slide the card against the same level of resistance.

Slide glass lid towards front or rear until ideal position is reached.

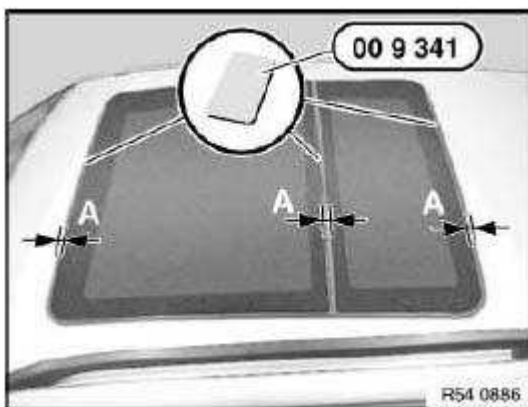


Fig. 47: Special Tool (00 9 341)
Courtesy of BMW OF NORTH AMERICA, INC.

Height adjustment:

NOTE: Front glass lid must be adjusted first.

Check height of glass lid (1) in relation to body (2) with special tool 00 9 315.

Press glass lid (1) at front and rear towards top or bottom until ideal position is reached.

Height:

- Front edge of glass lid at front 0 to 1 mm under roof edge
- Rear edge of glass lid at front 0 to 0.5 mm over glass lid at rear
- Rear edge of glass lid at rear 0 to 1 mm over roof edge

Check function and adjustment.

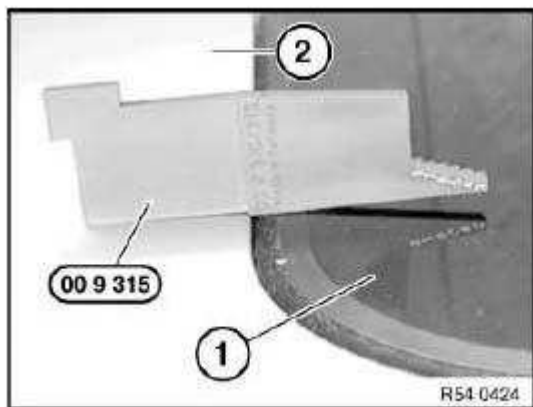


Fig. 48: Special Tool (00 9 315)

Courtesy of BMW OF NORTH AMERICA, INC.

54 13 050 REPLACING SEAL FOR SLIDE/TILT SUNROOF LID AT REAR

Necessary preliminary tasks:

- Open glass slide/tilt sunroof

NOTE: Follow repair instructions for bonded seals on glass slide/tilt sunroof.

Detach seal (1) from slide/tilt sunroof lid.

Installation:

Clean bonding surface with adhesive remover (sourcing reference: BMW Parts Service).

Press seal without stretching (squashing).

IMPORTANT: Do not touch bonding surface.

Surface temperature greater than 20°C

Incorrect bonding of the seal will result in leakage.

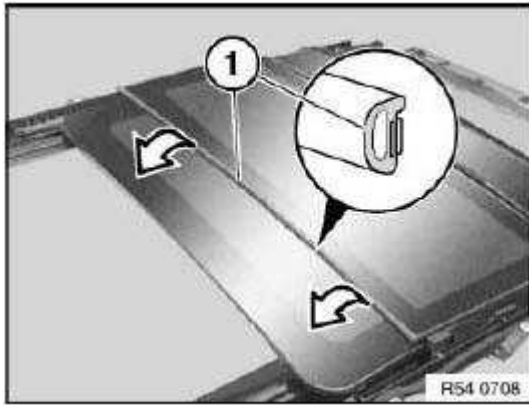


Fig. 49: Detaching Seal From Slide/Tilt Sunroof Lid
Courtesy of BMW OF NORTH AMERICA, INC.

54 13 055 REPLACING SEAL FOR SLIDE/TILT SUNROOF FRAME

Necessary preliminary tasks:

- Remove glass slide/tilt sunroof lid at rear, see **54 10 175 Removing and installing rear glass slide/tilt sunroof cover.**
- Lower (open) glass slide/tilt sunroof lid at front

NOTE: Follow repair instructions for bonded seals on glass slide/tilt sunroof, see **54 0 ... Notes on panorama glass roof (initialization/normalization/learning of characteristic curve).**

Pull off seal of sunroof cut-out at contact edge starting from body. (Peel off)

Installation:

Clean bonding surface with adhesive remover (sourcing reference: BMW Parts Service).

Press seal without stretching (squashing).

Stick on seal in sections.

Establish seal joint.

IMPORTANT: Do not touch bonding surface.
Surface temperature greater than 20°C
Incorrect bonding of the seal will result in leakage.

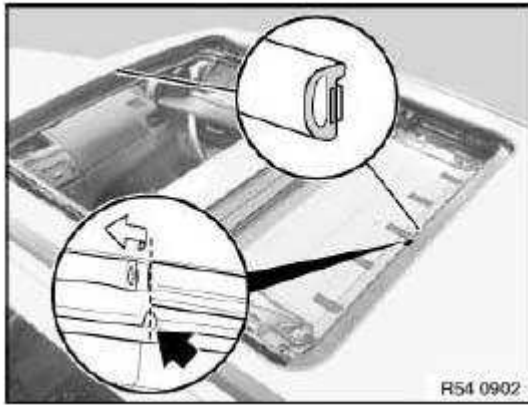


Fig. 50: Pulling Off Seal Of Sunroof Cut-Out
Courtesy of BMW OF NORTH AMERICA, INC.

54 13 060 REMOVING AND INSTALLING/REPLACING FRONT FLOATING ROOFLINER FOR GLASS SLIDE/TILT SUNROOF

This operation is described in section on:

- Removing both floating roofliners for glass slide/tilt sunroof, see **54 13 070 Removing and installing/replacing both floating roofliners for glass slide/tilt sunroof.**

54 13 065 REMOVING AND INSTALLING/REPLACING REAR FLOATING ROOFLINER FOR GLASS SLIDE/TILT SUNROOF

This operation is described in section on:

- Removing both floating roofliners for glass slide/tilt sunroof, see **54 13 070 Removing and installing/replacing both floating roofliners for glass slide/tilt sunroof.**

54 13 070 REMOVING AND INSTALLING/REPLACING BOTH FLOATING ROOFLINERS FOR GLASS SLIDE/TILT SUNROOF

Necessary preliminary tasks:

- Remove glass slide/tilt sunroof lid at rear, see **54 10 175 Removing and installing rear glass slide/tilt sunroof cover.**

NOTE: Front and rear floating roofliners can be removed separately from each other. Make sure that grease on the rails does not come into contact with the floating roofliner.

Release screw (1).

Release clips (2) with rotary block.

Remove fan plate (3).

Installation:

Do not tighten down screw (1), fan plate (3) should be able to move in Y-direction.

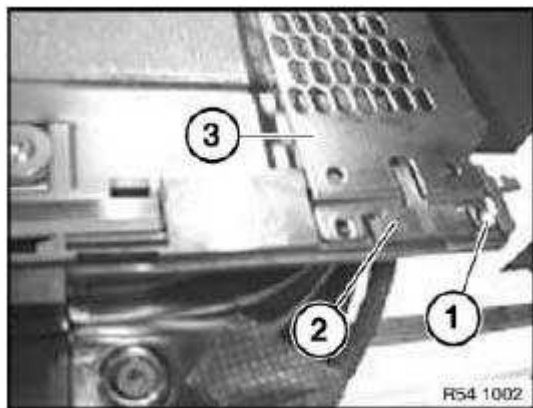


Fig. 51: Screw And Clips

Courtesy of BMW OF NORTH AMERICA, INC.

Front floating roofliner:

Open floating headliner approx. halfway.

Front rain channel must be situated between first and second screws.

Release screws (1).

Tightening torque: 54 12 10AZ, see **54 12 MECHANICAL SUN ROOF COMPONENTS** .

Remove star shims.

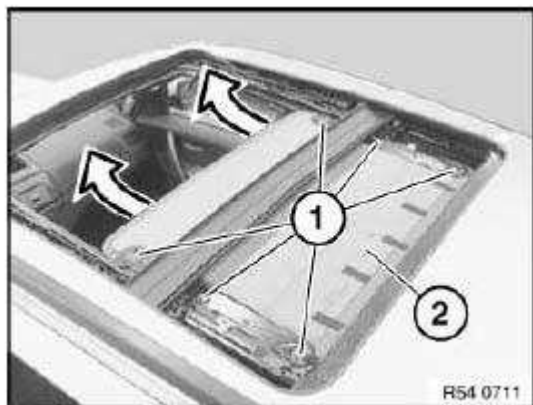


Fig. 52: Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace microencapsulated screws and insert with Loctite.

Make sure star shims are correctly positioned.

Pull out floating roofliner (2) in direction of arrow.

If necessary, press wind deflector downwards.

Installation:

Carefully raise floating roofliner mechanism.

Rear floating roofliner:

Close roofliner completely but not in fan position.

Release screws (1).

Remove tensioning springs (left side only) and washers.

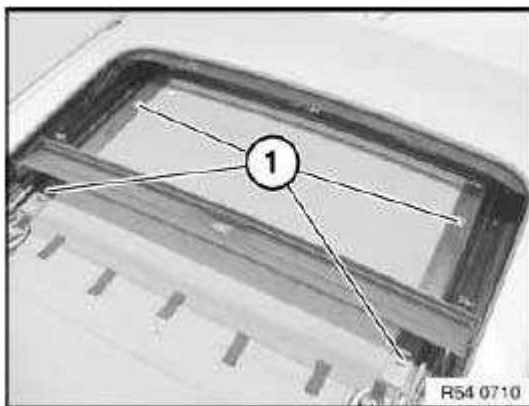


Fig. 53: Screw

Courtesy of BMW OF NORTH AMERICA, INC.

Slide floating roofliner (4) in direction of arrow (1) between outer body skin and roofliner.

Slide floating roofliner (4) up to end of control rail (3).

Raise floating roofliner (4) and remove over control rail (3) in direction of arrow (2).

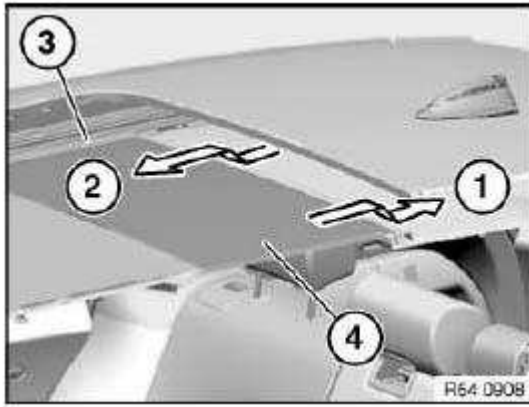


Fig. 54: Sliding Floating Roofliner
 Courtesy of BMW OF NORTH AMERICA, INC.

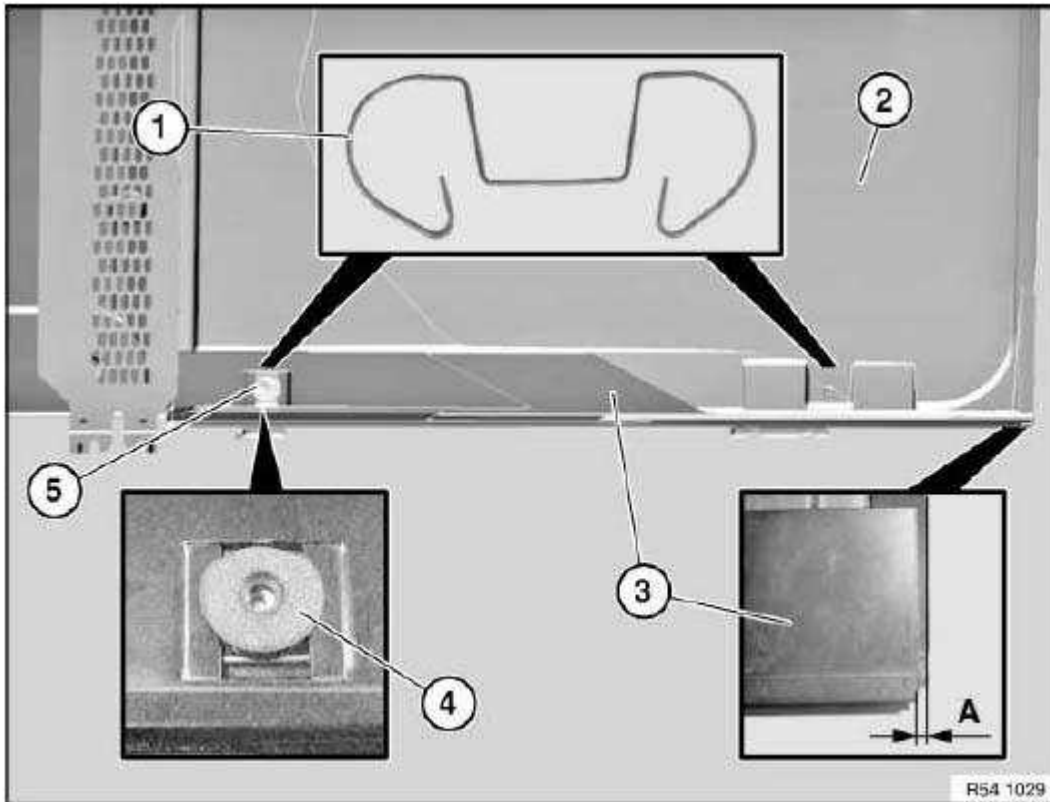


Fig. 55: Tension Spring And Floating Roofliner
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Tensioning springs (1) must rest correctly in recess of floating roofliner (2).

Adjust gap A = 3 ± 0.2 mm from control rail (3) to floating roofliner (2).

Make sure washer (4) is correctly positioned with turning lock.

Replace microencapsulated screws (5) and insert with Loctite.

Tightening torque: 54 12 11AZ, see **54 12 MECHANICAL SUN ROOF COMPONENTS** .

Performing function check:

- Floating roofliner must be able to move in control rail in X-direction.
- Floating roofliner is positioned on right and can be pressed towards left under spring tension.
- Floating roofliner springs back towards right into initial position.

54 13 080 REMOVING AND INSTALLING COMPLETE GLASS SLIDE/TILT SUNROOF

Special tools required:

- **54 1 110 CENTERING PINS**

Necessary preliminary tasks:

- Remove roofliner, see **51 44 013 REMOVING AND INSTALLING ROOFLINER (ON VERSION WITH PANORAMA SUNROOF)** .
- Open rear lid

E53 only:

- Partially remove rear-compartment head airbag.

IMPORTANT: Two persons are required to help in removing the glass slide/tilt sunroof.

E61/E83 only:

Remove holder for handles on left and right:

- Release screws.
- Remove holder.

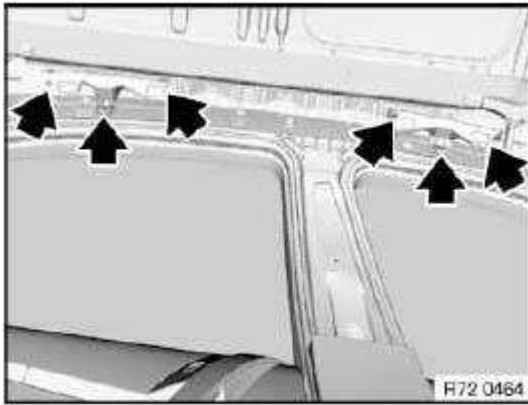


Fig. 56: Locating Screws And Holder
Courtesy of BMW OF NORTH AMERICA, INC.

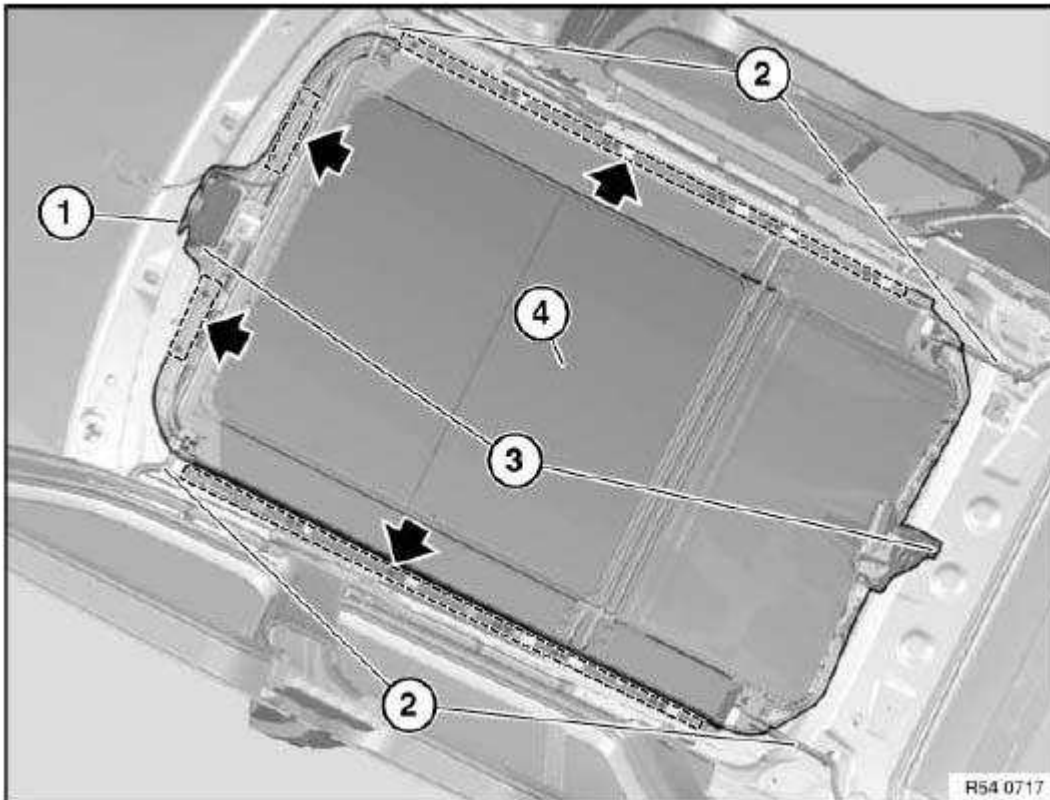


Fig. 57: Water Drain Hoses And Plug
Courtesy of BMW OF NORTH AMERICA, INC.

- Unlock and disconnect plug (1)
- Detach water drain hoses (2)

NOTE: Check hoses for damage and moisten with water before fitting

- Release screws in marked area (when installing: fit washers on front side)

Tightening torque: 54 12 6AZ, see **54 12 MECHANICAL SUN ROOF COMPONENTS** .

- Helper must hold glass sunroof to prevent it falling out.
- Release screws (3) on and carefully lower slide/tilt sunroof (4).

IMPORTANT: Do not damage any surrounding parts when removing slide/tilt sunroof (4).

- Remove slide/tilt sunroof (4) completely (through rear lid at rear).

Installation:

If necessary, remove fabric adhesive tape.

To stop grating noises, secure all screws (1) prior to installation with plastic washers (2).

If the standard screws can no longer grip, use "repair screws" (have larger threads).

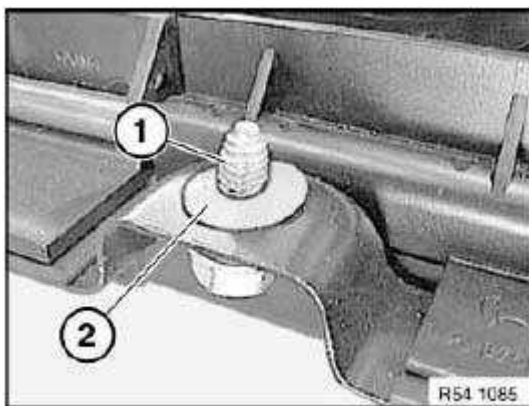


Fig. 58: Plastic Washers

Courtesy of BMW OF NORTH AMERICA, INC.

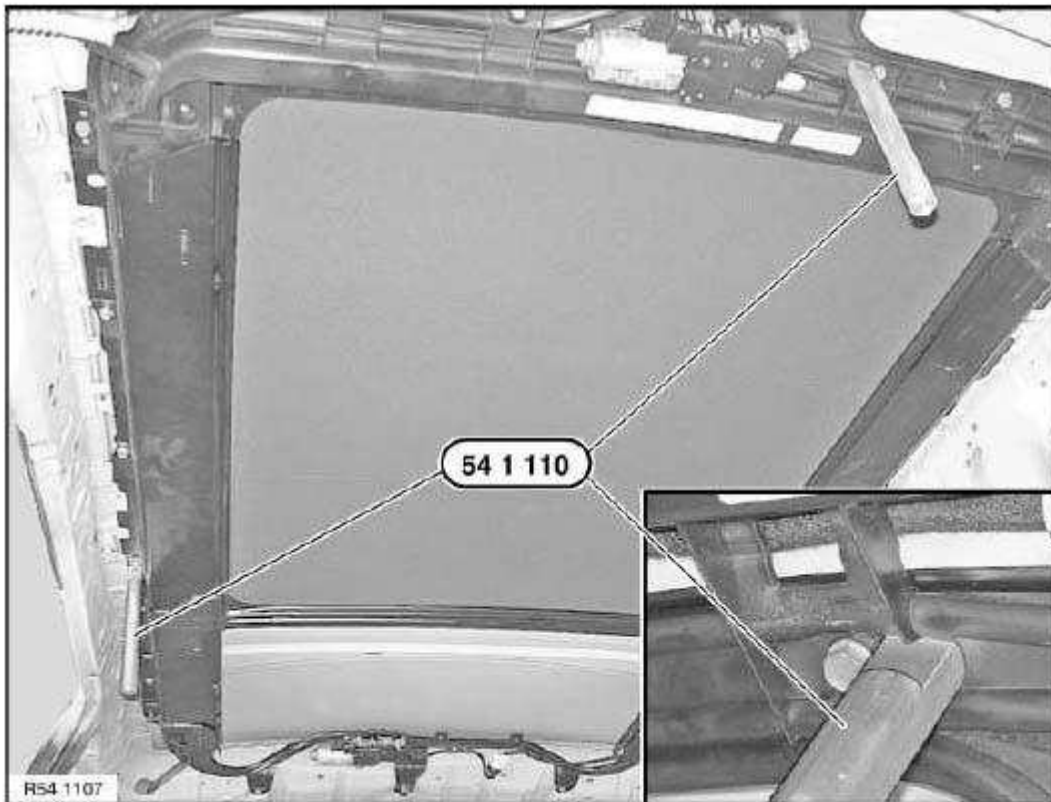


Fig. 59: Special Tool (54 1 110)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

To align panorama sunroof to body-cutout, insert screws and tighten loosely.

Panorama sunroof must still be able to move in the body-cutout.

On account of leaks, panorama sunroof must be exactly aligned to body-cutout.

Insert special tool 54 1 110 into centering bores up to stop in panorama sunroof and body.

Tighten down screws.

Tightening torque: 54 12 6AZ, see **54 12 MECHANICAL SUN ROOF COMPONENTS** .

E53 only:

Side centering bore omitted on body side.

Align panorama sunroof over front centering bore in longitudinal direction and align at sides over glass cover distance to body. (See next work step).

IMPORTANT: Do not crush any cables when fitting the glass slide/tilt sunroof.
Initialize glass slide/tilt sunroof, see 54 0 ... Notes on panorama glass roof (initialization/normalization/learning of characteristic curve)

54 13 090 REMOVING AND INSTALLING/REPLACING WIND DEFLECTOR

Necessary preliminary tasks:

- Open slide/tilt sunroof

NOTE: Shown removed here for purposes of clarity.

Pull plastic strip (1) on net of wind deflector out of retainers (2).

IMPORTANT: Do not pull on the net so as to avoid tearing the net.

Installation:

If necessary, reinstall retainers in frame.

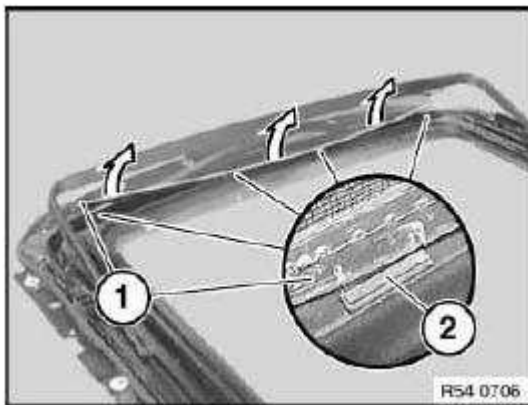


Fig. 60: Pulling Plastic Strip

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Tape off paintwork in working area.
Avoid bending wind deflector (1).

NOTE: Pictures show removal on the left side, proceed in the same way for the right side.
Slide control carriage (4) for wind deflector with plastic wedge towards front.

Carefully lift wind deflector (1) in direction of arrow with guide (2) out of rail (3).

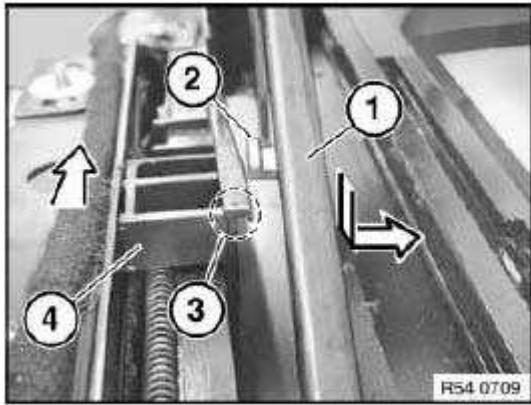


Fig. 61: Sliding Control Carriage And Wind Deflector
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Make sure clamping elements are correctly seated.

Tilt wind deflector (1) into vertical position and remove.

Installation:

Make sure wind deflector (1) is correctly seated in pivot point (2).

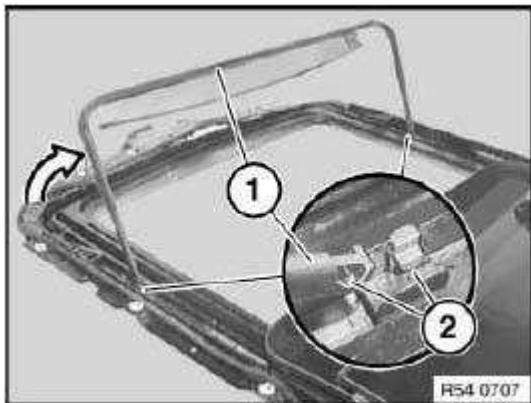


Fig. 62: Wind Deflector And Pivot Point
 Courtesy of BMW OF NORTH AMERICA, INC.

54 13 095 REPLACING/CLEANING NET FOR WIND DEFLECTOR

Necessary preliminary tasks:

- Open slide/tilt sunroof

Cleaning:

The wind deflector net can be cleaned while installed as follows:

- Accelerate vehicle with glass slide/tilt sunroof open to over 5 km/h
- Stop vehicle and turn ignition key to position 2.

NOTE: This prevents the wind deflector from retracting, and thereby leaving it fully open.

Net is now accessible and easy to clean.

Replacement:

Pull plastic strip (1) out of retainers (2) on panorama glass sunroof and wind deflector.

Installation:

If necessary, reinstall retainers.

Clip new net into place.

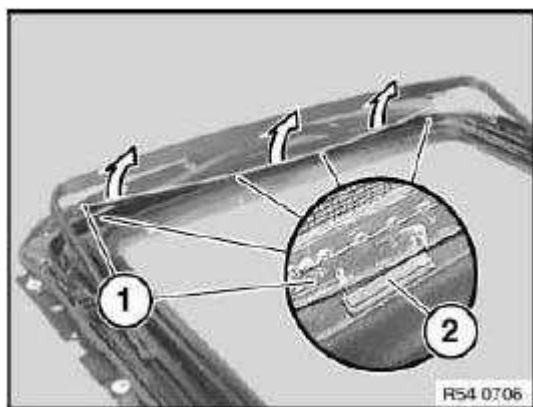


Fig. 63: Pulling Plastic Strip

Courtesy of BMW OF NORTH AMERICA, INC.

54 13 100 REMOVING AND INSTALLING/REPLACING DRIP MOLDING

Necessary preliminary tasks:

- Remove glass slide/tilt sunroof **54 13 080 Removing and installing complete glass slide/tilt sunroof.**
- Remove glass slide/tilt sunroof lid at rear **54 10 175 Removing and installing rear glass slide/tilt sunroof cover.**
- Remove glass slide/tilt sunroof lid at front, see **54 10 170 Removing and installing front glass slide/tilt sunroof cover.**

IMPORTANT: Risk of damage to drip molding carrier.

Carefully unclip drip molding (1) upwards out of carrier (2).

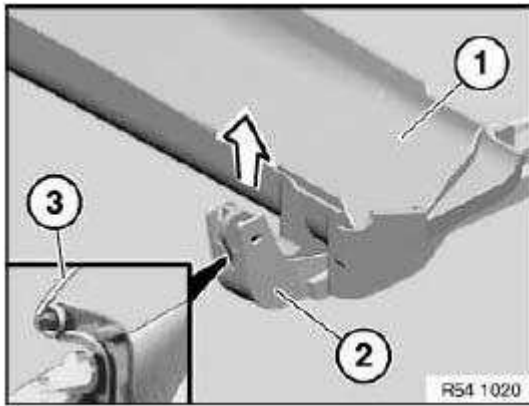


Fig. 64: Unclipping Drip Molding
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Attach spring (3) to drip molding pivot point.

Make sure spring is correctly positioned in drip molding.

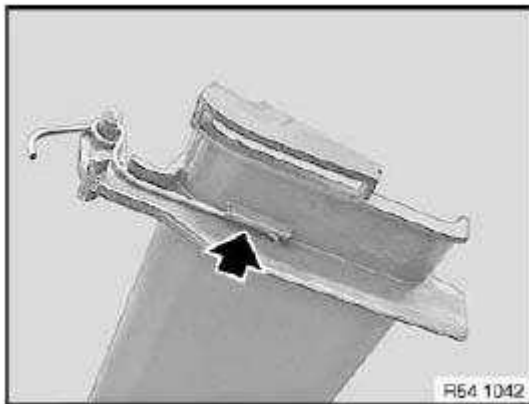


Fig. 65: Locating Spring
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Observe installation sequence:

1. Suspend spring in drip molding carrier
2. Press drip molding onto glass slide/tilt sunroof

3. Clip pivot point (bearing) of drip molding into carrier

Check drip molding for spring tension.

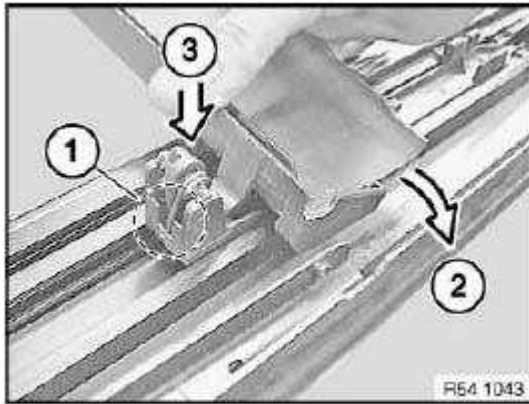


Fig. 66: Pressing Drip Molding Onto Glass Slide/Tilt Sunroof
Courtesy of BMW OF NORTH AMERICA, INC.

54 13 105 REMOVING AND INSTALLING/REPLACING REAR DRIP MOLDING

Necessary preliminary tasks:

- Remove glass slide/tilt sunroof **54 13 080 Removing and installing complete glass slide/tilt sunroof.**
- Remove glass slide/tilt sunroof lid at rear **54 10 175 Removing and installing rear glass slide/tilt sunroof cover.**

Unlock tab (2) and remove drip molding (1) towards top.

NOTE: 2 springs are loosely connected to guide for drip molding.

Installation:

Make sure springs are reinstalled on drip molding carriers.

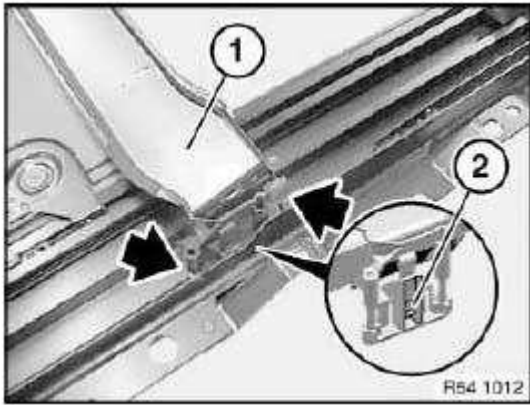


Fig. 67: Drip Molding

Courtesy of BMW OF NORTH AMERICA, INC.

Removing drip molding carrier:

NOTE: Drip molding carrier cannot be removed without incurring damage.

Break out tabs with a screwdriver and lever out carrier.

Installation:

Replace drip molding carrier and hook into place.

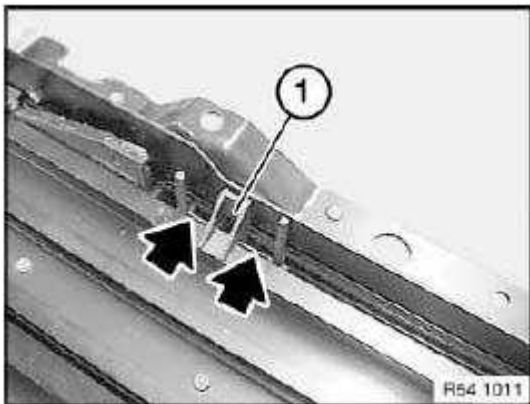


Fig. 68: [Tabs]

Courtesy of BMW OF NORTH AMERICA, INC.

54 13 130 REMOVING AND INSTALLING FRONT CROSS - MEMBER

Necessary preliminary tasks:

- Remove glass slide/tilt sunroof **54 13 080 Removing and installing complete glass slide/tilt sunroof.**
- Remove control unit for glass slide/tilt sunroof, see **61 35 714 REMOVING AND**

INSTALLING/REPLACING CONTROL UNIT FOR SLIDE/TILT SUNROOF .

- Remove drive, see **67 61 515 REPLACING DRIVE WITH GEAR (FRONT) FOR ACTUATING SLIDE/TILT SUNROOF (PANORAMA GLASS SUNROOF) .**

Release screws in marked area.

Feed cross-member (2) out of wiring harness (1) during removal.

If necessary, release fabric adhesive tape and replace.

Installation:

Pitch cables must be correctly located in guide

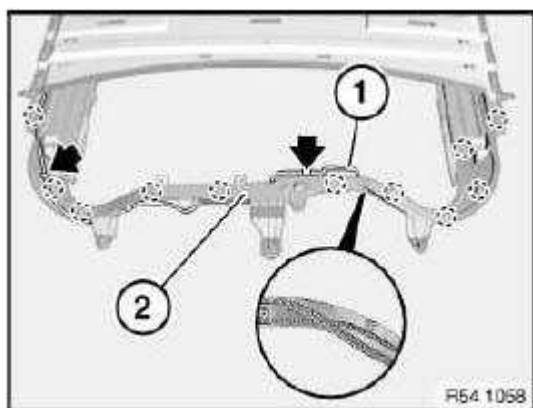


Fig. 69: Cross-Member And Wiring Harness

Courtesy of BMW OF NORTH AMERICA, INC.

54 13 150 REMOVING AND INSTALLING REAR CROSS - MEMBER

Necessary preliminary tasks:

- Remove glass slide/tilt sunroof **54 13 080 Removing and installing complete glass slide/tilt sunroof.**
- Remove control unit, see **61 35 714 REMOVING AND INSTALLING/REPLACING CONTROL UNIT FOR SLIDE/TILT SUNROOF .**
- Remove drive, see **67 61 515 REPLACING DRIVE WITH GEAR (FRONT) FOR ACTUATING SLIDE/TILT SUNROOF (PANORAMA GLASS SUNROOF) .**

Release screws in marked area.

Feed cross-member (2) out of wiring harness (1) during removal.

Installation:

Pitch cables must be correctly laid diagonally in guide.

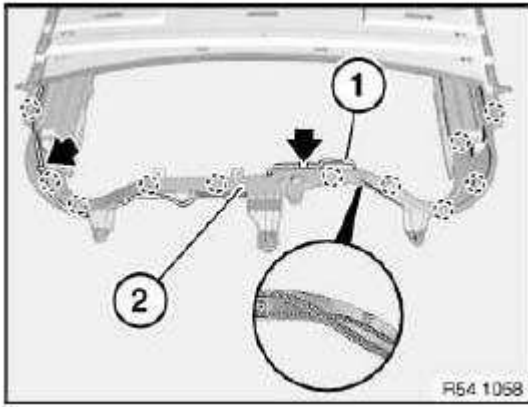


Fig. 70: Cross-Member And Wiring Harness
Courtesy of BMW OF NORTH AMERICA, INC.

ACCESSORIES & EQUIPMENT

Sunroof and Convertible Top - Operating Fluids

1.0 CONVERTIBLE TOP MATERIAL

Cleaning Kit consists of three fluids for periodic maintenance of the top's outer surface:

- Car Shampoo

For cleaning the entire convertible top. Add 2 to 3 capfuls of shampoo to 2.5 gallons of water. Rinse with clean water.

- Glass Cleaner

Cleans the plastic rear window as well as the vehicle's glass windows. Spray on, wipe off with dry cloth.

- Impregnating Spray

After cleaning the top, apply this spray over a large area about 12 inches from the surface to seal the top against possible leaks.

Convertible Top Cleaning Kit

BMW Part No. 83 12 9 407 806

Impregnating Spray

BMW Part No. 83 12 9 407 802

2.0 CONVERTIBLE TOP REAR (PLASTIC) WINDOW

REAR WINDOW CLEANER

Meguiar's Mirror Glaze Professional Plastic Cleaner #17 removes hairline scratches on the surface.

BMW Part No. 82 14 1 467 128.

REAR WINDOW POLISH

Meguiar's Mirror Glaze Professional Plastic Polish #10 restores and maintains clarity, leaves surface static-free.

BMW Part No. 82 14 1 467 129

CONTACT CEMENT

Attaching soft top material to zip-out rear window trim plastic channel on E30 and E36 convertibles. (former

BMW Part No. 81 22 9 407 524)

3M 1357 High Performance Contact Adhesive

3.0 CONVERTIBLE TOP STORAGE LID ADHESIVE

E30 and E36 Convertible top storage lid covering adhesive

3M™ Super Trim Adhesive Yellow Part No. 08090

4.0 CONVERTIBLE TOP SEALING FRAME ADHESIVE

0 E36 Z3 Sealing Frame Adhesive

One roll of Bostik 3/4" x 1/8" Butyl Tape, available in cases of 12 rolls from Springfield Paper Specialties.

5.0 CONVERTIBLE TOP HYDRAULIC FLUID

BMW PART NUMBER SPECIFICATION

Model	BMW Part Number
E36/7	54 34 8 410 306
E46	54347117733
E52	54348234324
E85	54347117733
E64	54347717733
E93	54340394395

6.0 SUNROOF

Cassette Lubricant

BMW PART NUMBER SPECIFICATION

Würth Glide Grease	Part No. 0893898
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Loctite 380

5 Series Touring double panel sunroof repairs. (former BMW Part No. 81 22 9 407 394)

BMW PART NUMBER SPECIFICATION

3M	Part No. 8155
Würth	Part No. 893 4103
Loctite	Part No. 38050

BRAKES

Brakes - Operating Fluids

1.0 GENERAL INFORMATION

Brake fluid, (glycol-based) as used in BMW brake systems, must conform with the following requirements:

- High boiling point
- Good low temperature resistance
- Low compressibility
- Corrosion inhibition for all metal parts inside of brake system
- Compatibility with all rubber parts used in brake system

These requirements are fulfilled by reputable brand name DOT 4 brake fluids.

Silicone-based brake fluid has better compressibility, but because it cannot absorb moisture, is subject to vapor lock at temperatures above 212°F/ 100°C. At lower temperatures, it may even ice-up. **Silicone-based brake fluid is not approved by BMW.**

Glycol-based brake fluid absorbs moisture from the atmosphere (hygroscopicity) through the brake fluid reservoir, brake hoses, etc. This absorption of water lowers the original boiling point of brake fluid and active safety of the entire system. If there is extended use of the brakes while driving downhill at high speeds, the thermal loads could cause vapor bubbles in the brake fluid. This situation could lead to reduced braking effectiveness.

The original boiling point of factory-approved brake fluids is approximately 500°F/260°C. Due to the hygroscopic behavior of brake fluid, 2% of water within one year is permissible. The boiling point of brake fluid will drop by 100°C with 3% water absorption. It is essential to conform with brake fluid changing intervals in order to guarantee the safety and maximum effectiveness of a brake system.

It would not be sufficient simply to replace the brake fluid in the reservoir. Experience has shown that vapor bubbles will occur first on areas of the brake caliper. This area is subjected to high thermal loads and also exposed to heat transmission.

When replacing the brake fluid, the brake fluid used as the working fluid in the hydraulic clutch should also be replaced. This is done by draining the clutch operation system or bleeding with the help of the clutch slave cylinder.

The brake fluid should be replaced by filling the brake fluid reservoir. Make sure that each bleeder valve of all wheel cylinders or brake calipers is kept open until the escaping brake fluid is clear and without air bubbles. Never use brake fluid that has been drained from the system.

Storage of brake fluids also deserves your special attention. The aging process begins with the initial contact between the brake fluid and the atmosphere. This means immediately after a new container is opened.

To keep the boiling point of stored brake fluids as high as possible, we recommend conforming with the following points:

- Close all containers tightly.
- Select small size containers, which can be used up quickly.
- Avoid pouring contents of one container into a different container.

2.0 HANDLING BRAKE FLUIDS

Brake fluids could be mixed up accidentally with mineral oil products so it is important to leave them in their original containers and not pour them into a different container.

CAUTION: If brake fluid accidentally comes into contact with your skin, wash it off with soap and water immediately. Eyes should be thoroughly flushed with cold water if contacted by brake fluid. Vomiting should be induced if brake fluid is internally consumed and a physician should be consulted.

If brake fluid is spilled or drips on a painted surface, wash it off with water immediately to prevent damage to the paint finish. Never rub it off. Brake fluids should not have contact with grease or oil. Wash hands to remove grease and oil before working with brake fluids. Also make sure that grease cannot enter the brake system.

Drained brake fluid must never be discarded in the garbage, oil disposal tanks or water drains.

Read instructions on container label prior to use.

3.0 BMW TESTED AND APPROVED BRAKE FLUIDS

BMW Tested and Approved DOT 4 ESL Brake Fluid is available as follows:

BMW PARTS SPECIFICATION

12 fl. oz. bottle	BMW Part No. 81 22 0 142 156
1 gallon container	BMW Part No. 81 22 0 142 155

4.0 BRAKE FLUID CHANGE INTERVALS

All Models Brake fluid change interval every 2 years.

5.0 OTHER OPERATING FLUIDS

ANTI-SQUEAK/CORROSION PASTE

Bostik NEVER-SEEZ® to prevent disc brake squeaking. It is applied on cleaned recesses, pressure surfaces of piston crowns, brake pad backplates and possibly transfer plates-but not on friction liners.

To prevent corrosion between the ABS impulse sensor and the hole in the wheel suspension component, apply a

thin coat of Bostik NEVER-SEEZ® to cleaned sensor and hole before assembly.

BMW PARTS SPECIFICATION

Bostik NEVER-SEEZ®

Part No. NSBT-16

BRAKE CLEANER SPRAY

Non-CFC spray (former BMW Part No. 81 22 9 407 704) for cleaning brakes, brake pads, brake shoes, drums, disks and other brake components. Also suitable for clutch pressure plates.

BMW PARTS SPECIFICATION

3M

Part No. 8895

Loctite

Part No. 82220

CRC

Part No. 08088

BRAKES

Brakes - SI Techniques - X3

34 BRAKES

VS-42 je

Baugruppe/Group: 34

weltweit

Datum/Date: 05/2005

34 01 05 (126)

Update: 10/2006

DYNAMIC STABILITY CONTROL 8PLUS

E60, E61, E63, E64, E83, E90, E91, E92



T3403001

Fig. 1: Dynamic Stability Control 8Plus
Courtesy of BMW OF NORTH AMERICA, INC.

**NOTE: Vehicles with DSC 8Plus:
This SBT describes DSC 8Plus, which is installed on the following model series:**

- > E60, E61, E63, E64 (rear and all-wheel drive)
- > E83
- > E90, E91, E92 (all-wheel drive only)

INTRODUCTION

The **xDrive** all-wheel drive system was introduced on the BMW 5-Series in 03/2005. From this time on, these vehicles are equipped as standard with Dynamic Stability Control (DSC) 8Plus.

DSC 8Plus is an advanced development of DSC 8.

The DSC unit (comprising DSC control unit and hydraulic unit) is even more powerful.

The newly developed switchover valves allow a more precise regulation, especially at low brake pressure. DSC 8Plus is supplied by Bosch.

- > E60, E61 from 03/2005 up to 09/2005 (all-wheel drive)
- > E60, E61, E63, E64 from 09/2005 (rear and all-wheel drive)
- > E83 from 09/2006
- > E90, E91 from 09/2005 and E92 from 06/2006 (all-wheel drive)
- > Hydraulic circuit diagram with electrically actuated valves

The principal new features of DSC 8Plus are:

- Additional functions:
 - Brake Standby through precautionary pre-tensioning of the brakes in an emergency
 - Brake disc drying on wet roads
 - Detection of fading and increase in brake pressure during fading
 - Start-off assistant
 - Soft stop when braking to standstill

**NOTE: New soft stop function not available on BMW 3-Series all-wheel drive or E83.
For technical reasons, the soft stop function has not been incorporated on
BMW 3-Series all-wheel drive or on E83 vehicles.**

- 2 additional brake pressure sensors, only in combination with Active Cruise Control (ACC)

New from 09/2005:

- > E60, E61, E63, E64

Introduction of DSC 8Plus on the BMW 5-Series and 6-Series **with rear-wheel drive.**

From this point time on, the body gateway module (KGM) is the gateway to the PT-CAN.

- > E90, E91

Introduction of DSC 8Plus on the BMW 3-Series **with all-wheel drive.**

In these vehicles, the junction box electronics (JBE) is the gateway to the PT-CAN.

New from 06/2006:

- > E92

Introduction of DSC 8Plus on BMW 3-Series Coup **with all-wheel drive.**

New from 09/2006:

- > E83

Introduction of DSC 8Plus on E83.

DSC is a control system that maintains dynamic stability within physical limits when the car is being driven close to the limits of performance and handling.

It also improves traction.

DSC needs the following input signals in order to discharge its control functions:

- Rate of yaw (measure of movement of the car about its vertical axis)
- Lateral acceleration
- Wheel speeds (measure of the car's roadspeed)
- Steering angle
- Brake pressure

The measured values available are used to calculate how the car is moving at any given instant. The actual condition is compared with nominal values (values in stable driving conditions) that are calculated in the DSC control unit. If the actual condition differs from the nominal values, DSC is activated and initiates brake actions and/or engine control functions.

The advantages:

The intervention of DSC in the engine control and brakes provides outstanding driving stability and traction in all driving situations.

DSC combats negative, dynamic driving forces. This means DSC brings about maximum active safety within

the physical limits. DSC thus enhances driving comfort by allowing more relaxed driving.

BRIEF DESCRIPTION OF COMPONENTS

The following components are described for the Dynamic Stability Control (DSC):

○ **DSC unit**

The DSC unit consists of the components DSC control unit and hydraulic unit.

The DSC control unit regulates the pressure in the brake system via the hydraulic unit (comprises valve block and pump motor).

○ **Brake light switch**

The brake light switch tells the DSC when the brake pedal has been pressed.

○ **4 wheel-speed sensors**

The active wheel-speed sensors register the speed of an individual wheel at their circumference. Moreover, the wheel-speed sensors also recognize the direction of rotation (forwards or backwards).

When a wheel is stationary, the wheel-speed sensor emits a pulse every 0.75 seconds.

○ **DSC sensor**

The DSC sensor measures:

- Vehicle rotation around the vertical axis (yaw rate)
- Lateral acceleration of vehicle
- Longitudinal acceleration of vehicle
- > E60, E61, E63, E64

The DSC sensor is linked to the DSC control unit by the F-CAN (chassis CAN).

The DSC sensor is secured to the floor assembly under the front-passenger seat.

- > E83

The DSC sensor is connected to the DSC control unit via the PT-CAN (powertrain CAN).

The DSC sensor is secured to the retainer plate for the parking brake lever.

- > E90, E91, E92

The DSC sensor is linked to the DSC control unit by the F-CAN (chassis CAN).

The DSC sensor is located on the seat cross member under the driver's seat.

○ **Steering-angle sensor**

The steering-angle sensor registers the movements of the steering wheel.

- > E60, E61, E63, E64

The steering-angle sensor is part of the steering column switch cluster (SZL).

The steering column switch cluster is connected to the F-CAN (chassis CAN) and to the PT-CAN (powertrain CAN).

- > E90, E91, E92

The steering-angle sensor is part of the steering column switch cluster (SZL).

The steering column switch cluster is connected to the F-CAN (chassis CAN).

- > E83

The steering-angle sensor is fitted to the steering spindle. The steering angle sensor is connected to the PT-CAN (powertrain CAN).

○ **Internal brake pressure sensor**

The DSC unit incorporates a brake-pressure sensor. This brake pressure sensor registers the braking pressure applied by the brake pedal and the brake booster.

○ **2 brake pad wear sensors**

The brake pad wear sensors (front left and rear right in the inner brake pads) provide additional information about the thickness of the brake pads. This additional information (2 reference points) is compared to the value calculated by the DSC.

A critical brake lining thickness will be indicated in the instrument cluster by the "Next Service" indicator (Condition Based Service, CBS) and by the general brake warning lamp lighting up red.

○ **DTC button**

The DTC button has the letters "DTC". The DTC button can be used to select 3 switch states:

- DTC button not pressed after terminal change: DSC in operation (default)
- DTC button briefly pressed: DTC in operation (DTC indicator light lights up in instrument cluster)
- DTC button pressed and held: DSC and ASC deactivated, ABS and ABD-X on all wheel drive vehicles remain active (indicator lamp in instrument cluster lights up permanently)

- > E60, E61, E63, E64

The DTC button is in the center console switch cluster (SZM) The signal is transmitted on the K-CAN **and** via a separate wire. The signal on the separate wire is decisive.

- > E83

The DTC button is in the center console switch cluster (SZM) The signal is transmitted via a separate wire.

- > E90, E91, E92

The DTC button is connected to the junction box electronics (JBE). The JBE transmits a bus signal.

- **Brake-fluid-level switch**

Insufficient brake fluid is detected and a signal sent to the DSC control unit.

If there is insufficient brake fluid, this will be indicated in the instrument cluster by the general brake warning lamp lighting up red.

The DSC control unit also communicates with the following control units:

- **DME or DDE: Digital engine electronics or digital diesel electronics**

The DME or DDE, as applicable, controls engine adaptation (for example, reduction in engine output to prevent spin at the driven wheels). The DME or DDE also receives the converted wheel speed signal from the rear right wheel. This signal is used to check the plausibility of engine misfires (DME). The signal on the PT-CAN is redundant.

- **RLS: Rain-light sensor**

The signal from the rain-light sensor is used to brake the brake discs dry on a wet road surface. In addition, it is important for a wiper stage to be switched on.

- > E60, E61, E63, E64

The rain-light sensor supplies the signal on the CAN bus.

- > E83

The rain-light sensor supplies the signal on the K-bus.

- > E90, E91, E92

The rain-light sensor is connected to the roof control panel (FZD) via the LIN bus.

- **CAS and M-ASK/CCC: Car Access System and multi-audio system controller/Car Communication Computer**

The CAS control unit and M-ASK/CCC receive the converted wheel speed signal from the rear left wheel.

Both these control units use this signal to ascertain whether the car is moving or at a standstill.

- **SGM: Safety and gateway module**

- > E60, E61, E63, E64 up to 09/2005

The SGM is the data interface (= gateway) between:

- PT-CAN
- K-CAN
- **Byteflight**
- Diagnosis wire to diagnosis socket

- **KGM: Body gateway module**

- > E60, E61, E63, E64 from 09/2005

The vehicle electrical system was changed from 09/2005. As a result of the change, several control units were discontinued and some control unit functions were integrated into new control units.

The new body gateway module supersedes the safety and gateway module (SGM) previously fitted.

The KGM is the data interface (= gateway) between:

- PT-CAN
- K-CAN
- Diagnosis wire to diagnosis socket

- **JBE: Junction box electronics**

- > E90, E91 from 09/2005 and
- > E92 from 06/2006

The JBE is the data interface (= gateway) between:

- PT-CAN
- K-CAN
- Diagnosis wire to diagnosis socket

Signals from the chassis CAN (F-CAN) are simply looped through.

- **ACC: Active Cruise Control**

DSC receives requests from Active Cruise Control (ACC) via the PT-CAN. In response, DSC reduces speed by applying the brakes at all four wheels.

- > E60, E61, E63, E64
- > E90, E91 from 09/2005 and E92 from 06/2006

The request for brake application is given by the LDM control unit (LDM: longitudinal dynamics management).

○ **LM: Light module**

- > E60, E61, E63, E64

As required by law, the brake lights are activated in the event of automatic braking when the Electronically Controlled Deceleration function (ECD) is triggered by the ACC.

To do this, a signal must be sent from the DSC to the light module (LM) via the K-CAN.

○ **FRM: Footwell module**

- > E90, E91, E92

As required by law, the brake lights are activated in the event of automatic braking when the Electronically Controlled Deceleration function (ECD) is triggered by the ACC.

To do this, a signal must be sent from the DSC to the footwell module via the PT-CAN.

○ **KOMBI: Instrument cluster**

The DSC control unit actuates the indicator and warning lights for the individual DSC functions via the instrument cluster (signal via CAN bus).

- > E83

The instrument cluster is the data interface (= gateway) between:

- PT-CAN
- K-bus

○ **EGS: Electronic gearbox control (vehicles with automatic transmission)**

The transmission control (EGS) receives the wheel-speed signals via the PT-CAN.

The gearbox controller responds by adapting the gearshift characteristics for cornering and ascents. In addition, the gearshift characteristics are adapted to winter conditions (high wheel slip).

Moreover, gearshifts are suppressed during DSC control.

○ **CID and CON: Central Information Display and controller**

The detailed texts for the Check-Control messages are shown in the Central Information Display (CID).

CID and controller are also used to initialize the Run Flat Indicator (RPA).

With xDrive an additional function can be activated to reduce speed when driving downhill: Hill descent control (HDC)

- **TCU or ULF: Telephone control unit with GPS antenna**

If the car is **not fitted with a navigation system**, the telephone control unit receives the converted wheel speed signals from the front left and right wheels.

The telephone control unit uses these signals to pinpoint the car's position by dead reckoning.

- **GM: General module**

- > E83

The general module supplies input signals with respect to terminal control.

SYSTEM FUNCTIONS

The dynamic stability control system (DSC) controls longitudinal and transverse dynamics by means of engine and brake system intervention.

DSC 8Plus includes the following **new** functions.

- Brake Standby through pre-tensioning of the brakes in an emergency
- Brake disc drying on wet roads
- Fading compensation
- Soft stop when braking to standstill (not on BMW 3-Series all-wheel drive or E83)
- Start-off assistant

DSC 8Plus includes the following **familiar** functions.

- ABS: Anti-lock braking system
- EBV: Electronic brake force distribution
- CBC: Cornering brake control
- DTC: Dynamic traction control
- ASC: Automatic stability control
- MSR: Engine drag torque control
- DBC: Dynamic brake control
- Trailer stabilization control
- HDC: Hill descent control
- ECD: Electronically controlled deceleration (only in conjunction with ACC)

- All-wheel control
- RPA: Run Flat Indicator
- CBS: Condition Based Service

New functions for DSC:

Brake Standby through pre-tensioning of the brakes in an emergency

Pre-tensioning the brakes shortens the brakes' response time.

If the accelerator pedal is rapidly released (accelerator pedal angle), the brakes are immediately pretensioned.

DSC generates a low brake pressure without a measurable deceleration taking place.

The clearance between the brake pads and brake discs is eliminated. If the brakes are not applied within half a second, the brake pressure that was generated early is reduced again. The pre-tensioning of the brakes depends on active at speeds greater than 70 km/h.

Brake disc drying on wet roads

Braking dry removes moisture that gathers on the brake discs during journeys on wet roads or in rain.

The brake pads are lightly applied. This function also shortens the brakes' response time.

Depending on the signal from the rain sensor and the position of the wiper switch, DSC cyclically generates a low brake pressure. This creates no measurable deceleration on the vehicle. The brake pads are cyclically applied. This means that the brake disc are regularly wiped down. How often and how long the brake pads are applied depends on:

- The intensity of the rain, e.g. the speed of the windscreen wiper
- Road speed greater than 70 km/h

Fading compensation

Fading means: braking effect deteriorates as a result of high brake-disc temperatures.

If fading is detected, DSC reacts by increasing the brake pressure above that specified by the driver.

At very high brake-disc temperatures, fading compensation is indicated by the following:

- General brake warning lamp lighting up yellow
- Check-Control symbol in LCD display in instrument cluster lighting up yellow

(not E83)

DSC detects fading as follows: DSC compares the current vehicle deceleration with a nominal value based on

the current brake pressure.

DSC increases brake pressure until the nominal deceleration is achieved or until all wheels are subject to ABS control. The process is ended when the brake pedal is no longer depressed or when the speed drops below a certain threshold.

Soft stop when braking to standstill (not on BMW 3-Series all-wheel drive or E83)

Soft stop prevents the vehicle from jolting to a stop (e.g. with an inexperienced driver).

When the vehicle is braked to a standstill, there is no uncomfortable jerk (causing the occupants to "lurch" forward). DSC calculates the moment that standstill can be expected from the current road speed and deceleration.

Just before standstill is achieved, the brake pressure on the rear axle is reduced so that the vehicle stops with practically no jerking.

Soft stop is only active for light braking, so that the shortest possible stopping distance can still be achieved in emergency braking situations.

Start-off assistant

When pulling away on a slope, it is necessary to move your foot from the brake pedal to the accelerator pedal. The start-off assistant prevents the vehicle from rolling downhill in the following situations:

- uphill in forward gear
- uphill in reverse gear

It does this by maintaining the brake pressure needed to hold the vehicle. The gradient is recorded by the longitudinal-acceleration sensor in the DSC control unit.

The braking torque and engine torque needed is calculated from the gradient. When pulling away is detected, brake pressure is reduced as soon as the available engine torque is sufficient to move the vehicle in the direction required. The start-off assistant is deactivated when the parking brake is applied. If no move is made to pull away within 2 seconds of the brake pedal being released, the start-off assistant will be deactivated.

Familiar functions for DSC:

DSC: Dynamic Stability Control

Dynamic Stability Control (DSC) detects the current status of the vehicle by evaluating the sensor signals.

This status is compared with the nominal values derived from a computational model.

In this way, the system recognizes incipient instabilities.

The vehicle is stabilized as soon as a deviation overshoots the control threshold stored in the DSC control unit.

Stabilization (within the limits imposed by the laws of physics) is achieved by reducing engine power and by braking individual wheels.

DSC actions are superimposed on the ABS and ASC functions.

The DSC function can be deactivated by means of the DTC button.

ABS: Anti-lock braking system

The anti-lock braking system (ABS) stops the wheels locking during braking.

Advantage: Shorter stopping distances, the car retains its directional stability and remains steerable.

Brake pressure is regulated at all wheels to ensure that each wheel runs in the best possible slip range.

When this happens, slip is controlled so that the maximum possible braking and lateral stability forces can be transmitted.

ABS alone is available for braking if a sensor for DSC fails or if a bus fault occurs (PT-CAN and chassis CAN).

ABS is the surviving safety function in circumstances in which DSC control is no longer possible.

EBV: Electronic brake force distribution

Electronic brake force distribution (EBV) is a component of the ABS. EBV regulates the brake force distribution between the front and rear axles, depending on vehicle load.

Advantage: Regardless of the load state of the vehicle, the best possible braking distance is achieved while driving stability is maintained. The brake pads wear more evenly.

If the ABS fails, the EBV function is sustained for as long as possible.

The signals from at least two wheel-speed sensors are needed for the EBV function.

CBC: Cornering brake control

Cornering brake control (CBC) is an extension of ABS. CBC increases driving stability when the brakes are applied as the car corners ("cornering logic").

Advantage: Optimum driving stability if brakes are partially applied when cornering.

The shift in wheel loads as the car corners (the onset of this phenomenon requires no more than light application of the brakes) can result in a reduction in handling stability. If required, CBC generates a stabilizing load moment when the brakes are applied lightly outside the ABS intervention range.

DTC: Dynamic traction control

DTC is a version of DSC that has been optimized for forward momentum in certain road conditions.

Dynamic traction control (DTC) offers better traction as a trade-off against a reduction in stability in some circumstances. Consequently, its use should be reserved for exceptional conditions. It is advisable to briefly activate DTC in the following exceptional circumstances:

- To rock the vehicle free or pull away in deep snow or on a loose surface.
- When driving on snowy uphill stretches, in slush and on roads that have not been cleared
- When driving with snow chains.

The DTC function approximates to that of DSC with a slightly modified control strategy.

DTC can be activated by deactivating DSC (DTC button). DTC intervenes in the braking actions to imitate the function of a conventional differential lock. This effect of this is to increase the input torque on those wheels that are on a higher-friction surface.

Advantage: Higher traction is available with DTC.

Vehicle stabilization intervention (e.g. reduced power output) is made slightly later than with DSC. In certain situation, the driver has to intervene more intensively himself to stabilize the vehicle.

ASC: Automatic stability control

Automatic stability control (ASC) prevents the wheels spinning during acceleration by intervention in brake and engine operations.

Advantage: More traction and better driving stability.

If the wheels on the driven axle have a different level of grip, the wheel that tends to spin is braked. If necessary, the engine's power output is also reduced.

MSR: Engine drag torque control

The engine drag torque control (MSR) counteracts the tendency of the wheels to lock on smooth surfaces. The engine's drag torque generated by downshifts or abrupt load changes can lock the driven wheels (especially on surfaces with a low coefficient of friction).

The wheel-speed sensors tell MSR as soon as the wheels are about to lock. MSR then briefly reduces the engine's drag torque by opening the throttle slightly.

Advantage: The drive wheels retain their lateral stability in overrun mode.

DBC: Dynamic brake control

Dynamic brake control (DBC) assists in emergency braking situations by automatically increasing the brake pressure.

Advantage: Shortest possible braking distances in emergency braking situations by achieving ABS regulation on all four wheels.

The brake pedal is frequently not depressed strongly enough in emergency braking situations. ABS regulation is then not activated.

In the following situations, the return pump increases the brake pressure until ABS regulation is activated:

- When the brake pedal is rapidly depressed with insufficient pedal force
- When the brake pedal is depressed slowly and the demand for deceleration is subsequently high, after one wheel reaches the ABS control threshold.

Which wheel locks first depends on load and coefficient of friction of the road surface.

Example of a typical situation:

The traffic slows, making light braking necessary at first, but then demands as short a stopping distance as possible.

Trailer stabilization control

Trailer stabilizing control detects when a trailer is rocking about its vertical axis. The system functions at a speed of about 65 km/h when the trailer socket is in use.

With the aid of the DSC sensors, Dynamic Stability Control (DSC) monitors the vehicle's yaw behavior.

If the trailer's rocking motion exceeds the limit, the engine output is reduced. In addition, DSC brakes all four wheels automatically.

If DSC is deactivated or faulty, then the trailer stabilizing control does not work either.

HDC: Hill Descent Control

Hill descent control (HDC) is an automatic cruise control system on **all-wheel-drive vehicles** for driving downhill.

HDC automatically reduces the vehicle's speed. The brakes are applied on all four wheels to reduce road speed to just above walking pace. This allows stable downhill driving on steep and slippery surfaces.

HDC holds this speed constant (all DSC functions remain active).

The vehicle's road speed can be continuously varied within the specified values by depressing the accelerator pedal and brake pedal or the cruise-control system steering-column stalk.

- > E60, E61

HDC can be switched on and off at the Central Information Display (CID): "Settings" menu and "Vehicle settings" submenu.

At the factory, HDC is assigned to the lower freely programmable button on the multi-function steering wheel.

- > E83 and E90, E91, E92

HDC can be activated and deactivated via a separate button in the SZM (center console switch cluster).

ELECTRONICALLY CONTROLLED DECELERATION

The electronically controlled deceleration (ECD) reacts to a demand from Active Cruise Control (ACC).

When the ACC system requires deceleration, DSC responds by applying the disc brakes on all four wheels (maximum rate of retardation 2.5 m/s^2).

When the car is on a decent with the speed preset by the driver, ECD automatically applies the brakes in order to keep the car's speed constant at the preset value.

When the brakes are applied automatically in this way, the brake lights are activated in accordance with the requirements of road-safety legislation.

The light module does not activate the brake lights unless the vehicle's rate of deceleration is greater than 1 m/s^2 . This prevents the brake lights from flickering on and off.

All-wheel control

Dynamic Stability Control (DSC) specifies the nominal value for xDrive all-wheel control. The DSC control unit calculates the locking moment for the multi-plate clutch in the transfer box.

The nominal value depends on the vehicle's tendency to oversteer or understeer and wheelslip. The nominal value is sent via the PT-CAN to the VTG control unit.

The VTG control unit reports the actual set locking moment back to the DSC control unit.

The DSC control unit calculates the locking torque for the multi-plate clutch as follows:

- Pre-activation = driver's command
- Driving dynamic control
- Detection of different tyre rolling circumferences

RPA: Run Flat Indicator

The Run Flat Indicator (RPA) is not a dynamic driving control function.

RPA is integrated into the DSC control unit as 4 wheel-speed signals are needed for this function.

By comparing the speed signals for all four wheels, the system detects differences in rolling circumference at the individual wheels. This enables a gradual drop in pressure to be detected.

CBS: Condition Based Service

CBS is not a driving dynamic function.

Condition Based Service, as the name suggests, is a means of ensuring that the car is serviced as and when necessary. CBS comprises various maintenance operations, e.g. engine oil, spark plugs and brake pads.

The remaining distance for the front and back brake pads are calculated separately in the DSC control unit.

When making the calculation, the condition of the brake pad wear sensors is taken into account (reference point at 6 mm and 4 mm).

OPERATION

- > E60, E61, E63, E64 and E83

The DTC button is located in the center console switch cluster (SZM).

- > E90, E91, E92

The DTC button is located between the central air vents in the instrument panel.

The DTC button has 2 functions that can be set by pressing the button for different lengths of time.

DTC BUTTON FUNCTIONS REFERENCE

Press button	Function	Remarks
short < 3 seconds	DTC function activated.	DTC indicator light on. DSC indicator and warning light on.
long > 3 seconds	DSC is completely deactivated	DSC indicator and warning light on. This mode is intended for service work (e.g. brake dynamometer).

NOTE:

Reactivating DSC

Briefly pressing the button again reactivates the DSC function. The DSC indicator and warning light goes out (unless a fault has developed in the system).

If the DTC button is pressed for longer than 10 seconds (e.g. by a handbag on the center console), DSC will recognize an operating error. The DSC function remains active and cannot be deactivated until the ignition has been switched off and on again.

BRAKES

Brakes - Special Tools - X3

34 BRAKES

34 1 050 FIXTURE

Note: For turning back brake piston when fitting new brake pads, disc brakes front and rear

Series: E12, E21, E23, E24, E28, E30, E31, E32, E34, E36, E38, E39, E52, E53, E60, E61, E63, E64, E65, E66, E67, E83, E85, E86, E87, E90, E91, E92, E93, RR2

Order number: 34 1 050

Fixture

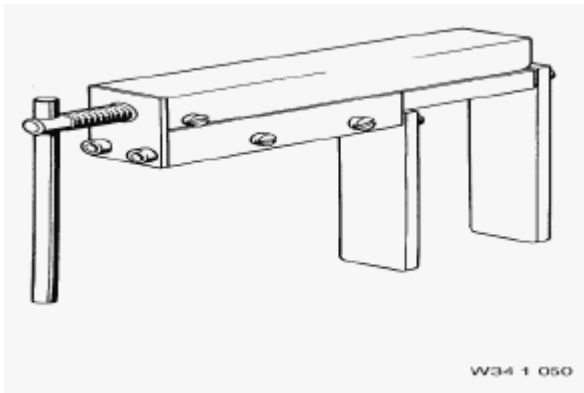


Fig. 1: Fixture (34 1 050)

Courtesy of BMW OF NORTH AMERICA, INC.

34 1 090 STEEL WIRE BRUSH

Note: (1 set = 3 x) For cleaning brake pad guides

Series: All models

SI number: 1 12 00(595)

Order number: 34 1 090

Steel wire brush

Consisting of:

1 = 34 1 091 Cleaning brush

Note: (1 x)

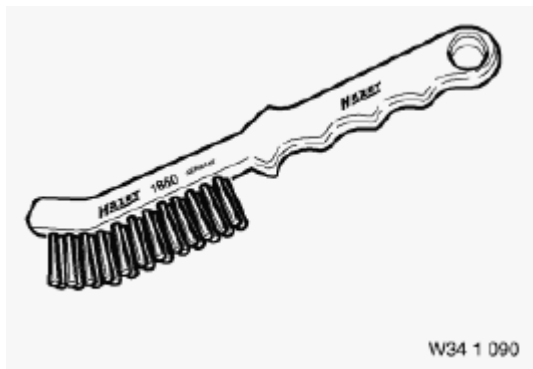


Fig. 2: Steel Wire Brush (34 1 090)

Courtesy of BMW OF NORTH AMERICA, INC.

34 1 260 BRAKE LINING MEASURING GAUGE

Minimum set: Mechanical tools

Note: For measuring brake lining thickness without removing wheels.

Series: E38, E39, E46, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53, R56

SI number: 1 12 95 (992)

Order number: 34 1 260

Brake lining measuring gauge

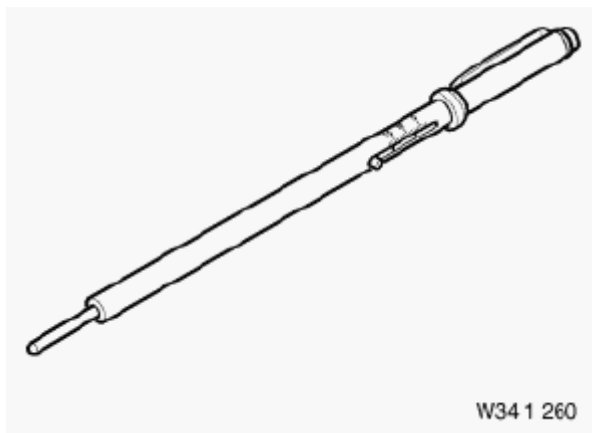


Fig. 3: Brake Lining Measuring Gauge (34 1 260)

Courtesy of BMW OF NORTH AMERICA, INC.

34 1 280 SLIDING CALIPER

Note: For measuring brake disk thickness.

Series: E31, E32, E34, E36, E38, E39, E46, E52, E53, E60, E61, E63, E65, E66, E67, E83, E85, E87, E90, E91, RR2

Order number: 34 1 280

Sliding caliper

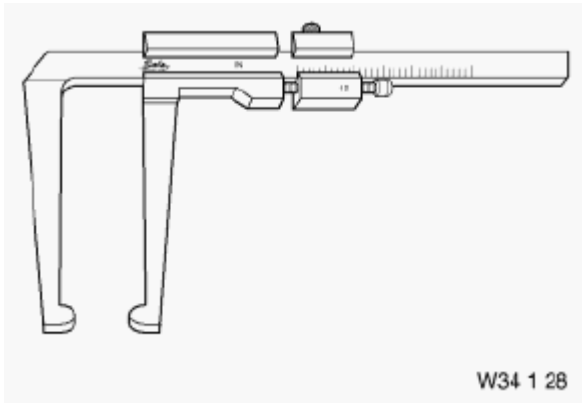


Fig. 4: Sliding Caliper (34 1 280)

Courtesy of BMW OF NORTH AMERICA, INC.

34 3 100 BRAKE BOOSTER TESTER

Note: For testing vacuum of brake booster

Series: E12, E21, E23, E24, E28, E30, E31, E32, E34, E36, E38, E39, E46, E52, E60, E61, E63, E64, E65, E66, E67, E83, E85, E87, E90, R50, R52, R53

Order number: 34 3 100

Brake booster tester

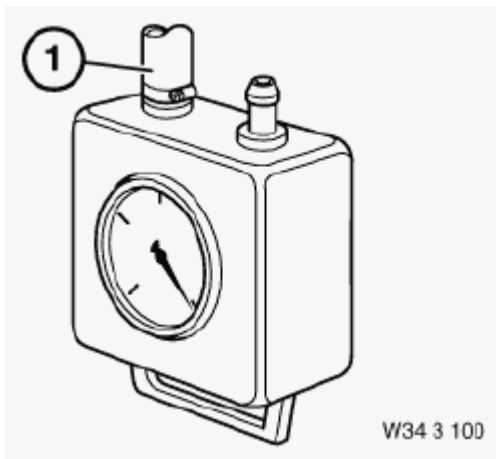


Fig. 5: Brake Booster Tester (34 3 100)

Courtesy of BMW OF NORTH AMERICA, INC.

34 4 000 ALLEN KEY

Note: For removing and installing handbrake shoe retaining spring as well as ABS pulse generator

Series: E12, E21, E23, E24, E28, E30, E31, E32, E34, E36, E38, E39, E52, E53, E60, E61, E63, E64, E65, E66, E67, E83, E85, E86, E87, E90, E91, E92, E93, RR1, RR2

Order number: 34 4 000

Allen key



Fig. 6: Allen Key (34 4 000)

Courtesy of BMW OF NORTH AMERICA, INC.

34 5 100 BENDING FIXTURE

Note: For brake lines

Series: E12, E21, E23, E24, E28, E30, E31, E32, E34, E36, E38, E39, E46, E52, E60, E61, E63, E64, E65, E66, E67, E83, E85, E86, E87, E90, E91, E92, E93

Order number: 34 5 100

Bending fixture



Fig. 7: Bending Fixture (34 5 100)

Courtesy of BMW OF NORTH AMERICA, INC.

BRAKES

Brakes - Technical Data - X3

11 FRONT BRAKES

34 11 FRONT BRAKE E83

TECHNICAL DATA - FRONT BRAKE E83

Thickness difference inside the braking surfaces (only with precision-turned brake disc!)	max. mm	0.01
Max. machining limit per friction ring side (M vehicles and perforated brake discs must not be machined). Brake disc minimum thickness (MIN TH) must not be undershot.	mm	0.8
Nominal size (diameter x thickness)	mm	332x30
Brake disk minimum thickness (MIN TH) stamped on brake disk body	mm	28.4
Nominal size (diameter x thickness)	mm	325x25
Brake disk minimum thickness (MIN TH) stamped on brake disk body	mm	23.4
Wear warning from residual lining thickness	mm	3.0

21 REAR BRAKES

34 21 REAR BRAKE DISCS E83

TECHNICAL DATA - REAR BRAKE DISCS E83

Thickness difference inside the braking surfaces (only with precision-turned brake disc!)	max. mm	0.01
Brake disc diameter	mm	320
Wear warning from residual lining thickness	mm	3.0
Brake disk minimum thickness (MIN TH) stamped on brake disk body	mm	20.4

Max. machining limit per friction ring side (M models must not be machined!)	mm	0.8
--	----	-----

41 PARKING BRAKE

34 41 PARKING BRAKE E83

TECHNICAL DATA - PARKING BRAKE E83

Handbrake drum diameter	mm	185
Minimum lining thickness	mm	1.5

BRAKES

Brakes - Tightening Torques - X3

00 BRAKE TESTING AND BLEEDING

34 00 TESTING AND BLEEDING BRAKES

TESTING AND BLEEDING BRAKES - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Vent valve	E39 / E38 / E46 / E52 / E53 / E83 / E85 / E86 / E65 / E66 / E67 / E60 / E61 / E63 / E64		Width across flats 7	3,5-5,0 Nm
			Width across flats 9	7-11 Nm
			Width across flats 11	12-16 Nm

11 FRONT BRAKES

34 11 FRONT BRAKE

FRONT BRAKE - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Brake disk to wheel hub (contact faces between brake disk and wheel hub cleaned and grease-free)	E39 / E38 / E46 / E52 / E53 / E85 / E86 / E83 / E65 / E66 / E67 / E60 / E61 / E63 / E64			16 Nm
2AZ Brake caliper to steering knuckle (screws lightly oiled, contact surfaces between brake caliper and steering knuckle cleaned and grease-free)	E34 / E36 / E32 / E31 / E38 / E39 / E46 / E52 / E53 / E65, E30 / 325iX, E66 / E67 / E83 / E85 / E86 / E60 / E61 / E63 / E64			110 Nm
2AZ with aluminum brake caliper	E31			115 Nm
	E12 / E21 / E23 / E24 to 5.82			95 Nm
	E28 / E30 / E24 / from 5.82			123 Nm
3AZ Guide bolt	E39 / E38 / E46 / E52 / E53 / E85 / E86 / E83 / E65 / E66 / E67 / E60 / E61 / E63 / E64	wrench size 7 mm		30-5 Nm
4AZ Bolts to guide pin (always replace)	E30			35 Nm
5AZ Protective plate to steering knuckle	E85 / E86 / E83	M6		9 Nm
	E67 / E60 / E61 / E63 / E64 / E65 / E66	M6		12 Nm

21 REAR BRAKES

34 21 REAR BRAKE

REAR BRAKE - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Brake drum/disc to wheel hub	E39 / E38 / E46 / E52 / E53 / E83 / E85 / E86 / E65 / E66 / E67 / E60 / E61 / E63 / E64			16 Nm
2AZ Wheel brake cylinder to brake anchor plate	E36			10 Nm
3AZ Brake carrier on semi-trailing arm/wheel carrier	E65 / E66 / E67 / E60 / E61 / E63 / E64			110 Nm
	E46 / E85 / E86 / E86			65 Nm
	E83	M10	Replace micro-encapsulated screws	65 Nm
5AZ Guide bolt	E39 / E38 / E46 / E52 / E53 / E83 / E85 / E86 / E65 / E66 / E67 / E60 / E61 / E63 / E64	wrench size 7 mm		30 - 5 Nm
6AZ Protective plate to wheel carrier	E85 / E86 / E83	M6		9 Nm
	E85 / E86 / E83	M8		15 Nm
	E60 / E61 / E63 / E64 / E65 / E66 / E67	M6		12 Nm

31 MASTER BRAKE CYLINDER

34 31 BRAKE MASTER CYLINDER

BRAKE MASTER CYLINDER - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Brake master cylinder to brake booster (vacuum)	E30			24 Nm
	E32		Replace self-locking nut.	21 Nm
	E28 / E34 / E36 / E46 / E38 / E39 / E52 / E53 / E85 / E86 / E83		Replace self-locking nut.	26 Nm
	E65 / E66 / E60 / E61 / E63 / E64		Replace self-locking nut. Retighten after 30 minutes.	26 Nm
2AZ Brake master			Replace hexagon socket head	

cylinder to brake booster hydraulic	E31 / E32 / E34 / E24		screw with a hexagon screw, refer to	28 Nm
3AZ Expansion tank to brake master cylinder	E36 / E46 / E85 / E86			3,5 Nm
	E83 / E60 / E61 / E63 / E64			8 ±2 Nm

32 BRAKE LINES

34 32 BRAKE LINES

BRAKE LINES - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Brake hose couplings	E36 / E38 / E39	M10 x 1		18 Nm
	E53 / E60 / E61 / E63 / E64 / E65 / E66 / E67 / E83 / E85 / E86	M10 x 1		14 Nm
	E36 / E38 / E39	M12 x 1		18 Nm
	E53 / E60 / E61 / E63 / E64 / E65 / E66 / E67 / E85 / E86	M12 x 1		14 Nm
2AZ Brake hose to brake caliper, front and rear	E85 / E83 / E86			19 Nm
3AZ Bracket to trailing arm	E85 / E86 / E83	M6		9 Nm
	E85 / E86	M5		5 Nm
4AZ Brake hose to brake caliper, front	E53 / E60 / E61 / E63 / E64 / E65 / E66 / E67	M10 x 1		24 ±2 Nm
5AZ Brake hose to brake caliper, rear	E53	Banjo bolt M10 x 1		40 Nm
	E60 / E61 / E63 / E64 / E65 / E66 / E67	M10 x 1		24 ±2 Nm
6AZ Brake lines to master brake cylinder / hydraulic unit	E83			17 Nm

33 BRAKE BOOSTER

34 33 BRAKE BOOSTER

BRAKE BOOSTER - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
10AZ Hydraulic pipe to pressure reservoir on power flow regulator	E31 / E32			47 Nm
11AZ Hydraulic pipe to pressure reservoir	E31 / E32			40 Nm

12AZ Brake booster to pedal assembly console	E85 / E86	M8	Retighten 1x after 30 minutes on brake booster	22 Nm
	E36 / E46			25 Nm
	E38 / E39 / E52 / E53			31 Nm
	E65 / E66 / E67 / E60 / E61 / E63 / E64 / E83		Retighten 1x after 30 minutes on brake booster	26 Nm

41 PARKING BRAKE

34 41 PARKING BRAKE

PARKING BRAKE - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Handbrake lever to body	E52 / E53 / E60 / E61 / E63 / E64			21 Nm
2AZ Housing cover to parking brake	E65 / E66 / E67			2 Nm
3AZ Actuating unit and control unit of parking brake	E65 / E66 / E67			4 Nm
4AZ Mounting pan to tunnel	E85 / E86	M6		8 Nm
5AZ Spring clip to wheel carrier	E60 / E61 / E63 / E64	M6		8 Nm
6AZ Support Duo-Servo to wheel carrier, rear	E60 / E61 / E63 / E64	M10		60 Nm

51 MECHANICAL-HYDRAULIC COMPONENTS

34 51 SLIP CONTROL SYSTEM (ABS, ASC+T, DSC)

SLIP CONTROL SYSTEM - TIGHTENING TORQUES (ABS, ASC+T, DSC)

	Type	Thread	Tightening specification	Measure
1 AZ Control unit on hydraulic unit	E46 (MK20)			2,6 Nm
	E46 / E85 / E86 / (MK60)			5+1 Nm
	E38 / E39 / E52 / E53 / E46 AWD / E65 / E66 / E67			2,9 Nm
	E60 / E61 / E63 / E64 / E83			3±0,3 Nm
2AZ Pressure sensor "V" and "H" to master brake cylinder	E46 / E85			25 + 5 Nm
Pressure sensor to hydraulic unit	E38 / E39			20 Nm
	E52 / E53 / E46 AWD / E65 / E66		Only with special tool 34 1 290	19 Nm
	E46 / E65 / E66 / E67 / E60 /			

3AZ Rotation rate sensor / DSC sensor to holder	E61 / E63 / E64 / E83 / E85 / E86			8 Nm
4AZ Bracket, rotation rate sensor to body	E46 / E85 / E86			8 Nm
5AZ Banjo bolt for pre-boost pump intake line to pre-boost pump	E46			20 Nm
6AZ Pulse generator to swivel bearing/wheel carrier	E52 / E53 / E46 / E85 / E60 / E61 / E63 / E64 / E67			8 Nm
	E39 / E38 / E65 / E66			9 Nm
7AZ Rotation rate sensor to body	E38 / E39			8,6 Nm
8AZ Rotation rate sensor to body	E52 / E53			8 Nm
9AZ Bracket to hydraulic unit	E52 / E53 / E46 / E85 / E86 / E83 / E60 / E61 / E63 / E64			8 Nm
10AZ Bracket, hydraulic unit to body	E52 / E53 / E46 / E85 / E86 / E83 / E60 / E61 / E63 / E64			8 Nm
11 AZ All screws to precharging pump and holder	E52 / E53 / E46 (M3) / E65 / E66	M6		8 Nm
12AZ Pressure sensor, front and rear for ACC, to brake line	E60 / E61 / E63 / E64			25 + 5 Nm

BRAKES

Disc - Repair Instructions - X3

00 BRAKE TESTING AND BLEEDING

34 00 ... GENERAL INFORMATION

The brake system is one of the most important safety systems on any motor vehicle. It is therefore essential to act with utmost care when working on the brake system and to follow the instructions below.

General:

- Ensure cleanliness and only use rags which do not lose lint.
- Wash away or vacuum up brake dust, do not clear it away using compressed air. This dust is a health hazard.
- Do not under any circumstances allow any oil or grease to get into the brake system. This would result in a complete malfunction of the brake system.
- When cleaning brake components with brake cleaner, do not allow brake cleaner to get into in the brake system.
- Even the most minute traces of brake cleaner must be avoided.

Brake fluid:

- Replace brake fluid at least every two years.
- Never reuse drained brake fluid.
- Always use BMW-approved brake fluid.
- Dispose of brake fluid in approved appliances only.
- Do not allow brake fluid to drain into drain pipes, into the outside environment or into unsuitable facilities. This would create the risk of groundwater contamination since brake fluid is classed as a fluid that is hazardous to water.
- Do not allow brake fluid to come into contact with paintwork as this will destroy the paint.
- Brake fluid must not be allowed to remain on bare skin too long in order to avoid skin problems. Wash skin coated with brake fluid with water and soap.
- If brake fluid makes contact with eyes, immediately flush with large quantity of clean water and visit eye doctor.

Wheel brakes:

- Brake pads:

Brake pads must be replaced when the warning threshold of the brake pad wear indicator is reached, see **34 11 ... Overview of front brakes.**

Brake pads must always be replaced on both sides of any axle.

The friction surfaces of the brake pads must not come into contact with oil or grease. The brake pads must be replaced if they are fouled by such substances.

In the case of rotation-dependent brake pads, make sure the arrow marking points in the direction of rotation of the brake disk for when the vehicle is moving forward. Brake pads with left/right markings must be fitted on the relevant side of the vehicle.

One-sided angled areas on the brake pads must be located on the disk contact side of the brake caliper for when the vehicle is moving forward.

- Brake discs:

Brake disks must not be scored or cracked. Furthermore, minimum brake disk thickness, disk runout, parallelism and surface roughness of the friction surfaces must not exceed or drop below the permitted values, see **34 11 ... Overview of front brakes**.

Always strip preservative off new parts before installation. With the rear brake discs, also strip preservative off brake drum on parking brake.

- Always strip preservative off new parts before installation.
- Brake calipers:

Only approved pastes on the basis of glycol must be used for repairs on brake calipers.

All moving parts on the brake caliper must move freely: note grease specifications.

Use only BMW-approved lubricants to grease caliper guides.

Brake lines, brake hoses:

- Brake lines and brake hoses must be correctly routed and must not abut with body or components in a way which would cause chafing.
- To prevent damage, release and tighten brake line couplings with a special brake line wrench only.
- The system must be bled each time any brake lines have been detached.
- All connection points must be checked for leaks.
- Only tighten down brake hoses on the front axle when wheels are in straight-ahead position.
- Close off open connections of brake lines and individual components to prevent dirt from getting into the brake system.
- When tightening down brake line couplings, observe tightening torque: 34 32 1AZ, see **34 32 BRAKE LINES** .

Wheel-slip control system:

The wheel-slip control system is essentially maintenance-free; however the following must be observed:

- When carrying out welding work with electric welding equipment, be sure to disconnect the plug from the electronic control unit (ignition turned off).
- During painting work, the control unit may be subjected for brief periods to loads of max. 95°C and for long periods (approx. 2 hours) to loads of max. 85°C.
- Terminals must be completely tight on end poles of battery.
- Brake lines on hydraulic unit must not be swapped over: if applicable, mark them prior to disassembly.

On completion of repair work, carry out swap-over test with the DIS diagnosis system.

34 00 ... GENERAL INFORMATION ON BRAKING IN NEW BRAKE DISCS / BRAKE PADS

IMPORTANT: After completing work:

- **Carry out function check on brake analyzer (test stand) to ensure that the brakes complies with legal requirements.**
- **Carry out test braking while driving at low speed; the effectiveness of the brakes may be reduced during the initial braking operations.**
- **Exaggerated drastic and continuous braking operations for faster braking in are not permitted.**
- **Advise the customer not to perform any wilful drastic braking in the first 200 km after brake replacement.**
- **Attach mirror tag to interior rearview mirror.**

34 00 ... TESTING AWD VEHICLES ON DYNAMIC BRAKE AND POWER ANALYZERS (E30, E34, E46, E53, E83, E60, E61, E90, E91, E92)

NOTE: Running AWD vehicles on dynamic brake analyzers is governed by different instructions, depending on the vehicle model.

IMPORTANT: Power measurements on single-axle roller dynamometers are generally not permitted as total failure of the transfer case cannot be ruled out during such measurements.

In order to test AWD vehicles on dynamic brake analyzers, it is essential to follow various measures in accordance with the special instructions in Appendices 1 to 5 for the vehicles in question:

1. E30 AWD
2. E34 AWD
3. E46 AWD
4. E53 X5
5. E83 X3
6. E60 / E61 AWD
7. E90 / E91/ E92 AWD

34 00 009 CHECKING BRAKES ON TEST STAND

- NOTE:**
1. Check tires for damage
 2. Check tire treads
 3. Check tire pressure

Follow Brake testing instructions for E83 (X3).

You must follow without fail the guidelines contained in the operating instructions of the relevant test stand manufacturer.

IMPORTANT: Only brake test stands (analyzers) with test speeds of 2.5 - 6 km/h may be used.

Before driving onto the brake test stand (dynamic brake analyzer), switch off the Hill Descent Control (HDC) and keep it switched off while testing the brakes.

The HDC indicator lamp must not light up!

NOTE: It is possible for the HDC indicator lamp to go out or not to light up even when HDC mode is activated if HDC is temporarily unavailable on account of high operating temperature.

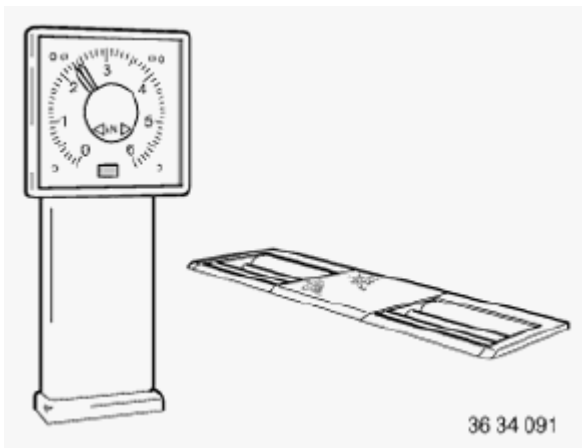


Fig. 1: Brake Test Stands

Courtesy of BMW OF NORTH AMERICA, INC.

- IMPORTANT:**
- Vehicles with manual transmission and XDrive:
Do not select a gear and do not accelerate.
 - Vehicles with automatic transmission and XDrive:

Carry out brake testing with selector lever in N position (Neutral) only.

Do not accelerate when the rollers start up.

Failure to comply with this instruction may result in damage to the test stand or to the vehicle.

34 00 010 CHECKING THICKNESS OF BRAKE PAD

Special tools required:

- 34 1 260 BRAKE LINING MEASURING GAUGE

NOTE: The thickness of the outer brake pads can be determined without removing the wheels.

If necessary, move car until opening for brake pad wear indicator (brake pad) can be seen through rim styling.

Insert special tool 34 1 260 through rim into opening for brake pad wear indicator.

Press special tool onto brake pad. Slide ring (1) in direction of arrow up to stop and read off measured value.

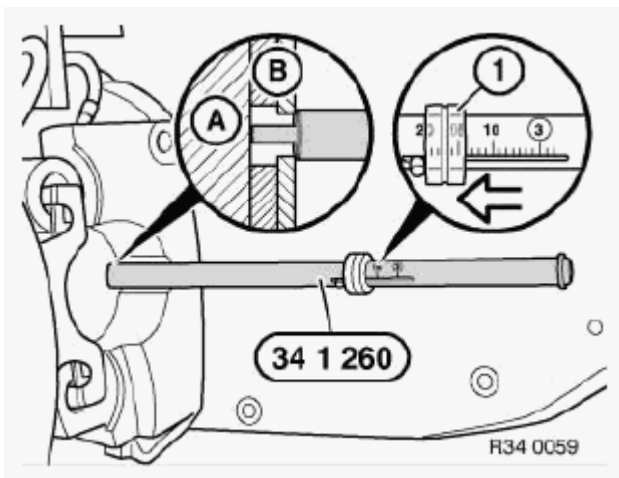


Fig. 2: Special Tool (34 1 260)

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: A. Brake disk
B. Brake pad with backplate

Safe limit for lining wear, front brake, see 34 11 FRONT BRAKE E83 .

Safe limit for lining wear, rear brake, see 34 21 REAR BRAKE DISCS E83 .

34 00 025 REPLACING FLUID IN ABS/ASC+T BRAKE SYSTEM

NOTE: Read and comply with General Information, see 34 00 ... General Information.

IMPORTANT: When carrying out repairs to the brake system, follow the procedure set out in Bleeding brake system with DSC, see 34 00 050 Bleeding brake system with DSC.

Connect brake fluid changer to expansion tank and switch on.

NOTE: Check relevant Operating Instructions for each device.

Charging pressure should not exceed 2 bar.

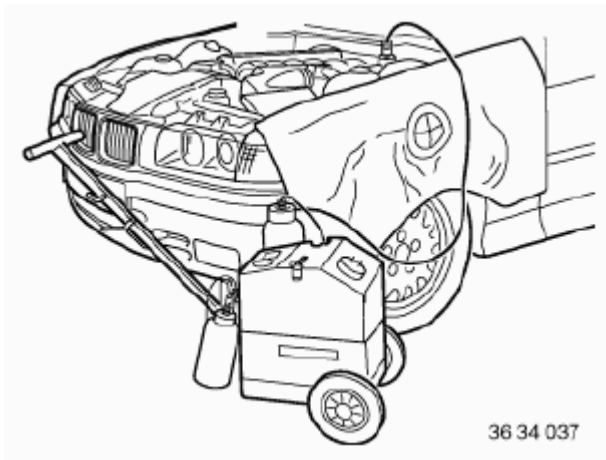


Fig. 3: Connecting Brake Fluid Changer To Expansion Tank
Courtesy of BMW OF NORTH AMERICA, INC.

Flushing brake system completely

Connect bleeder hose with collecting tray to bleeder valve on rear right brake caliper.

Open bleeder valve and purge until clear, bubble-free brake fluid emerges.

Close bleed valve.

Follow same procedure on rear left, front right and front left wheel brake.

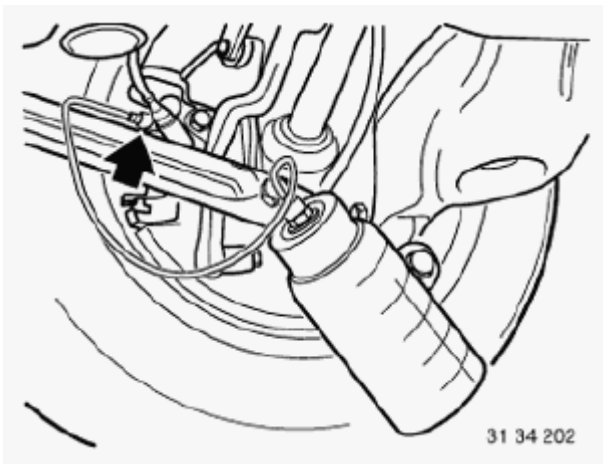


Fig. 4: Brake Flushing System

Courtesy of BMW OF NORTH AMERICA, INC.

The clutch slave cylinder must also be scavenged in vehicles with manual transmissions.

Switch off brake fluid changer and remove from expansion tank.

Check brake fluid level.

Close expansion tank.

NOTE: Pay attention to rubber seal (1) in sealing cap.

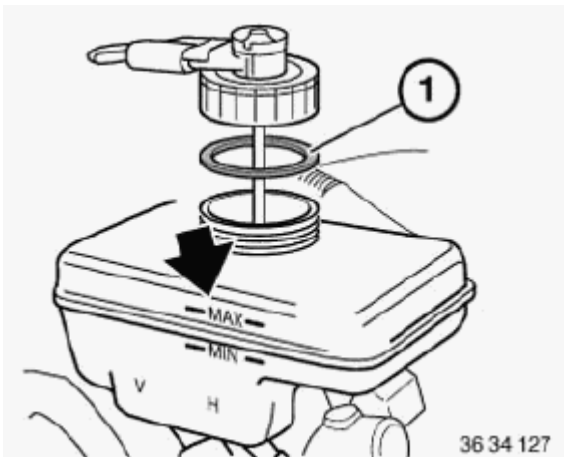


Fig. 5: Locating Rubber Seal In Sealing Cap

Courtesy of BMW OF NORTH AMERICA, INC.

34 00 050 BLEEDING BRAKE SYSTEM WITH DSC

NOTE: Read and comply with General Information, see 34 00 ... General Information.

When replacing or repairing, observe the filling and bleeding instructions for the following parts:

1. Tandem brake master cylinder
2. Hydraulic unit DSC3
3. and components/connecting lines which are fitted between these assemblies.

After work has been completed on the precharging pump, only the front-axle brake circuit has to be bled. Activate precharging pump once with Diagnosis and Information System (DIS).

(Bleeder unit connected with max. 2 bar filling pressure).

After completing work: Carry out final check with DIS under menu item "Service functions".

Contrary to the instructions in the DIS, the bleeding routine must be restarted on each wheel.

A second person is needed to help carry out this work.

Connect DIS.

Call up service function "Bleeding ABS/DSC3 Hydraulics".

Connect bleeder unit to expansion tank and switch on.

NOTE: Check relevant Operating Instructions for each device.

Charging pressure should not exceed 2 bar.

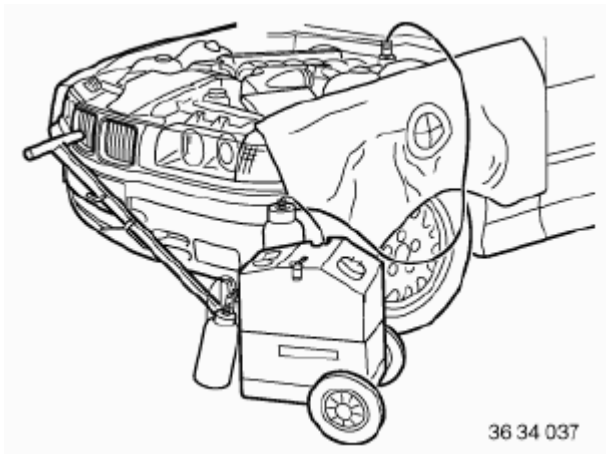


Fig. 6: Connecting Brake Fluid Changer To Expansion Tank
Courtesy of BMW OF NORTH AMERICA, INC.

Flushing brake system completely

Connect bleeder hose with collecting tray to bleeder valve on rear right brake caliper.

Open bleeder valve and purge until clear, bubble-free brake fluid emerges.

Close bleed valve.

Follow same procedure on rear left, front right and front left wheel brake.

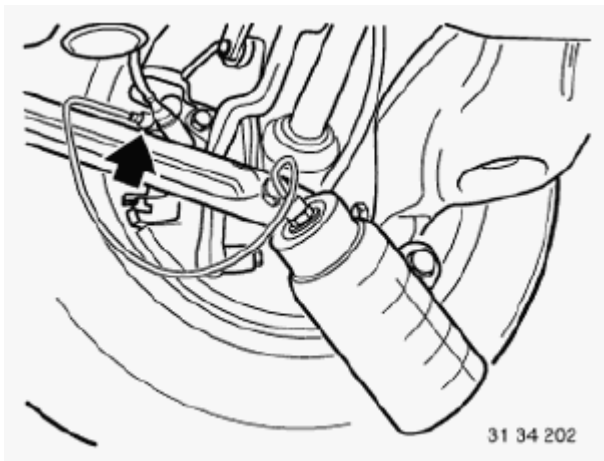


Fig. 7: Brake Flushing System

Courtesy of BMW OF NORTH AMERICA, INC.

Bleeding rear-axle brake circuit

Connect bleeder hose with collecting tray to bleeder valve on rear right brake caliper.

Close bleeder valve.

Run bleeding routine with DIS with bleeder valve open.

After completing routine, press brake pedal 5 times to floor; clear and bubble-free brake fluid must flow out.

Close bleed valve.

Repeat procedure at rear left.

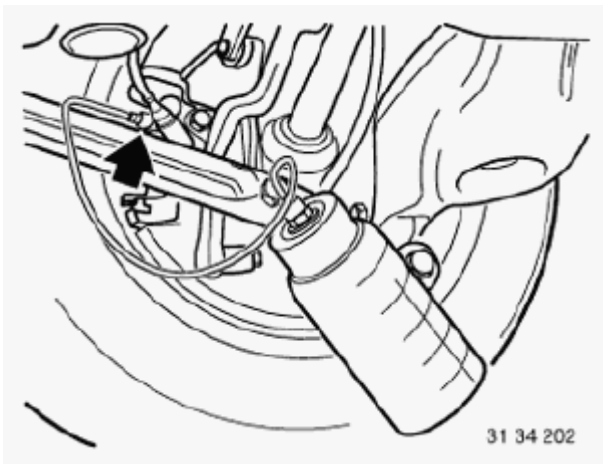


Fig. 8: Brake Flushing System
Courtesy of BMW OF NORTH AMERICA, INC.

Bleeding front-axle brake circuit

Connect bleeder hose with collecting tray to bleeder valve on front right brake caliper.

Close bleeder valve.

Run bleeding routine with DIS with bleeder valve open.

After completing routine, press brake pedal 5 times to floor, clear and bubble-free brake fluid must flow out.

Close bleed valve.

Repeat procedure at front left.

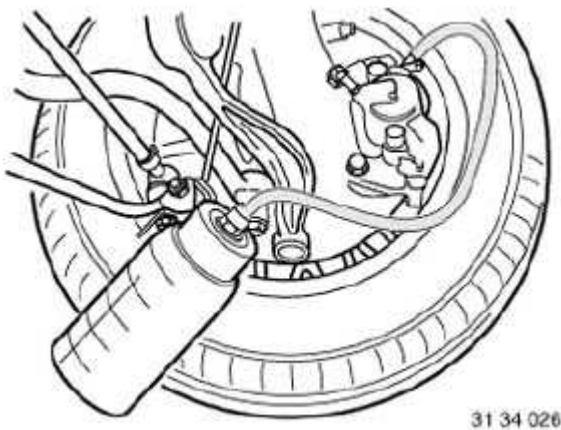


Fig. 9: Bleeding Front-Axle Brake Circuit
Courtesy of BMW OF NORTH AMERICA, INC.

Switch off bleeder unit and remove from expansion tank.

Check brake fluid level.

Close expansion tank.

NOTE: Pay attention to rubber seal (1) in sealing cap.

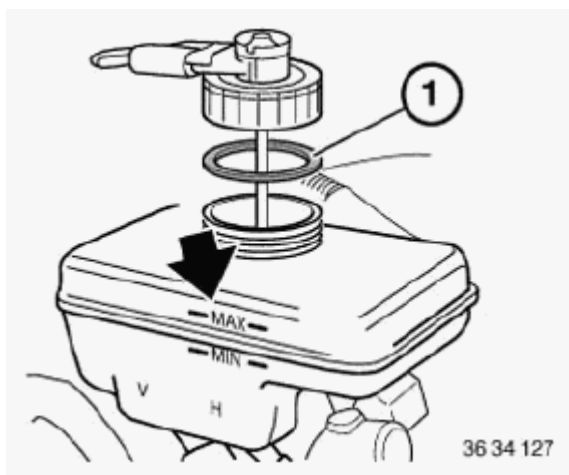


Fig. 10: Locating Rubber Seal In Sealing Cap

Courtesy of BMW OF NORTH AMERICA, INC.

10 HAND BRAKE

34 10 014 ADJUSTING HANDBRAKE

Special tools required:

- **32 1 030 LEVER**

Perform inspection in the following manner:

When 1st ratchet is engaged, no braking force should be exerted.

The difference in wheel circumferential forces between the left and right wheels may deviate by max. 30 % from the greater value (measured on brake analyzer).

In event of larger deviations of wheel circumferential force: carry out readjustment.

It must be possible to brake with locked wheels with the handbrake.

The handbrake must be readjusted whenever the actuation stroke is greater than 10 teeth.

NOTE: The handbrake can only be adjusted correctly when the parking brake Bowden cables and all moving handbrake parts are free to move and fully operational.

Basic handbrake adjustment is necessary:

- Replacing parking brake shoes.
- Replacing brake disks.
- Excessive actuation stroke (10 teeth).
- Replacing handbrake Bowden cables.

1. **Setting instruction for brake shoes (basic setting)**

Lock adjuster unit (ASZE).

Using special tool 32 1 030 , press stop (1) of adjusting spring back to such an extent that retaining hook (2) engages in stop (1).

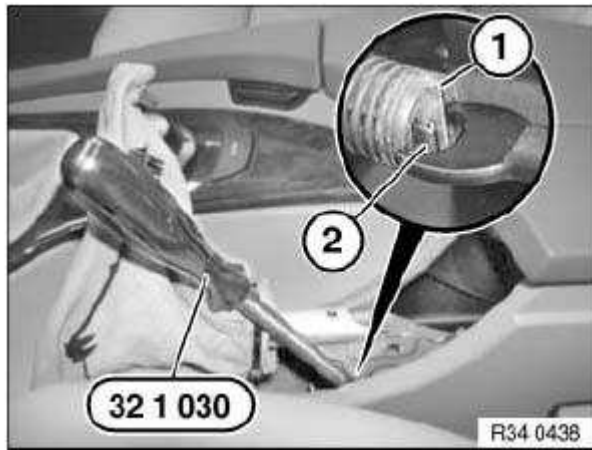


Fig. 11: Special Tool (32 1 030) With Retaining Hook
Courtesy of BMW OF NORTH AMERICA, INC.

Completely unscrew one wheel stud on each rear wheel.

Installation:

Tightening torque: 36 10 1AZ, see **36 10 WHEELS** .

Turn wheel until adjustment screw is visible in tapped hole.



Fig. 12: Locating Wheel Stud On Each Rear Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

Turn adjusting screw with a screwdriver until the wheel is no longer able to turn.

Then unfasten the adjusting screw 6 notches.

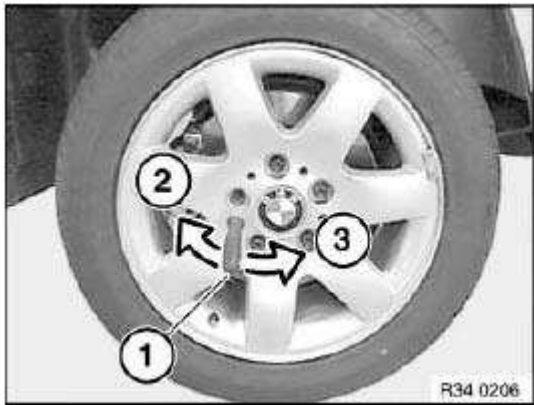


Fig. 13: Turning Wheel Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock adjuster unit (ASZE).

Lever restraint hook (2) outwards with a suitable screwdriver (1).

Restraint hook (2) must disengage from stop of adjusting spring.

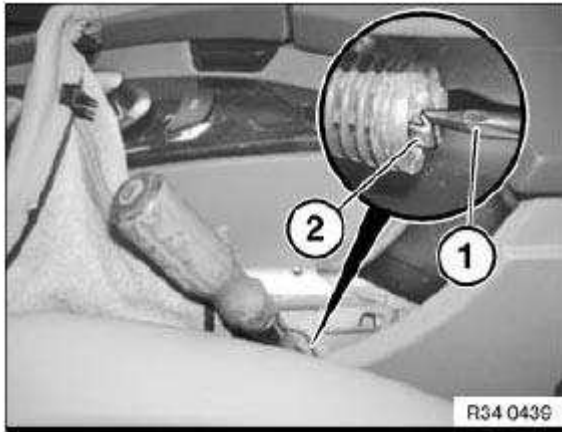


Fig. 14: Restraint Hook With Screwdriver
 Courtesy of BMW OF NORTH AMERICA, INC.

**IMPORTANT: Follow instructions for Brake testing on test stand, see 34 00 009
Checking brakes on test stand.**

2. Setting instruction for parking brake Bowden cables

The handbrake lever must be applied 5 times to approx. 400N actuating force.

1. On brake analyzer

0th tooth (handbrake released): Vehicles with manual transmission: Shift lever in neutral position.

Vehicles with automatic transmission: Selector lever in Nth position.

- Without locking differential $< \text{ or } = 150 \text{ N}$.
- With locking differential $< \text{ or } = 200 \text{ N}$ (possibly odd display).

1st tooth: No increase in braking force with regard to 0th tooth. Indicator lamp can be lit.

2nd tooth: An increase in braking force must take place, indicator lamp must be lit.

3rd tooth: Increase in braking force.

5st tooth: The brake force display must have reached $< \text{ or } = 500 \text{ N}$.

3. Braking in the duo-servo parking brake

The following braking-in procedures are applicable in case of insufficient braking effect or after replacing brake disks and/or brake shoes.

1. On brake analyzer

Apply handbrake lever until wheel circumferential force on first wheel is 800 N.

Lock lever in next lower tooth.

Release handbrake lever after approx. 2 minutes.

2. **When driving on road**

(If possible inside the company grounds or on an unused road)

At approx. 40 km/h, apply handbrake lever until braking action can be felt.

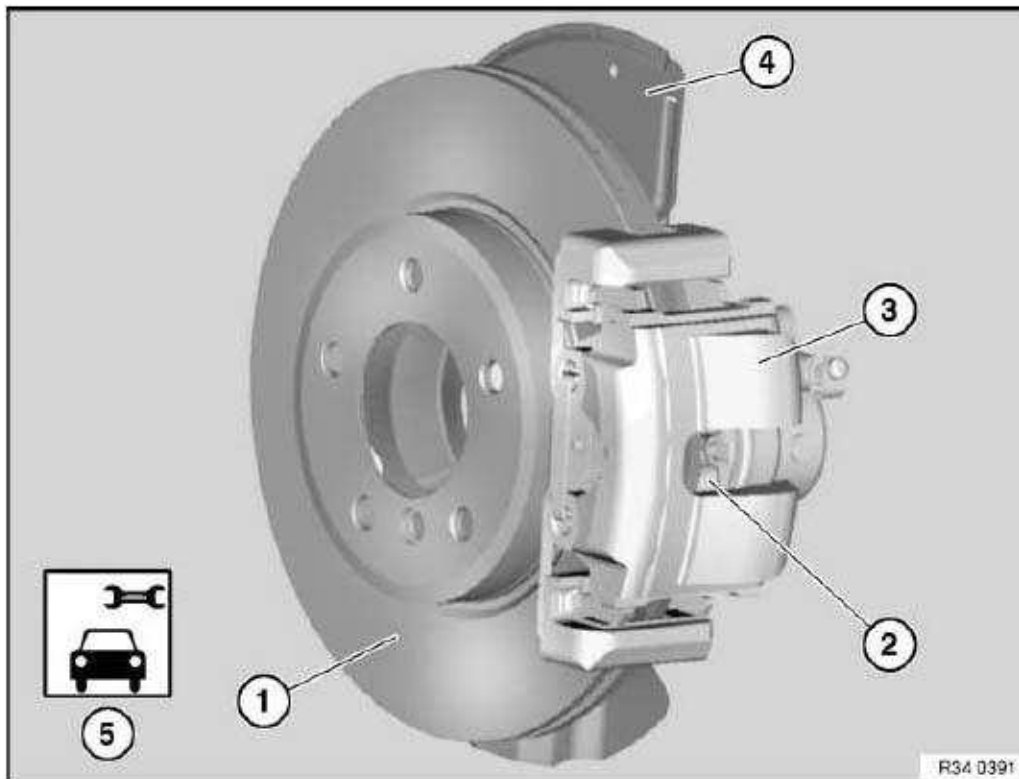
Pull up handbrake lever into next notch and drive on for approx. 400 m.

A basic requirement is that handbrake is adjusted uniformly.

NOTE: Repeat braking-in procedure if necessary; allow brake to cool down sufficiently.

11 FRONT BRAKES

34 11 ... OVERVIEW OF FRONT BRAKES



- 1 Brake disk
- 2 Brake pad
- 3 Brake caliper

- 4 Brake guard plate
- 5 Checking thickness of brake lining

Fig. 15: Front Brakes Components

Courtesy of BMW OF NORTH AMERICA, INC.

34 11 000 REMOVING AND INSTALLING/REPLACING BRAKE LININGS OF BOTH FRONT DISC BRAKES

Necessary preliminary tasks:

- Remove wheels, see 36 10 300 REMOVING OR INSTALLING FRONT OR REAR WHEEL .

NOTE: **After completing work:**

- Fully depress brake pedal several times so that brake linings contact brake discs.
- When installing new brake linings at front and rear axles, brake fluid level must be brought up to "MAX" marking.
- Read and comply with notes on braking in new brake discs / brake pads, see 34 00 ... General information on braking in new brake discs / brake

pads.

Lift out retaining spring (1).

Left:

Disconnect plug connection for brake lining wear sensor.

If necessary, replace brake lining wear sensor, see [34 35 001 Replacing a brake lining sensor.](#)

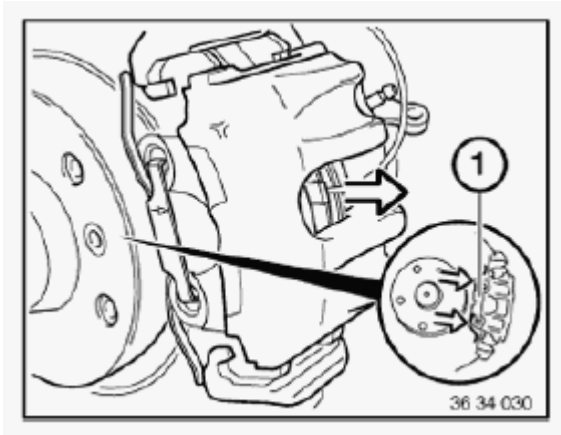


Fig. 16: Retaining Spring

Courtesy of BMW OF NORTH AMERICA, INC.

Remove plastic plugs (2).

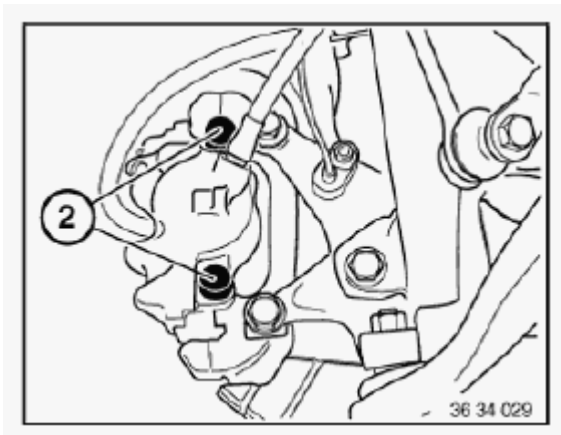


Fig. 17: Plastic Plugs

Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten guide screws (1) and lift out brake caliper towards rear of vehicle. Do not allow brake caliper to hang from brake hose, risk of damage to brake hose.

Installation:

Only clean guide screws; do not grease.

Check threads.

Replace all guide screws which are not in perfect condition.

Installation:

Tightening torque: 34 11 3AZ, see **34 11 FRONT BRAKE** .

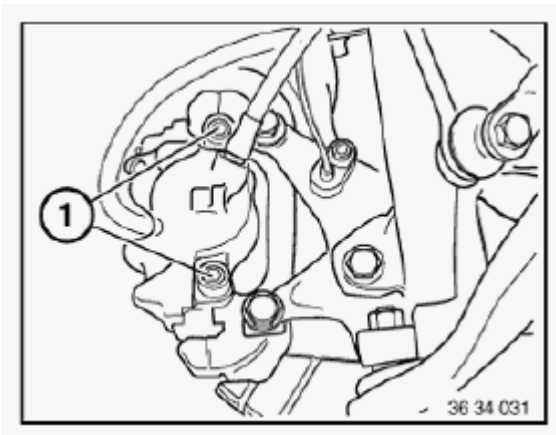


Fig. 18: Brake Caliper And Screw

Courtesy of BMW OF NORTH AMERICA, INC.

Turn piston fully back with special tool 34 1 050.

IMPORTANT: When turning back the piston, watch the brake-fluid level in the expansion tank, as overflowing brake fluid will destroy the paintwork.

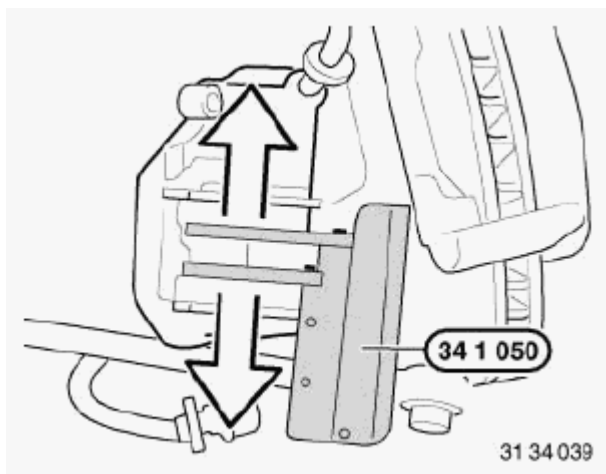


Fig. 19: Retracting Piston With Special Tool (34 1 050)

Courtesy of BMW OF NORTH AMERICA, INC.

Remove outer brake lining.

Inner brake lining is located with its spring in the piston.

IMPORTANT: Mark any worn brake linings.

In the event of one-sided brake lining wear, do not change brake linings round.

New brake linings may only be installed if the brake disc thickness is greater than or equal to the minimum brake disc thickness (MIN TH), see **34 11 FRONT BRAKE E83** .

Observe minimum thickness of brake linings, see **34 11 FRONT BRAKE E83** , Clean brake linings.

Do not grease backs of brake linings sleeve.

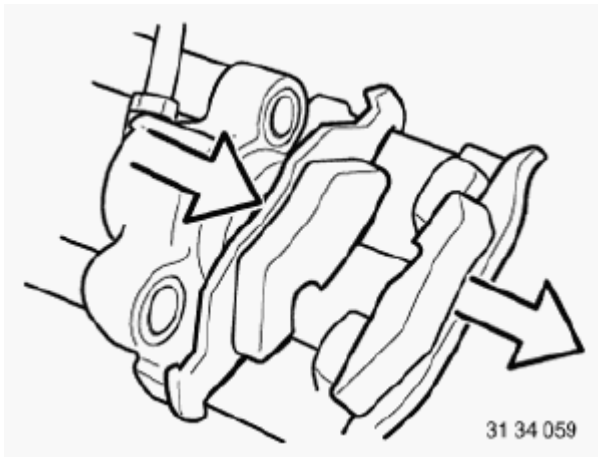


Fig. 20: Removing Outer Brake Lining

Courtesy of BMW OF NORTH AMERICA, INC.

Check dust sleeve (1) for damage and replace if necessary.

Clean contact face (2) of brake piston and apply a thin coating of anti-squeak compound.

IMPORTANT: Dust sleeve must not come into contact with anti-squeak compound as this may cause the dust sleeve to swell.

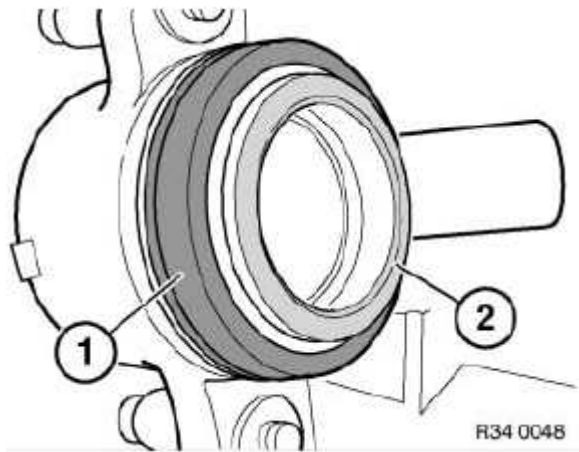


Fig. 21: Contact Face And Dust Sleeve
Courtesy of BMW OF NORTH AMERICA, INC.

Clean contact faces (1...2) of brake lining hammer heads/brake caliper housing and coat with anti-squeak compound.

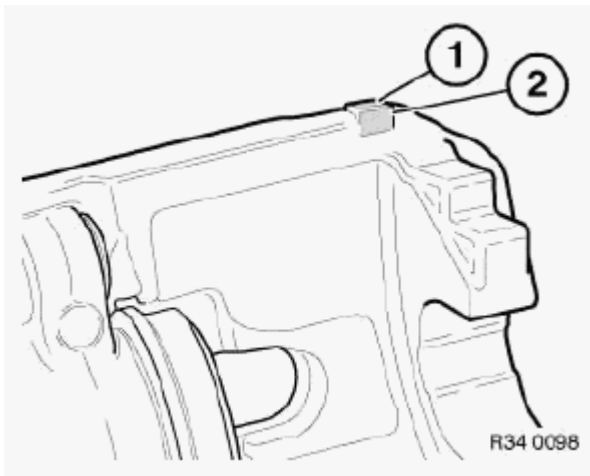


Fig. 22: Contact Face Of Brake Piston
Courtesy of BMW OF NORTH AMERICA, INC.

Clean contact face (3) of brake caliper and apply a thin coating of anti-squeak compound.

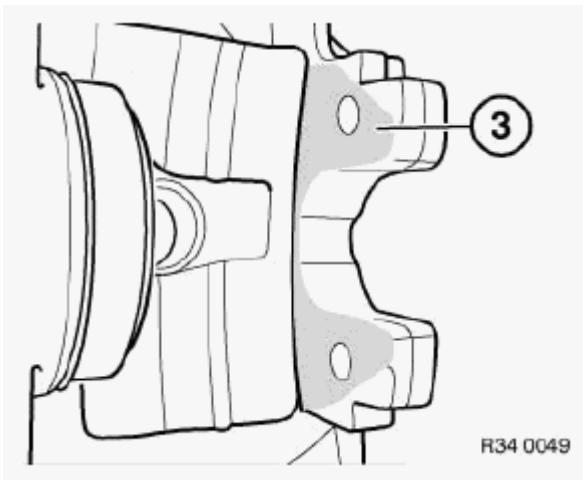


Fig. 23: Brake Caliper And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Clean contact face of brake caliper mounting bracket and apply a thin coating of anti-squeak compound.

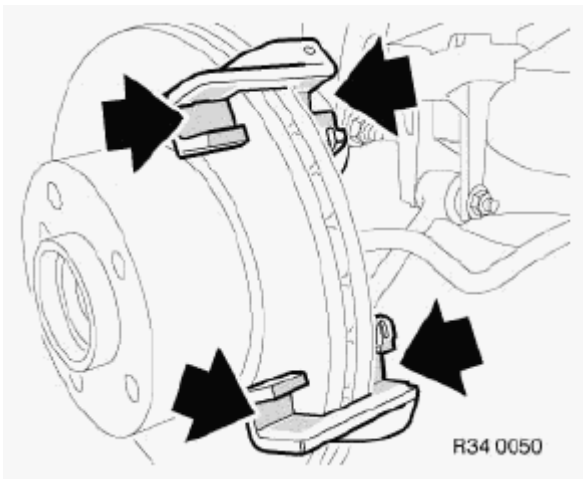


Fig. 24: Locating Brake Caliper Mounting Bracket
Courtesy of BMW OF NORTH AMERICA, INC.

34 11 220 REMOVING AND INSTALLING/REPLACING BOTH FRONT BRAKE DISCS

Necessary preliminary tasks:

- Remove wheels, see **36 10 300 REMOVING OR INSTALLING FRONT OR REAR WHEEL** .
- If necessary, remove and clean brake pads, see **34 11 000 Removing and installing/replacing brake linings of both front disc brakes.**

IMPORTANT: The brake discs must be replaced if their thickness is below the minimum thickness (MIN TH).

Brake discs may only be replaced in pairs (for each axle).

If the brake discs are replaced, you must also fit new brake pads.

The brake discs of M models are tied to the direction of travel:

The uneven part number denotes the left brake disc, the even part number the right brake disc!

Read and comply with notes on braking in new brake discs / brake pads, see 34 00 ... General information on braking in new brake discs / brake pads.

Unfasten screws (1), remove brake caliper and fasten up.

NOTE: Brake hose remains connected.

Installation:

Tightening torque: 34 11 2AZ, see 34 11 FRONT BRAKE .

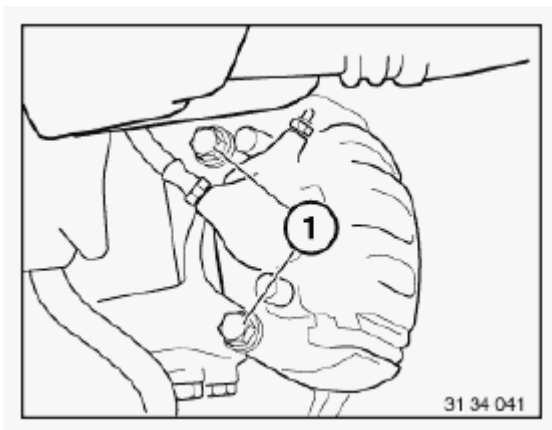


Fig. 25: Brake Caliper And Screw

Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew bolts and take off brake disc.

IMPORTANT: To release brake disc: Do not under any circumstances strike friction ring with a hammer or similar! If necessary, carefully tap on base of brake disc chamber with a rubber mallet.

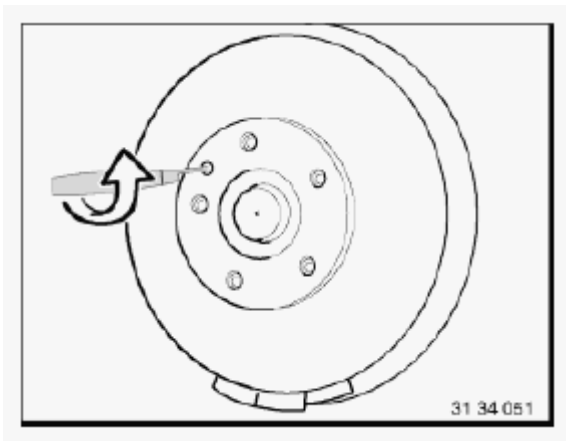


Fig. 26: Releasing Brake Disc

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace brake disc retaining screw.

Thoroughly clean contact surface of wheel hub and remove traces of corrosion if necessary.

Unevenness on contact surface may result in distortion of brake disc!

Tightening torque: 34 11 1AZ, see **34 11 FRONT BRAKE** .

IMPORTANT: Internally ventilated brake discs are balanced.

Never remove or reposition balance clips.

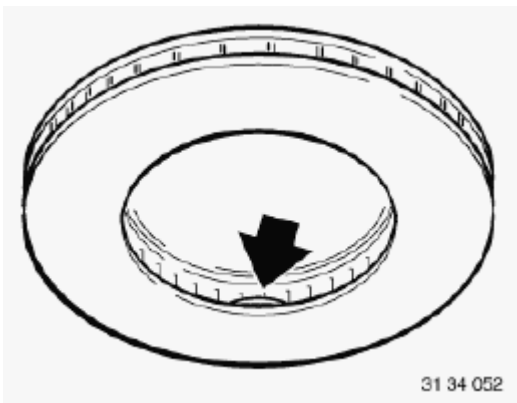


Fig. 27: Locating Brake Discs Contact Surface

Courtesy of BMW OF NORTH AMERICA, INC.

34 11 250 REMOVING AND INSTALLING/REPLACING A BRAKE CARRIER/BRAKE GUARD PLATE AT FRONT

Necessary preliminary tasks:

- Remove front swivel bearing, see **31 21 090 REPLACING (REMOVING AND INSTALLING) LEFT OR RIGHT SWIVEL BEARING** .

Release screws (1) and remove brake guard plate (2).

Installation:

Tightening torque: 34 11 5AZ, see **34 11 FRONT BRAKE** .

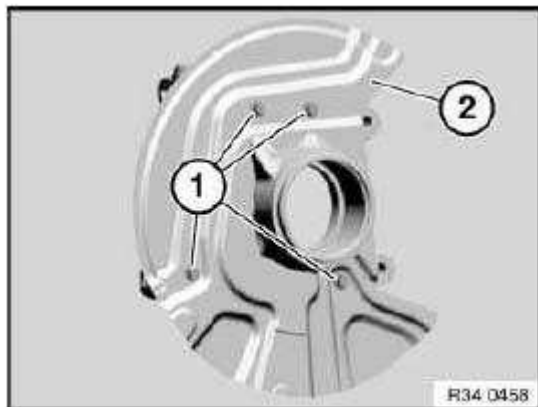


Fig. 28: Brake Guard Plate And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

34 11 519 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT FRONT BRAKE CALIPER

Necessary preliminary tasks:

Remove wheels, see **36 10 300 REMOVING OR INSTALLING FRONT OR REAR WHEEL** .

After completing tasks, bleed brake system, see **34 00 050 Bleeding brake system with DSC**.

Apply pedal prop and depress brake pedal slightly. This prevents brake fluid from emerging from the expansion tank and air from entering the brake system after the brake lines have been detached.

Disconnect brake pipe from connection with brake hose.

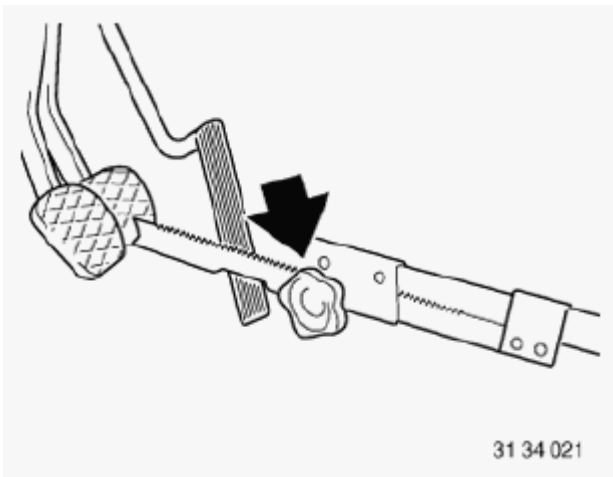


Fig. 29: Locating Pedal Prop

Courtesy of BMW OF NORTH AMERICA, INC.

Left:

Remove connector for wear indicator.

Installation:

Tighten brake hose on brake caliper.

Tightening torque: 34 32 2AZ, see **34 32 BRAKE LINES** .

Set steering to straight-ahead setting.

Screw brake hose to brake line, ensuring that brake hose is not twisted.

Tightening torque: 34 32 1AZ, see **34 32 BRAKE LINES** .

Release screws (1) and remove brake caliper.

Installation:

Tightening torque: 34 11 2AZ, see **34 11 FRONT BRAKE** .

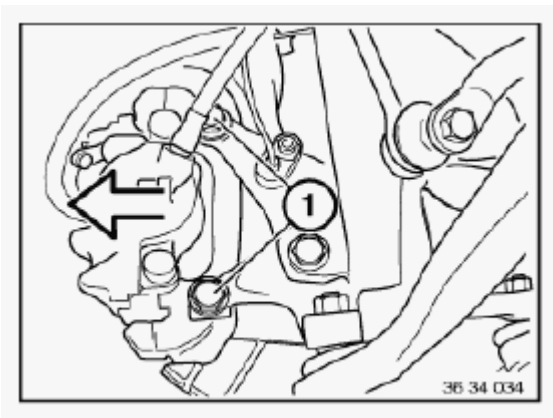


Fig. 30: Brake Caliper And Screw

Courtesy of BMW OF NORTH AMERICA, INC.

34 11 552 OVERHAULING LEFT OR RIGHT FRONT BRAKE CALIPER (BRAKE CALIPER REMOVED)

Special tools required:

- 00 9 316

WARNING: In the following work step, large forces occur at the brake caliper piston (up to more than 2800 N).

Risk of injury!

Carefully force piston out through connection bore with compressed air.

To protect piston, place a protective plate (e.g. hard wood or hard felt) in caliper recess.

Do not grip piston with fingers - risk of trapping!

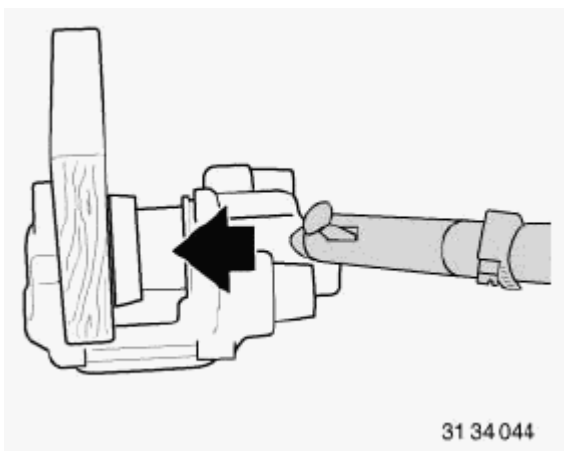


Fig. 31: Force Piston Out

Courtesy of BMW OF NORTH AMERICA, INC.

Check guide sleeves (5), fitting repair-kit guide sleeve if necessary.



Fig. 32: Guide Sleeves

Courtesy of BMW OF NORTH AMERICA, INC.

Press off dust sleeve (1).

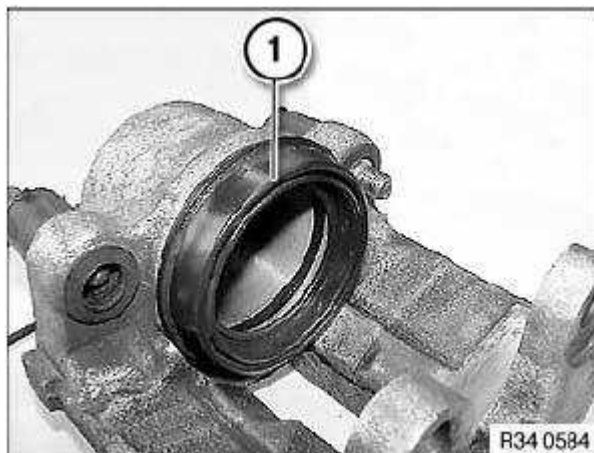


Fig. 33: Dust Sleeve

Courtesy of BMW OF NORTH AMERICA, INC.

Carefully remove seal (1) with special tool 00 9 316 .

Clean cylinder bores and parts with alcohol and dry with compressed air.

Thoroughly inspect cylinder bore, piston and flange surfaces.

Machining of cylinders and pistons is not permitted.

Install new seal.

Installation:

Apply a light coat of Ate brake cylinder paste to cylinder bore, piston and seal.

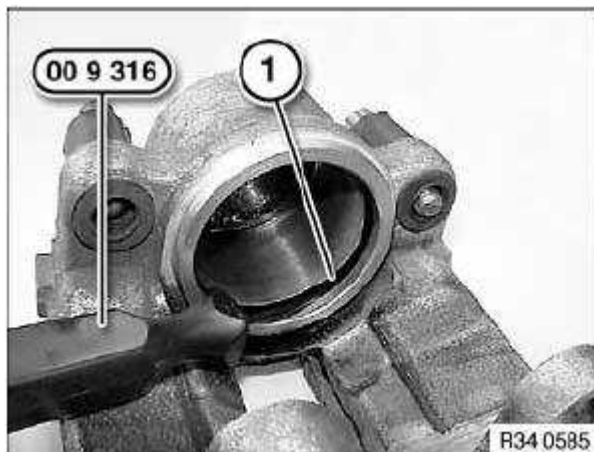


Fig. 34: Seal With Special Tool (00 9 316)
Courtesy of BMW OF NORTH AMERICA, INC.

Fit dust sleeve (1) in annular groove of piston (2).

Press piston into cylinder bore.

IMPORTANT: Do not tilt piston.

Evenly press dust sleeve onto brake caliper housing as far as it will go.

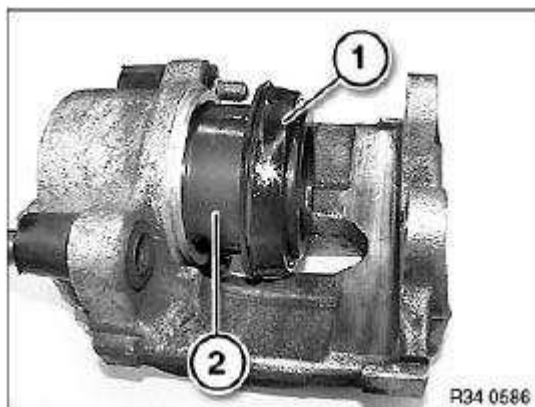


Fig. 35: Annular Groove Of Piston And Dust Sleeve
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

The area between the dust sleeve and the brake caliper housing must be kept dry. It must not come into contact with Ate brake cylinder paste or brake fluid so as to ensure that the dust sleeve is perfectly seated.

34 11 667 PRECISION-TURNING BOTH FRONT BRAKE DISCS ON BOTH SIDES

IMPORTANT: Always precision-turn both sides of both brake discs on one axle.

Observe Max. machining dimension per friction ring side, see 34 11 FRONT BRAKE E83 .

Minimum brake disc thickness (MIN TH)

Brake discs of M models (Compound brake discs) must not be machined!

Only one brake pad set may be used up on brake discs which have been lathe-turned to minimum thickness (MIN TH).

Stationary brake disc lathe:

In the case of stationary brake disc lathes, the brake disc must be removed, see 34 11 220 Removing and installing/replacing both front brake discs.

Please refer to the lathe manufacturer's instruction manual for the exact procedure.

IMPORTANT: Only BMW-approved brake disc lathes may be used!

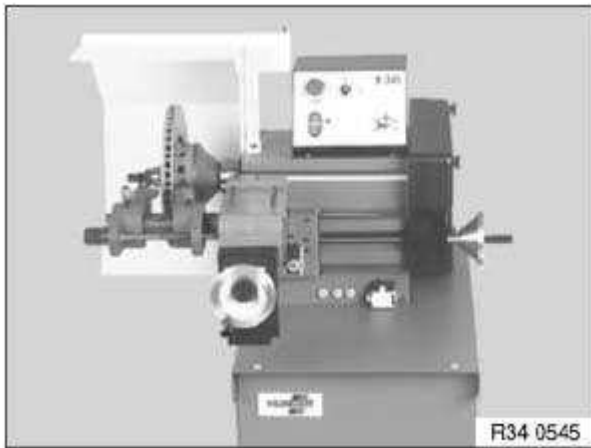


Fig. 36: Stationary Brake Disc Lathe
Courtesy of BMW OF NORTH AMERICA, INC.

Mobile brake disc lathe:

In the case of mobile brake disc lathes, only the brake caliper must be removed, see 34 11 519 Removing and installing/replacing left or right front brake caliper.

The brake discs remain on the car.

Please refer to the lathe manufacturer's instruction manual for the exact procedure.

IMPORTANT: Only BMW-approved brake disc lathes may be used!



Fig. 37: Mobile Brake Disc Lathe
Courtesy of BMW OF NORTH AMERICA, INC.

After fine-grinding the brake discs, measure the thickness difference inside the braking surfaces at 8 points with an external micrometer, see **34 11 FRONT BRAKE E83** .

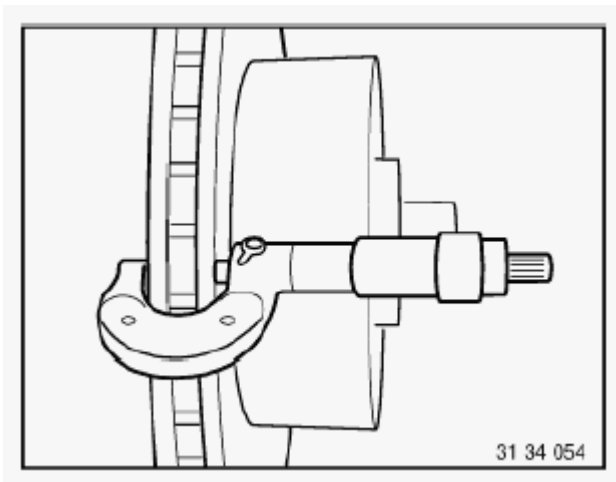
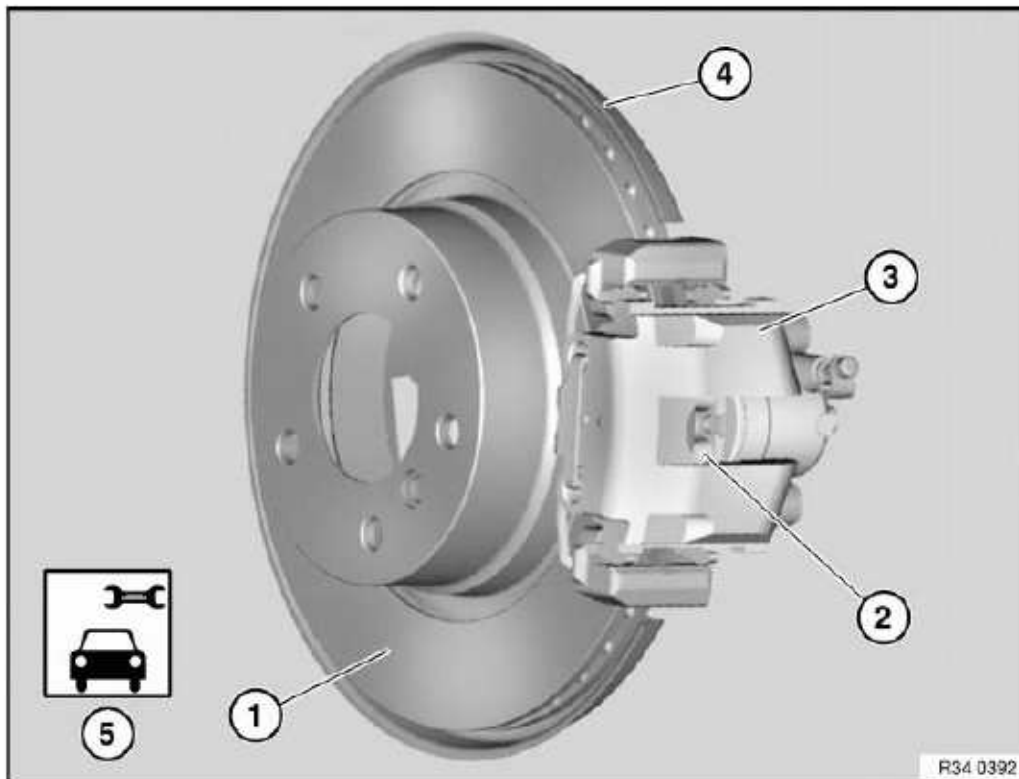


Fig. 38: Measuring Brake Discs Thickness
Courtesy of BMW OF NORTH AMERICA, INC.

21 REAR BRAKES

34 21 ... OVERVIEW OF REAR BRAKE



- | | | | |
|---|-------------------------------|---|--|
| 1 | Brake disk | 4 | Brake guard plate |
| 2 | Brake pad | 5 | Checking thickness of brake lining |
| 3 | Brake caliper | | |

Fig. 39: Rear Brakes Components

Courtesy of BMW OF NORTH AMERICA, INC.

34 21 171 REMOVING AND INSTALLING/REPLACING A BRAKE CARRIER/BRAKE GUARD PLATE AT REAR

Necessary preliminary tasks:

- Remove expander lock, see **34 41 250 Removing and installing/replacing expander lock for handbrake shoes.**
- Remove wheel hub, see **33 41 153 REPLACING LEFT WHEEL BEARING ON REAR AXLE SHAFT .**
- After completing tasks, adjust handbrake, see **34 10 014 Adjusting handbrake.**

Release screws (1).

Release screws (2) and remove brake carrier (3).

Installation:

Tightening torque: 34 21 6AZ, see **34 21 REAR BRAKE** .

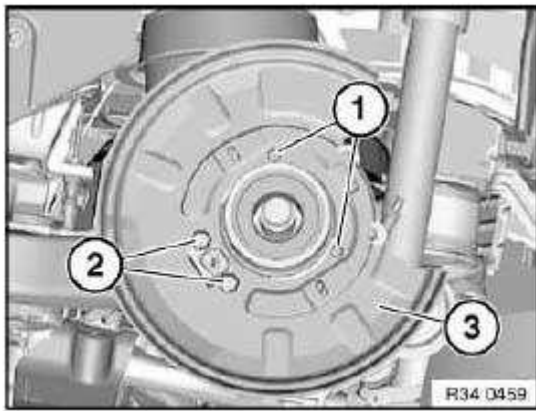


Fig. 40: Brake Carrier And Screw

Courtesy of BMW OF NORTH AMERICA, INC.

34 21 173 REPLACING REAR LEFT (OR RIGHT) BRAKE CARRIER/BRAKE GUARD

Necessary preliminary tasks:

- Remove **expander lock**.
- Remove wheel hub. See **33 41 153 REPLACING LEFT WHEEL BEARING ON REAR AXLE SHAFT** .
- After completing tasks, **adjust handbrake**.

Release screws (1). Release screws (2) and remove brake carrier (3). Installation: Tightening torque, see 34 21 6AZ in **34 21 REAR BRAKE** .

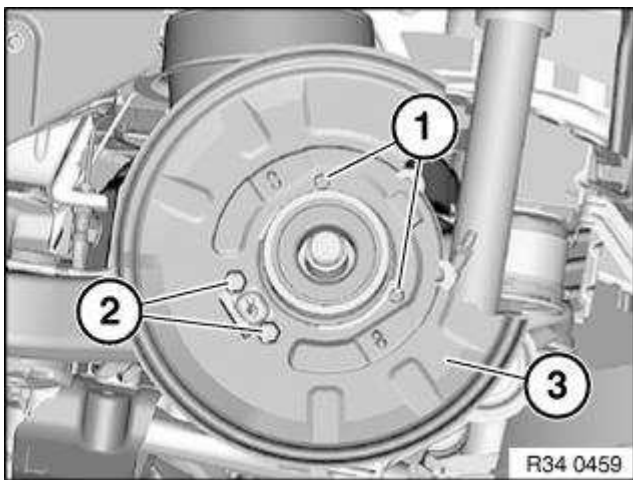


Fig. 41: Release Screws (2) And Remove Brake Carrier (3)

Courtesy of BMW OF NORTH AMERICA, INC.

34 21 200 REMOVING AND INSTALLING/REPLACING BOTH REAR DISC BRAKES

Special tools required:

- 34 1 050

Necessary preliminary tasks:

- Remove wheels, see **36 10 300 REMOVING OR INSTALLING FRONT OR REAR WHEEL** .

NOTE: After completing work:

- Fully depress brake pedal several times so that brake linings contact brake discs.
- When installing new brake linings at front and rear axles, brake fluid level must be brought up to "MAX" marking.
- Read and comply with notes on braking in new brake discs / brake pads, see **34 00 ... General information on braking in new brake discs / brake pads.**

Remove cover plug (1).

Right side:

Disconnect plug connection for brake lining wear sensor.

If necessary, replace brake lining wear sensor.

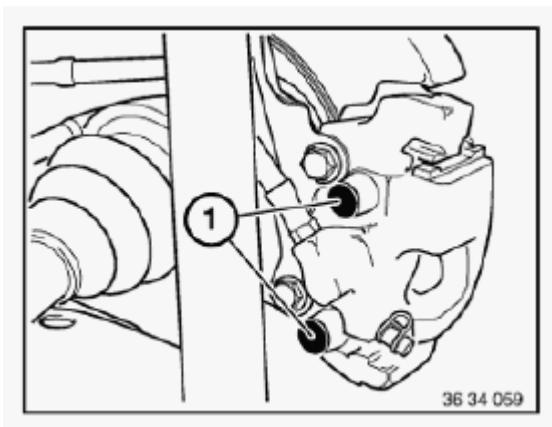


Fig. 42: Cover Plug

Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew guide screws (2).

Installation:

Only clean guide screws; do not grease.

Check threads.

Replace all guide screws which are not in perfect condition.

Tightening torque: 34 21 5AZ, see **34 21 REAR BRAKE** .

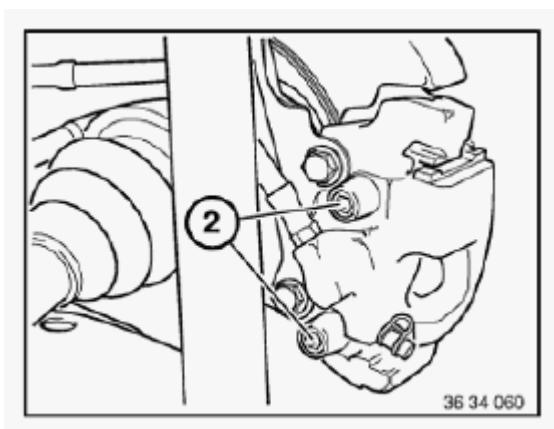


Fig. 43: Guide Screw

Courtesy of BMW OF NORTH AMERICA, INC.

Lift out retaining spring (3).

Withdraw brake caliper backwards.

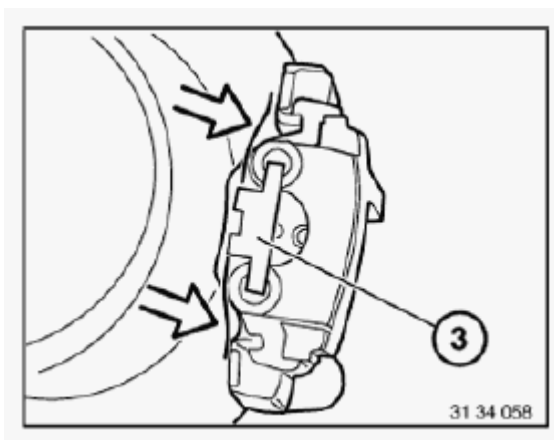


Fig. 44: Locating Retaining Spring

Courtesy of BMW OF NORTH AMERICA, INC.

Turn piston fully back with special tool 34 1 050 .

IMPORTANT: When turning back the piston, watch the brake-fluid level in the expansion tank, as overflowing brake fluid will destroy the paintwork.

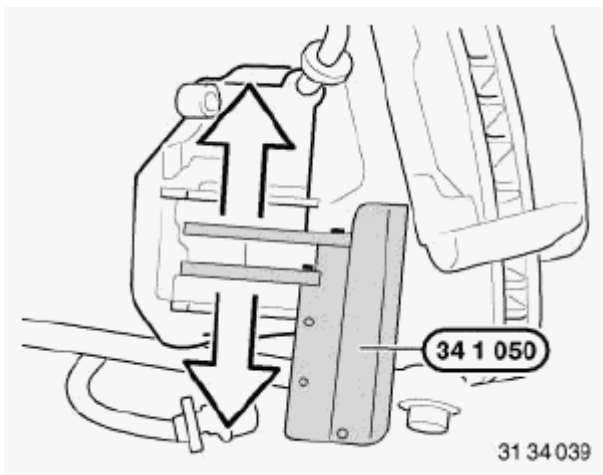


Fig. 45: Turning Piston With Special Tool (34 1 050)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove outer brake lining.

Inner brake lining is located with its spring in the piston.

IMPORTANT: Mark any worn brake linings.

In the event of one-sided brake lining wear, do not change brake linings round.

New brake linings may only be installed if the brake disc thickness is greater than or equal to the minimum brake disc thickness (MIN TH), see **34 21 REAR BRAKE DISCS E83** .

Observe minimum thickness of brake linings, see **34 21 REAR BRAKE DISCS E83** .

Clean brake linings.

Do not grease backs of brake linings sleeve.

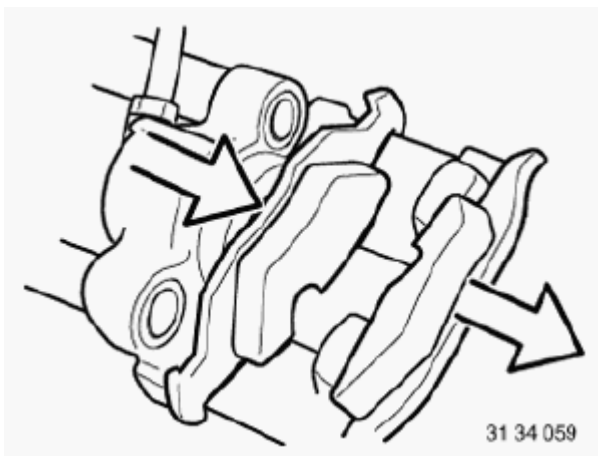


Fig. 46: Removing Outer Brake Lining

Courtesy of BMW OF NORTH AMERICA, INC.

Check dust sleeve (1) for damage and replace if necessary.

Clean contact face (2) of brake piston and apply a thin coating of anti-squeak compound.

IMPORTANT: Dust sleeve must not come into contact with anti-squeak compound as this may cause the dust sleeve to swell.

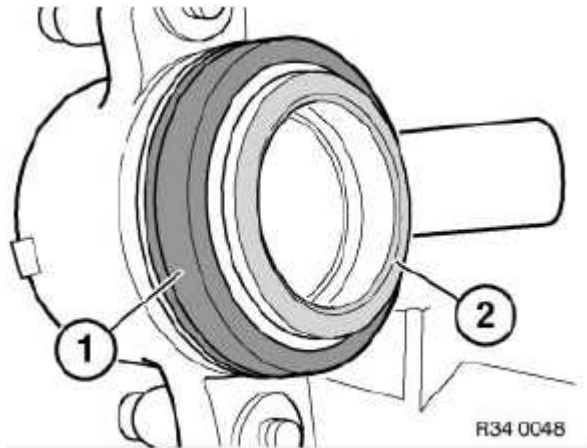


Fig. 47: Contact Face And Dust Sleeve

Courtesy of BMW OF NORTH AMERICA, INC.

Clean contact faces (1...2) of brake lining hammer heads/brake caliper housing and coat with anti-squeak compound.

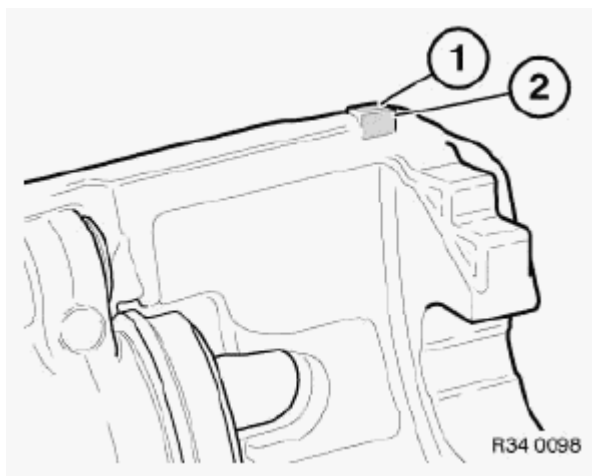


Fig. 48: Contact Face Of Brake Piston

Courtesy of BMW OF NORTH AMERICA, INC.

Clean contact face (3) of brake caliper and apply a thin coating of anti-squeak compound.

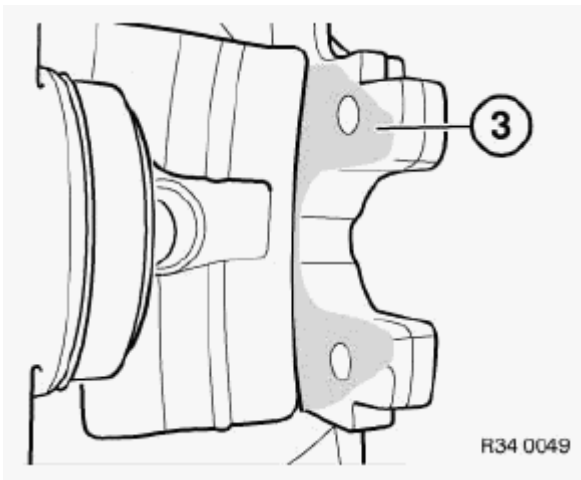


Fig. 49: Brake Caliper And Screw
 Courtesy of BMW OF NORTH AMERICA, INC.

Clean brake caliper mounting bracket at hammer head guides and apply a thin coating of anti-squeak compound.

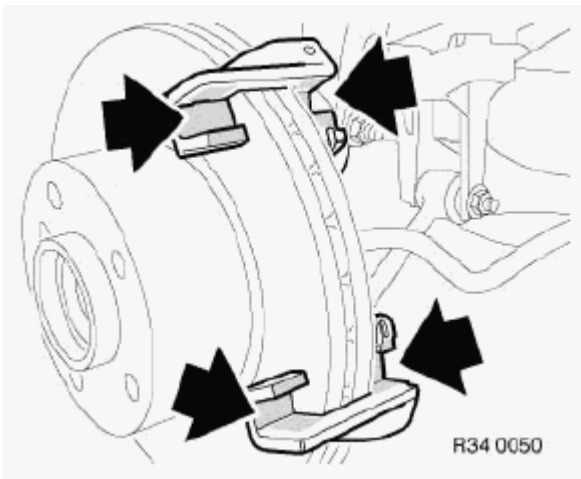


Fig. 50: Locating Brake Caliper Mounting Bracket
 Courtesy of BMW OF NORTH AMERICA, INC.

34 21 320 REMOVING AND INSTALLING/REPLACING BOTH BRAKE DISKS

Necessary preliminary tasks:

- Remove wheels, see **36 10 300 REMOVING OR INSTALLING FRONT OR REAR WHEEL** .
- If necessary, remove and clean brake linings **34 21 200 Removing and installing/replacing both rear disc brakes**.

After completing tasks, adjust handbrake, see **34 10 014 Adjusting handbrake**.

IMPORTANT: The brake disks must be replaced if their thickness is below the minimum

thickness, see 34 21 REAR BRAKE DISCS E83 .

Always replace brake disks in pairs.

If the brake disks are replaced, you must also fit new brake linings.

Release bolts (1), pull off brake caliper towards rear and tie up.

IMPORTANT: Replace micro-encapsulated bolts.

If necessary, remove adhesive residue in nut thread with M10x1.5 tap. Then blow tapped hole out with compressed air.

Tightening torque: 34 21 3AZ, see 34 21 REAR BRAKE .

NOTE: Brake hose remains connected.

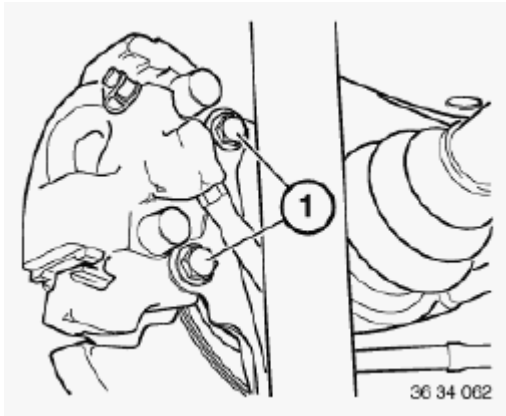


Fig. 51: Brake Caliper And Bolts

Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew bolts and take off brake disk.

Installation:

Replace brake disk retaining screw.

Tightening torque: 34 21 1AZ, see 34 21 REAR BRAKE .

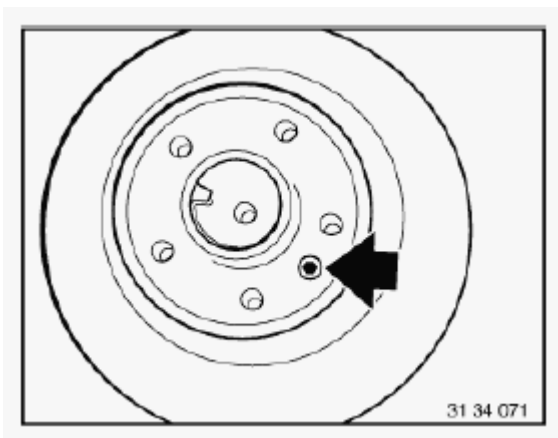


Fig. 52: Locating Brake Disk Retaining Screw
Courtesy of BMW OF NORTH AMERICA, INC.

34 21 745 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT REAR BRAKE CALIPER

Necessary preliminary tasks:

- Remove rear wheel .

After completing tasks, bleed brake system, see **34 00 050 Bleeding brake system with DSC.**

Apply pedal prop and depress brake pedal slightly. This prevents brake fluid from emerging from the expansion tank and air from entering the brake system when the brake lines are opened.

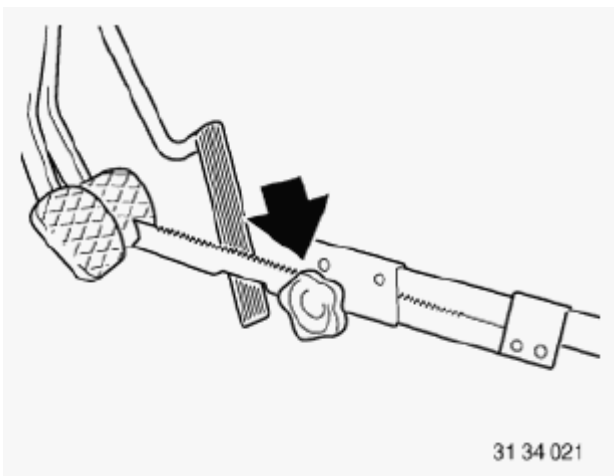


Fig. 53: Locating Pedal Prop
Courtesy of BMW OF NORTH AMERICA, INC.

Slacken union nut (1); to do so, grip brake hose at square (2).

Installation:

Tightening torque: 34 32 1AZ, see **34 32 BRAKE LINES** .

Detach brake hose from brake caliper (3).

Installation:

Tightening torque: 34 32 2AZ, see **34 32 BRAKE LINES** .

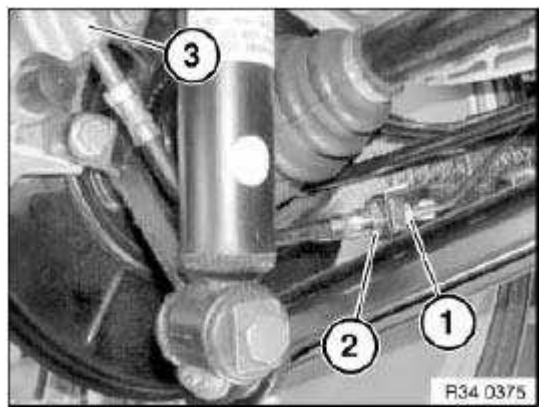


Fig. 54: Brake Hose From Brake Caliper And Slacken Union Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Installation:

Tightening torque: 34 21 3AZ, see **34 21 REAR BRAKE** .

Right side:

Disconnect plug connection for brake lining wear sensor.

Pull off fist caliper towards rear of vehicle.

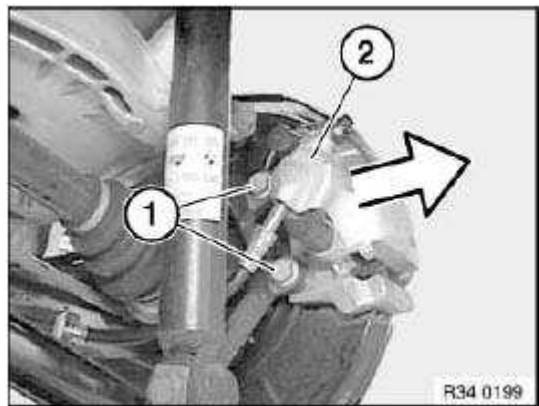


Fig. 55: Disconnecting Plug Connection For Brake Lining Wear Sensor
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Install brake hose without torsional stress.

First tighten the brake hose on the brake cover, then tighten connection on brake line.

Never twist brake hose when installing it and avoid all contact with parts attached rigidly to the body.

Check routing and securing of brake-pad-wear indicator cable. Check for correct securing with tab of dust cap. It is absolutely essential to prevent the cable on the rim from being scuffed.

34 21 812 OVERHAULING LEFT OR RIGHT REAR BRAKE CALIPER (BRAKE CALIPER REMOVED)

NOTE: Use repair kit.

Take off plastic caps (1).

Unscrew guide screws (2).

Installation:

Only clean guide screws; do not grease. Check guide bolts, replace if necessary.

Tightening torque: 34 21 5AZ, see **34 21 REAR BRAKE** .

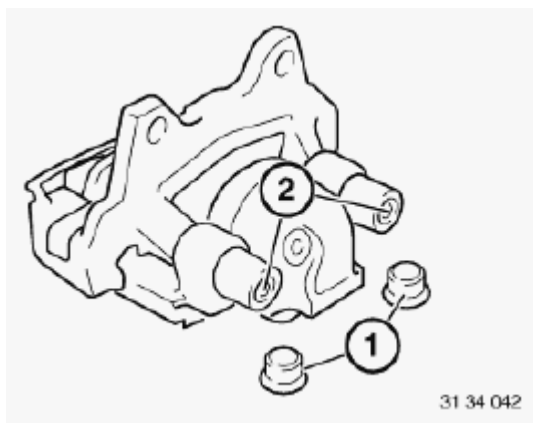


Fig. 56: Guide Screws And Plastic Caps
Courtesy of BMW OF NORTH AMERICA, INC.

Dismantle brake caliper and remove brake linings.

Installation:

Press brake lining fully outwards and insert spring (4).

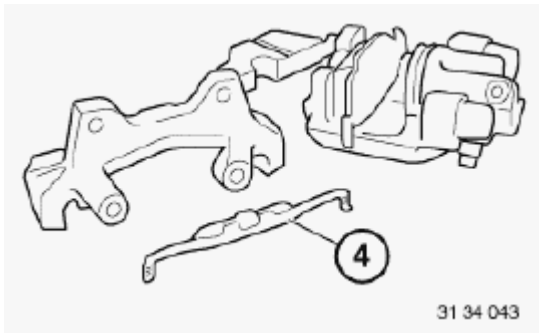


Fig. 57: Brake Lining Fully Outwards And Spring
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: In the following work step, large forces occur at the brake caliper piston (up to more than 2800 N!).

Danger of injury!

Carefully force piston out through connection bore with compressed air.

To protect piston, place a protective plate (e.g. hard wood or hard felt) in caliper recess.

Do not grip piston with fingers - risk of trapping!

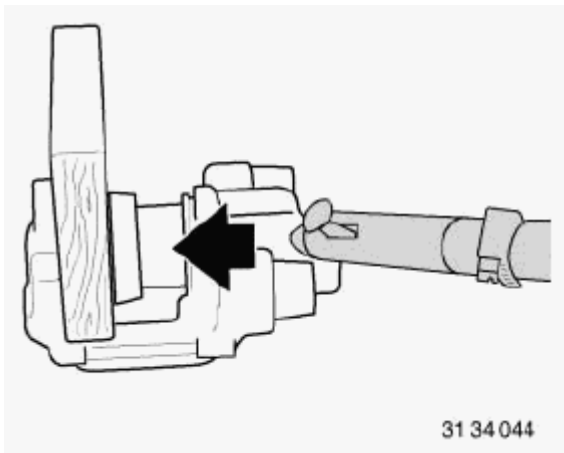


Fig. 58: Locating Brake Caliper Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Check guide sleeves (5), fitting repair-kit guide sleeve if necessary.



Fig. 59: Guide Sleeves

Courtesy of BMW OF NORTH AMERICA, INC.

Remove sealing ring carefully with a plastic needle.

Clean cylinder bores and parts with alcohol and dry with compressed air.

Thoroughly inspect cylinder bore, piston and flange surfaces.

Machining of cylinders and pistons is not permitted.

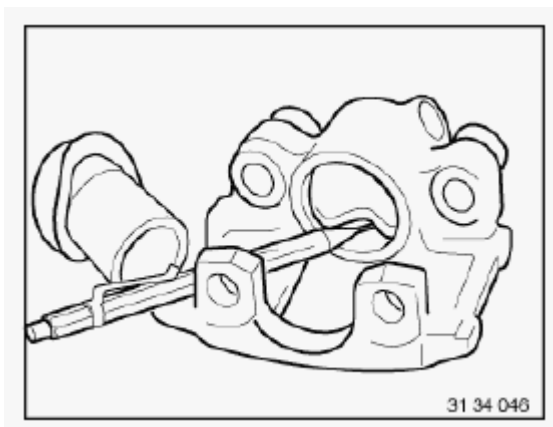


Fig. 60: Removing Sealing Ring With Plastic Needle

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Apply a light coat of Ate brake cylinder paste to cylinder bore, piston and sealing sleeve.

Install sealing cover in rear annular groove of cylinder bore.

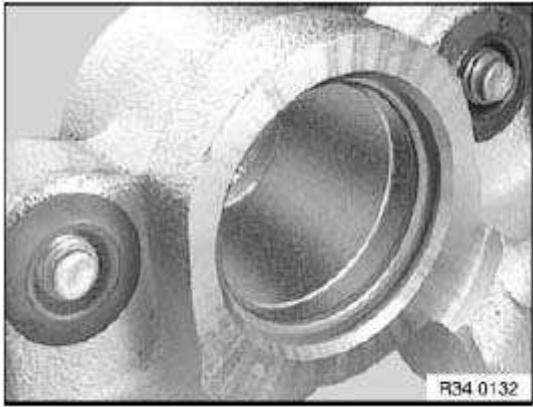


Fig. 61: Sealing Cover In Rear Annular Groove Of Cylinder Bore
Courtesy of BMW OF NORTH AMERICA, INC.

Insert dust sleeve in front annular groove and press into annular groove over entire diameter.

Installation:

The area between the dust sleeve and the brake caliper housing must be kept dry. This area must not come into contact with Ate brake cylinder paste or brake fluid so as to ensure that the dust sleeve is perfectly seated.

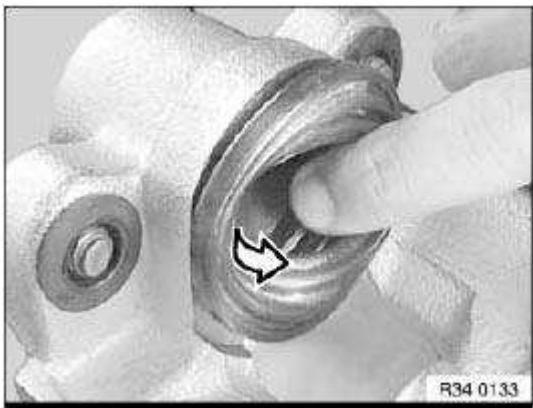


Fig. 62: Area Between Dust Sleeve And Brake Caliper Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Take up brake piston with a commercially available extension and socket and gently press onto dust sleeve.

Blow up sleeve with compressed air (max. 3 bar). Sleeve jumps over brake piston.

Installation:

Coat dust sleeve and brake piston with brake fluid to facilitate installation of dust sleeve.

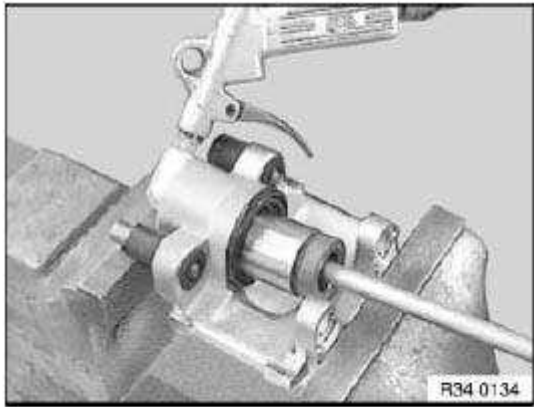


Fig. 63: Pressing Onto Dust Sleeve

Courtesy of BMW OF NORTH AMERICA, INC.

34 21 947 PRECISION-TURNING BOTH REAR BRAKE DISCS ON BOTH SIDES

IMPORTANT: Always precision-turn both sides of both brake discs on one axle.

Observe Max. machining dimension per friction ring side, see 34 21 REAR BRAKE DISCS E83 .

New brake linings may only be installed if the brake disc thickness is greater than or equal to the minimum brake disc thickness (MIN TH), see 34 21 REAR BRAKE DISCS E83 .

Brake discs of M models (Compound brake discs) must not be machined!

Only one brake pad set may be used up on brake discs which have been lathe-turned to minimum thickness (MIN TH), see 34 21 REAR BRAKE DISCS E83 .

Stationary brake disc lathe:

In the case of stationary brake disc lathes, the brake disc must be removed, see **34 11 220 Removing and installing/replacing both front brake discs.**

Please refer to the lathe manufacturer's instruction manual for the exact procedure.

IMPORTANT: Only BMW-approved brake disc lathes may be used!

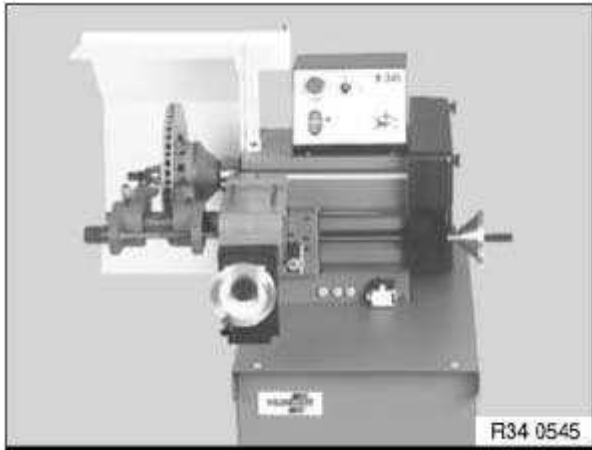


Fig. 64: Stationary Brake Disc Lathe
Courtesy of BMW OF NORTH AMERICA, INC.

Mobile brake disc lathe:

In the case of mobile brake disc lathes, only the brake caliper has must be removed, see **34 21 745 Removing and installing/replacing left or right rear brake caliper.**

The brake discs remain on the car.

Please refer to the lathe manufacturer's instruction manual for the exact procedure.

IMPORTANT: Only BMW-approved brake disc lathes may be used!



Fig. 65: Mobile Brake Disc Lathe
Courtesy of BMW OF NORTH AMERICA, INC.

After fine-grinding the brake discs, measure the thickness difference, see **34 21 REAR BRAKE DISCS E83** inside the braking surfaces at 8 points with an external micrometer.

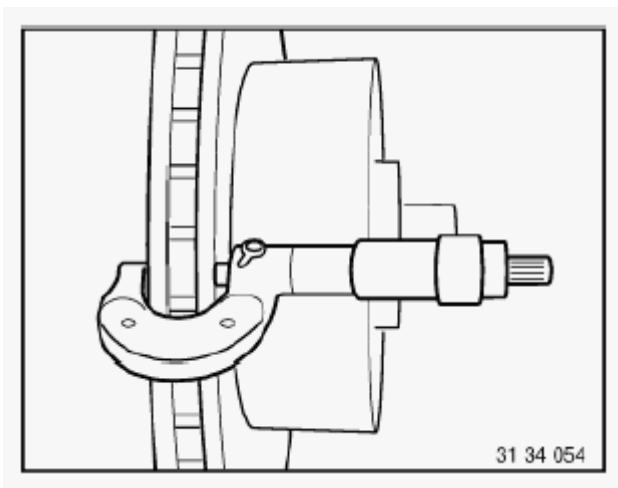
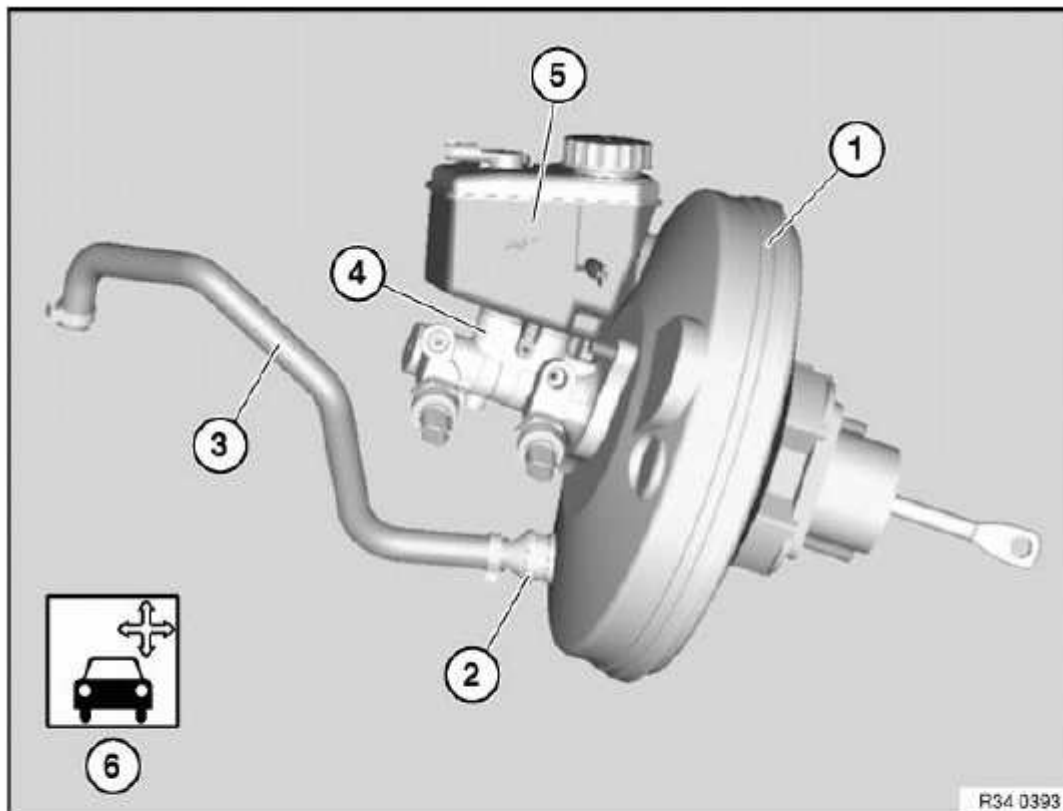


Fig. 66: Measuring Brake Discs Thickness

Courtesy of BMW OF NORTH AMERICA, INC.

31 MASTER BRAKE CYLINDER

34 31 ... OVERVIEW OF BRAKE MASTER CYLINDER / BRAKE BOOSTER



- | | | | |
|---|----------------------------------|---|---|
| 1 | Brake booster | 4 | Brake master cylinder |
| 2 | Non-return valve | 5 | Expansion tank |
| 3 | Vacuum hose | 6 | Bleeding braking system |

Fig. 67: Brake Master Cylinder / Brake Booster Components

Courtesy of BMW OF NORTH AMERICA, INC.

34 31 181 REMOVING AND INSTALLING/REPLACING EXPANSION TANK FOR HYDRAULIC BRAKE ACTUATION

Necessary preliminary tasks:

- Follow general instructions, see **34 00 ... General Information**.
- Remove left partition wall for equipment compartment .
- Remove non-return valve, see **34 33 051 Removing and installing/replacing nonreturn valve for brake booster** from brake booster.
- After completing tasks, bleed brake system, see **34 00 050 Bleeding brake system with DSC**.

NOTE: Suck the brake fluid out of the expansion tank. Use a suction bottle used exclusively for drawing off brake fluid.

Do not reuse drawn out brake fluid.

Unfasten plug connection (1) and disconnect.

Pull off supply hose (2) of clutch hydraulic system if necessary.

Release retaining screw (3).

Installation:

Tightening torque: 34 31 3AZ, see **34 31 BRAKE MASTER CYLINDER** .

Pull expansion tank (4) vertically out of brake master cylinder.

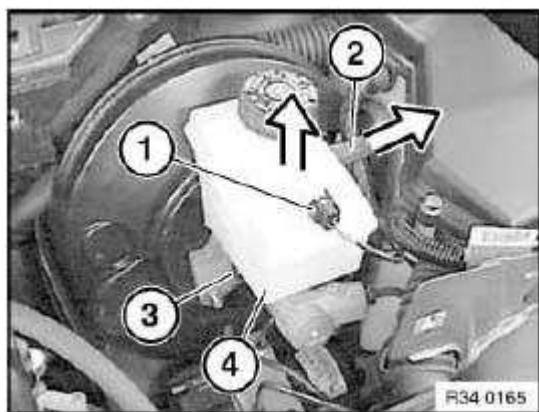


Fig. 68: Pulling Expansion Tank And Supply Hose
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Check rubber plug in brake master cylinder for damage and replace if necessary.

Push the expansion tank vertically onto the master brake cylinder.

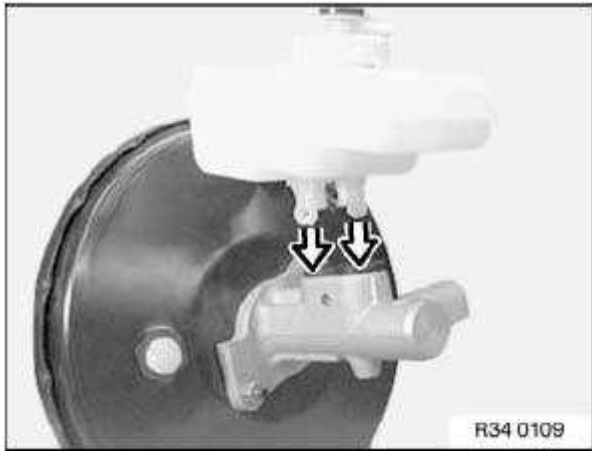


Fig. 69: Checking Rubber Plug In Brake Master Cylinder
Courtesy of BMW OF NORTH AMERICA, INC.

34 31 505 REMOVING AND INSTALLING/REPLACING MASTER BRAKE CYLINDER FOR DSC

Necessary preliminary tasks:

- Read and comply with General Information, see **34 00 ... General Information**.
- Remove expansion tank, see **34 31 181 Removing and installing/replacing expansion tank for hydraulic brake actuation**.
- After completing tasks, bleed brake system, see **34 00 050 Bleeding brake system with DSC**.

Unfasten brake lines (1).

Installation:

Note changed tightening torque.

Tightening torque: 34 32 6AZ, see **34 32 BRAKE LINES** .

Release nuts (2) and pull brake master cylinder (3) in direction of arrow straight out of brake booster.

Installation:

Replace self-locking nuts.

Tightening torque: 34 31 1AZ, see **34 31 BRAKE MASTER CYLINDER** .

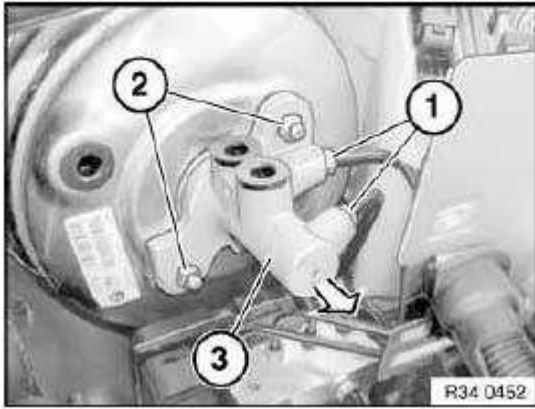


Fig. 70: Brake Master Cylinder, Brake Lines And Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace O-ring (1).

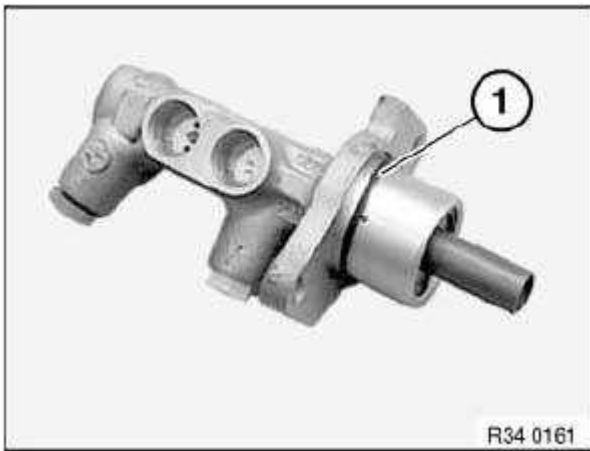


Fig. 71: O-ring
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

When inserting brake master cylinder (2) into brake booster (1), make sure that pressure rod of brake booster (1) and pressure rod of brake master cylinder (2) lie on a single plane.

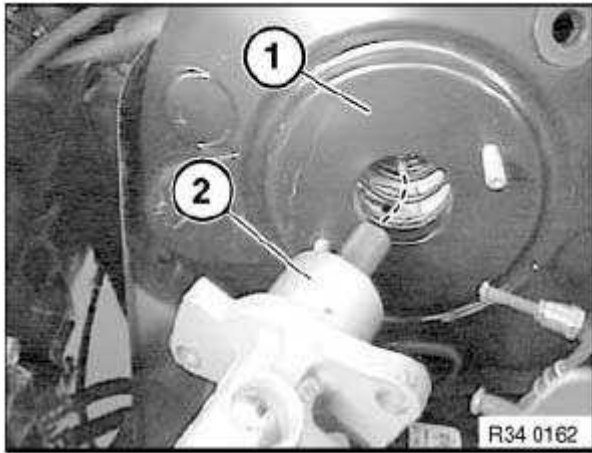
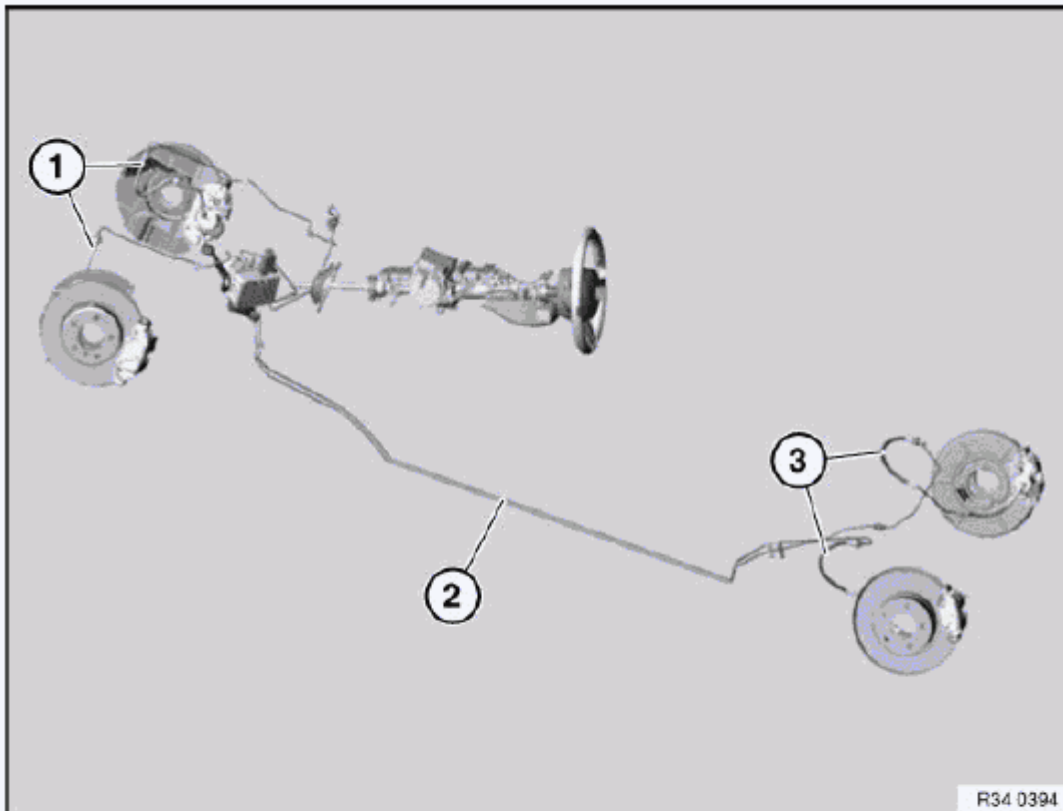


Fig. 72: Brake Master Cylinder Into Brake Booster
Courtesy of BMW OF NORTH AMERICA, INC.

32 BRAKE LINES

34 32 ... OVERVIEW OF BRAKE LINES



1 [Brake hose, front](#)

2 [Brake tubes](#)

3 [Brake hose, rear](#)

Fig. 73: Brake Lines Components

Courtesy of BMW OF NORTH AMERICA, INC.

34 32 861 REPLACING ALL BRAKE PIPES

Special tools required:

- **34 5 100 BENDING FIXTURE**

NOTE: The brake lines are only supplied in the straight version and correct length with connecting nipple.

Read and comply with General Information, see [34 00 ... General Information](#).

After completing tasks, bleed brake system, see [34 00 050 Bleeding brake system with DSC](#).

Observe safety instructions on raising the vehicle, see [00 LIFTING VEHICLE WITH A LIFTING PLATFORM](#) .

New brake lines are bent into shape with bending tool 34 5 100 .

Removed brake pipes can be used as templates for bending.

IMPORTANT:

- **Protective coating of brake line must not be damaged during bending.**
- **Do not kink or bend back brake lines.**
- **Watch distances to rigid and movable vehicle parts. Brake lines may not make contact or rub.**
- **Tighten down brake line couplings with torque wrench.**



Fig. 74: Special Tool (34 5 100)

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Tightening torque: 34 32 1AZ, see **34 32 BRAKE LINES** .

34 32 881 REPLACING FRONT LEFT OR RIGHT BRAKE HOSES

Necessary preliminary tasks:

- Remove wheel, see **36 10 300 REMOVING OR INSTALLING FRONT OR REAR WHEEL** .
- After completing tasks, bleed brake system, see **34 00 050 Bleeding brake system with DSC**.

Apply pedal prop and depress brake pedal slightly. This prevents brake fluid from emerging from the expansion tank when the brake lines are opened.

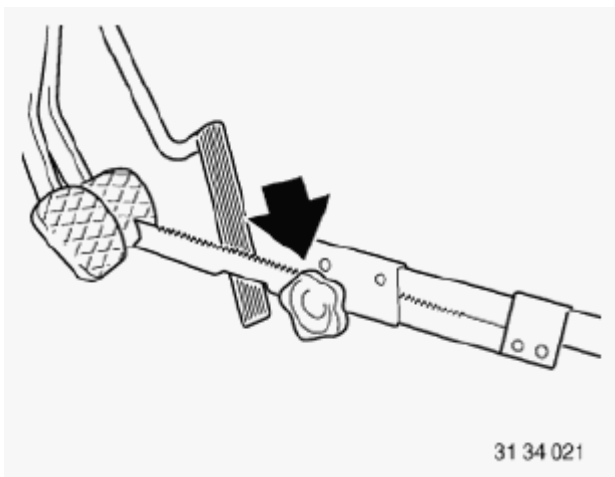


Fig. 75: Locating Pedal Prop

Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect brake hose from brake line (1).

Installation:

Tightening torque: 34 32 1AZ, see **34 32 BRAKE LINES** .

IMPORTANT: Grip brake hose at square drive to prevent connecting piece from turning in retaining bracket.

Remove retaining clip (2) and pull brake hose out of holder.

IMPORTANT: Make sure the retaining clip is correctly fitted.

Detach brake hose (3) from brake caliper.

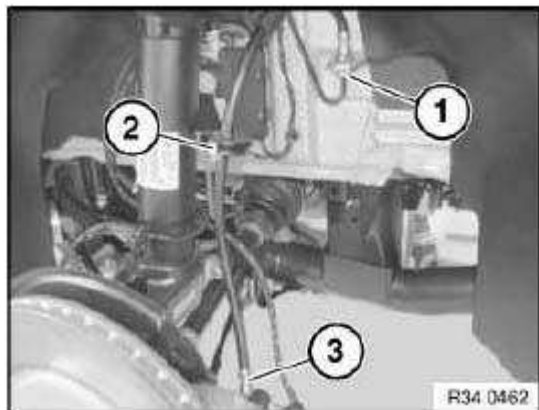


Fig. 76: Brake Hose From Brake Line, Retaining Clip And Brake Hose

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Tightening torque: 34 32 2AZ, see **34 32 BRAKE LINES** .

Installation:

First tighten brake hose on brake caliper.

Move wheels into straight-ahead position.

Insert brake hose in bracket and screw onto brake pipe.

Fit retaining clip.

IMPORTANT: Never twist brake hose when installing it and avoid all contact with parts attached rigidly to the body.

34 32 980 REPLACING REAR LEFT OR RIGHT BRAKE HOSES

Necessary preliminary tasks:

- Read and comply with General Information, see **34 00 ... General Information**.
- After completing tasks, bleed brake system, see **34 00 050 Bleeding brake system with DSC**.

Apply pedal prop and depress brake pedal slightly. This prevents brake fluid from emerging from the expansion tank and air from entering the system when the brake lines are opened.

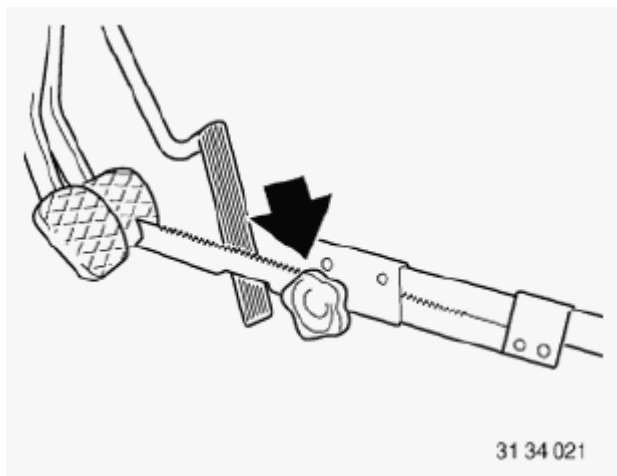


Fig. 77: Locating Pedal Prop

Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect brake hose (2) from brake line (1).

Installation:

Tightening torque: 34 32 1AZ, see **34 32 BRAKE LINES** .

IMPORTANT: Grip brake hose at square (3) to prevent connecting piece from turning in retaining bracket.

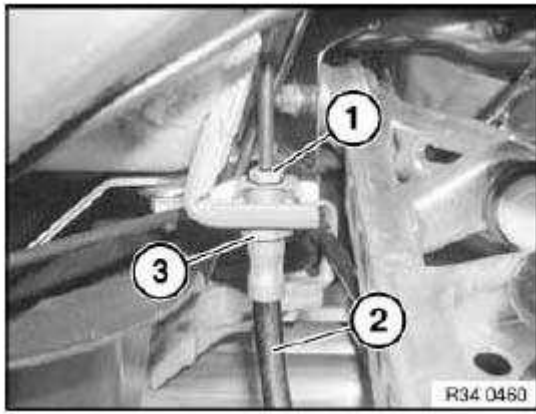


Fig. 78: Brake Hose From Brake Line
Courtesy of BMW OF NORTH AMERICA, INC.

Detach retaining plate (1) from metal bracket and feed out brake hose (2).

Disconnect brake hose (2) from brake caliper.

Installation:

Tightening torque: 34 32 2AZ, see **34 32 BRAKE LINES** .

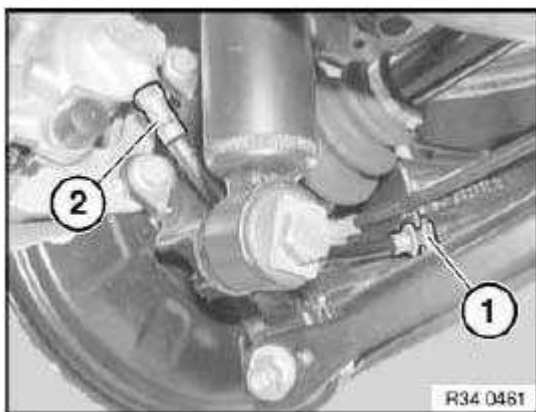


Fig. 79: Retaining Plate And Brake Hose
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

First tighten brake hose on brake caliper.

Insert brake hose in bracket and screw onto brake pipe.

Fit retaining plate (1).

IMPORTANT: Never twist brake hose when installing it and avoid all contact with parts attached rigidly to the body.

33 BRAKE BOOSTER

34 33 051 REMOVING AND INSTALLING/REPLACING NONRETURN VALVE FOR BRAKE BOOSTER

Necessary preliminary tasks:

- Read and comply with General Information, see **34 00 ... General Information**.
- Remove heater bulkhead, see **51 71 080 REMOVING AND INSTALLING/REPLACING HEATER BULKHEAD**.

IMPORTANT:

- If a rubber vacuum hose is fitted, it can be replaced individually.
- If a plastic vacuum line is fitted, it can only be replaced as a single unit together with the non-return valve.

NOTE: Before beginning work, fully press the brake pedal several times to reduce the vacuum pressure in the brake booster. This makes it easier to remove the non-return valve.

Release clip (1) and detach vacuum hose (2) from non-return valve (3).

Remove non-return valve (3) from brake booster.

Installation:

Replace hose clip.

Check sealing ring in brake booster and replace if necessary.

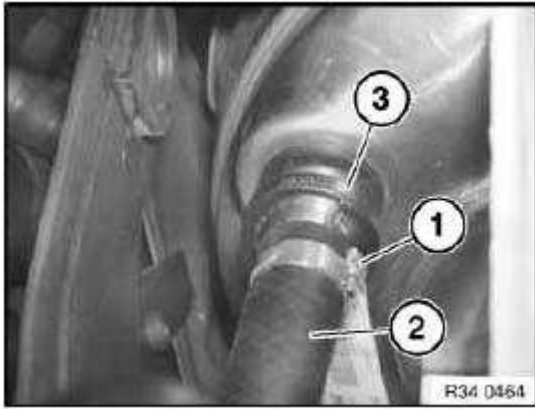


Fig. 80: Clip, Vacuum Hose And Non-Return Valve
Courtesy of BMW OF NORTH AMERICA, INC.

34 33 505 REMOVING AND INSTALLING/REPLACING BRAKE BOOSTER

Necessary preliminary tasks:

- Read and comply with General Information, see **34 00 ... General Information.**
- Remove brake master cylinder, see **34 31 505 Removing and installing/replacing master brake cylinder for DSC.**
- Remove left footwell trim, see **51 45 185 REMOVING AND INSTALLING/REPLACING TRIM FOR PEDAL ASSEMBLY .**

Detach locking clip (1) from brake pedal, disengage and pull out locking pin.

Unscrew nuts (2).

Installation:

Replace self-locking nuts.

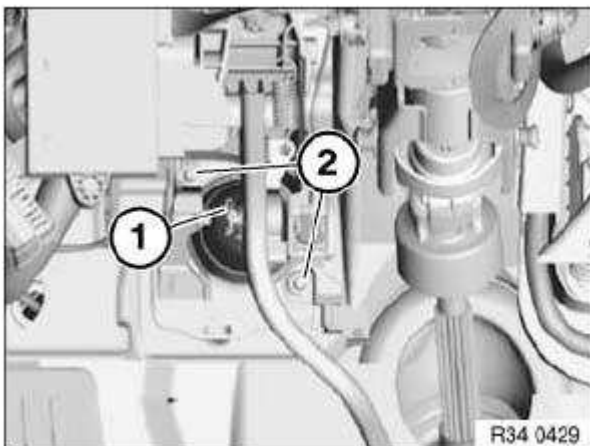


Fig. 81: Locking Clip And Nuts

Courtesy of BMW OF NORTH AMERICA, INC.

Carefully pull brake booster (1) out of bulkhead and tilt out.

IMPORTANT: Do not use any force when removing and installing the brake unit; the brake unit can be damaged under certain circumstances.

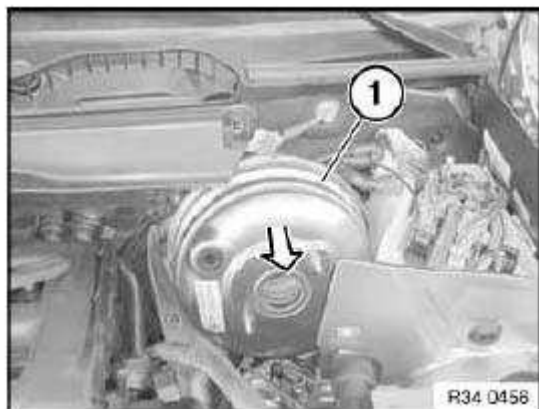


Fig. 82: Pulling Brake Booster

Courtesy of BMW OF NORTH AMERICA, INC.

Tilt microfilter housing cover (2) upwards and lift out brake booster (1) in direction of arrow.

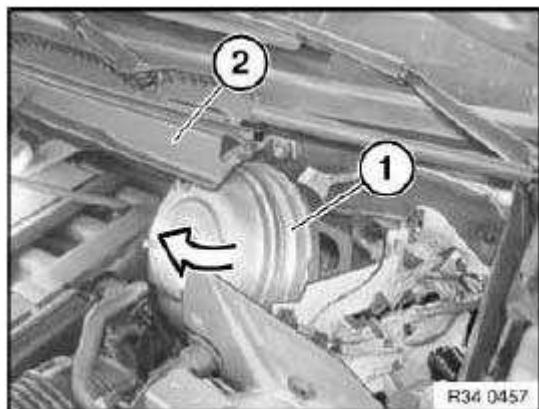


Fig. 83: Tilting Microfilter Housing Cover

Courtesy of BMW OF NORTH AMERICA, INC.

35 ELECTRICAL COMPONENTS

34 35 ... REPLACING A BRAKE PAD SENSOR (REAR)

IMPORTANT: If a brake pad sensor that has already been ground has to be replaced even though the minimum brake pad thickness has not yet been reached, you must

observe the following: The new sliding contact must be filed down with a file to the same length as the ground sliding contact.

Necessary preliminary tasks:

- Remove wheel, see **36 10 300 REMOVING OR INSTALLING FRONT OR REAR WHEEL** .

Release screws (1). Release expander rivet (2) and remove cover (3).

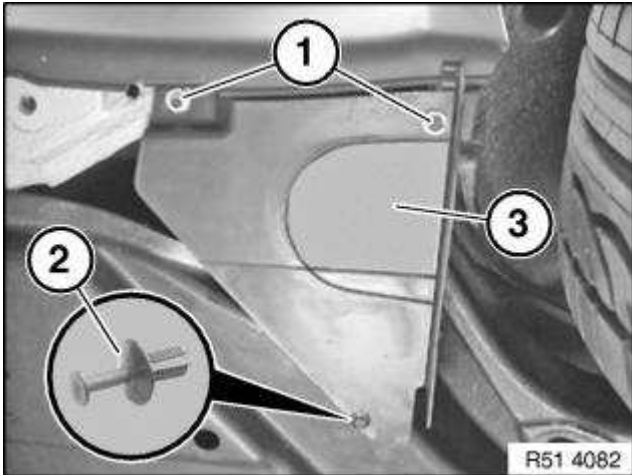


Fig. 84: Release Expander Rivet (2) And Remove Cover (3)
Courtesy of BMW OF NORTH AMERICA, INC.

Open cover (1). Disconnect plug connection (2). Disengage cable from holders (3). Installation: Ensure proper locking of the plug connector and proper seating of the cable in the brackets.

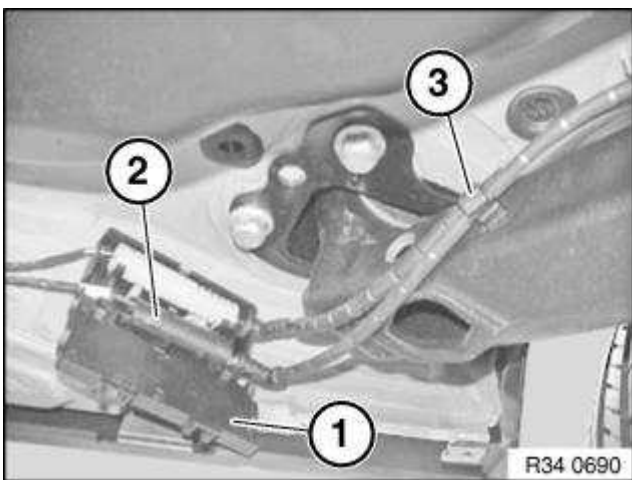


Fig. 85: Disconnect Plug Connection (2) And Disengage Cable From Holders (3)
Courtesy of BMW OF NORTH AMERICA, INC.

Disengage cable from holders (1). Pull off brake pad wear sensor (2) in direction of arrow from brake caliper. Installation: Make sure cable and brake pad wear sensor are correctly seated in brake caliper.

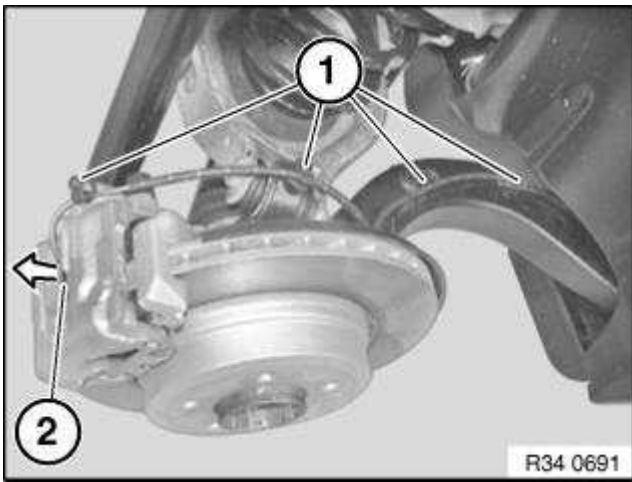


Fig. 86: Disengage Cable From Holders (1)
Courtesy of BMW OF NORTH AMERICA, INC.

34 35 001 REPLACING A BRAKE LINING SENSOR (FRONT)

IMPORTANT: If a brake pad sensor that has already been ground has to be replaced even though the minimum brake pad thickness has not yet been reached, you must observe the following: The new sliding contact must be filed down with a file to the same length as the ground sliding contact.

Necessary preliminary tasks:

- Remove wheel, see **36 10 300 REMOVING OR INSTALLING FRONT OR REAR WHEEL** .

Open plug housing (1).

Unclip lead of brake lining sensor (2) from plug housing (1).

Disconnect associated plug connection of lead from brake lining sensor (2).

Feed lead from brake lining sensor (2) out of fixtures.

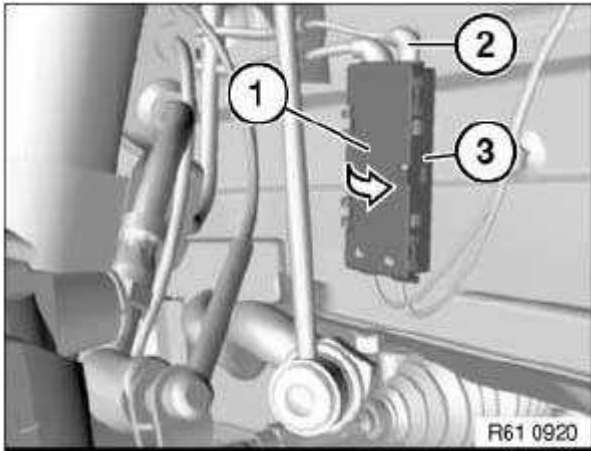


Fig. 87: Brake Lining Sensor, Plug Housing And Brake Lining Sensor
 Courtesy of BMW OF NORTH AMERICA, INC.

Press clip (1) together and detach brake lining sensor (2) in direction of arrow from brake caliper (3).

Installation:

Make sure clip (1) and brake lining sensor (2) are correctly seated in brake caliper (3).

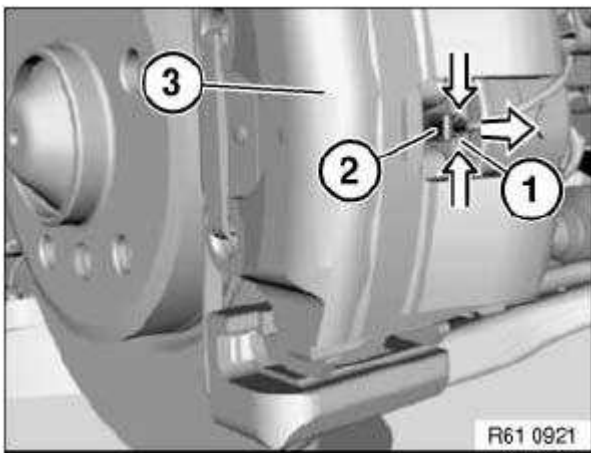


Fig. 88: Pressing Clip And Lining Sensor
 Courtesy of BMW OF NORTH AMERICA, INC.

41 PARKING BRAKE

34 41 ... OVERVIEW OF PARKING BRAKE

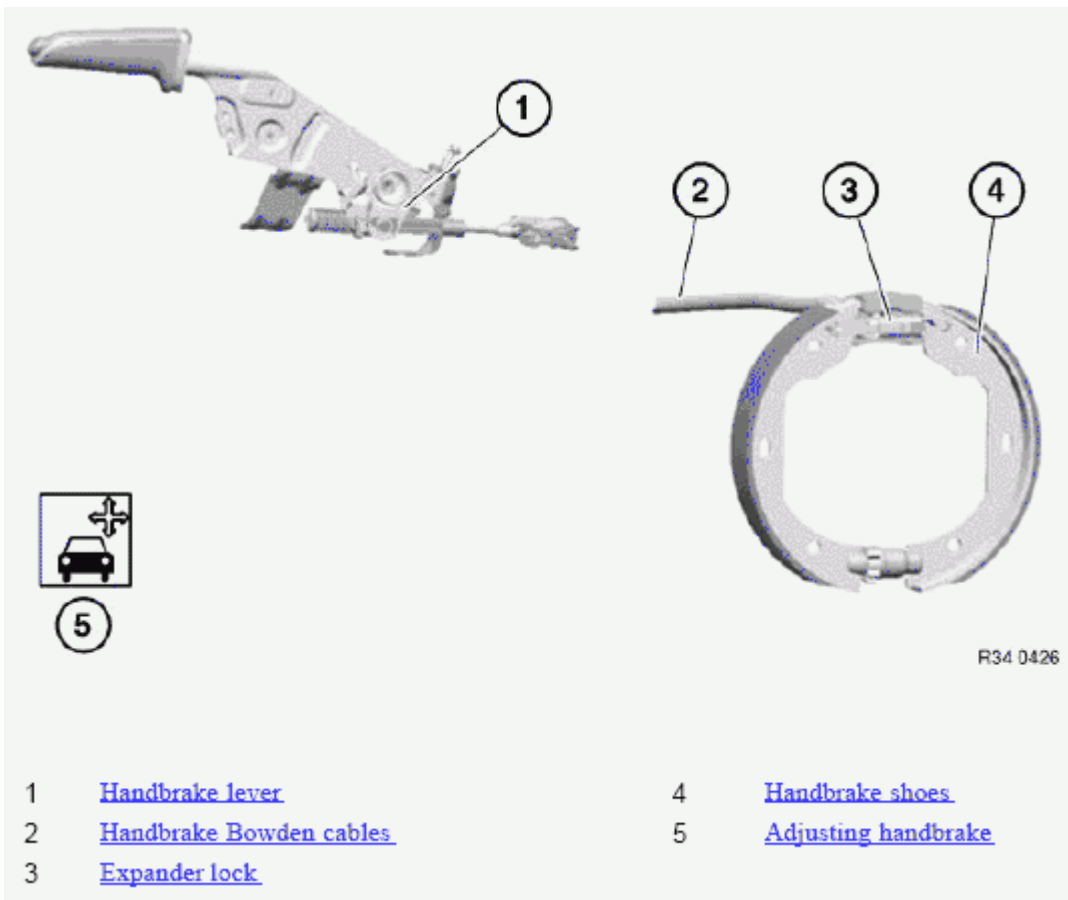


Fig. 89: Parking Brake Components

Courtesy of BMW OF NORTH AMERICA, INC.

34 41 000 REMOVING AND INSTALLING/REPLACING HANDBRAKE LEVER

Special tools required:

- **32 1 030 LEVER**

Necessary preliminary tasks:

- Remove storage compartment, see **51 16 200 REMOVING AND INSTALLING STORAGE COMPARTMENT** .
- After completing tasks, adjust handbrake, see **34 10 014 Adjusting handbrake**.

Lock adjuster unit (ASZE).

Using special tool 32 1 030 , press stop (2) of adjusting spring back to such an extent that retaining hook (3) engages in stop (2).

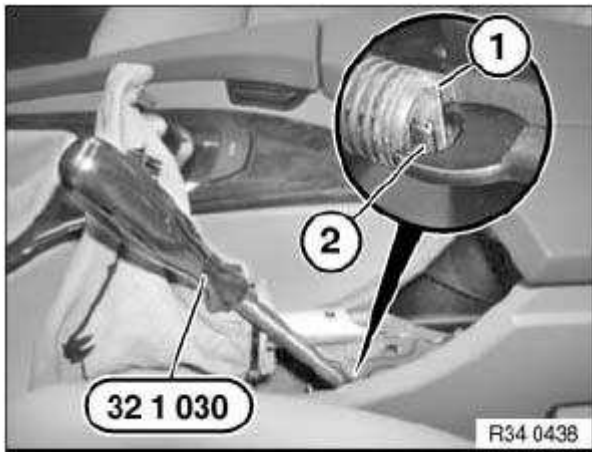


Fig. 90: Special Tool (32 1 030) With Retaining Hook
Courtesy of BMW OF NORTH AMERICA, INC.

Release nuts (1) and remove carrier for center console (2).

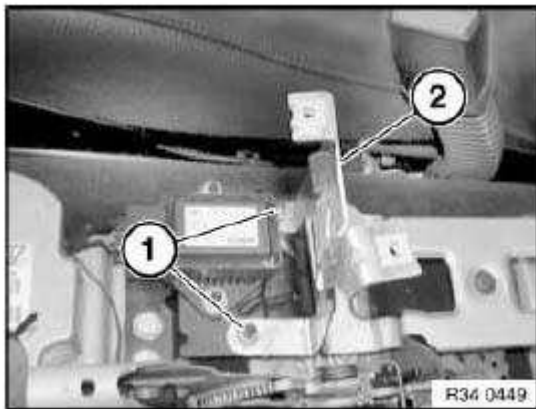


Fig. 91: Carrier For Center Console And Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1).

Release screws (2) and remove holder with DSC sensor.

IMPORTANT: Follow instructions on removing and installing DSC sensor .

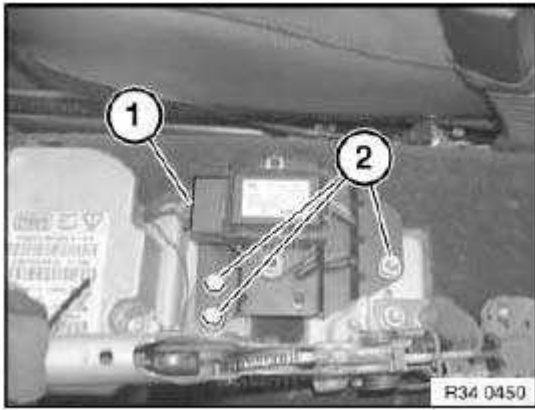


Fig. 92: Plug Connection And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Unclip mounting clip (1) upwards out of balance arm (2).

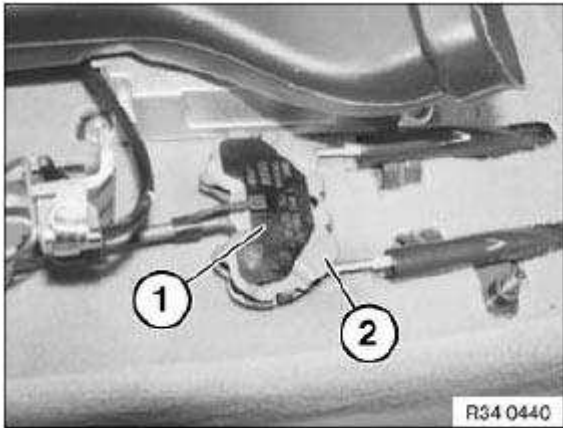


Fig. 93: Balance Arm And Mounting Clip
Courtesy of BMW OF NORTH AMERICA, INC.

Guide handbrake Bowden cables (1) with a screwdriver inwards and pull out of balance bar (2).

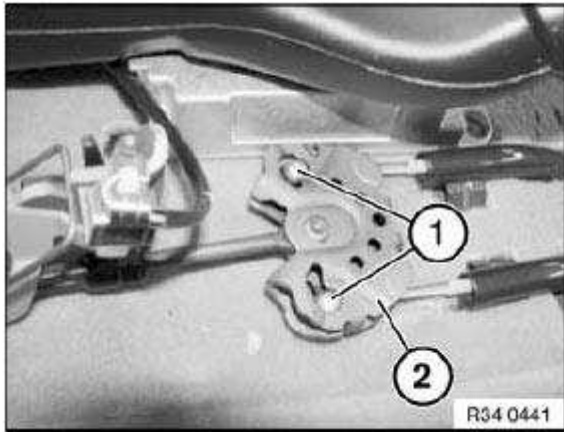


Fig. 94: Guide Handbrake Bowden Cables And Balance Bar
 Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect cable (1) from handbrake check switch.

Release screw (2) and remove handbrake lever (3).

Installation:

Tightening torque: 34 41 1AZ, see **34 41 PARKING BRAKE** .

Handbrake lever and adjustment unit (ASZE) are only exchanged completely as a single unit.

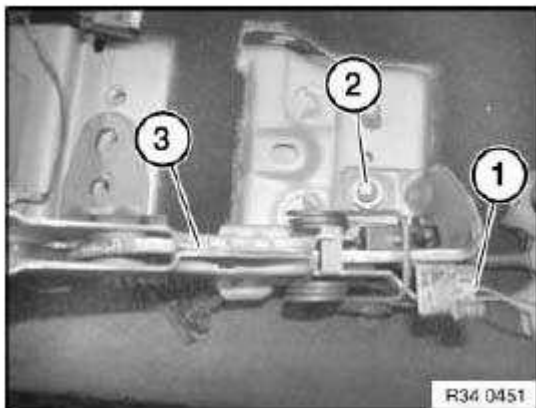


Fig. 95: Handbrake Lever, Cable And Screw
 Courtesy of BMW OF NORTH AMERICA, INC.

34 41 120 REMOVING AND INSTALLING/REPLACING BOTH HANDBRAKE BOWDEN CABLES

Special tools required:

- **32 1 030 LEVER**

Necessary preliminary tasks:

Remove storage compartment, see **51 16 200 REMOVING AND INSTALLING STORAGE COMPARTMENT** .

Remove rear brake disks .

Remove exhaust system, see **18 00 020 REMOVING AND INSTALLING COMPLETE EXHAUST SYSTEM (M54)** .

Remove heat shield.

NOTE: **After completing tasks, adjust handbrake, see 34 10 014 Adjusting handbrake.**

Lock adjuster unit (ASZE).

Using special tool 32 1 030 , press stop (1) of adjusting spring back to such an extent that retaining hook (2) engages in stop (1).

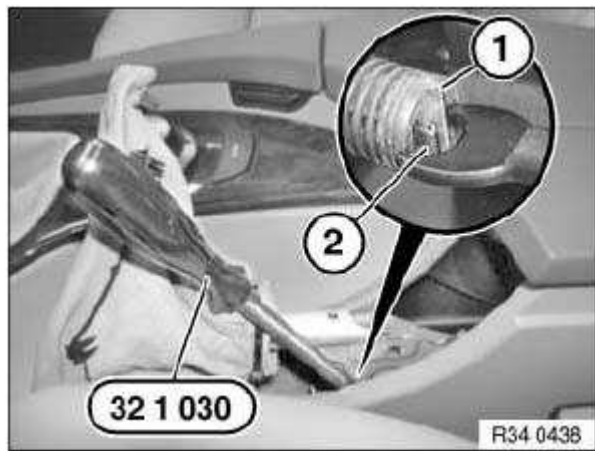


Fig. 96: Special Tool (32 1 030) With Retaining Hook
Courtesy of BMW OF NORTH AMERICA, INC.

Unclip mounting clip (1) upwards out of balance arm (2).

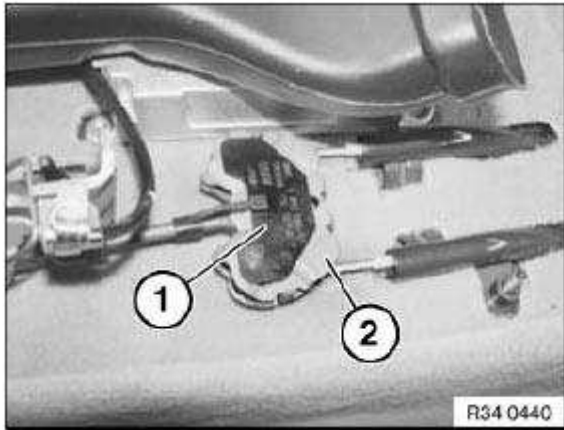


Fig. 97: Balance Arm And Mounting Clip
Courtesy of BMW OF NORTH AMERICA, INC.

Guide handbrake Bowden cables (1) with a screwdriver inwards and pull out of balance bar (2).

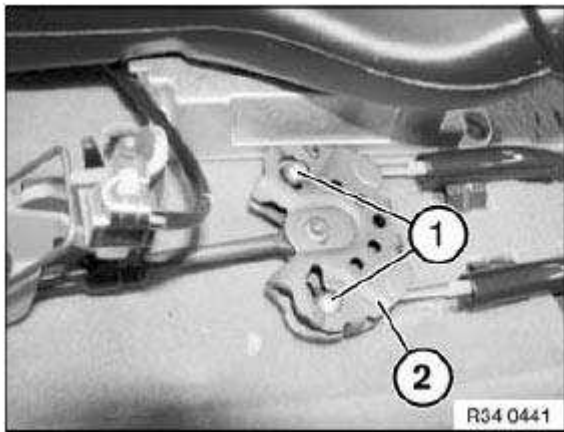


Fig. 98: Guide Handbrake Bowden Cables And Balance Bar
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect handbrake Bowden cables at expander locks.

Release screw (1) and remove holder.

Installation:

Tightening torque: 34 41 5AZ, see **34 41 PARKING BRAKE** .

Pull handbrake Bowden cables (2) out of wheel carrier.

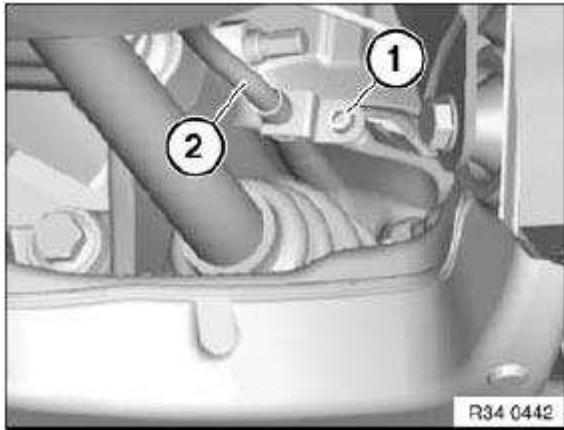


Fig. 99: Handbrake Bowden Cables And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect handbrake Bowden cables (1) out of mountings (2).

Pull handbrake Bowden cables (1) out of guide (3).

Feed handbrake Bowden cables (1) out of guide of rear axle (4).

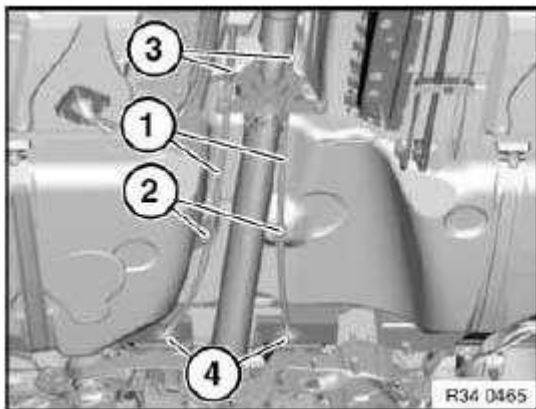


Fig. 100: Handbrake Bowden Cables, Guide And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

34 41 220 REMOVING AND INSTALLING/REPLACING ALL HANDBRAKE SHOES

Special tools required:

- **32 1 030 LEVER**
- **34 4 000 ALLEN KEY**

Necessary preliminary tasks:

- Remove rear brake disk

After completing work:

- Adjusting handbrake, see **34 10 014 Adjusting handbrake.**

Release handbrake lever.

Lock adjuster unit (ASZE).

Using special tool 32 1 030 , press stop (1) of adjusting spring back to such an extent that retaining hook (2) engages in stop (1).

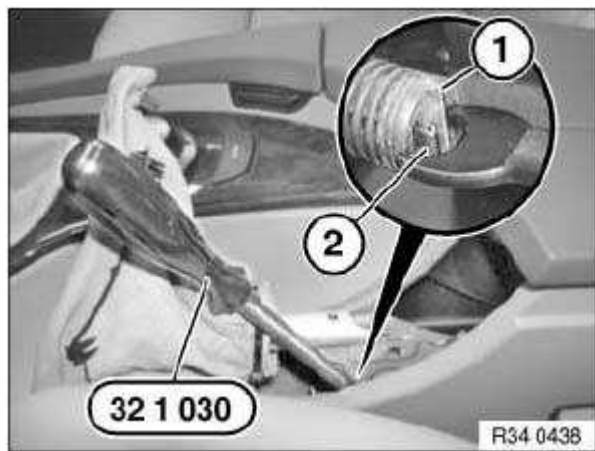


Fig. 101: Special Tool (32 1 030) With Retaining Hook
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect return spring (1) with brake spring pliers.

Installation:

Check and if necessary replace return spring (1).

Pay attention to installation position of adjustment screw (2).

Apply a thin coat of grease to bush and screw threads.

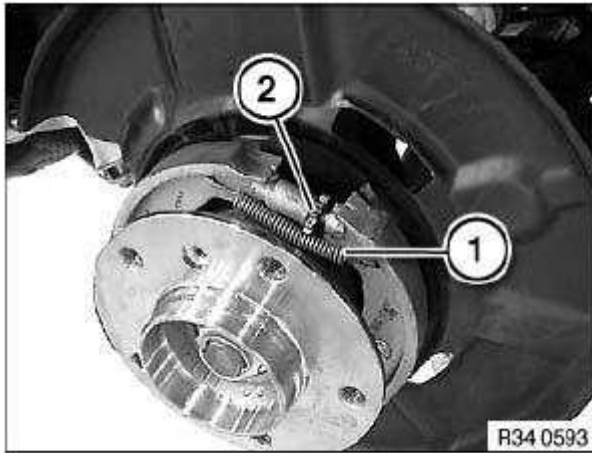


Fig. 102: Return Spring And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect return spring (1) with brake spring pliers.

Installation:

Check and if necessary replace return spring (1).

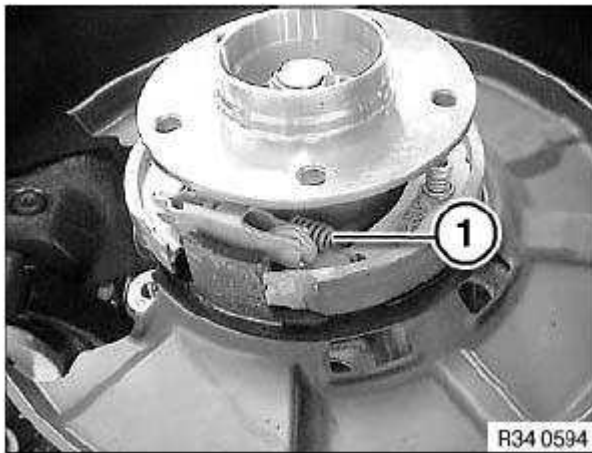


Fig. 103: Return Spring
Courtesy of BMW OF NORTH AMERICA, INC.

Turn clamping pins (1) with special tool 34 4 000 through 90° and disconnect.

Remove brake shoes (2).

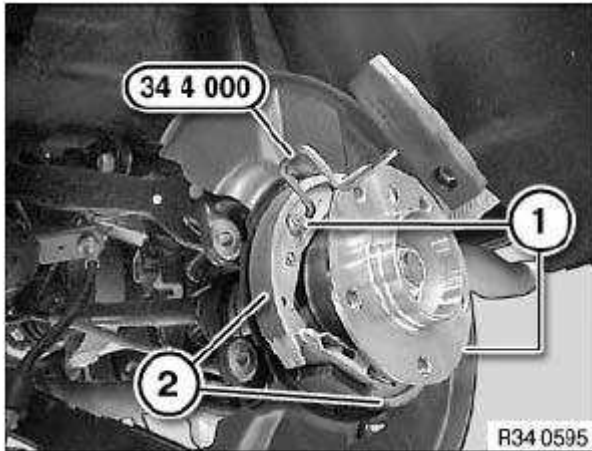


Fig. 104: Clamping Pins, Brake Shoes With Special Tool (34 4 000)
Courtesy of BMW OF NORTH AMERICA, INC.

34 41 250 REMOVING AND INSTALLING/REPLACING EXPANDER LOCK FOR HANDBRAKE SHOES

Special tools required:

- **32 1 030 LEVER**

Necessary preliminary tasks:

- Remove handbrake shoes, see **34 41 220 Removing and installing/replacing all handbrake shoes.**

After completing work:

- After completing tasks, adjust handbrake, see **34 10 014 Adjusting handbrake.**

Lock adjuster unit (ASZE).

Using special tool 32 1 030 , press stop (1) of adjusting spring back to such an extent that retaining hook (2) engages in stop (1).

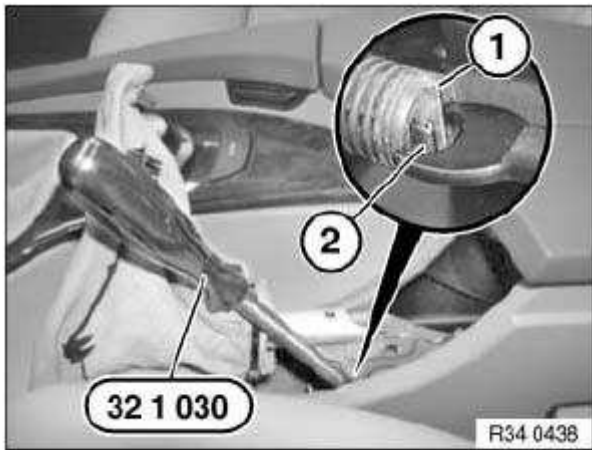


Fig. 105: Special Tool (32 1 030) With Retaining Hook
 Courtesy of BMW OF NORTH AMERICA, INC.

Pull expander lock (1) forwards, disconnect handbrake Bowden cable (2) and remove expander lock.

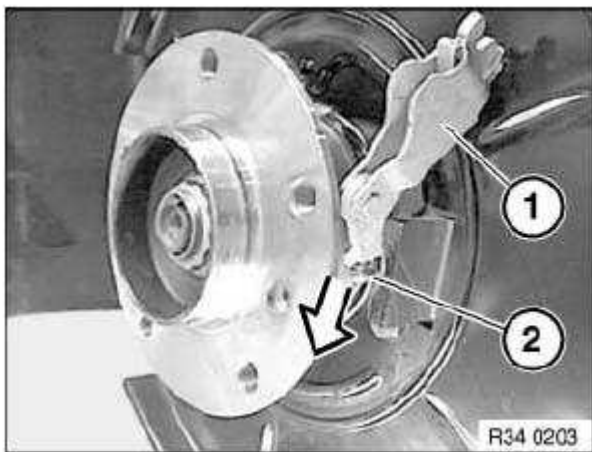


Fig. 106: Pulling Expander Lock And Handbrake Bowden Cable
 Courtesy of BMW OF NORTH AMERICA, INC.

51 MECHANICAL/HYDRAULIC COMPONENTS

34 51 527 REMOVING AND INSTALLING/REPLACING DSC HYDRAULIC UNIT

Necessary preliminary tasks:

- Read and comply with General Information, see **34 00 ... General Information**.
- Remove brake master cylinder, see **34 31 505 Removing and installing/replacing master brake cylinder for DSC**.
- After completing tasks, bleed brake system, see **34 00 050 Bleeding brake system with DSC**.

When replacing control unit:

- Carry out programming/coding
- Adjustment of steering angle sensor
- Mix-up check of brake lines
- Function check, hydraulic unit

IMPORTANT: Do not mix up brake lines, mark prior to removal if necessary.

Seal off connection bores with plugs.

Disconnect plug connection (1) to control unit.

Release brake lines (2) and if necessary disconnect lines to brake master cylinder completely.

Installation:

Note changed tightening torque.

Tightening torque: 34 32 6AZ, see **34 32 BRAKE LINES** .

Release screw (3) and carefully feed out and remove hydraulic unit.

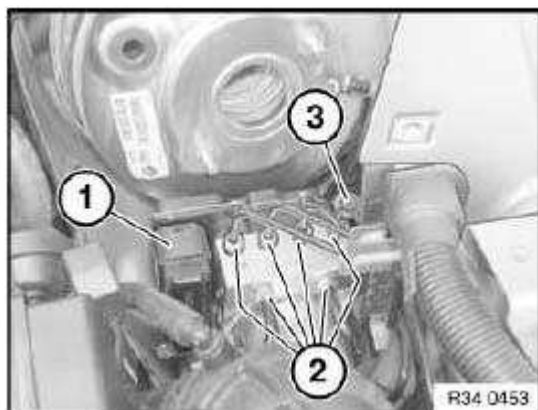


Fig. 107: Brake Lines, Plug Connection And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: If necessary, detach brake lines from mounting.

Brake lines must not be bent.

When replacing hydraulic unit:

Release screws (1) and convert holder (2).

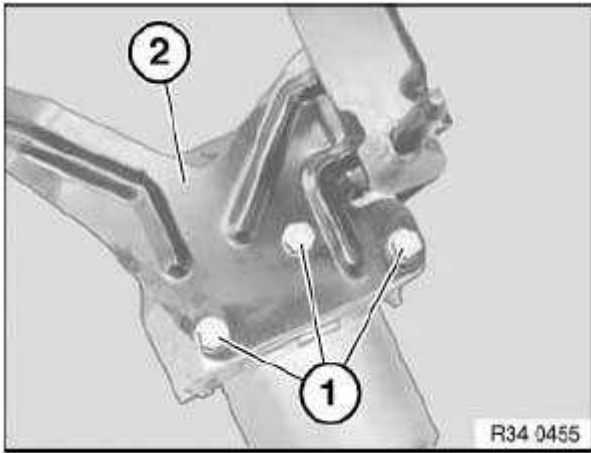


Fig. 108: Convert Holder And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

52 ELECTRONIC COMPONENTS

34 52 ... OVERVIEW OF ELECTRONIC COMPONENTS

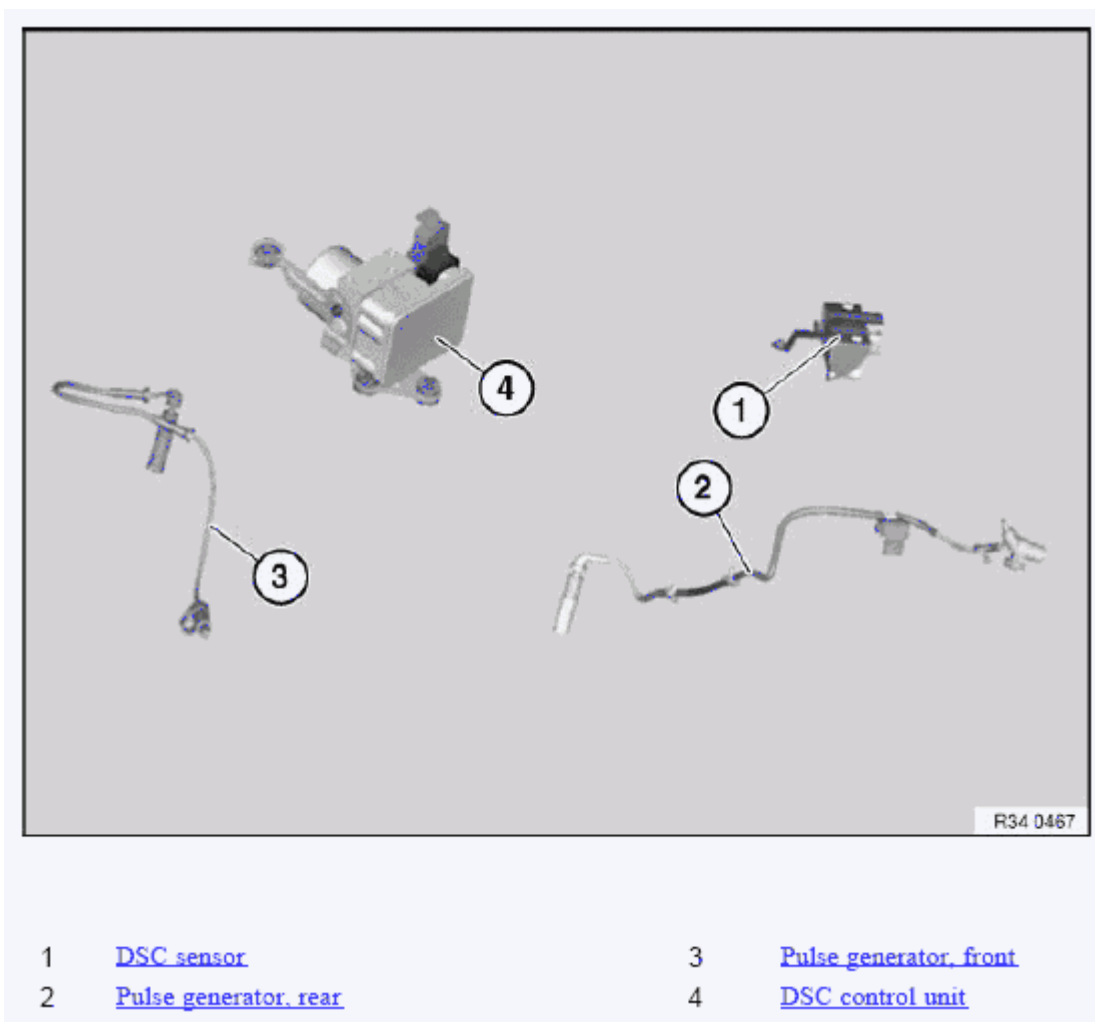


Fig. 109: Electronic Components

Courtesy of BMW OF NORTH AMERICA, INC.

34 52 516 REMOVING AND INSTALLING/REPLACING DSC CONTROL UNIT

IMPORTANT: Read and comply with 61 35 ... NOTES ON ESD PROTECTION (ELECTRO STATIC DISCHARGE) .

Necessary preliminary tasks:

- Remove hydraulic unit, see 34 51 527 Removing and installing/replacing DSC hydraulic unit.

Replacement:

- Carry out programming/coding using appropriate BMW service tool.
- Adjustment of steering angle sensor
- Mix-up check of brake lines
- Function check, hydraulic unit

Release screws (1) and carefully detach control unit (2) towards front.

IMPORTANT: Risk of damage to the contacts when removing and installing the hydraulic unit.

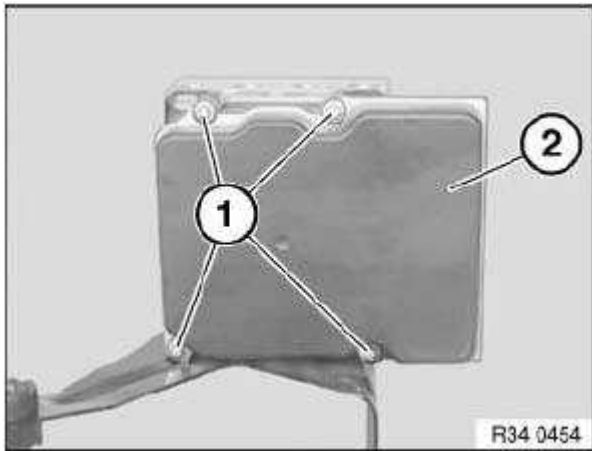


Fig. 110: Control Unit And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Keep sealing faces clean.

Replace screws.

Observe tightening sequence (1-4).

Tightening torque: 34 51 1AZ, see [34 51 SLIP CONTROL SYSTEM \(ABS, ASC+T, DSC\)](#) .

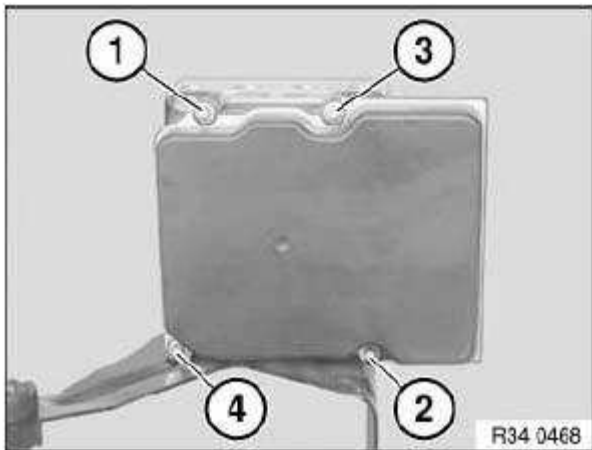


Fig. 111: Hydraulic Unit Screw Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

34 52 525 REPLACING ONE FRONT PULSE GENERATOR

IMPORTANT: Read and comply with 61 35 ... NOTES ON ESD PROTECTION (ELECTROSTATIC DISCHARGE) .

Read and comply with General Information, see 34 00 ... General Information.

Open plug housing (1), pull plug connection (2) out of fixture and disconnect.

Pull cable with rubber grommet out of fixture on spring strut and on body.

Installation:

Ensure proper locking of plug connector and proper seating of rubber grommets.

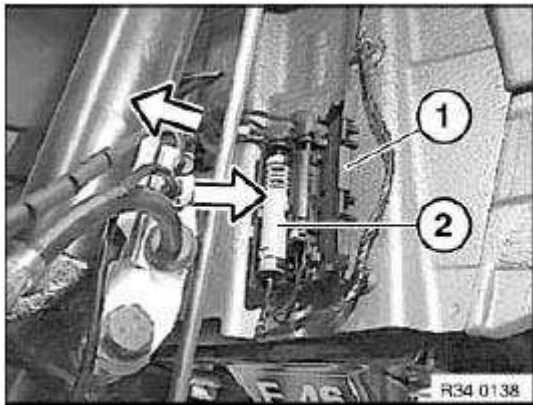


Fig. 112: Pulling Plug Connection And Plug Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Release socket head cap screw (1).

Withdraw pulse generator (2) from bore.

Installation:

Tightening torque: 34 51 6AZ, see 34 51 SLIP CONTROL SYSTEM (ABS, ASC+T, DSC) .

Clean bore hole for pulse generator and grease with Staburags NBU 12/K lubricating grease.

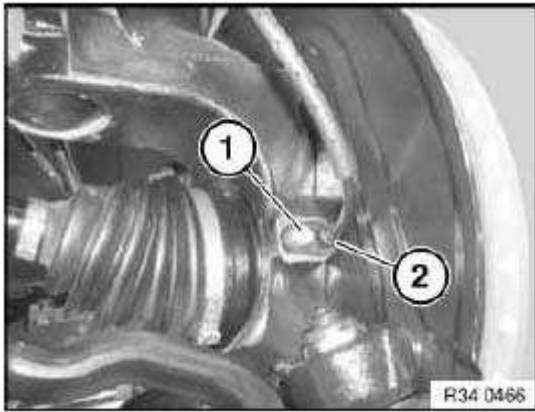


Fig. 113: Socket Head Cap Screw And Pulse Generator
Courtesy of BMW OF NORTH AMERICA, INC.

34 52 535 REPLACING A REAR PULSE GENERATOR

IMPORTANT: Read and comply with 61 35 ... NOTES ON ESD PROTECTION (ELECTROSTATIC DISCHARGE) .

Necessary preliminary tasks:

- Read and comply with General Information, see 34 00 ... General Information.
- Remove lip.

Open plug housing (1).

Pull plug connection for wheel speed sensor out of fixture and disconnect.

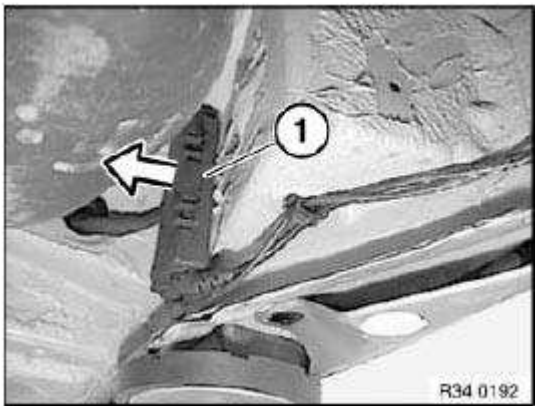


Fig. 114: Pulling Plug Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Release cable holder along trailing arm.

Release hexagon socket screw (1). Withdraw wheel speed sensor (2) from bore hole.

Installation:

Clean bore hole for pulse generator and grease with Staburags NBU 12/K lubricating grease.

Tightening torque: 34 51 6AZ, see **34 51 SLIP CONTROL SYSTEM (ABS, ASC+T, DSC)** .

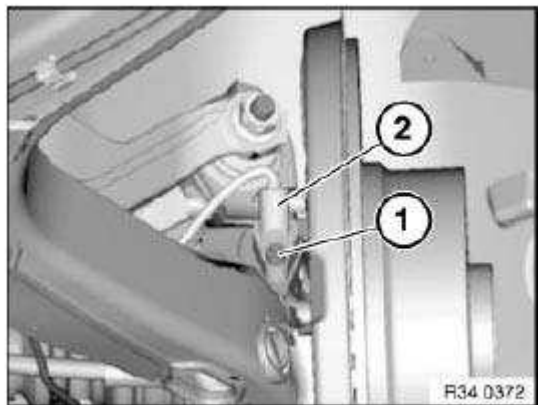


Fig. 115: Hexagon Socket Screw And Wheel Speed Sensor
Courtesy of BMW OF NORTH AMERICA, INC.

34 52 550 REMOVING AND INSTALLING/REPLACING DSC SENSOR

IMPORTANT: Read and comply with 61 35 ... NOTES ON ESD PROTECTION (ELECTRO STATIC DISCHARGE) .

Necessary preliminary tasks:

- Remove storage compartment, see **51 16 200 REMOVING AND INSTALLING STORAGE COMPARTMENT** .

NOTE: The DSC sensor contains the functions of the transversal acceleration sensor and the rotation rate sensor.

Unfasten plug connection (1).

Installation:

Make sure plug connection locks correctly.

Release screws (2) and remove rotation rate sensor.

Installation:

Tightening torque: 34 51 3AZ, see **34 51 SLIP CONTROL SYSTEM (ABS, ASC+T, DSC)** .

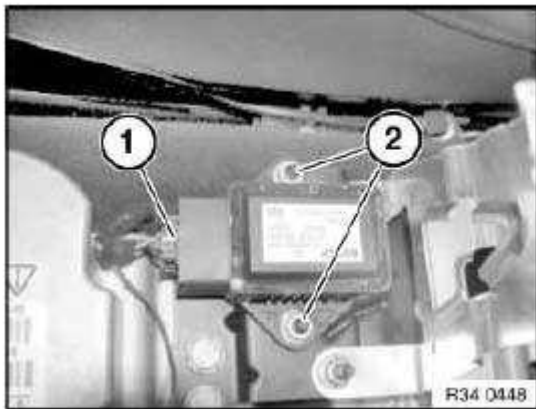


Fig. 116: Plug Connection And Screw
 Courtesy of BMW OF NORTH AMERICA, INC.

90 TROUBLESHOOTING

34 90 ... TROUBLESHOOTING BRAKE SYSTEM

TROUBLESHOOTING BRAKE SYSTEM CHART

Fault	Cause	Remedy
Brakes pull to one side	a) Tyre inflation pressure not in keeping with regulations b) Unevenly worn tire treads c) Oil on pads/liners d) Wrong type of pads/liners f) Guide bolts dirty or damaged g) Axle geometry not correct h) Corrosion in floating calipers	a) Correct tire inflation pressure b) <u>36 12 001 REPLACING A TYRE</u> c) Replace brake pads, see <u>34 11 000 Removing and installing/replacing brake linings of both front disc brakes</u> , Check for causes c) Replace brake pads, see <u>34 11 000 Removing and installing/replacing brake linings of both front disc brakes</u> , Check for causes f) Replace guide bolts, see <u>34 11 000 Removing and installing/replacing brake linings of both front disc brakes</u> . g) Check wheel alignment, see <u>32 00 ... CHASSIS/WHEEL ALIGNMENT CHECK PROCEDURE</u> . h) Remove and install, repair or

	<p>i) No shock absorber action</p> <p>k) Pad of one caliper worn</p>	<p>replace floating calipers, see <u>34 11 000 Removing and installing/replacing brake linings of both front disc brakes.</u></p> <p>i) Check shock absorber, replacing if necessary, see <u>31 31 031 REPLACING FRONT LEFT OR RIGHT SPRING STRUT SHOCK ABSORBER .</u></p> <p>c) Replace brake pads, see <u>34 11 000 Removing and installing/replacing brake linings of both front disc brakes,</u> Check floating caliper</p>
Brakes excessively hot while driving	<p>a) Compensating port in brake master cylinder blocked</p> <p>c) Swollen rubber parts due to use of wrong brake fluid</p> <p>d) Bleeder hole on expansion tank blocked</p> <p>e) Corroded floating calipers</p> <p>f) Handbrake lever not released fully</p>	<p>a) Replace master brake cylinder, see <u>34 31 505 Removing and installing/replacing master brake cylinder for DSC.</u></p> <p>c) Replace master brake cylinder, see <u>34 31 505 Removing and installing/replacing master brake cylinder for DSC.</u></p> <p>d) Clean expansion tank, see <u>34 31 181 Removing and installing/replacing expansion tank for hydraulic brake actuation.</u></p> <p>e) Remove and install, repair or replace floating calipers, see <u>34 11 000 Removing and installing/replacing brake linings of both front disc brakes.</u></p> <p>f) Check handbrake and handbrake Bowden cables, repair if necessary, see <u>34 41 120 Removing and installing/replacing both handbrake Bowden cables.</u></p>
Poor braking effect in spite of great force on pedal Travel at brake pedal normal	Brake pads oil-splattered or burnt; wrong type of brake pads	c) Replace brake pads, see <u>34 11 000 Removing and installing/replacing brake linings of both front disc brakes.</u>
Poor braking effect in spite of great force on pedal Travel at brake pedal too short	Brake booster malfunctions - engine vacuum	Check brake booster
Poor braking effect in spite of great force on pedal Travel at brake pedal too long	One brake circuit failed due to leaks or damage	Leakage test of brake system

<p>Brake pedal can be pressed down softly and springily</p>	<p>a) Air in brake system</p> <p>b) Not enough brake fluid in expansion tank</p> <p>c) Overheated brake fluid - vapor lock due to excessive water content in brake fluid or excessive brake loads</p>	<p>a) Bleed brakes, see <u>34 00 050 Bleeding brake system with DSC.</u></p> <p>b) Top up or change brake fluid, Bleed brakes, see <u>34 00 050 Bleeding brake system with DSC.</u></p> <p>c) Change brake fluid, Bleed brakes, see <u>34 00 050 Bleeding brake system with DSC.</u></p>
<p>Brake is bled and readjusted, but brake pedal can be pressed down too far</p>	<p>a) Primary cup seal in brake master cylinder damaged</p> <p>b) Leaking separating cup seals on floating piston of brake master cylinder</p> <p>c) Leak in brake system</p>	<p>a) Replace master brake cylinder, see <u>34 31 505 Removing and installing/replacing master brake cylinder for DSC.</u></p> <p>b) Replace master brake cylinder, see <u>34 31 505 Removing and installing/replacing master brake cylinder for DSC.</u></p> <p>c) Leakage test of brake system</p>
<p>Uneven pad wear</p>	<p>a) Wrong type of pads/liners</p> <p>b) Dirty fist caliper recesses, damaged caps</p> <p>c) Corrosion in floating calipers</p> <p>d) Swollen rubber ring for piston control</p>	<p>a) Replace brake pads, see <u>34 11 000 Removing and installing/replacing brake linings of both front disc brakes.</u></p> <p>b) Remove and install, repair or replace floating calipers, see <u>34 11 000 Removing and installing/replacing brake linings of both front disc brakes.</u></p> <p>c) Remove and install, repair or replace floating calipers, see <u>34 11 000 Removing and installing/replacing brake linings of both front disc brakes.</u></p> <p>d) Remove and install, repair or replace floating calipers, see <u>34 11 000 Removing and installing/replacing brake linings of both front disc brakes.</u></p>
<p>Brake pads worn at angle</p>	<p>a) Wheel-bearing play excessive</p> <p>b) Brake disk not aligned with fist caliper</p> <p>c) Corrosion in floating calipers</p> <p>d) Angular brake-disk wear</p>	<p>a) Replace wheel bearings</p> <p>b) Check floating caliper installation</p> <p>c) Remove and install, repair or replace floating calipers, see <u>34 11 000 Removing and installing/replacing brake linings of both front disc brakes.</u></p> <p>d) Grind or replace brake disks, see</p>

	<p>e) Minimum lining thickness undershot</p> <p>f) Spring force insufficient</p> <p>g) Guide bolts damaged</p>	<p><u>34 11 220 Removing and installing/replacing both front brake discs.</u></p> <p>e) Replace brake pads, see <u>34 11 000 Removing and installing/replacing brake linings of both front disc brakes.</u></p> <p>f) Replace spring, see <u>34 11 000 Removing and installing/replacing brake linings of both front disc brakes.</u></p> <p>g) Replace guide bolts, see <u>34 11 000 Removing and installing/replacing brake linings of both front disc brakes.</u></p>
<p>Seized brake pads, pad does not move off brake disk</p>	<p>a) Dirty fist caliper recesses, damaged caps</p> <p>b) Corrosion in floating calipers</p> <p>c) Compensating port in brake master cylinder blocked</p>	<p>a) Remove and install, repair or replace floating calipers, see <u>34 11 000 Removing and installing/replacing brake linings of both front disc brakes.</u></p> <p>b) Remove and install, repair or replace floating calipers, see <u>34 11 000 Removing and installing/replacing brake linings of both front disc brakes.</u></p> <p>c) Replace master brake cylinder, see <u>34 31 505 Removing and installing/replacing master brake cylinder for DSC.</u></p>
<p>Brakes squeal or rattle</p>	<p>a) Wrong type of pads/liners</p> <p>b) Dirty floating caliper recesses</p> <p>c) Spring force insufficient</p> <p>d) Brake disk not aligned with fist caliper</p>	<p>a) Replace brake pads, see <u>34 11 000 Removing and installing/replacing brake linings of both front disc brakes.</u></p> <p>b) Remove and install/clean floating calipers, see <u>34 11 000 Removing and installing/replacing brake linings of both front disc brakes.</u></p> <p>c) Replace spring, see <u>34 11 000 Removing and installing/replacing brake linings of both front disc brakes.</u></p> <p>d) Check floating caliper installation, see <u>34 11 000 Removing and installing/replacing brake linings of both front disc brakes.</u></p>

	<p>e) Brake-disk runout</p> <p>f) Excessive thickness deviation within braking surface</p> <p>g) Liner wear excessive or one-sided</p> <p>h) Rust edges on brake disks</p> <p>i) Pad loose</p> <p>j) Wheel-bearing play excessive</p>	<p>e) Replace brake discs, see <u>34 11 220 Removing and installing/replacing both front brake discs.</u></p> <p>f) Measure brake disk thickness. Grind or replace disks, see <u>34 11 667 Precision-turning both front brake discs on both sides.</u></p> <p>g) Replace brake shoes, see <u>34 41 220 Removing and installing/replacing all handbrake shoes.</u></p> <p>h) Grind or replace brake disks, see <u>34 11 220 Removing and installing/replacing both front brake discs.</u></p> <p>i) Replace brake pads, see <u>34 11 000 Removing and installing/replacing brake linings of both front disc brakes.</u></p> <p>j) Replace wheel bearings</p>
Brake-pedal dead travel excessive	<p>a) Wheel-bearing play excessive</p> <p>b) Brake disk not aligned with fist caliper</p> <p>c) Brake-disk runout</p> <p>d) Excessive thickness deviation within braking surface</p> <p>e) Brake system leaking</p> <p>f) Air in brake system</p> <p>g) Wrong type of pads/liners</p>	<p>a) Replace wheel bearings</p> <p>b) Check floating caliper installation</p> <p>c) Replace brake discs, see <u>34 11 220 Removing and installing/replacing both front brake discs.</u></p> <p>d) Measure brake disk thickness. Grind or replace disks, see <u>34 11 667 Precision-turning both front brake discs on both sides.</u></p> <p>e) Leakage test of brake system</p> <p>f) Bleed brakes, see <u>34 00 050 Bleeding brake system with DSC.</u></p> <p>g) Replace brake pads, see <u>34 11 000 Removing and installing/replacing brake linings of both front disc brakes.</u></p>
Jammed piston in brake caliper	<p>a) Dirty fist caliper recesses, damaged caps</p> <p>b) Brake disk not aligned with fist caliper</p>	<p>a) Remove and install, repair or replace floating caliper, see <u>34 11 519 Removing and installing/replacing left or right front brake caliper.</u></p> <p>b) Check floating caliper installation, see <u>34 11 000</u></p>

	c) Pistons corroded in floating calipers	<p><u>Removing and installing/replacing brake linings of both front disc brakes.</u></p> <p>c) Remove and install, repair or replace floating caliper, see <u>34 11 519 Removing and installing/replacing left or right front brake caliper.</u></p>
Pulsating effect on brake pedal	<p>a) Wheel-bearing play excessive</p> <p>b) Brake disk not aligned with fist caliper</p> <p>c) Brake-disk runout</p> <p>d) Excessive thickness deviation within braking surface</p>	<p>a) Replace wheel bearings</p> <p>b) Check floating caliper installation, see <u>34 11 000 Removing and installing/replacing brake linings of both front disc brakes.</u></p> <p>c) Replace brake discs, see <u>34 11 220 Removing and installing/replacing both front brake discs.</u></p> <p>d) Measure brake disk thickness. Grind or replace disks, see <u>34 11 667 Precision-turning both front brake discs on both sides.</u></p>
Handbrake effect insufficient	<p>a) Brake shoes oil-splattered</p> <p>b) Excessive dead travel between brake shoes and brake drums</p> <p>c) Corroded transmitting elements</p>	<p>a) Replace brake shoes, see <u>34 41 220 Removing and installing/replacing all handbrake shoes,</u> determine cause</p> <p>b) Adjust handbrake, see <u>34 10 014 Adjusting handbrake.</u></p> <p>c) Remove and install handbrake and expander locks. Check Bowden cables, replacing if necessary, see <u>34 41 120 Removing and installing/replacing both handbrake Bowden cables.</u></p>

BRAKES

Pedal Assembly - Repair Instructions - X3

11 PEDAL MOUNTING BLOCK

35 11 000 REMOVING AND INSTALLING COMPLETE BEARING BLOCK FOR FOOT PEDAL

Necessary preliminary tasks:

- Remove brake pedal, see [35 21 000 Removing and installing/replacing brake pedal](#).
- Remove clutch pedal, see [35 31 000 Removing and installing/replacing clutch pedal](#).
- Remove clutch master cylinder from bearing block.

Unscrew nuts (1).

Release nut (2) and remove bearing block (3).

Installation:

Tighten nuts (1) in front of nut (2).

Tightening torque, see 1AZ in [PEDALS - TIGHTENING TORQUES -- X3](#).

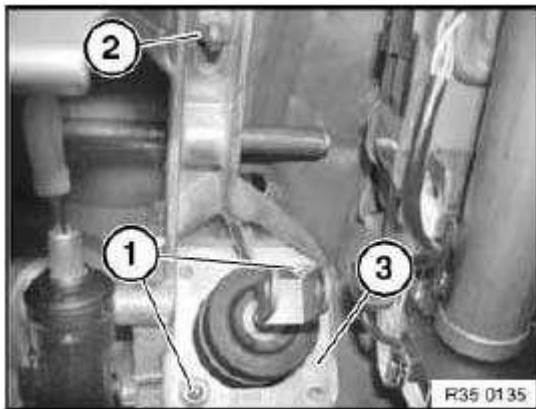


Fig. 1: Nut And Bearing Block

Courtesy of BMW OF NORTH AMERICA, INC.

21 BRAKE PEDAL WITH LINKAGE

35 21 000 REMOVING AND INSTALLING/REPLACING BRAKE PEDAL

Necessary preliminary tasks:

- Remove pedal trim, see [51 45 185 REMOVING AND INSTALLING/REPLACING TRIM FOR](#)

PEDAL ASSEMBLY .

Disconnect return spring (1).

Release screw (2) and remove holder (3).

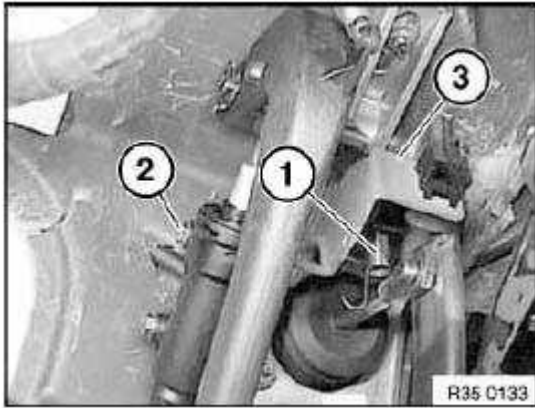


Fig. 2: Spring, Screw And Holder

Courtesy of BMW OF NORTH AMERICA, INC.

Remove locking clip (1), disconnect pin (2) and pull out.

Remove locking clip (3) and feed out brake pedal (4).

Installation:

Replace locking clip.

The locking clip must be seated with both legs in the pin groove.

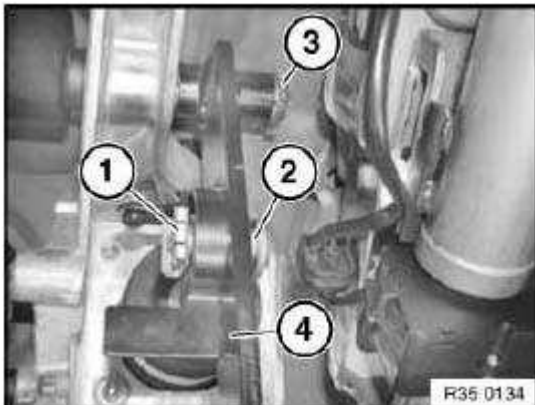


Fig. 3: Locking Clip, Pin And Brake Pedal

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check bearing bushes (1) and replace if necessary.

Lightly grease bearing bushes (1).

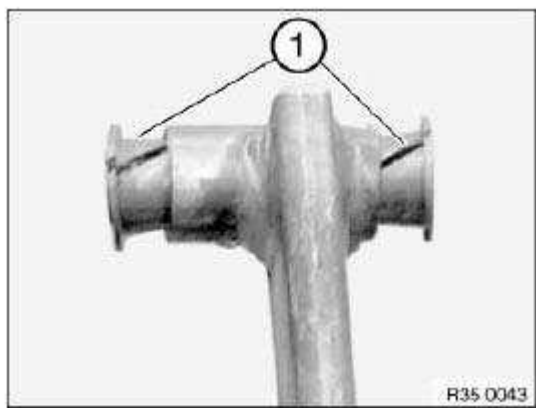


Fig. 4: Bearing Bushes

Courtesy of BMW OF NORTH AMERICA, INC.

35 21 041 REPLACING SPRING FOR BRAKE PEDAL

- Remove pedal trim, see **51 45 185 REMOVING AND INSTALLING/REPLACING TRIM FOR PEDAL ASSEMBLY** .

Disconnect return spring (1). 2 = Clutch master cylinder 3 = Brake light switch Note: Check grommet for damage, replace if necessary.

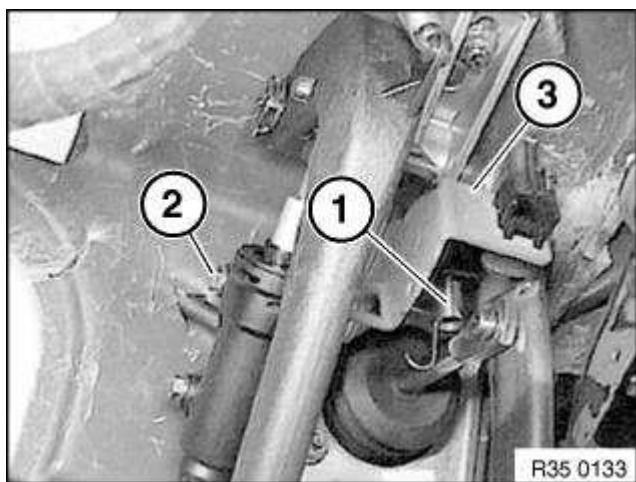


Fig. 5: Disconnecting Return Spring

Courtesy of BMW OF NORTH AMERICA, INC.

35 21 041 REPLACING SPRING FOR CLUTCH PEDAL

Operation is described in: Removing and installing clutch pedal.

31 CLUTCH PEDAL WITH LINK

35 31 000 REMOVING AND INSTALLING/REPLACING CLUTCH PEDAL

Necessary preliminary tasks:

- Remove pedal trim, see 51 45 185 REMOVING AND INSTALLING/REPLACING TRIM FOR PEDAL ASSEMBLY .

Disconnect return spring (1).

Press pin ends (2) together and remove pin.

Detach locking clip (3) and pull clutch pedal off bearing block.

Installation:

Replace locking clip.

The locking clip must be seated with both legs in the pin groove.

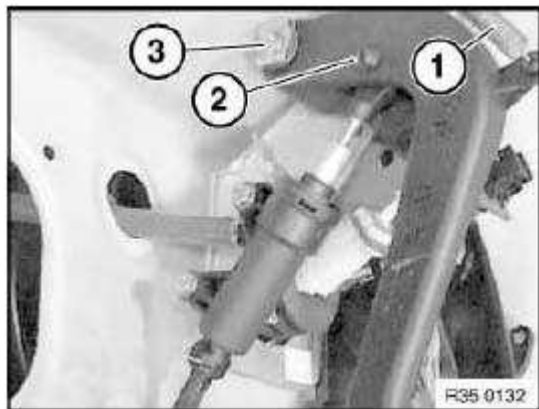


Fig. 6: Spring, Pin Ends And Locking Clip
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check bearing bushes (1) and replace if necessary.

Lightly grease bearing bushes (1),

Replace rubber grommet (2) if necessary.

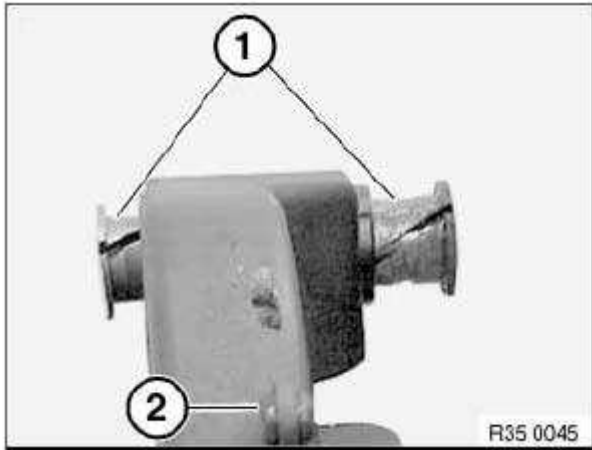


Fig. 7: Bearing Bushes

Courtesy of BMW OF NORTH AMERICA, INC.

40 ACCELERATOR PEDAL ACTUATOR

35 40 001 REMOVING AND INSTALLING OR REPLACING ACCELERATOR PEDAL MODULE

Take off cap.

Release screw.

Pull accelerator pedal module upwards out of fixture.

Installation:

Tightening torque, see 1AZ in **35 40 PEDALS** .

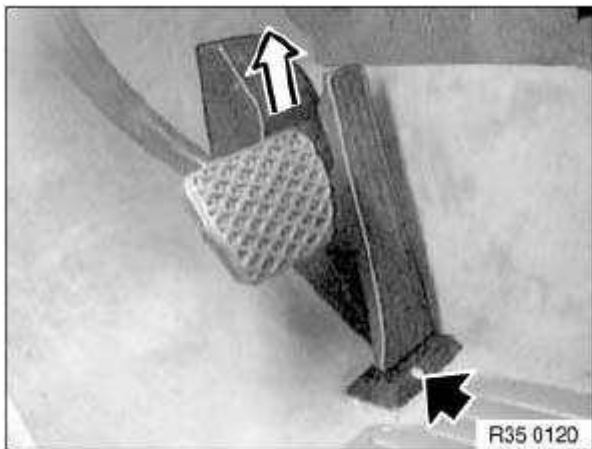


Fig. 8: Pulling Accelerator Pedal

Courtesy of BMW OF NORTH AMERICA, INC.

Pull off plug (1).

Remove accelerator pedal module.

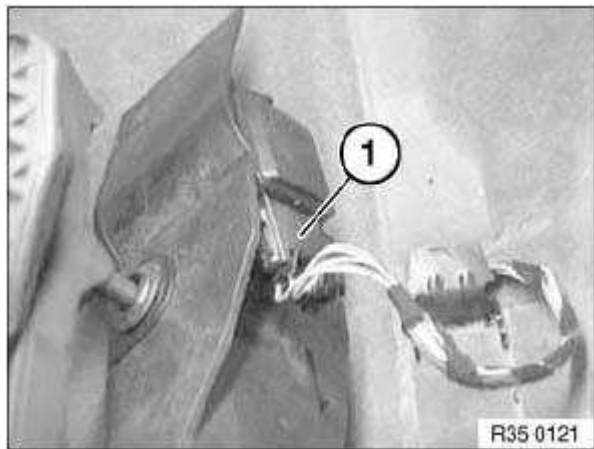


Fig. 9: Plug

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Accelerator pedal module can only be replaced completely with adapter plate.

BRAKES

Pedals - Operating Fluids

1.0 GENERAL INFORMATION

For lubricating friction points on the pedal assemblies, use Syntheso Glep 1 (BMW Part No. 83 23 9 407 778).

BRAKES

Pedals - Tightening Torques - X3

11 PEDAL MOUNTING BLOCK

35 11 PEDAL ASSEMBLY CONSOLE

PEDAL ASSEMBLY CONSOLE - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Bearing pedestal to brake assembly and body	E38 / E39 / E52			31 Nm
	E36 / E46			25 Nm
	E53 / E65 / E66 / E67 / E60 / E61 / E63 / E64 / E83		Retighten 1x on brake booster after 30 min.	25 Nm
	E85 / E86	M8	Retighten 1x on brake booster after 30 min	22 Nm
2AZ Bracket to bearing block	E85 / E86	M6		9 Nm

40 ACCELERATOR PEDAL ACTUATION

35 40 PEDALS

PEDALS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Accelerator pedal module to body	E65 / E66 / E83 / E85 / E86	M6		9 Nm
	E60 / E61 / E63 / E64 / E67	M6		8 Nm

DRIVELINE/AXLES

Front Axle - Operating Fluids

1.0 GENERAL INFORMATION ON HIGH TEMPERATURE MULTI-PURPOSE GREASE

High temperature multi-purpose grease consists of a lithium complex soap in a mineral oil product with a selected combination of additives. Extremely fine soap is contained in the oil, and serves as the basic ingredient.

This lubricating grease possesses the following properties:

- Very good thermal resistance and penetration stability

The structure and consistency must be maintained over long service life with temperatures from -22°F to +302°F (-30°C to +150°C) in continuous operation and very high loads.

- Oxidation stability

A lubricating grease contains effective inhibitors (which limit or prevent chemical reactions) in order to stop oxidation at very high operating temperatures.

- Water resistance and corrosion inhibition

A high temperature multi-purpose grease is water resistant. At the same time lubricated parts are given maximum protection against rust by the corrosion inhibitors.

2.0 APPROVED HIGH TEMPERATURE MULTI-PURPOSE GREASE

High temperature multi-purpose grease is used for the lubrication of wheel bearings.

Ball Bearings (E24 from mid 1982, E28, E30, E31, E32 and all following)

Provided with lifetime lubrication.

No subsequent lubrication approved!

Tapered Roller Bearings (E23, E21)

50 grams grease packing in wheel hub and 20 grams in wheel hub grease cap per wheel.

Grease type: Retinax A

CRC Part No. SL 3131 (former BMW Part No. 81 22 9 407 710)

3.0 APPROVED FRONT AXLE FINAL DRIVE OILS

Approvals are the same as for rear axle final drive oils.

DRIVELINE/AXLES

Propeller Shaft - Operating Fluids

1.0 GENERAL INFORMATION

The locating tabs of the drive shaft to the transmission output flange may be lubricated with any high temperature resistant, long-term grease (available locally).

DRIVELINE/AXLES

Propeller Shaft - Repair Instructions - X3

00 PROPELLER SHAFT GENERAL

26 00 ... PROPELLER SHAFT DEFLECTION ANGLES

IMPORTANT: Specifications on propeller shaft deflection angles

For E53, E6x, E8x, E9x

Only possible on request with the vehicle identification number of the problem vehicle via PuMA.

26 20 001 REPLACING FRONT PROPELLER SHAFT

IMPORTANT: Do not move vehicle with engine power once propeller shaft has been removed. Replace propeller shaft only in conjunction with a new drive flange and radial shaft seal for front axle output.

IMPORTANT: Replacement only: according to installation with BMW diagnosis and information system under control unit function Perform functional check of transfer box (calibration)

Remove **front propeller shaft**. Replace output flange for front axle output. See **27 10 050 REPLACING OUTPUT FLANGE FOR FRONT AXLE OUTPUT (ATC 400/500 X-DRIVE)** . Replace radial shaft seal for output front axle. See **27 21 030 REPLACING RADIAL SHAFT SEAL FOR FRONT AXLE OUTPUT (ATC 400/500 X-DRIVE)** .

26 20 000 REMOVING AND INSTALLING FRONT PROPELLER SHAFT

IMPORTANT: Do not move vehicle with engine power once propeller shaft has been removed.

Necessary preliminary tasks: If necessary, remove underbody protection.

Unfasten screws. Tightening torque, see 26 11 9AZ in **26 11 PROPELLER SHAFT COMPLETE** .

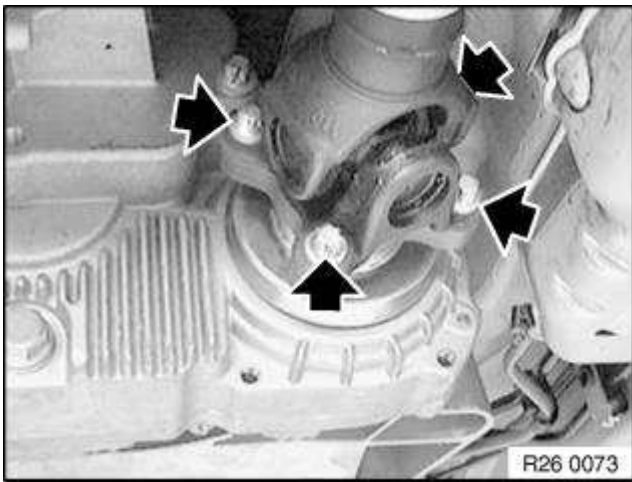


Fig. 1: Unfastening Screws

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: M47T2 From 10/04, front propeller shaft with locking mass (1).

Unfasten screws. Tightening torque, see 26 11 9AZ in **26 11 PROPELLER SHAFT COMPLETE** . Remove propeller shaft with locking mass.

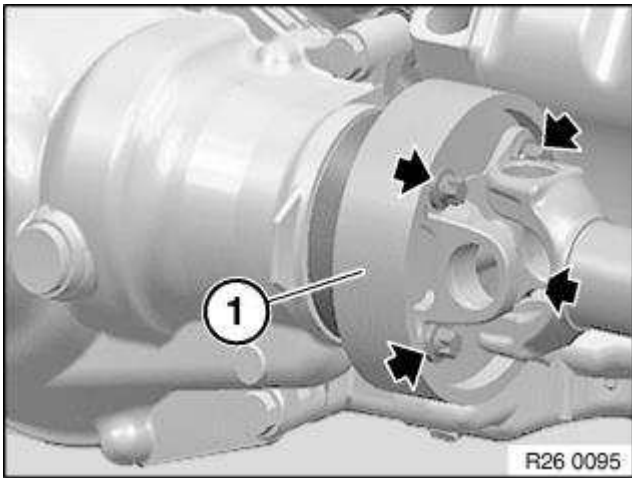


Fig. 2: Front Propeller Shaft With Locking Mass (1)

Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws. Tightening torque, see 26 11 9AZ in **26 11 PROPELLER SHAFT COMPLETE** . Remove propeller shaft.

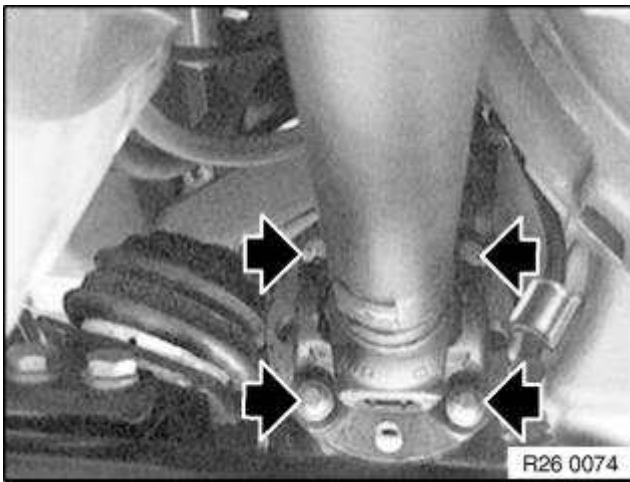


Fig. 3: Removing Propeller Shaft

Courtesy of BMW OF NORTH AMERICA, INC.

11 PROPELLER SHAFT ASSEMBLY

26 11 000 REMOVING AND INSTALLING PROPELLER SHAFT (CARDAN UNIVERSAL JOINT) COMPLETELY

Special tools required:

See **26 1 040 SPANNER** .

- 26 1 040

Necessary preliminary tasks:

- Remove complete exhaust system, see **18 00 020 REMOVING AND INSTALLING COMPLETE EXHAUST SYSTEM (M54)** .
- Remove heat shield.

Release threaded ring (1) several turns with special tool 26 1 040.

Installation:

Tighten threaded ring with special tool 26 1 040.

Tightening torque: 3AZ, See **26 11 PROPELLER SHAFT COMPLETE** .

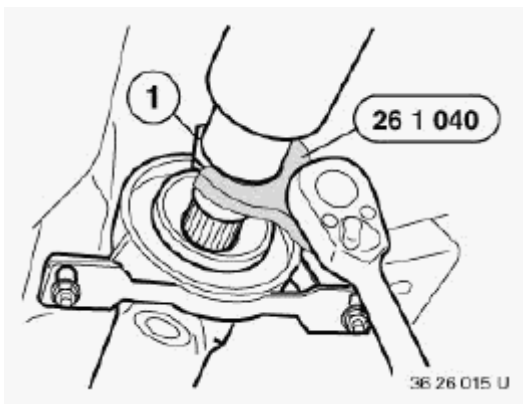


Fig. 4: Threaded Ring And Special Tool (26 1 040)
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws.

Tightening torque: 1AZ, see **26 11 PROPELLER SHAFT COMPLETE** .

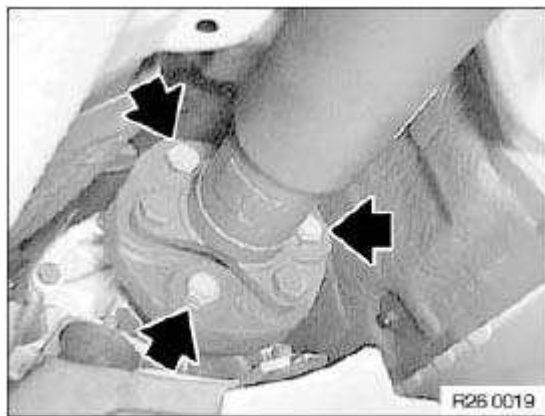


Fig. 5: Driveshaft Screws
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: To avoid complaints of humming:

Before removing propeller shaft, mark cardan universal joint to drive flange of final drive.

Reinstall joint in this position.

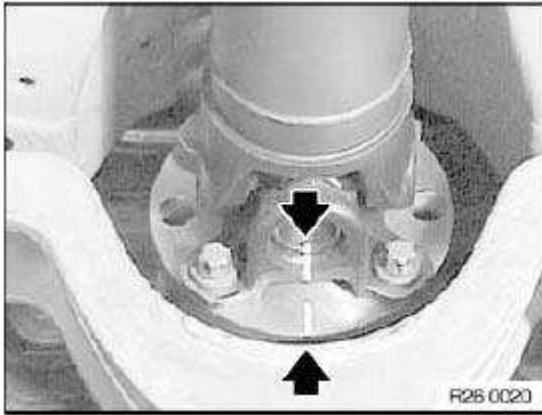


Fig. 6: Mark On Universal Joint To Drive Flange Of Final Drive
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws.

Tightening torque: 4AZ, see **26 11 PROPELLER SHAFT COMPLETE** .

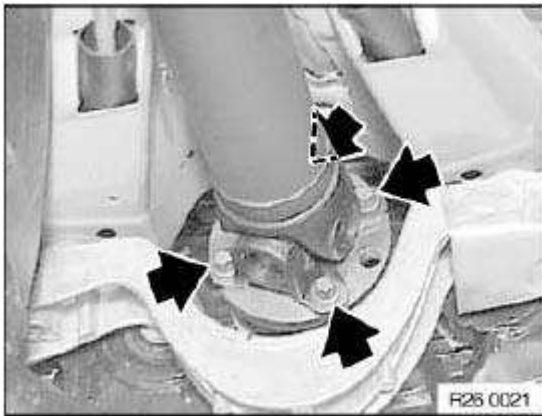


Fig. 7: Driveshaft Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Push rear propeller shaft (1) forwards.

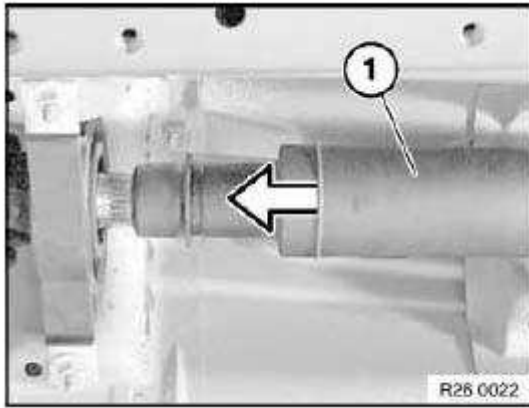


Fig. 8: Rear Propeller Shaft

Courtesy of BMW OF NORTH AMERICA, INC.

Grip propeller shaft and release nuts.

Tightening torque: 6AZ, see **26 11 PROPELLER SHAFT COMPLETE** .

Bend propeller shaft downwards at center bearing (1).

Detach propeller shaft from transmission output flange and remove downwards.

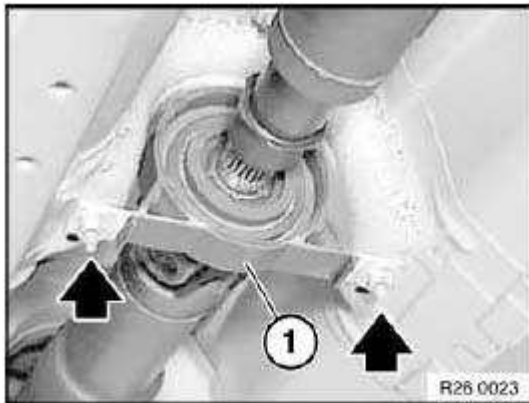


Fig. 9: Driveshaft Retaining Nuts

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check centering; if necessary, replace damaged centering, see **26 11 090 Removing and installing /replacing centering mount for propeller shaft.**

Grease centering mount.

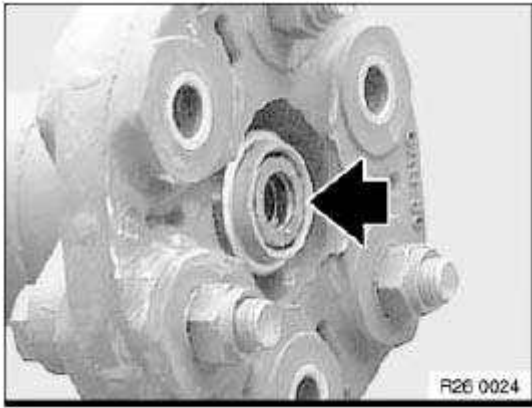


Fig. 10: Centering Mount

Courtesy of BMW OF NORTH AMERICA, INC.

26 11 020 REPLACING CENTRE MOUNT GAITER

Necessary preliminary tasks:

- Remove propeller shaft, see **26 11 000 Removing and installing propeller shaft (cardan universal joint) completely.**

NOTE: The propeller shaft is balanced. The front and rear propeller shafts must be reassembled in the same position.
Detach gaiter (1) from groove (2).

Mark front propeller shaft (3) and rear propeller shaft (4) in one plane.

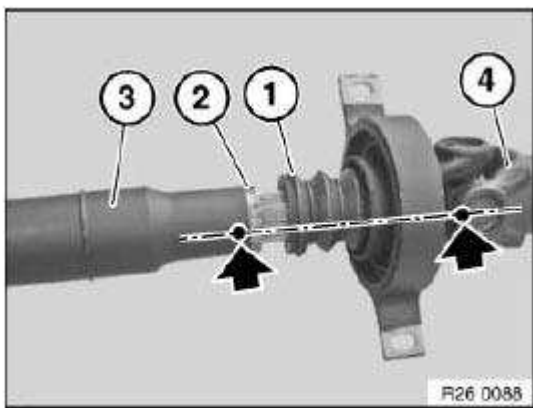


Fig. 11: Gaiter, Groove, Front Propeller Shaft And Rear Propeller Shaft

Courtesy of BMW OF NORTH AMERICA, INC.

Pull propeller shaft apart.

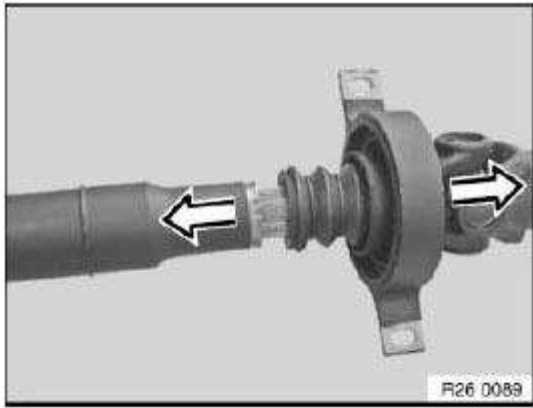


Fig. 12: Separating Propeller Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

If necessary, insert new clamping ring (1) into front propeller shaft (2).

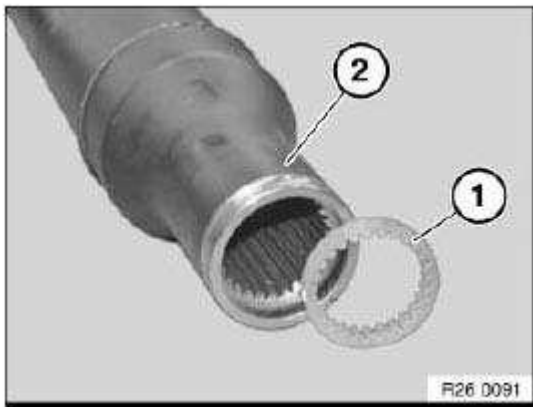


Fig. 13: Clamping Ring And Front Propeller Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Release gaiter (1) with screwdriver from groove (2) and pull off over longitudinal splines.

Installation:

Apply an even coating of grease to longitudinal splines on shaft.

Observe markings and force front propeller shaft onto longitudinal splines (markings must be flush).

Push gaiter (1) during installation into groove (2) and make sure it is firmly seated.

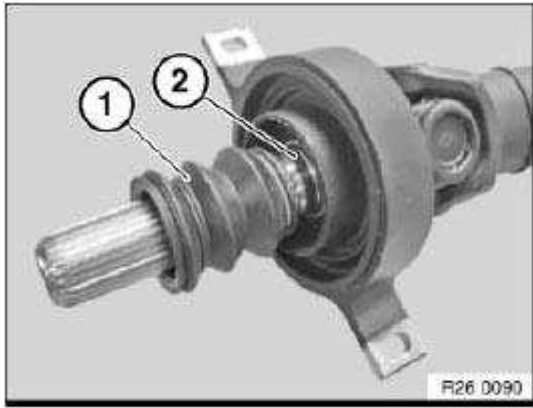


Fig. 14: Gaiter And Groove
 Courtesy of BMW OF NORTH AMERICA, INC.

26 11 051 REPLACING FLEXIBLE DISK FOR PROPELLER SHAFT

Necessary preliminary tasks:

- Remove propeller shaft, see 26 11 000 Removing and installing propeller shaft (cardan universal joint) completely.

NOTE: To protect universal joints, tie back propeller shaft in area of center bearing.

Release screws and remove flexible disk (1) from propeller shaft.

Installation:

- Arrows (3) on circumference of flexible disk must point to flange arms (2).
- Replace self-locking nuts.
- Tighten mounting screws of flexible disk on transmission flange by means of nuts only.

Tightening torque: 1AZ, see 26 11 PROPELLER SHAFT COMPLETE .

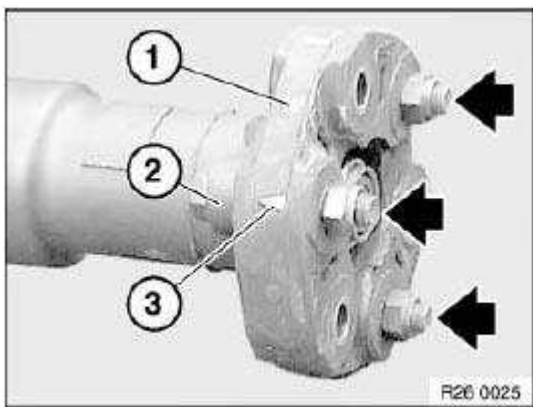


Fig. 15: Self-Locking Nuts

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check centering element, replace centering element if damaged, see **26 12 001 Replacing complete propeller shaft Centre mount**.

Grease centering mount.

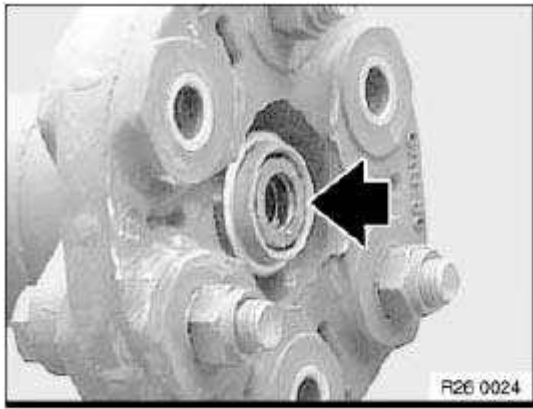


Fig. 16: Centering Mount

Courtesy of BMW OF NORTH AMERICA, INC.

26 11 090 REMOVING AND INSTALLING /REPLACING CENTERING MOUNT FOR PROPELLER SHAFT

Special tools required:

- **00 5 500 HANDLE FOR DRIFTS**
- 11 1 310
- 11 2 030

Necessary preliminary tasks:

- Remove propeller shaft, see **26 11 000 Removing and installing propeller shaft (cardan universal joint) completely**.

Fill centering bore (1) completely with viscous grease.

Drive special tool 11 1 310 with a plastic hammer into centering bore.

The centering mount (1) is forced out of the propeller shaft by the pressure on the grease filling.

If necessary, top up grease repeatedly.

NOTE: To drive out the mount, you can also fill the centering bore with water instead of grease.

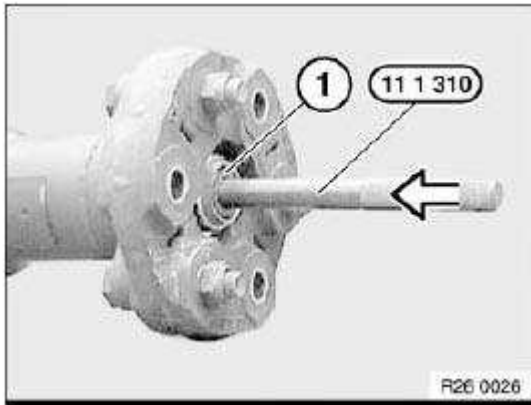


Fig. 17: Centering Bore And Special Tool (11 1 310)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Remove grease/water from mount bore.

Drive in centering (1) with special tools 11 2 030 and 00 5 500 into propeller shaft (observe protrusion).

Grease centering mount.

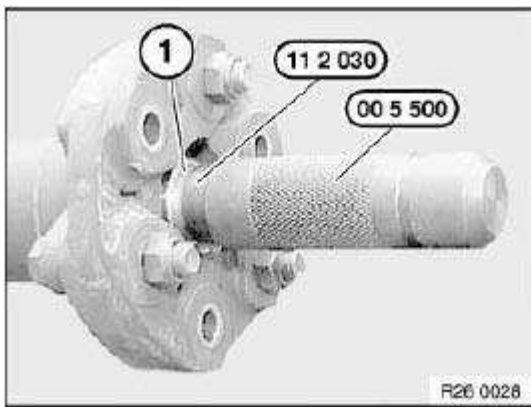


Fig. 18: Special Tools (11 2 030) (00 5 500)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Observe protrusion $A = 4^{+2}$ mm of centering (1).

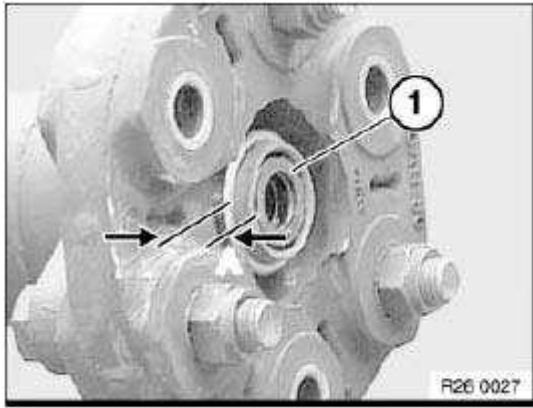


Fig. 19: Protrusion Dimensions Of Centering Bore
 Courtesy of BMW OF NORTH AMERICA, INC.

12 CENTER CONSOLE ASSEMBLY

26 11 020 REPLACING CENTRE MOUNT GAITER

Necessary preliminary tasks:

- Remove propeller shaft, see **26 11 000 Removing and installing propeller shaft (cardan universal joint) completely.**

NOTE: The propeller shaft is balanced. The front and rear propeller shafts must be reassembled in the same position.
 Detach gaiter (1) from groove (2).

Mark front propeller shaft (3) and rear propeller shaft (4) in one plane.

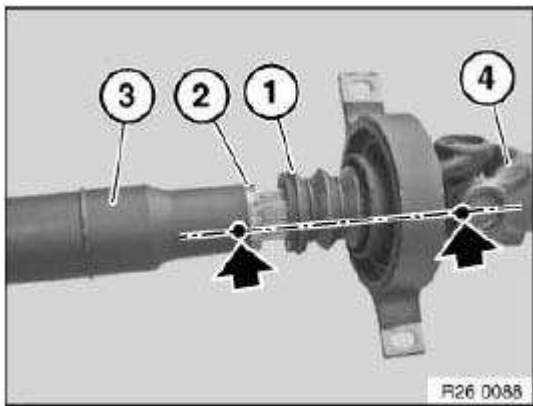


Fig. 20: Gaiter, Groove, Front Propeller Shaft And Rear Propeller Shaft
 Courtesy of BMW OF NORTH AMERICA, INC.

Pull propeller shaft apart.

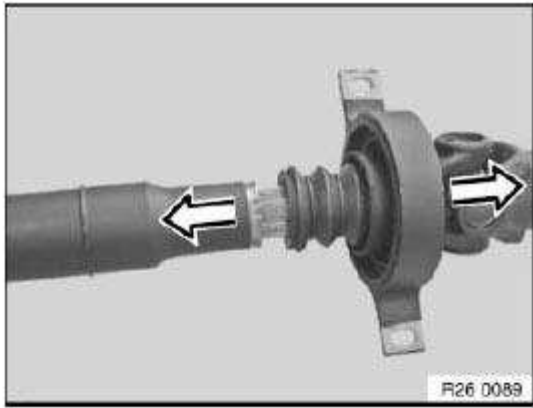


Fig. 21: Separating Propeller Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

If necessary, insert new clamping ring (1) into front propeller shaft (2).

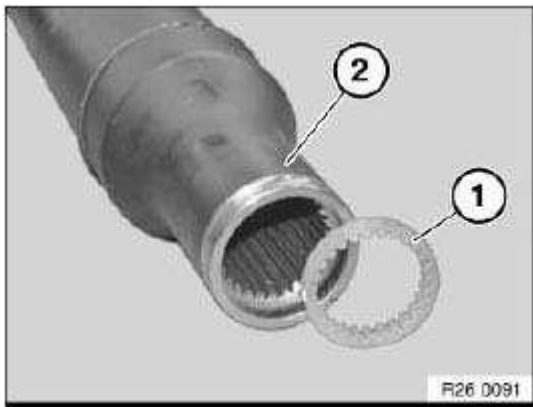


Fig. 22: Clamping Ring And Front Propeller Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Release gaiter (1) with screwdriver from groove (2) and pull off over longitudinal splines.

Installation:

Apply an even coating of grease to longitudinal splines on shaft.

Observe markings and force front propeller shaft onto longitudinal splines (markings must be flush).

Push gaiter (1) during installation into groove (2) and make sure it is firmly seated.

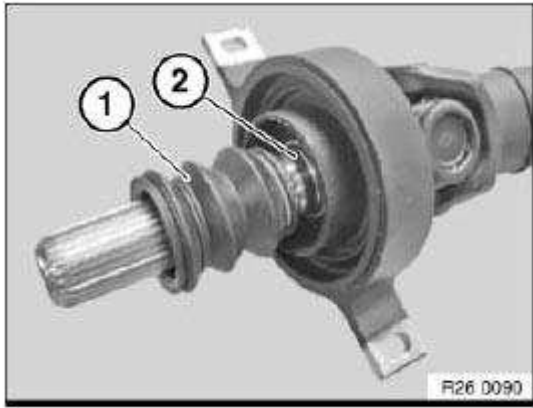


Fig. 23: Gaiter And Groove

Courtesy of BMW OF NORTH AMERICA, INC.

26 12 001 REPLACING COMPLETE PROPELLER SHAFT CENTRE MOUNT

Special tools required:

See

- **00 5 500 HANDLE FOR DRIFTS**
- 23 1 160
- **26 1 040 SPANNER**

Necessary preliminary tasks:

- Remove propeller shaft, see **26 11 000 Removing and installing propeller shaft (cardan universal joint) completely.**

NOTE: **The propeller shaft is balanced. The front and rear propeller shafts must be reassembled in the same position.**

Mark front propeller shaft (1) and rear propeller shaft (2) in one plane.

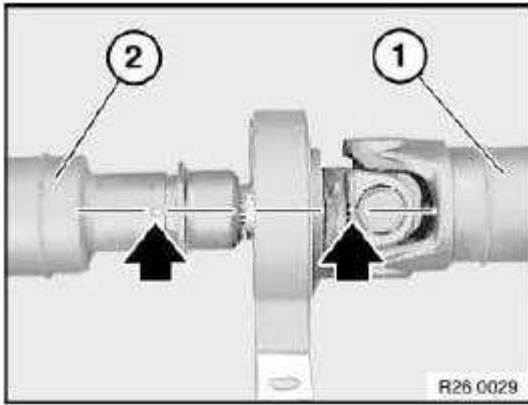


Fig. 24: Mark On Front Propeller Shaft And Rear Propeller Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Pull propeller shaft apart.

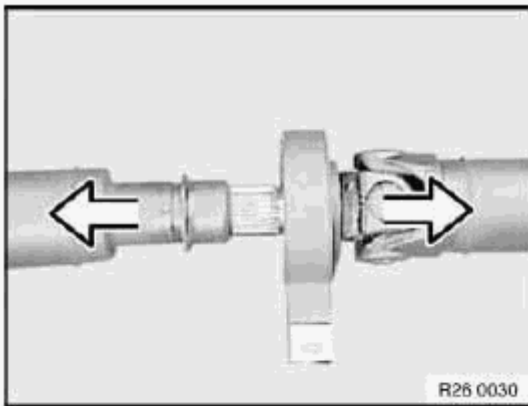


Fig. 25: Separating Propeller Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Remove snap ring (1).



Fig. 26: Snap Ring

Courtesy of BMW OF NORTH AMERICA, INC.

Install special tool 00 7 500 between center bearing (1) and universal joint (2).

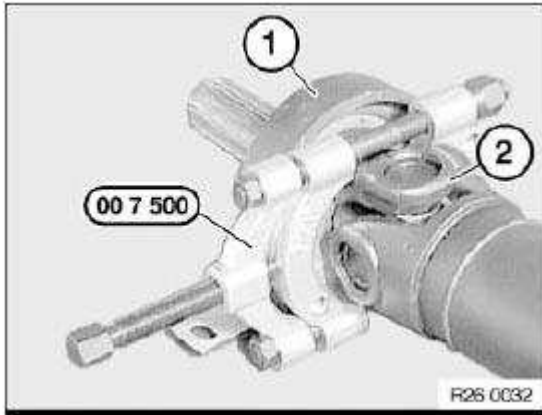


Fig. 27: Special Tool (00 7 500), Center Bearing And Universal Joint

Courtesy of BMW OF NORTH AMERICA, INC.

Using a hydraulic press, force center bearing (1) off propeller shaft (2).

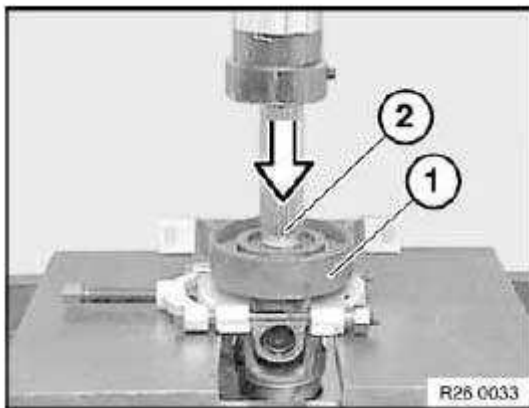


Fig. 28: Pressing Center Bearing Off Propeller Shaft Using Hydraulic Press

Courtesy of BMW OF NORTH AMERICA, INC.

Force new center bearing (1) onto propeller shaft. Collar (2) must point to universal joint (3). Drive Centre mount firmly home with special tool 23 1 160.

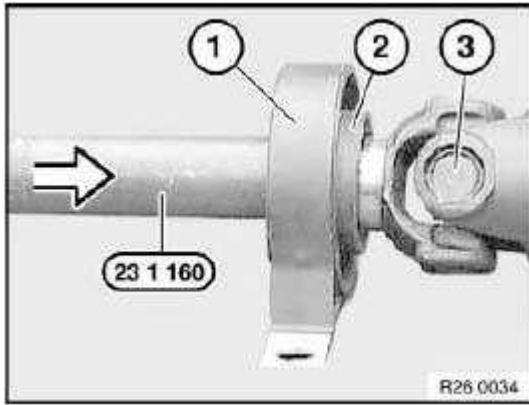


Fig. 29: Driving Centre Mount Firmly Home With Special Tool (23 1 160)
Courtesy of BMW OF NORTH AMERICA, INC.

Install new snap ring (1), with plate to bearing.

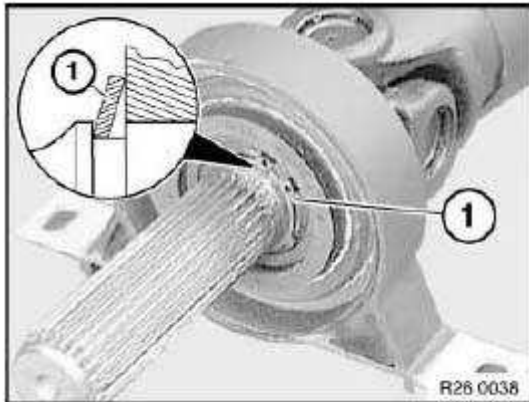


Fig. 30: Snap Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Screw threaded ring (1) off propeller shaft. If necessary, use special tool 26 1 040 as an aid.

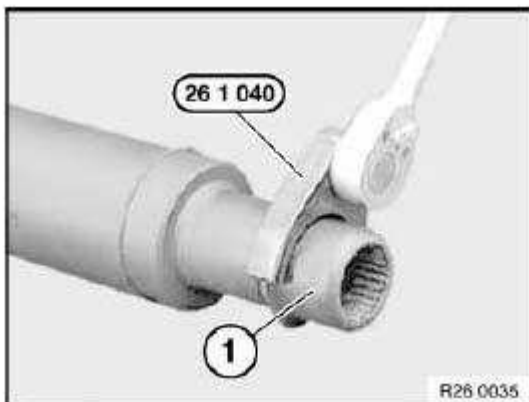


Fig. 31: Threaded Ring Of Propeller Shaft And Special Tool (26 1 040)
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, insert new clamping ring (1) in threaded ring (2).

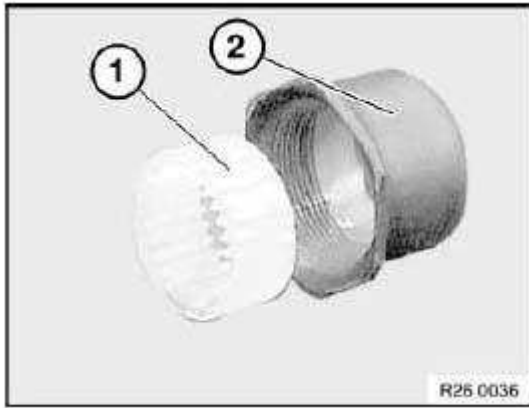


Fig. 32: Clamping Ring And Threaded Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Force threaded ring (1) onto shaft (2).

Grease longitudinal splines of shaft (2) uniformly.

Observe markings and force rear propeller shaft (3) onto shaft (2) (markings must be flush).

Screw down threaded ring (1) with propeller shaft (3) until hand - tight.

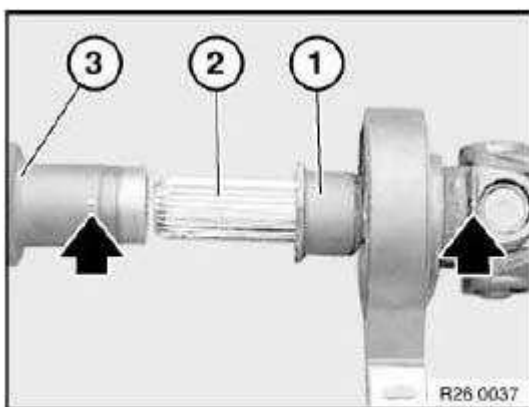


Fig. 33: Threaded Ring, Shaft And Rear Propeller Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

DRIVELINE/AXLES

Propeller Shaft - Special Tools - X3

26 PROPELLER SHAFTS

26 1 040 SPANNER

Note: For threaded bushing on slide of propeller shaft - Not for four-wheel drive vehicles

Series: E12, E21, E23, E24, E28, E30, E31, E32, E34, E36, E38, E39, E46, E83, E85, E86

Storage location: A33

Order number: 26 1 040

Spanner

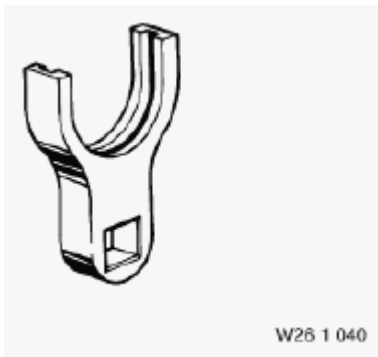


Fig. 1: Identifying Spanner (26 1 040)

Courtesy of BMW OF NORTH AMERICA, INC.

26 1 110 REMOVAL DISK

Minimum set: Mechanical tools

Note: For detaching constant-velocity joint from propeller shaft.

Series: E31, E32, E34, E36, E36/7, E38, E39, E46, E52, E53, E60, E61, E63, E64, E65, E66, E67, E81, E83, E85, E86, E87, E90, E91, E92, E93, RR1, RR2

Storage location: C26

SI number: 1 06 94 (801)

Order number: 26 1 110

Removal disk

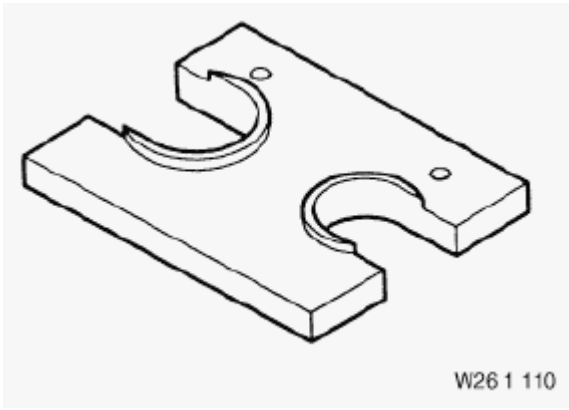


Fig. 2: Identifying Removal Disk (26 1 110)
Courtesy of BMW OF NORTH AMERICA, INC.

DRIVELINE/AXLES

Propeller Shaft - Technical Data - X3

00 PROPELLER SHAFT GENERAL

26 00 PROPELLER SHAFT IN GENERAL

TECHNICAL DATA - PROPELLER SHAFT GENERAL

Grease for slide		Molykote Longtherm 2
Grease for constant velocity joint		Optimol
Volume of grease for velocity joints	g	80

DRIVELINE/AXLES

Propeller Shaft - Tightening Torques - X3

11 PROPELLER SHAFT ASSEMBLY

26 11 PROPELLER SHAFT COMPLETE

PROPELLER SHAFT COMPLETE - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Flexible disk to propeller shaft and transmission output flange Steel propeller shaft	E36 / E38 / E39 / E46 / E52 / E53 / E60 / E61 / E63 / E64 / E65 / E66 / E83 / E85 / E87 / E90 / E91	M10 8.8		48 Nm
	E36 / E38 / E39 / E46 / E52 / E53 / E60 / E61 / E63 / E64 / E65 / E66 / E83 / E85 / E87 / E90 / E91	M10 10.9		64 Nm
	E31 / E38 / E39 / E46	M14		140 Nm
	E32 / E34 / E36 / E38 / E39	M12 8.8		81 Nm
	E60 / E61 / E63 / E64	M12 8.8		90 Nm
	E32 / E34 / E36 / E38 / E39 / E46 / E53 / E85	M12 10.9		100 Nm
	E60 / E61 / E63 / E64	M12 10.9	Jointing torque	55 Nm
			Torque angle	90°
	E39 (M5) / E36 (M3) / E46 (M3),	M12 10.9		115 Nm
	E65	M12 10.9		90 Nm
Flexible disk to transmission output flange	E46 / E39 / E60 / M57 only		Screw with rolled-on shim only	
			Jointing torque	50 Nm
			Torque angle	90°
Flexible disk to transmission output flange	E65 / E66 / All except N73, M67		Screw with rolled-on shim only	
			Jointing torque	50 Nm
			Torque angle	90°
	E60 / E61 / E63 / E64 / E65 / E66 / E67	M12 10.9	Double-stage flexible disc	
			Jointing torque	50 Nm

			Torque angle	90°
Flexible disk on propeller shaft	E83	M12 10.9	Tighten via nut	100 Nm
Flexible disk to transmission output flange	E83	M12 10.9		90 Nm
Aluminium propeller shaft: Flexible disk to transmission output flange	E39 / E60	M12 10.9		100 Nm
Aluminium propeller shaft: Flexible disk on propeller shaft	E39 / E60	M12 10.9		90 Nm
	E60 / E61 / E63 / E64	M10 10.9		64 Nm
	E60	M12 8.8		90 Nm
	E63 (N52)	M12		110 Nm
Flexible disk to transmission output flange ZNS screws and nuts Shiny zinc coating All versions			Replace bolts and nuts Jointing torque and angle of rotation must be observed without fail	
	E60 / E61 / E63 / E64 / E85 / E86 / E87 / E90 / E91 / E92 / E93 / E81	M10 - 10.9	Jointing torque	20 Nm
			Torque angle	90°
	E46 / E53 / E60 / E61 / E63 / E64 / E65 / E83 / E85 / E86 / E87 / E90 / E91 / E92 / E93 / E70 / E81	M12- 10.9	Jointing torque	55 Nm
			Torque angle	90°
	E60 / E61 / E63 / E64 / E65	M12- 8.8	Jointing torque	30 Nm
			Torque angle	90°
2AZ Coupling propeller shaft to transmission	E36 / E38 / E39 / E46 / E52 / E53 / E60 / E61 / E63 / E64 / E65 / E66 / E83 / E85 / E87 / E90 / E91	M10		60 Nm
	E32 / E31	M12		95 Nm
3AZ Clamping ring for slide after installation in the car	E36 / E38 / E39 / E46 / E52 / E53 / E60 / E61 / E63 / E64 / E65 / E66 / E83 / E85 / E87 / E90 / E91			10 Nm
	E30 / Four Wheel Drive			22 Nm

26 11 PROPELLER SHAFT COMPLETE

PROPELLER SHAFT COMPLETE - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
4AZ Propeller shaft to drive flange (rear differential)				
Version, universal joint: >Compression nut	E36 / E38 / E39 / E46 / E52 / E53 / E60 / E61 / E63 / E64 / E65 / E66 / E83 / E85	M10	Only finned nuts to higher tightening torque	64 Nm
Version, universal joint: >Torx bolt	E36 / E38 / E39 / E46 / E52 / E53 / E60 / E61 / E63 / E64 / E65 / E66 / E83 / E85	M10		85 Nm
Version, constant-velocity joint: >Torx bolt	E46 (M3) / E38/ E39/ E46 / E60 / E83 (M57TU) E63 (N52)	M10		70 Nm
Version, constant-velocity joint: >Compression nut	E36 / E38 / E39 / E46 / E52 / E53 / E60 / E61 / E63 / E64 / E65 / E66 / E83 / E85	M8		32 Nm
Compression nut	E36 / E38 / E39 / E46 / E52 / E53 / E60 / E61 / E63 / E64 / E65 / E66 / E83 / E85	M10		64 Nm
Finned nut	E36 / E38 / E39 / E46 / E52 / E53 / E60 / E61 / E63 / E64 / E65 / E66 / E83 / E85	M8		43 Nm
Finned nut	E36 / E38 / E39 / E46 / E52 / E53 / E60 / E61 / E63 / E64 / E65 / E66 / E83 / E85	M10		70 Nm
ZNS screws and nuts, shiny zinc coating All versions with universal or constant-velocity joint			Replace bolts and nuts Jointing torque and angle of rotation must be observed without fail	
	E83 / E85 / E86 / E87 / E90 / E91 / E92 / E93 / E81	M10-10.9 screw with ribbed teeth	Jointing torque	40 Nm
			Torque angle	45°
	E46 / E60 / E61 / E63 / E64 / E65 / E66 / E83 / E85 / E86 / E87 / E90 / E91 / E92	M10-10.9	Jointing torque	20 Nm
			Torque angle	90°
	E90 / E91 / E92 / E81 / E87	M12x55-10.9	Jointing torque	55 Nm
			Torque angle	90°

Screw with ribbed teeth	E85 / M, E86 / M	M10x46-10.9	Replace screws and shims	70 Nm
5AZ Pivot to center propeller shaft journal with Loctite (Version without slide)	E36 / E38 / E39 / E46 / E52 / E53 / E60 / E61 / E63 / E64 / E65 / E66 / E83 / E85 / E86 / E87/E90/E91/ E92			97 Nm
6AZ Centre mount to body	E36 / E38 / E39 / E46 / E52 / E53 / E60 / E61 / E63 / E64 / E65 / E66 / E83 / E85 / E86 / E87/E90/E91/ E92 / E93 / E70 / E81			21 Nm
7AZ Flexible disk to front axle differential	E53	M10 - 10.9		60 Nm
8AZ Flexible disk on propeller shaft	E53	M10 - 10.9		64 Nm
9AZ Front propeller shaft to transfer box/front differential ZNS screws and nuts, shiny zinc coating			Replace bolts and nuts Jointing torque and angle of rotation must be observed without fail	
	E60 / E61 / E90 / E91 / E92	M8	Jointing torque	20 Nm
			Torque angle	45°
	E46 / E83	M10-10.9	Jointing torque	20 Nm
			Torque angle	45°
	E53 / E70	M10 - 12.9	Jointing torque	10 Nm
			Torque angle	90°
	E46	M10x1.5 10.9	Jointing torque	5 Nm
			Torque angle	90°
Universal joint	E70	M10 - 10.9	Jointing torque	20 Nm
			Torque angle	45°

DRIVELINE/AXLE

Rear Axle - Operating Fluids

1.0 GENERAL INFORMATION ON FINAL DRIVE OIL

Final Drive oil or hypoid gear lubricant must conform with the following requirements because of the high loads which occur on the profiles of the hypoid gear teeth:

- Load carrying capacity.
- Sufficient protection against seizure.
- Good wear protection.
- Optimal friction and temperature behavior.
- Seal compatibility.
- Aging resistance.

These and other properties are already contained in brand-name hypoid gear lubricants because of the high content of EP additives (EP = extreme pressure).

OIL ADDITIVES

The factory has **not approved** oil additives for hypoid gear lubricants.

All final drives are designed in such a manner that they do not require any type of oil additives. Any type of additives is fundamentally rejected by the factory. BMW NA cannot accept any liability for follow-up damage resulting from the use of additives.

2.0 APPROVED FINAL DRIVE OILS FOR FRONT AND REAR AXLE FINAL DRIVES WITH AND WITHOUT LIMITED SLIP OR VISCOUS COUPLING

Mineral based final drive oils are no longer recommended due to the release of synthetic final drive oils for all vehicles with or without limited slip differentials.

Limited Slip Differentials

With the introduction of the Z3 roadster a new synthetic final drive oil for all vehicles with a multi-plate limited-slip differential has been released. The new BMW final drive oil SAF-XJ will replace the old final drive oil SAF-XLS.

The SAF-XLS final drive oil is not to be used in the final drive of the Z3 roadster.

Use only the SAF-XJ in the final drive of the Z3 roadster.

NOTE: If a non-limited slip differential oil is used in a limited slip differential a whining or chattering sound can be heard on very tight turns and will eventually result

in a failure of the differential.

BMW PARTS NUMBER SPECIFICATION

Description	Quantity	Part Number
BMW Synthetic Final Drive Oil (with multi-plate Limited Slip Differential)	55 liter drum (SAF-XJ)	83 22 1 470 080

Motorsport Vehicles:

All E46 M3, E60 M5, E63/E64 M6 and E85 M roadster and M coupe require SAF-XJ Fluid.

Non Limited Slip Differentials

BMW PARTS NUMBER SPECIFICATION

Description	Quantity	Part Number
BMW Synthetic Final Drive Oil (without multi-plate limited slip differential, or with viscous differential lock (325iX/iXA))	55 liter drum (SAF-XO)	83 22 9 407 768

3.0 FINAL DRIVE OIL FOR BMW M1 MOTORSPORT COUPE

The final drive of a BMW M1 is integrated in the manual transmission and oil supply is accomplished with a mutual oil filling.

Use reputable brand SAE 80 manual transmission oil conforming with specifications MIL-L-2105 A or API-GL 4.

4.0 OIL CHANGE INTERVALS

Maintenance requirements per the vehicle's Service Booklet or the respective Service Maintenance Checklist.

Replacement final drives: same as for new vehicles.

All models as of 9/97 production are factory-filled with synthetic rear axle oil having a lifetime service rating. No oil changes are required for the life of the vehicle.

5.0 CARS WITHOUT SERVICE INDICATOR (INCLUDING BMW M1)

First oil change at 600 miles

Further oil changes at 18,000 miles

Special rule for BMW 530i, 528i (E 12):

1st oil change at 600 miles after final drive replacement

2nd oil change at 4,500 miles after final drive replacement

Further oil changes at 9,000 miles intervals, beginning at 9,000 miles.

6.0 CARS WITH SERVICE INDICATOR

BREAK-IN PROCEDURES

Drive the car with changing engine speeds and road speeds during the first 1,200 miles/2,000 km, but never faster than 2/3rds of maximum speed in a selected gear. Avoid using full throttle and kick-down positions of the accelerator pedal during this period.

BMW PARTS NUMBER SPECIFICATION

BMW M3/M5/M6	Up to 1,200 miles max. engine speed 5500 RPM Generally avoid full-throttle position of the accelerator.
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These break-in procedures are, of course, also applicable to replacement final drives.

7.0 OUTPUT SHAFTS

The joints of output shafts have permanent grease lubrication and require no servicing. The amount of joint grease required after repairing is supplied in the "dust cover repair kit".

8.0 WHEEL BEARINGS

Ball Bearings E24 (Since 5/82), E28, E30, E31, E32 And All Following

Bearing unit is lubricated for its service life, cannot be disassembled and does not require subsequent lubrication.

Grooved Ball Bearings E12, E21, E23, E24 Before 5/82

Grease type: Retinax A (former BMW Part No. 81 22 9 407 710)

CRC Part No. SL 3131

9.0 DIFFERENTIAL HOUSING FINAL DRIVE COVERS AND HOUSING

On 735i/iL, 750iL, M6 and M5 (E28) models, the attaching bolts are to be installed with Hylogrip/Loctite 270 (green) thread sealant (former BMW Part No. 81 22 9 400 086).

BMW PARTS NUMBER SPECIFICATION

Wurth Loctite	Part No. 8932700
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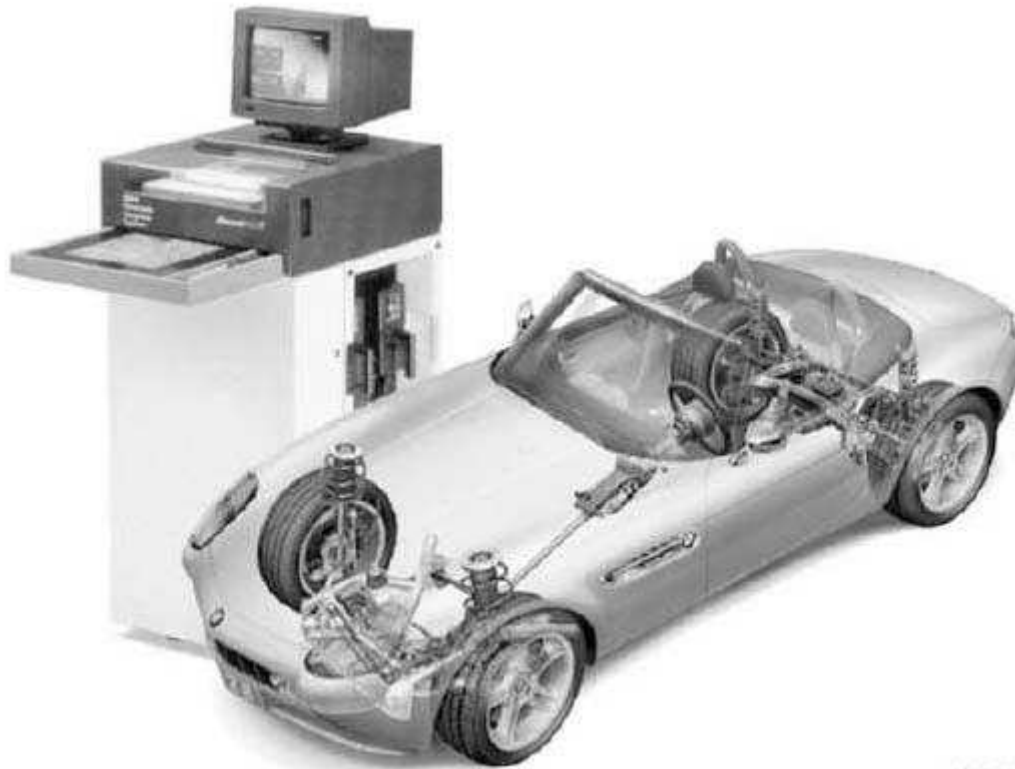
DRIVELINE/AXLES

Rear Axle - SI Techniques - X3

KINEMATIC DIAGNOSIS SYSTEM AND ENVIRONMENT

VS-23/Friedrich Baugruppe/Group: 32 weltweit all countries 10/1999 32 01 99 (503)

BMW KDS (Beissbarth)



R32 0243

Fig. 1: Kinematic Diagnosis System
Courtesy of BMW OF NORTH AMERICA, INC.

1. FOREWORD

1.1 Objectives

Wheel alignment has become an increasingly complex subject. The aim of this BMW Service Technology bulletin, therefore, is to achieve several objectives:

- Creation of guidelines for working with the BMW Kinematic Diagnosis System (KDS).
- Familiarization with wheel alignment technology for current vehicles and clarifying any questions which arise in this connection.
- Transparency and clarification of different terms.

- Clarification of the causes of errors in the past, such that they can be avoided after reading this document.
- Creation of conditions for dealing safely with the BMW KDS.

1.2 Further development of the BMW Kinematic Diagnosis System

- The BMW Kinematic Diagnosis System is an integrated part of automotive system concepts. It ensures that work is carried out in a particularly rational manner which is appropriate for BMW requirements, such that you can also be certain of being prepared for future technological developments. As far as precision and performance in wheel alignment and tuning is concerned, BMW, together with leading manufacturers, has made the best of what is technically feasible: the BMW Kinematic Diagnosis System.
- The BMW Kinematic Diagnosis System manufactured by Beissbarth is more than just the further development of conventional wheel alignment equipment. It sets new standards in precision, performance, speed and handling. It is a guarantor for the perfection which BMW service customers rely on.
- Ride comfort, road safety and tyre wear depend to a large extent on the perfect interplay of the vehicle's kinematic functions. BMW is constantly launching new generations of chassis which are even better than their predecessors. This is why there are fewer kinematics system adjusting points and narrower tolerances when measuring and tuning the chassis.
- With the use of the multi-link rear suspension and the E36, the electronic wheel alignment devices are no longer suitable for BMW wheel alignment purposes. This applies to both the measuring procedure and measuring precision. The generation of equipment which was approved with the E36 series still fulfils all the requirements placed on a modern wheel alignment device, including the use of the latest computer technology.
- Only BMW Kinematic Diagnosis Systems manufactured by Beissarath and Bosch may be used for wheel alignment.

1.3 Technical Data



Fig. 2: Display Kinematic Diagnosis System Technical Data
 Courtesy of BMW OF NORTH AMERICA, INC.

KINEMATIC DIAGNOSIS SYSTEM TECHNICAL DATA

1. Display	○ 17" graphic screen with high-resolution graphics (640x480 pixels with 256 colours)
2. On-screen text	○ in the appropriate national language
3. Wheel dimensions	○ 12"...20"
4. Vehicle memory locations	○ unlimited
5. Rotating plates	○ Loadbearing capacity 1000 kg, angle of rotation $\pm 360^\circ$, 450 x 450 x 50 mm (L x W x H), sliding range ± 50 mm, weight 18 kg
6. Sliding plates	○ Loadbearing capacity 1000 kg, angle of rotation $\pm 10^\circ$, 450 x 450 x 50mm (L x W x H), sliding range ± 65 mm, weight 17 kg
7. Electrical connection	○ 100...115 V/ 220...240 V 50/60 Hz, 0.5 kW (other connections on request)

1.4 Scope of delivery

- 1 PC display device with graphic screen, graphical tablet, small or large equipment cabinet including automatic charging station, DIN A4 dot matrix printer
- 4 Measuring sensors with CCD camera technology and infrared data transmission with built-in power supply
- 1 Cable set (comprising 4 cables)
- 1 Brake clamping device

- 1 Steering lock device
- 2 Electronic precision rotating plates with integrated sensor without access ramps
- 2 Sliding plates without access ramps
- 4 BMW quick-clamping units, comprising a P8-68 locating bell and P267 01 quick-acting clamp including coated holding claws
- 1 Operating instructions for BMW KDS (8 languages)
- 1 BMW software and the BMW vehicle setpoint data with setting screens as well as text for the measurement preparations

1.5 Accessories required

- 2 Locating rods for positioning the vehicle
- 1 Set of sand bags for the prescribed loading

1.6 Accessories recommended

- 4 Quick-clamping units
- 2 Sets of access ramps
- 1 Remote control / display
- 1 Trolley (for ballast bags, rotating and sliding plates and 4 quick-acting clamps)

2. MEASURING OPTIONS USING THE BMW KINEMATIC DIAGNOSIS SYSTEM

2.1 Front axle

- Toe-in (single and total toe-in in relation to the geometrical drive axis)
- Camber (with steering wheel pointing straight ahead)
- Wheel displacement (in relation to the left-hand front wheel)
- Castor, kingpin inclination and toe-differential angle

2.2 Rear axle

- Toe-in (single and total toe-in in relation to the longitudinal center plane of the vehicle <-- previously called symmetrical axis)
- Geometrical drive axis
- Camber

2.3 Other measuring options

- Rear wheel displacement
- Wheelbase difference
- Lateral displacement on right
- Lateral displacement on left

- Track difference
- Axial displacement

3. SYSTEM DESCRIPTION

3.1 BMW Kinematic Diagnosis System 1, based on the Beissbarth ML4000

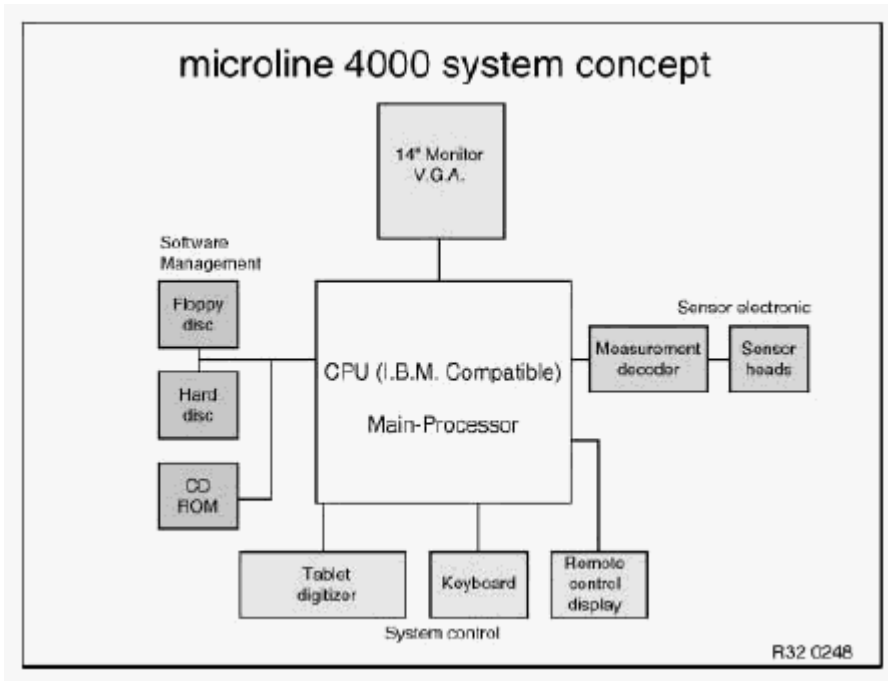


Fig. 3: BMW Kinematic Diagnosis System Diagram
 Courtesy of BMW OF NORTH AMERICA, INC.

The KDS 1 is available in two different designs at no extra charge:

1. Mobile workstation



Fig. 4: Mobile Workstation

Courtesy of BMW OF NORTH AMERICA, INC.

2. Mobile compact cabinet



Fig. 5: Mobile Compact Cabinet
Courtesy of BMW OF NORTH AMERICA, INC.

The larger workstation offers a small storage area for accessories, while the compact cabinet is mobile and ideal for restricted working areas. Both variants can be supplied as a cableless measuring system (infrared). From the point of view of measuring technology, there is only a difference in the handling and equipping of the system. For both designs, the four measuring sensors are stored in integrated inserts with rechargeable battery charging points. When automatically charged over night, the measuring sensor batteries provide enough power for 10 hours of continuous use.

3.2 Computer

- The KDS 1 system comprises tested and reliable industrial components. The computer is an IBM-compatible, 32-bit Intel processor with CD ROM drive to the industry standard.



Fig. 6: Computer
Courtesy of BMW OF NORTH AMERICA, INC.

3.3 Graphical tablet

- All functions are shown in graphical form on a "pictogram" panel. The panel is protected by a plexiglass cover. It can easily be replaced if more extensive design modifications are necessary. The operator interface has no membrane and is thus protected against damage. The main functions are activated by clicking the icon with the digital pen.

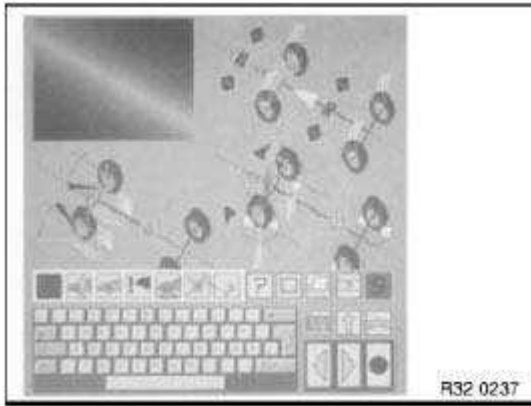


Fig. 7: Graphical Tablet
Courtesy of BMW OF NORTH AMERICA, INC.

3.4 Equipment cabinet

- The PC with graphic monitor and removable operating panel, supports for the measuring sensors, the remote control and the A4 printer are integrated into the workstation. The charging station is located in the cabinet and can also be connected to the measuring sensors and the remote control using the plug-in cables (operating while simultaneously charging the batteries).

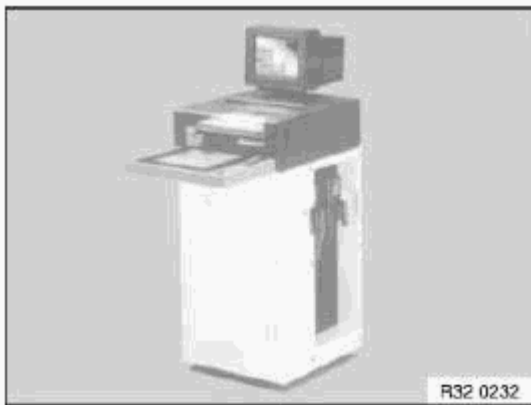


Fig. 8: Equipment Cabinet
Courtesy of BMW OF NORTH AMERICA, INC.

3.5 Remote display

A cableless remote display can be supplied on request. The remote control keys are only active during measuring and adjustment (not for customer data input, or if selecting a vehicle or editing the setpoint data etc.). The following displays are supported by the remote control:

- Measured value with setpoint / actual comparison and tolerance bar
- Steering graphics for steering routines
- Live overview of the track / camber values with a setpoint / actual comparison
- Rim run-out compensation



Fig. 9: Remote Display
 Courtesy of BMW OF NORTH AMERICA, INC.

3.6 Measuring sensors with CCD camera

The measuring sensors are each equipped for automatic measurement with two CCD cameras and their own processor for the cableless infrared transmission of data with integrated batteries. Benefits:

- No temperature deviation
- Very high measuring resolution (the track could theoretically be measured in angular seconds)
- Single track range of more than ± 9 degrees for the constant display of toe-in when changing the tie-rod ends
- Exact system accuracy, i.e. when carrying out measurements at the vehicle following rim run-out compensation, the toe-in and camber measurements are accurate to 2 angular minutes



Fig. 10: Measuring Sensors With CCD Camera
Courtesy of BMW OF NORTH AMERICA, INC.

3.7 BMW Quick-acting clamp

- BMW quick-acting clamp for holding the measuring sensors precisely in position and measuring without rim run-out compensation.

NOTE: Any existing quick-acting clamps, e.g. from older F1600s or ML-3000s, must not be used on the BMW KDS.

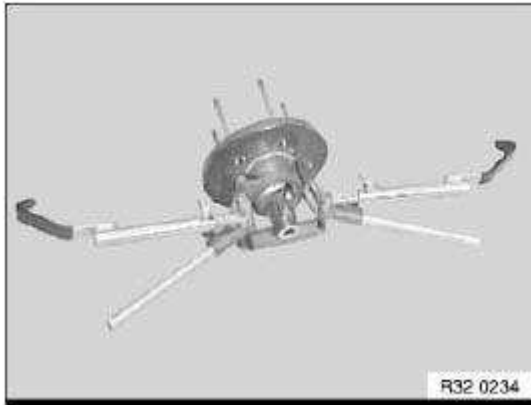


Fig. 11: BMW Quick-Acting Clamp
Courtesy of BMW OF NORTH AMERICA, INC.

3.8 Rotating / sliding plates

- Electronic precision rotating plates for the front wheels with integrated sensor (360 degree measuring range)
- Stable sliding plates for the rear wheels with a swivelling / rotating top plate
- Accessories: Cover hood for aluminium rotating plates

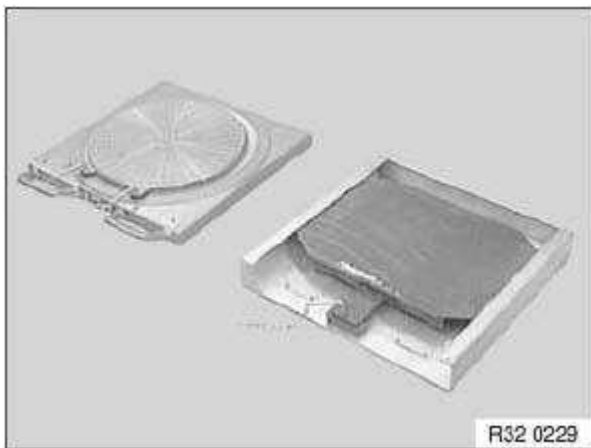


Fig. 12: Rotating/Sliding Plates

Courtesy of BMW OF NORTH AMERICA, INC.

3.9 Sensor pins

- A new BMW light alloy wheel (styling no. 18) has been available as optional equipment from April 1993. When measurements are being made on vehicles with these wheels, new sensor pins are required for the quick-acting clamps of the recommended wheel alignment equipment.
- The new sensor pins are included in the scope of supply for new deliveries of KDS 1 (order number: BS 90 19 11).

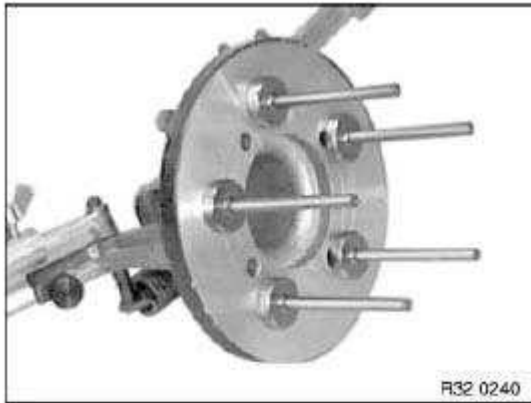


Fig. 13: Sensor Pins

Courtesy of BMW OF NORTH AMERICA, INC.

3.10 Spoiler adapter

- In the case of vehicles with very low spoilers, the sensor beam may be broken by the spoiler between the measuring sensors. This primarily occurs in front of the front axle.
- The spoiler adapter is used here as a connecting element between the measuring equipment clamp and the measuring sensor. Thanks to the adapter, the sensors are placed 50 mm lower, thus allowing the sensor beam to move freely below the spoiler.



Fig. 14: Spoiler Adapter

Courtesy of BMW OF NORTH AMERICA, INC.

3.11 Quick-clamping units

- Quick-clamping units for wheel alignment on non-BMW vehicles with rim run-out compensation.
- Rims without sensors boreholes (rims for BMW vehicles from other manufacturers)

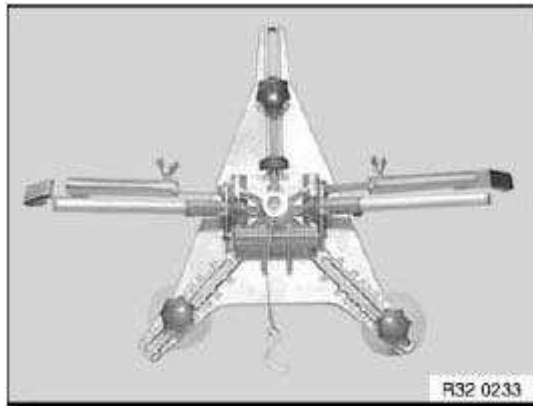


Fig. 15: Quick-Clamping Units

Courtesy of BMW OF NORTH AMERICA, INC.

3.12 Retainers

- The most varied clamping options for the measuring equipment are possible thanks to the versatile retainers and the rubber-coated thrust pieces, even on exotic light-alloy rims.

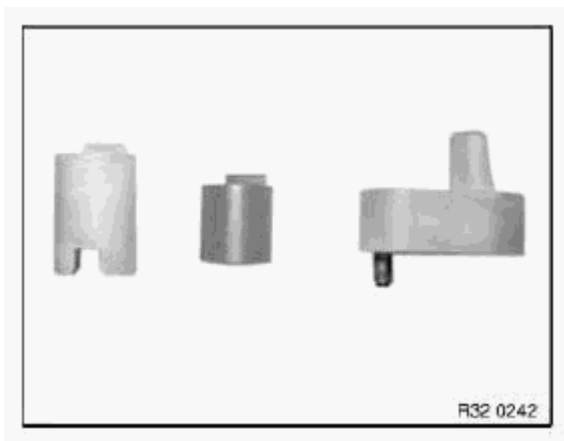


Fig. 16: Retainers

Courtesy of BMW OF NORTH AMERICA, INC.

4. WORKSTATION

4.1 Environment

DESCRIPTION AND REQUIREMENTS REFERENCE

Description:

All lifting platforms currently recommended by BMW (see) for wheel alignment meet the requirements for the BMW KDS.

No particular requirements have to be met in respect of the location at which the BMW KDS is used. The measuring device can be installed over working pits or on lifting platforms.

Requirements:

- Wheel alignment pits
- Pillar-type lifts with set-down device
- 2 plunger-type lifting platforms with set-down device
- One measuring area (approx. 4.5 m x 7.0 m).
- Repair stands with set-down device
- The rotating plates must be pinned to the platform

The support surfaces for the rotating and sliding plates may only display the following maximum height difference:

- from left to right ± 0.5 mm
- from front to back ± 1.0 mm
- diagonally ± 1.0 mm.

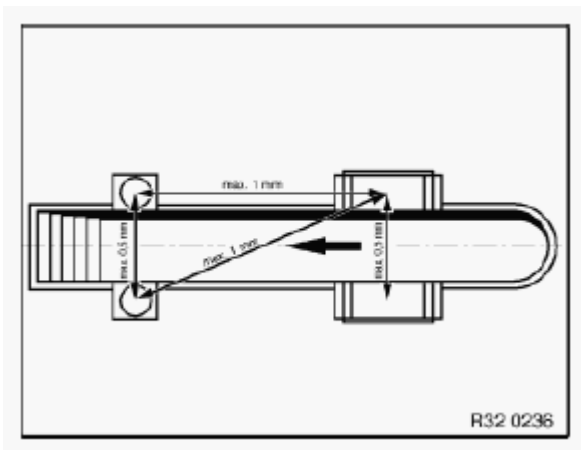


Fig. 17: Rotating And Sliding Plates Height Difference
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: A difference in the height of the rotary plates of ± 2 mm from left to right results in a measuring error of 4.8° in the camber.
As a comparison: The camber tolerance on the E36 is $\pm 10'$. The tyre tread difference or varying tyre pressure cause measuring errors of the same magnitude.

4.2 Preconditions for alignment

When carrying out the wheel alignment, the front and rear wheels must be centered on the rotating and sliding plates in order that all wheel suspensions remain free of tension during the steering routine and adjustment work. As a result, the rotating and sliding plates for the relevant wheel bases and track widths of the vehicle to be aligned must be moved.

4.3 Measuring tolerance

All measuring tolerances are system tolerances. This means that the sum of all individual tolerances gives the value shown in the example. Example of camber: Quick-acting clamp + measuring sensor + computer = 1' at a measuring range of $\pm 3^\circ$ (all BMW vehicles are within this measuring range).

4.4 Levelling the measuring station

The manufacturers of the BMW KDS (Beissbarth / Bosch) are able to measure the measuring area to the required accuracy using levelling devices. Any "normal" water level is not suitable for this. Lifting platforms must be levelled under load so that the uneven deflection in the travel rails is taken into account.

IMPORTANT: Adjustment work for the lifting platform concerned must be executed by a specialist (manufacturer's after-sales service).

5. CHASSIS-RELATED TERMS

5.1 Toe-differential angle

- The toe-differential angle (a) is the angular position of the internal wheel on the curve in relation to the external wheel on the curve when driving round bends. The steering is designed such that the angular position of the wheels in relation to each other changes as the steering angle increases.
- In ideal cases, the wheel axes meet at point D in any steering position (except for straight ahead).

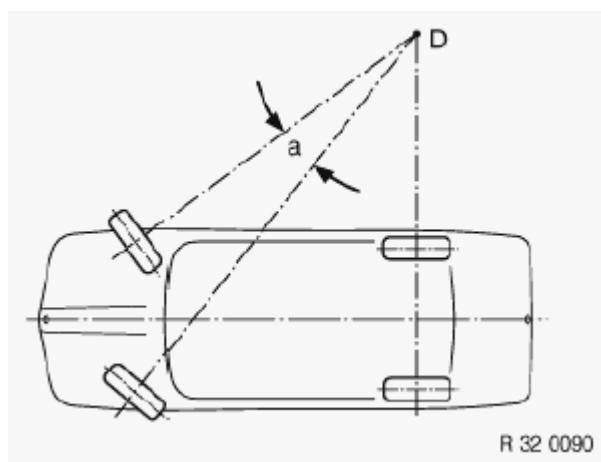


Fig. 18: Toe-Differential Angle
Courtesy of BMW OF NORTH AMERICA, INC.

5.2 Camber

- The camber is the angle of inclination of the wheel in relation to the vertical.

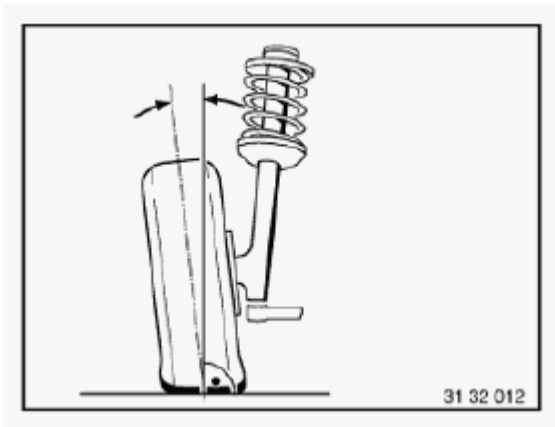


Fig. 19: Camber Angle

Courtesy of BMW OF NORTH AMERICA, INC.

5.3 Toe-in

- The toe-in is the reduction in the distance between the front of the wheels and the rear. The toe-in prevents the wheels from moving apart while driving (wobbling and grinding).

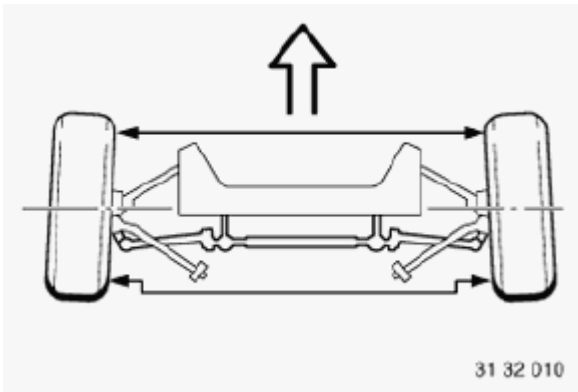


Fig. 20: Toe-In

Courtesy of BMW OF NORTH AMERICA, INC.

5.4 Castor

- The castor is the kingpin angle seen from the side in the opposite direction of travel. The line through the center of the spring strut mount and control arm ball joint corresponds to the kingpin.

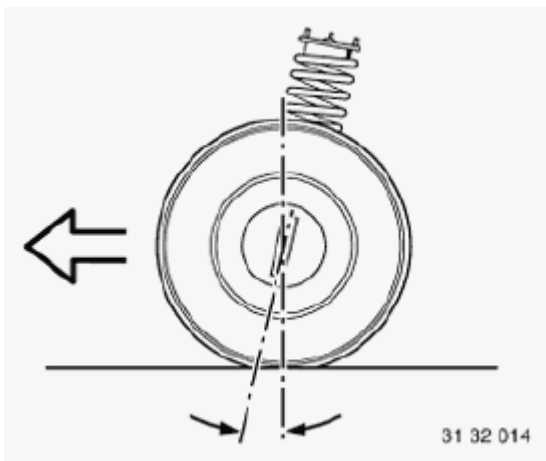


Fig. 21: Castor Angle
 Courtesy of BMW OF NORTH AMERICA, INC.

5.5 Geometrical drive axis / symmetrical axis

- (1) The geometrical drive axis is the line bisecting the angle of the overall rear wheel toe. The measurements of the front wheels relate to this axis.
- (2) The symmetrical axis represents the center line through the front and rear axes.

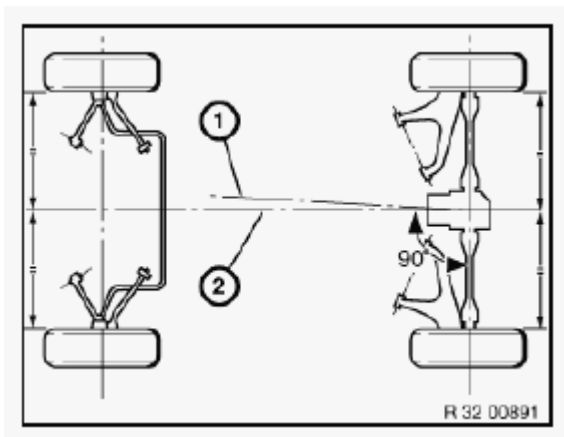


Fig. 22: Geometrical Drive Axis/Symmetrical Axis
 Courtesy of BMW OF NORTH AMERICA, INC.

5.6 Wheel displacement angle

- The wheel displacement angle is the angular deviation of the connecting line of the wheel contact points in relation to a line running at 90° to the geometrical drive axis. The wheel displacement angle is positive if the right-hand wheel is displaced to the front, and is negative if it is displaced to the rear.

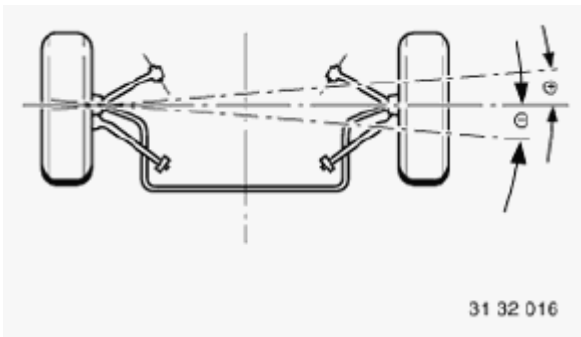


Fig. 23: Wheel Displacement Angle
 Courtesy of BMW OF NORTH AMERICA, INC.

5.7 Kingpin offset

- The kingpin offset is the distance from the center of the wheel contact point to the contact point of the kingpin extrapolation.

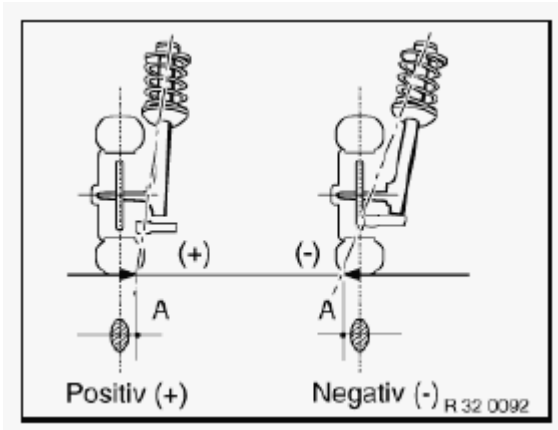


Fig. 24: Kingpin Offset
 Courtesy of BMW OF NORTH AMERICA, INC.

6. WHEEL SUSPENSION

Those parts which connect the wheel to the mostly load-bearing floor elements of the bodywork and guide it in the required direction belong to the wheel suspension. They are connected by axles or other comparable structures and guided by the arms. The wheel suspension plays a decisive role in the handling characteristics of a vehicle. Two main groups have to be distinguished: 1. Rigid axle suspension and 2. Independent wheel suspension.

6.1 Rigid axle suspension

RIGID AXLE SUSPENSION ADVANTAGES AND DISADVANTAGES

Description	Advantages	Disadvantages
The rigid axle suspension has a rigid connection between both wheels or wheel pairs. Any change in one wheel is more or	In the event of deflection taking place, there are no changes to the camber or	Non-driven rear axles may also acquire negative camber

less transferred to the other. It is now only fitted as a rear axle, if at all. However it is frequently used for lorries or busses.	wheel toe. This means: less tyre wear and good track stability.	as well as increasing tyre lateral guidance, thus increasing tyre wear.
--	---	---

6.2 Independent wheel suspension

INDEPENDENT WHEEL SUSPENSION ADVANTAGES AND DISADVANTAGES

Description	Advantages	Disadvantages
State-of-the-art individual wheel suspension is available on BMW vehicles on the front and rear axles. This development has its cause in mass inertia, as a reduction in the non-suspended mass improves wheel and ground contact, and the wheel stays better on the road. Control arms and trailing arms, which have to absorb high longitudinal and lateral forces to some extent, are required for guiding independently suspended wheels.	Wheels suspended independently from each other have no mutual influence on each other.	Depending on the type, changes may occur in the camber, wheel toe, track width, castor and wheelbase.

7. WHEEL ALIGNMENT / PROCEDURE

7.1 Measuring options

An overview of all measuring options and values (VA = front axle, HA = rear axle) is shown below.

WHEEL ALIGNMENT SPECIFICATION

Measuring options	Measuring accuracy	In measuring range	Total measuring range
Total wheel toe (VA + HA)	± 2'	± 2°	± 18°
Single wheel toe (VA + HA)	± 2'	± 2°	± 9°
Camber (VA + HA)	± 1'	± 3°	± 10°
Wheel displacement (VA)	± 2'	± 2°	± 9°
Geometrical drive axis	± 2'	± 2°	± 9°
Castor	± 4'	± 18°	± 22°
Kingpin inclination	± 4'	± 18°	± 22°
Toe-differential angle	± 4'	± 20°	± 20°
Maximum steering angle (VA)	± 4'	± 60°	± 300°
Maximum steering angle (HA)	± 4'	± 9°	± 9°
Castor correction range	± 4'	± 7°	± 10°

NOTE: The measuring accuracy details only apply when using the precision rotating and sliding plates as well as the BMW quick-acting clamps.

7.2 Preparatory work

Before commencing the measurement, preparatory work must be carried out at the measuring area and on the vehicle. Preparatory work includes:

- Easy-running rotating and sliding plates
- Aligning the rotating and sliding plates in relation to the track width and wheelbase
- Centering the vehicle on the plates
- Applying the parking brake
- Removing the lock pins on the plates to prevent tension in the chassis under loading
- Checking the rim and tyre size, tread depth, tyre pressure, steering wheel play, wheel bearings and condition of suspension and shock absorbers
- Fastening the measuring equipment to the wheels
- Loading the vehicle according to BMW KDS specifications
- Rock the vehicle firmly with the brakes released to ensure a stable center position
- Lock the service brake using the brake clamping device

7.3 Initial / final measurement

This measurement can be carried out as a program-guided measurement in the same way as any subsequent adjusting work and the final measurement. The sequence of the chassis measuring points to be called up is specified and controlled by the system software. The individual steps comprise:

- Driving straight ahead to correctly record the wheel toe and camber values for the rear axle
- Steering routine for recording the castor, kingpin inclination and toe-differential angle
- Recording the wheel toe and camber of the front axle (adjust the steering center point in advance)
- Steering routine for measuring the maximum steering angle on the left/right
- Checking the overview of measured values with the setpoint and actual comparison of all measured values

7.4 Printing out the data



Fig. 25: Printing Layout Of Customer And Vehicle Identification Data
 Courtesy of BMW OF NORTH AMERICA, INC.

The report printout from the integrated DIN A4 printer is subdivided into three sections:

- Header lines with customer and vehicle identification data <-- the customer data entered before beginning the measurement as well as vehicle data are printed out here.
- Centre section with vehicle data <-- this includes the make, type, model and vehicle model year defined when the setpoint data record was selected. The values previously measured for height level, tyre pressure and tread depth are also printed in this section.
- The end section with all vehicle alignment values comprises the 3 columns initial measurement, setpoint values and output measurement. The measured values are recorded separately in these three columns.

8. SPECIAL FEATURES

8.1 Free wheel alignment

With free wheel alignment the selection and sequence of the measuring points is freely selectable. The following points must be observed for attaining the correct measurement results:

- Carry out all work in the same way as with the program-guided measurement.
- Before measuring the wheel toe and camber values for the rear axle, the steering must be in the "straight ahead" position to ensure that it is perfectly aligned in relation to the longitudinal center plane of the vehicle.
- Before measuring the single wheel toe values on the front axle, the center of steering must be established to ensure the correct position of the steering wheel.

8.2 System settings

The following settings must only be entered or set once: language, display format, date/time, advertising text, remote control with display, rotating plate selection and printer settings. They remain stored.

9. BMW KINEMATIC DIAGNOSIS SYSTEM COMPARISON (BOSCH - BEISSBARTH)

BMW KINEMATIC DIAGNOSIS SYSTEM COMPARISON (BOSCH - BEISSBARTH)

	Bosch	Beissbarth
Measured value recording	Infrared	CCD camera
Data transmission	Cable	Infrared / cable
Measuring sensor power supply	Cable	Battery / cable
Remote control	Infrared	Infrared
Remote control with measured value display	Cable	Infrared
Setpoint data memory	Floppy disk	Hard disk
Measured value memory	Always the last vehicle measured	Unlimited vehicle memory
Operating system	---	MS-DOS
Languages	English and one language on request	EN, DE, NI, SV, IT, FR, SP (further languages can be called up)
Update	3.5" floppy disk	3.5" floppy disk using TIS/DIS
Monitor	20"	17"
Computer	---	Pentium
Disk drives	2 x floppy disk	1 x floppy, 1 x CD ROM

10. CONTROL MODIFICATION (MENU)

10.1 Remote control with display

The following steps show how the remote control with display is activated:

1. Call up the "**Service**" menu in special functions ("S" key)
2. Call up the "**Remote control**" sub-menu in the "**Service**" menu.
3. Select the "**Remote control with display**" item in the "**Remote control**" sub-menu-this configuration is retained.

IMPORTANT: In the case of equipment without remote control, this must be configured to "No remote control" .

10.2 Brief operating instructions

1. Activate the remote control with the "**ON**" button (it may also be switched on during alignment). The title page will appear on the LCD.
2. Select "**Straight ahead**" of the "**Initial measurement**" , "**Adjustment work**" or "**Final**

measurement" at the measuring equipment cabinet. The steering graphics for **"Straight ahead"** will appear on the LCD.

3. Use the **"Forward arrow"** to change to the next measurement image. Display blocks will appear on the LCD with the designation of the measured value and tolerance bar with the measured value. If the measured value is within the tolerance range, it is shown in dark figures against a light background. If the measured value is outside the tolerance range, it will be shown in inverse video (light figures against a dark background).
4. By pressing the **"F"** key shortly, you can move alternately between the designation of the measured value and the setpoint value with the tolerance inside the display blocks.
5. You can scroll through the measured values using the **"Forward arrow"** , **"Backward arrow"** and **"Cancel" (red dot)** keys. The function of these keys is identical to that of the keys on the graphics panel.
6. Even with **"Free alignment"** , it is possible to scroll through the measured values in the same way as with **"Program-guided alignment"** .
7. During measurement, the report print-out can be initiated using the **"Printer"** key. The remote control keys are only active during measurement and adjustment (not during customer data input, vehicle selection etc.).

10.3 Display support

- Measured values with a setpoint/actual comparison and tolerance bar (setpoint figures can be displayed with the **"F"** key)
- Steering graphics for steering routines
- Overview of measured values with current setpoint/actual comparison
- Rim run-out compensation
- With all other functions (e.g. customer input), the title illustration appears on the LCD display

NOTE: **If the data transmission from the remote control to the computer is interrupted, the remote control icon in the bottom right-hand corner of the screen changes color from green to red and the illustration on the LCD display is shown inversely - black turns to white, white to black. This change does not take place in the title illustration. Once the line-of-sight connection has been re-established, the remote control continues to operate from the point of interruption in the program. A continuous visual connection during alignment is therefore not necessary.**

- The **"Hour glass"** icon in the LCD display means: **"Please wait"** .
- The **"Battery"** icon in the top right-hand corner of the LCD display means that the battery reserve has been reached.
- To switch off the remote control: press the **"F"** key for 5 seconds, then return it to its charging unit or connect it to a charge cable. The title illustration will again appear as a charging check.
- If, during the measurement, the remote control has been placed back in the charging unit, it must be switched on again using the **"ON"** button.

11. UPDATING THE SOFTWARE / SETPOINT DATA

Floppy disks will no longer be sent to BMW partners who have acquired a "**BMW KDS** (Beissbarth / Bosch)". For cost-related reasons, you can create these disks yourself on the "**Dis-tester**" or on the "**TIS/EPC server**". The data for this is regularly updated on the TIS CD.

11.1 Requirements

- BMW KDS (Beissbarth / Bosch)
- TIS CD program status (Beissbarth): from CD 12/95
- EPC program status: from 12/95
- TIS CD program status (Bosch): from CD 08/97
- DIS program status: from V6.0
- 3.5" diskettes, 1.44 MB (Beissbarth 5 diskettes / Bosch 1 diskette)

11.2 Procedure (Beissbarth)

1. Go to the "Administration" screen
2. Select the **KDS button**
3. Select **Beissbarth**
4. Insert "**Diskette 1**" on request and confirm with "**OK**" (program diskette 1 of 2 is created, label it)
5. Insert "**Diskette 2**" on request and confirm with "**OK**" (program diskette 2 of 2 is created, label it)
6. Insert "**Diskette 3**" on request and confirm with "**OK**" (setpoint data diskette 1 of 3 is created, label it)
7. Insert "**Diskette 4**" on request and confirm with "**OK**" (setpoint data diskette 2 of 3 is created, label it)
8. Insert "**Diskette 5**" on request and confirm with "**OK**" (setpoint data diskette 3 of 3 is created, label it)
9. Perform update and/or setpoint data on the KDS in the usual manner with the diskettes which have just been created.

11.3 Procedure (Bosch)

1. Go to the "Administration" screen
2. Select the **KDS button**
3. Select **Bosch**
4. Label "**Diskette 3.1**", insert it into the drive on request and confirm with "**OK**" (2x) <-- Setpoint data is copied to the diskettes.
5. Insert setpoint data diskette 3.1 into the 3.1 floppy disk drive, insert operating system diskette 3.0 into the 3.0 drive.
6. Switch on the machine in the usual manner.

IMPORTANT: When creating the KDS diskettes, all data on the diskettes used is overwritten.

NOTE: In the event of an error, a corresponding message is shown and the program is cancelled completely. The procedure must be run from the beginning again and all data on the diskette will be deleted. A new diskette may have to be used.

12. CREATING, COPYING AND EDITING SETPOINT DATA

12.1 Copying

- Press the "C" button and select the vehicle to be copied.
- Select the "**Edit setpoint data**" menu item from the special functions. Create a new vehicle in the usual manner. The setpoint values for the last vehicle selected will appear in the data input screen. Enter the data and save the data record.

12.2 Creating

- Press the "C" button and select the "**Edit setpoint data**" menu item from the special functions. Create a new vehicle in the usual manner. An empty data input screen will appear. Enter the data and save the data record.

12.3 Editing

- Factory-programmed setpoint data can neither be deleted nor modified. If this data does need to be modified, a new vehicle with modified setpoint data must be created. New vehicles created by the user are identified by a "+" in the selection menu. These vehicles can be deleted by the user using the "-" key or modified using the "<>" key. These keys only appear if vehicles have been entered by the user.

13. SPECIAL FUNCTIONS

13.1 Customer-specific printer report header

The sub-item "**Customer-specific text**" must be called up in the "**Special functions**" menu. An input screen will appear on the monitor. This input screen must be filled out with the name and address and stored with the "S" screen key. The text entered is inserted into the report header.

13.2 Adjusting options

- Call up the "**Service**" menu in the special functions ("S" key).
- Select the "**Wheel toe adjustment**" item or the "**Camber adjustment**" item from the "**Adjustment**" sub-menu. The toe and camber adjustment program will guide the user step by step through the adjustment using text and images. The measuring deviation for each measuring sensor will be shown on the screen when the adjustment has been completed.
- You can store the adjustment values in the measuring sensor using the "**Store**" key or you can quit the program with the "**Red dot key**" without saving them (check). The adjustment values can be printed out.

13.3 Rotating plate test

- Call up the "**Service**" menu in the special functions ("S" key).
- Call up the "**Rotating plate**" item in the "**Service**" menu. Turn the left-hand and right-hand rotating plate and check the display on the screen. Important: The measuring range is ± 306 degrees.

13.4 Viewing and deleting customer entries from database

- Call up the menu item "**Delete**" in the "**Database**" menu in the special functions. The data input screen will appear. Fill in the search fields with the data to be deleted.
- Use the "-" button to delete this data record. A new data record can then be highlighted and deleted with the digital pen.
- You can scroll through the entire database with the "**Arrow up**" and "**Arrow down**" keys.
- You can quit the delete function by pressing the cancel key (red dot).

14. MODIFICATIONS WITHIN PROGRAM

Further modifications were carried out within the program which only slightly change the program sequence but which optimize the alignment in respect of comfort and speed. This is described below:

- Optimization of the rim run-out compensation in respect of speed.
- Optimization of the steering routines: Highlighted values within the gate can still be corrected. The message "**Rotating plates not connected**" no longer causes the steering routine to be cancelled. Further measurements can be carried out after the rotating plates have been connected.
- Standardization of screen colors with the colors on the tablet.
- Addition of texts in several foreign languages.
- Elimination of program-related and cosmetic faults.
- Electronic water level.
- Omission of kingpin inclination measurement.

15. FAULTS

15.1 Tyre faults

TYRE FAULTS DESCRIPTION CHART

Fault	Effect
1 Wheel toe, camber, toe-differential angle and castor not correct	1 Severe tyre squeaking even at relatively low speeds
2 Excessive toe-in and excessive positive camber	2 Tyres are worn down on one outside edge in the longitudinal direction
3 Excessive negative camber	3 Tyre wear on inside edge
4 Worn front-axle suspension on front-wheel-drive vehicles	4 Increased noise / Vehicle pulls on one side when accelerating
5 Incorrect wheel alignment	5 Wheels scrubbing / Tyre surface shows feathering in the tread
6 Play in the suspension due to mechanical parts (suspension, steering)	6 Washout / Wobbling of front wheels
7 Tyre pressure too low	7 Outside tyre surface wear

15.2 Front axle faults

FRONT AXLE FAULTS DESCRIPTION CHART

Fault	Cause	Remedy
1. Toe deviation	<ul style="list-style-type: none"> a) Vehicle not in normal position b) Tie rod(s) bent c) Tie rod ball joints worn d) Rubber mount in control arm defective 	<ul style="list-style-type: none"> a) Correct height level b) Replace tie rod(s) c) Replace tie rod(s) d) Replace control arm
2. Camber deviation: The camber is fixed during the design stage and cannot be adjusted.	<ul style="list-style-type: none"> a) Rubber mount in control arm defective b) Control arm deformed c) Spring strut deformed d) Traction strut worn e) Spring deflection too great f) Front axle carrier deformed g) Spring strut mount deformed h) Distortion in the floor assembly (engine bracket) 	<ul style="list-style-type: none"> a) Replace control arm b) Replace control arm c) Replace spring strut d) Replace control arm e) Replace coil spring, height level f) Replace front axle carrier g) Repair forward structure h) Repair body
3. Castor deviation: The castor is fixed during the design stage and cannot be adjusted.	<ul style="list-style-type: none"> a) Rubber mount for tension / traction strut defective b) Tension / traction strut deformed c) Control arm deformed d) Spring strut deformed e) Wheelhouse deformed (spring strut mount) f) Distortion in the floor assembly (engine bracket) 	<ul style="list-style-type: none"> a) Replace rubber mount b) Replace tension / traction strut c) Replace control arm d) Replace spring strut e) Repair forward structure f) Repair body
4. Toe-differential angle deviation	<p>Requirement: camber and castor are correct</p> <ul style="list-style-type: none"> a) Tie rods unevenly adjusted 	<ul style="list-style-type: none"> a) Set wheel toe on left and right to identical values
5. Wheel displacement deviation	<p>Requirement: Front wheels have same single toe in relation to the geometrical axis</p> <ul style="list-style-type: none"> a) Front axle carrier deformed b) Engine bracket deformed c) Control arm deformed d) Tension / traction strut deformed 	<ul style="list-style-type: none"> a) Replace front axle carrier b) Repair body c) Replace control arm d) Replace tension / traction strut

15.3 Rear axle faults

REAR AXLE FAULTS DESCRIPTION CHART

Fault	Cause	Remedy
1. Camber deviation	a) Vehicle not in normal position: spring deflection too great b) Rubber mount on rear axle carrier defective c) Rear axle carrier deformed d) Control arm deformed e) Traction strut deformed f) Distortion in the floor assembly g) Swinging arm deformed	a) Correct height level b) Replace rubber mount c) Check rear axle carrier and replace, if necessary d) Check control arm and replace, if necessary e) Check traction strut and replace, if necessary f) Repair body g) Replace swinging arm
2. Rear wheel position is not correct	a) Rear axle carrier has been shifted laterally b) Distortion in the floor assembly	a) Check the rubber mounts on the rear axle carrier and replace, if necessary b) Repair body
3. Toe deviation	a) Vehicle not in normal position, i.e. spring deflection too great b) Rubber mount in rear axle carrier defective c) Control arm deformed d) Rubber mount and swinging arm defective e) Rear axle carrier deformed f) Traction strut deformed	a) Correct height level b) Replace rubber mount c) Replace control arm d) Replace swinging arm e) Check rear axle carrier and replace, if necessary f) Check traction strut and replace, if necessary
4. Deviation from the geometrical drive axis	Requirement: Total wheel toe is correct a) Distortion in the floor assembly	a) Repair body

Further details on the "Kinematic Diagnosis System" can be found in the operating instructions for the BMW KDS (Beissbarth / Bosch).

Functional and system descriptions are not subject to change. Parts availability and immediate ordering availability cannot be derived from this information. The specialist departments will be providing further details at the relevant time.

ACCESSORIES AND EQUIPMENT

Accessories Control System - Repair Instructions - X3

00 TROUBLESHOOTING

12 00 ... INSTRUCTIONS ON STARTING AID

Do not start the engine with help of starting sprays.

Preparation:

Conform with the following when starting engine with starting cable.

- Ensure that jump lead wires are to appropriate cross-section size.
- Only use fuse-protected jump leads.
- Check whether the current supplying battery has 12 V voltage.
- If engine is started from battery of another vehicle, ensure that there is no contact between the bodies of both vehicles.

CAUTION: Never touch ignition system components and current - dangerous high tension!

If the battery in the vehicle supplying power is weak, start the engine of this vehicle and let it run at idling speed.

Carrying out:

Always conform with the procedures to avoid injury to persons or damage to parts.

- On automatic transmission, select "P" setting, apply handbrake.
- Move the shift lever of vehicles with manual transmission into neutral and apply the parking brake.
- Ensure that the jump leads cannot get caught in rotating parts, e.g. fan.
- First connect positive terminals of both batteries with one jump lead (red).
- Use positive connection point in engine compartment for vehicles with one battery in trunk.
- Then attach second jump lead (black) to negative terminal of donor battery and to engine ground or body ground on vehicle to be started.

CAUTION: Never connect second jump lead (black) to negative terminal of battery in vehicle to be started. This would produce explosive gas which could be ignited by sparks.

Danger of explosion!

After engine of vehicle to be started has started up, first disconnect the jump lead on the negative terminal/ground connection. Then remove jump lead from positive terminals.

61 00 ... BATTERY

NOTE: Important notes and instructions for handling batteries in the dealership can be found in:

- Battery master document
- Disconnecting battery, see 12 00 ... Instructions for disconnecting and connecting battery
- Battery charging, see 61 20 ... Battery charging
- Welding work
- External jump-starting aid, see 12 00 ... Instructions on starting aid

Battery care and maintenance

In low-maintenance batteries, check the acid level at least once a year. If necessary, top up with distilled water up to the top marking.

The increasing number of electronic control units in the car reduces the self-discharging time of the battery (even in standby mode). To maintain the battery service life and to avoid exhaustive discharging, recharge laid-up vehicles every 6 weeks at the latest. The time for self-discharging depends on vehicle type and equipment specification.

Battery test

The battery acid density can be used to measure the charge state. However this test produces uncertainty caused by a design-related range of variation. The acid density e.g. for a charged battery is 1.28 kg/l (in the tropical version the acid density is 1.23 kg/l).

Another interference factor is the acid lamination immediately after filling with distilled water.

Battery wear with partially sulphated and/or heavily contaminated plates will also lead to incorrect acid density test results.

61 00 ... REPAIRING AIRBAG CABLES

IMPORTANT: Only repair those cables which show visible signs of damage. In the event of visible damage, make sure there is only one cable repair in effect after the repair work. If no visible damage can be identified, the entire cable must be replaced. When carrying out repairs to the airbag wiring harness, you must use the spare parts offered in the Electronic Parts Catalogue (EPC).

Safety regulations:

Safety regulations for handling components of airbag system, see 72 00 ... SAFETY REGULATIONS FOR

HANDLING COMPONENTS WITH GAS GENERATORS .

Instructions for disconnecting and connecting battery, see **12 00 ... Instructions for disconnecting and connecting battery**

Procedure for cable repair

In event of non-visible damage to wiring harness:

Disconnect plug connection on airbag module or on adapter plug. It is absolutely vital to disconnect the contacts in succession as there is a risk of them being mixed up! Cut through one cable after the other at an appropriate position, do not under any circumstances cut through both cables at the same time. Insulate cables remaining in wiring harness with insulating tape. Now disconnect plug connection on airbag control unit. Unpin contacts. Cut through one cable after the other at an appropriate position and insulate with insulating tape, do not under any circumstances cut through both cables at the same time. Pin contacts of repair cable for airbag control unit in control unit plug, assignment of repair cables is relevant. Lay repair cable in car parallel to existing airbag lead. Now pin in contacts for airbag control unit or contacts of adapter plug, assignment of repair cables is relevant. Cut off excess length of repair cable in proximity (visible area) of airbag module or of adapter plug. Twist open cables. With the connectors and shrink-fit hoses in the Electronic Parts Catalogue (EPC), reconnect the cables with the same cable colors. Twist cables again, open length (twist) must not exceed 40 mm. Secure interface (shrink-fit hoses) with insulating tape to prevent cables from twisting open.

Instructions for cutting off, insulating, crimping cables, installing and removing contacts:

Cutting off and insulating cables, see **61 13 Cutting to length and stripping insulation from cables**

Repairing a plug connection using connectors, see **61 13 Butt connector for repairing a plug connection**

Installing and removing contacts, see **61 13 Opening plug housings and removing contacts of different plug systems**

In event of visible damage:

Expose cable at damaged areas. Cut through one cable after the other at an appropriate position and insulate cables no longer required in wiring harness with insulating tape, do not under any circumstances cut through both cables at the same time. Now, depending on the scope of work, unpin contacts either on airbag control unit/airbag module or on adapter plug. Cut off unpinned cables. Insulate cables remaining in wiring harness with insulating tape. Now pin in contacts of repair cable, assignment of repair cables is relevant. Lay repair lead in car parallel to existing airbag lead up to cutting point. Cut off excess length of repair lead. Twist open cables. Connect cables with connectors and shrink-fit hoses in Electronic Parts Catalogue (EPC), assignment of repair cables is relevant. Twist cables again, open length (twist) must not exceed 40 mm. Secure interface (shrink-fit hoses) with insulating tape to prevent cables from twisting open.

Instructions for cutting off, insulating, crimping cables, installing and removing contacts:

Cutting off and insulating cables, see **61 13 Cutting to length and stripping insulation from cables**

Repairing a plug connection using connectors, see **61 13 Butt connector for repairing a plug connection**

Installing and removing contacts, see **61 13 Opening plug housings and removing contacts of different plug systems**

61 00 ... SAFETY INSTRUCTIONS FOR HANDLING VEHICLE BATTERY

Battery acid is highly corrosive:

Do not allow any battery acid to come into contact with the eyes, the skin or clothing. Therefore wear protective clothing, gloves and goggles.

Do not tilt the battery, acid may emerge from the vent opening.

In event of contact with acid:

If acid is splashed into the eyes, rinse them immediately for several minutes with clear water. You must then consult a doctor without delay.

If acid is splashed onto the skin or clothing, neutralize it immediately with a soapy solution and rinse with lots of water.

Seek medical attention immediately if battery acid is accidentally swallowed.

Explosion hazard:

Strictly no flames, sparks, naked light or smoking!

A highly explosive mixture of electrolytic gas is created when batteries are charged. The rooms where charging is carried out must therefore always be well ventilated.

Avoid the formation of sparks when handling cables, wiring and electrical devices.

Turn the ignition lock to the 0 position before disconnecting or connecting the battery.

Do not place tools or any similar object on the battery (danger of short-circuiting and explosion!).

61 13 OPENING PLUG HOUSINGS AND REMOVING CONTACTS OF DIFFERENT PLUG SYSTEMS

Special tools required:

- **61 0 300 RELEASING TOOL (COMPLETE KIT)**
- 61 0 400
- **61 1 150 RELEASING TOOL KIT**

Abbreviations and what they mean:

ABBREVIATIONS REFERENCE CHART

D 1.5 / 2.5	Round contacts of 1.5 mm or 2.5 mm diameter
MDK 3plus	Miniature double flat spring contact
JPT ELA	Junior Power Timer flat spring contacts with strand sealing
DFK ELA	Double flat spring contacts with strand sealing
Elo	Electronic contacts with and without strand sealing Manufacturer: Siemens
Elo Power	Electronic contacts for heavy loads with and without strand sealing Manufacturer: Siemens
MQS	Micro Quadlock System electronic contacts with and without strand sealing Manufacturer: AMP
MPQ	Micro Power Quadlock electronic contacts for heavy loads with and without strand sealing Manufacturer: AMP

Ultrasonic-welded connectors:

Ultrasonic-welded connectors (1) can be identified by the welds (2) on their longitudinal side.

The contacts of these connectors cannot be replaced. Replace plug completely.

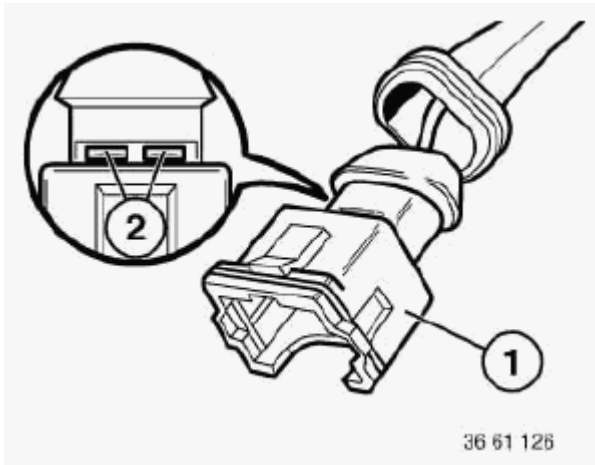


Fig. 1: Identifying Ultrasonic-Welded Connectors
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Special tools referred to in the repair instructions below are contained in the following special tool kits:

Release and press-out tool 61 1 150

Replaced as from 09/2005 by: 61 0 300

61 0 400

61 13 .. UNLOCKING AND DISCONNECTING DIFFERENT PLUG CONNECTIONS

NOTE: Examples of unlocking and disconnecting different plug connections.

Press lock and open clip in direction of arrow.

Disconnect plug connection.

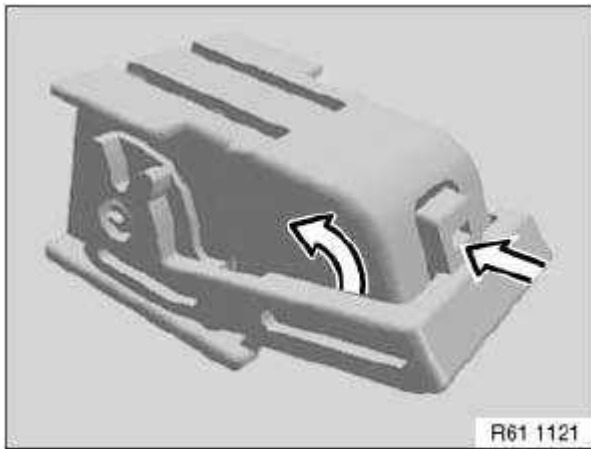


Fig. 2: Disconnecting Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Press lock and open clip in direction of arrow.

Disconnect plug connection.

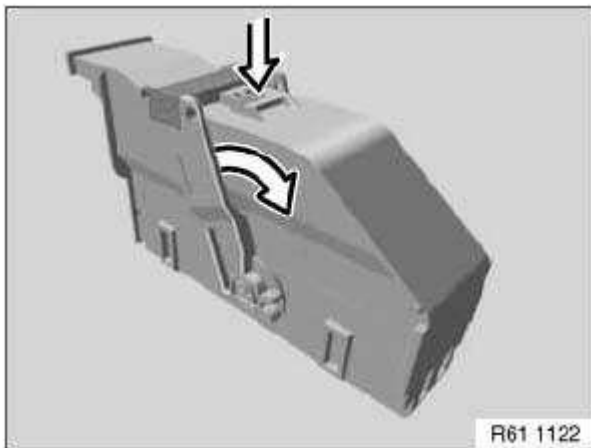


Fig. 3: Pressing Lock
Courtesy of BMW OF NORTH AMERICA, INC.

Open clip in direction of arrow and disconnect plug connection in direction of arrow.

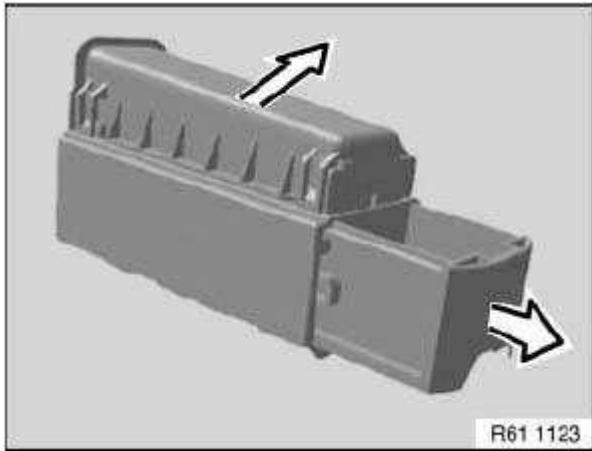


Fig. 4: Disconnecting Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Press lock and disconnect plug connection in direction of arrow.

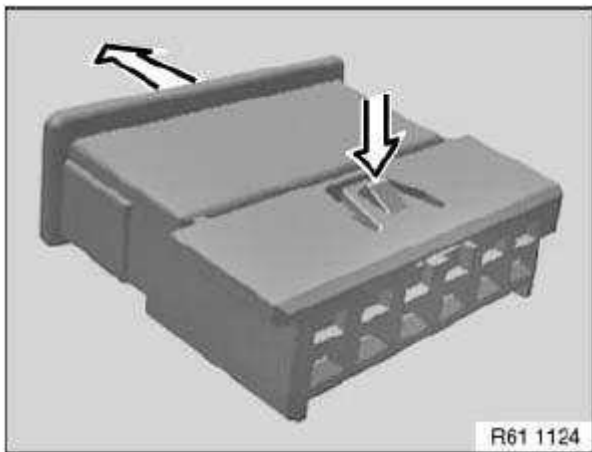


Fig. 5: Pressing Lock (1 Of 6)
Courtesy of BMW OF NORTH AMERICA, INC.

Press lock and disconnect plug connection in direction of arrow.

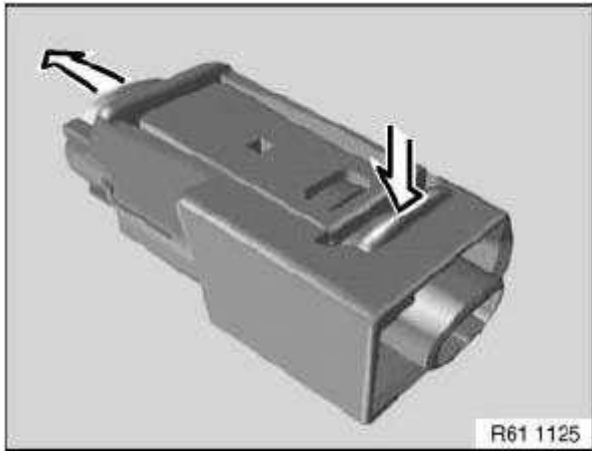


Fig. 6: Pressing Lock (2 Of 6)

Courtesy of BMW OF NORTH AMERICA, INC.

Press lock and disconnect plug connection in direction of arrow.

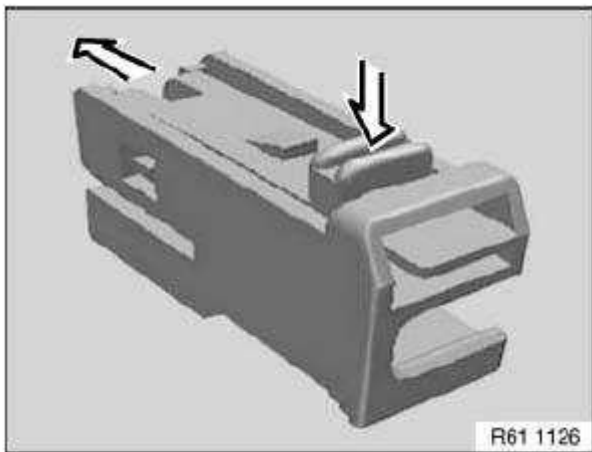


Fig. 7: Pressing Lock (3 Of 6)

Courtesy of BMW OF NORTH AMERICA, INC.

Press lock and disconnect plug connection in direction of arrow.

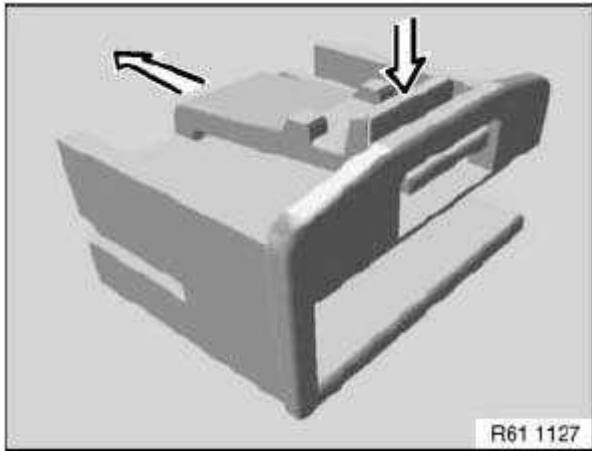


Fig. 8: Pressing Lock (4 Of 6)

Courtesy of BMW OF NORTH AMERICA, INC.

Press lock and disconnect plug connection in direction of arrow.

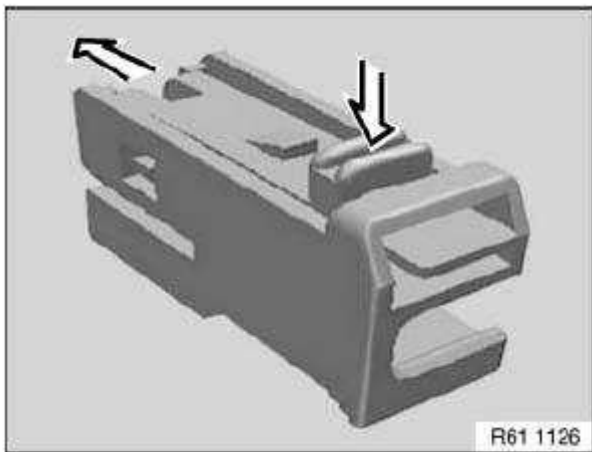


Fig. 9: Pressing Lock (5 Of 6)

Courtesy of BMW OF NORTH AMERICA, INC.

Press lock and disconnect plug connection in direction of arrow.

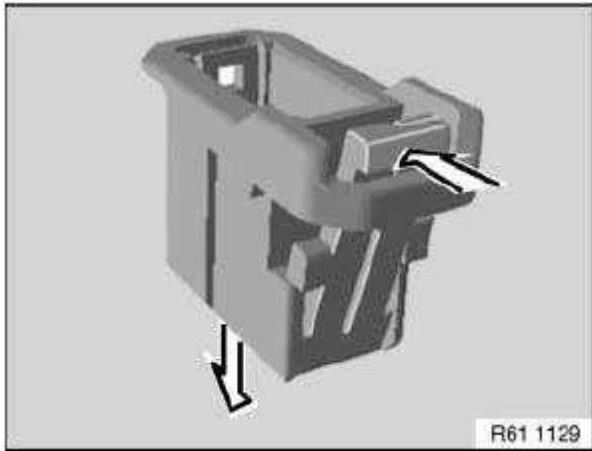


Fig. 10: Pressing Lock (6 Of 6)

Courtesy of BMW OF NORTH AMERICA, INC.

61 13 ... TREATING CABLES AND FIBRE-OPTIC CABLES

Special tools required:

- **61 1 190 PLIERS**
- **61 4 320 CRIMPING SET WITH PLIERS**

NOTE: Special tools referred to in the repair instructions below are contained in the following special tool kits:

REPAIR INSTRUCTIONS CHART

Repair range for vehicle electrical system	SI 2 04 07 341
Crimping set with tool for fibre-optic cables, Micro Power Quadlock (MPQ), Micro Quadlock System (MQS) contacts and universal crimping head	61 4 320
Insulation displacement tool for ribbon cable	61 1 190

Subject of repair instructions

- Special tools for wiring harness repairs, see **61 13 Special tools for wiring harness repairs**
- Cutting to length and stripping insulation from cables, see **61 13 Cutting to length and stripping insulation from cables**
- Crimping stop parts (contacts), see **61 13 Crimping stop parts**
- Butt connector for repairing a plug connection, see **61 13 Butt connector for repairing a plug connection**
- Fan connector for retrofitting/repairs, see **61 13 Installing fan connector for retrofitting/repairs**
- Aerial elbow plug on radio receiver
- Cutting to length and stripping insulation from optical fibers, see **61 13 ... Cutting off, stripping**

insulation and cutting optical fibres to length

- Crimping optical fibres, see **61 13 ... Crimping optical fibres**
- Insulation displacement connector for repairing ribbon cables, see **61 13 ... Repairing ribbon cables**

61 20 908 PERFORMING BATTERY "POWER RESET" (FOR PROGRAMMING/CODING CONTROL UNIT(S))

IMPORTANT: Observe safety instructions for handling vehicle battery, see 61 00 ... Safety instructions for handling vehicle battery.

The following steps must be carried out for a "power reset":

- Switch off and disconnect battery charger
- Switch off ignition

Cars with ignition key: Turn ignition key to 0 position

Cars with identification sensor: Remove identification sensor from slot

Cars with comfort access system: Make sure terminal is in 0 position

- Disconnect battery negative terminal
- Reconnect battery negative terminal (to ensure bus activity)
- Waiting time (5-10 seconds)
- Disconnect battery negative terminal
- Waiting time (1 minute)
- Connect battery negative terminal and tighten, tightening torque: 61 21 1AZ, see **61 21 BATTERY WITH TERMINAL** .
- Connect and switch on battery charger
- Switch ignition on

12 AUXILIARY CABLES

61 12 004 REPLACING BATTERY POSITIVE LEAD (FROM BATTERY TO ENGINE COMPARTMENT PARTITION CONNECTOR)

WARNING: Observe safety instructions for handling vehicle battery, see 61 00 ... Safety instructions for handling vehicle battery

Necessary preliminary tasks:

- Remove right luggage compartment wheel arch trim, see **51 47 161 REMOVING AND INSTALLING/REPLACING RIGHT LUGGAGE COMPARTMENT WHEEL ARCH TRIM**

- Remove instrument panel trim, see **51 45 030 REMOVING AND INSTALLING INSTRUMENT PANEL TRIM**
- Remove right front seat, see **52 13 015 REMOVING AND INSTALLING / REPLACING CONTROLS ON LEFT / RIGHT FRONT SEAT (NORMAL / MANUAL)**
- Remove central bass cover, see **65 12 050 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT CENTRAL BASS SPEAKER (UNDER FRONT SEAT)**
- Remove panel for door pillar on right, see **51 43 150 REMOVING AND INSTALLING OR REPLACING TRIM FOR LEFT OR RIGHT DOOR PILLAR (BOTTOM)**

Unfasten plug connection (2) and disconnect.

Disconnect battery negative lead (1), see **61 20 900 Disconnecting and connecting battery negative lead.**

Open positive terminal cover (3).

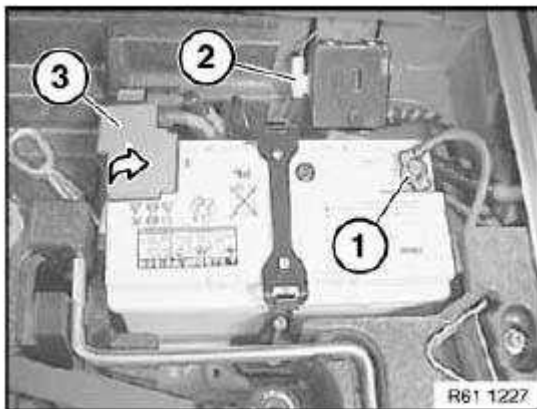


Fig. 11: Identifying Plug Connection

Courtesy of BMW OF NORTH AMERICA, INC.

Release nut (3), tightening torque: 61 12 1AZ, see **61 12 AUXILIARY CABLES/LEADS** .

Disconnect lead (4).

Release nut (1) of safety battery terminal (2), tightening torque: 61 21 1AZ, see **61 12 AUXILIARY CABLES/LEADS** .

IMPORTANT: Do not under any circumstances pull/lever safety battery terminal (2) off by force.

Detach safety battery terminal (2) towards top, lay to one side and secure.

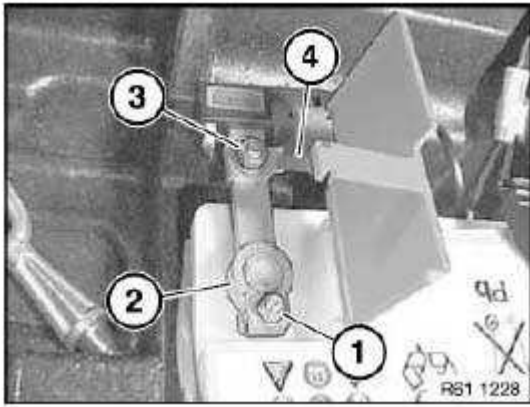


Fig. 12: Identifying Battery Terminal And Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Lever out covers (1) and remove.

Unfasten screws (2).

Lift out rail (3).

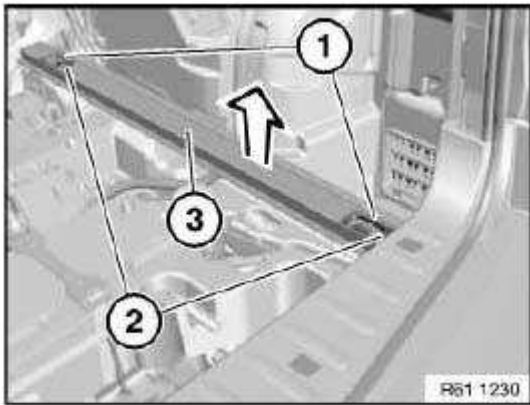


Fig. 13: Lifting Out Rail
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not kink floor panelling under any circumstances!

Cut and fold back floor panelling (1) in area (2).

Installation:

Cut into floor panelling (2) at marked points. Join cutting lines with cable straps (short).

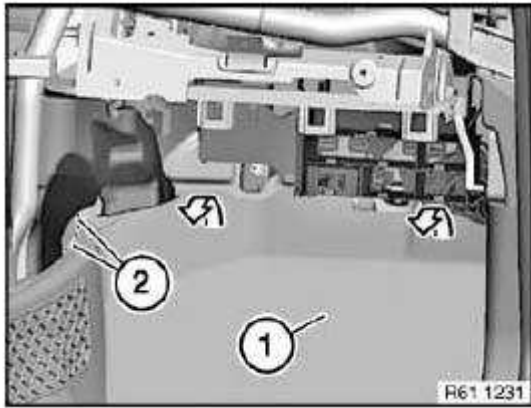


Fig. 14: Folding Back Floor Panelling
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock cable lug mounting (1) and fold back.

Release screw (2), tightening torque: 61 12 2AZ, see **61 12 AUXILIARY CABLES/LEADS** .

Unclip cable lug mounting (1) from positive battery cable (3) and remove.

WARNING: Risk of short circuits!
When installing, ensure:

- Correct seating of cable lug mounting (1) on positive battery cable (3)
- Correct screw connection

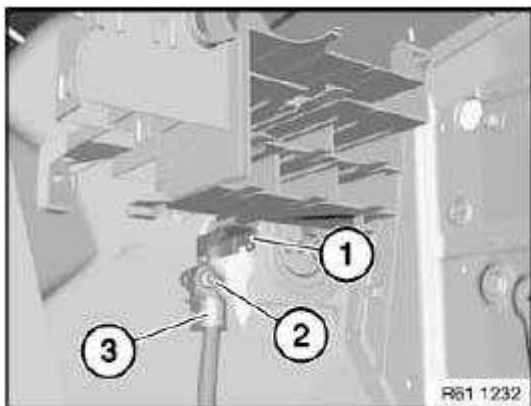


Fig. 15: Identifying Cable Lug Mounting And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: For purposes of clarity, the following illustrations show the front/rear floor panelling removed.

Raise front/rear floor panelling in area of battery positive lead.

Remove front insert (1).

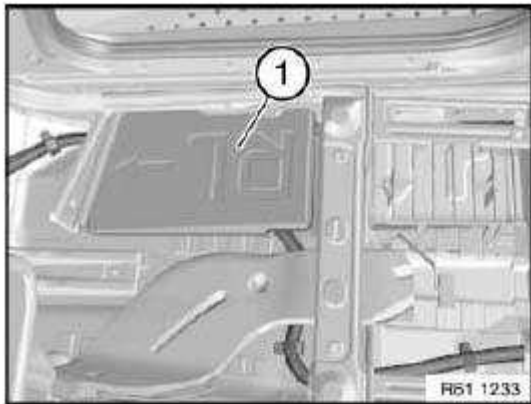


Fig. 16: Identifying Front Insert

Courtesy of BMW OF NORTH AMERICA, INC.

Remove battery positive lead (1) from cable guides (2).

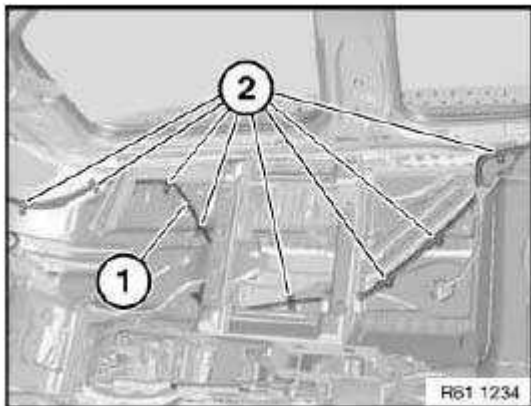


Fig. 17: Identifying Battery Lead And Cable Guides

Courtesy of BMW OF NORTH AMERICA, INC.

Detach battery positive lead (1) from cable guides (2) and remove.

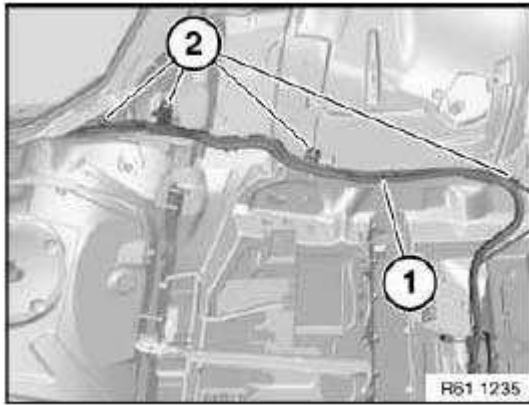


Fig. 18: Identifying Battery Lead And Cable Guides
 Courtesy of BMW OF NORTH AMERICA, INC.

61 12 013 REPLACING NEGATIVE BATTERY CABLE

WARNING: Observe safety instructions for handling vehicle battery, see 61 00 ... Safety instructions for handling vehicle battery

Necessary preliminary tasks:

- Remove roller cover from luggage compartment.
- Release cover on seat belt at top rear, see **72 11 100 REMOVING AND INSTALLING/REPLACING REAR LEFT OR RIGHT SEAT BELTS**
- Remove both rest side sections on rear seat backrest, see **52 26 008 REMOVING AND INSTALLING/REPLACING LEFT/RIGHT SIDES OF BACKREST ON REAR SEAT BACKREST (THROUGH-LOADING)**
- Remove backrest for rear seat, see **52 26 015 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT REAR SEAT BACKREST (THROUGH-LOADING SYSTEM)**
- Remove rear luggage compartment floor trim, see **51 47 102 REMOVING AND INSTALLING/REPLACING LUGGAGE COMPARTMENT FLOOR TRIM PANEL**
- Remove front trim for luggage compartment floor, see **51 47 131 REPLACING FRONT TRIM FOR LUGGAGE COMPARTMENT FLOOR**
- Remove trim for rear right roof pillar (C-pillar), see **51 43 251 REMOVING AND INSTALLING/REPLACING TRIM PANEL FOR REAR LEFT OR RIGHT ROOF PILLAR (C - PILLAR)**
- Remove flap in luggage compartment panel, see **51 47 172 REMOVING AND INSTALLING/REPLACING FLAP IN LUGGAGE COMPARTMENT TRIM, LEFT OR RIGHT**
- Remove both trims for rear roof pillar (D-pillar), see **51 43 252 REPLACING TRIM PANEL FOR REAR LEFT OR RIGHT ROOF PILLAR (D-PILLAR)**
- Remove trim on tail panel at top, see **51 46 050 REMOVING AND INSTALLING/REPLACING TOP TRIM ON REAR APRON**
- Remove inner window cavity cover strip on right, see **51 37 261 REMOVING AND**

INSTALLING/REPLACING WINDOW CAVITY COVER STRIP FOR DOOR WINDOW, REAR LEFT OR RIGHT

- Remove storage compartment in luggage compartment on right, see **51 47 ... REMOVING AND INSTALLING/REPLACING STORAGE COMPARTMENT IN LUGGAGE COMPARTMENT ON RIGHT**
- Remove right luggage compartment wheel arch trim, see **51 47 161 REMOVING AND INSTALLING/REPLACING RIGHT LUGGAGE COMPARTMENT WHEEL ARCH TRIM** .
- Remove lashing rail in luggage compartment floor on right, see **51 47 135 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT LASHING RAIL IN LUGGAGE COMPARTMENT FLOOR**
- Remove right luggage compartment recess panel

Release nut (1) on battery negative terminal.

Tightening torque: 61 21 1AZ, see **61 21 BATTERY WITH TERMINAL** .

Detach battery negative cable (2) upwards.

Release nut (3) and battery negative cable (2).

Tightening torque: 61 21 2AZ, see **61 21 BATTERY WITH TERMINAL** .

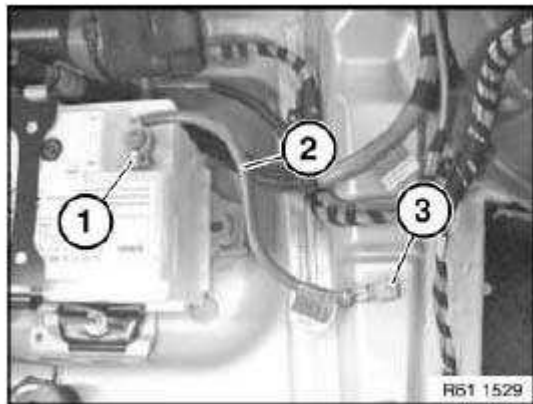


Fig. 19: Identifying Battery Cable Nut
Courtesy of BMW OF NORTH AMERICA, INC.

61 12 137 REPLACING WIRING HARNESS FOR REAR LID ON RIGHT

Necessary preliminary tasks:

- Disconnect battery negative lead, see **61 20 900 Disconnecting and connecting battery negative lead**
- Remove trim for rear lid, see **51 49 008 REMOVING AND INSTALLING/REPLACING PANEL FOR REAR LID**
- Remove roofliner, see **51 44 002 REMOVING AND INSTALLING ROOFLINER (ON VERSION WITHOUT PANORAMA SUNROOF)**

Disconnect plug connection (1).

Feed wiring harness (2) out of rear lid.

Installation:

Correctly lay wiring harness (2).

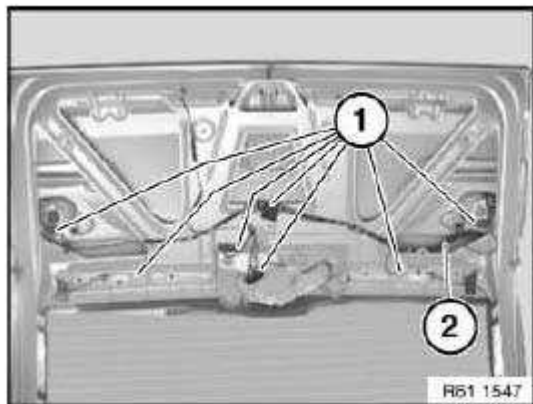


Fig. 20: Identifying Plug Connection

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Make sure rubber seal (1) is correctly installed in groove on frame.

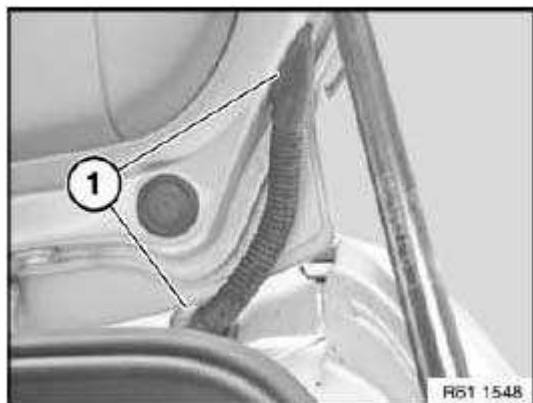


Fig. 21: Identifying Rubber Seal

Courtesy of BMW OF NORTH AMERICA, INC.

Remove wiring harness sheathing in area (A).

Cut one cable after another at the appropriate point.

Connect cables of new wiring harness with butt connectors and heat-shrink sleeves.

Insulate wiring harness with insulating tape and secure in place.

Installation:

Correctly lay wiring harness (2).

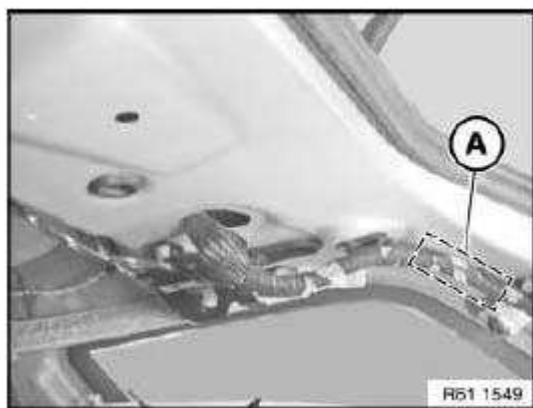


Fig. 22: Identifying Wiring Harness Sheathing Area
Courtesy of BMW OF NORTH AMERICA, INC.

61 12 200 REPLACING WIRING HARNESS IN LEFT OR RIGHT FRONT DOOR

Necessary preliminary tasks:

- Close front side window completely
- Remove front door trim panel, see **51 41 000 REMOVING AND INSTALLING LEFT OR RIGHT FRONT DOOR TRIM PANEL**
- Remove front acoustic insulation, see **51 48 060 REMOVING AND INSTALLING/REPLACING SOUND INSULATION IN LEFT OR RIGHT FRONT DOOR**

Disconnect plug connection (1).

Unclip door wiring harness at points (2).

Installation:

Make sure door wiring harness is correctly laid.

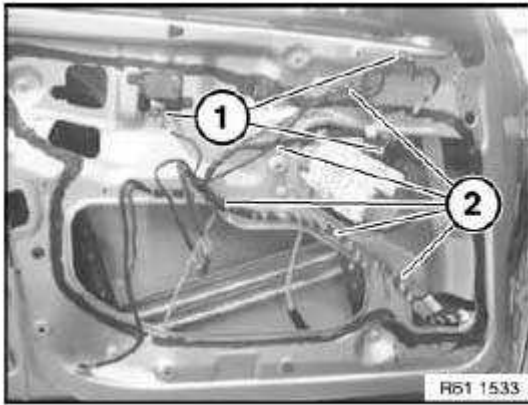


Fig. 23: Identifying Plug Connection And Door Wiring Harness Points
 Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1), fold door wiring harness plug on A-pillar (2) downwards slightly and remove.

Unlock plug connection behind and disconnect.

Pull rubber grommet (3) out of front door.

Feed out door wiring harness towards front to A-pillar and remove.

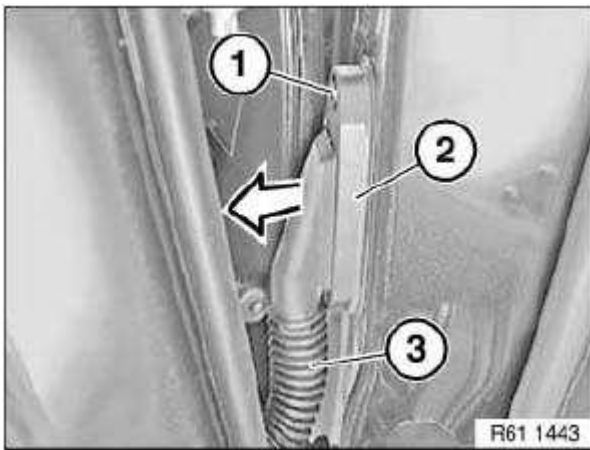


Fig. 24: Pulling Rubber Grommet
 Courtesy of BMW OF NORTH AMERICA, INC.

61 12 210 REPLACING WIRING HARNESS IN LEFT OR RIGHT REAR DOOR

Necessary preliminary tasks:

- Close rear side window completely
- Remove cover on door handle, see **51 41 017 REMOVING AND INSTALLING/REPLACING COVER ON DOOR HANDLE, FRONT LEFT OR RIGHT**

- Remove rear door trim panel, see **51 42 000 REMOVING AND INSTALLING LEFT OR RIGHT REAR DOOR TRIM PANEL**
- Remove rear acoustic insulation, see **51 48 070 REMOVING AND INSTALLING/REPLACING SOUND INSULATION ON LEFT OR RIGHT REAR DOOR**

Disconnect plug connection (1) on power window unit.

Unclip door wiring harness at points (2).

Installation:

Make sure door wiring harness is correctly laid.

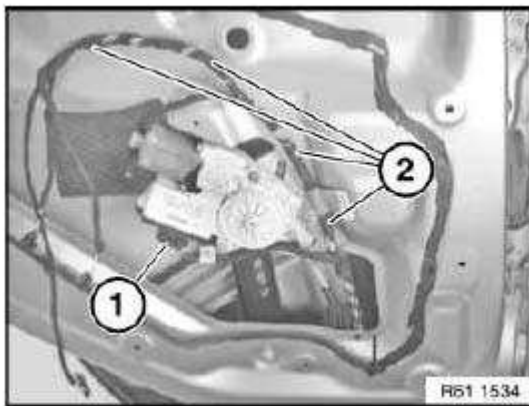


Fig. 25: Identifying Plug Connection And Door Wiring Harness Points
 Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1), fold door wiring harness plug on B-pillar (2) downwards slightly and remove.

Unlock plug connection behind and disconnect.

Pull rubber grommet (3) out of rear door.

Feed out door wiring harness towards front to B-pillar and remove.

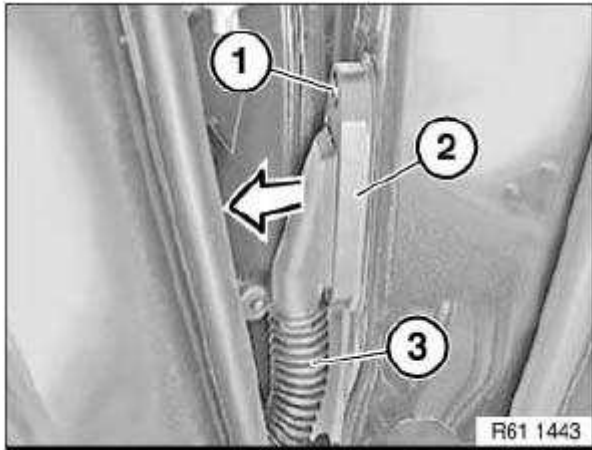


Fig. 26: Pulling Rubber Grommet

Courtesy of BMW OF NORTH AMERICA, INC.

61 13 OPENING PLUG HOUSINGS AND REMOVING CONTACTS OF DIFFERENT PLUG SYSTEMS

Special tools required:

- **61 0 300 RELEASING TOOL (COMPLETE KIT)**
- 61 0 400
- **61 1 150 RELEASING TOOL KIT**

Abbreviations and what they mean:

ABBREVIATIONS REFERENCE CHART

D 1.5 / 2.5	Round contacts of 1.5 mm or 2.5 mm diameter
MDK 3plus	Miniature double flat spring contact
JPT ELA	Junior Power Timer flat spring contacts with strand sealing
DFK ELA	Double flat spring contacts with strand sealing
Elo	Electronic contacts with and without strand sealing Manufacturer: Siemens
Elo	Power Electronic contacts for heavy loads with and without strand sealing Manufacturer: Siemens
MQS	Micro Quadlock System electronic contacts with and without strand sealing Manufacturer: AMP
MPQ	Micro Power Quadlock electronic contacts for heavy loads with and without strand sealing Manufacturer: AMP

Ultrasonic-welded connectors:

Ultrasonic-welded connectors (1) can be identified by the welds (2) on their longitudinal side.

The contacts of these connectors cannot be replaced. Replace plug completely.

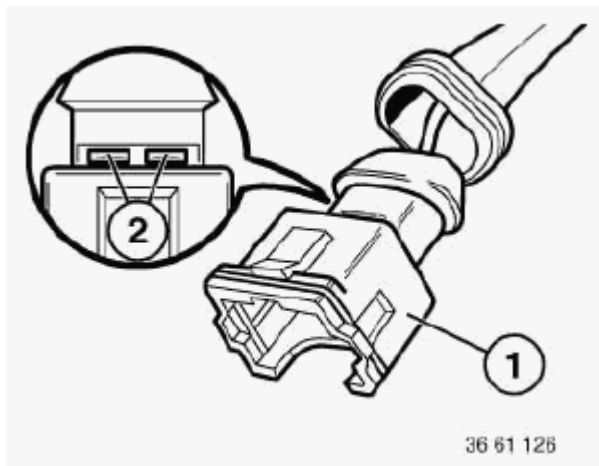


Fig. 27: Identifying Ultrasonic-Welded Connectors
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Special tools referred to in the repair instructions below are contained in the following special tool kits:

Release and press-out tool 61 1 150

Replaced as from 09/2005 by: 61 0 300

61 0 400

61 13 .. UNLOCKING AND DISCONNECTING DIFFERENT PLUG CONNECTIONS

NOTE: Examples of unlocking and disconnecting different plug connections.

Press lock and open clip in direction of arrow.

Disconnect plug connection.

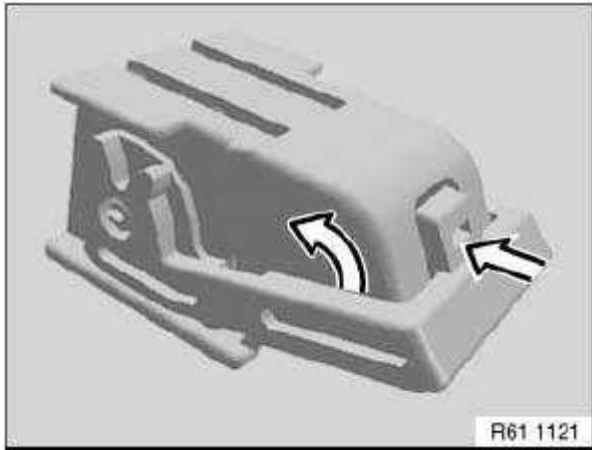


Fig. 28: Disconnecting Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Press lock and open clip in direction of arrow.

Disconnect plug connection.

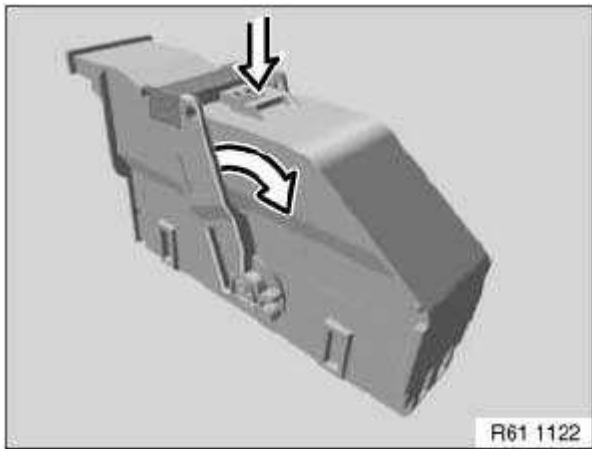


Fig. 29: Pressing Lock
Courtesy of BMW OF NORTH AMERICA, INC.

Open clip in direction of arrow and disconnect plug connection in direction of arrow.

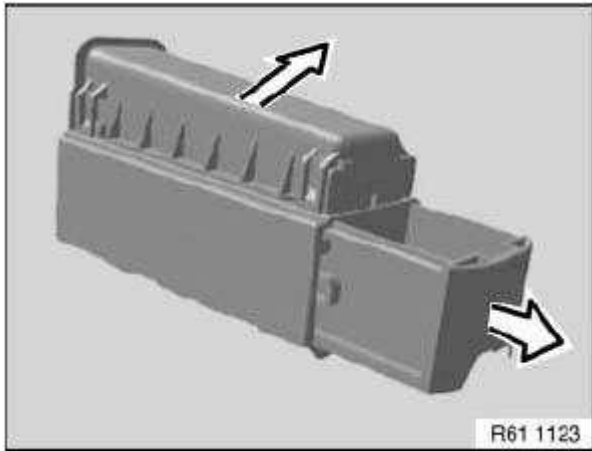


Fig. 30: Disconnecting Plug Connection

Courtesy of BMW OF NORTH AMERICA, INC.

Press lock and disconnect plug connection in direction of arrow.

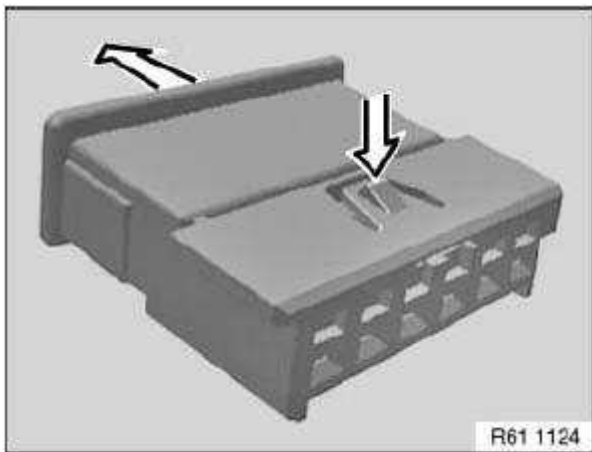


Fig. 31: Pressing Lock (1 Of 6)

Courtesy of BMW OF NORTH AMERICA, INC.

Press lock and disconnect plug connection in direction of arrow.

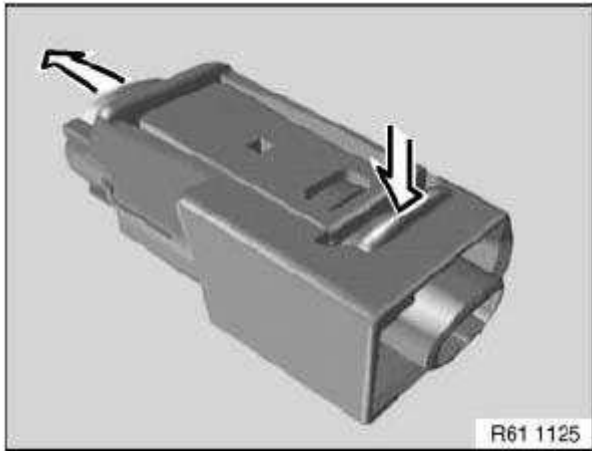


Fig. 32: Pressing Lock (2 Of 6)

Courtesy of BMW OF NORTH AMERICA, INC.

Press lock and disconnect plug connection in direction of arrow.

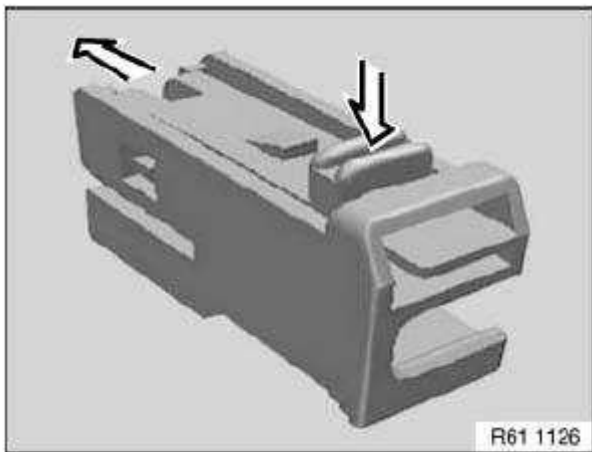


Fig. 33: Pressing Lock (3 Of 6)

Courtesy of BMW OF NORTH AMERICA, INC.

Press lock and disconnect plug connection in direction of arrow.

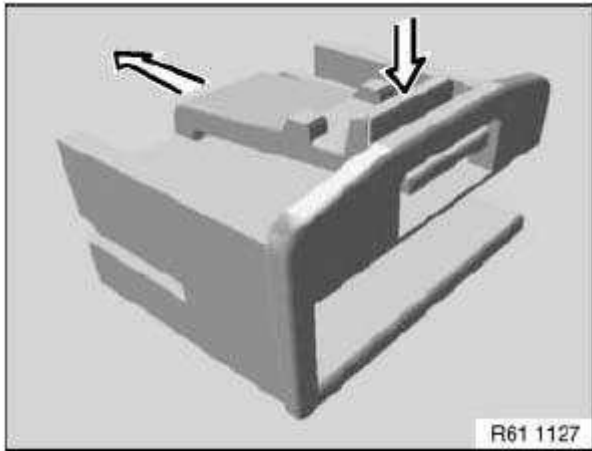


Fig. 34: Pressing Lock (4 Of 6)

Courtesy of BMW OF NORTH AMERICA, INC.

Press lock and disconnect plug connection in direction of arrow.

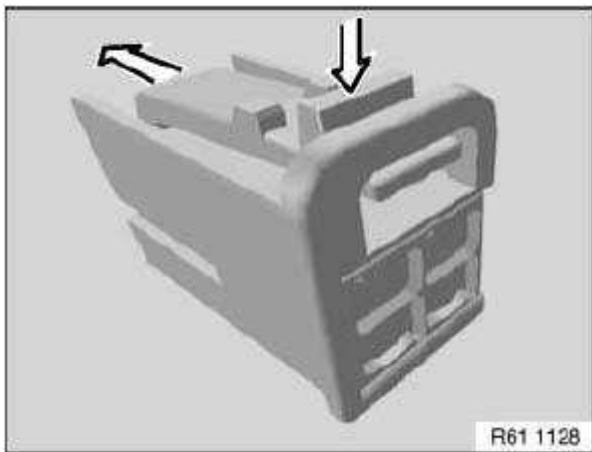


Fig. 35: Pressing Lock (5 Of 6)

Courtesy of BMW OF NORTH AMERICA, INC.

Press lock and disconnect plug connection in direction of arrow.

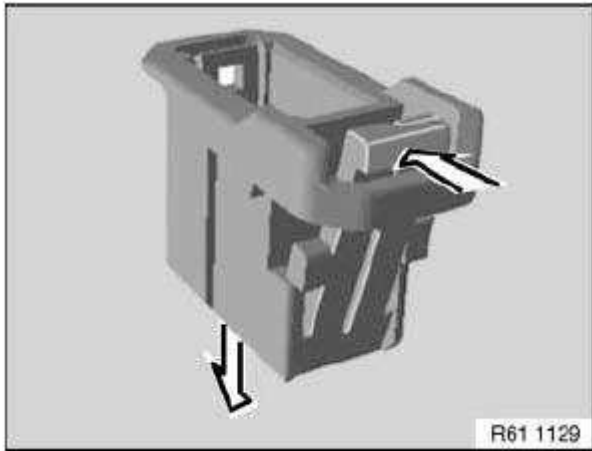


Fig. 36: Pressing Lock (6 Of 6)

Courtesy of BMW OF NORTH AMERICA, INC.

13 CONNECTORS, TERMINALS, FUSE BOX

61 00 ... REPAIRING AIRBAG CABLES

IMPORTANT: Only repair those cables which show visible signs of damage. In the event of visible damage, make sure there is only one cable repair in effect after the repair work. If no visible damage can be identified, the entire cable must be replaced. When carrying out repairs to the airbag wiring harness, you must use the spare parts offered in the Electronic Parts Catalogue (EPC).

Safety regulations:

Safety regulations for handling components of airbag system, see **72 00 ... SAFETY REGULATIONS FOR HANDLING COMPONENTS WITH GAS GENERATORS** .

Instructions for disconnecting and connecting battery, see **12 00 ... Instructions for disconnecting and connecting battery**

Procedure for cable repair

In event of non-visible damage to wiring harness:

Disconnect plug connection on airbag module or on adapter plug. It is absolutely vital to disconnect the contacts in succession as there is a risk of them being mixed up! Cut through one cable after the other at an appropriate position, do not under any circumstances cut through both cables at the same time. Insulate cables remaining in wiring harness with insulating tape. Now disconnect plug connection on airbag control unit. Unpin contacts. Cut through one cable after the other at an appropriate position and insulate with insulating tape, do not under any circumstances cut through both cables at the same time. Pin contacts of repair cable for airbag control unit in control unit plug, assignment of repair cables is relevant. Lay repair cable in car parallel to existing airbag lead. Now pin in contacts for airbag control unit or contacts of adapter plug, assignment of repair cables is relevant.

Cut off excess length of repair cable in proximity (visible area) of airbag module or of adapter plug. Twist open cables. With the connectors and shrink-fit hoses in the Electronic Parts Catalogue (EPC), reconnect the cables with the same cable colors. Twist cables again, open length (twist) must not exceed 40 mm. Secure interface (shrink-fit hoses) with insulating tape to prevent cables from twisting open.

Instructions for cutting off, insulating, crimping cables, installing and removing contacts:

Cutting off and insulating cables, see **61 13 Cutting to length and stripping insulation from cables**

Repairing a plug connection using connectors, see **61 13 Butt connector for repairing a plug connection**

Installing and removing contacts, see **61 13 Opening plug housings and removing contacts of different plug systems**

In event of visible damage:

Expose cable at damaged areas. Cut through one cable after the other at an appropriate position and insulate cables no longer required in wiring harness with insulating tape, do not under any circumstances cut through both cables at the same time. Now, depending on the scope of work, unpin contacts either on airbag control unit/airbag module or on adapter plug. Cut off unpinned cables. Insulate cables remaining in wiring harness with insulating tape. Now pin in contacts of repair cable, assignment of repair cables is relevant. Lay repair lead in car parallel to existing airbag lead up to cutting point. Cut off excess length of repair lead. Twist open cables. Connect cables with connectors and shrink-fit hoses in Electronic Parts Catalogue (EPC), assignment of repair cables is relevant. Twist cables again, open length (twist) must not exceed 40 mm. Secure interface (shrink-fit hoses) with insulating tape to prevent cables from twisting open.

Instructions for cutting off, insulating, crimping cables, installing and removing contacts:

Cutting off and insulating cables, see **61 13 Cutting to length and stripping insulation from cables**

Repairing a plug connection using connectors, see **61 13 Butt connector for repairing a plug connection**

Installing and removing contacts, see **61 13 Opening plug housings and removing contacts of different plug systems**

61 13 BUTT CONNECTOR FOR REPAIRING A PLUG CONNECTION

Special tools required:

- **61 0 300 RELEASING TOOL (COMPLETE KIT)**
- **61 9 040 SET OF TOOLS FOR REPAIR KIT IV**

- IMPORTANT:**
1. **Identify cause of damage (e.g. sharp-edged body parts, faulty electrical loads, jammed mechanisms, corrosion caused by ingress of water, etc.).**
 2. **Read out fault memory**
 3. **Eliminate cause of damage.**

4. Disconnect battery negative terminal
5. Make sure that no safety-related system according to connection scheme (e.g. anti-lock braking system, active rear-axe kinematics, airbags, etc.) are influenced. Otherwise replace faulty wiring harness or use repair cable (sourcing reference: BMW Parts Service)
6. Carry out function test and read out fault memories again
7. Eliminate new faults if applicable and clear fault memories

NOTE: The repair range IV for vehicle electrical system contained the required special tools and individual parts for retrofitting and repair work with the aid of fan connectors.

The case can no longer be ordered. Order individual parts for wiring harness repair through BMW Parts Service.

Special tools:

- Special tool 61 9 040

Choose repair kit.

Example: Repair kit, circular plug system D 2.5.

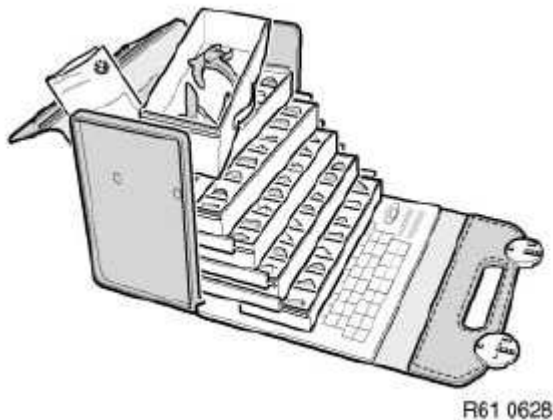


Fig. 37: Identifying Special Tool Kit
Courtesy of BMW OF NORTH AMERICA, INC.

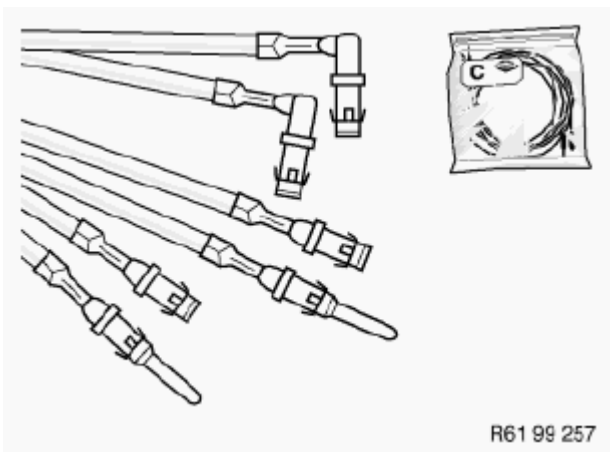


Fig. 38: Identifying Circular Plug System D 2.5
Courtesy of BMW OF NORTH AMERICA, INC.

Remove following parts:

1. Prepackaged end of cable with requisite wire cross-section
2. Crimp connector for selected wire cross-section
3. Shrink-fit hose

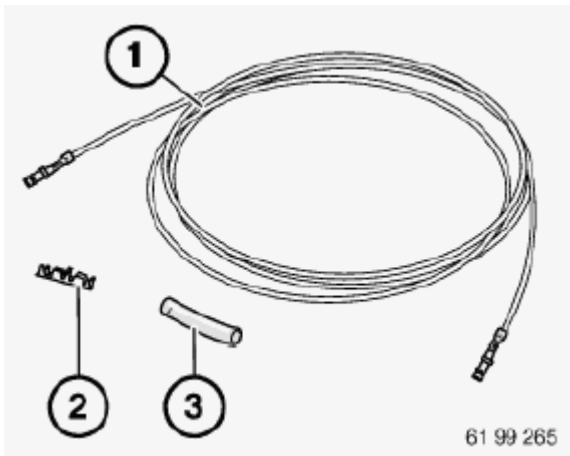


Fig. 39: Identifying Crimp Connector And Shrink-Fit Hose
Courtesy of BMW OF NORTH AMERICA, INC.

Open secondary lock on housing.

Mark damaged contact (4) with socket number of housing and press it out of housing using relevant special tool contained in special tool kit 61 0 300 .

Refer to repair instructions:

Opening plug housings and removing contacts of different plug systems, see **61 13 Opening plug housings and removing contacts of different plug systems**

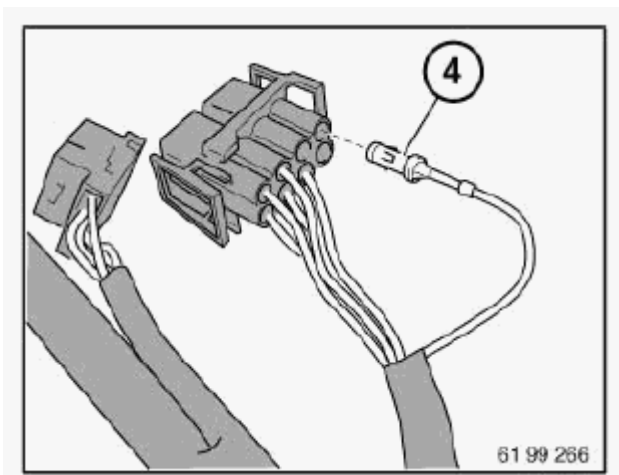


Fig. 40: Identifying Damaged Contact Mark With Socket Number
Courtesy of BMW OF NORTH AMERICA, INC.

- IMPORTANT:**
- Check maximum length of repair cable!
 - If more than one wire is to be repaired, the individual interfaces must be offset so that the wiring harness is not too thick at the repaired point.

Observe following procedure:

- Cut off wire with faulty contact at point which is easily accessible.
- Strip wiring-harness wire end (6).
- Cut preassembled wire end (7) to length and strip insulation.

Refer also to repair instruction:

Cutting to length and stripping insulation from cables, see **61 13 Cutting to length and stripping insulation from cables**

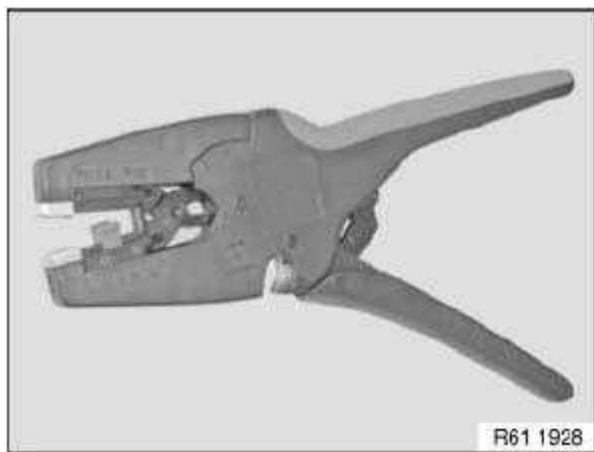


Fig. 41: Identifying Cutting Plier

Courtesy of BMW OF NORTH AMERICA, INC.

Crimp butt connector on preassembled wire end.

Refer to repair instructions:

Crimping on stop parts, see **61 13 Crimping stop parts**

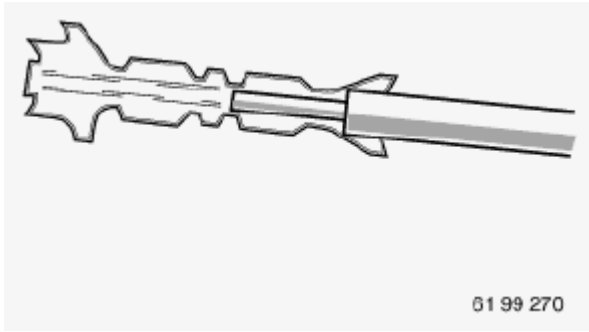


Fig. 42: Identifying Crimp Butt Connector On Preassembled Wire End
Courtesy of BMW OF NORTH AMERICA, INC.

Push shrink-fit hose (8) onto free wire end.

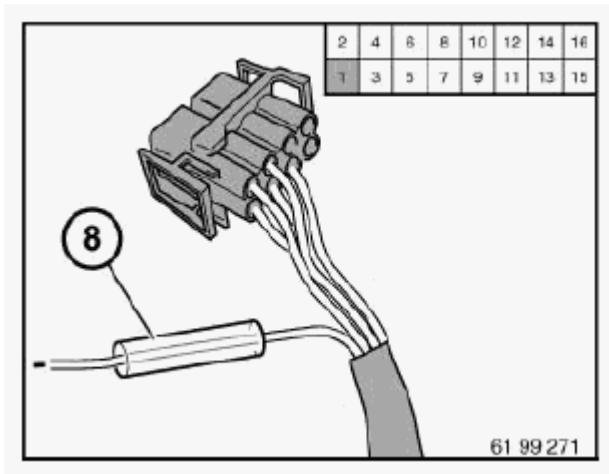


Fig. 43: Identifying Shrink-Fit Hose
Courtesy of BMW OF NORTH AMERICA, INC.

Crimp unused wire end to butt connector.

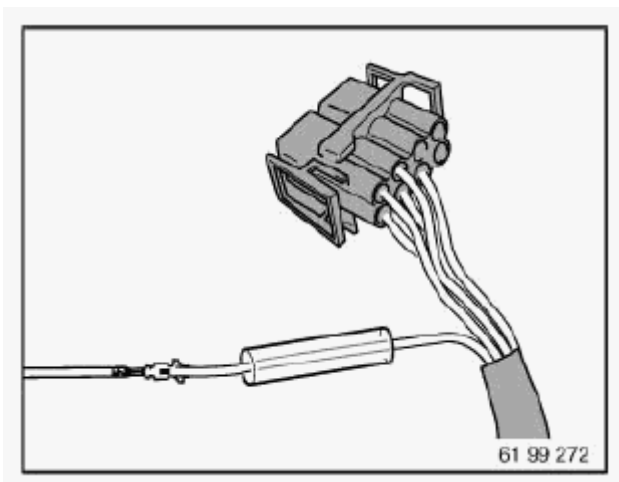


Fig. 44: Crimping Unused Wire End To Butt Connector
Courtesy of BMW OF NORTH AMERICA, INC.

Pull shrink-on sleeve over butt connector.

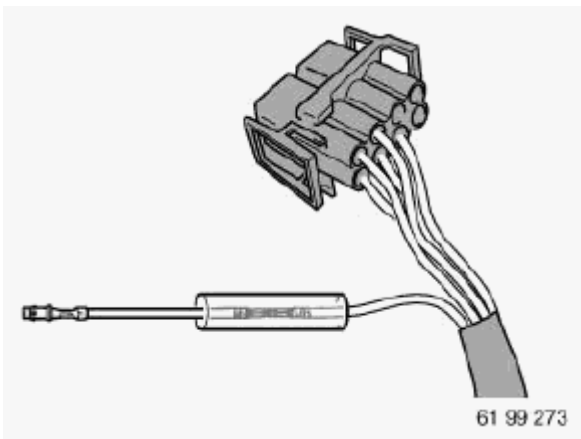


Fig. 45: Identifying Shrink-On Sleeve Over Butt Connector
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not burn shrink-on sleeve.

With hot air blower, shrink the shrink-on sleeve on both sides (9) of shrink-fit hose until glue emerges uniformly all round.

Insert contact in housing.

Close secondary lock on housing.

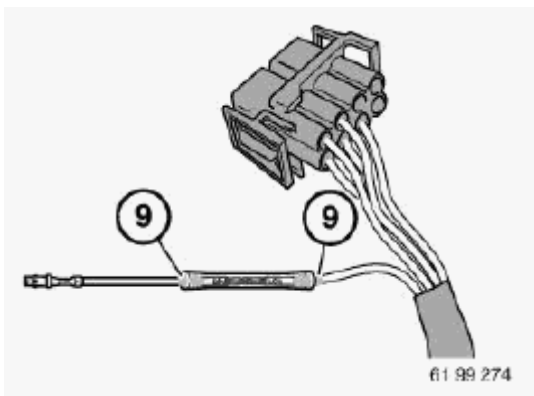


Fig. 46: Identifying Shrink-On Sleeve
Courtesy of BMW OF NORTH AMERICA, INC.

61 13 CRIMPING STOP PARTS

Special tools required:

- 12 1 080
- 12 1 081
- 12 1 083

Spare parts for in-car electronics (housing and contacts):

1. **Crimping butt connectors and contact sleeves for fan connectors up to 2.5 mm²**
2. **Crimping butt connectors and contact sleeves for fan connectors from 2.5 mm²**
3. **Crimping contact sleeves for fan connectors 4 mm² and ignition cable contacts**

Special tool kit 12 1 080 is used to fit ignition cable contacts to crimp 4 mm² contact sleeves for fan connectors.

- 12 1 081 (hand crimping tool)
- 12 1 083 (matrix)

Special tools for wiring harness repairs, see **61 13 Special tools for wiring harness repairs**

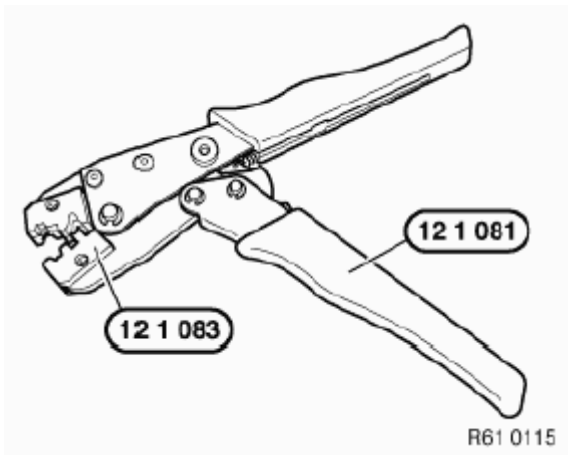


Fig. 47: Identifying Special Tool (12 1 083) And (12 1 081)
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock special tool 12 1 081 :

Squeeze grips (1) lightly and push unlocking lever (2) in direction of arrow.

Or:

Compress handles as far as they will go, tool unlocks automatically.

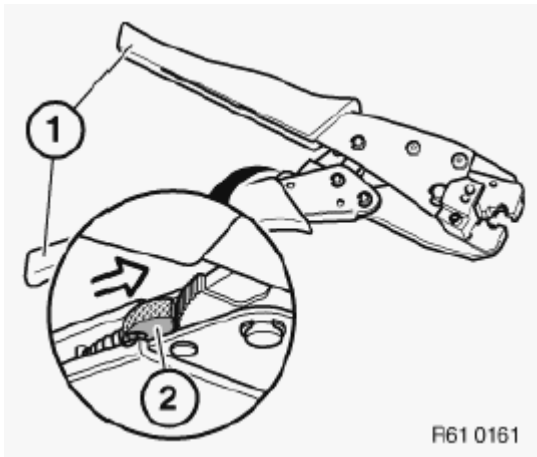


Fig. 48: Identifying Grips And Lever
Courtesy of BMW OF NORTH AMERICA, INC.

Insert contact sleeve 4 mm² in nest with lock (1) as far as it will go.

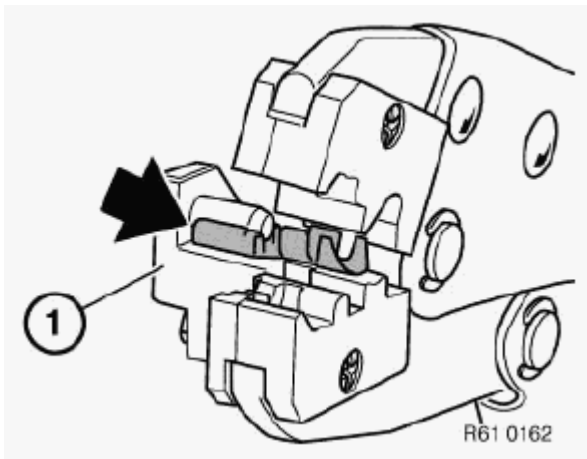


Fig. 49: Locating Lock
Courtesy of BMW OF NORTH AMERICA, INC.

Preload contact by squeezing matrix in crimping tool. Grip contact (1) firmly only, do not crimp.

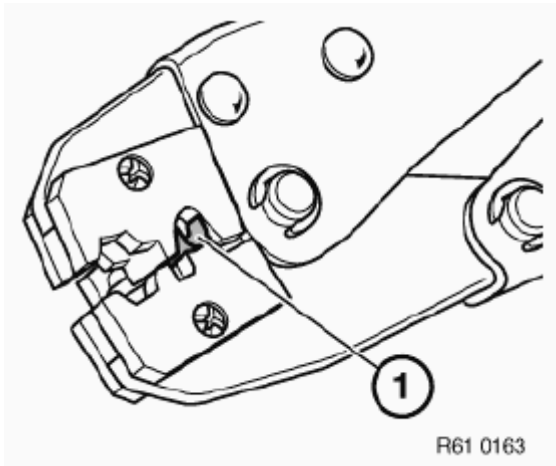


Fig. 50: Locating Grip Contact
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Follow procedure for cutting and stripping insulation from cables, see 61 13 Cutting to length and stripping insulation from cables

Insert stripped end of wire (7) in the contact. Ensure insulation and stripped wire end are correctly laid in contact.

Compress crimping tool as far as it will go.

Crimping tool unlocks automatically.

Take contact out of crimping tool.

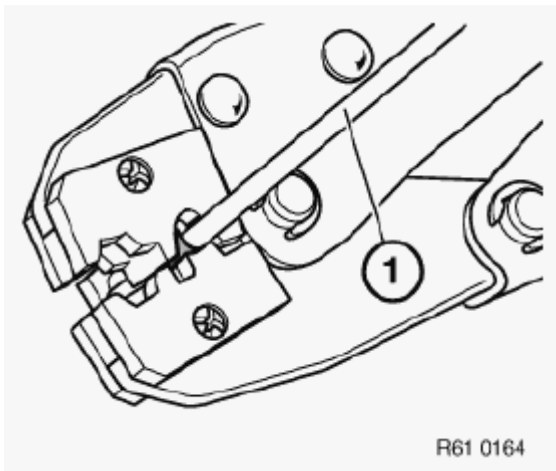


Fig. 51: Identifying Wire And Crimping Tool
 Courtesy of BMW OF NORTH AMERICA, INC.

4. Checking crimping

Check insulation crimp (8) and wire crimp (9) against following illustrations to ensure crimps are correctly located.

NOTE: Illustration shows butt connectors and contact sleeves for fan connectors knocked on one side. The crimping procedure is identical here.

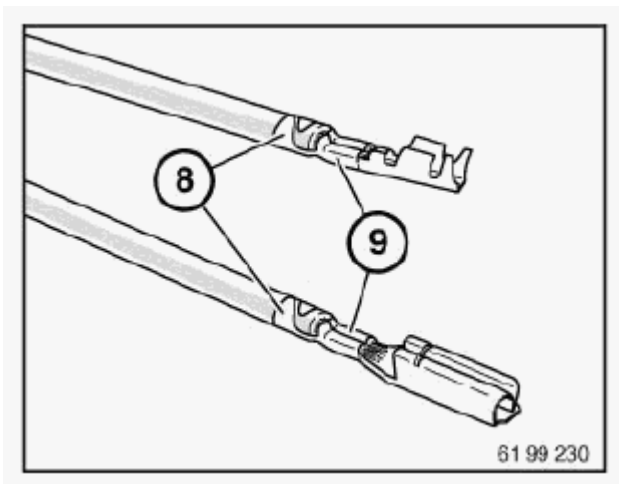


Fig. 52: Identifying Insulation Crimp And Wire Crimp
 Courtesy of BMW OF NORTH AMERICA, INC.

Correct crimping:

Visible conductor end (10).

Visible insulation end (11).

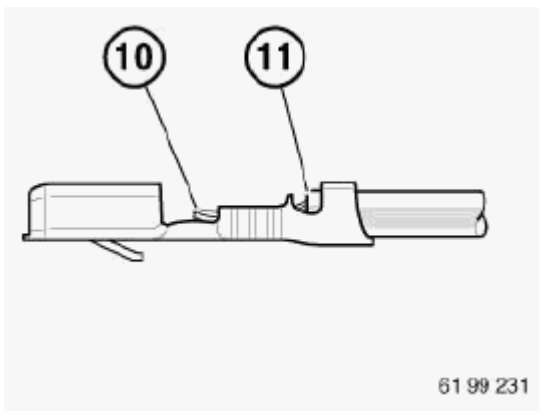


Fig. 53: Identifying Conductor End And Insulation End (Correct Crimping)
Courtesy of BMW OF NORTH AMERICA, INC.

Incorrect crimping:

Conductor end (10) inserted too far.

Insulation end (11) in wire crimp.

If necessary, repeat crimping with a new contact.

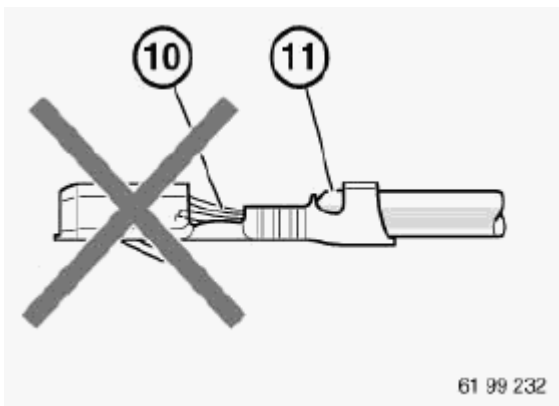


Fig. 54: Identifying Conductor End And Insulation End (Incorrect Crimping) (1 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

Incorrect crimping:

Conductor end (10) not visible.

Insulation end (11) not visible.

If necessary, repeat crimping with a new contact.

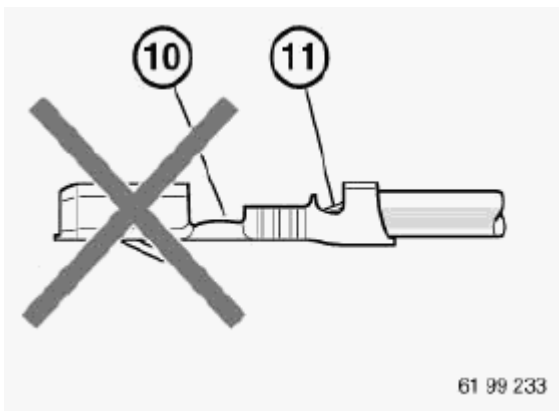


Fig. 55: Identifying Conductor End And Insulation End (Incorrect Crimping) (2 Of 2)
 Courtesy of BMW OF NORTH AMERICA, INC.

61 13 CUTTING TO LENGTH AND STRIPPING INSULATION FROM CABLES

Stripped length:

STRIPPED LENGTH SPECIFICATION

Wire cross-section (mm ²)	Stripped length (mm)
0.35 ... 0.50	4.0
0.75 ... 1.00	4.5
1.00 ... 2.50	5.0

61 13 ... DME MASTER RELAY CONNECTOR

Unlock locking flap (1) of corresponding cable.

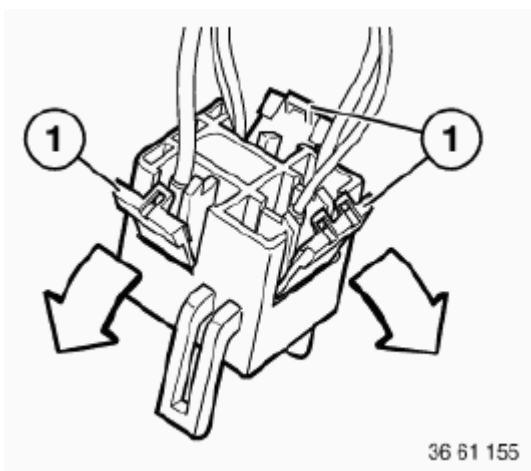


Fig. 56: Unlocking Locking Flap
 Courtesy of BMW OF NORTH AMERICA, INC.

With special tool 61 1 136 or 61 1 137 (ejector), press back arrester hook (2) of appropriate contact and pull out cable.

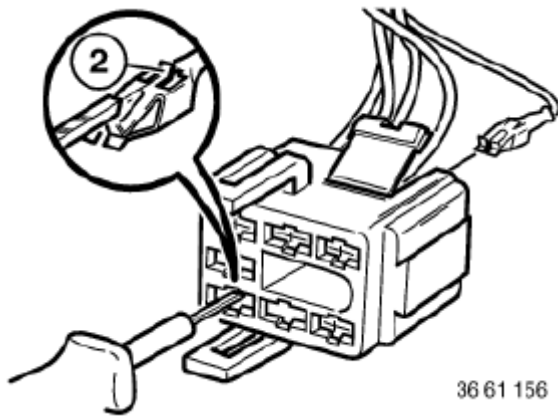


Fig. 57: Identifying Arrester Hook
Courtesy of BMW OF NORTH AMERICA, INC.

61 13 INSTALLING FAN CONNECTOR FOR RETROFITTING/REPAIRS

Special tools required:

- **61 9 040 SET OF TOOLS FOR REPAIR KIT IV**
- 61 9 041 **61 9 040 SET OF TOOLS FOR REPAIR KIT IV**
- 61 9 042 **61 9 040 SET OF TOOLS FOR REPAIR KIT IV**

NOTE: The repair range IV for vehicle electrical system contained the required special tools and individual parts for retrofitting and repair work with the aid of fan connectors.

Special tools:

- special tool 61 9 040

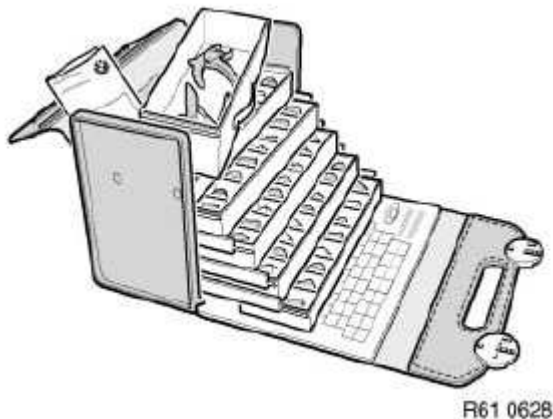


Fig. 58: Identifying Special Tool Kit
Courtesy of BMW OF NORTH AMERICA, INC.

Choose contact sleeve (up to 4 mm²) in accordance with wire cross-section.

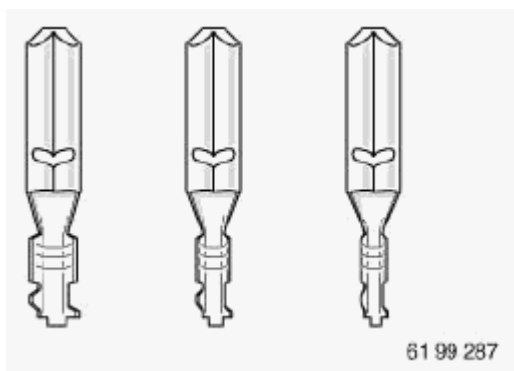


Fig. 59: Identifying Contact Sleeve
Courtesy of BMW OF NORTH AMERICA, INC.

Alternatively:

Choose contact sleeves (up to 2.5 mm²) for fan connectors.

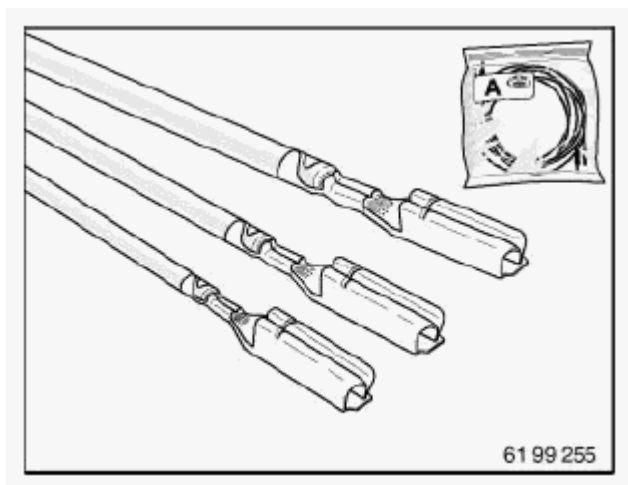


Fig. 60: Identifying Contact Sleeves
Courtesy of BMW OF NORTH AMERICA, INC.

Cut through wire loop in wiring harness at established point.

Strip insulation from both wire ends.

Refer to repair instructions:

Cutting to length and stripping insulation from cables, see **61 13 Cutting to length and stripping insulation from cables**

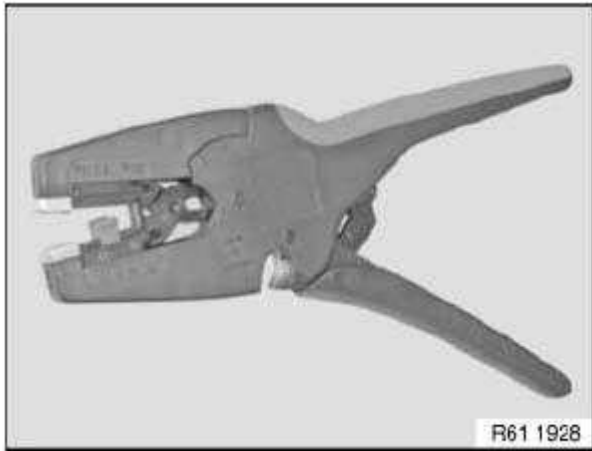


Fig. 61: Identifying Cutting Plier

Courtesy of BMW OF NORTH AMERICA, INC.

Crimp contact sleeves on both wire ends.

Refer to repair instructions:

Crimping on stop parts, see **61 13 Crimping stop parts**

NOTE: If using repair kit for contact sleeves, refer to repair instruction **Butt connector for repairing a plug connection**, see **61 13 Butt connector for repairing a plug connection**

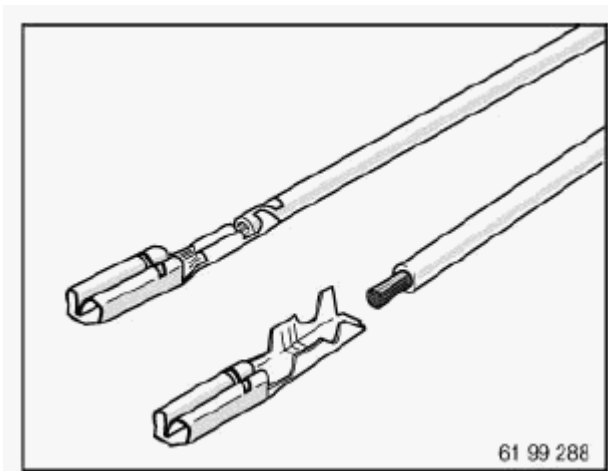


Fig. 62: Identifying Crimp Contact Sleeves On Wire Ends

Courtesy of BMW OF NORTH AMERICA, INC.

Crimp connecting cable for retrofitting likewise with contact sleeve.

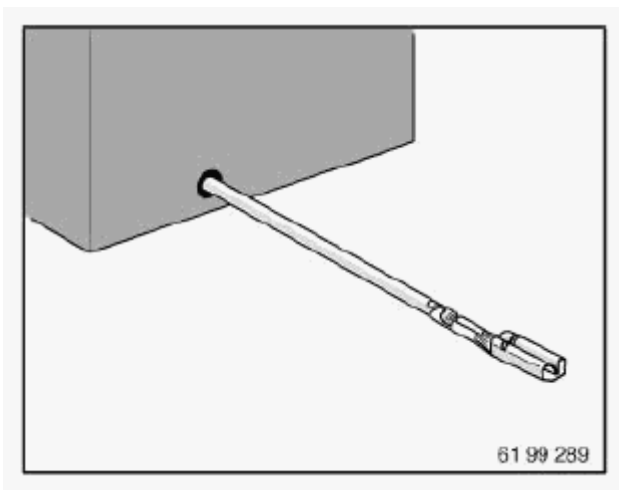


Fig. 63: Crimping Connecting Cable
Courtesy of BMW OF NORTH AMERICA, INC.

Cut required number of poles to length for fan connectors.

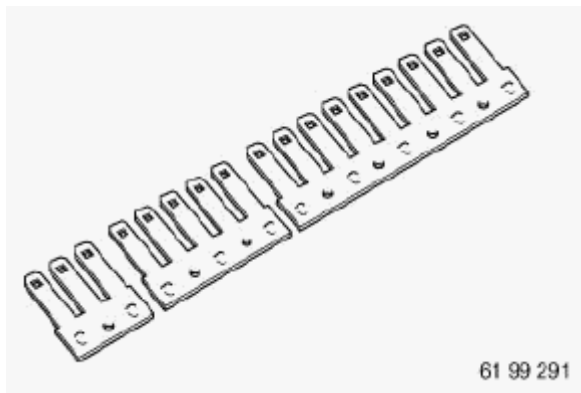


Fig. 64: Identifying Fan Connectors Poles
Courtesy of BMW OF NORTH AMERICA, INC.

Special tool 61 9 041 (hand crimping tool) in conjunction with 61 9 042 (matrix) are used for pushing contact sleeves onto fan connectors.

Refer to repair instructions:

Special tools for wiring harness repairs, see **61 13 Special tools for wiring harness repairs**

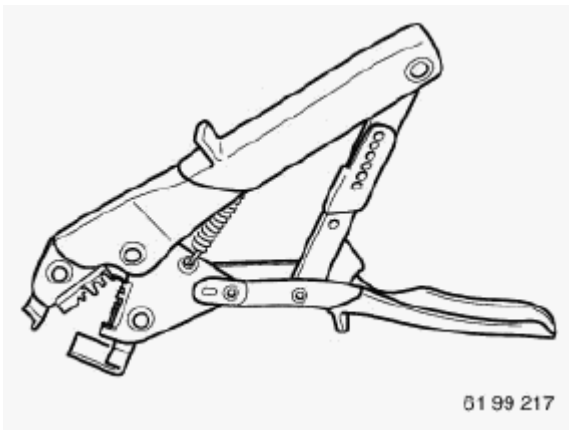


Fig. 65: Identifying Special Tools
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock special tool 61 9 041 :

Squeeze grips (1) lightly and push unlocking lever (2) in direction of arrow.

Or:

Compress handles as far as they will go, tool unlocks automatically.

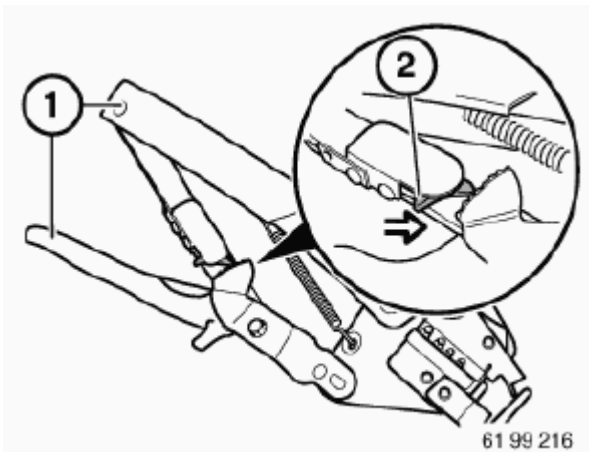


Fig. 66: Identifying Grips And Unlocking Lever
Courtesy of BMW OF NORTH AMERICA, INC.

Insert prepared fan connector (3) in special tool 61 9 041 / 61 9 042 .

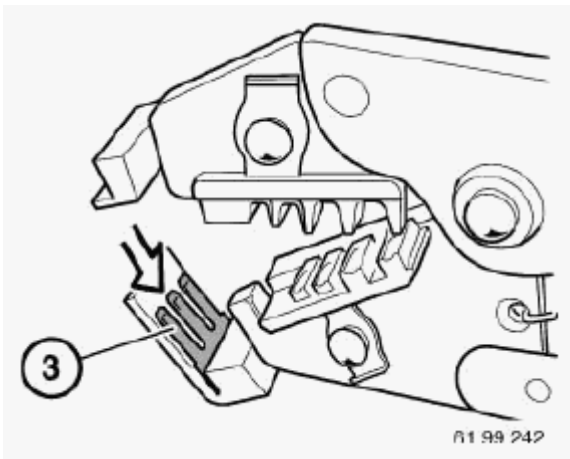


Fig. 67: Inserting Fan Connector
Courtesy of BMW OF NORTH AMERICA, INC.

Attach wire with contact sleeve to fan connector.

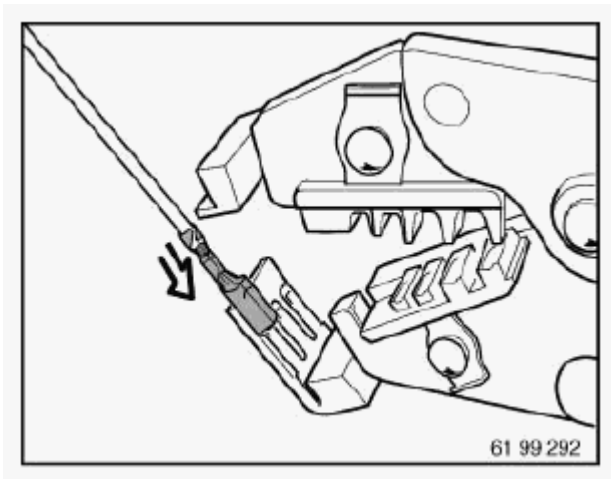


Fig. 68: Attaching Wire With Contact Sleeve To Fan Connector
Courtesy of BMW OF NORTH AMERICA, INC.

Press crimping tool together and slide contact sleeve firmly home.

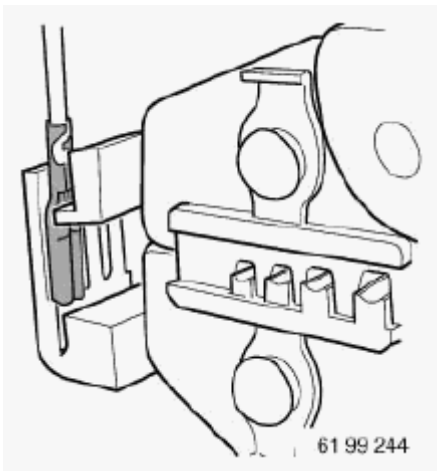


Fig. 69: Identifying Slide Contact Sleeve

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Once contact sleeves have been pushed on, they should not be detached again from the fan connector or reused.

Push on further contact sleeves for potential branching.

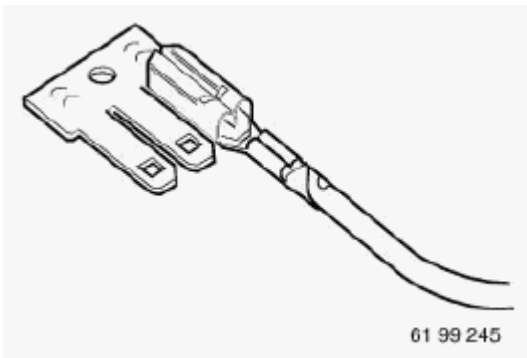


Fig. 70: Identifying Contact Sleeves

Courtesy of BMW OF NORTH AMERICA, INC.

Installation in wet area (engine compartment, wheel arch):

Apply sealing compound on both sides and press into contacts (1).

Fit shrink-fit hose and heat up with hot air blower (2) (approx. 250°C).

NOTE: Ensure that fan connector has sufficient contact surface on mounting point.

Do not heat shrink-fit hose on edges of fan connector too strongly, risk of cracking.

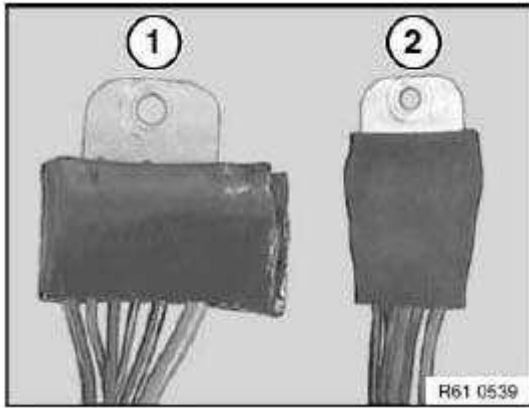


Fig. 71: Identifying Sealing Compound
Courtesy of BMW OF NORTH AMERICA, INC.

Allow shrink-fit hose to cool down until hand-warm. Then press sealing material again into contacts and onto edges of fan connector.

If necessary, carefully heat shrink-fit hose again.

Installation in dry area (interior, luggage compartment):

Slide assembled fan connector into insulation housing until it locks into place.

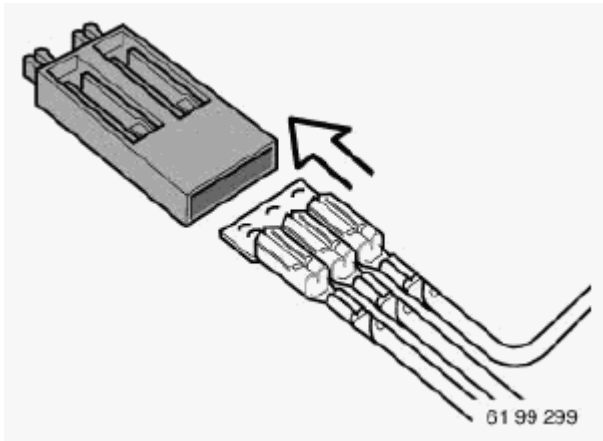


Fig. 72: Sliding Fan Connector Into Insulation Housing
Courtesy of BMW OF NORTH AMERICA, INC.

61 13 OPENING PLUG HOUSINGS AND REMOVING CONTACTS OF DIFFERENT PLUG SYSTEMS

Special tools required:

- **61 0 300 RELEASING TOOL (COMPLETE KIT)**
- 61 0 400

- **61 1 150 RELEASING TOOL KIT**

Abbreviations and what they mean:

ABBREVIATIONS REFERENCE CHART

D 1.5 / 2.5	Round contacts of 1.5 mm or 2.5 mm diameter
MDK 3plus	Miniature double flat spring contact
JPT ELA	Junior Power Timer flat spring contacts with strand sealing
DFK ELA	Double flat spring contacts with strand sealing
Elo	Electronic contacts with and without strand sealing Manufacturer: Siemens
Elo Power	Electronic contacts for heavy loads with and without strand sealing Manufacturer: Siemens
MQS	Micro Quadlock System electronic contacts with and without strand sealing Manufacturer: AMP
MPQ	Micro Power Quadlock electronic contacts for heavy loads with and without strand sealing Manufacturer: AMP

Ultrasonic-welded connectors:

Ultrasonic-welded connectors (1) can be identified by the welds (2) on their longitudinal side.

The contacts of these connectors cannot be replaced. Replace plug completely.

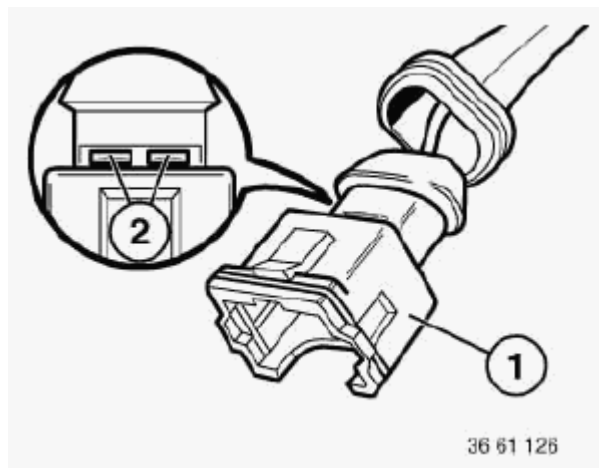


Fig. 73: Identifying Ultrasonic-Welded Connectors
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Special tools referred to in the repair instructions below are contained in the following special tool kits:

Release and press-out tool 61 1 150

Replaced as from 09/2005 by: 61 0 300

61 0 400

61 13 SPECIAL TOOLS FOR WIRING HARNESS REPAIRS

Special tools required:

- 12 1 080
- **61 0 200 CRIMPING SET (BASIC TOOL)**
- **61 0 210 MATRIX LSK 8**
- **61 0 220 MATRIX FOR SLK 2.8**
- **61 0 230 STENCIL FOR CONTACTS "DFK 40" AND "MAK 8"**
- **61 0 300 RELEASING TOOL (COMPLETE KIT)**
- 61 0 400
- **61 1 190 PLIERS**
- **61 4 320 CRIMPING SET WITH PLIERS**
- 61 9 041 **61 9 040 SET OF TOOLS FOR REPAIR KIT IV**
- 61 9 044 **61 9 040 SET OF TOOLS FOR REPAIR KIT IV**

Repair range, vehicle electrical system:

- Refer to Service Information:

SI 2 04 07 341

Release and press-out tool:

- Special tool 61 0 300
- Special tool 61 0 400 (MINI N12/N14)

Handling:

- Opening plug housings and removing contacts of different plug systems, see **61 13 Opening plug housings and removing contacts of different plug systems**



Fig. 74: Identifying Special Tool

Courtesy of BMW OF NORTH AMERICA, INC.

Cutting to length and stripping insulation from cables:

Handling:

- Cutting to length and stripping insulation from cables, see **61 13 Cutting to length and stripping insulation from cables**

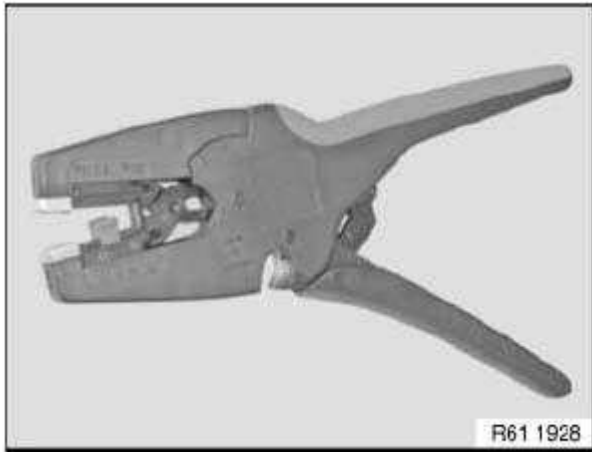


Fig. 75: Identifying Cutting Plier

Courtesy of BMW OF NORTH AMERICA, INC.

Crimping stop parts (small contacts):

- Special tool 61 4 320
 1. Tool without crimping head
 2. Crimping head, see **61 13 ... Cutting off, stripping insulation and cutting optical fibres to length**
 3. Crimping head, see **61 13 ... Crimping optical fibres**

4. Crimping head **61 13 ... Crimping Micro Quadlock System contacts (MQS)**
5. Crimping head, see **61 13 ... Crimping Micro Power Quadlock contacts (MPQ)**
6. Replacement blade (face-cutting fibre-optic cables)
7. Replacement blade with tool (insulation stripping unit)
8. Universal crimping head

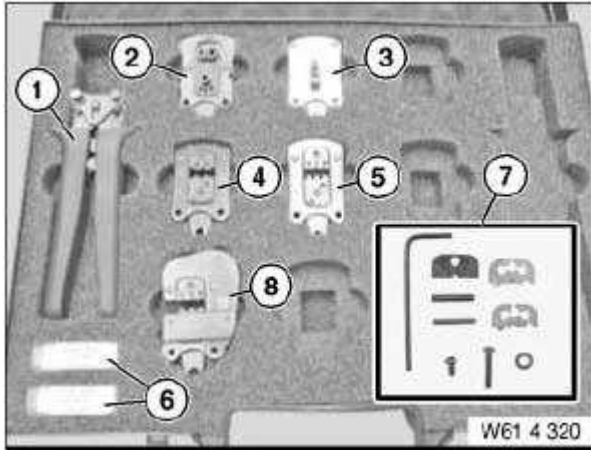


Fig. 76: Identifying Crimping Stop Parts (Small Contacts)
 Courtesy of BMW OF NORTH AMERICA, INC.

Crimping stop parts (large contacts):

- Special tool 61 0 200 (crimping set)
- Special tool 61 0 210 (matrix set LSK 8)
- Special tool 61 0 220 (matrix set SLK 2.8)
- Special tool 61 0 230 (matrix set MAK 8 / DFK4)

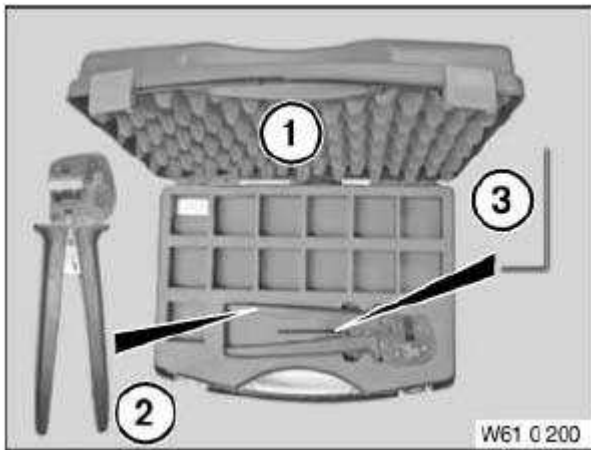


Fig. 77: Identifying Crimping Stop Parts (Large Contacts)
 Courtesy of BMW OF NORTH AMERICA, INC.

Crimping antenna elbow plugs:

- Special tool 61 9 041 (hand crimping tool)
- Special tool 61 9 044 (matrix)

Handling:

- Antenna elbow plug on radio receiver

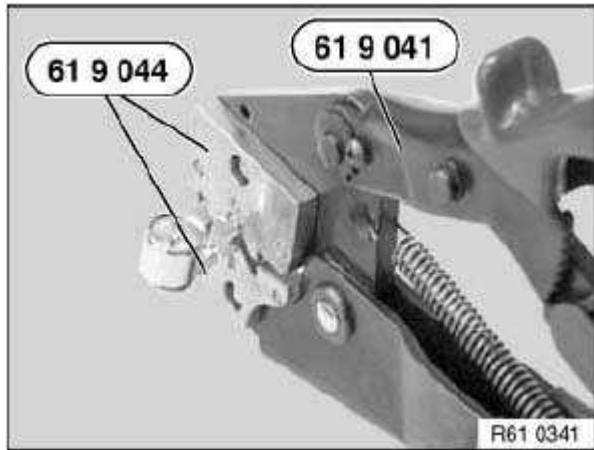


Fig. 78: Identifying Special Tool (61 9 044) And (61 9 041)
Courtesy of BMW OF NORTH AMERICA, INC.

Repair kit for ignition cables and for crimping fan connector receptacles **4 mm²** :

- Special tool 12 1 080

Handling:

- Crimping stop parts (contacts), see **61 13 Crimping stop parts**



W12 1 080

Fig. 79: Identifying Special Tool Kit

Courtesy of BMW OF NORTH AMERICA, INC.

Repairing ribbon cables:

- Special tool 61 1 190

Handling:

- Repairing ribbon cables, see **61 13 ... Repairing ribbon cables**

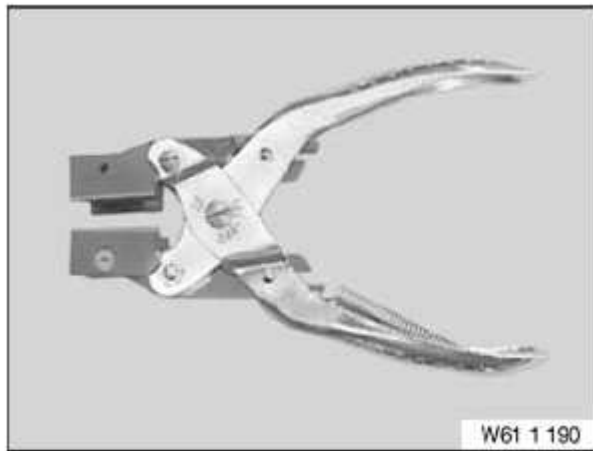


Fig. 80: Identifying Special Tool

Courtesy of BMW OF NORTH AMERICA, INC.

61 13 .. UNLOCKING AND DISCONNECTING DIFFERENT PLUG CONNECTIONS

NOTE: Examples of unlocking and disconnecting different plug connections.

Press lock and open clip in direction of arrow.

Disconnect plug connection.

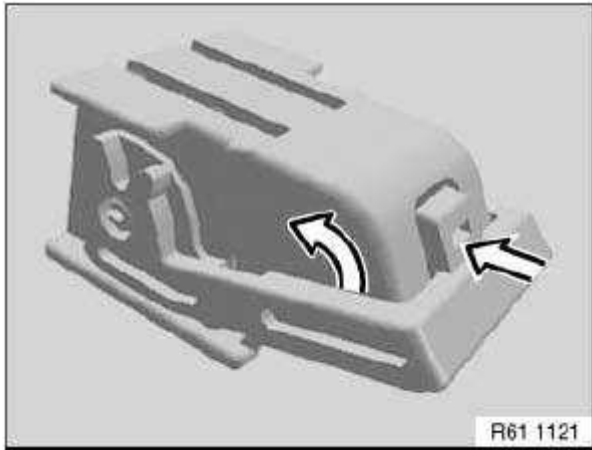


Fig. 81: Disconnecting Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Press lock and open clip in direction of arrow.

Disconnect plug connection.

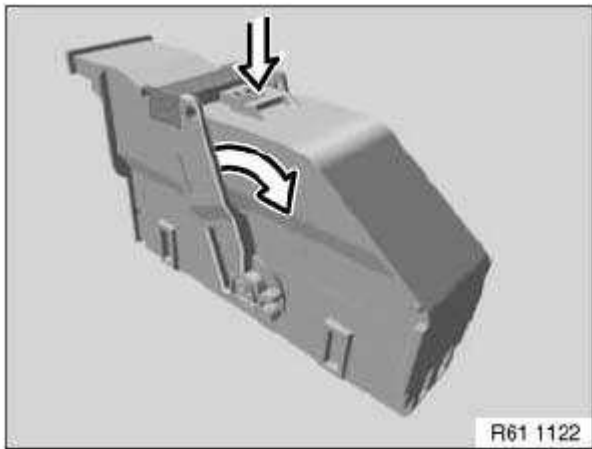


Fig. 82: Pressing Lock
Courtesy of BMW OF NORTH AMERICA, INC.

Open clip in direction of arrow and disconnect plug connection in direction of arrow.

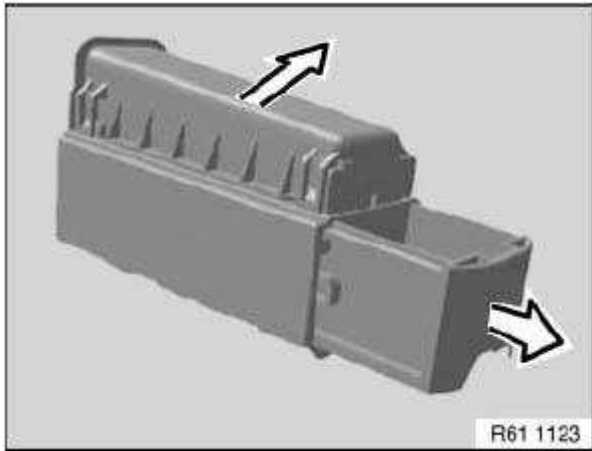


Fig. 83: Disconnecting Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Press lock and disconnect plug connection in direction of arrow.

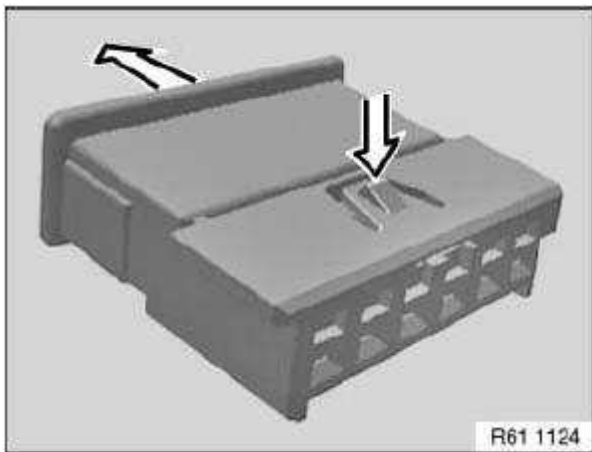


Fig. 84: Pressing Lock (1 Of 6)
Courtesy of BMW OF NORTH AMERICA, INC.

Press lock and disconnect plug connection in direction of arrow.

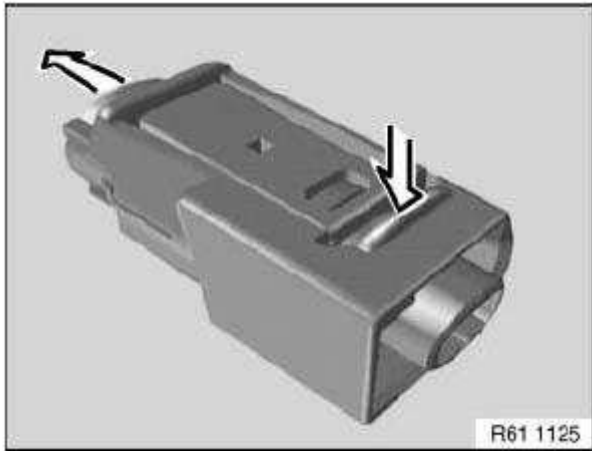


Fig. 85: Pressing Lock (2 Of 6)

Courtesy of BMW OF NORTH AMERICA, INC.

Press lock and disconnect plug connection in direction of arrow.

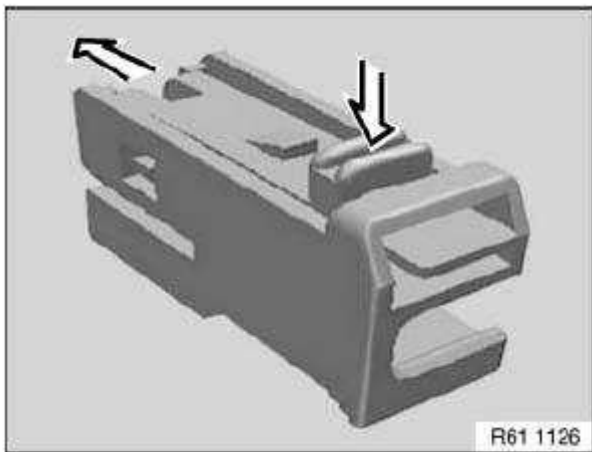


Fig. 86: Pressing Lock (3 Of 6)

Courtesy of BMW OF NORTH AMERICA, INC.

Press lock and disconnect plug connection in direction of arrow.

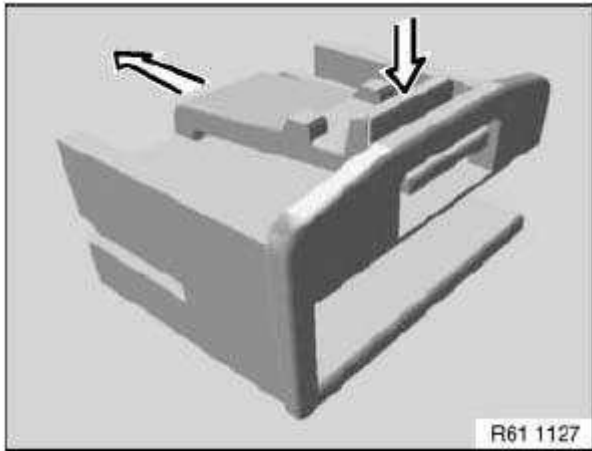


Fig. 87: Pressing Lock (4 Of 6)

Courtesy of BMW OF NORTH AMERICA, INC.

Press lock and disconnect plug connection in direction of arrow.

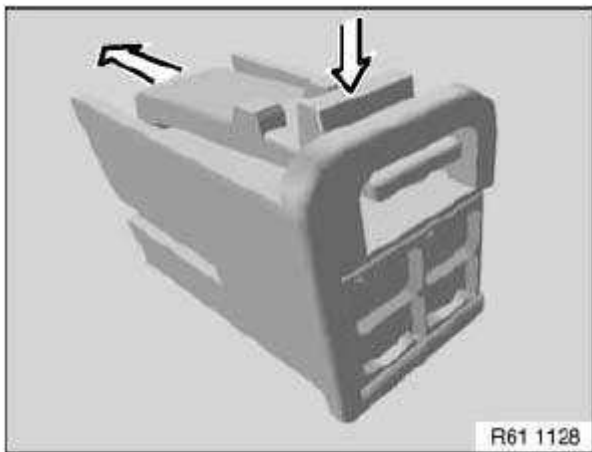


Fig. 88: Pressing Lock (5 Of 6)

Courtesy of BMW OF NORTH AMERICA, INC.

Press lock and disconnect plug connection in direction of arrow.

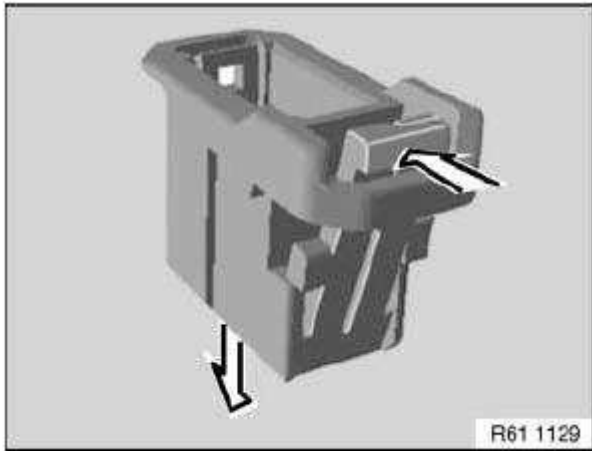


Fig. 89: Pressing Lock (6 Of 6)

Courtesy of BMW OF NORTH AMERICA, INC.

61 13 ... BASE OF TAB CONNECTOR HOUSINGS

Unlock hook (1) with special tool 61 1 360 and slide plug housing downwards out of base.

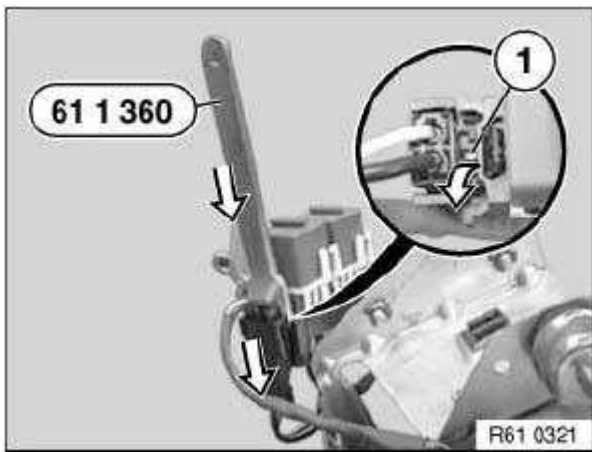


Fig. 90: Identifying Special Tool (61 1 360)

Courtesy of BMW OF NORTH AMERICA, INC.

61 13 ... CRIMPING MICRO POWER QUADLOCK CONTACTS (MPQ)

Special tools required:

- **61 4 320 CRIMPING SET WITH PLIERS**

To crimp MPQ contacts, use pliers 61 4 321 (1) in conjunction with crimping head 61 4 325 (2) from crimping set 61 4 320 .

NOTE: **Pliers (1) open automatically as far as they will go when handles are pressed**

together.

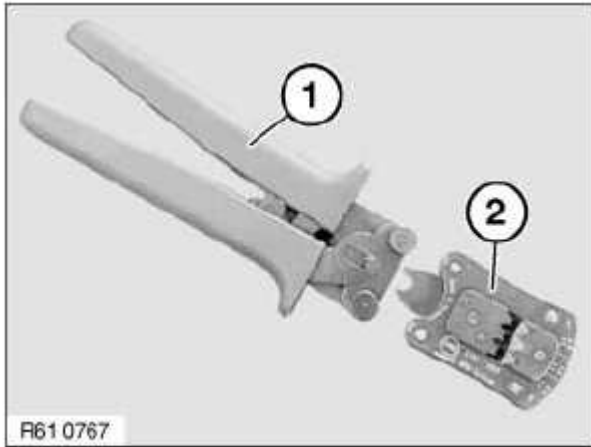


Fig. 91: Identifying Crimping Head And Crimping Set Plier
Courtesy of BMW OF NORTH AMERICA, INC.

Open pliers (1).

NOTE: Place contact (2) with utmost care in designated nest (observe cable cross-section) in crimping head (3). Make sure it is exactly positioned.

Place MPQ contact (2) in crimping head (3).

Close pliers (1) one notch.

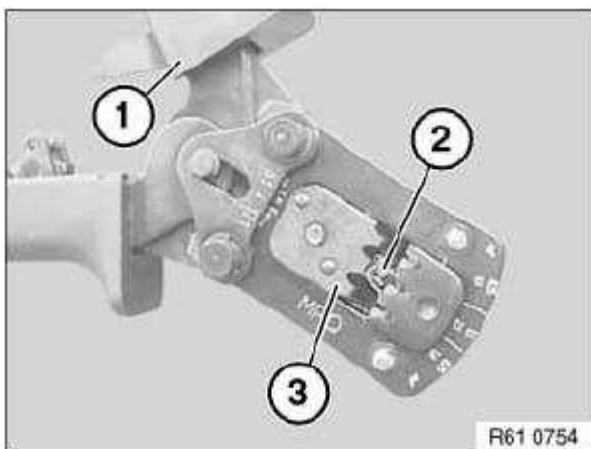


Fig. 92: Identifying MPQ Contact In Crimping Head
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Follow procedure for cutting and stripping insulation from cables, see 61 13 Cutting to length and stripping insulation from cables

Insert stripped cable (2).

Close pliers (1) fully.

Open pliers (1) and remove cable (2).

NOTE: Check contact for correct crimping.

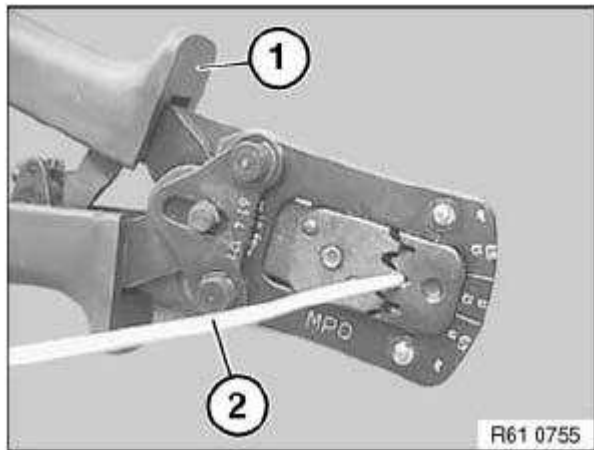


Fig. 93: Identifying Pliers And Stripped Cable
Courtesy of BMW OF NORTH AMERICA, INC.

61 13 ... CRIMPING MICRO QUADLOCK SYSTEM CONTACTS (MQS)

Special tools required:

- **61 4 320 CRIMPING SET WITH PLIERS**

To crimp MQS contacts, use pliers 61 4 321 (1) in conjunction with crimping head 61 4 324 (2) from crimping set 61 4 320 .

NOTE: Pliers (1) open automatically as far as they will go when handles are pressed together.

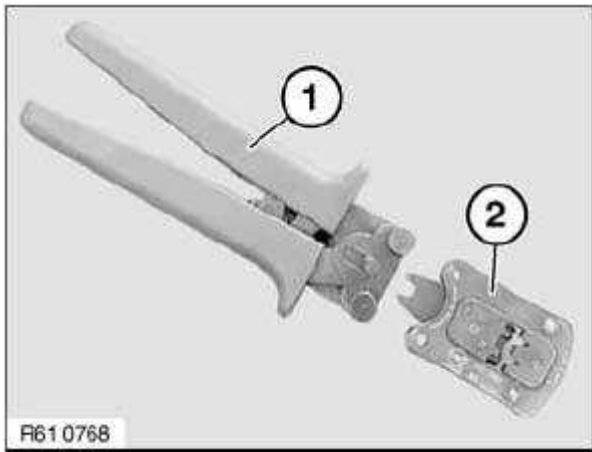


Fig. 94: Identifying Crimping Head And Crimping Set Plier
Courtesy of BMW OF NORTH AMERICA, INC.

Open pliers (1).

Fold up contact carrier (2).

Insert MQS contact (3) in contact carrier (2).

Fold back contact carrier (2).

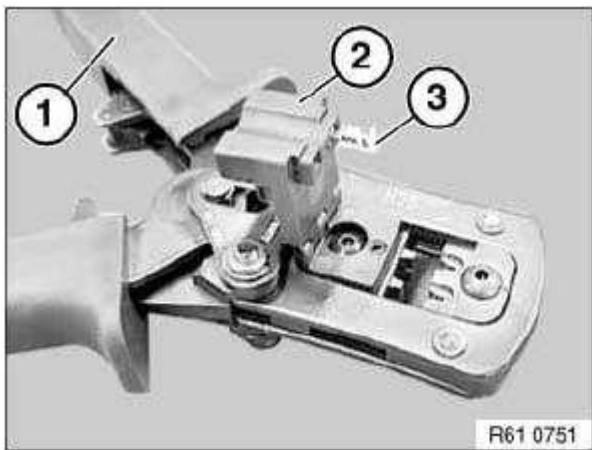


Fig. 95: Identifying MQS Contact
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Follow procedure for cutting and stripping insulation from cables, see 61 13 Cutting to length and stripping insulation from cables

Close pliers (1) one notch.

Insert stripped cable (2).

Close pliers (1) fully.

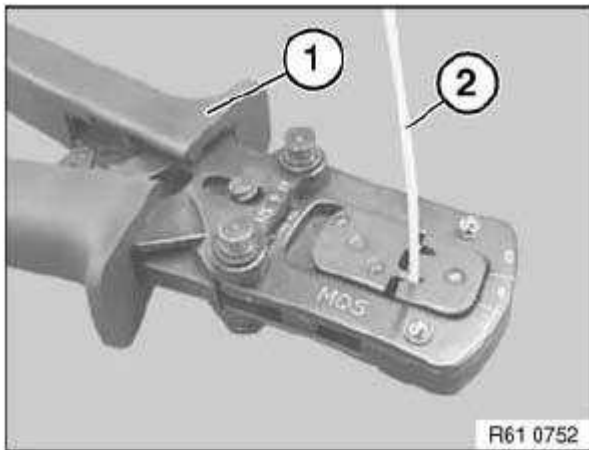


Fig. 96: Identifying Pliers And Cable
Courtesy of BMW OF NORTH AMERICA, INC.

Open pliers (1).

Open contact carrier (2) gently and carefully remove MQS contact.

NOTE: Check contact for correct crimping.

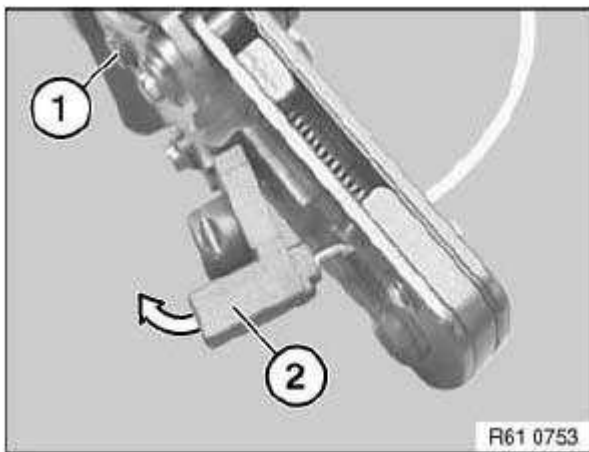


Fig. 97: Opening Contact Carrier
Courtesy of BMW OF NORTH AMERICA, INC.

61 13 ... CRIMPING ANNULAR CONTACTS

Special tools required:

- **61 4 320 CRIMPING SET WITH PLIERS**

Crimping annular contacts:

Special tool 61 4 320

61 13 ... CRIMPING OPTICAL FIBRES

Special tools required:

- **61 4 320 CRIMPING SET WITH PLIERS**

To crimp optical fibres, use pliers 61 4 321 (1) in conjunction with crimping head 61 4 323 (2) from crimping set 61 4 320 .

NOTE: **Pliers (1) open automatically as far as they will go when handles are pressed together.**

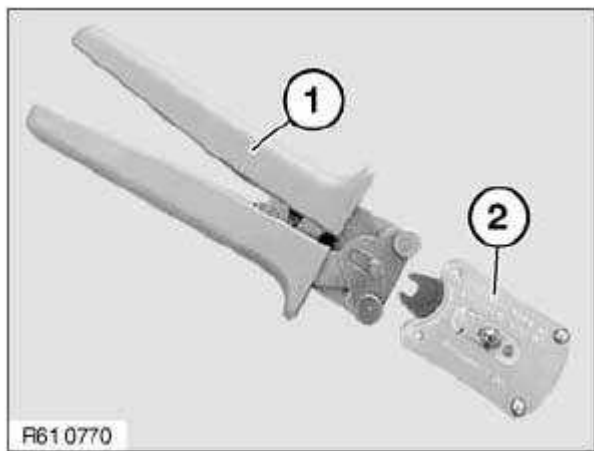


Fig. 98: Identifying Crimping Head Plier
Courtesy of BMW OF NORTH AMERICA, INC.

Move contact guide by means of stop lever (1) into corresponding position (pin contact or jack).

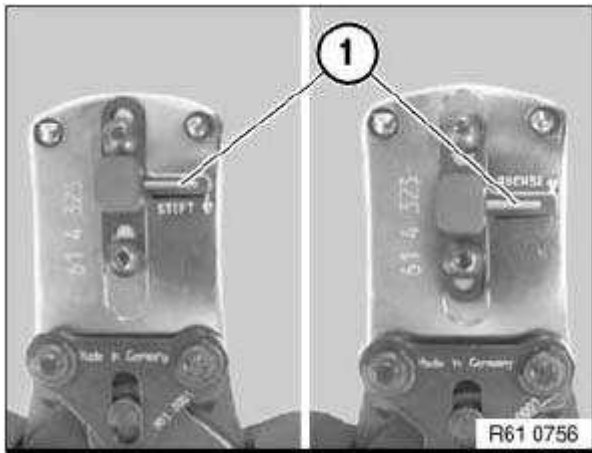


Fig. 99: Identifying Stop Lever

Courtesy of BMW OF NORTH AMERICA, INC.

Open pliers (2).

Place pin contact or jack (1) in crimping head and secure with locking lever (3).

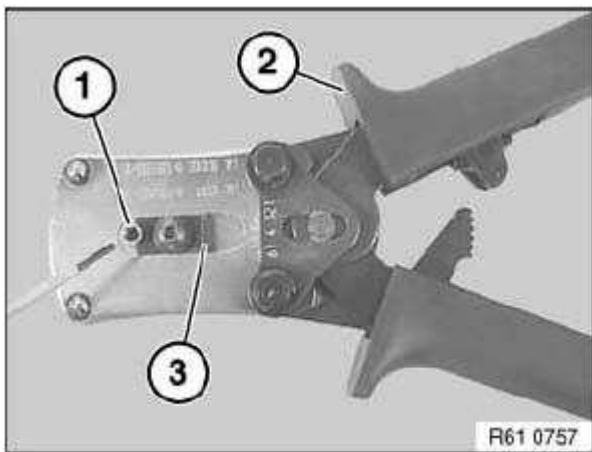


Fig. 100: Identifying Pin Contact Or Jack

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Follow procedure for cutting and stripping insulation from cables, see 61 13 Cutting to length and stripping insulation from cables

Insert stripped optical fibre (1) as far as it will go into pin contact or jack (2).

Close pliers (3) fully.

Open pliers (3) and locking lever (4).

Remove optical fibre (1).

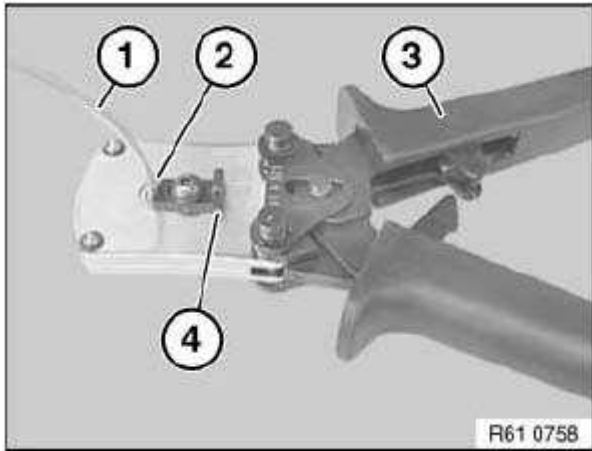


Fig. 101: Identifying Optical Fibre Plier
 Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Make sure optical fibre is correctly seated in jack.

Right (A)

End of optical fibre (1) must be flush with tip of pin contact (2).

Wrong (B)

End of optical fibre (1) is not flush with tip of pin contact (2).

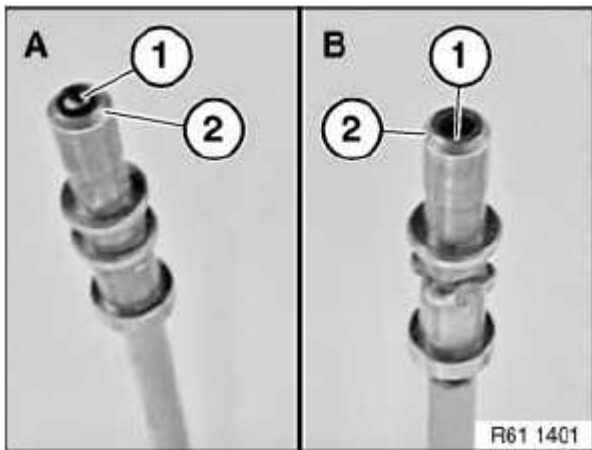


Fig. 102: Identifying End Of Optical Fibre
 Courtesy of BMW OF NORTH AMERICA, INC.

61 13 ... CUTTING OFF, STRIPPING INSULATION AND CUTTING OPTICAL FIBRES TO LENGTH

Special tools required:

- **61 4 320 CRIMPING SET WITH PLIERS**

To cut off, strip insulation and cut optical fibres to length, use pliers 61 4 321 (1) in conjunction with crimping head 61 4 322 (2) from crimping set 61 4 320 .

NOTE: **Pliers (1) open automatically as far as they will go when handles are pressed together.**

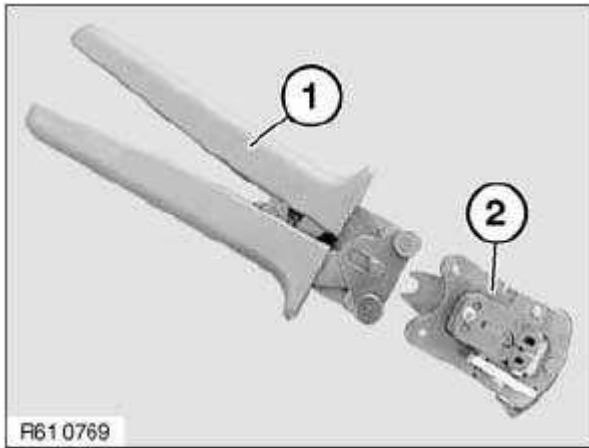


Fig. 103: Identifying Crimping Head And Crimping Set
Courtesy of BMW OF NORTH AMERICA, INC.

Cutting optical fibre

Open pliers (1).

Place optical fibre (2) in cutting device (3).

Close pliers (1) and remove optical fibre (2).

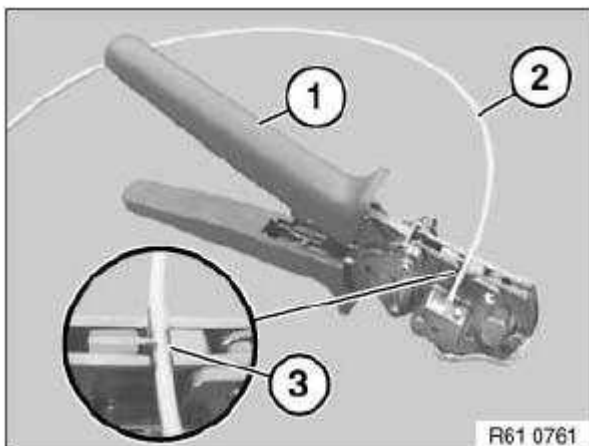


Fig. 104: Identifying Optical Fibre Plier

Courtesy of BMW OF NORTH AMERICA, INC.

Stripping insulation from optical fibre

Open pliers (1).

Open lever (2) in direction of arrow.

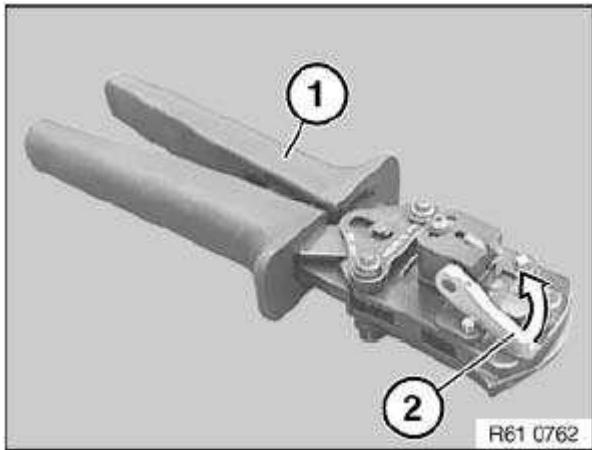


Fig. 105: Opening Lever

Courtesy of BMW OF NORTH AMERICA, INC.

Slide optical fibre (1) into stripping device (2) until flush at point (3).

Close pliers (4) fully.

Close clamping lever (5) in direction of arrow.

Open pliers (4) by one tooth notch.

Open clamping lever (5) against direction of arrow again and remove optical fibre (1).

NOTE: A stripping replacement blade set is available under number 61 4 327.

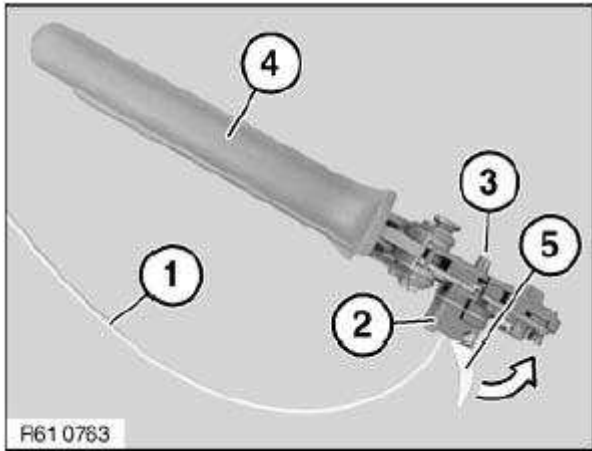


Fig. 106: Identifying Pliers Clamping Lever
Courtesy of BMW OF NORTH AMERICA, INC.

Cutting optical fibre to length

IMPORTANT: The cutting blade must be replaced prior to each cutting of the optical fibre.

Pull pin (1) in direction of arrow.

Fold up blade retaining link (2) in direction of arrow.

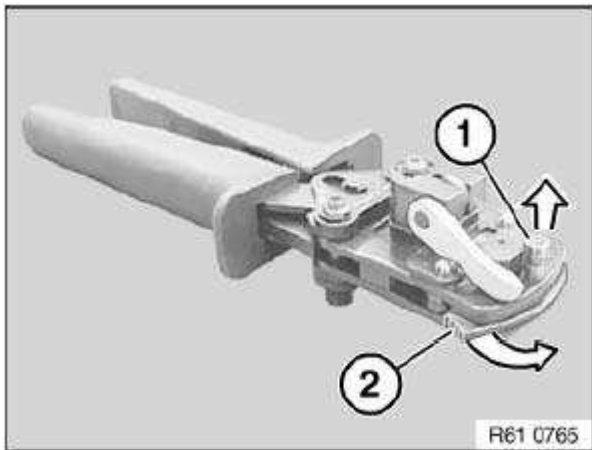


Fig. 107: Pulling Pin
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Risk of injury when changing the blade.

Remove blade (1) and replace.

Installation:

Make sure blade (1) is correctly seated on locating points (2).

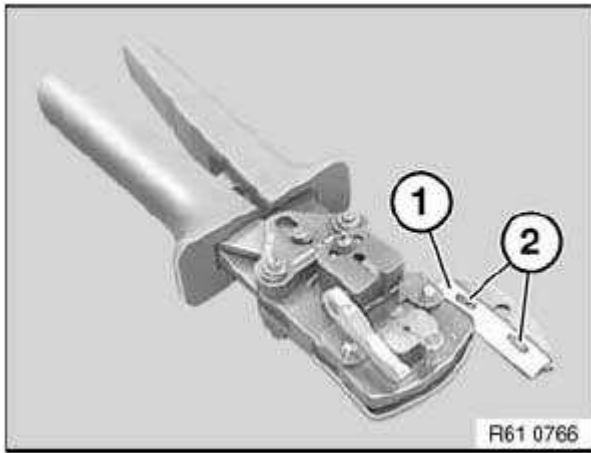


Fig. 108: Identifying Blade
Courtesy of BMW OF NORTH AMERICA, INC.

Open pliers (3).

Slide optical fibre (1) into cutting device (2) until insulation of optical fibre (1) butts against clamping device.

Close pliers (3) fully and keep closed.

Remove optical fibre (1).

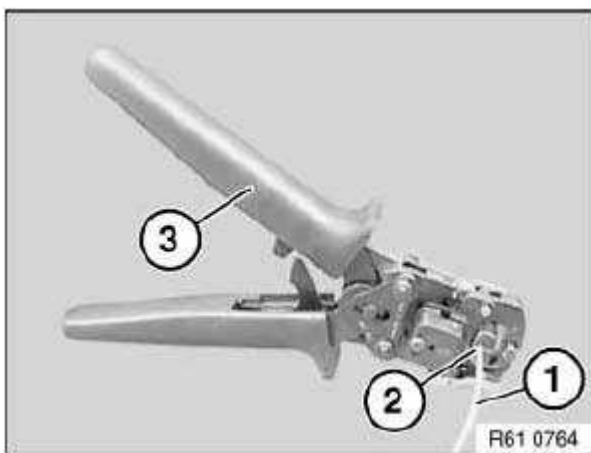


Fig. 109: Identifying Optical Fibre Plier
Courtesy of BMW OF NORTH AMERICA, INC.

Manufactured by AMP: The following contact types without strand sealing can be fitted in the plug housings:

- MQS (Micro Quadlock System)
- MPQ, width 2.8 mm (Micro Power Quadlock)
- MPQ, width 5.2 mm (Micro Power Quadlock)

Socket housing:

Raise lock (1) on housing (2).

Push contact carrier (3) from rear out of housing (2).

NOTE: Pushing out the contact carrier releases the secondary locks of the socket contacts.

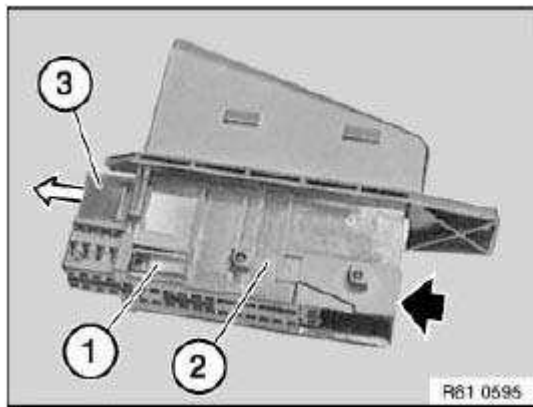


Fig. 110: Pushing Contact Carrier From Rear Out Of Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Hold down retaining hook (1) of socket contact in opening of contact carrier with a small screwdriver.

Pull wire with socket contact in direction of arrow as far as secondary lock (2).

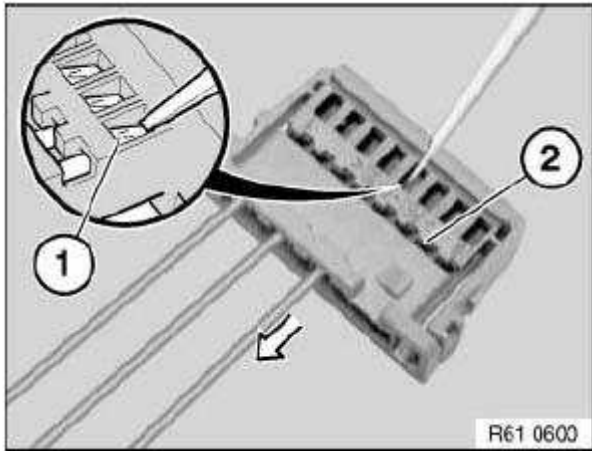


Fig. 111: Identifying Retaining Hook Of Socket
Courtesy of BMW OF NORTH AMERICA, INC.

Hold down retaining hook in secondary lock (1) again and pull cable with socket contact (2) completely out of contact carrier (3).

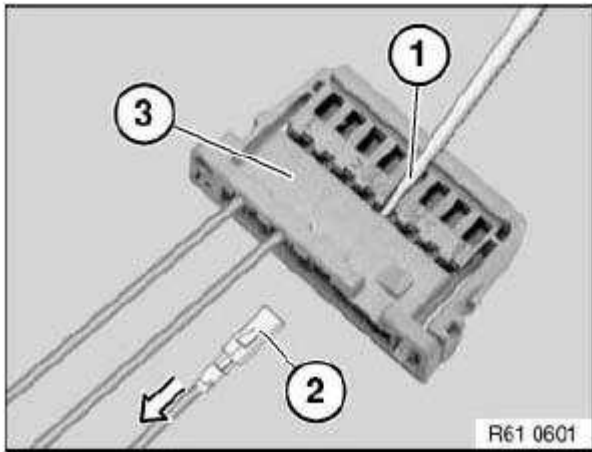


Fig. 112: Pulling Cable With Socket Contact
Courtesy of BMW OF NORTH AMERICA, INC.

Pin housing:

Contacts 1 ... 13 and 19 ... 27:

Raise locking slide (1) on both sides (2) of housing and detach.

NOTE: Detaching the locking slide releases the secondary locks of the pin contacts.

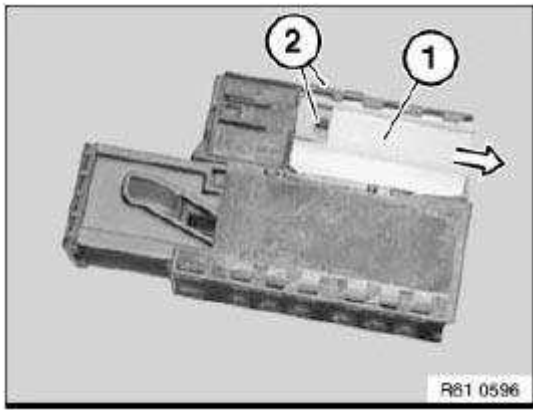


Fig. 113: Raising Locking Slide
 Courtesy of BMW OF NORTH AMERICA, INC.

Contacts 14 ... 18 and 28 ... 30:

Pull slide (1) outwards completely.

Raise lock (2) on housing.

Pull contact carrier (3) out of housing.

NOTE: Pulling out the contact carrier releases the secondary locks of the pin contacts.

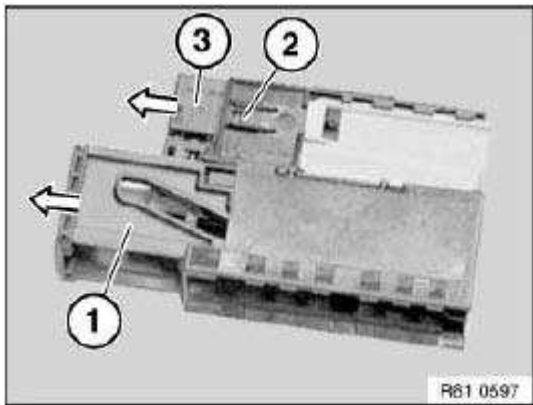


Fig. 114: Pulling Slide And Contact Carrier
 Courtesy of BMW OF NORTH AMERICA, INC.

The pin contacts are pulled out of a contact carrier as described under "Socket housing".

61 13 ... PLUG HOUSING, LCC CONTACT (LOAD CURRENT CONTACT)

Special tools required:

- 61 0 317 **61 0 300** **RELEASING TOOL (COMPLETE KIT)**

Socket housing:

Press lock (1) with suitable tool (2) in direction of arrow out of socket housing (3).

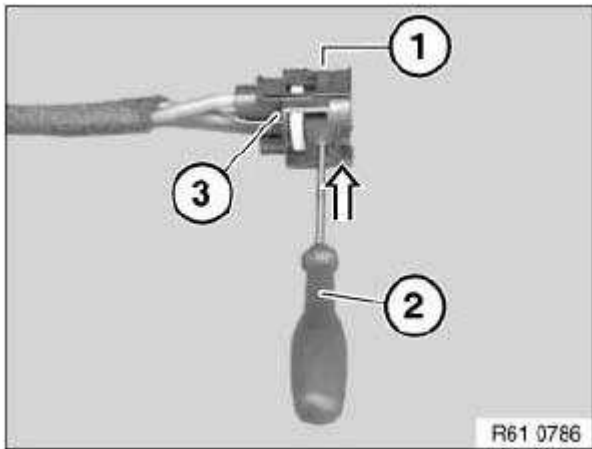


Fig. 115: Pressing Lock

Courtesy of BMW OF NORTH AMERICA, INC.

Pull lock (1) out of socket housing (2).

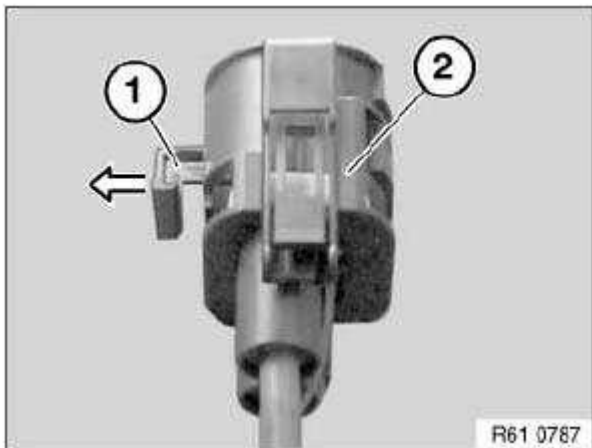


Fig. 116: Pulling Lock Out Of Socket Housing

Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool 61 0 317 into socket housing (1) and pull out lead with LCC contact (2) in direction of arrow.

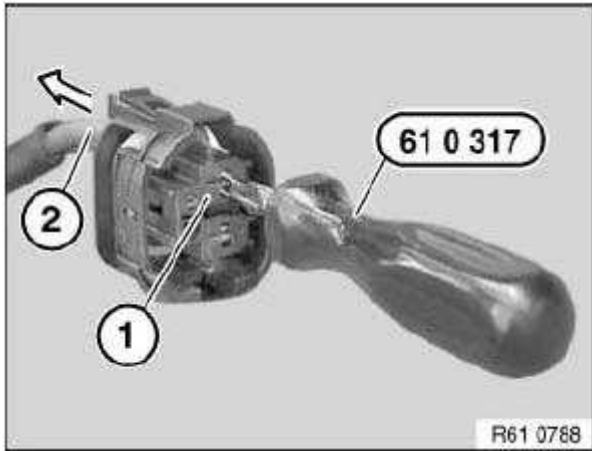


Fig. 117: Identifying Special Tool (61 0 317)
Courtesy of BMW OF NORTH AMERICA, INC.

Pin housing:

Unlock locking slide (1) of pin housing (2) with suitable tool (3) in direction of arrow.

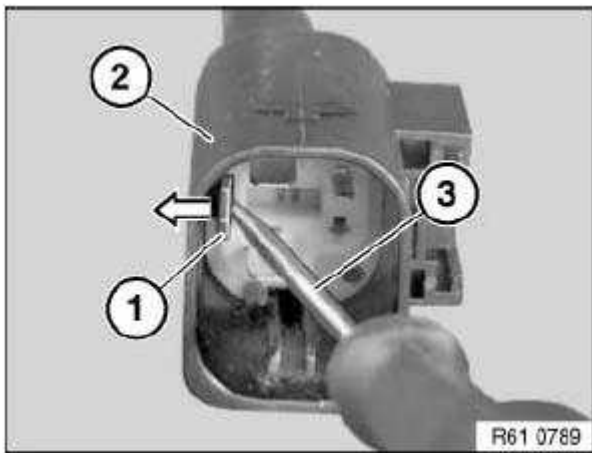


Fig. 118: Unlocking Locking Slide Of Pin Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool 61 0 317 into pin housing (1) and pull out lead with LCC contact (2) in direction of arrow.

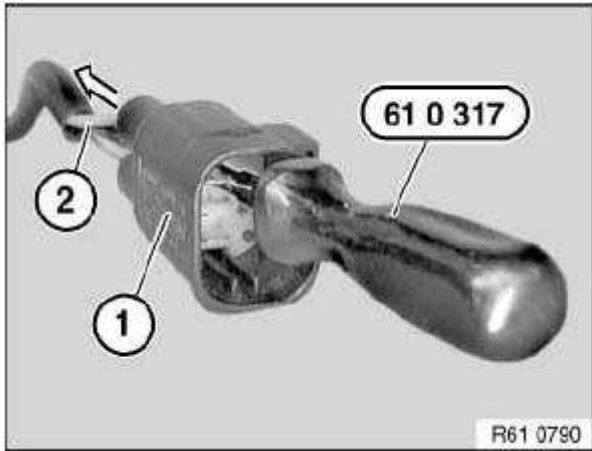


Fig. 119: Identifying Special Tool (61 0 317)
Courtesy of BMW OF NORTH AMERICA, INC.

61 13 ... RELAY CARRIER

Place special tool 61 1 153 on relay carrier (1) and carefully pull in direction of arrow until retaining lugs (2) on relay carrier are raised.

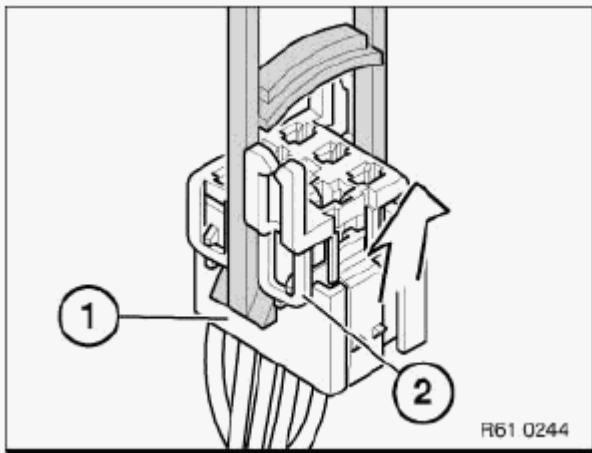


Fig. 120: Identifying Relay Carrier And Retaining Lugs
Courtesy of BMW OF NORTH AMERICA, INC.

Pull relay carrier (2) in direction of arrow into first catch (3).

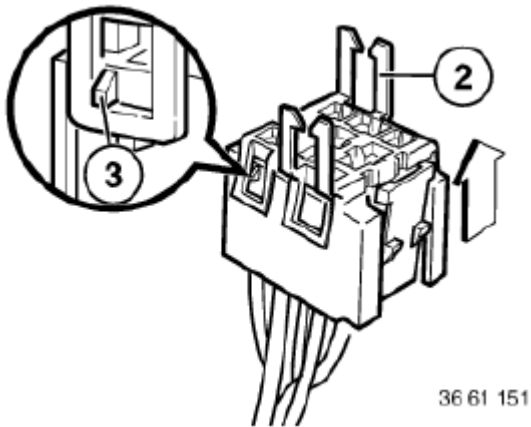


Fig. 121: Pulling Relay Carrier
 Courtesy of BMW OF NORTH AMERICA, INC.

Press down arrester hook (4) of appropriate contact and pull out cable with contact.

Press out double flat spring contact with special tool 61 1 136 or 61 1 137 (ejector).

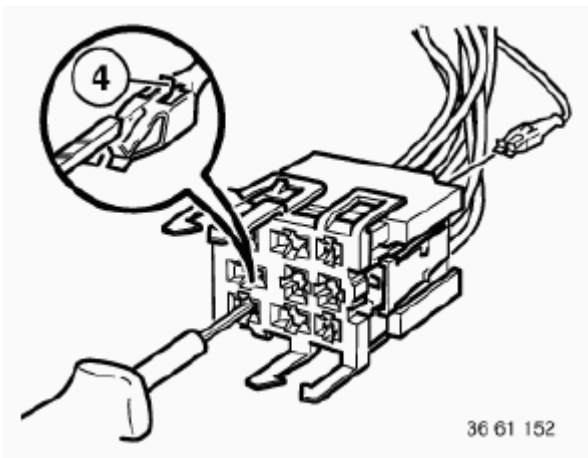


Fig. 122: Identifying Arrester Hook
 Courtesy of BMW OF NORTH AMERICA, INC.

61 13 ... REPAIRING RIBBON CABLES

Special tools required:

- **61 1 190 PLIERS**

Place ribbon cables (1) in connector housing (2) and close cover (3).

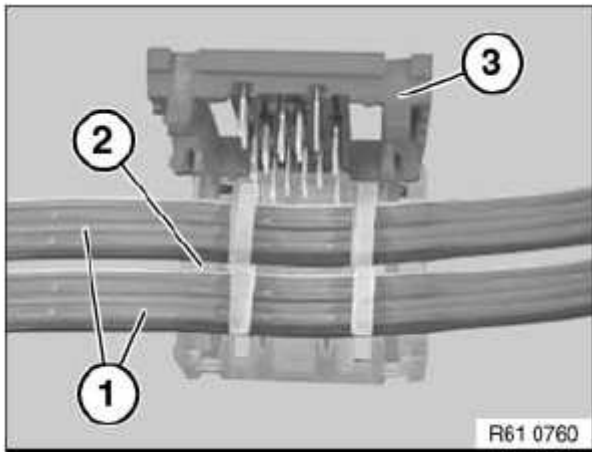


Fig. 123: Identifying Ribbon Cables And Connector Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Place connector housing (1) in tool (2) 61 1 190 .

Close tool (2).

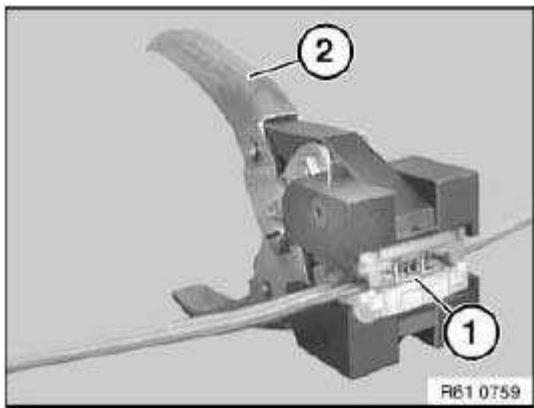


Fig. 124: Identifying Connector Housing
Courtesy of BMW OF NORTH AMERICA, INC.

61 13 ... Retaining bracket

Pull relevant fuse out of fuse block (1).

NOTE: Mark positions when removing fuses.

Pull locking slide (2) out of fuse block (1) as far as it will go.

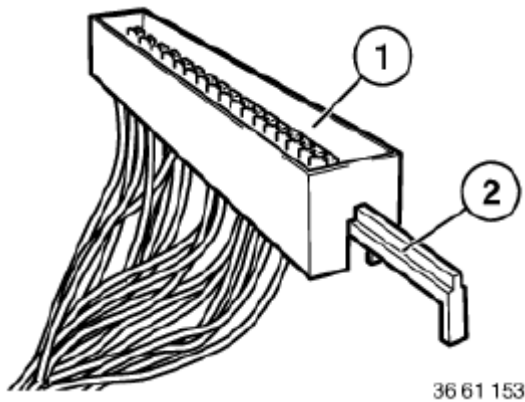


Fig. 125: Identifying Fuse Block
 Courtesy of BMW OF NORTH AMERICA, INC.

With special tool 61 1 136 or 61 1 137 (ejector), press back arrester hook (3) of appropriate contact and pull out cable.

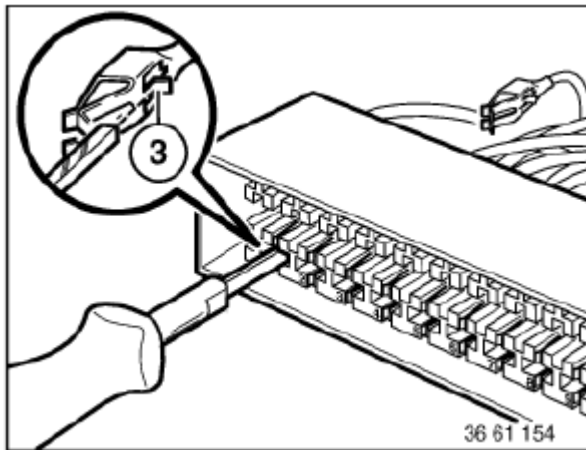


Fig. 126: Identifying Locking Slide And Fuse Block
 Courtesy of BMW OF NORTH AMERICA, INC.

61 13 ... SOCKET HOUSING (RADIO PLUG), HYBRID SYSTEM MQS/MPQ

Manufactured by AMP: The following contact types without strand sealing can be fitted in the plug housings:

- MQS (Micro Quadlock System)
- MPQ, width 2.8 mm (Micro Power Quadlock)
- MPQ, width 5.2 mm (Micro Power Quadlock)

Removing MPQ contacts from radio plug:

Press lock (1) in direction of arrow.

Detach secondary lock (2) from radio plug.

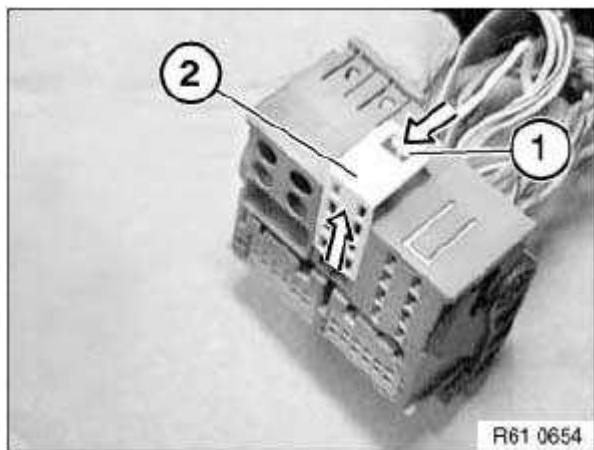


Fig. 127: Pressing Lock

Courtesy of BMW OF NORTH AMERICA, INC.

Feed special tool 61 1 135 past side of contact.

Press special tool 61 1 135 in direction of arrow.

Pull wire (1) with socket contact out of radio plug (2).

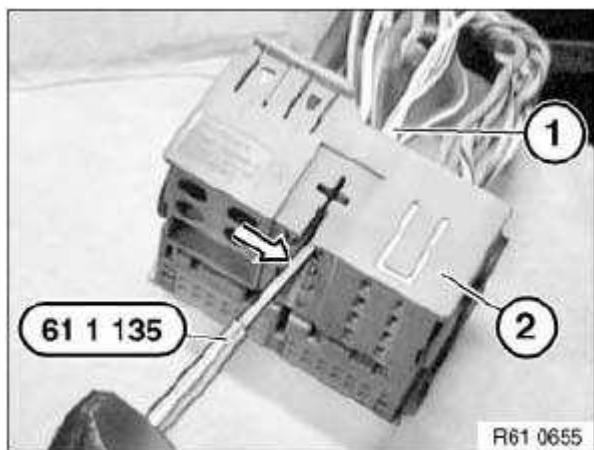


Fig. 128: Pulling Wire With Socket Contact Out Of Radio Plug

Courtesy of BMW OF NORTH AMERICA, INC.

Removing MQS contacts from contact carrier:

Press lock (1) in direction of arrow and pull housing (2) out of radio plug.

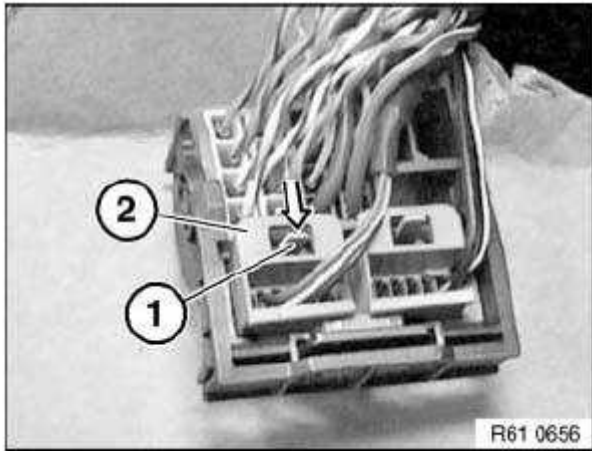


Fig. 129: Pressing Lock

Courtesy of BMW OF NORTH AMERICA, INC.

Press lock (1) in direction of arrow. Pull contact carrier (2) out of housing (3).

NOTE: When the contact carrier is pulled out, the secondary locks of the socket contacts are raised.

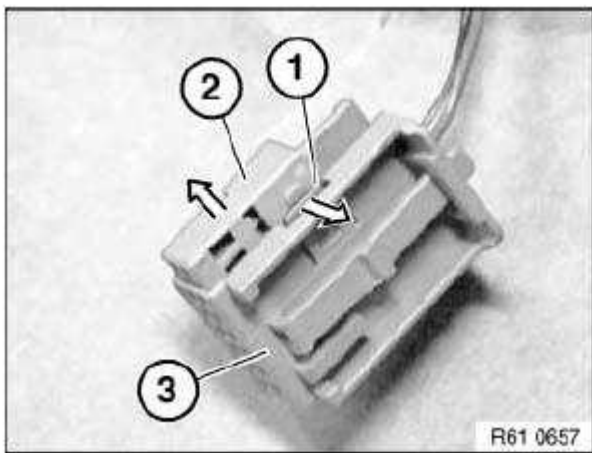


Fig. 130: Pressing Lock

Courtesy of BMW OF NORTH AMERICA, INC.

Hold down retaining hook (1) of socket contact in opening of contact carrier with a small screwdriver.

Pull wire with socket contact in direction of arrow as far as secondary lock (2).

NOTE: The illustration shows an 8-pin socket housing where removal of the contacts is identical.

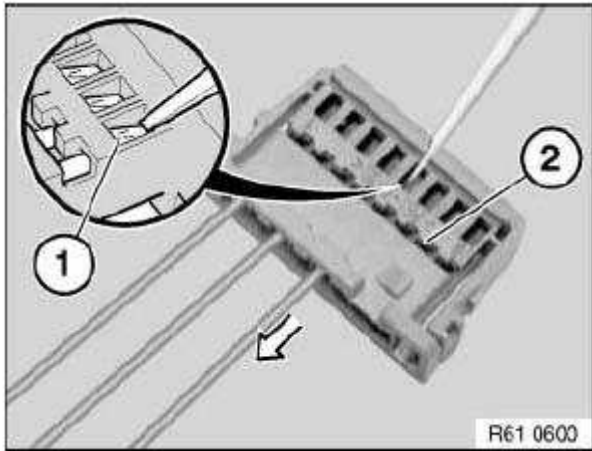


Fig. 131: Identifying Retaining Hook Of Socket
Courtesy of BMW OF NORTH AMERICA, INC.

Hold down arrester hook in secondary lock (1) again. Pull wire with socket contact (2) out of contact carrier (3).

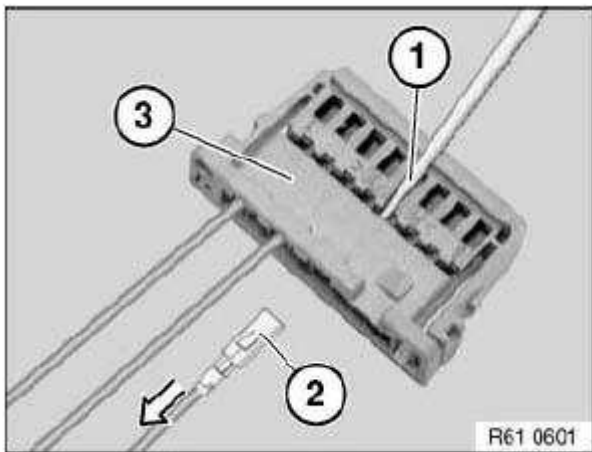


Fig. 132: Pulling Cable With Socket Contact
Courtesy of BMW OF NORTH AMERICA, INC.

Removing MPQ contacts from contact carrier:

Remove contact carrier (1) with MQS contacts from radio plug.

Raise lock (2) on radio plug.

Pull contact carrier (3) out of radio plug.

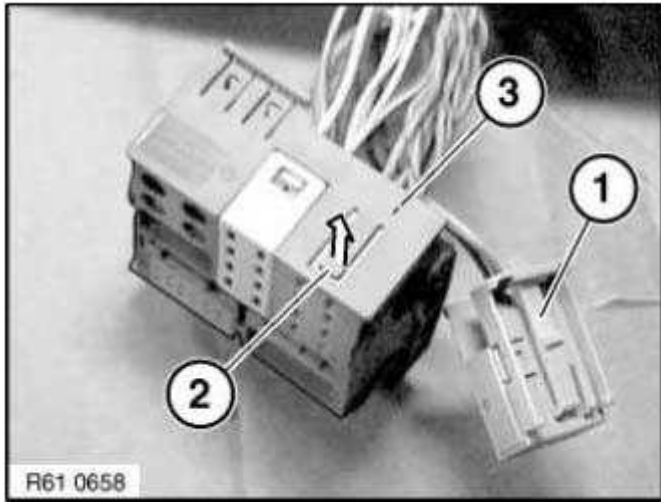


Fig. 133: Pressing Lock

Courtesy of BMW OF NORTH AMERICA, INC.

Press lock (1) in direction of arrow.

Pull secondary lock (2) in direction of arrow completely out of contact carrier (3).

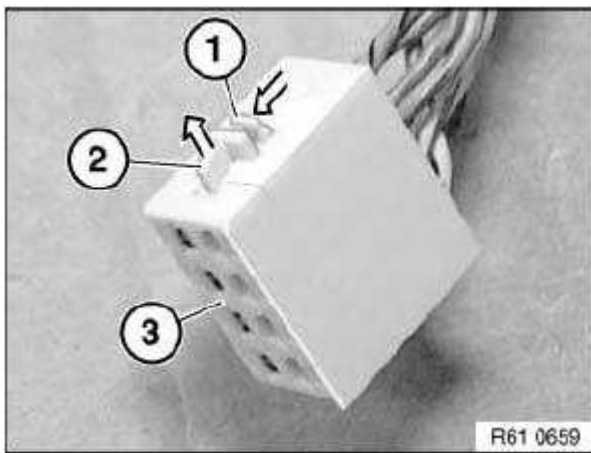


Fig. 134: Pulling Secondary Lock

Courtesy of BMW OF NORTH AMERICA, INC.

Press special tool 61 1 135 on inside of contact into contact carrier (2).

Pull wire with socket contact (1) out of contact carrier (2).

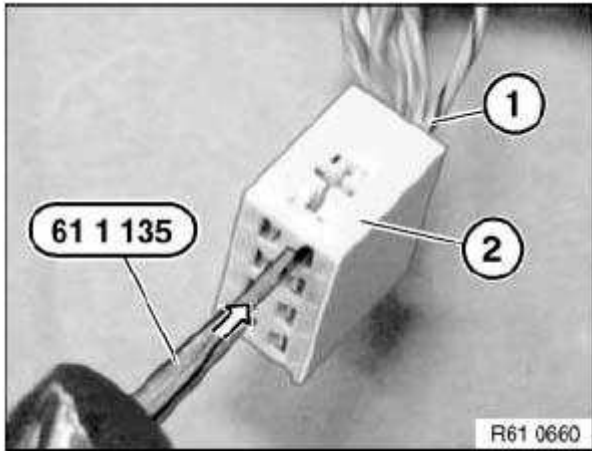


Fig. 135: Pulling Wire With Socket Contact
 Courtesy of BMW OF NORTH AMERICA, INC.

61 13 ... TREATING CABLES AND FIBRE-OPTIC CABLES

Special tools required:

- **61 1 190 PLIERS**
- **61 4 320 CRIMPING SET WITH PLIERS**

NOTE: Special tools referred to in the repair instructions below are contained in the following special tool kits:

REPAIR INSTRUCTIONS CHART

Repair range for vehicle electrical system	
Crimping set with tool for fibre-optic cables, Micro Power Quadlock (MPQ), Micro Quadlock System (MQS) contacts and universal crimping head	61 4 320
Insulation displacement tool for ribbon cable	61 1 190

Subject of repair instructions

- Special tools for wiring harness repairs, see **61 13 Special tools for wiring harness repairs**
- Cutting to length and stripping insulation from cables, see **61 13 Cutting to length and stripping insulation from cables**
- Crimping stop parts (contacts), see **61 13 Crimping stop parts**
- Butt connector for repairing a plug connection, see **61 13 Butt connector for repairing a plug connection**
- Fan connector for retrofitting/repairs, see **61 13 Installing fan connector for retrofitting/repairs**
- Aerial elbow plug on radio receiver
- Cutting to length and stripping insulation from optical fibers, see **61 13 ... Cutting off, stripping**

insulation and cutting optical fibres to length

- Crimping optical fibres, see 61 13 ... Crimping optical fibres
- Insulation displacement connector for repairing ribbon cables, see 61 13 ... Repairing ribbon cables

20 BATTERY

12 00 ... INSTRUCTIONS FOR DISCONNECTING AND CONNECTING BATTERY

Observe safety instructions for handling vehicle battery, see 61 00 ... Safety instructions for handling vehicle battery

Before disconnecting battery:

Turn off the ignition and other electrical loads/consumers to prevent sparking when reconnecting.

NOTE: If the ignition is not turned off when the battery is disconnected, fault memories may be set in some control units.

IMPORTANT:

- **There is a danger of mixing up battery leads: If the battery positive and negative leads are the same color and you are in doubt, follow the polarity to the battery, then mark and cover the leads.**
- **On vehicles with radio code: After disconnecting the battery, the radio code must be re-entered. Therefore obtain the radio code card from the customer beforehand. Note stored stations and restore them after connecting the battery.**
- **Stored settings of the on-board computer and clock will also be lost.**
- **All available central keys must be recoded for cars with first generation infrared transmitter locking systems.**

General notes on disconnecting battery:

- Do not disconnect battery leads and leads from alternator and starter motor while engine is running.
- Cars with IBS on battery negative terminal:

Do not under any circumstances pull/lever off pole shoes by force.

Do not under any circumstances release socket-head cap screw of IBS.

- Detach terminal of battery negative lead from car battery and second battery if fitted. Cover battery negative terminal(s) and secure.
- When work is carried out on the electrical system, faults may be caused in the fault memories of some control units when the battery is connected.
- When installing battery terminal: Tightening torque: 61 21 1AZ, see 61 21 BATTERY WITH TERMINAL .

After connecting battery:

IMPORTANT: After a power supply interruption some equipment is disabled and must be reactivated.

Likewise, individual settings are lost and must be activated.

Example:

- Vehicles with build date from 03/2007:

Teach-in mid-position for power steering, see 61 31 996 Carry out steering angle sensor adjustment

- If necessary, activate sliding sunroof
- If necessary, carry out adjustment of active front steering
- If necessary, activate power windows
- If necessary, activate mirror with compass, see 51 16 ... CALIBRATING COMPASS IN INTERIOR REARVIEW MIRROR

Please refer to the Progman user documentation for further information on vehicle-specific activation.

Vehicles with a two-battery system

Starter and equipment batteries

A two-battery system has a starter battery circuit and an equipment battery circuit. A secondary control unit monitors both battery circuits. Depending on the situation, the battery circuits are connected to or isolated from the secondary control unit via an isolating relay.

Two AGM batteries, whose design and properties are described in 61 20 ... AGM battery, are used as a storage battery.

IMPORTANT: These batteries must not under any circumstances be charged with a voltage in excess of 14.8 V. Rapid programs must not be used either.

Receiving/giving starting assistance via jump start terminal

The engine can be jump-started with an external voltage supply via the jump start terminal on the right side of the engine compartment.

NOTE: The starter battery is isolated from the alternators when the engine hood/bonnet is open.

Giving starting assistance via the jump start terminal is thus limited by the capacity of the starter battery when

the engine hood/bonnet is open.

Charging starter and equipment batteries via jump start terminal

The starter battery is charged as a matter of priority with a charger connected to the jump start terminal. The voltage at the starter battery is the decisive factor in determining whether the equipment battery is also included in the charging operation. The secondary control unit automatically detects a charging operation at a charging voltage at the starter battery of greater than 13.5 V. The isolating relay is closed and thus the equipment battery is connected in parallel. Both batteries are now charged.

Prerequisite:

- Terminal 61 inactive
- Terminal 15 inactive

If terminal 15 becomes "active" during the charging operation, the isolating relay is opened immediately and again only the starter battery is charged.

NOTE: When the engine hood is open, the isolating relay is also opened in normal operation when the engine is running.

A special mode can be set by means of diagnosis for workshop/garage operation. The isolating relay is closed from terminal R in this operating mode. This mode is automatically reset once a distance of 5 km has been driven.

Trickle charging

The increased closed-circuit current consumption can be compensated for via the jump-start connection point with the aid of the "Acctiva easy" battery trickle charger.

IMPORTANT: The cigarette lighter is isolated from the electrical system after terminal R "OFF" on a timed basis (60 mins.), thereby interrupting charging of the equipment battery via the cigarette lighter. This is prevented if the battery master switch (on the right side of the luggage compartment behind the panel) is turned on and off again twice within 2 seconds. (Cigarette light battery charging function).

12 00 ... INSTRUCTIONS ON STARTING AID

Do not start the engine with help of starting sprays.

Preparation:

Conform with the following when starting engine with starting cable.

- Ensure that jump lead wires are to appropriate cross-section size.

- Only use fuse-protected jump leads.
- Check whether the current supplying battery has 12 V voltage.
- If engine is started from battery of another vehicle, ensure that there is no contact between the bodies of both vehicles.

CAUTION: Never touch ignition system components and current - dangerous high tension!

If the battery in the vehicle supplying power is weak, start the engine of this vehicle and let it run at idling speed.

Carrying out:

Always conform with the procedures to avoid injury to persons or damage to parts.

- On automatic transmission, select "P" setting, apply handbrake.
- Move the shift lever of vehicles with manual transmission into neutral and apply the parking brake.
- Ensure that the jump leads cannot get caught in rotating parts, e.g. fan.
- First connect positive terminals of both batteries with one jump lead (red).
- Use positive connection point in engine compartment for vehicles with one battery in trunk.
- Then attach second jump lead (black) to negative terminal of donor battery and to engine ground or body ground on vehicle to be started.

CAUTION: Never connect second jump lead (black) to negative terminal of battery in vehicle to be started. This would produce explosive gas which could be ignited by sparks.

Danger of explosion!

After engine of vehicle to be started has started up, first disconnect the jump lead on the negative terminal/ground connection. Then remove jump lead from positive terminals.

61 00 ... BATTERY

NOTE: Important notes and instructions for handling batteries in the dealership can be found in:

- Battery master document
- Disconnecting battery, see **12 00 ... Instructions for disconnecting and connecting battery**
- Battery charging, see **61 20 ... Battery charging**
- Welding work
- External jump-starting aid, see **12 00 ... Instructions on starting aid**

Battery care and maintenance

In low-maintenance batteries, check the acid level at least once a year. If necessary, top up with distilled water up to the top marking.

The increasing number of electronic control units in the car reduces the self-discharging time of the battery (even in standby mode). To maintain the battery service life and to avoid exhaustive discharging, recharge laid-up vehicles every 6 weeks at the latest. The time for self-discharging depends on vehicle type and equipment specification.

Battery test

The battery acid density can be used to measure the charge state. However this test produces uncertainty caused by a design-related range of variation. The acid density e.g. for a charged battery is 1.28 kg/l (in the tropical version the acid density is 1.23 kg/l).

Another interference factor is the acid lamination immediately after filling with distilled water.

Battery wear with partially sulphated and/or heavily contaminated plates will also lead to incorrect acid density test results.

61 00 ... REPAIRING AIRBAG CABLES

IMPORTANT: Only repair those cables which show visible signs of damage. In the event of visible damage, make sure there is only one cable repair in effect after the repair work. If no visible damage can be identified, the entire cable must be replaced. When carrying out repairs to the airbag wiring harness, you must use the spare parts offered in the Electronic Parts Catalogue (EPC).

Safety regulations:

Safety regulations for handling components of airbag system, see **72 00 ... SAFETY REGULATIONS FOR HANDLING COMPONENTS WITH GAS GENERATORS** .

Instructions for disconnecting and connecting battery, see **12 00 ... Instructions for disconnecting and connecting battery**

Procedure for cable repair

In event of non-visible damage to wiring harness:

Disconnect plug connection on airbag module or on adapter plug. It is absolutely vital to disconnect the contacts in succession as there is a risk of them being mixed up! Cut through one cable after the other at an appropriate position, do not under any circumstances cut through both cables at the same time. Insulate cables remaining in wiring harness with insulating tape. Now disconnect plug connection on airbag control unit. Unpin contacts. Cut through one cable after the other at an appropriate position and insulate with insulating tape, do not under any circumstances cut through both cables at the same time. Pin contacts of repair cable for airbag control unit in

control unit plug, assignment of repair cables is relevant. Lay repair cable in car parallel to existing airbag lead. Now pin in contacts for airbag control unit or contacts of adapter plug, assignment of repair cables is relevant. Cut off excess length of repair cable in proximity (visible area) of airbag module or of adapter plug. Twist open cables. With the connectors and shrink-fit hoses in the Electronic Parts Catalogue (EPC), reconnect the cables with the same cable colors. Twist cables again, open length (twist) must not exceed 40 mm. Secure interface (shrink-fit hoses) with insulating tape to prevent cables from twisting open.

Instructions for cutting off, insulating, crimping cables, installing and removing contacts:

Cutting off and insulating cables, see **61 13 Cutting to length and stripping insulation from cables**

Repairing a plug connection using connectors, see **61 13 Butt connector for repairing a plug connection**

Installing and removing contacts, see **61 13 Opening plug housings and removing contacts of different plug systems**

In event of visible damage:

Expose cable at damaged areas. Cut through one cable after the other at an appropriate position and insulate cables no longer required in wiring harness with insulating tape, do not under any circumstances cut through both cables at the same time. Now, depending on the scope of work, unpin contacts either on airbag control unit/airbag module or on adapter plug. Cut off unpinned cables. Insulate cables remaining in wiring harness with insulating tape. Now pin in contacts of repair cable, assignment of repair cables is relevant. Lay repair lead in car parallel to existing airbag lead up to cutting point. Cut off excess length of repair lead. Twist open cables. Connect cables with connectors and shrink-fit hoses in Electronic Parts Catalogue (EPC), assignment of repair cables is relevant. Twist cables again, open length (twist) must not exceed 40 mm. Secure interface (shrink-fit hoses) with insulating tape to prevent cables from twisting open.

Instructions for cutting off, insulating, crimping cables, installing and removing contacts:

Cutting off and insulating cables, see **61 13 Cutting to length and stripping insulation from cables**

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Installing and removing contacts, see **61 13 Opening plug housings and removing contacts of different plug systems**

61 00 ... SAFETY INSTRUCTIONS FOR HANDLING VEHICLE BATTERY

Battery acid is highly corrosive:

Do not allow any battery acid to come into contact with the eyes, the skin or clothing. Therefore wear protective clothing, gloves and goggles.

Do not tilt the battery, acid may emerge from the vent opening.

In event of contact with acid:

If acid is splashed into the eyes, rinse them immediately for several minutes with clear water. You must then consult a doctor without delay.

If acid is splashed onto the skin or clothing, neutralize it immediately with a soapy solution and rinse with lots of water.

Seek medical attention immediately if battery acid is accidentally swallowed.

Explosion hazard:

Strictly no flames, sparks, naked light or smoking!

A highly explosive mixture of electrolytic gas is created when batteries are charged. The rooms where charging is carried out must therefore always be well ventilated.

Avoid the formation of sparks when handling cables, wiring and electrical devices.

Turn the ignition lock to the 0 position before disconnecting or connecting the battery.

Do not place tools or any similar object on the battery (danger of short-circuiting and explosion!).

61 20 ... THRESHOLD VALUES FOR BATTERY INSPECTION OF ALL BATTERY (TELEPHONE EXCEPT FOR TELEPHONE BATTERY)

Observe safety instructions for handling vehicle battery, see **61 00 ... Safety instructions for handling vehicle battery**

Test step 1 - before charging the battery

BATTERY CHARGING REFERENCE CHART

Charge state ⁽¹⁾	Starting capability ⁽¹⁾	Test result
Not testable		Charge
less than 50 % ⁽¹⁾		Charge
more than 50 %	less than 75 %	Charge
more than 50 %	more than 75 % ⁽¹⁾	Charge
more than 80 %	more than 75 %	O.K.

Test step 2 - after charging the battery

BATTERY CHARGING REFERENCE CHART

Charge condition ⁽¹⁾	Starting capability ⁽²⁾	Test result
Not testable		Defective
less than 50 %	less than 75 %	Charge
more than 50 %	more than 75 %	Charge

- (1) Charge condition and starting power must always be evaluated together
- (2) When test charging for more than 5 hours, use charger Gossen CG 32 or Siemens / Gossen VB 801
- (3) Fully charge until charge state is more than 80 %.

NOTE: If battery was checked on the positive terminal in the engine compartment, repeat check directly on battery for sake of safety.

61 20 ... AGM BATTERY



7610891E

Fig. 136: Identifying AGM Battery
Courtesy of BMW OF NORTH AMERICA, INC.

Introduction

In September 2002 so-called VRLA batteries, better known as **AGM batteries**, were introduced.

(VRLA stands for **V**alve **R**egulated **L**ead **A**cid, i.e. lead acid battery with pressure relief valve; **AGM** stands for **A**bsorbent **G**lass Mat, i.e. absorbent glass fibre fleece)

AGM batteries are fitted in models with electrical loads/consumers which have a high energy demand.

With the option SA 146 (2nd battery), the AGM battery (70 Ah) is fitted as the 2nd battery.

The constantly increasing energy demand of modern vehicle electrical systems calls for ever more powerful

battery solutions. Today, up to 100 servomotors, which have to be electrically powered, operate in a modern luxury-class motor vehicle. Added to these are safety, environmental and comfort and convenience elements which are increasingly becoming standard features, such as e.g. Anti-lock Brake System (ABS), Dynamic Stability Control (DSC), electric steering effort assistance (EPS), heated catalytic converter, electronic chassis and suspension control, air conditioning and navigation system.

The power consumption is considerable even when the vehicle is parked.

The somewhat higher price compared with a battery of similar size is fully balanced by the following benefits:

- Significantly longer service life
- Increased starting reliability at low temperatures
- Safe starting of engines with high starting current demands, e.g. high-performance diesel engines
- 100 % freedom from maintenance
- Low risk in event of an accident (reduced risk to the environment)

Service life of AGM battery

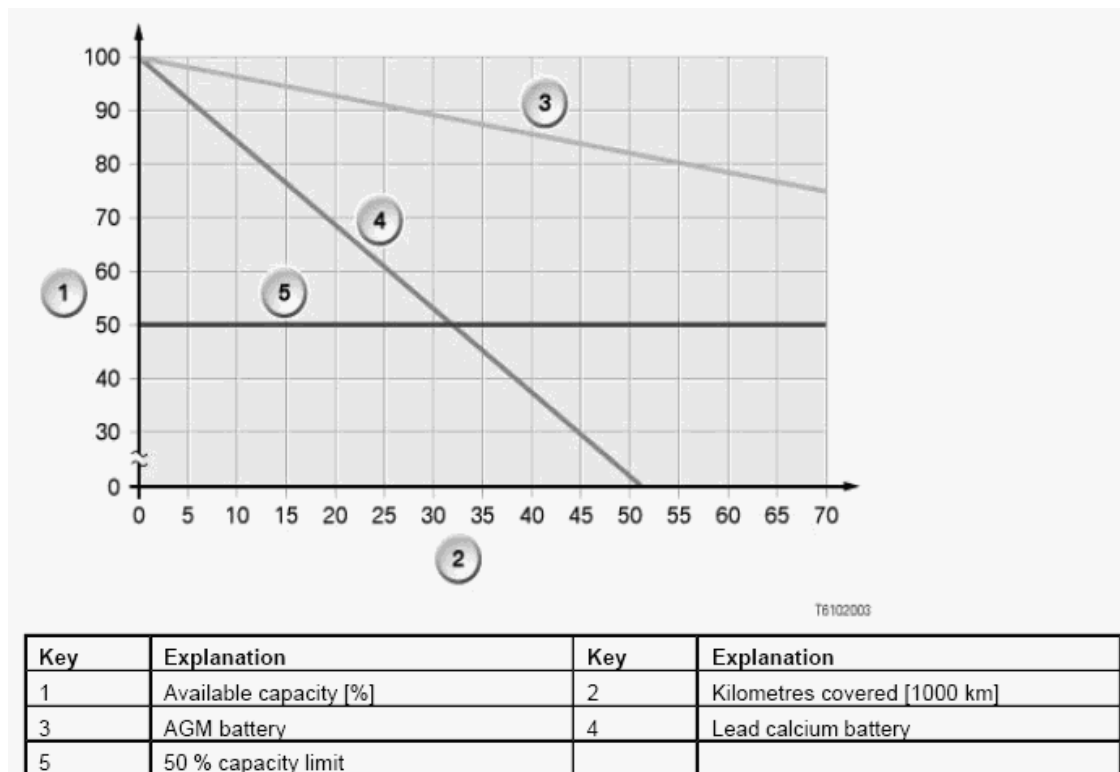


Fig. 137: AGM Battery Service Life Graph
 Courtesy of BMW OF NORTH AMERICA, INC.

Unlike the previously used lead calcium batteries, the sulphuric acid contained in batteries with fleece technology is not self-contained in the battery housing.

Instead, the sulphuric acid is 100 % bound up in glass fibre fleece mats (separators). Thus, no acid can escape if the battery housing is damaged. In addition, the AGM battery is sealed gas-tight. This is possible because the gases are converted back into water as a result of the separator permeability.

Brief description of components

An AGM battery can be recognized by its black housing and the lack of a so-called "Magic Eye".

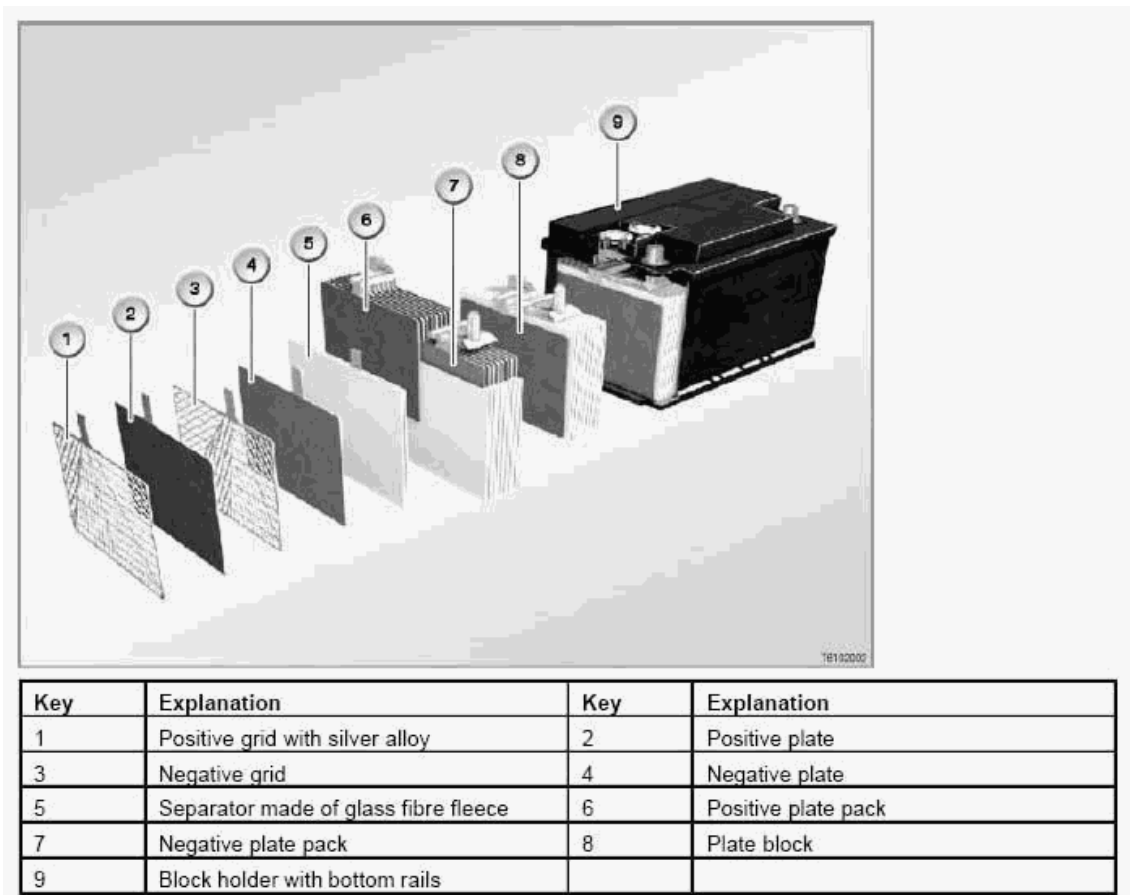


Fig. 138: Identifying AGM Battery Components
 Courtesy of BMW OF NORTH AMERICA, INC.

Design

The AGM battery differs from the conventional lead calcium battery as follows:

- Larger plates:
 - Larger plates provide for a 25 % higher power density.
- Separators made of glass fibre fleece:
 - These provide for up to 3 times higher cycle reliability.

This in turn improves cold starting performance, current consumption and service life.

- Gas-tight housing with pressure relief valve:

The cell plugs are welded and cannot be opened.

- Acid bound up in the glass fibre fleece:

The acid is not as previously self-contained in the housing, but 100 % bound up in the glass fibre fleece. This provides increased protection against acid leakage and thus represents a reduced risk to the environment.

Mode of operation

The AGM battery differs from conventional batteries in its non-polluting and substance-retaining behavior during charging.

When vehicle batteries are charged, the two gases oxygen and hydrogen are released by electrolysis.

- In a conventional wet lead calcium battery, the two gases hydrogen and oxygen are dissipated into the atmosphere.
- In an AGM battery, the two gases are converted back into water: The oxygen which is created at the positive electrode during charging passes through the permeable glass fibre fleece to the negative electrode. At the negative electrode the oxygen reacts with the arriving hydrogen ions in the electrolyte to form water (oxygen cycle).

In this way, the gas and thus also the electrolyte are not lost.

Only in the event of an excessively heavy buildup of gas, i.e. excessively high pressure buildup (20 to 200 mbar), does the pressure relief valve discharge the gas. In this process, the pressure relief valve does not allow any oxygen in the air to enter. Because a valve regulates the pressure in the battery, the AGM battery is also known as a VRLA battery (Valve Regulated Lead Acid).

Notes and instructions for service personnel

It is necessary when handling an AGM battery to observe some particular points pertaining to battery changing and installation location.

Charging

WARNING: Do not charge the AGM battery with greater than 15.2 V. No quick-charging routines!

When charging removed batteries (so-called stand-alone batteries), do not exceed the maximum charging voltage of 15.2 V at room temperature. Also when charging via the jump start terminal, do not exceed the maximum charging voltage of 15.2 V at room temperature.

The AGM battery will be damaged even when it is only briefly charged with a charging voltage of more than 15.2 V. A charging voltage of more than 15.2 V is usually used in quick-charging routines.

Installation location

WARNING: Do not install the AGM battery in the engine compartment.

The AGM battery must not be installed in the engine compartment on account of the high spatial temperature differences, otherwise its service life will be significantly shortened.

Housing

WARNING: Do not open the AGM battery.

The AGM battery must not be opened under any circumstances as the introduction of oxygen from the air will cause the battery to lose its chemical equilibrium and be rendered non-operational.

Battery changing

Any conventional lead calcium battery can always be replaced by an AGM battery.

Using an AGM battery does not require any alterations to be made to the vehicle electrical system.

NOTE: The AGM battery is recommended for "problem customers".

"Problem customers" encounter a high energy throughput through their batteries. This high energy throughput is caused by stationary loads/consumers (TV, independent heating, etc.) and a bad use profile for the battery ("chauffeur operation", short-distance driving, "stop-and-go"). The use of an AGM battery is recommended for these problem customers.

61 20 ... BATTERY CHARGING

If a normal or quick charger is used to charge the battery, the battery must be disconnected from the vehicle electrical system and removed. This prevents damage to paintwork and upholstery.

IMPORTANT: In order to prevent the intelligent battery sensor from malfunctioning, the charging terminals in the engine compartment must be used without fail in vehicles from E60 and should be used if possible in other vehicles.

IMPORTANT: Before charging the battery while it is installed, first carry out a closed-circuit current test, see 61 20 ... Battery open-circuit current test. If here the voltage is 10 V or less, one or more of the cells may be faulty or the entire battery may already be damaged. In this case, always remove the battery as escaping gases

during charging could damage the interior equipment and trim. Attempt to regenerate faulty cells with low charging current.

If necessary, open existing plugs on the individual cells.

61 20 ... BATTERY OPEN-CIRCUIT CURRENT TEST

NOTE: Observe safety instructions for handling vehicle battery, see 61 00 ... Safety instructions for handling vehicle battery
Observe Service Information Adapter for open-circuit current measurement.



W05 95 001

Fig. 139: Identifying Battery Open-Circuit Current Testing Machine
Courtesy of BMW OF NORTH AMERICA, INC.

The open-circuit current test is performed using the Diagnosis and Information System (DIS).

61 20 900 DISCONNECTING AND CONNECTING BATTERY NEGATIVE LEAD

WARNING: Observe safety instructions for handling vehicle battery.
Follow instructions for disconnecting and connecting battery!
Observe notes on power supply / on intelligent battery sensor (IBS).

Necessary preliminary tasks:

- Remove luggage compartment floor trim panel with fitted mat, see **51 47 102 REMOVING AND INSTALLING/REPLACING LUGGAGE COMPARTMENT FLOOR TRIM PANEL**

Version with intelligent battery sensor (IBS):

Loosen nut (1).

Tightening torque: 61 21 1AZ, see **61 21 BATTERY WITH TERMINAL** .

**IMPORTANT: Do not under any circumstances use force to pull off pole shoe.
Do not under any circumstances release socket head cap screw of IBS (2).**

Detach battery negative lead (3) with IBS (2) in upward direction, lay to one side and secure.

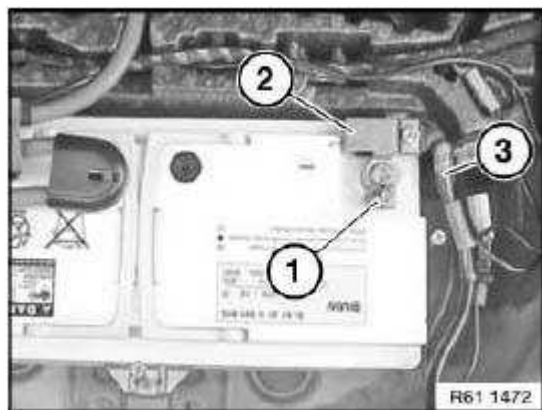


Fig. 140: Identifying Head Cap Screw Of IBS
Courtesy of BMW OF NORTH AMERICA, INC.

Version without intelligent battery sensor (IBS):

Disconnect battery negative lead (1).

IMPORTANT: Cover battery negative terminal post and secure negative lead (1) at side.

Tightening torque: 61 21 1AZ, see **61 21 BATTERY WITH TERMINAL** .

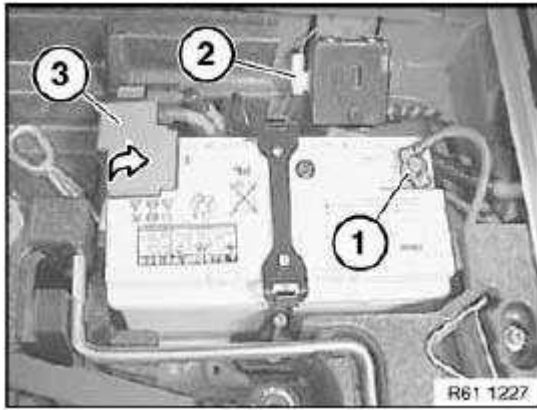


Fig. 141: Identifying Plug Connection

Courtesy of BMW OF NORTH AMERICA, INC.

61 20 908 PERFORMING BATTERY "POWER RESET" (FOR PROGRAMMING/CODING CONTROL UNIT(S))

IMPORTANT: Observe safety instructions for handling vehicle battery, see 61 00 ... Safety instructions for handling vehicle battery

The following steps must be carried out for a "power reset":

- Switch off and disconnect battery charger
- Switch off ignition

Cars with ignition key: Turn ignition key to 0 position

Cars with identification sensor: Remove identification sensor from slot

Cars with comfort access system: Make sure terminal is in 0 position

- Disconnect battery negative terminal
- Reconnect battery negative terminal (to ensure bus activity)
- Waiting time (5-10 seconds)
- Disconnect battery negative terminal
- Waiting time (1 minute)
- Connect battery negative terminal and tighten, tightening torque: 61 21 1AZ, see **61 21 BATTERY WITH TERMINAL** .
- Connect and switch on battery charger
- Switch ignition on

21 BATTERY REMOVAL

61 20 900 DISCONNECTING AND CONNECTING BATTERY NEGATIVE LEAD

**WARNING: Observe safety instructions for handling vehicle battery.
Follow instructions for disconnecting and connecting battery!
Observe notes on power supply / on intelligent battery sensor (IBS).**

Necessary preliminary tasks:

- Remove luggage compartment floor trim panel with fitted mat, see **51 47 102 REMOVING AND INSTALLING/REPLACING LUGGAGE COMPARTMENT FLOOR TRIM PANEL**

Version with intelligent battery sensor (IBS):

Loosen nut (1).

Tightening torque: 61 21 1AZ, see **61 21 BATTERY WITH TERMINAL** .

**IMPORTANT: Do not under any circumstances use force to pull off pole shoe.
Do not under any circumstances release socket head cap screw of IBS (2).**

Detach battery negative lead (3) with IBS (2) in upward direction, lay to one side and secure.

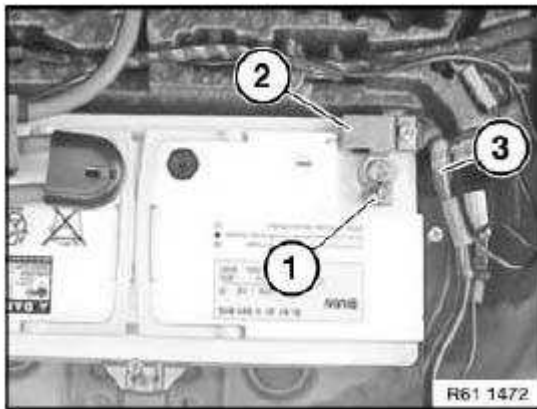


Fig. 142: Identifying Head Cap Screw Of IBS
Courtesy of BMW OF NORTH AMERICA, INC.

Version without intelligent battery sensor (IBS):

Disconnect battery negative lead (1).

IMPORTANT: Cover battery negative terminal post and secure negative lead (1) at side.

Tightening torque: 61 21 1AZ, see **61 21 BATTERY WITH TERMINAL** .

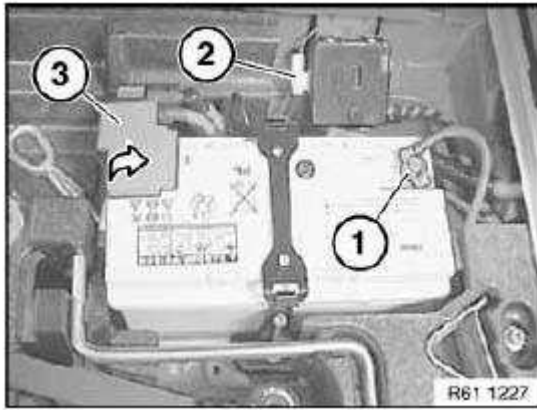


Fig. 143: Identifying Plug Connection

Courtesy of BMW OF NORTH AMERICA, INC.

61 20 908 PERFORMING BATTERY "POWER RESET" (FOR PROGRAMMING/CODING CONTROL UNIT(S))

IMPORTANT: Observe safety instructions for handling vehicle battery, see 61 00 ... Safety instructions for handling vehicle battery

The following steps must be carried out for a "power reset":

- Switch off and disconnect battery charger
- Switch off ignition

Cars with ignition key: Turn ignition key to 0 position

Cars with identification sensor: Remove identification sensor from slot

Cars with comfort access system: Make sure terminal is in 0 position

- Disconnect battery negative terminal
- Reconnect battery negative terminal (to ensure bus activity)
- Waiting time (5-10 seconds)
- Disconnect battery negative terminal
- Waiting time (1 minute)
- Connect battery negative terminal and tighten, tightening torque: 61 21 1AZ, see **61 21 BATTERY WITH TERMINAL** .
- Connect and switch on battery charger
- Switch ignition on

61 21 010 REMOVING AND INSTALLING BATTERY

WARNING: Observe safety instructions for handling vehicle battery, see 61 00 ... Safety instructions for handling vehicle battery

Necessary preliminary tasks:

- Remove luggage compartment floor trim panel, see **51 47 102 REMOVING AND INSTALLING/REPLACING LUGGAGE COMPARTMENT FLOOR TRIM PANEL**

Unfasten plug connection (2) and disconnect.

Disconnect battery negative lead, see **61 20 900 Disconnecting and connecting battery negative lead**

Open positive terminal cover (3).

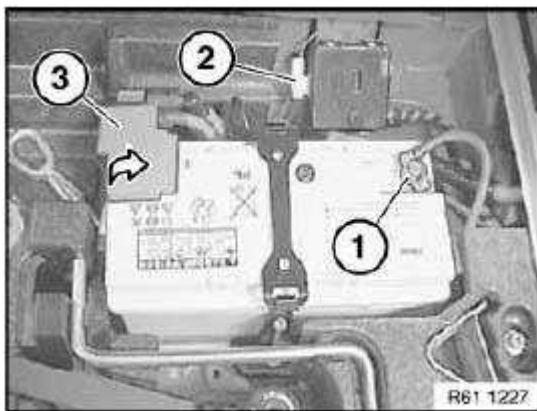


Fig. 144: Identifying Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Release nut (1) of safety battery terminal (2), tightening torque: 61 21 1AZ, see **61 21 BATTERY WITH TERMINAL** .

IMPORTANT: Do not under any circumstances pull/lever safety battery terminal (2) off by force.

Detach safety battery terminal (2) towards top, lay to one side and secure.

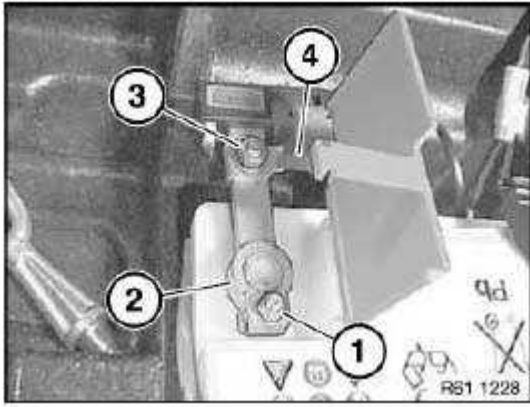


Fig. 145: Identifying Battery Terminal And Nut
 Courtesy of BMW OF NORTH AMERICA, INC.

Release threaded pin (1).

Fold upper holder (3) up.

Take off holder (2).

Detach vent (6) in direction of arrow.

Fold both clips (4) open.

Lift out battery (5).

Installation:

Make sure battery (5) is correctly seated in associated mounts.

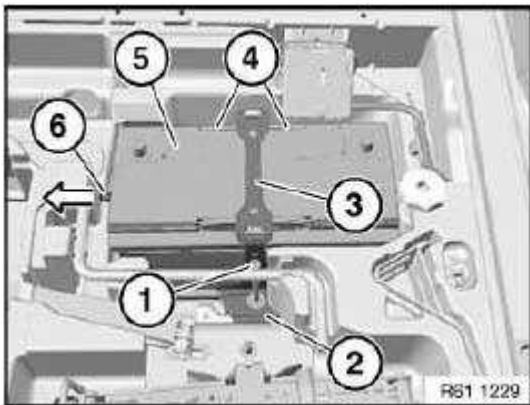
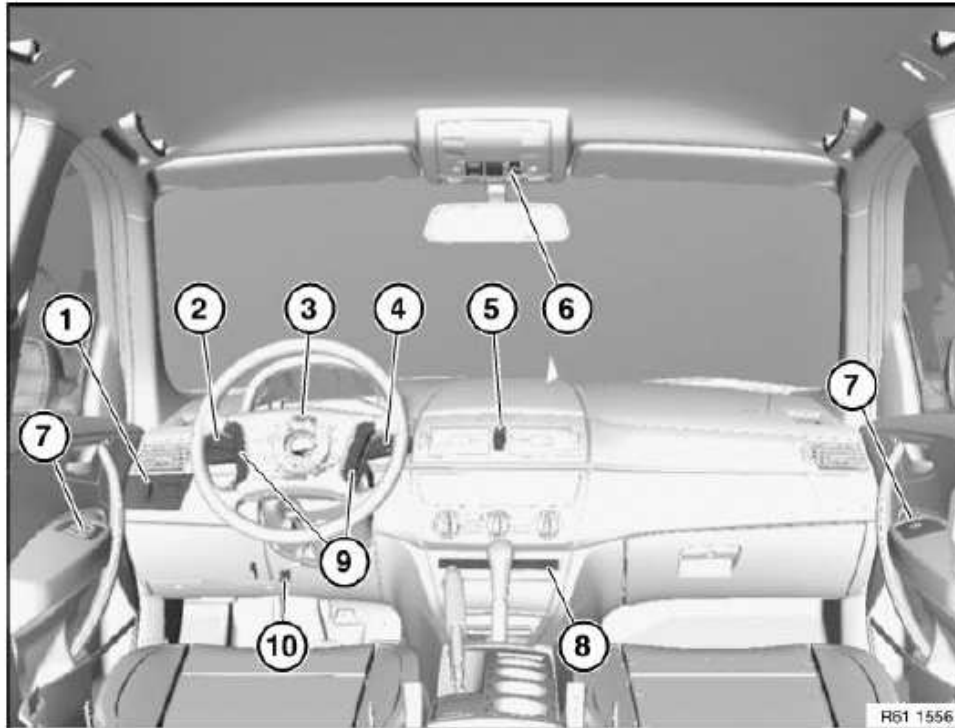


Fig. 146: Detaching Vent
 Courtesy of BMW OF NORTH AMERICA, INC.

31 SWITCH

61 31 .. OVERVIEW OF SWITCHES



- | | | | |
|---|--|----|---|
| 1 | Light operating unit | 6 | Switch for slide/tilt sunroof |
| 2 | Turn signal/headlight dipping stalk | 7 | Toggle switch for power window control |
| 3 | Fixture for steering column stalk | 8 | Switch unit on center console |
| 4 | Windscreen wiper switch | 9 | Switch for sport steering wheel |
| 5 | Switch for hazard warning system/central locking | 10 | Brake light switch / clutch switch module |

Fig. 147: Identifying Switches Components

Courtesy of BMW OF NORTH AMERICA, INC.

61 31 005 REMOVING AND INSTALLING/REPLACING FIXTURE FOR STEERING COLUMN STALK

WARNING: Move wheels into straight-ahead position and do not alter this position during the repair work.
With steering wheel removed, do not under any circumstances turn/twist fixture for steering column stalk!

Necessary preliminary tasks:

- Remove steering wheel, see [32 33 000 REMOVING AND INSTALLING/REPLACING STEERING WHEEL \(FROM 09/2006\)](#)

- Remove lower section of steering column trim, see **32 31 020 REMOVING AND INSTALLING / REPLACING LOWER SECTION OF STEERING COLUMN TRIM**
- Remove top section of steering column casing, see **32 31 003 REPLACING UPPER SECTION OF STEERING COLUMN TRIM** .

Unlock and disconnect plug connections (1) on turn indicator/headlight dipping stalk and on windscreen wiper stalk.

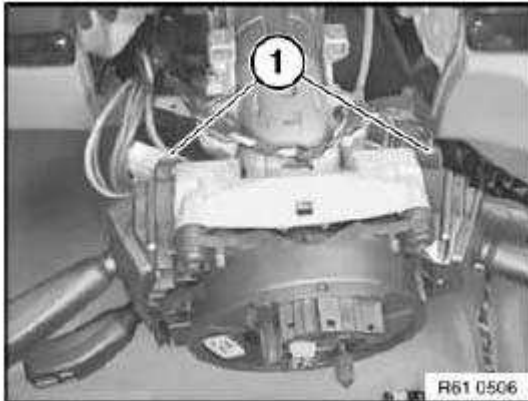


Fig. 148: Identifying Plug Connections
 Courtesy of BMW OF NORTH AMERICA, INC.

Unlock and disconnect plug connections (1) on fixture for steering column stalk.

If necessary, unlock and disconnect plug connection (2) on steering column adjustment stalk.

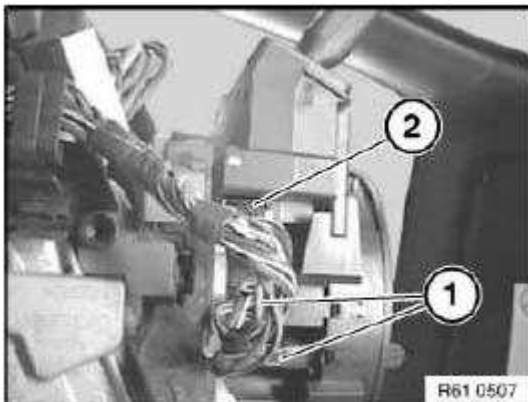


Fig. 149: Identifying Plug Connections
 Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Remove fixture for steering column stalk (2).

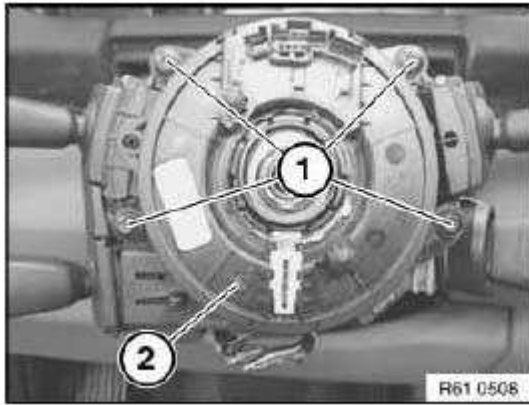


Fig. 150: Identifying Fixture And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: When removed, the cover (1) of the fixture for the steering column stalk (2) is secured against turning/twisting by the lock (3). Do not under any circumstances twist the cover (1) out of its centered position against the fixture for the steering column stalk (2).

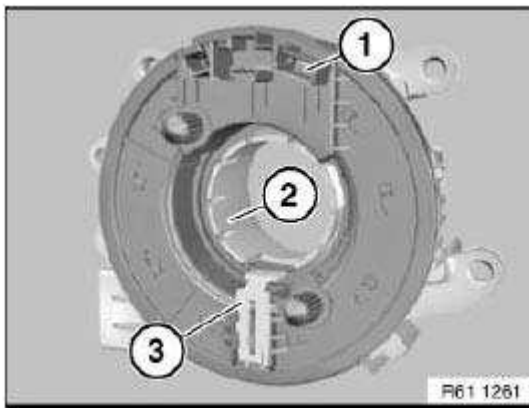


Fig. 151: Identifying Cover Of Fixture For Steering Column Stalk
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock clips and pull out stalk for windscreen wipers (1).

NOTE: If necessary, remove steering column adjustment stalk (2).
Raise lock in direction of arrow and pull out stalk for steering column adjustment (2) in direction of arrow.

Unlock clips and pull out turn indicator/dimmer stalk (3) towards top.

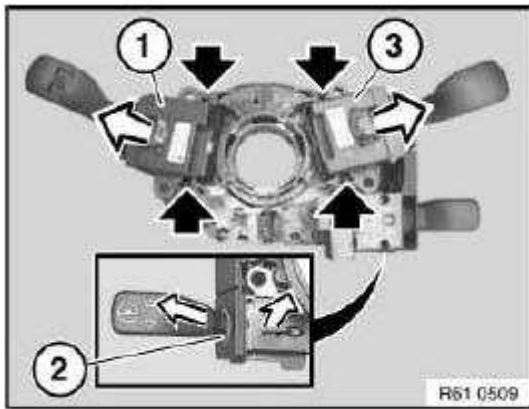


Fig. 152: Pulling Out Stalk For Steering Column Adjustment
 Courtesy of BMW OF NORTH AMERICA, INC.

61 31 016 REMOVING AND INSTALLING/REPLACING TURN INDICATOR/HEADLIGHT DIPPING SWITCH

Necessary preliminary tasks:

- Disconnect battery negative lead, see **61 20 900 Disconnecting and connecting battery negative lead**
- Remove fixture for steering column stalks, see **61 31 005 Removing and installing/replacing fixture for steering column stalk**
- **E85, E86 only:** Remove cruise control switch

Press locks (1) and feed direction indicator/dipping stalk (2) in direction of arrow out of fixture for steering column stalk (3).

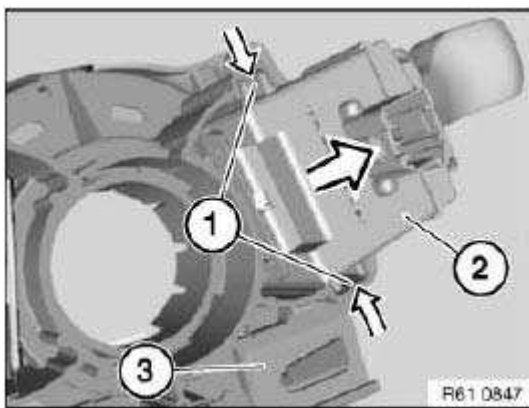


Fig. 153: Pressing Locks And Feed Direction Indicator/Dipping Stalk
 Courtesy of BMW OF NORTH AMERICA, INC.

61 31 020 REMOVING AND INSTALLING/REPLACING IGNITION STARTER SWITCH

Necessary preliminary tasks:

- Disconnect battery negative lead, see **61 20 900 Disconnecting and connecting battery negative lead**
- Remove lower section of steering column trim, see **32 31 020 REMOVING AND INSTALLING / REPLACING LOWER SECTION OF STEERING COLUMN TRIM**

Remove sealing varnish and release headless setscrews (1).

Detach ignition starter switch (2) in direction of arrow.

Installation:

Secure headless setscrews (1) with sealing varnish.

Open lock (3) in direction of arrow and disconnect plug (4) from ignition starter switch (2).

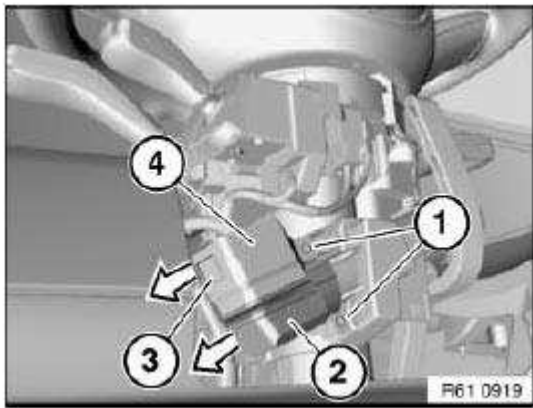


Fig. 154: Opening Lock

Courtesy of BMW OF NORTH AMERICA, INC.

61 31 037 REMOVING AND INSTALLING/REPLACING LIGHT CONTROL UNIT

Special tools required:

- 00 9 341

Necessary preliminary tasks:

- Remove left fresh-air grill, see **64 22 135 REMOVING AND INSTALLING/REPLACING LEFT FRESH-AIR GRILL**

Fit special tool 00 9 341 at side as illustrated.

Lever out lighting control unit (1) all round.

Unlock and disconnect associated plug connection, remove lighting control unit (1) in direction of arrow.

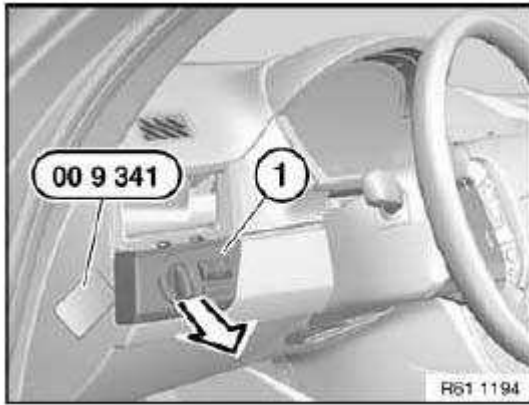


Fig. 155: Identifying Special Tool (00 9 341)
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

If necessary, remove felt strip (1) from instrument panel (2).

Installation:

Make sure lighting control unit is correctly seated in instrument panel (2).

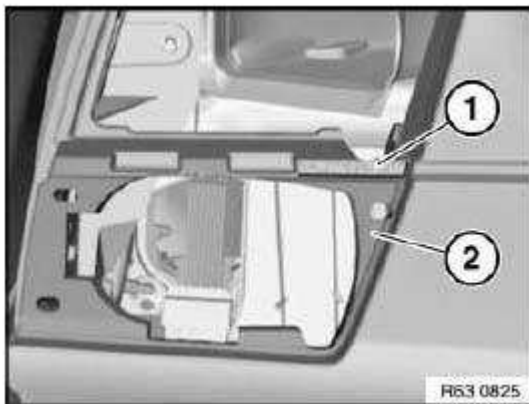


Fig. 156: Identifying Felt Strip From Instrument Panel
Courtesy of BMW OF NORTH AMERICA, INC.

61 31 040 REMOVING AND INSTALLING/REPLACING SWITCH FOR WINDSCREEN WIPERS

Necessary preliminary tasks:

- Disconnect battery negative lead, see **61 20 900 Disconnecting and connecting battery negative lead**
- Remove fixture for steering column stalks, see **61 31 005 Removing and installing/replacing fixture for steering column stalk**

Press locks (1) and windshield wiper stalk (2) in direction of arrow out of fixture for steering column stalk (3).

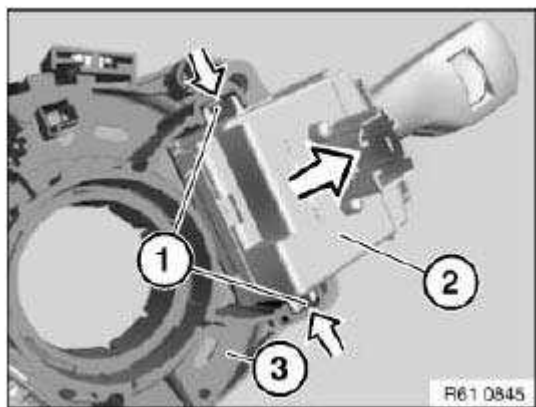


Fig. 157: Pressing Locks And Windshield Wiper Stalk
Courtesy of BMW OF NORTH AMERICA, INC.

61 31 057 REMOVING AND INSTALLING/REPLACING SWITCH UNIT IN CENTER CONSOLE

Necessary preliminary tasks:

- Remove operator unit for heater/air conditioner, see **64 11 377 REMOVING AND INSTALLING CONTROL PANEL FOR HEATER - A/C SYSTEM (REPLACING, AUTOMATIC AIR CONDITIONING)**

Press out switch unit in storage tray (1) in direction of arrow.

Unlock and disconnect associated plug connection (2), remove switch unit in storage tray (1).

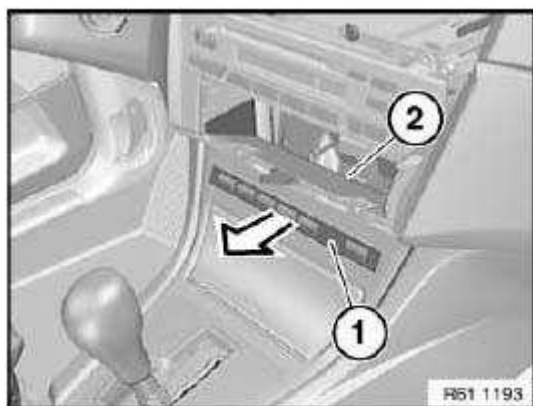


Fig. 158: Pressing Out Switch Unit In Storage Tray
Courtesy of BMW OF NORTH AMERICA, INC.

61 31 069 REMOVING AND INSTALLING/REPLACING INDICATOR FOR FRONT PASSENGER AIRBAG DEACTIVATION

Necessary preliminary tasks:

- Remove front roofliner trim, see **51 44 ... REMOVING AND INSTALLING FRONT ROOFLINER TRIM**

Press locks (1) and unclip indicator for front passenger airbag deactivation (2) in direction of arrow from front roofliner trim (3).

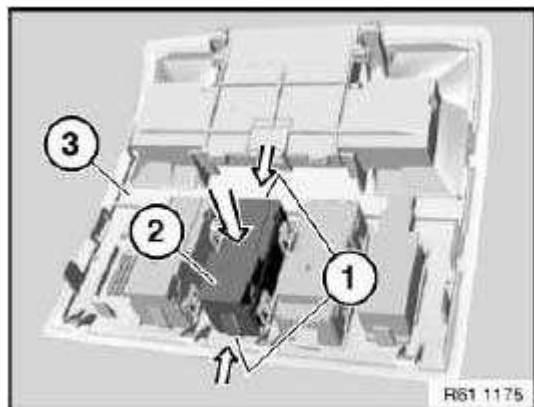


Fig. 159: Pressing Locks And Unclip Indicator
Courtesy of BMW OF NORTH AMERICA, INC.

61 31 079 REMOVING AND INSTALLING/REPLACING SWITCH FOR HAZARD WARNING FLASHERS/CENTRAL LOCKING

Special tools required:

- **64 1 020 RELEASE HOOK**

Lever out switch for hazard warning system/central locking (1) with special tool 64 1 020 and pull back.

Disconnect associated plug connection and remove switch for hazard warning system/central locking (1).

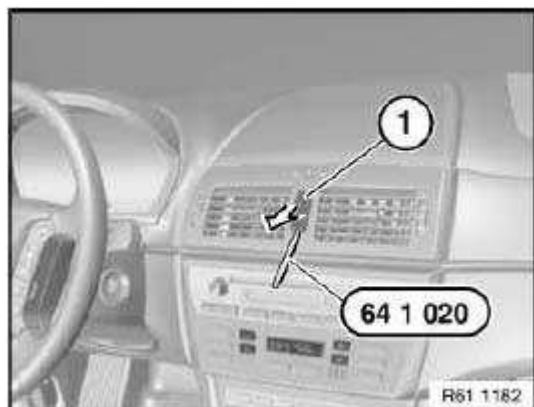


Fig. 160: Identifying Special Tool (64 1 020)

Courtesy of BMW OF NORTH AMERICA, INC.

61 31 115 REPLACING ROCKER SWITCH FOR SIDE WINDOW OPERATION (FRONT)

Special tools required:

- 00 9 341

Carefully lever out rocker switch for side window operation (1) with special tool 00 9 341 at specified points.

Feed rocker switch for side window operation (1) out of front door trim panel (2).

Disconnect associated plug connection and remove rocker switch for side window operation (1).

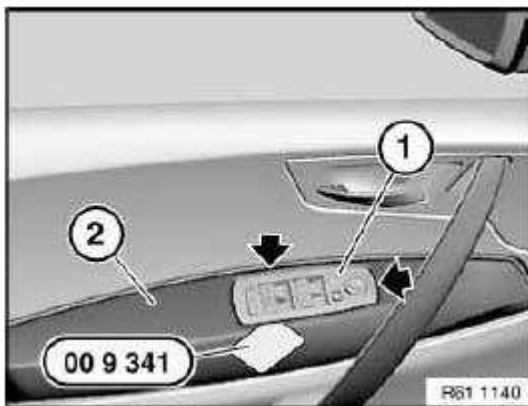


Fig. 161: Identifying Special Tool (00 9 341)

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Retaining hooks (1) of rocker switch for side window operation (2) must not be damaged.

Make sure rocker switch for side window operation (2) is correctly seated.

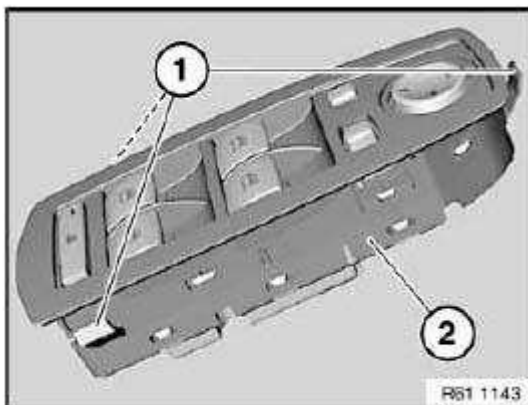


Fig. 162: Identifying Retaining Hooks Of Rocker Switch
Courtesy of BMW OF NORTH AMERICA, INC.

61 31 116 REPLACING ROCKER SWITCH FOR SIDE WINDOW OPERATION (REAR)

Special tools required:

- 00 9 317 **00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)**

IMPORTANT: Comply with the following work steps in order to avoid damaging the door trim panel and rocker switch.
To avoid damaging leather armrests, wrap front end of special tool 00 9 317 in fabric adhesive tape.

Procedure:

- Slide special tool 00 9 317 under rocker switch for side window operation (1) (do not lift the switch in the process).
- Slide rocker switch (1) with special tool 00 9 317 towards rear and lever out.

Feed rocker switch (1) out of rear door trim panel (2) and disconnect plug connection.

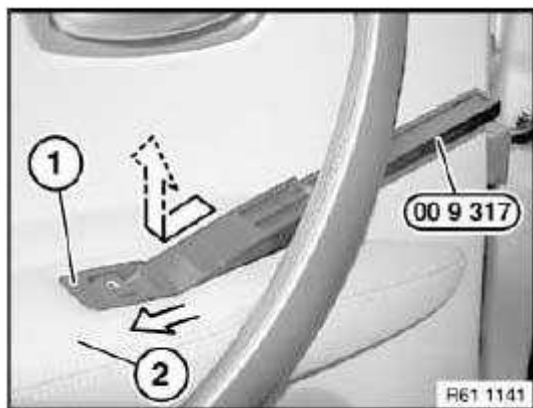


Fig. 163: Identifying Special Tool (00 9 317)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Retaining hooks (1) of rocker switch for side window operation (2) must not be damaged.

Make sure rocker switch for side window operation (2) is correctly seated.

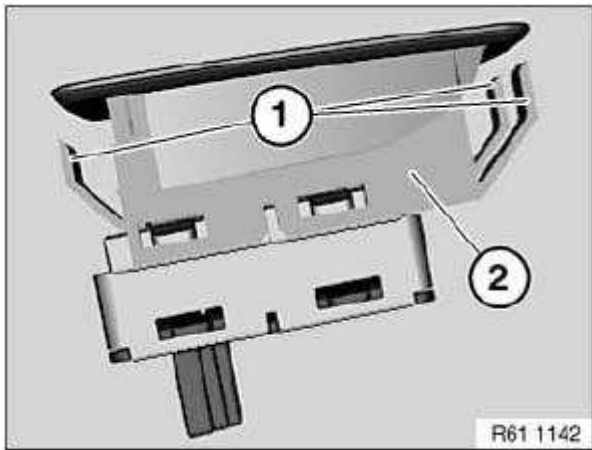


Fig. 164: Identifying Retaining Hooks Of Rocker Switch
 Courtesy of BMW OF NORTH AMERICA, INC.

61 31 175 REMOVING AND INSTALLING/REPLACING SWITCH FOR SLIDE/TILT SUNROOF

Necessary preliminary tasks:

- Remove front roofliner trim, see **51 44 ... REMOVING AND INSTALLING FRONT ROOFLINER TRIM**

Press catches (1) and unclip switch for slide/tilt sunroof (2) in direction of arrow from front roofliner trim (3).

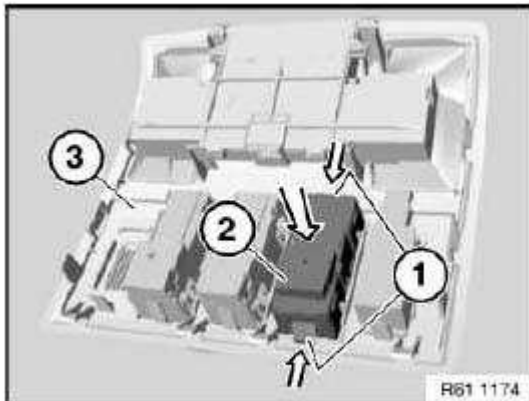


Fig. 165: Pressing Catches And Unclip Switch
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

- Initialise slide/tilt sunroof.

61 31 176 REMOVING AND INSTALLING/REPLACING EMERGENCY CALL BUTTON

Necessary preliminary tasks:

- Remove front roofliner trim, see **51 44 ... REMOVING AND INSTALLING FRONT ROOFLINER TRIM**

Press catches (1) and unclip emergency call button (2) in direction of arrow from front roofliner trim (3).

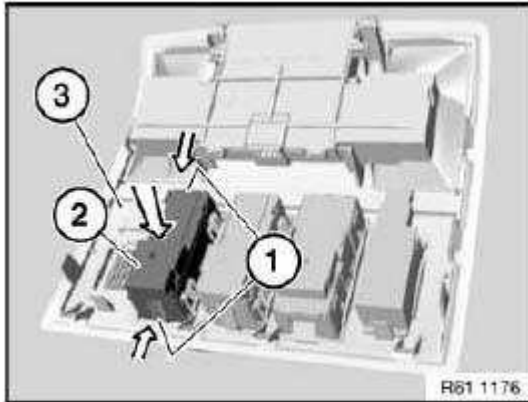


Fig. 166: Pressing Catches And Unclip Emergency Call Button
Courtesy of BMW OF NORTH AMERICA, INC.

61 31 204 REPLACING SWITCH COMBINATION FOR SEAT ADJUSTMENT

This operation is described in:

"Removing outer cover on front seat", see **52 14 040 REMOVING AND INSTALLING/REPLACING OUTER COVER ON FRONT LEFT OR RIGHT SEAT (NORMAL/ELECTRIC)** .

All models except Convertible:

Carry out programming/coding, see **Vehicle programming and coding**.

61 31 208 REMOVING AND INSTALLING/REPLACING SWITCH FOR FRONT LUMBAR SUPPORT

This operation is described in:

"Removing outer cover on front seat" see **52 13 040 REMOVING AND INSTALLING / REPLACING OUTER COVER ON LEFT OR RIGHT FRONT SEAT BACK-REST (NORMAL / MANUAL)** .

61 31 225 REPLACING SWITCH ON IMPACT CUSHION FOR LEFT AND RIGHT AIRBAGS

Necessary preliminary tasks:

- Remove airbag unit, see **32 34 020 REMOVING AND INSTALLING/REPLACING AIRBAG UNIT (FROM 09/2006)**

Disconnect plug connections (1).

Loosen screws (2).

Feed out switch on impact cushion for airbag (3) in each case in direction of arrow from airbag unit (4) and remove.

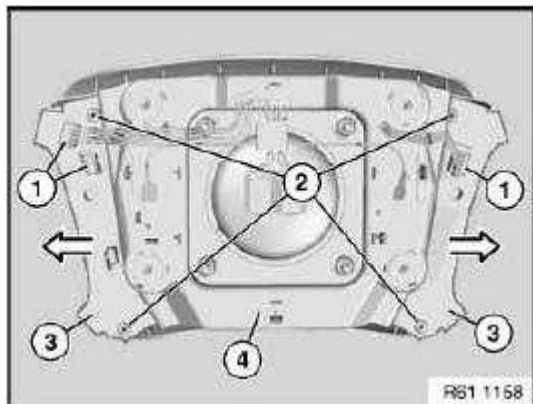


Fig. 167: Disconnecting Plug Connections

Courtesy of BMW OF NORTH AMERICA, INC.

61 31 228 REPLACING SWITCH ON SPORTS STEERING WHEEL

Necessary preliminary tasks:

- Remove steering wheel, see **32 33 000 REMOVING AND INSTALLING/REPLACING STEERING WHEEL (FROM 09/2006)**

Release screws (1) on sports steering wheel (2).

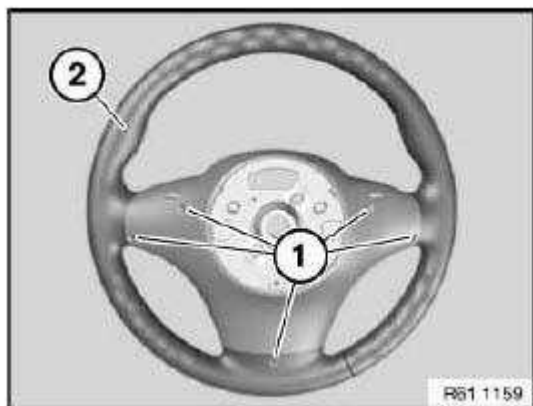


Fig. 168: Identifying Sports Steering Wheel Screw

Courtesy of BMW OF NORTH AMERICA, INC.

Unclip complete trim (1) in direction of arrow from mountings (2) and remove from sports steering wheel (3).

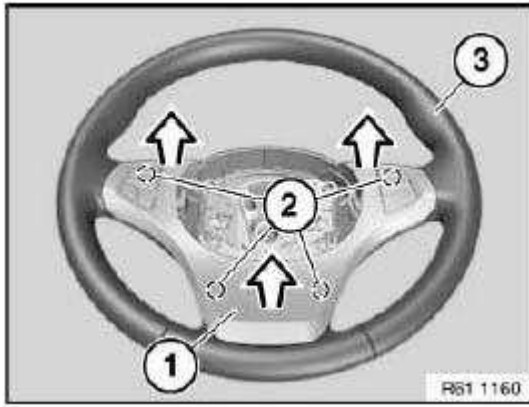


Fig. 169: Unclipping Trim

Courtesy of BMW OF NORTH AMERICA, INC.

Loosen screws (2).

Remove both switches on sports steering wheel (1) together from trim (5).

Installation:

Make sure wiring harness (4) is correctly laid in associated mountings (3).

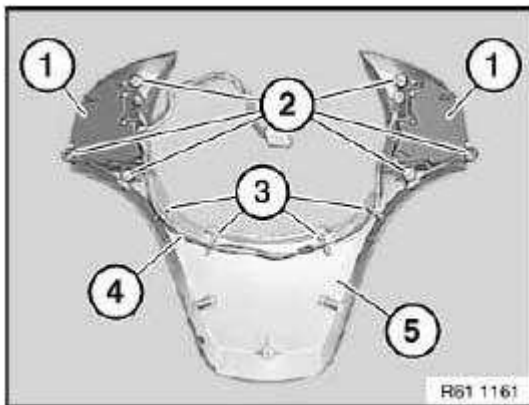


Fig. 170: Identifying Sports Steering Wheel Switches

Courtesy of BMW OF NORTH AMERICA, INC.

61 31 241 REMOVING AND INSTALLING/REPLACING ENGINE HOOD CONTACT SWITCH

Unfasten plug connection (1) and disconnect.

Press catches (2) together and feed hood contact switch (4) in direction of arrow out of fixture (3).

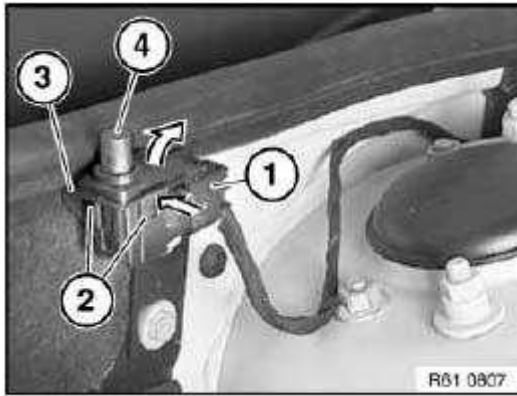


Fig. 171: Unfastening Plug Connection
 Courtesy of BMW OF NORTH AMERICA, INC.

61 31 255 REPLACING SWITCH FOR OUTSIDE MIRROR

This operation is described in:

Replacing rocker switch for side window operation, see **61 31 115 Replacing rocker switch for side window operation (front)**.

61 31 270 REMOVING AND INSTALLING/REPLACING SWITCH FOR REVERSING LIGHT

Unfasten plug connection (1) and disconnect.

Unfasten switch for reversing light (2), tightening torque: 23 41 5AZ, see **23 41 EXTERNAL GEARSHIFT COMPONENTS** .

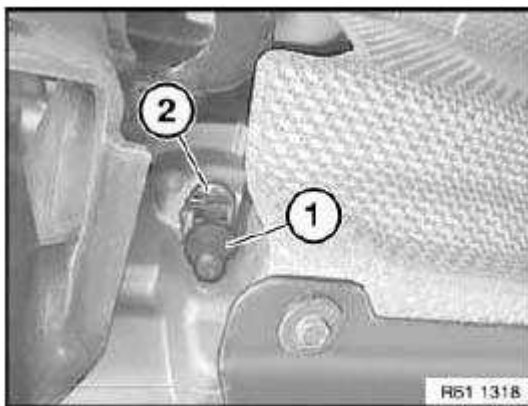


Fig. 172: Identifying Plug Connection And Reversing Light
 Courtesy of BMW OF NORTH AMERICA, INC.

61 31 299 REMOVING AND INSTALLING/REPLACING CLUTCH SWITCH MODULE

Necessary preliminary tasks:

- Remove trim panel for pedal assembly, see **51 45 185 REMOVING AND INSTALLING/REPLACING TRIM FOR PEDAL ASSEMBLY** .

NOTE: Clutch master cylinder (2) is removed for purposes of clarity.

Lever out clutch switch module (1) from clutch master cylinder (2) with screwdriver.

Unlock plug (4) and disconnect from housing (3).

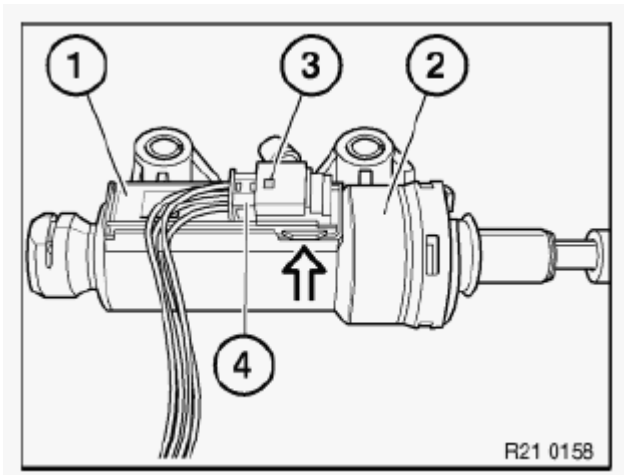


Fig. 173: Identifying Clutch Master Cylinder And Clutch Switch Module
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Clutch switch module is secured against incorrect installation.

Clutch switch module must snap audibly into place.

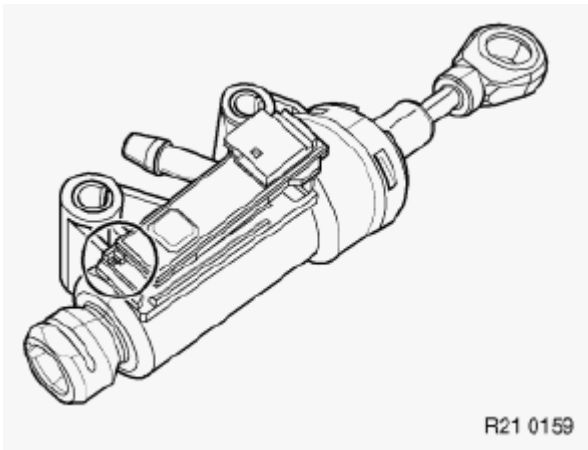


Fig. 174: Identifying Clutch Switch Module
Courtesy of BMW OF NORTH AMERICA, INC.

61 31 310 REPLACING BRAKE-LIGHT SWITCH

Necessary preliminary tasks:

- Remove trim panel for pedal assembly, see **51 45 185 REMOVING AND INSTALLING/REPLACING TRIM FOR PEDAL ASSEMBLY** .

NOTE: Brake light switch (2) is situated above the brake pedal.

Disconnect plug connection (1).

Pull brake light switch (2) in direction of arrow out of brake light switch holder (3).

Press catches (4) together and unclip brake light switch holder (3) from brake pedal.

Installation:

Depress brake pedal.

Slide brake light switch (2) as far as it will go into brake light switch holder (3).

Grip brake light switch holder (3), slowly return brake pedal to starting position and pull back to stop.

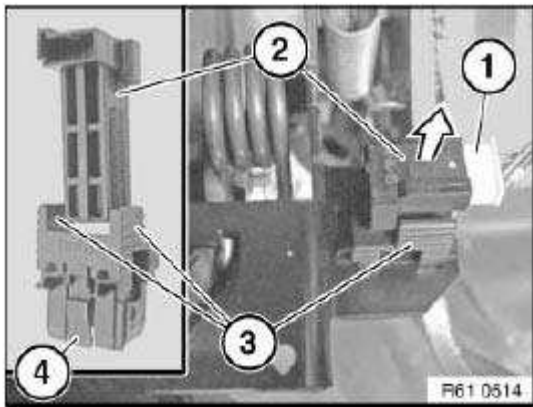


Fig. 175: Identifying Brake Light Switch
Courtesy of BMW OF NORTH AMERICA, INC.

61 31 382 REPLACING LEVEL SWITCH FOR COOLANT

WARNING: Danger of scalding!
Only perform this work after engine has cooled down.

Release screws (1).

Unlock plug connection for coolant level switch (4) and disconnect.

Pull coolant expansion tank (2) in direction of arrow out of grommet (3) underneath.

Installation:

Make sure coolant expansion tank (2) is correctly seated in grommet (3).

If necessary, replace grommet (3).

IMPORTANT: Do not damage connected water hoses.
Reposition coolant expansion tank (2) as far as possible until coolant level switch (4) forms the highest point. This will prevent coolant from escaping on opening.
If necessary, catch escaping coolant and feed back in later.

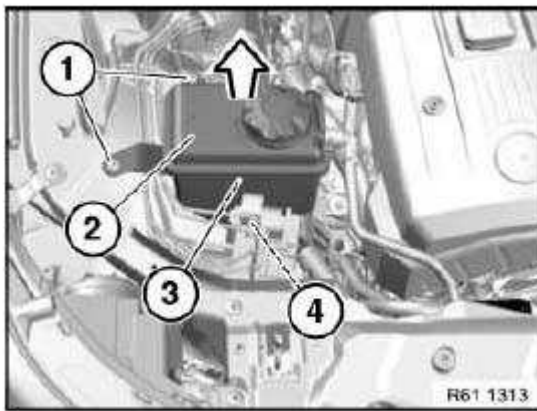


Fig. 176: Pulling Coolant Expansion Tank
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: For purposes of clarity, illustration shows coolant expansion tank (2) removed.

Turn coolant level switch (1) in direction of arrow, pull upwards out of coolant expansion tank (2) and remove.

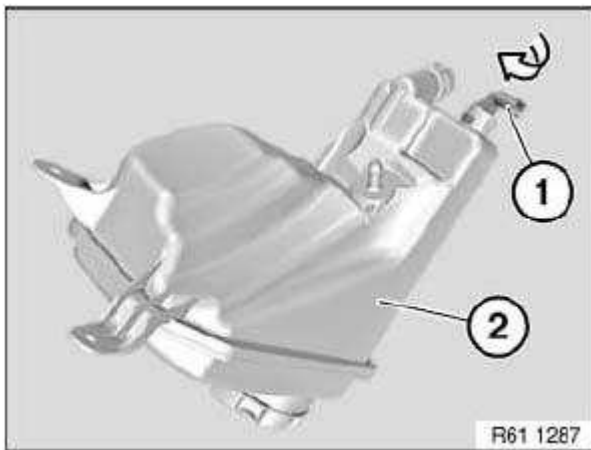


Fig. 177: Turning Coolant Level Switch

Courtesy of BMW OF NORTH AMERICA, INC.

61 31 440 REMOVING AND INSTALLING/REPLACING TEMPERATURE SWITCH FOR HEATED WINDSHIELD SPRAY JETS

Necessary preliminary tasks:

- **E52:** Detach front right wheel arch cover (front section)
- **E83:** Remove front underbody protection, see **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION**

If necessary, unlock associated plug connection and disconnect.

Unclip temperature switch for heated windshield spray jets (1) in direction of arrow and remove.

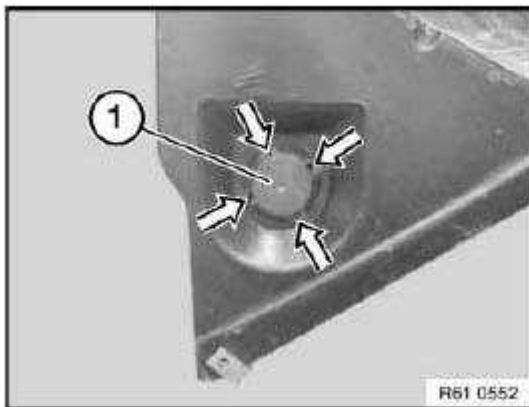


Fig. 178: Identifying Heated Windshield Spray Jets

Courtesy of BMW OF NORTH AMERICA, INC.

61 31 465 REMOVING AND INSTALLING/REPLACING RELAY/MODULE (IN DEVICE HOLDER ON LEFT)

Necessary preliminary tasks:

- Remove luggage compartment floor trim panel, see **51 47 102 REMOVING AND INSTALLING/REPLACING LUGGAGE COMPARTMENT FLOOR TRIM PANEL**
- Disconnect battery negative lead, see **61 20 900 Disconnecting and connecting battery negative lead**

Release screws (1).

Remove electronics box cover (2).

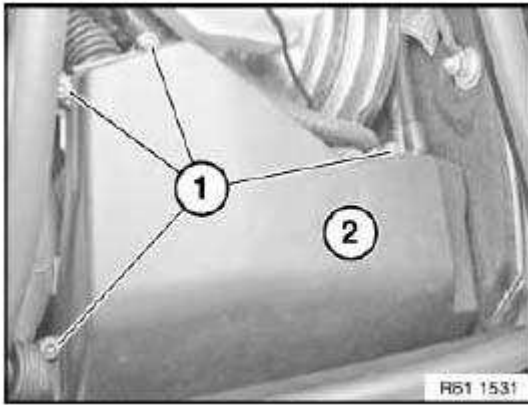


Fig. 179: Identifying Electronics Box Cover Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Detach relay.



Fig. 180: Identifying Relay
Courtesy of BMW OF NORTH AMERICA, INC.

61 31 470 REMOVING AND INSTALLING/REPLACING RELAY/MODULE (IN INSTRUMENT PANEL AT BOTTOM RIGHT)

Necessary preliminary tasks:

- Remove luggage compartment floor trim panel, see **51 47 102 REMOVING AND INSTALLING/REPLACING LUGGAGE COMPARTMENT FLOOR TRIM PANEL**
- Disconnect battery negative lead, see **61 20 900 Disconnecting and connecting battery negative lead**
- Remove right glovebox with housing, see **51 16 366 REMOVING AND INSTALLING RIGHT GLOVEBOX WITH HOUSING**

Detach relay.

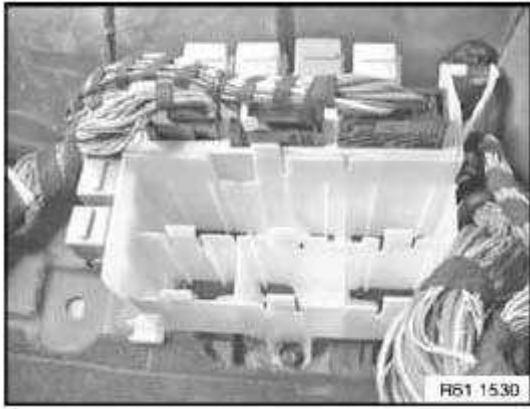


Fig. 181: Identifying Relay

Courtesy of BMW OF NORTH AMERICA, INC.

61 31 492 REPLACING LEVEL SWITCH FOR WINDSCREEN WASHER SYSTEM

This operation is described in:

"Replacing fluid reservoir for windscreen washer system", see **61 71 061 Replacing fluid reservoir for windshield washer system**

61 31 996 CARRY OUT STEERING ANGLE SENSOR ADJUSTMENT

IMPORTANT: In vehicles with active front steering, steering angle sensor adjustment is integrated in the service function "Initial operation/adjustment for active front steering" and must not be carried out separately!

NOTE: **Steering angle sensor adjustment must be carried out:**

- after adjustment work on the front axle/steering
- after all mechanical work on the steering system
- after replacement / coding / programming of the following components:
 - Fixture for switches of steering column / switch cluster / steering angle sensor
 - Dynamic Stability Control (DSC) control unit
 - Control unit active anti-roll stabilization (ARS)

Connect vehicle to BMW diagnosis system or Software Service Station.

Select and carry out steering angle sensor adjustment under Service functions.

33 HORN

61 33 040 REMOVING AND INSTALLING/REPLACING A FANFARE HORN (LEFT OR RIGHT)

Necessary preliminary tasks:

- Remove front underbody protection, see **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION**

Unfasten plug connection (1) and disconnect.

Release nut (2) and remove fanfare horn (3).

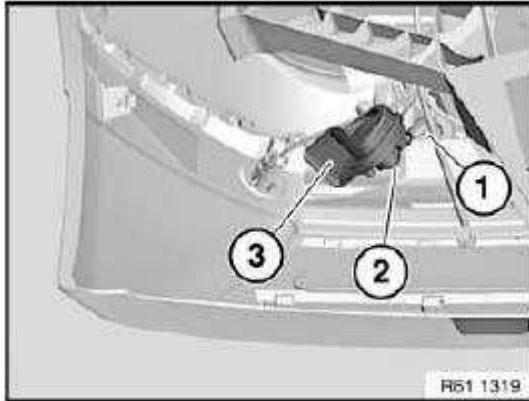
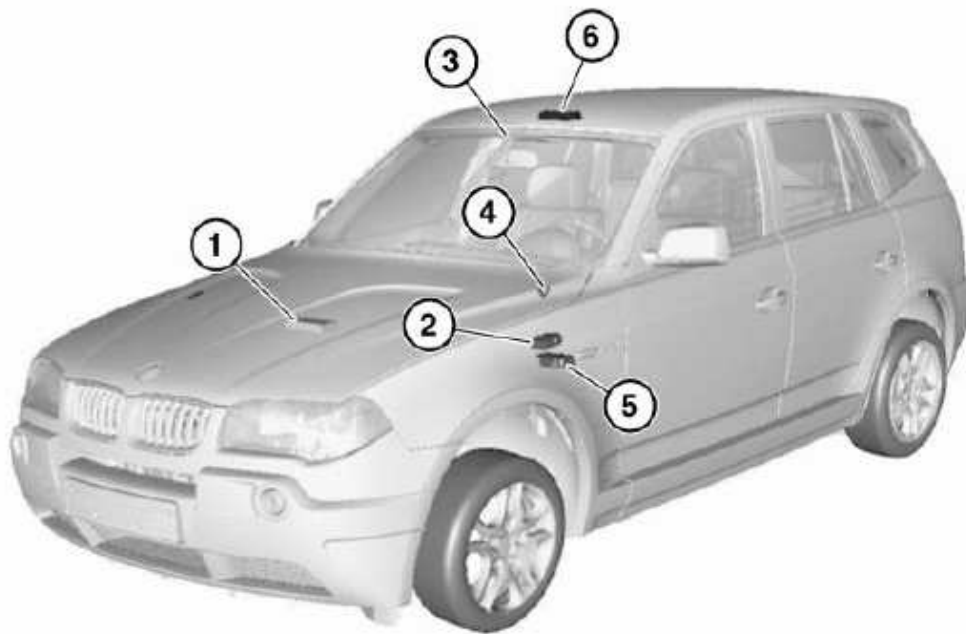


Fig. 182: Identifying Plug Connection And Fanfare Horn
Courtesy of BMW OF NORTH AMERICA, INC.

35 ECUS, MODULES

61 35 .. OVERVIEW OF CONTROL UNITS



R61 1555

- | | | | |
|---|--|---|--|
| 1 | General module | 4 | Ring antenna of electronic immobilizer |
| 2 | Control unit, electronic immobilizer | 5 | Control unit, light module |
| 3 | Rain/light sensor | 6 | Control unit, slide/tilt sunroof |

Fig. 183: Identifying Control Units Components
 Courtesy of BMW OF NORTH AMERICA, INC.

61 35 ... NOTES ON ESD PROTECTION (ELECTRO STATIC DISCHARGE)

Special tools required:

- 12 7 060 ANTISTATIC MAT (ESD)

NOTE: Electrical components which are particularly sensitive to electrostatic discharge (electronic control units, sensors, etc.) are marked with the ESD warning symbol.

E -Electro

S -Static

D -Discharge

IMPORTANT: Read and comply without fail with the notes on this subject from Service Information 2 06 04 128 .

Statically charged persons can discharge by touching electrical components.

NOTE: Humans can only detect a discharge starting from a level of approx. 3000 V. The danger threshold for electrical components already starts from a level of approx. 100 V.

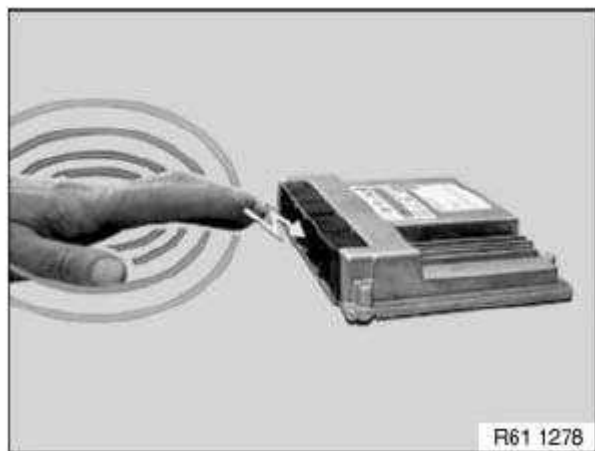


Fig. 184: Touching Electrical Components
Courtesy of BMW OF NORTH AMERICA, INC.

Example:

Mechatronic control unit.

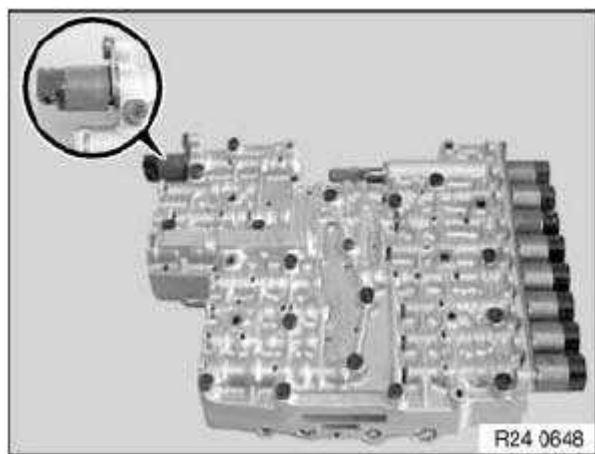


Fig. 185: Identifying Mechatronic Control Unit
Courtesy of BMW OF NORTH AMERICA, INC.



Fig. 186: Precaution For - Do Not Touch Pins Or Multi-Pin Connectors Directly
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not touch pins or multi-pin connectors directly!

Touch electrical components by their housings only.

IMPORTANT: To prevent electrical components from being damaged or destroyed by electrostatic discharge, it is absolutely essential to comply with the following instructions:

- **When replacing electrical components, leave the replacement components in their original packaging until immediately before they are to be installed**
- **If necessary, always return a removed component in its original packaging (always pack the component away immediately)**
- **Read and comply with user information on using the associated special tool 12 7 060**

61 35 000 REMOVING AND INSTALLING/REPLACING MODULE (FOR TRAILER TWO HITCH)

Necessary preliminary tasks:

- Remove luggage compartment floor trim panel, see **51 47 102 REMOVING AND INSTALLING/REPLACING LUGGAGE COMPARTMENT FLOOR TRIM PANEL**

Remove clips (1) and fold up front luggage compartment floor trim panel (2) slightly.

Installation:

Make sure front luggage compartment floor trim panel (2) is correctly seated.

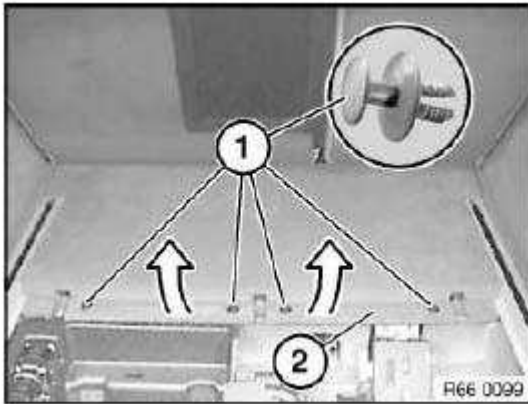


Fig. 187: Removing Clips

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Front luggage compartment floor trim panel shown removed for purposes of clarity.

Unfasten plug connection (1) and disconnect.

Unscrew nuts (2).

Remove module (3) in direction of arrow.

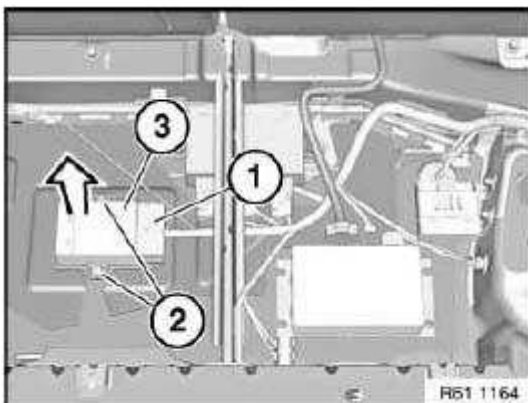


Fig. 188: Unfastening Plug Connection

Courtesy of BMW OF NORTH AMERICA, INC.

61 35 122 REMOVING AND INSTALLING/REPLACING GENERAL MODULE

IMPORTANT: Read and comply with 61 35 ... Notes on ESD protection (Electro Static Discharge).

Necessary preliminary tasks:

- Remove luggage compartment floor trim panel, see **51 47 102 REMOVING AND INSTALLING/REPLACING LUGGAGE COMPARTMENT FLOOR TRIM PANEL**
- Disconnect negative battery cable
- Remove right glovebox with housing, see **51 16 366 REMOVING AND INSTALLING RIGHT GLOVEBOX WITH HOUSING**

Release plastic nut (1).

Unclip device holder (2) from fixtures (3).

Unlock plug connections (4) and disconnect.

Press catch (6) and remove general module (5) towards rear.

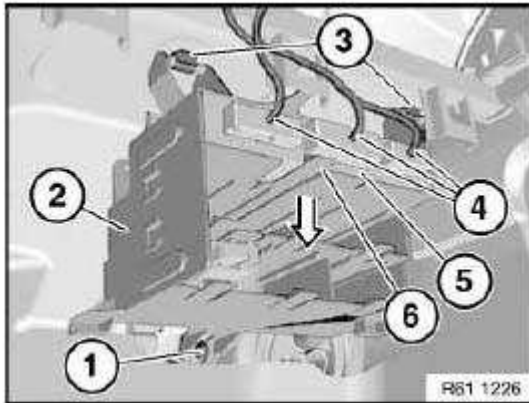


Fig. 189: Pressing Catch And Remove General Module
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

Carry out programming/coding, see **Vehicle programming and coding**.

61 35 177 REMOVING AND INSTALLING (REPLACING) RAIN/LIGHT SENSOR

Expand two-part mirror base cover (1) by pressing from below and detach.

Feed out two-part mirror base cover (1) and remove.

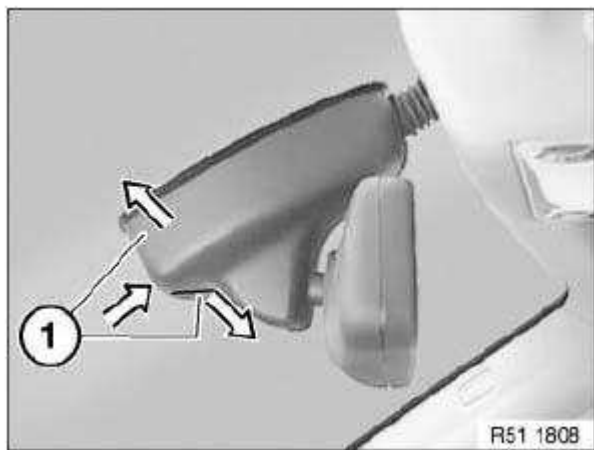


Fig. 190: Expanding Two-Part Mirror Base Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (3).

Press locks (1) in direction of arrow and remove rain/light sensor (2) towards bottom.

Installation:

Do not damage optical element covered by rain/light sensor (2).

If necessary, initialize rain/light sensor, see **61 35 679 Initializing rain/light sensor**.

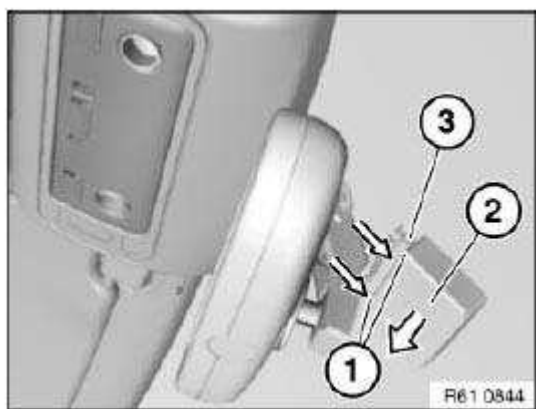


Fig. 191: Pressing Locks
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

Carry out programming/coding, see **Vehicle programming and coding**.

61 35 285 REMOVING AND INSTALLING (REPLACING) LIGHT MODULE

IMPORTANT: Read and comply with 61 35 ... Notes on ESD protection (Electro Static Discharge).

Necessary preliminary tasks:

- Remove trim panel for pedal assembly, see **51 45 185 REMOVING AND INSTALLING/REPLACING TRIM FOR PEDAL ASSEMBLY** .

Unlock plug connections (2) and (4) and disconnect.

Release screws (1), feed out light module (3) in direction of arrow and remove.

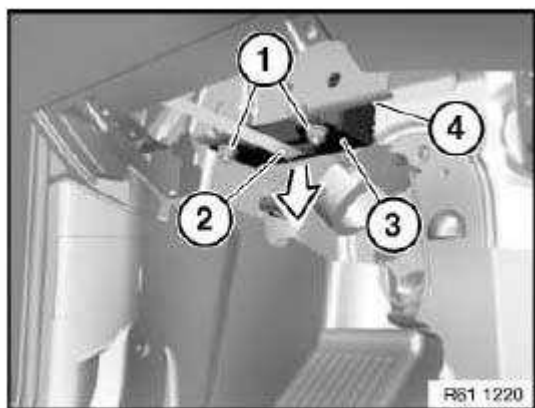


Fig. 192: Unlocking Plug Connections
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Make sure guides (1) of light module (2) are correctly seated in associated mountings.

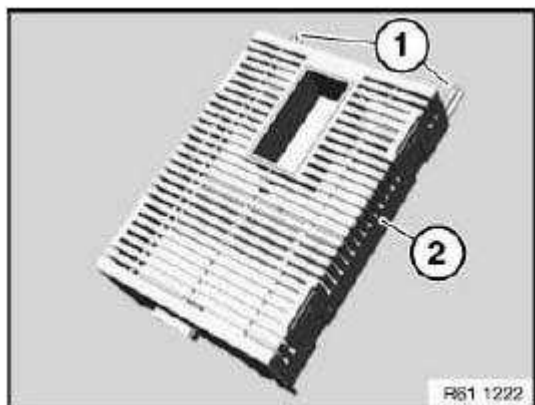


Fig. 193: Identifying Guides Of Light Module

Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

Carry out programming/coding, see Vehicle programming and coding.

61 35 679 INITIALIZING RAIN/LIGHT SENSOR

NOTE: Initialization is necessary:

- After replacing windshield
- When installing a used rain/light sensor

NOTE:

- Connect BMW diagnosis system
- Initialize rain/light sensor.

61 35 714 REMOVING AND INSTALLING/REPLACING CONTROL UNIT FOR SLIDE/TILT SUNROOF

IMPORTANT: Read and comply with 61 35 ... Notes on ESD protection (Electro Static Discharge).

Necessary preliminary tasks:

- Remove front roofliner trim, see 51 44 ... REMOVING AND INSTALLING FRONT ROOFLINER TRIM
- Remove complete ceiling light (front)

NOTE: Secure drive for slide/tilt sunroof (3) against falling out.

Release screws (2).

Lower control unit for slide/tilt sunroof (3).

Unlock and disconnect plug connections (1) and remove control unit for slide/tilt sunroof (3).

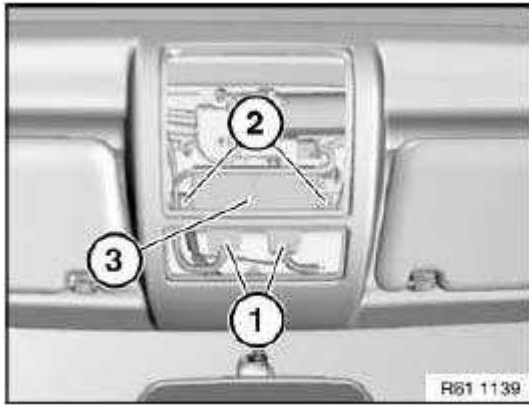


Fig. 194: Identifying Lower Control Unit For Slide/Tilt Sunroof
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

- Initialise slide/tilt sunroof.

Replacement:

Carry out programming/coding, see **Vehicle programming and coding**.

IMPORTANT: There is a risk of permanent battery discharge if programming/coding is not carried out!

61 35 795 REMOVING AND INSTALLING (REPLACING) CONTROL UNIT FOR ADAPTIVE HEADLIGHT

IMPORTANT: Read and comply with 61 35 ... Notes on ESD protection (Electro Static Discharge).

Necessary preliminary tasks:

- Remove right glovebox with housing, see **51 16 366 REMOVING AND INSTALLING RIGHT GLOVEBOX WITH HOUSING**

Unlock catch (1) in direction of arrow.

Pull control unit for adaptive headlight (2) out of equipment carrier (3) slightly.

Unlock plug connection (4) and disconnect.

Remove control unit for adaptive headlight (2).

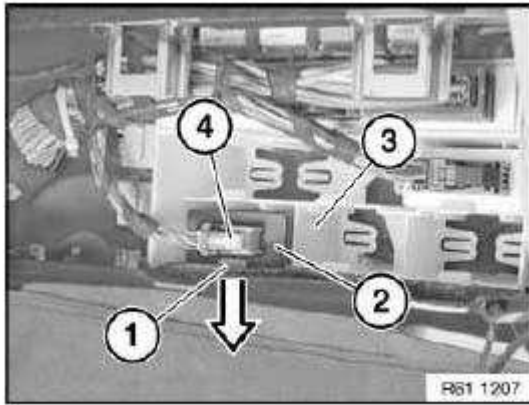


Fig. 195: Unlocking Catch

Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

Carry out programming/coding, see **Vehicle programming and coding**.

61 35 900 REMOVING AND INSTALLING/REPLACING RING ANTENNA OF ELECTRONIC IMMOBILIZER

Special tools required:

- 61 3 300

Necessary preliminary tasks:

- Remove top section of steering column casing, see **32 31 003 REPLACING UPPER SECTION OF STEERING COLUMN TRIM** .

Disconnect plug connection (1).

Position special tool 61 3 300 as illustrated with flattened side (A) to ring antenna of electronic immobilizer (2).

Lever out ring antenna of electronic immobilizer (2) in direction of arrow and remove.

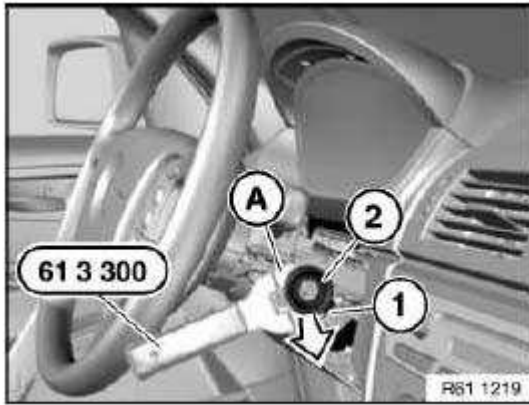


Fig. 196: Identifying Special Tool (61 3 300)

Courtesy of BMW OF NORTH AMERICA, INC.

61 35 910 REMOVING AND INSTALLING/REPLACING CONTROL UNIT OF ELECTRONIC IMMOBILIZER

IMPORTANT: Read and comply with 61 35 ... Notes on ESD protection (Electro Static Discharge).

Necessary preliminary tasks:

- Disconnect battery negative lead, see **61 20 900 Disconnecting and connecting battery negative lead**
- Remove trim panel for pedal assembly, see **51 45 185 REMOVING AND INSTALLING/REPLACING TRIM FOR PEDAL ASSEMBLY** .

Unfasten plug connection (1) and disconnect.

NOTE: Secure control unit of electronic immobilizer (3) against falling out.

Release screws (2) and remove control unit of electronic immobilizer (3).

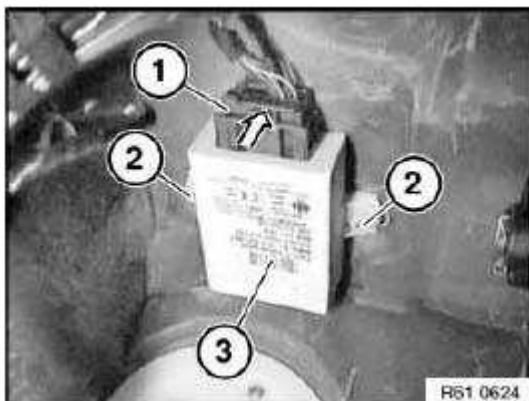


Fig. 197: Unfastening Plug Connection

Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

IMPORTANT: Check hardware version of old control unit.

Part numbers of control units with hardware version HW03:

- 61 35 8 374 957
- 61 35 6 905 666
- 61 35 6 905 667
- 61 35 6 905 670

If hardware version HW03 was fitted, observe the following.

Disconnect cable from pin 3 of plug.

Replace double flat spring contact with a larger one.

Connect cable to pin 2 of plug.

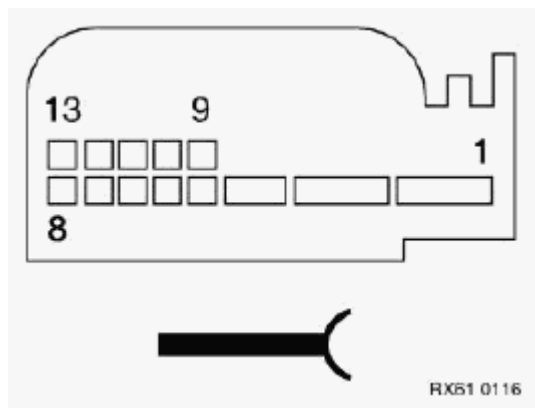
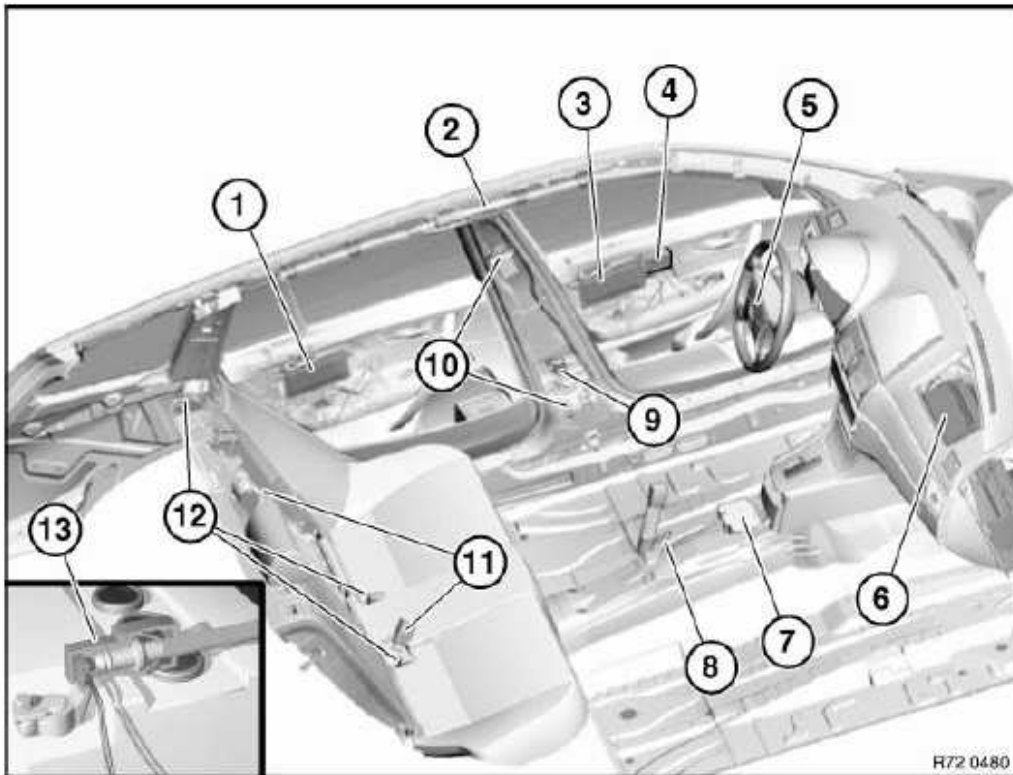


Fig. 198: Identifying Plug Connector Pin

Courtesy of BMW OF NORTH AMERICA, INC.

Carry out programming/coding, see Vehicle programming and coding.

72 12 ... OVERVIEW OF AIRBAG MODULES, SEAT BELTS AND AIRBAG CONTROL UNITS



0 [Safety precautions and general information](#)

- | | | | |
|---|---|----|---|
| 1 | Airbag module, rear left/right | 8 | Lower strap (belt tensioner), front |
| 2 | AHPS head airbag, left/right | 9 | Sensor, B-pillar |
| 3 | Airbag module, front left/right | 10 | Seat belt, front left/right |
| 4 | Sensor, front door | 11 | Seat belts, rear middle |
| 5 | Airbag module, driver's side | 12 | Seat belt, rear left/right |
| 6 | Airbag module, front passenger side | 13 | Safety battery terminal |
| 7 | Airbag control unit | | |

Fig. 199: Identifying Airbag Modules, Seat Belts And Airbag Control Units Components
 Courtesy of BMW OF NORTH AMERICA, INC.

VEHICLE PROGRAMMING AND CODING

Select menu item (1).

Select corresponding procedure from selection list.

Example:

- Preparation and subsequent evaluation of vehicle programming
- Start a Progman session
- Sequence of BMW/MINI vehicle programming and coding

- BMW/MINI Car & Key Memory
- BMW/MINI initialization
- BMW/MINI service functions in Progman
- ...

NOTE: In order to avoid incorrect programming procedures and error messages, it is essential when working with the Progman programming system always to use the latest Progman version.

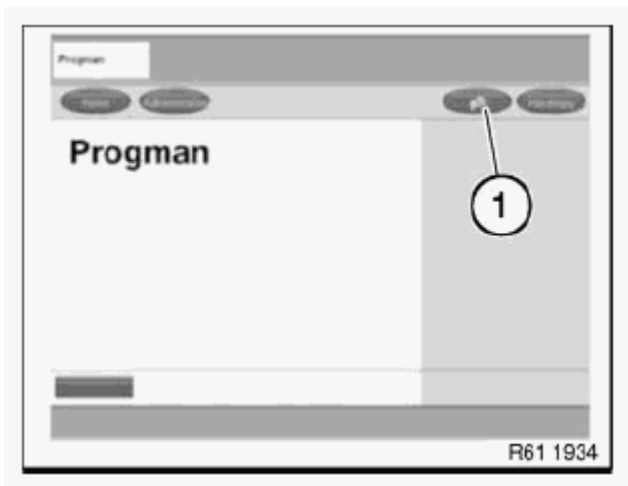


Fig. 200: Display Screen Of - Programming
 Courtesy of BMW OF NORTH AMERICA, INC.

36 RELAYS

61 13 ... DME MASTER RELAY CONNECTOR

Unlock locking flap (1) of corresponding cable.

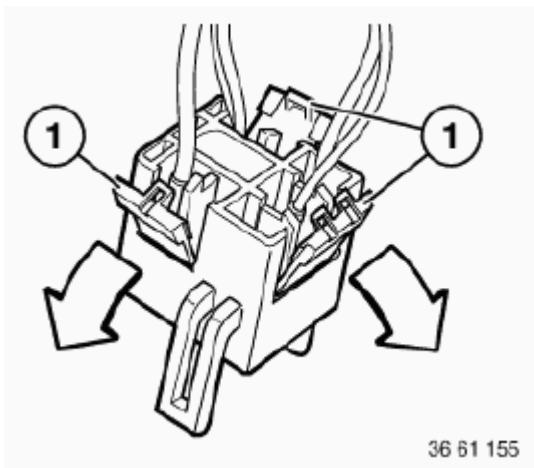


Fig. 201: Unlocking Locking Flap

Courtesy of BMW OF NORTH AMERICA, INC.

With special tool 61 1 136 or 61 1 137 (ejector), press back arrester hook (2) of appropriate contact and pull out cable.

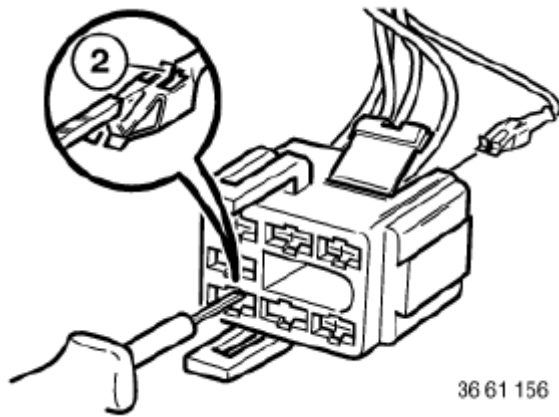


Fig. 202: Identifying Arrester Hook

Courtesy of BMW OF NORTH AMERICA, INC.

61 13 ... RELAY CARRIER

Place special tool 61 1 153 on relay carrier (1) and carefully pull in direction of arrow until retaining lugs (2) on relay carrier are raised.

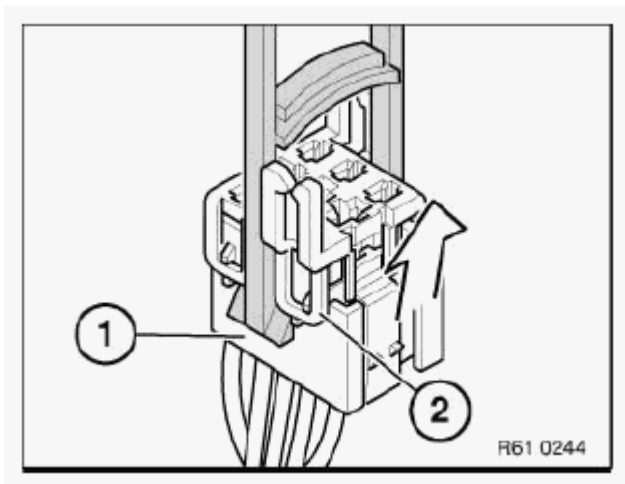


Fig. 203: Identifying Relay Carrier And Retaining Lugs

Courtesy of BMW OF NORTH AMERICA, INC.

Pull relay carrier (2) in direction of arrow into first catch (3).

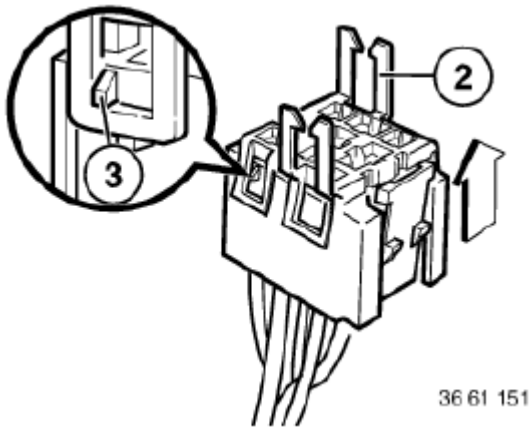


Fig. 204: Pulling Relay Carrier
 Courtesy of BMW OF NORTH AMERICA, INC.

Press down arrester hook (4) of appropriate contact and pull out cable with contact.

Press out double flat spring contact with special tool 61 1 136 or 61 1 137 (ejector).

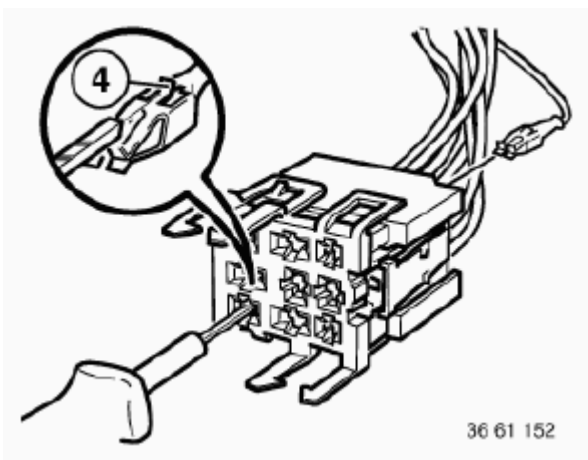


Fig. 205: Identifying Arrester Hook
 Courtesy of BMW OF NORTH AMERICA, INC.

61 31 465 REMOVING AND INSTALLING/REPLACING RELAY/MODULE (IN DEVICE HOLDER ON LEFT)

Necessary preliminary tasks:

- Remove luggage compartment floor trim panel, see **51 47 102 REMOVING AND INSTALLING/REPLACING LUGGAGE COMPARTMENT FLOOR TRIM PANEL**
- Disconnect battery negative lead, see **61 20 900 Disconnecting and connecting battery negative lead**

Release screws (1).

Remove electronics box cover (2).

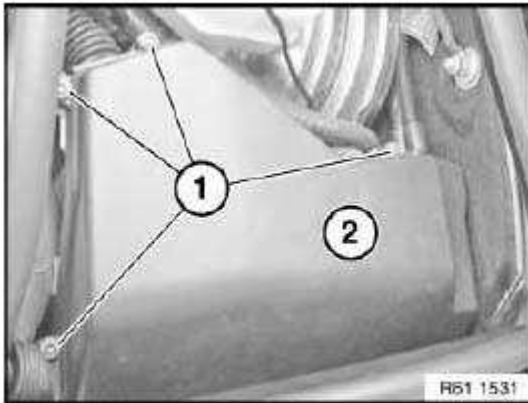


Fig. 206: Identifying Electronics Box Cover Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Detach relay.



Fig. 207: Identifying Relay
Courtesy of BMW OF NORTH AMERICA, INC.

61 31 470 REMOVING AND INSTALLING/REPLACING RELAY/MODULE (IN INSTRUMENT PANEL AT BOTTOM RIGHT)

Necessary preliminary tasks:

- Remove luggage compartment floor trim panel, see **51 47 102 REMOVING AND INSTALLING/REPLACING LUGGAGE COMPARTMENT FLOOR TRIM PANEL**
- Disconnect battery negative lead, see **61 20 900 Disconnecting and connecting battery negative lead**
- Remove right glovebox with housing, see **51 16 366 REMOVING AND INSTALLING RIGHT GLOVEBOX WITH HOUSING**

Detach relay.

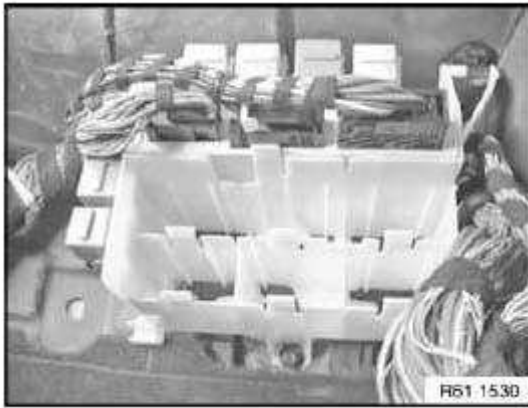
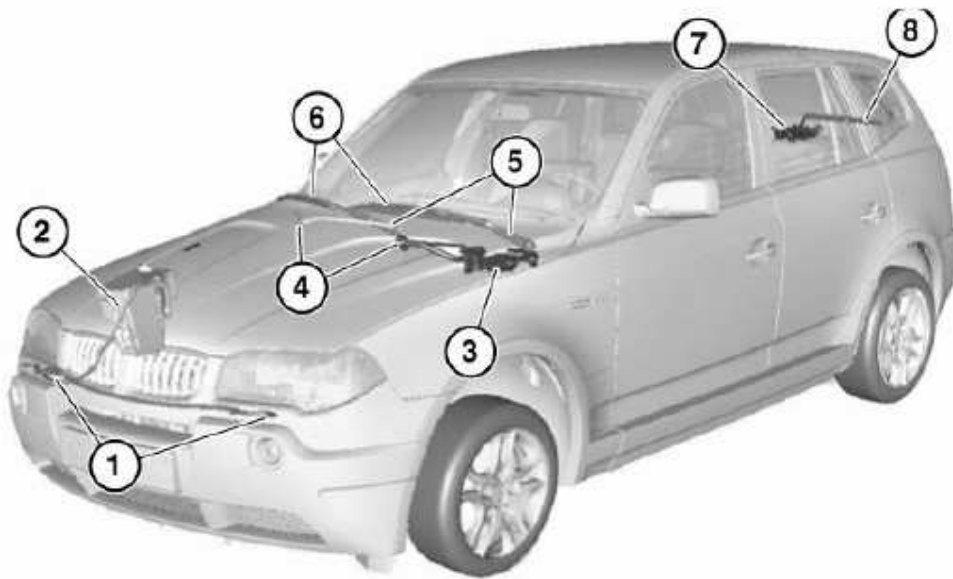


Fig. 208: Identifying Relay

Courtesy of BMW OF NORTH AMERICA, INC.

61 WINDSCREEN WIPERS

61 61 .. OVERVIEW OF WINDSCREEN WIPER SYSTEM AND HEADLIGHT WASHER SYSTEM



R61 1554

- | | | | |
|---|--|---|---|
| 1 | <u>Spray nozzles of headlight washer system</u> | 5 | <u>Windscreen wiper arms</u> |
| 2 | <u>Washer pumps, fluid reservoir for washer system</u> | 6 | <u>Wiper blades</u> |
| 3 | <u>Wiper bracket</u> | 7 | <u>Rear window wiper motor</u> |
| 4 | <u>Spray nozzles of windscreen washer system</u> | 8 | <u>Window wiper arm, window wiper blade</u> |

Fig. 209: Identifying Windscreen Wiper System And Headlight Washer System Components

Courtesy of BMW OF NORTH AMERICA, INC.

61 61 01. ADJUSTING LEFT OR RIGHT WINDSCREEN WIPER

Special tools required:

- 61 6 100 ANGLE MEASURING INSTRUMENT

Correctly adjusting the contact angle of the wiper arms on the windscreen increases wiping quality. For adjustment, refer to the vehicle-specific repair instruction.

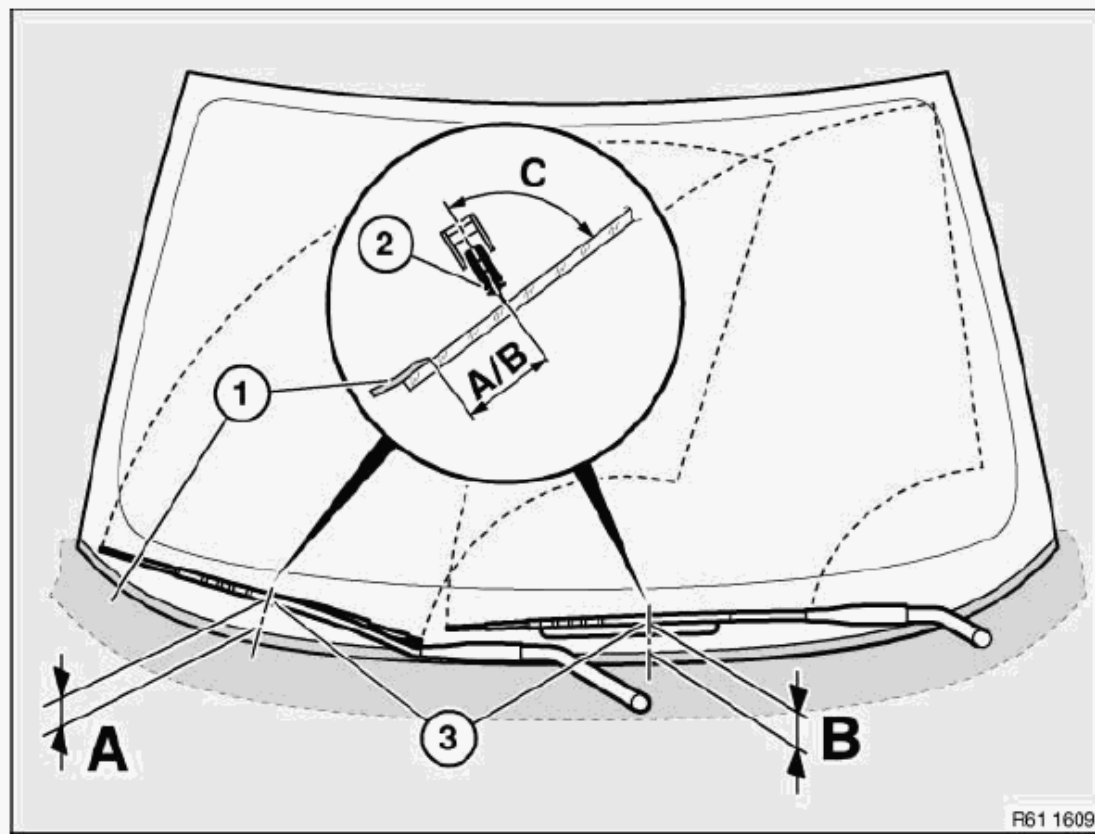


Fig. 210: Adjusting Contact Angle Of Wiper Arms On Windscreen
Courtesy of BMW OF NORTH AMERICA, INC.

A/B = Distance between windscreen wiper blade (2) and trim panel on cowl panel (1)

NOTE: Measurement is taken at the height of the locators (3) for the windscreen wiper arms

C= Contact angle between wiper blade center plane and windscreen

When adjusting with special tool 61 6 100 , set the scale value in accordance with the following table.

For RHD cars, change the preceding sign of the scale values.

- LHD cars, scale range 0 to-10
- RHD cars, scale range 0 to +10

WINDSCREEN WIPER ARM SPECIFICATIONS

Model	Contact angle (C) on windscreen wiper arm		Scale value (LHD) on special tool		Adjustment dimension (A, B) on windscreen wiper arm			
	Passenger side	Driver side	Passenger side	Driver side	Passenger side	Driver side	Rear end	
1'	E81	85.5° +1.5 to 1.0°	85.5° +1.5 to 1.0°	-5	-5	47 ± 3 mm	54 ± 3 mm	
	E82	85.5° +1.5 to 1.0°	85.5° +1.5 to 1.0°	-5	-5	47 ± 3 mm	54 ± 3 mm	
	E87	85.5° +1.5 to 1.0°	85.5° +1.5 to 1.0°	-5	-5	47 ± 3 mm	54 ± 3 mm	
3'	E46	85.7° ± 1°	85.3° ± 1°	-4	-5			
	E83	85.2° ± 1°	85.4° ± 1°	-5	-5	66 ± 3 mm	61 ± 3 mm	29 ± 1 mm
	E90	86.7° ± 1°	86.0° ± 1°	-3	-4	88 ± 3 mm	95 ± 3 mm	
	E91	86.7° ± 1°	86.0° ± 1°	-3	-4	88 ± 3 mm	95 ± 3 mm	35 ± 3 mm
	E92	86.7° ± 1°	86.0° ± 1°	-3	-4	75 ± 3 mm	84 ± 3 mm	
	E93	86.7° ± 1°	86.0° ± 1°	-3	-4	75 ± 3 mm	84 ± 3 mm	
5'	E39	86.5° ± 1°	86.5° ± 1°	-4	-4			60.1 ± 1 mm
	E53	85.0° ± 1°	85.0° ± 1°	-5	-5	54 ± 3 mm	55 ± 3 mm	32.5 ± 2 mm
	E60	86.0° ± 1°	86.0° ± 1°	-4	-4	69 ± 3 mm	87 ± 3 mm	
	E61	86.0° ± 1°	86.0° ± 1°	-4	-4	69 ± 3 mm	87 ± 3 mm	30 ± 3 mm
	E70	85.6° ± 1°	85.0° ± 1°	-4	-5	103 ± 3 mm	90 ± 3 mm	39 ± 2 mm
6'	E63	86.0° ± 1°	86.0° ± 1°	-4	-4	69 ± 3 mm	87 ± 3 mm	
	E64	86.0° ± 1°	86.0° ± 1°	-4	-4	69 ± 3 mm	87 ± 3 mm	
7'	E38	87.0° ± 1°	87.0° ± 1°	-3	-3	65 ± 3 mm	58 ± 3 mm	
	E65	85.5° ± 1°	87.0° ± 1°	-	-	20 ± 3 mm	48 ± 3 mm	
	E66	85.5° ± 1°	87.0° ± 1°	-	-	20 ± 3 mm	48 ± 3 mm	
8'	E52	85.5° ± 1°	85.5° ± 1°	-4	-4	38 ± 2 mm	104 ± 2 mm	
Z	E85	85.5° ± 1°	85.5° ± 1°	-4	-4	57 ± 2 mm	52 ± 2 mm	
	E86	85.5° ± 1°	85.5° ± 1°	-4	-4	57 ± 2 mm	52 ± 2 mm	

61 61 010 CHECKING/ADJUSTING CONTACT ANGLE OF WINDSCREEN WIPER ARMS ON WINDSCREEN

Special tools required:

- **00 9 220 BENDING LEVER (2 X)**
- **00 9 331 00 9 330 WINDSCREEN WIPER SETTING TOOL**
- **61 6 100 ANGLE MEASURING INSTRUMENT**

NOTE: Wipe quality is improved by precise adjustment of contact/approach angle of wiper arms, see **61 61 01. Adjusting left or right windscreen wiper**
Adjustment angle can be checked with special tool 00 9 331 or 61 6 100 .

Checking with setting gauge:

Before checking approach angle, briefly lift windscreen wiper arms off windscreen.

Place special tool 00 9 331 next to pivot point of wiper blade on windscreen.

Check light gap, adjust wiper arm if necessary.

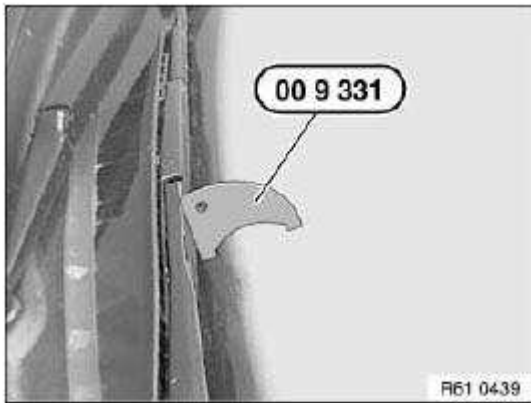


Fig. 211: Identifying Special Tool (00 9 331)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Tape off wiper arm with fabric adhesive tape to avoid damage.

Press special tools 00 9 220 in appropriate direction until correct contact/approach angle is obtained.

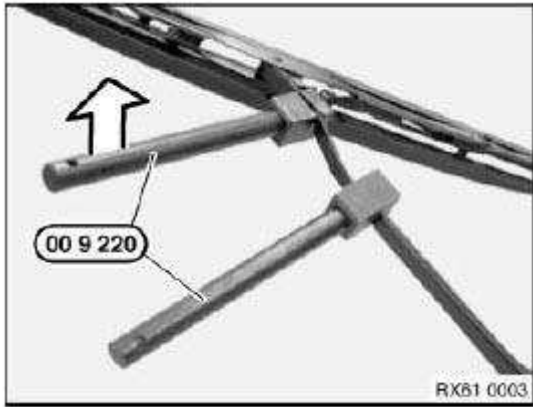


Fig. 212: Identifying Special Tool (00 9 220)
Courtesy of BMW OF NORTH AMERICA, INC.

Checking with angulometer:

Remove wiper blades.

Insert windscreen wiper arm (1) in angulometer 61 6 100 .

Using screw (2) and pressure plate (3), locate windscreen wiper arm (1) and position on windscreen.

Read off value in degrees, adjust wiper arm if necessary.

NOTE: Windscreen wiper arm (1) must rest correctly on lower and side contact surfaces (4) of angulometer 61 6 100 .

On right-hand-drive cars, screw (2) must be located on left side of special tool 61 6 100.

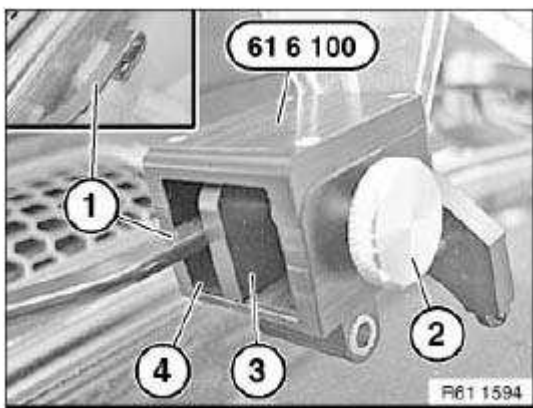


Fig. 213: Identifying Special Tool (61 6 100)
Courtesy of BMW OF NORTH AMERICA, INC.

Press special tools 00 9 220 in appropriate direction until correct contact/approach angle is obtained.

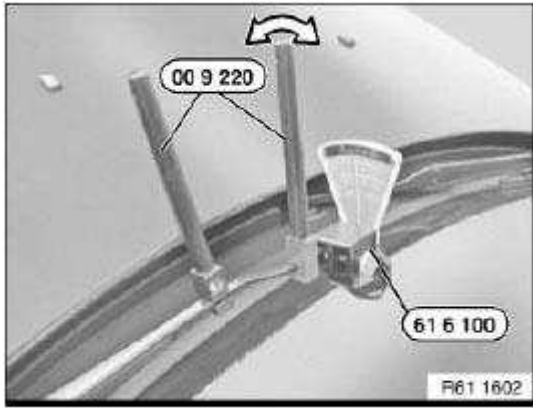


Fig. 214: Identifying Special Tool (00 6 100) And (00 6 100)
 Courtesy of BMW OF NORTH AMERICA, INC.

61 61 041 REPLACING BOTH WINDSCREEN WIPER BLADES

Move wipers into fold-back position:

- Switch on terminal "R".
- Actuate wiper control lever and bring wiper arms to a stop in vertical position (fold-back position) by switching off terminal "R".
- Remove ignition key from ignition switch.

Fold back wiper arm (3).

Press locking spring (1) in direction of arrow. Pull wiper blade (2) to wiper arm (3) and feed out.

Installation:

Install new wiper blade and snap into place.

Fold wiper arms to windscreen.

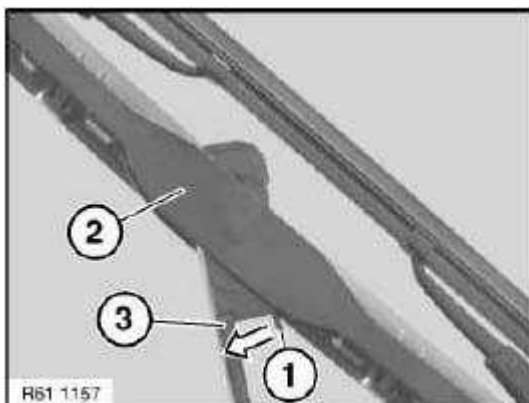


Fig. 215: Pressing Locking Spring

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Before switching on terminal "R" or the ignition or starting the engine, you must fold the wiper arms onto the windscreen otherwise damage will be caused.

Switch on terminal "R".

Set wiper system to rest position by flick-wiping.

61 61 100 REMOVING AND INSTALLING/REPLACING BOTH WINDSCREEN WIPER ARMS

Special tools required:

- **61 6 060 UNIVERSAL WIPER ARM PULLER**

Take off cap.

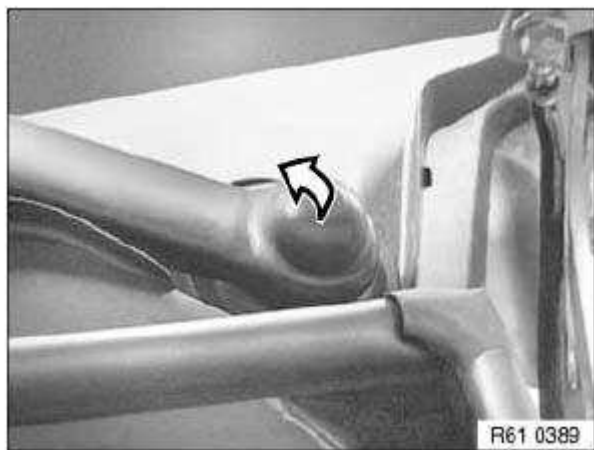


Fig. 216: Taking Off Cap

Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten nut.

Installation:

Observe tightening torque: 61 61 10AZ, see **61 61 WINDSHIELD WIPERS** .

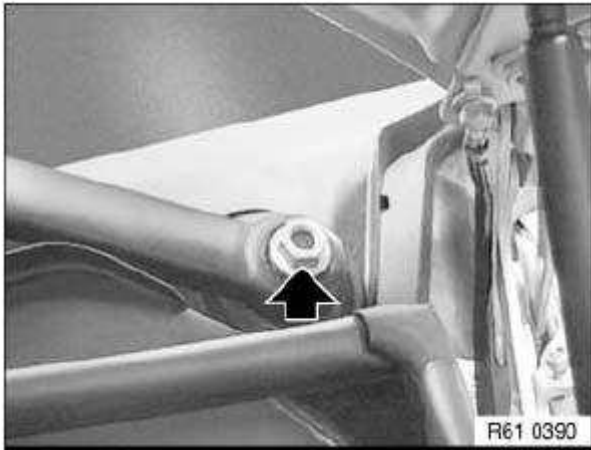


Fig. 217: Locating Nut

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not bend windscreen wiper arm during removal (risk of breakage).

Detach windscreen wiper arm with special tool 61 6 060 .



Fig. 218: Identifying Special Tool (61 6 060)

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check that sleeve (1) is firmly seated.

If sleeve (1) is loose, it must be replaced.

A sleeve (1) firmly seated in the windscreen wiper arm can be reused.

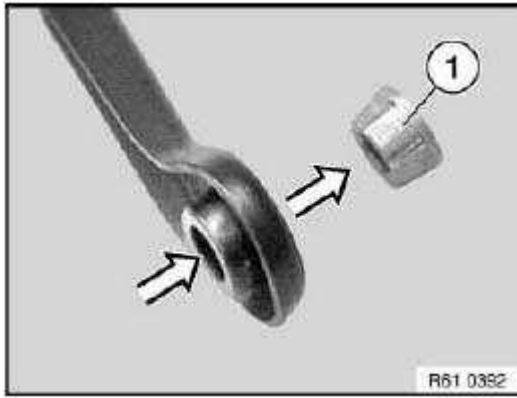


Fig. 219: Identifying Sleeve

Courtesy of BMW OF NORTH AMERICA, INC.

Windscreen wiper arm with firmly seated sleeve (1):

Return wiper system to rest position. Push wiper arm (2) with firmly seated sleeve (1) onto shaft and tighten down.

Observe tightening torque: 61 61 10AZ, see **61 61 WINDSHIELD WIPERS** .

Check setting of wiper arm (2).

To correct setting, replace sleeve (1).

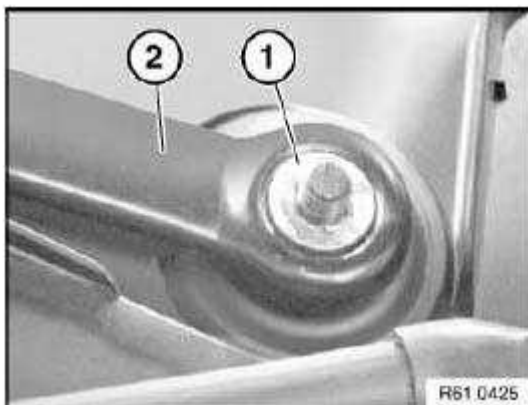


Fig. 220: Identifying Wiper Arm Sleeve

Courtesy of BMW OF NORTH AMERICA, INC.

Windscreen wiper arm with new sleeve (2):

Return wiper system to rest position.

Push wiper arm (1) with sleeve (2) onto shaft and tighten until hand-tight.

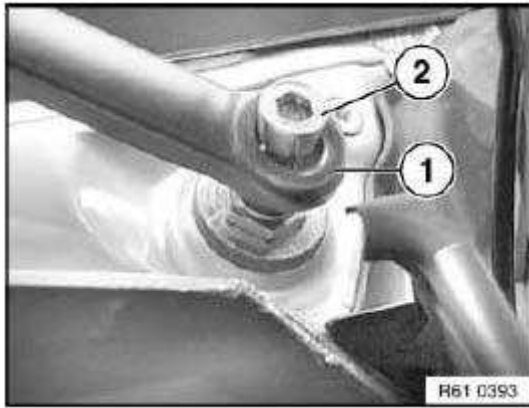


Fig. 221: Identifying Wiper Arm With Sleeve
 Courtesy of BMW OF NORTH AMERICA, INC.

Adjust position of wiper arm in question in rest position (measured between wiper lip and top edge of cowl panel cover).

Then tighten down wiper arm and check position of relevant wiper arm again.

$66 \pm 1.5 \text{ mm}$

$61 \pm 1.5 \text{ mm}$

Observe tightening torque: 61 61 10AZ, see **61 61 WINDSHIELD WIPERS** .

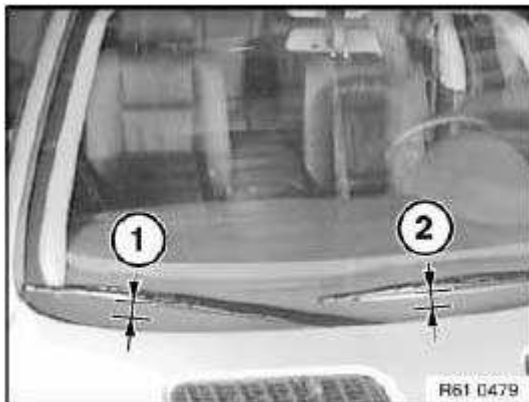


Fig. 222: Measuring Dimension Between Wiper Lip And Top Edge Of Cowl Panel Cover
 Courtesy of BMW OF NORTH AMERICA, INC.

61 61 270 REMOVING AND INSTALLING COMPLETE WIPER CONSOLE

Necessary preliminary tasks:

- Remove cowl panel cover, see **51 13 115 REMOVING AND INSTALLING/REPLACING COWL PANEL COVER**

- Remove heater bulkhead, see 51 71 080 REMOVING AND INSTALLING/REPLACING HEATER BULKHEAD

Unfasten plug connection (1) and disconnect.

Unscrew bolt (2).

Installation:

Observe tightening torque: 61 61 6AZ, see 61 61 WINDSHIELD WIPERS .

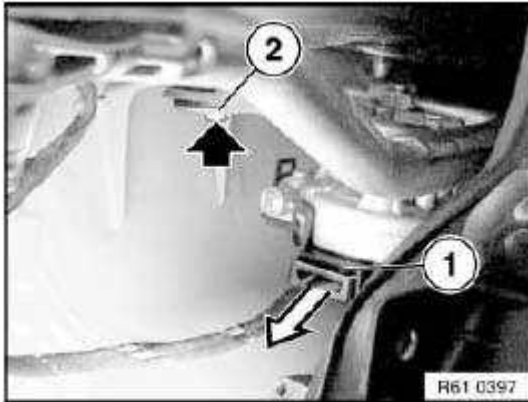


Fig. 223: Unfastening Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Fit rubber grommet (1) of wiper console on pin (2).

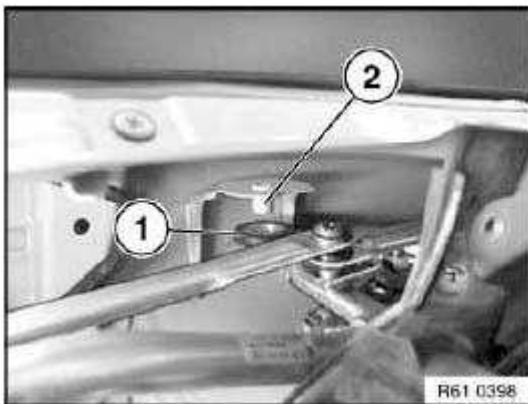


Fig. 224: Identifying Rubber Grommet Of Wiper Console On Pin
Courtesy of BMW OF NORTH AMERICA, INC.

Release nuts and feed out complete wiper console through opening in heater bulkhead.

Installation:

Observe tightening torque: 61 61 5AZ, see **61 61 WINDSHIELD WIPERS** .

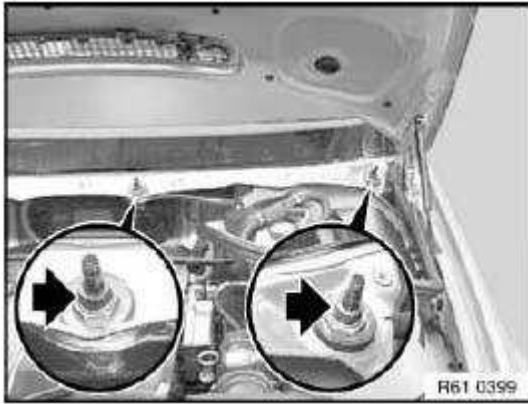
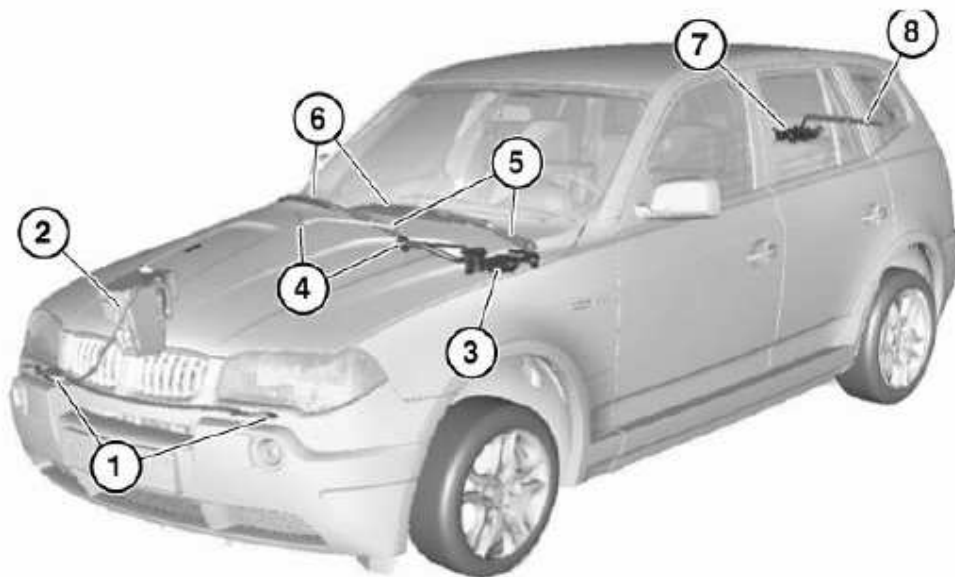


Fig. 225: Locating Wiper Console Nut
Courtesy of BMW OF NORTH AMERICA, INC.

62 REAR WINDOW WIPERS

61 61 .. OVERVIEW OF WINDSCREEN WIPER SYSTEM AND HEADLIGHT WASHER SYSTEM



R61 1554

- | | | | |
|---|--|---|---|
| 1 | <u>Spray nozzles of headlight washer system</u> | 5 | <u>Windscreen wiper arms</u> |
| 2 | <u>Washer pumps, fluid reservoir for washer system</u> | 6 | <u>Wiper blades</u> |
| 3 | <u>Wiper bracket</u> | 7 | <u>Rear window wiper motor</u> |
| 4 | <u>Spray nozzles of windscreen washer system</u> | 8 | <u>Window wiper arm, window wiper blade</u> |

Fig. 226: Identifying Windscreen Wiper System And Headlight Washer System Components
 Courtesy of BMW OF NORTH AMERICA, INC.

61 62 020 REMOVING AND INSTALLING/REPLACING REAR WINDOW WIPER BLADE

Fold wiper arm (1) away from rear window.

Unclip wiper blade (2) in direction of arrow.

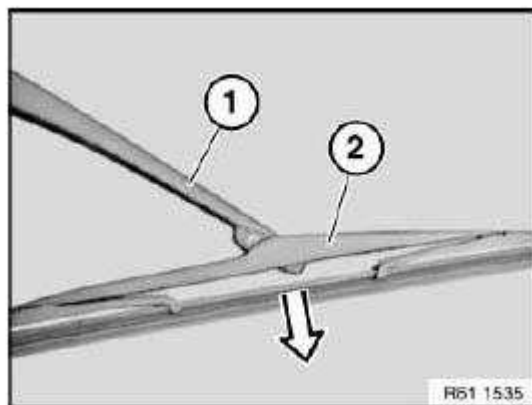


Fig. 227: Unclipping Wiper Blade

Courtesy of BMW OF NORTH AMERICA, INC.

61 62 030 REPLACING WIPER ARM FOR REAR WINDOW WIPER

Pull internal locks (2) in direction of arrow and remove cover cap (1) as illustrated.

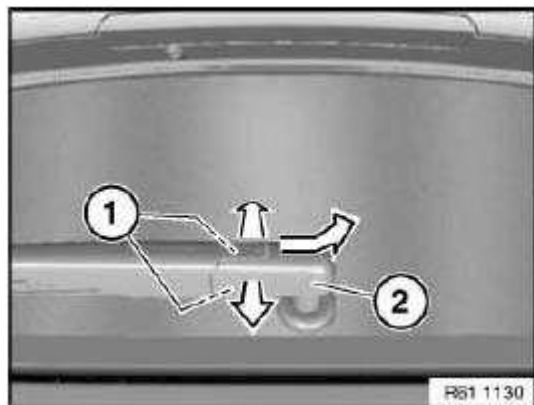


Fig. 228: Pulling Internal Locks

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Locks (1) and (2) of cover cap (3) must not be damaged.

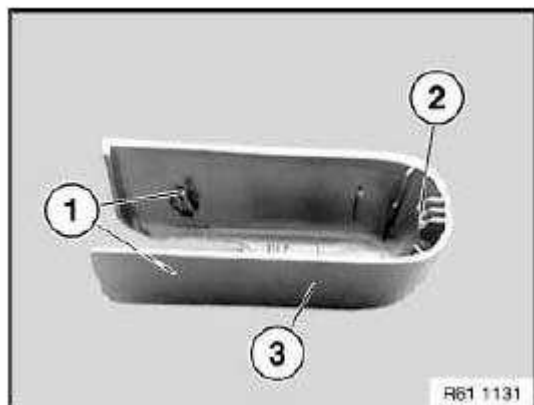


Fig. 229: Identifying Locks And Of Cover Cap

Courtesy of BMW OF NORTH AMERICA, INC.

Set wiper arm (1) upwards.

Release nut (2) and remove wiper arm (1) in direction of arrow.

Installation:

Observe tightening torque: 61 61 5AZ, see 61 61 WINDSHIELD WIPERS .

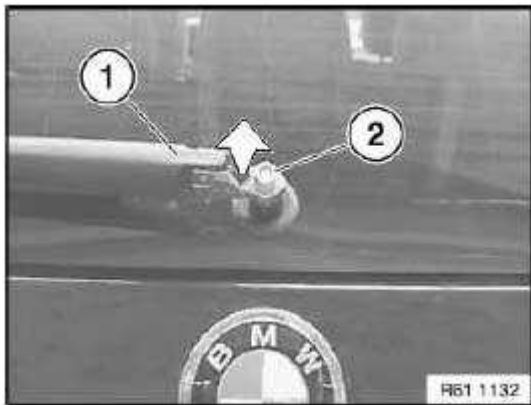


Fig. 230: Identifying Wiper Arm Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Rear window wiper motor must be in wiper rest position.

Adjust measurement (A) between wiper blade (1) and rear window edge (2).

Measurement (A): 29 mm.

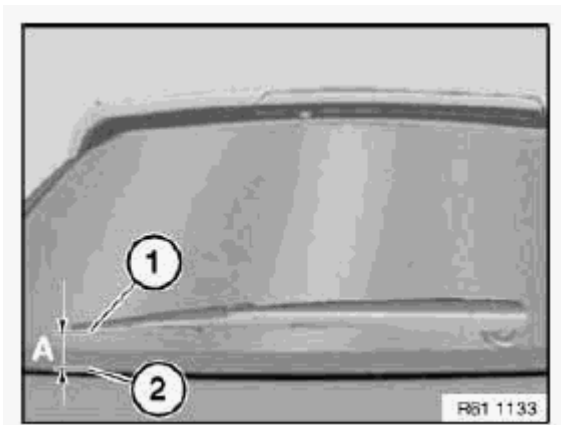


Fig. 231: Identifying Measurement Between Wiper Blade And Rear Window Edge
Courtesy of BMW OF NORTH AMERICA, INC.

61 62 060 REMOVING AND INSTALLING/REPLACING REAR WINDOW WIPER MOTOR

Necessary preliminary tasks:

- Remove wiper arm for rear window, see 61 62 030 Replacing wiper arm for rear window wiper
- Remove panel for rear lid, see 51 49 008 REMOVING AND INSTALLING/REPLACING PANEL

FOR REAR LID .

Unfasten plug connections (1) and disconnect.

NOTE: **Secure rear window wiper motor (3) against falling out.**

Release screws (2).

Installation:

Tightening torque: 61 62 8AZ, see **61 62 TAILGATE WINDOW WIPER .**

Remove rear window wiper motor (3) in direction of arrow.

Installation:

Replace grommet (4) if necessary.

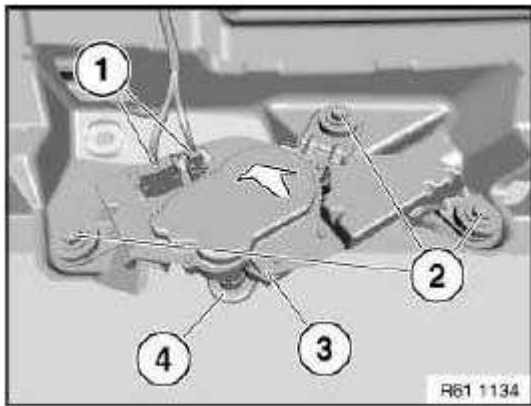


Fig. 232: Identifying Plug Connections And Rear Window Wiper Motor
Courtesy of BMW OF NORTH AMERICA, INC.

61 62 100 ADJUSTING JET NOZZLE FOR REAR WINDOW WASHER UNIT

NOTE: **The spray must meet the contact point (1).**

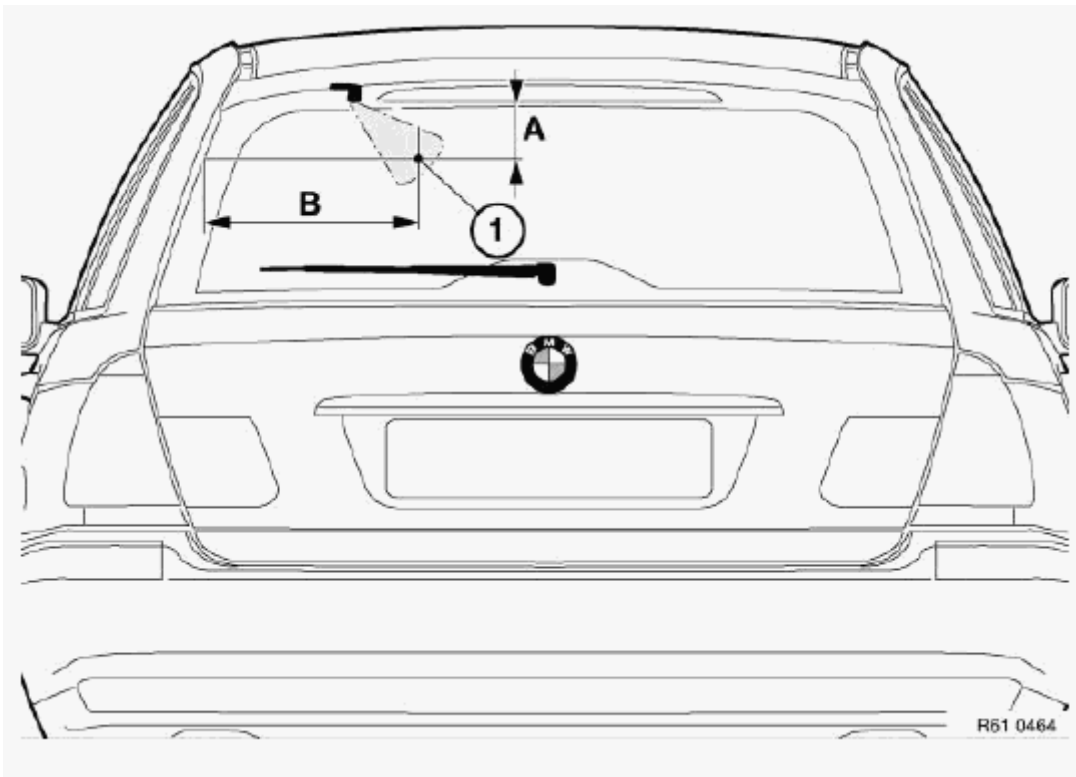


Fig. 233: Identifying Jet Nozzle For Rear Window Washer Unit Contact Point
 Courtesy of BMW OF NORTH AMERICA, INC.

Adjustment measurements:

MEASUREMENTS CHART

	Measurement A [mm]	Measurement B [mm]
E46 Touring	100	320
E53	100	450
E83	180	460

IMPORTANT: Do not insert any pointed objects in nozzle (risk of damage).

Mark contact point with crepe tape. Adjust jet nozzle with offset screwdriver (3.5 mm) in slot.

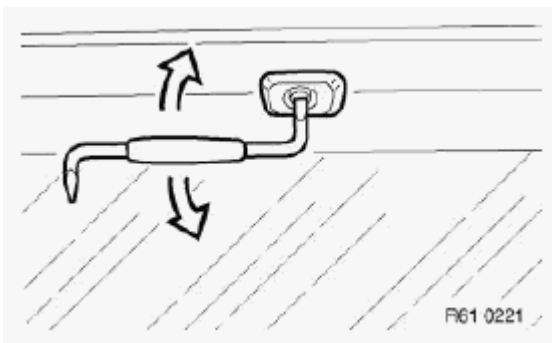


Fig. 234: Adjusting Jet Nozzle With Offset Screwdriver
Courtesy of BMW OF NORTH AMERICA, INC.

61 62 110 REMOVING AND INSTALLING/REPLACING SPRAY NOZZLE FOR REAR WINDOW WIPER

Special tools required:

- 00 9 317 **00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)**

Lever spray nozzle for rear window wiper (1) with special tool 00 9 317 out of spray nozzle holder (2).

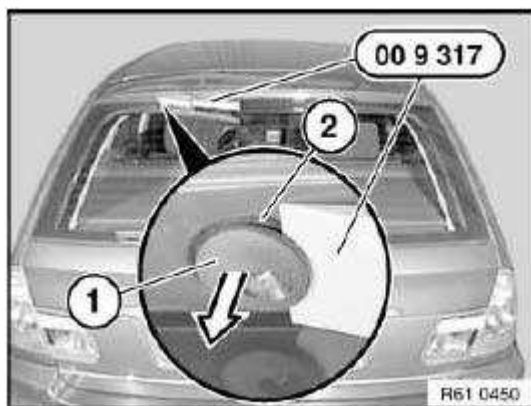


Fig. 235: Identifying Special Tool (00 9 317)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Make sure turning lock (2) of spray nozzle for rear window wiper (1) is correctly seated in spray nozzle holder.

Adjust spray nozzle, see **61 62 100 Adjusting jet nozzle for rear window washer unit**

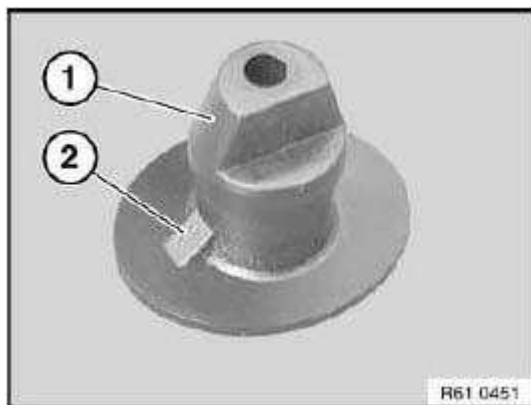


Fig. 236: Identifying Turning Lock Of Spray Nozzle
Courtesy of BMW OF NORTH AMERICA, INC.

61 62 150 REMOVING AND INSTALLING/REPLACING WINDOW WASHER PUMP FOR REAR WINDOW WASHER SYSTEM

NOTE: Drain washer fluid reservoir.

Unfasten plug connection (1) and disconnect.

Detach hose (2) in direction of arrow from windshield washer pump (3).

If necessary, turn window washer pump (3) and pull in direction of arrow out of washer fluid reservoir (4).

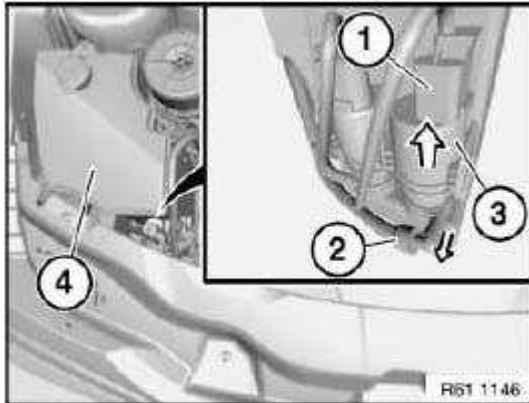


Fig. 237: Detaching Hose

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace sealing ring of window washer pump.

Coat sealing ring of window washer pump with antiseize agent.

Ensure hose is laid without kinks.

Fill washer fluid reservoir.

61 62 170 REMOVING AND INSTALLING/REPLACING NONRETURN VALVE FOR REAR WINDOW WASHER SYSTEM

Necessary preliminary tasks:

- Remove rear spoiler, see **51 71 412 REMOVING AND INSTALLING REAR SPOILER** .

Detach hose (1) in direction of arrow from non-return valve (2).

Pull non-return valve (2) out of spray nozzle holder (3) and remove.

Installation:

Make sure hose (1) and non-return valve (2) are correctly seated.

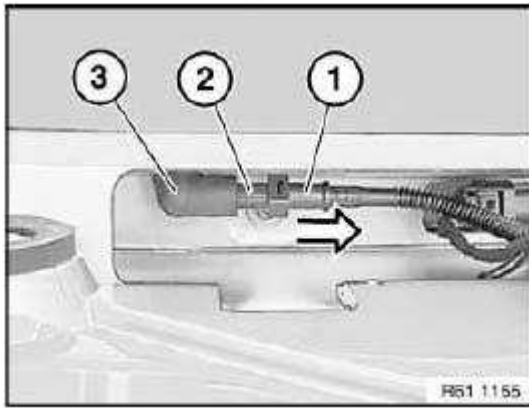
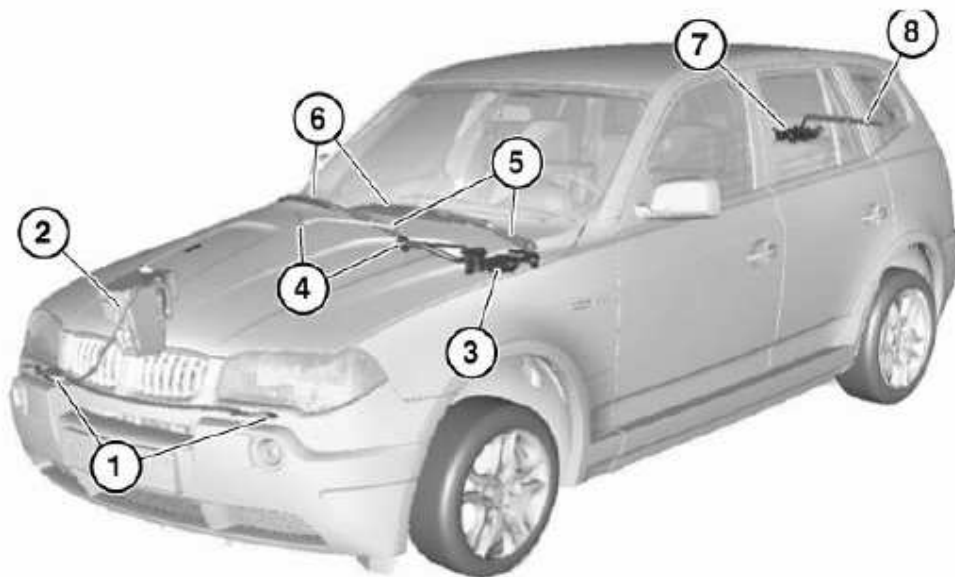


Fig. 238: Detaching Hose

Courtesy of BMW OF NORTH AMERICA, INC.

67 HEADLIGHT WASHER SYSTEM

61 61 .. OVERVIEW OF WINDSCREEN WIPER SYSTEM AND HEADLIGHT WASHER SYSTEM



R61 1554

- | | | | |
|---|--|---|---|
| 1 | <u>Spray nozzles of headlight washer system</u> | 5 | <u>Windscreen wiper arms</u> |
| 2 | <u>Washer pumps, fluid reservoir for washer system</u> | 6 | <u>Wiper blades</u> |
| 3 | <u>Wiper bracket</u> | 7 | <u>Rear window wiper motor</u> |
| 4 | <u>Spray nozzles of windscreen washer system</u> | 8 | <u>Window wiper arm, window wiper blade</u> |

Fig. 239: Identifying Windscreen Wiper System And Headlight Washer System Components
 Courtesy of BMW OF NORTH AMERICA, INC.

61 67 010 REMOVING AND INSTALLING/REPLACING WASHER PUMP OF HEADLIGHT CLEANING SYSTEM

NOTE: Drain washer fluid tank.

Unfasten plug connection (1) and disconnect.

Press lock (2) and detach hose (3) from washer pump of headlight cleaning system (4).

Pull washer pump of headlight cleaning system (4) in direction of arrow out of washer fluid reservoir (5).

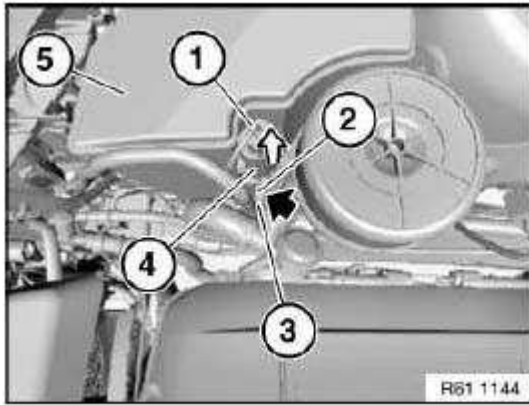


Fig. 240: Unfastening Plug Connection
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace sealing ring/strainer of washer pump.

Coat sealing ring of washer pump with antiseize agent.

Ensure hose is laid without kinks.

Fill washer fluid reservoir.

61 67 040 ADJUSTING SPRAY NOZZLES FOR HEADLIGHT CLEANING SYSTEM

NOTE: The spray nozzles of the headlight cleaning system have been adjusted at the factory and normally this setting is not altered (except by an accident). The nozzles therefore do not have to be adjusted.

The spray nozzles do not have to be adjusted even in the event of replacement as the nozzles themselves and the telescopic nozzle form a single unit (high-pressure nozzle) and are already preset.

61 67 045 REMOVING AND INSTALLING/REPLACING SPRAY NOZZLES FOR LEFT OR RIGHT HEADLIGHT CLEANING SYSTEM (UP TO 9/2006)

Necessary preliminary tasks:

- Remove front bumper trim, see **51 11 156 REMOVING AND INSTALLING/REPLACING FRONT BUMPER TRIM (M TECHNIC AERODYNAMIC KIT)** .

Press lock (1) and detach hose connection (2).

Pull out retainer (3) in direction of arrow.

Remove spray nozzle for headlight cleaning system (4) towards front.

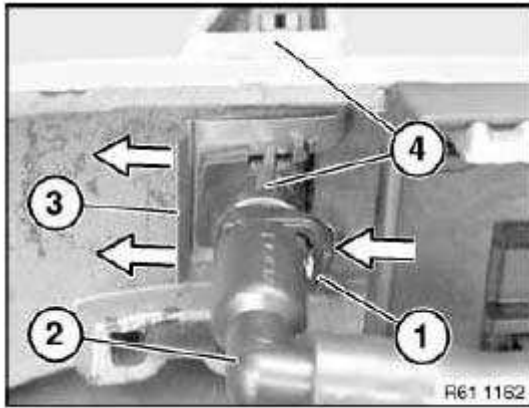


Fig. 241: Pulling Out Retainer
 Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

Unclip spray nozzle (2) from trim (3).

Installation:

If necessary, replace backing (1).

Guides (5) of backing (1) must be located in openings of spray nozzle (2).

Catches (4) of trim (3) must not be damaged or missing.

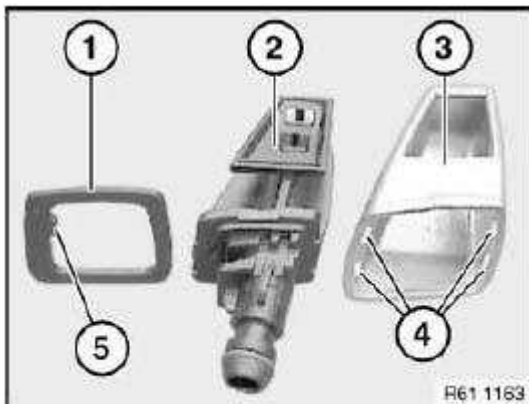


Fig. 242: Identifying Spray Nozzle From Trim
 Courtesy of BMW OF NORTH AMERICA, INC.

61 67 045 REMOVING AND INSTALLING/REPLACING SPRAY NOZZLES OF HEADLIGHT WASHER SYSTEM ON LEFT OR RIGHT (FROM 09/2006)

- **13 3 010 HOSE CLIP**

Necessary preliminary tasks:

- Remove front bumper trim, see **51 11 156 REMOVING AND INSTALLING/REPLACING FRONT BUMPER TRIM (M TECHNIC AERODYNAMIC KIT)** .
- Remove cover for headlight washer system, see **1 11 ... REMOVING AND INSTALLING/REPLACING FRONT COVER FOR HEADLIGHT WASHER SYSTEM ON LEFT OR RIGHT (M TECHNIC AERODYNAMIC KIT)**

To prevent excess escape of washer fluid, seal off end of high - pressure line with special tool 13 3 010 .

Catch any escaping washer fluid if necessary.

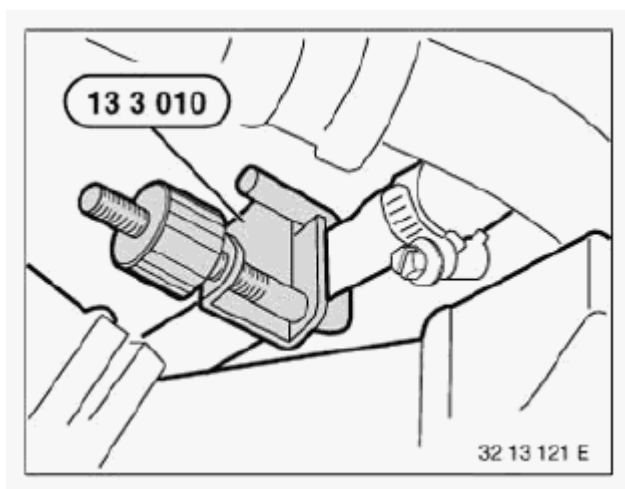


Fig. 243: Identifying Special Tool (13 3 010)

Courtesy of BMW OF NORTH AMERICA, INC.

Unlock plug connection (1) and detach high-pressure line (2) from spray nozzle for headlight washer system (3). Release screws (5). Remove spray nozzle for headlight washer system (3) in direction of arrow from bumper trim (6).

Installation: Make sure guide (4) is correctly seated on bumper trim (6). Keep plug connection (1) of high-pressure line (2) and high-pressure nozzle (3) clean and free from grease.

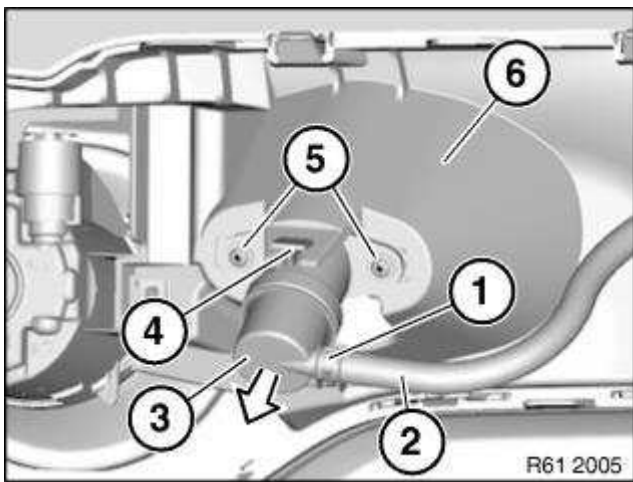


Fig. 244: Make Sure Guide (4) Is Correctly Seated On Bumper Trim (6)
Courtesy of BMW OF NORTH AMERICA, INC.

Make sure high-pressure line (2) is correctly engaged on spray nozzle (3). If necessary, top up washer fluid.

61 67 083 REMOVING AND INSTALLING/REPLACING HIGH - PRESSURE NOZZLE OF LEFT OR RIGHT HEADLIGHT WASHER SYSTEM (M AERODYNAMIC KIT)

Special tools required:

- **13 3 010 HOSE CLIP**

Necessary preliminary tasks:

- Remove cover for headlight washer system, see **1 11 ... REMOVING AND INSTALLING/REPLACING FRONT COVER FOR HEADLIGHT WASHER SYSTEM ON LEFT OR RIGHT (M TECHNIC AERODYNAMIC KIT)**
- Remove front bumper trim, see **51 11 156 REMOVING AND INSTALLING/REPLACING FRONT BUMPER TRIM (M TECHNIC AERODYNAMIC KIT)** .

To prevent excess escape of washer fluid, seal off end of high - pressure line with special tool 13 3 010 .

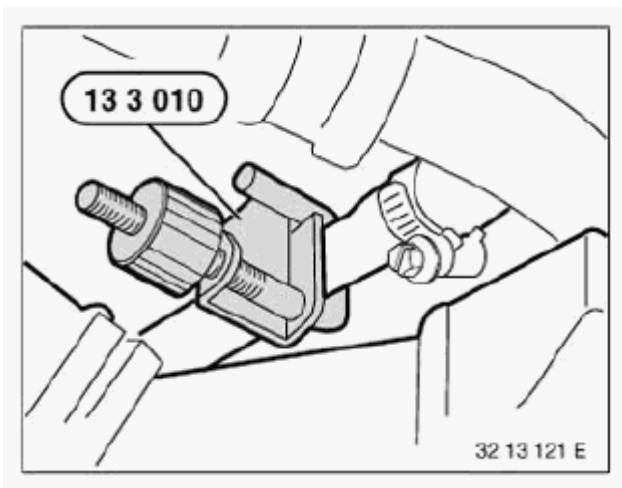


Fig. 245: Identifying Special Tool (13 3 010)
 Courtesy of BMW OF NORTH AMERICA, INC.

Unlock H.P. line (3) and detach from H.P. nozzle (1).

Release screws (2).

Remove H.P. nozzle (1).

Installation:

New spray nozzles are already preset.

Check function.

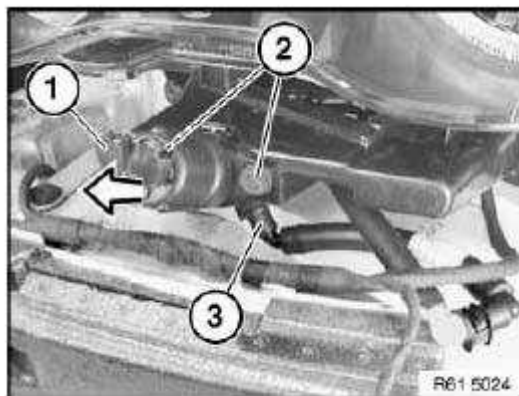
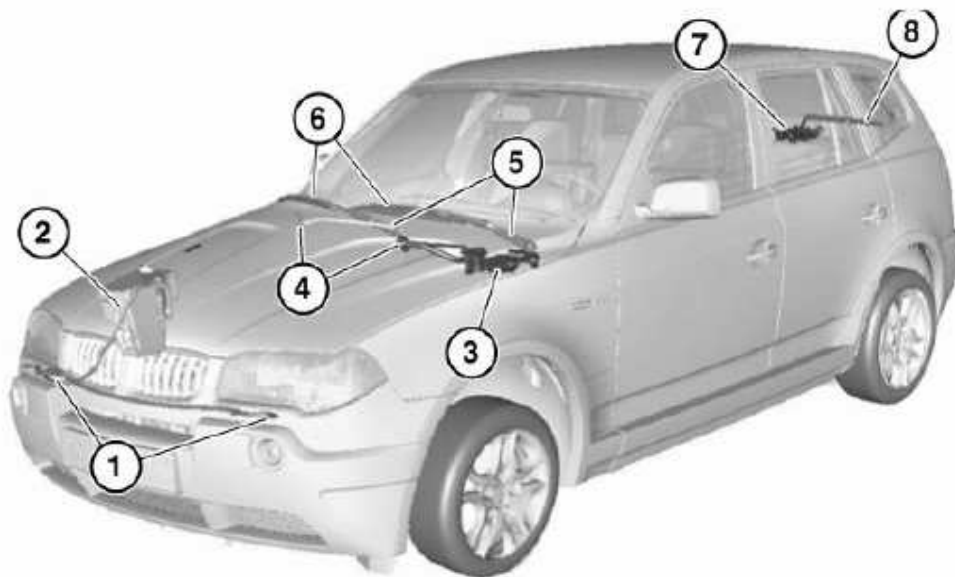


Fig. 246: Unlocking H.P. Line
 Courtesy of BMW OF NORTH AMERICA, INC.

71 WINDOW WASHER SYSTEM



R61 1554

- | | | | |
|---|--|---|---|
| 1 | <u>Spray nozzles of headlight washer system</u> | 5 | <u>Windscreen wiper arms</u> |
| 2 | <u>Washer pumps, fluid reservoir for washer system</u> | 6 | <u>Wiper blades</u> |
| 3 | <u>Wiper bracket</u> | 7 | <u>Rear window wiper motor</u> |
| 4 | <u>Spray nozzles of windscreen washer system</u> | 8 | <u>Window wiper arm, window wiper blade</u> |

Fig. 247: Identifying Windscreen Wiper System And Headlight Washer System Components
 Courtesy of BMW OF NORTH AMERICA, INC.

61 62 150 REMOVING AND INSTALLING/REPLACING WINDOW WASHER PUMP FOR REAR WINDOW WASHER SYSTEM

NOTE: **Drain washer fluid reservoir.**

Unfasten plug connection (1) and disconnect.

Detach hose (2) in direction of arrow from windshield washer pump (3).

If necessary, turn window washer pump (3) and pull in direction of arrow out of washer fluid reservoir (4).

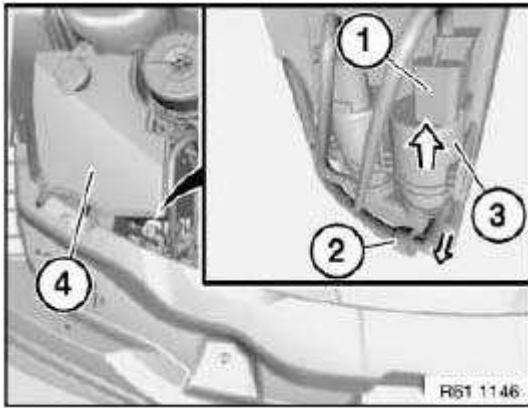


Fig. 248: Detaching Hose

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace sealing ring of window washer pump.

Coat sealing ring of window washer pump with antiseize agent.

Ensure hose is laid without kinks.

Fill washer fluid reservoir.

61 71 015 REMOVING AND INSTALLING/REPLACING A JET NOZZLE IN WINDSHIELD WASHER SYSTEM

NOTE: The jet nozzles of the windshield washer system are preset at the factory and cannot be readjusted.

Lever out sealing plug (1) in direction of arrow.

Unclip, unlock and disconnect plug connection (2) behind.

Installation:

Make sure plug connection (2) is correctly seated in mounting (3).

Ensure correct installation position (mounting (3) at top) and correct seating of sealing plug (1).

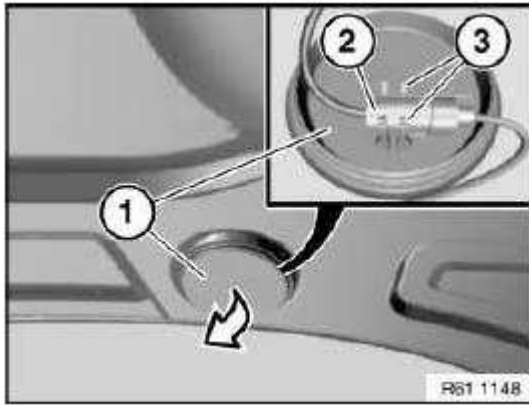


Fig. 249: Removing Sealing Plug

Courtesy of BMW OF NORTH AMERICA, INC.

Detach connector (1) in direction of arrow from nozzle of windshield washer system (2).

Unlock spray nozzle (2), press out through opening and remove.

Installation:

Make sure nozzle of windshield washer system (2) is correctly seated.

Ensure hose is laid without kinks.

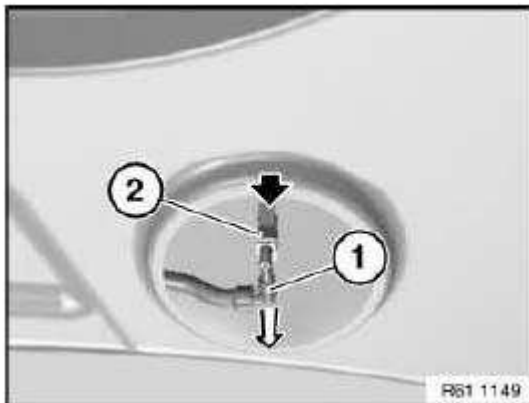


Fig. 250: Detaching Connector

Courtesy of BMW OF NORTH AMERICA, INC.

61 71 061 REPLACING FLUID RESERVOIR FOR WINDSHIELD WASHER SYSTEM

NOTE: Drain fluid tank for windshield washer system.

Necessary preliminary tasks:

- Pull out windshield washer pump (unlock and disconnect plug connection), see **61 71 100 Removing and installing/replacing windshield washer pump**
- Pull out window washer pump for rear window cleaning system (unlock and disconnect plug connection), see **61 62 150 Removing and installing/replacing window washer pump for rear window washer system**
- If necessary, pull out washer pump of headlight cleaning system (unlock and disconnect plug connection). See **61 67 010 Removing and installing/replacing washer pump of headlight cleaning system**

Unscrew bolt (1).

Unlock and disconnect level switch plug connection on windshield washer system (2).

If necessary, unclip hose (3).

Remove fluid reservoir for windshield washer system (4) in direction of arrow.

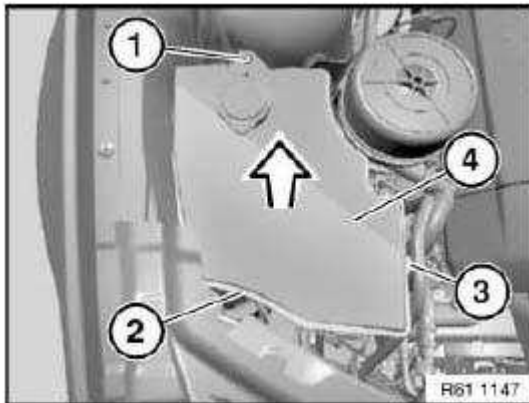


Fig. 251: Removing Fluid Reservoir For Windshield Washer System
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Feed guide (1) of fluid reservoir for windshield washer system (2) in direction of arrow into mountings (3).

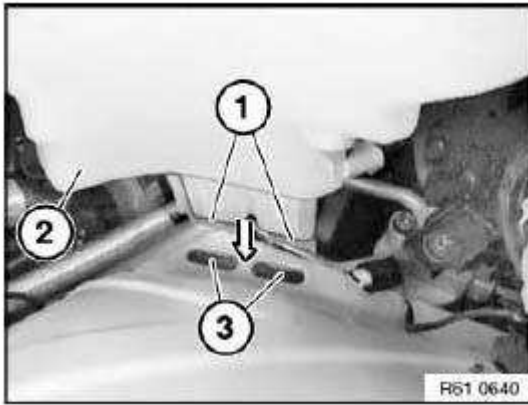


Fig. 252: Identifying Guide Of Fluid Reservoir
Courtesy of BMW OF NORTH AMERICA, INC.

Turn level switch for windshield washer system (1) in direction of arrow, remove downwards from water reservoir for windshield washer system (2) and place to one side.

Remove cover and strainer from water reservoir for windshield washer system.

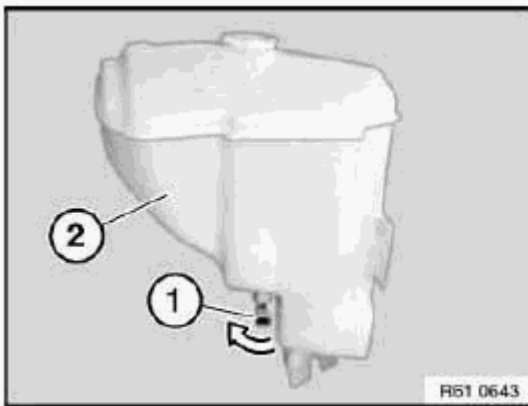


Fig. 253: Removing Cover And Strainer From Water Reservoir
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace sealing rings/strainers on washer pumps.

Coat sealing rings of washer pump with anti-friction agent.

Make sure hoses are laid without kinks.

Fill fluid tank for windshield washer system.

NOTE: Drain washer fluid tank.

Unfasten plug connection (1) and disconnect.

Detach hose (2) in direction of arrow from windshield washer pump (3).

If necessary, turn window washer pump (3) and pull in direction of arrow out of washer fluid reservoir (4).

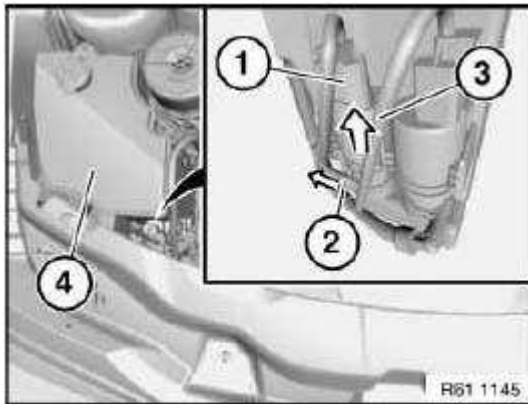


Fig. 254: Detaching Hose

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace sealing ring of windshield washer pump.

Coat sealing ring of windshield washer pump with antiseize agent.

Ensure hose is laid without kinks.

Fill washer fluid reservoir.

ACCESSORIES AND EQUIPMENT

Electrical Drives - Repair Instructions - X3

11 CENTRAL LOCKING UNIT/UNLOCKING UNITS

67 11 510 REMOVING AND INSTALLING/REPLACING SERVODRIVE FOR FRONT LEFT OR RIGHT DOOR LOCKING MECHANISM

NOTE: Servodrive for door locking mechanism is integrated in door lock in front door.

Procedure is described in the document [51 21 090 REMOVING AND INSTALLING/REPLACING DOOR LOCK IN LEFT OR RIGHT FRONT DOOR](#) .

67 11 530 REMOVING AND INSTALLING/REPLACING SERVODRIVE FOR REAR LEFT OR RIGHT DOOR LOCKING MECHANISM

This operation is described in:

[51 22 090 REMOVING AND INSTALLING/REPLACING DOOR LOCK IN LEFT OR RIGHT REAR DOOR](#) .

67 11 555 REMOVING AND INSTALLING/REPLACING SERVODRIVE FOR TANK FILLER FLAP

Necessary preliminary tasks:

- Remove Right Luggage Compartment Wheel Arch Trim, see **[51 47 161 REMOVING AND INSTALLING/REPLACING RIGHT LUGGAGE COMPARTMENT WHEEL ARCH TRIM](#) .**

Unclip emergency actuator (1) on emergency actuator pull strap (2).

Feed out emergency actuator pull strap (2) through opening (3).

Slacken screws (4) and feed servodrive for tank filler flap (5) towards rear out of retaining plate.

If necessary, carry out adjustment of servodrive for tank filler flap (5) via elongated holes of retaining plate. It must be possible to lock or unlock the fuel filler flap completely.

Disconnect associated plug connection and remove servodrive for tank filler flap (5).

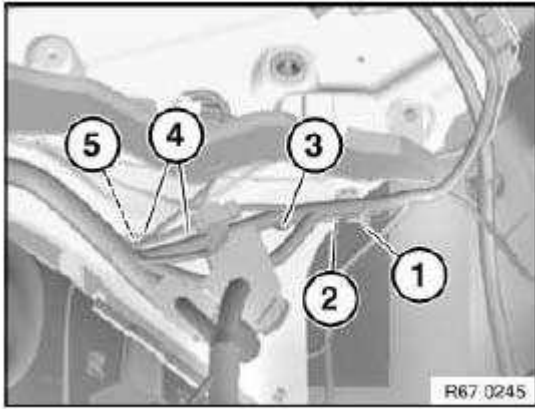


Fig. 1: Emergency Actuator And Strap
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Insert servodrive for tank filler flap (1) in direction of arrow into gaiter (2).

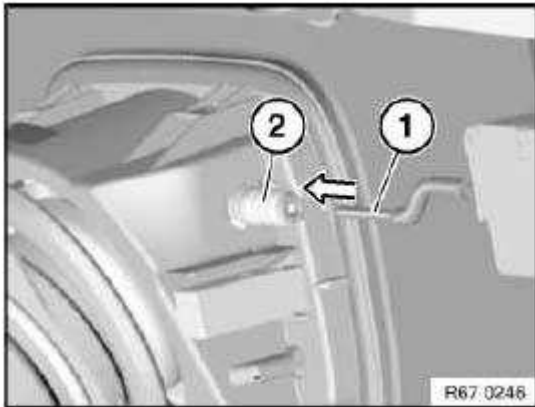


Fig. 2: Tank Filler Flap
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

Unhook emergency actuator pull strap (1) from clip (2) and remove from locking pin (3) of servodrive for fuel filler flap (4).

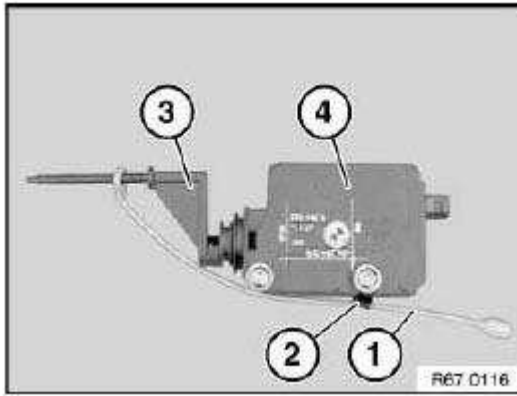


Fig. 3: Servodrive For Fuel Filler Flap
Courtesy of BMW OF NORTH AMERICA, INC.

67 11 560 REPLACING SERVODRIVE FOR REAR LID LOCK

This operation is described under:

51 24 105 REMOVING AND INSTALLING/REPLACING REAR LID LOCK (LOWER SECTION OF LOCK) .

13 MIRROR ADJUSTMENT

67 13 001 REPLACING DRIVE UNIT FOR ELECTRICALLY OPERATED LEFT OR RIGHT DOOR MIRROR

Necessary preliminary tasks:

- Remove Mirror Glass, see **51 16 026 REPLACING MIRROR GLASS** .

Release screws (1).

Fold out drive unit for electrically operated door mirror (2) in direction of arrow.

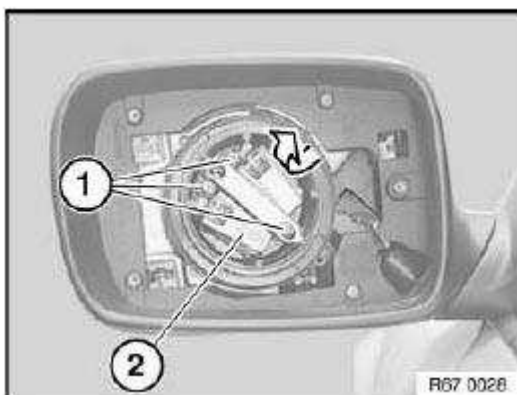


Fig. 4: Screws And Electrically Operated Door Mirror
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1) and remove drive unit for electrically operated door mirror (2).

IMPORTANT: In order to avoid ingress of water in non-sealed plug housing, coat plug housing (1) at cable and connection ends with battery terminal grease.

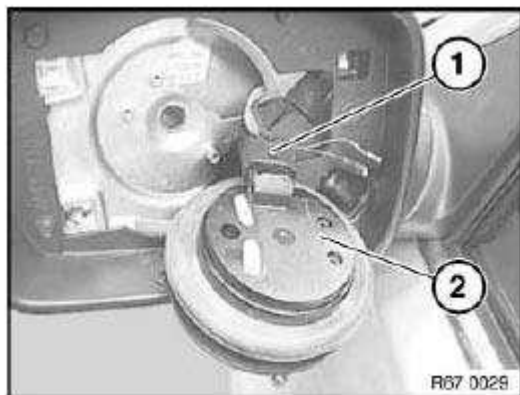


Fig. 5: Plug Connection And Electrically Operated Door Mirror
Courtesy of BMW OF NORTH AMERICA, INC.

67 13 005 REPLACING DRIVE UNIT FOR ELECTRICALLY ADJUSTABLE LEFT OR RIGHT DOOR MIRROR (WITH MEMORY)

Special tools required:

- **61 1 150 RELEASING TOOL KIT**

Necessary preliminary tasks:

- Remove Mirror Glass, see **51 16 026 REPLACING MIRROR GLASS** .
- Remove Mirror On Left Or Right Front Door, see **51 16 000 REMOVING AND INSTALLING/REPLACING MIRROR ON LEFT OR RIGHT FRONT DOOR** .

Release screws (1).

Remove drive unit for electrically adjustable door mirror (2) in direction of arrow.

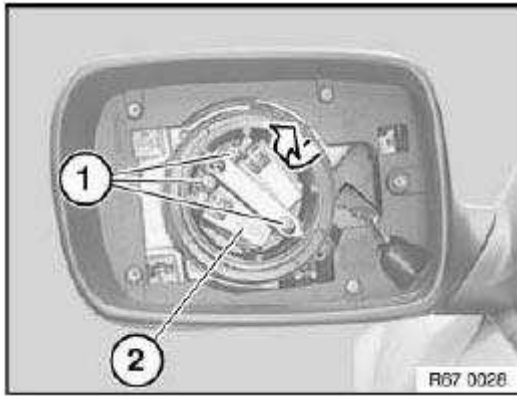


Fig. 6: Screws And Electrically Operated Door Mirror
Courtesy of BMW OF NORTH AMERICA, INC.

Unclip cap (1) with a suitable tool.

Remove sound insulation (2) from mirror. Correctly disconnect cable plug (3) with special tool 61 1 150 .

Feed out cable (4).

Installation:

Make sure ribbon cable (4) is correctly routed. Cable must not be kinked!

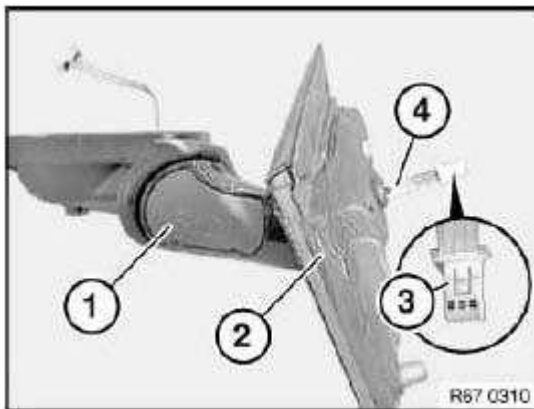


Fig. 7: Sound Insulation And Cable Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Sound insulation (1) on mirror (2) must not be damaged.

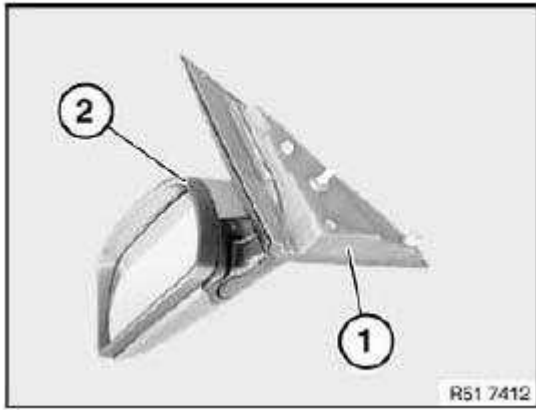


Fig. 8: Sound Insulation On Mirror
 Courtesy of BMW OF NORTH AMERICA, INC.

31 DRIVE, SEAT ADJUSTMENT

67 31 501 REMOVING AND INSTALLING/REPLACING DRIVE FOR LONGITUDINAL SEAT ADJUSTMENT (FRONT SEAT REMOVED)

Disconnect plug connection (1).

Unclip plug housing (2) in direction of arrow from retaining fixture underneath.

NOTE: Secure drive for longitudinal seat adjustment (4) against falling out.

Release screws (3) and remove drive for longitudinal seat adjustment (4) in direction of arrow from flange (5).

If necessary, remove inner drive shaft from drive for longitudinal seat adjustment (4).

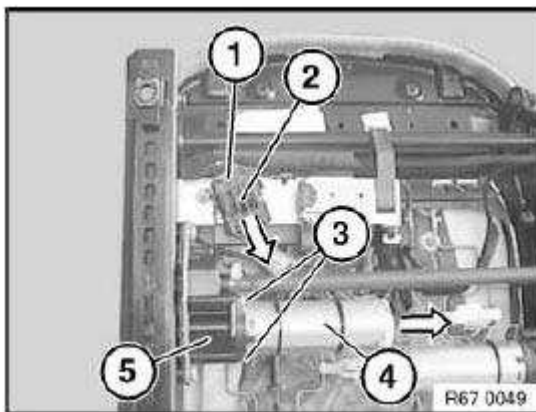


Fig. 9: Plug Housing
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Make sure drive shaft (1) is correctly seated.

Make sure drive for longitudinal seat adjustment (2) is correctly seated on flange (3).

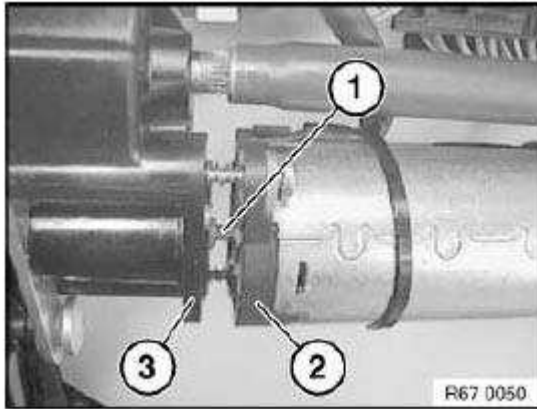


Fig. 10: Drive Shaft

Courtesy of BMW OF NORTH AMERICA, INC.

67 31 511 REMOVING AND INSTALLING/REPLACING DRIVE FOR SEAT TILT ADJUSTMENT (FRONT SEAT REMOVED)

Disconnect plug connection (4).

NOTE: Secure drive for seat tilt adjustment (5) against falling out.

Loosen screws (1).

Remove drive for seat tilt adjustment (5) with fixture for plug connection (3) in direction of arrow from flange (2).

If necessary, remove inner drive shaft from drive for seat tilt adjustment (5).

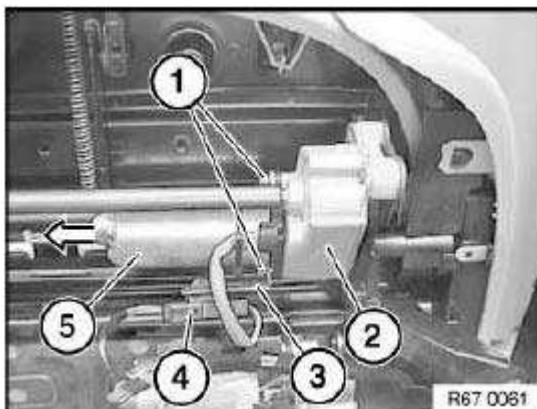


Fig. 11: Seat Tilt Adjustment

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Make sure drive shaft (1) is correctly seated.

Ensure fixture for plug connection (3) and drive for seat tilt adjustment (4) on flange (2) are correctly seated.

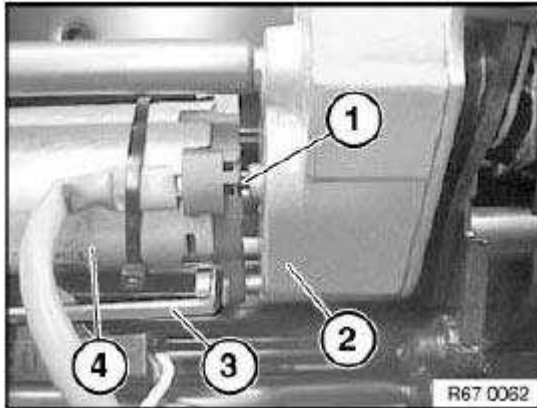


Fig. 12: Drive Shaft And Plug Connection

Courtesy of BMW OF NORTH AMERICA, INC.

67 31 521 REMOVING AND INSTALLING/REPLACING DRIVE FOR SEAT HEIGHT ADJUSTMENT (FRONT SEAT REMOVED)

Disconnect plug connection (2).

NOTE: **Secure drive for seat height adjustment (3) against falling out.**

Release screws (1).

Remove drive for seat height adjustment (3) with fixture for plug connection (4) in direction of arrow from flange (5).

If necessary, remove inner drive shaft from drive for seat height adjustment (3).

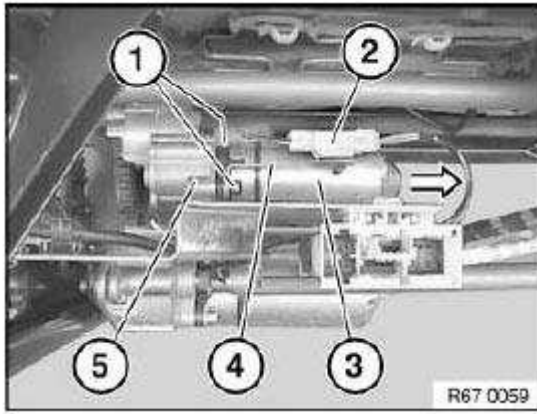


Fig. 13: Seat Height Adjustment And Inner Drive Shaft
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Make sure drive shaft (1) is exactly seated.

Ensure fixture for plug connection (2) and drive for seat height adjustment (3) on flange (4) are correctly seated.

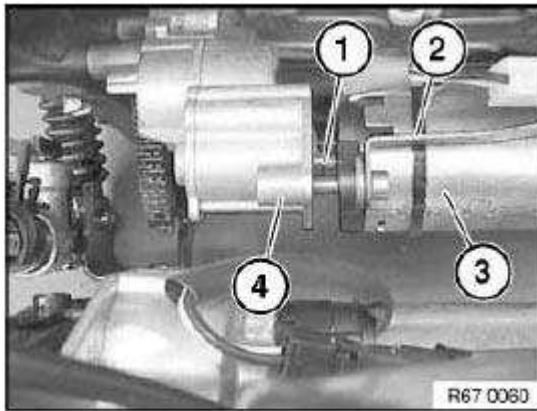


Fig. 14: Drive Shaft And Plug Connection
 Courtesy of BMW OF NORTH AMERICA, INC.

67 31 531 REMOVING AND INSTALLING/REPLACING DRIVE FOR BACKREST ANGLE ADJUSTMENT (FRONT SEAT REMOVED)

Disconnect plug connection (1).

NOTE: **Secure drive for backrest angle adjustment (5) against falling out.**

Release screws (3).

Remove drive for backrest angle adjustment (5) with fixture for plug connection (2) in direction of arrow from

flange (4).

If necessary, remove inner drive shaft from drive for backrest angle adjustment (5).

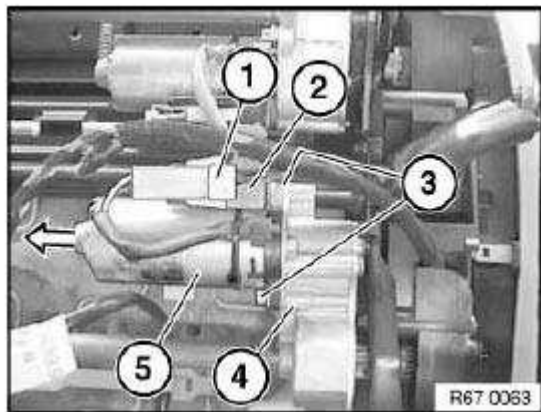


Fig. 15: Backrest Angle Adjustment
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Make sure drive shaft (1) is exactly seated.

Ensure fixture for plug connection (3) and drive for backrest angle adjustment (4) on flange (2) are correctly seated.

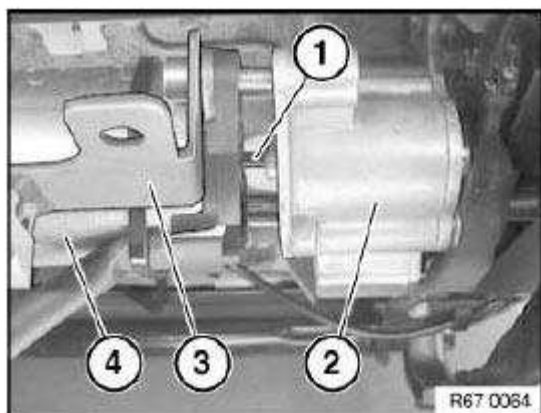


Fig. 16: Drive Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

61 DRIVE, SLIDE-TILT SUNROOF/CONVERTIBLE TOP

67 61 515 REPLACING DRIVE WITH GEAR (FRONT) FOR ACTUATING SLIDE/TILT SUNROOF (PANORAMA GLASS SUNROOF)

Necessary preliminary tasks:

- **E53:** Remove mounting bracket from roofliner at front.
- **E83:** Remove Front Roofliner Trim, see **51 44 ... REMOVING AND INSTALLING FRONT ROOFLINER TRIM** .

NOTE: **Secure drive with gear for actuating slide/tilt sunroof (2) against falling out.**

Release screws (1), tightening torque: 1AZ, see **54 13 ELECTRIC SUN ROOF COMPONENTS** .

Lower drive with gear for actuating slide/tilt sunroof (2).

NOTE: **Screws (1) are microencapsulated.**

Unlock plug connection (3), disconnect and remove drive with gear for actuating slide/tilt sunroof (2).

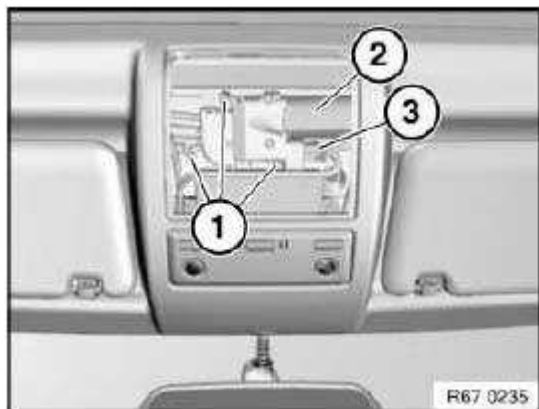


Fig. 17: Screws And Actuating Slide/Tilt Sunroof
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Insert gear wheel (1) of drive with gear for actuating slide/tilt sunroof (2) exactly in gear teeth (3).

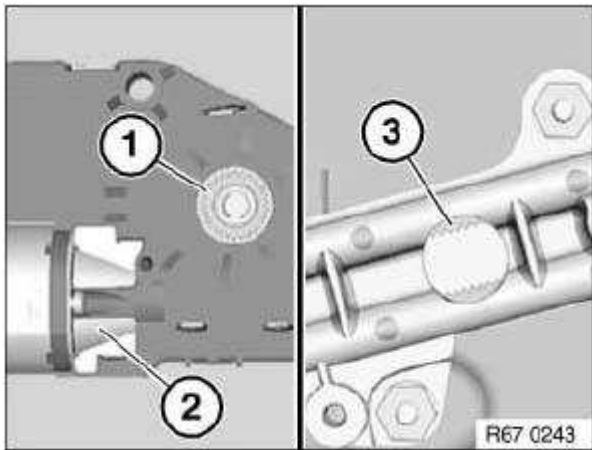


Fig. 18: Gear Wheel And Gear Teeth

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

- Initialize Panorama Glass Roof, see **54 0 ... NOTES ON PANORAMA GLASS ROOF (INITIALIZATION/NORMALIZATION/LEARNING OF CHARACTERISTIC CURVE)** .

67 61 517 REPLACING DRIVE WITH GEAR (REAR) FOR ACTUATING SLIDE/TILT SUNROOF

Necessary preliminary tasks:

- Remove rear grab handles, see **51 16 450 REMOVING AND INSTALLING/REPLACING REAR LEFT/RIGHT GRAB HANDLE** .
- Remove trim for rear left and right roof pillar (C-pillar), see **51 43 251 REMOVING AND INSTALLING/REPLACING TRIM PANEL FOR REAR LEFT OR RIGHT ROOF PILLAR (C - PILLAR)** .
- Remove trim for rear left and right roof pillar (D-pillar), see **51 43 252 REPLACING TRIM PANEL FOR REAR LEFT OR RIGHT ROOF PILLAR (D-PILLAR)** .
- Remove left and right interior lights, see **63 31 015 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT INTERIOR LIGHT (SIDE ROOFLINER)** .
- Detach mocket in area of roofliner

IMPORTANT: Do not under any circumstance kink roofliner (1).

Unclip roofliner (1) at retaining point (2) towards bottom and lower.

NOTE: Secure drive with gear for actuating slide/tilt sunroof (4) against falling out.

Release screws (3), tightening torque: 1AZ, see **54 13 ELECTRIC SUN ROOF COMPONENTS** .

Lower drive with gear for actuating slide/tilt sunroof (4).

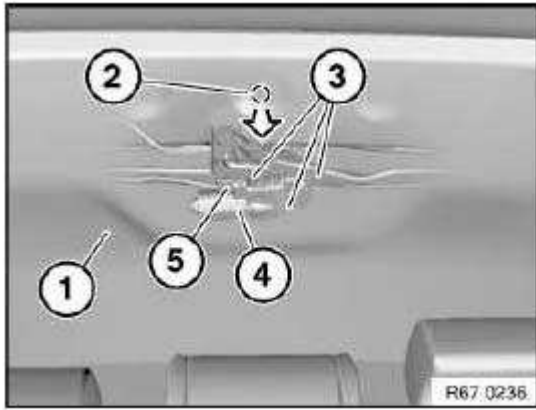


Fig. 19: Roofliner And Actuating Slide/Tilt Sunroof
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Screws (3) are microencapsulated.

Unlock plug connection (5), disconnect and remove drive with gear for actuating slide/tilt sunroof (4).

Installation:

Insert gear wheel (1) of drive with gear for actuating slide/tilt sunroof (2) exactly in gear teeth (3).

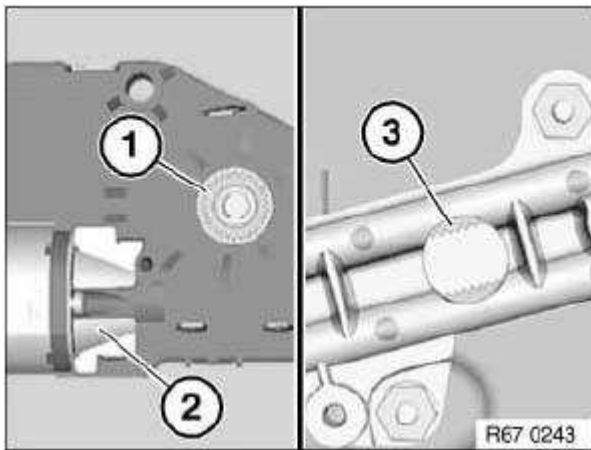


Fig. 20: Gear Wheel And Gear Teeth
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

- Initialize Panorama Glass Roof, see **54 0 ... NOTES ON PANORAMA GLASS ROOF (INITIALIZATION/NORMALIZATION/LEARNING OF CHARACTERISTIC CURVE)**.

62 DRIVE, WINDOW REGULATOR

67 62 000 REMOVING AND INSTALLING / REPLACING FLAT MOTOR FOR FRONT LEFT OR RIGHT POWER WINDOW UNIT

Special tools required:

- **00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)**

Necessary preliminary tasks:

- Detach sound insulation on front door in working area, see **51 48 060 REMOVING AND INSTALLING/REPLACING SOUND INSULATION IN LEFT OR RIGHT FRONT DOOR**.

NOTE: For clearer illustration, shown with sound insulation removed.

Disconnect plug connection (1).

Unfasten screws (2).

Detach flat motor (3) in direction of arrow from power window unit (4) and remove.

IMPORTANT: If necessary, use special tool 00 9 310 to release flat motor (3) from power window unit (4).

Guide wheel must not be pulled out of power window unit (4).

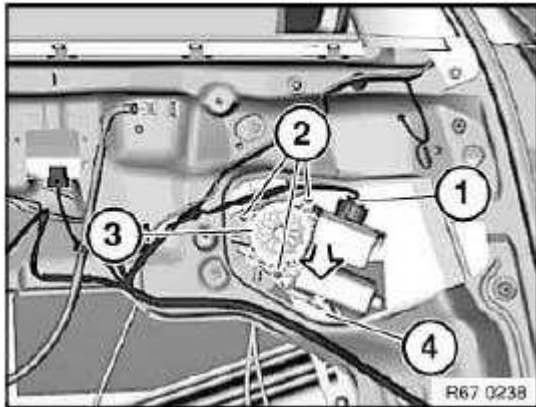


Fig. 21: Screws And Flat Motor

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Fit flat motor (3) exactly on teeth of power window unit.

Replacement:

A normalization must be carried out in order to activate anti - trapping protection.

Operating sequence for normalization:

- Open corresponding window completely.
- Operate corresponding power window switch in "Close" position (second switch stage).
- Once the upper end position has been reached, hold power window switch down for approx. 1 second more.

Normalization is thus completed.

NOTE: Carry out function check (one-touch function, anti-trapping protection and, if necessary, comfort function).

67 62 020 REMOVING AND INSTALLING/REPLACING FLAT MOTOR FOR REAR LEFT OR RIGHT POWER WINDOW UNIT

Necessary preliminary tasks:

- Detach sound insulation on rear door in working area, see **51 48 070 REMOVING AND INSTALLING/REPLACING SOUND INSULATION ON LEFT OR RIGHT REAR DOOR** .

NOTE: For clearer illustration, shown with sound insulation removed.

Unfasten plug connection (1) and disconnect.

Release screws (2).

Detach flat motor for power window unit (3) in direction of arrow from power window unit (4) and remove.

Installation:

Fit flat motor for power window unit (3) exactly on teeth of power window unit.

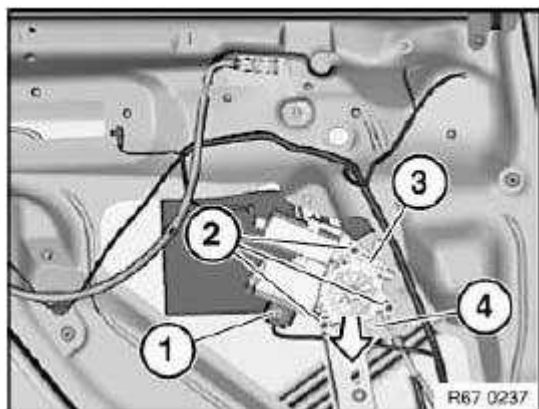


Fig. 22: Screws And Flat Motor

Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

A normalization must be carried out in order to activate anti - trapping protection.

Operating sequence for normalization:

- Open corresponding window completely.
- Operate corresponding power window switch in "Close" position (second switch stage).
- Once the upper end position has been reached, hold power window switch down for approx. 1 second more.

Normalization is thus completed.

NOTE: Carry out function check (one-touch function, anti-trapping protection and, if necessary, comfort function).

66 DRIVE, SEAT ADJUSTMENT

67 66 010 REMOVING AND INSTALLING/REPLACING LUMBAR SUPPORT DRIVE MECHANISM ON FRONT SEAT, LEFT OR RIGHT

Necessary preliminary tasks:

- Remove rear panel on front seat backrest, see **52 13 198 REMOVING AND INSTALLING / REPLACING REAR PANEL ON LEFT OR RIGHT FRONT SEAT BACKREST (NORMAL/MANUAL)** .

E53 comfort seat:

- Remove rear panel at bottom.

Detach backrest cover (1) in direction of arrow from backrest frame (2).

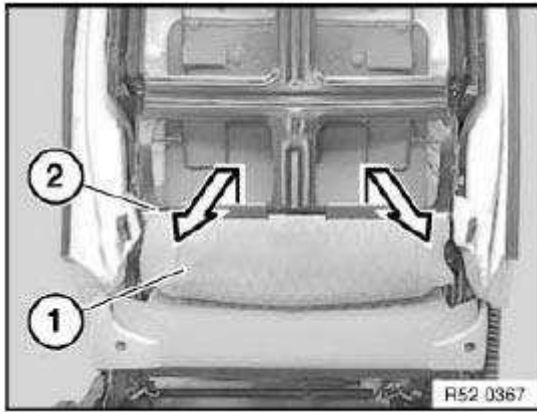


Fig. 23: Backrest Cover And Backrest Frame
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1).

Detach transparent hose (2) from valve housing (3).

NOTE: If necessary, gently heat transparent hose (2) if firmly seated.

If necessary, detach fabric adhesive tape (4).

Detach drive unit for lumbar support (5) with jacket in direction of arrow.

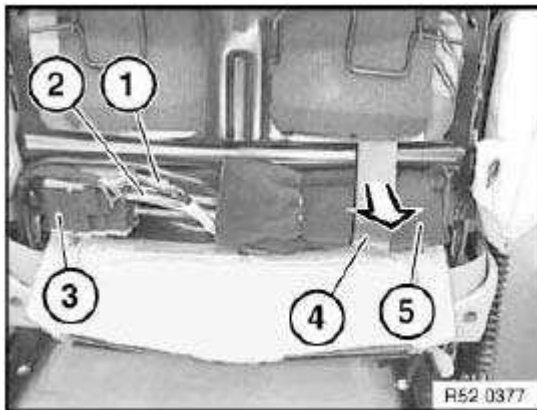


Fig. 24: Transparent Hose And Valve Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Clean adhesive area (1) on backrest frame (2).

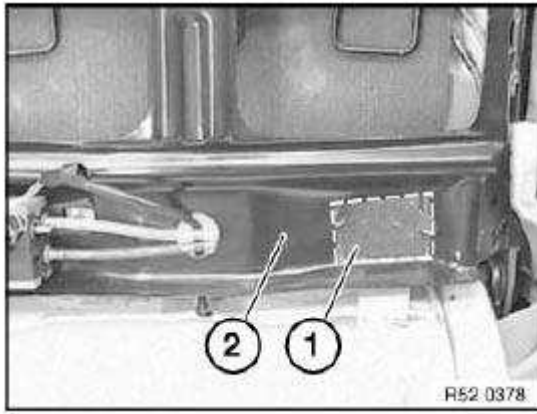


Fig. 25: Adhesive Area On Backrest Frame
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Transparent hose (1) of drive unit for lumbar support must not be kinked.

Pull off protective film (3) from jacket (2). Stick drive unit for lumbar support to backrest frame.

If necessary, secure jacket (2) with cable strap.

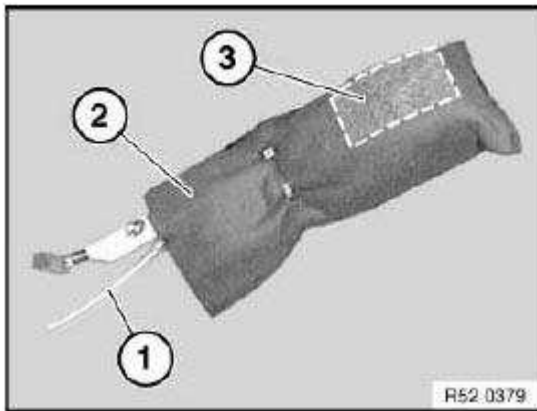


Fig. 26: Transparent Hose And Protective Film
Courtesy of BMW OF NORTH AMERICA, INC.

ACCESSORIES AND EQUIPMENT

Electrical Drives - Tightening Torques - X3

62 DRIVE, WINDOW REGULATOR

67 62 DRIVES, POWER WINDOWS

DRIVES, POWER WINDOWS TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Motor to window regulator	E46, E85, E86, E93			4.5 Nm
	E31, E36, E65, E66			5 Nm
	E81, E83			3 Nm
	E60, E61, E63, E64, E87, E90, E91, E92			6 Nm
	E70		Observe screwing sequence	6 Nm

ELECTRICAL

Electrical System - Operating Fluids

1.0 BATTERY

Only distilled water (available locally) is to be used when topping up the electrolyte level.

If a new battery (delivered dry) is to be placed into service, use only battery electrolyte ("sulfuric acid"), available locally.

2.0 SEALANT/SUPER GLUE/CONTACT CLEANER

Sealant

Aftermarket accessory installations which require routing electrical wires through metal body panels are to have the access holes sealed.

(former BMW Part No. 81 22 9 400 013)

BMW PART NUMBER SPECIFICATION

Wurth	Part No. 893430
-------	-----------------

SUPER GLUE

The rubber seal around the trunk release button of E39 vehicles can be repositioned with Wurth Rubberized Super Glue (Part No. 893 4103).

3.0 ELECTRICAL CONTACT ENHANCER AND CONTACT CLEANER

ELECTRICAL CONTACT/CONNECTOR GREASE

NyoGel 760G is resistive to moisture and can be used for a lubrication of tin-lead type electrical connectors.

NyoGel 760G BMW Part No. 83 23 0 392 297

ELECTRICAL CONTACT ENHANCER

Stabilant 22A evaporates and leaves a thin polymer film which is conductive between the mating surfaces, while staying non-conductive between adjacent pins. At the same time it prevents the formation of any further harmful deposits.

BMW PART NUMBER SPECIFICATION

Wurth	Part No. 893622 (Stabilant 22A)
-------	---------------------------------

NOTE: 1 : Stabilant 22A must not be used on Oxygen Sensor connectors. To function, oxygen sensors require a flow of oxygen through the terminal connector to the sensor element. Stabilant 22A will affect this flow of oxygen, and will result in irreparable damage to the sensor.

NOTE: 2 : Stabilant 22A must not be used on plug connectors which carry fiber optics. Stabilant 22A may migrate to the fiber optic and attenuate the optical signal.

CONTACT CLEANER SPRAY

Use to clean electrical and electronic components of dirt, grease, etc. Will not harm components or epoxy coverings. Allow to air dry. **Do not** dry with shop air supply as this may contaminate the connector.

BMW PART NUMBER SPECIFICATION

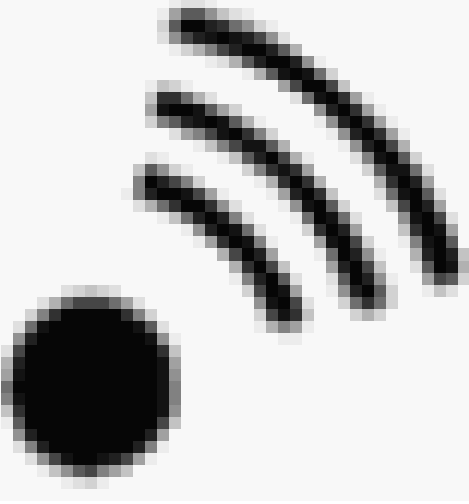
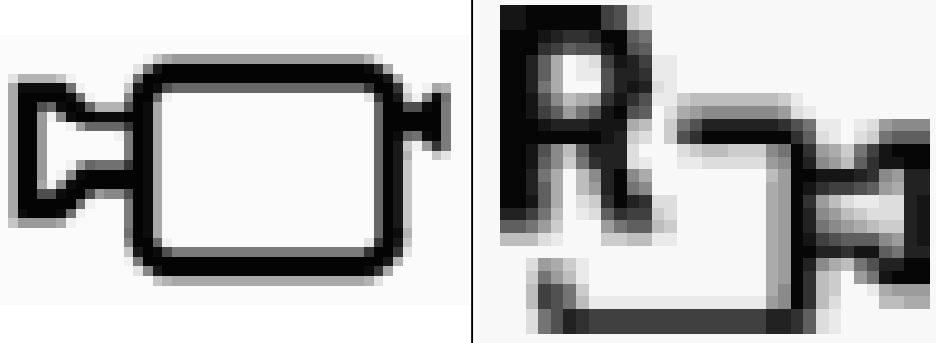
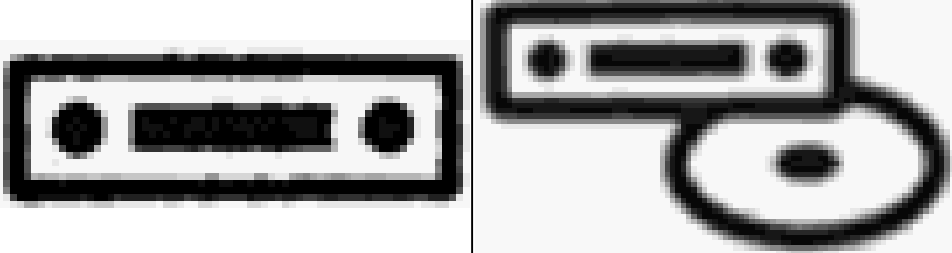
Wurth	Part No. 89365 (Zero Residue Electrical Contact Cleaner)
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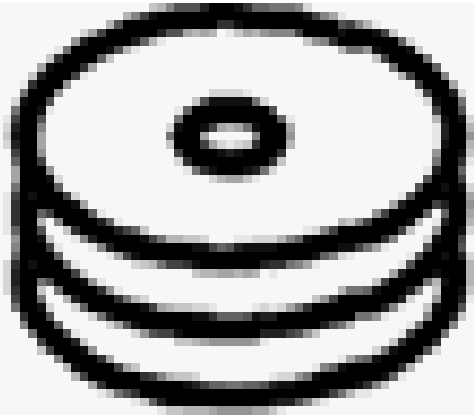



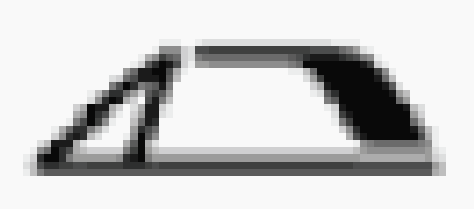
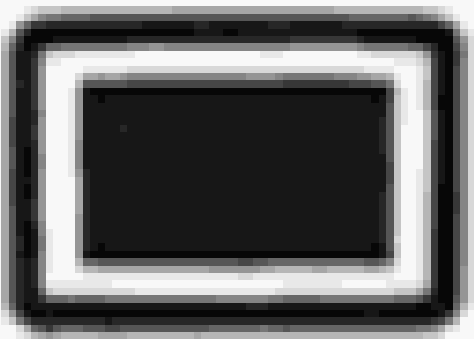
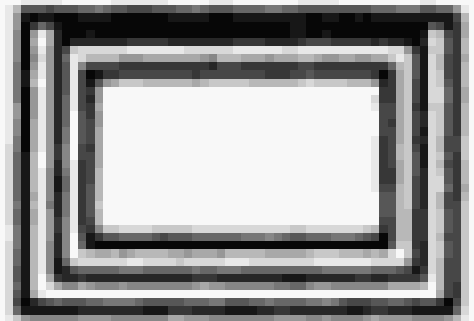

ELECTRICAL

Fuse Assignment Symbol Definitions - BMW

FUSE SYMBOLS

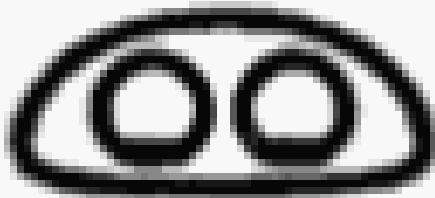
Fuse Assignment Symbol Definitions

System	Symbols (Including Variations)	
Accessories		
Alarm System		
Camera System/ (Rear View/Side View)		
CD/Radio		

<p>CD Changer</p>		
<p>Cigarette Lighter/ Accessory Socket</p>		
<p>Convertible Top (Down)</p>		
<p>Convertible Top (Up)</p>		
<p>Display (On-Board Monitor)</p>		
<p>Horn</p>		



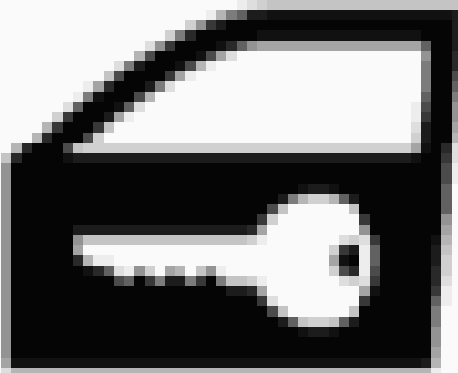
Instrument Cluster



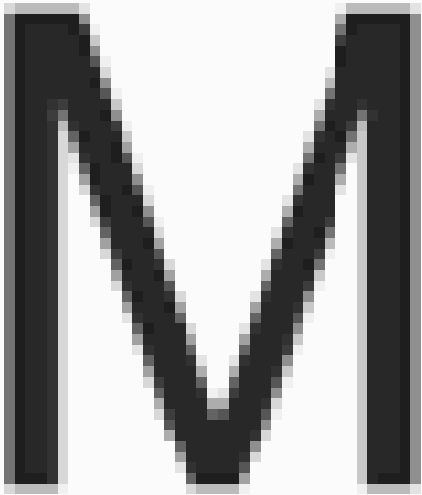
Door Module



Locking System



Memory
(Seat, Mirror, Steering
Wheel)



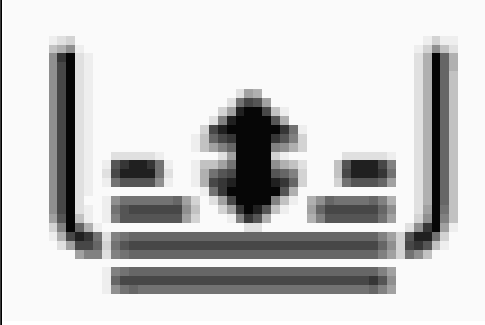
Mirror (Side)



Navigation System



Roller Sun Blind



Seat (Adjust)



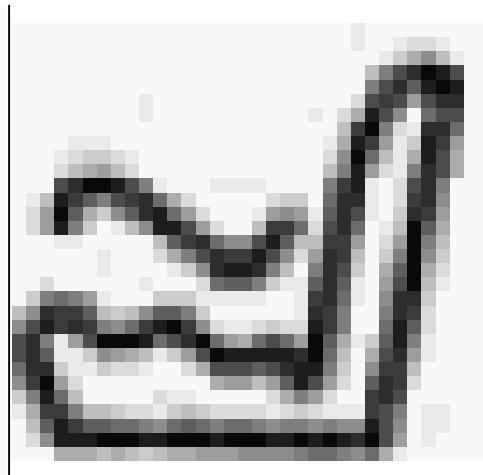
Seat (Passenger Adjust)/
Gentleman Function



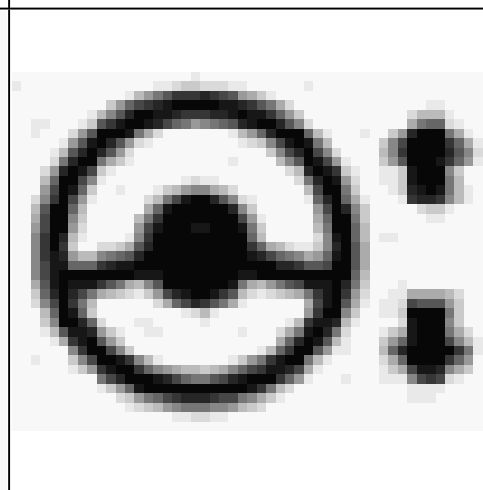
Seat (Heated)



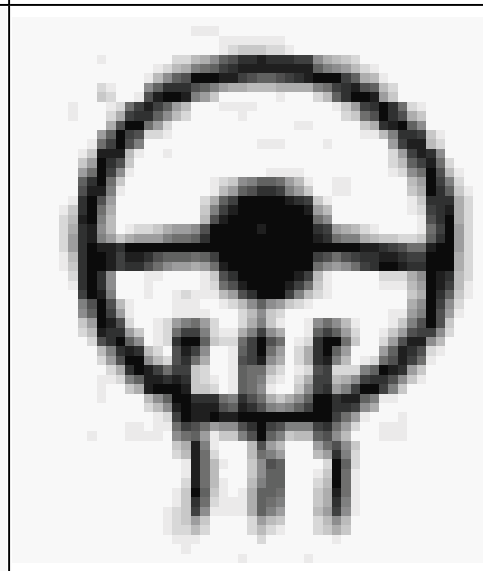
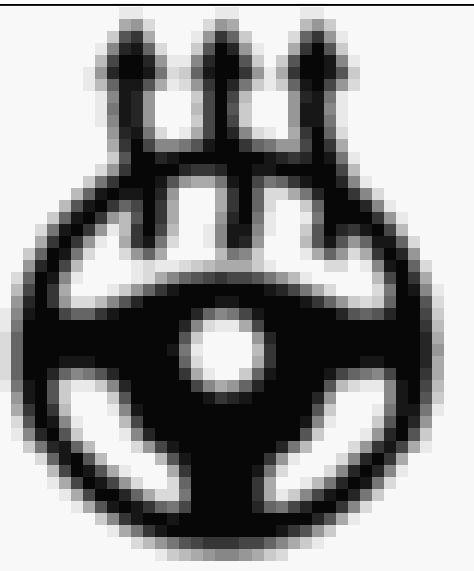
Seat (Active)



Steering Wheel (Adjust)



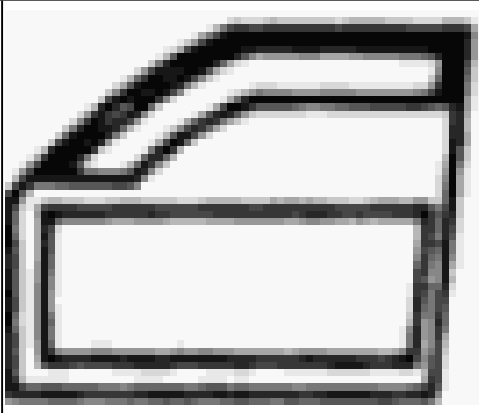
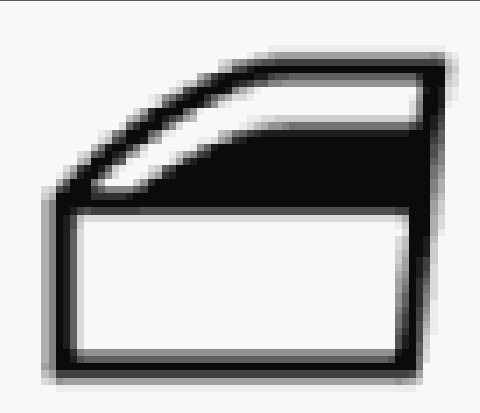
Steering Wheel (Heated)



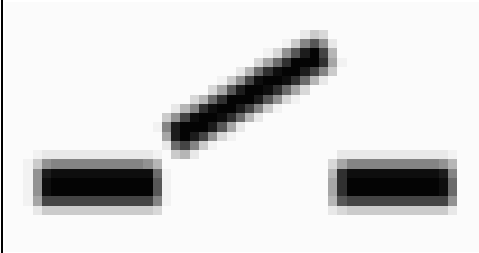
Telephone



Window (Up/Down)



Sunroof (Powered)





Rear Hatch/Trunk



Trailer/Tow

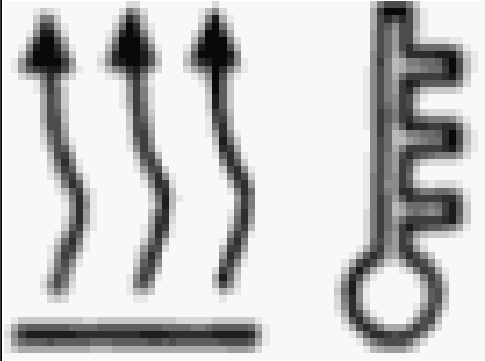


A/C & Heating

Heater
(Heated seats on older
models)



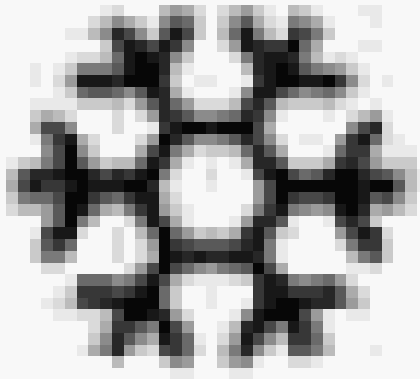
Heater
(Auxillary/Independent)



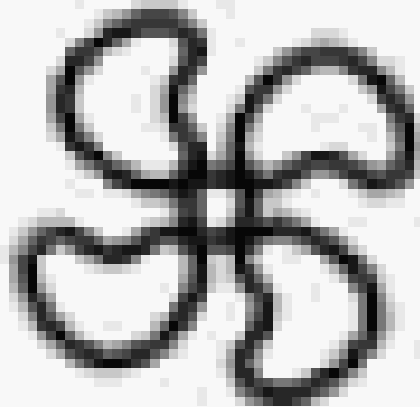
Heater (Fuel Burning)



A/C Cooling



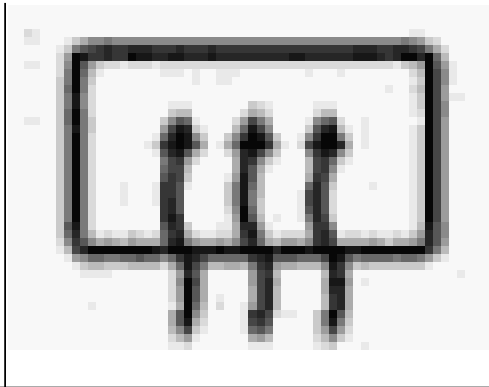
A/C-Heater Blower



Window Defroster

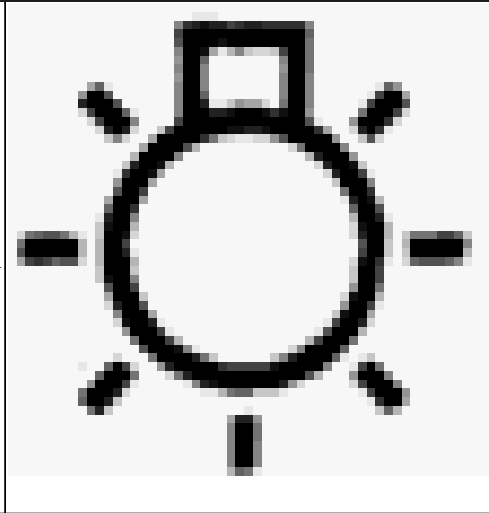


Window Defroster (Rear)/
Heated Rear Window



Lighting (Interior/Exterior)

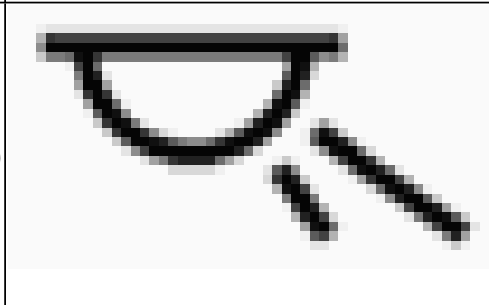
Lighting System



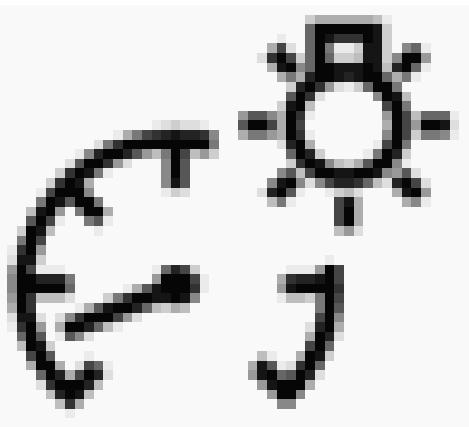
Lighting (Interior)



Lighting (Reading)



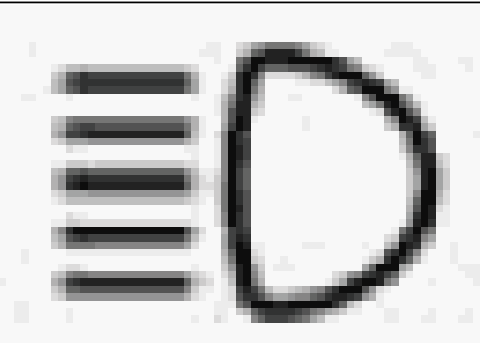
Lighting (Instrument)



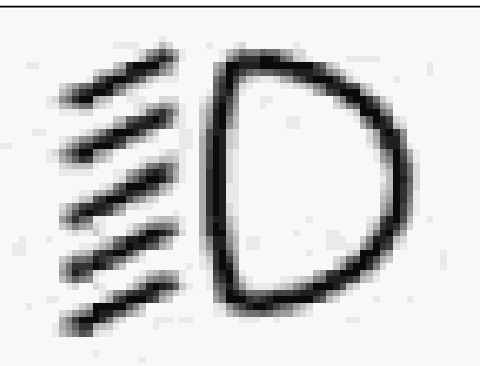
Exterior Lights
(Adaptive Headlight on Some
Models)







Headlight (High Beam)



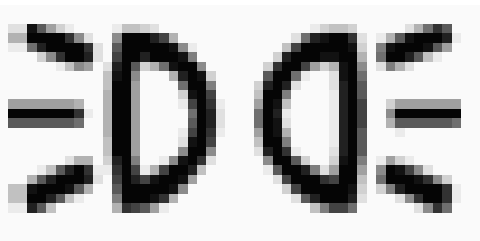
Headlight (Low Beam)



Headlight (Automatic
Control)

		
<p>Headlight (Cleaning System)</p>		
<p>Headlight (Cleaning System)/ Wiper (Rear) ⁽²⁾</p>		
<p>Fog Light</p>		

Parking Lights
or Daytime Running Lights

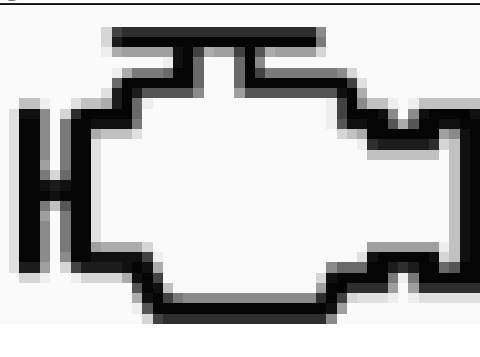


Parking Lights (Roadside)

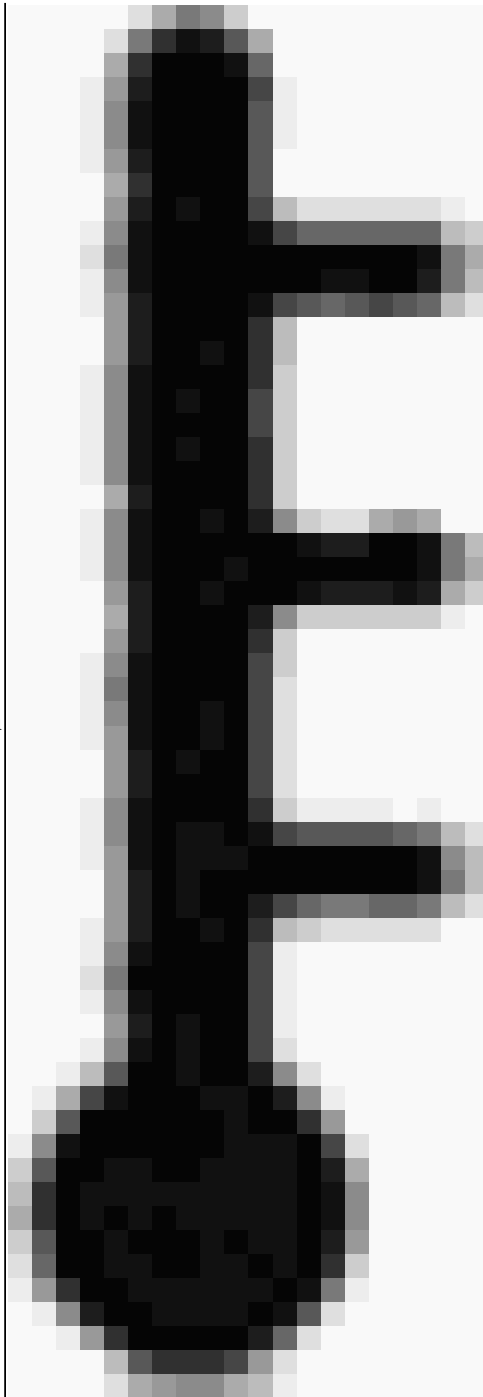


Engine, Transmission, & Diagnostic

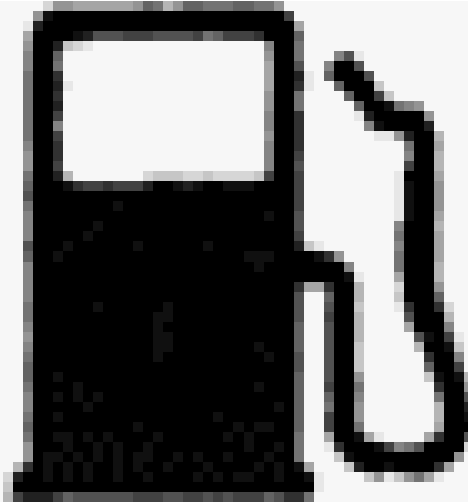
Engine Management



Engine Fan



Fuel Pump



Hybrid Interface Module

HIM
(Hybrid Interface Modul)

Ignition System (Electronic)

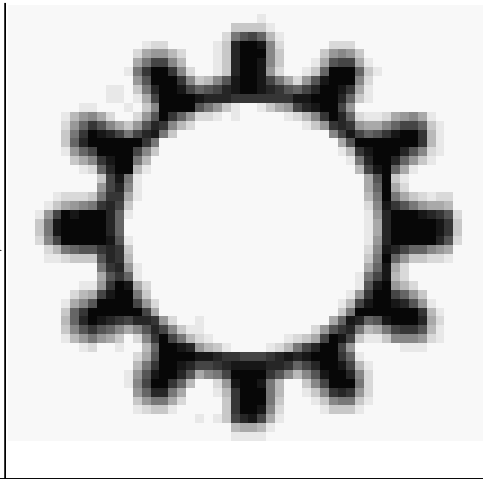
START
STOP



Data Link Connector (DLC)/
Diagnostic Socket

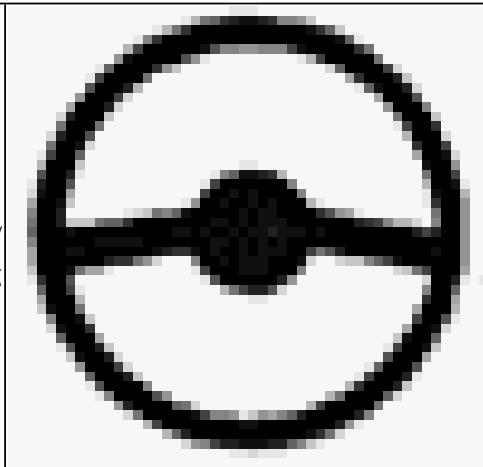
OBD

Transmission



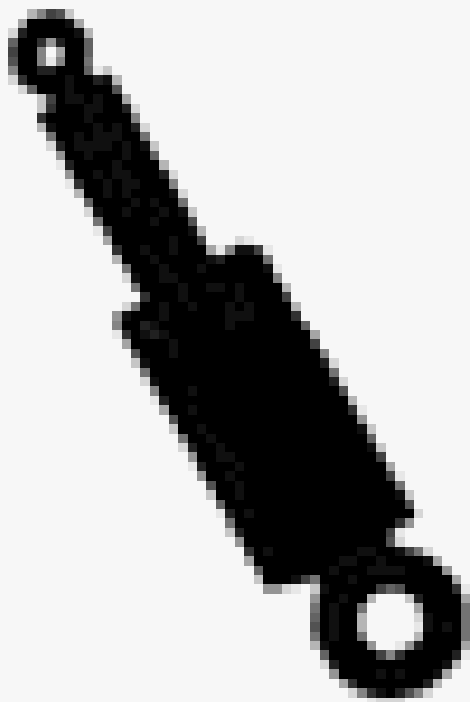
Steering & Suspension

Steering System/
Active Steering



Suspension System
(Electronic)





Electronic Damper Control

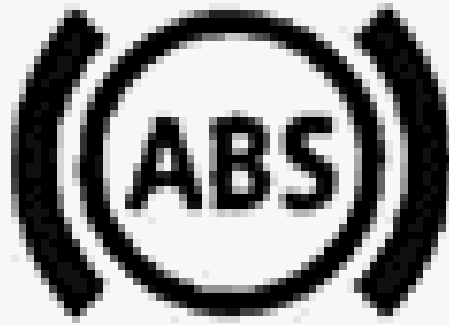
EDC

Suspension System (Self-Leveling)



Safety & Vehicle Control

ABS



DSC



Active Roll Stabilization



Cruise Control/
Active Cruise Control



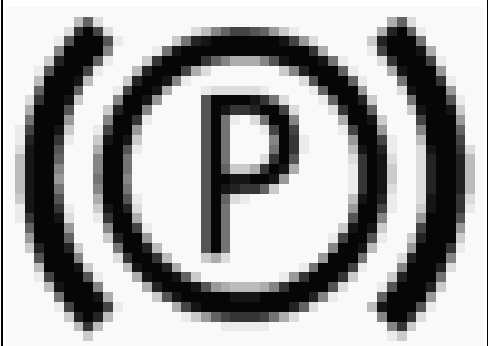
Park Distance Control (PDC)

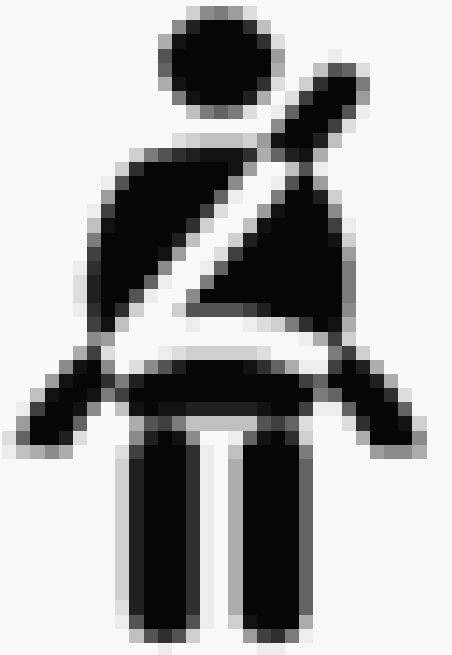





Park Distance Control
(PDC)/
Remote Garage Door Opener
(2)



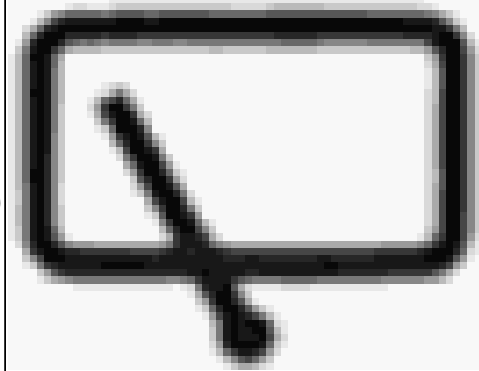
Parking Brake



<p>Restraint System (Belts/Air Bag)</p>		
<p>Tire Pressure Monitor (TPMS)</p>		
<p>Wiper/Washer</p>		
<p>Wiper System</p>		
<p>Wiper (Front)</p>		



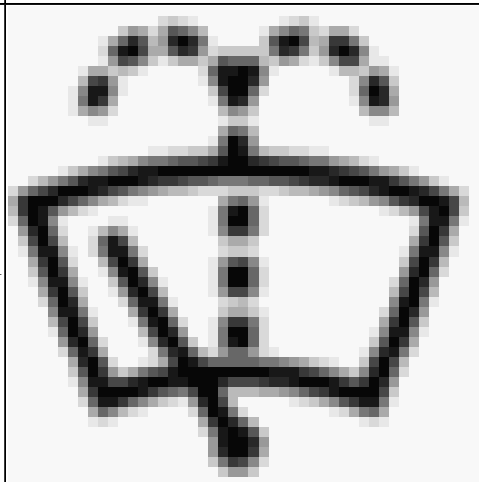
Wiper (Rear)







Wiper (Rain Sensor)



Washer System



<p>Washer (Rear Window)</p>		
<p>Washer (Heated Jets)</p>		
<p>Misc.</p>		
<p>(1)</p>		
<p>(1) Definition has not been determined.</p>		
<p>(2) While the definition of the individual symbols in this combined set is known, the meaning behind the combination has not been determined.</p>		

ELECTRICAL

BMW - X3 (E83) - 2004-10

IDENTIFICATION

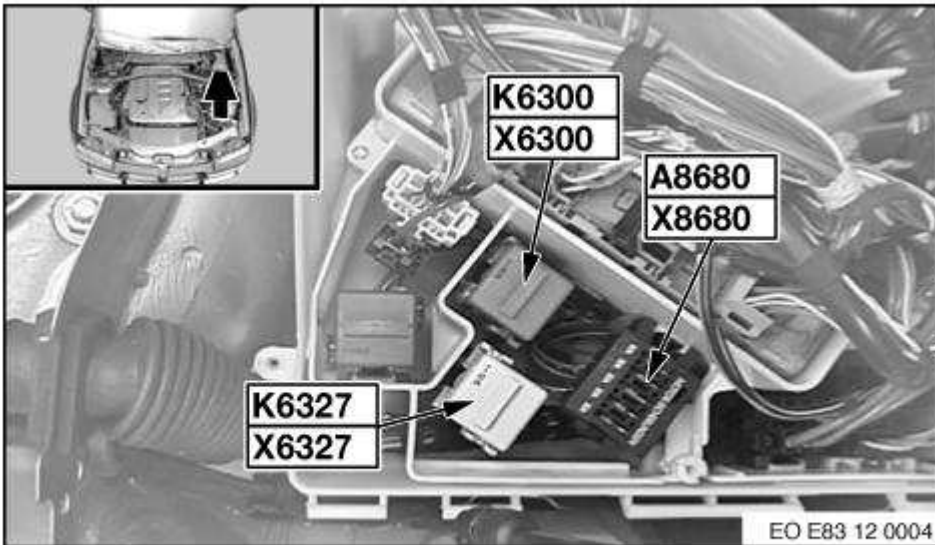
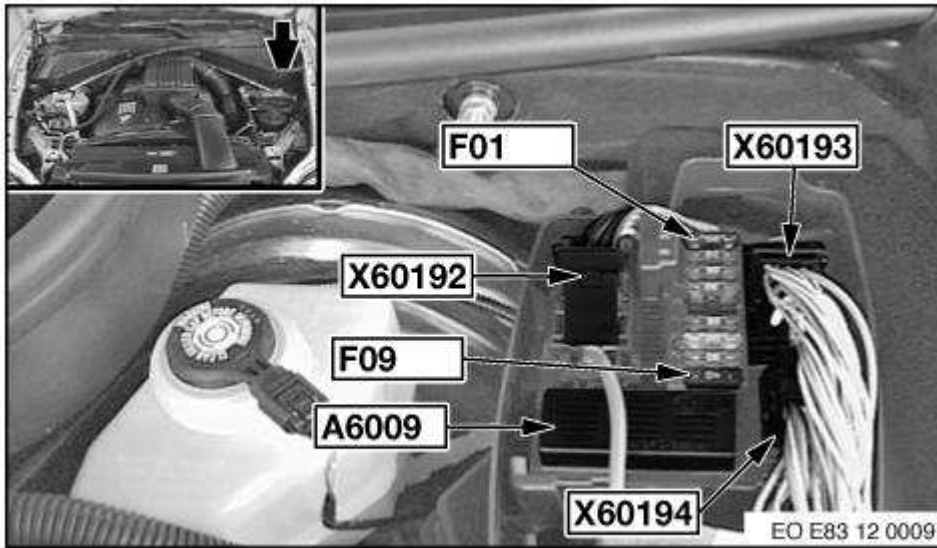
WARNING: Vehicles are equipped with air bag supplemental restraint system. Before attempting any repairs involving steering column, instrument panel or related components, see appropriate **AIR BAG SAFETY PRECAUTIONS** and **ACTIVATING AIR BAG SYSTEM** in **AIR BAG RESTRAINT SYSTEMS** article.

CAUTION: When battery is disconnected, vehicle computer and memory systems may lose memory data. Driveability problems may exist until computer systems have completed a relearn cycle. See appropriate **COMPUTER RELEARN PROCEDURES** article in **GENERAL INFORMATION** before disconnecting battery.

COMPONENT IDENTIFICATION

ENGINE ELECTRONICS FUSE CARRIER

Engine electronics fuse carrier (A8680 or A6009) is located in left rear of engine compartment. See **Fig. 1**.



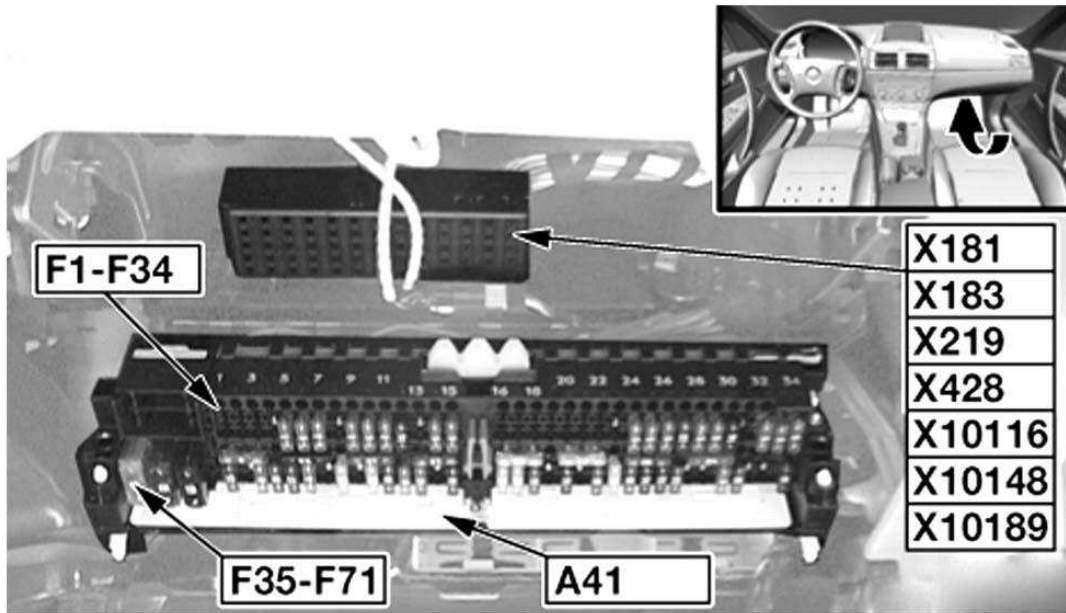
G00315123

Fig. 1: Locating Engine Electronics Fuse Carrier
 Courtesy of BMW OF NORTH AMERICA, INC.

FRONT FUSE HOLDER

For location of front fuse holder and power distribution (A41), see **Fig. 2**.

For amperage and components covered, see **Fig. 3** or **Fig. 4**.



G00315119

Fig. 2: Locating Fuses & Power Distribution

Courtesy of BMW OF NORTH AMERICA, INC.

Equipment	Fuse No.	Equipment	Fuse No.
A/C auxiliary water pump	62	Interior light	49,52
Adaptive light control	23,58	Light module	9,32
Adjustment driver seat	65	Make-up mirror light	6
Adjustment passenger seat	70	Navigation	7,42
Airbag	11	On-board computer	9
Air conditioner	28,62,63	On-board Diagnose II	30,43
Automatic gearbox diesel	56	On-board monitor	42
Blower	50	Outside mirror	31,57
Brake light	9	Panoramic sunroof	46
Central locking system	49,52,60	Parking aid	24
Central locking system		Passenger comp./trunk lighting	52
Japan/Korea	52,60,67	Radio	7,41
CD changer	42	Rain sensor	15
Cigarette lighter	47	Rear wiper	15,45
Cigarette lighter (Australia)	26,47	Reversing light	27
Clutch switch	9	Secondary air pump	36
Diesel fuel heater	36	Servotronic	69
DSC 4-wheel drive	12,33,35,40,53	Shifting gate illumination	40
Electric fan	37	Side airbag	11
Electric seat heating	12,61	Socket	47
Engine control	27,29,30	Speed control	9
Folding outside mirror	57	Starter interlock	14
Front fog light	38	Telephone	7,39
Fuel pump	34,54	Theftproofing system	49,67
Garage door opener	24	Trailer coupling	44
Glove box light	52	Transfer gear	26
Hand lamp	52	TV	42
Headlight cleaning	51	Voice input system	7
Heated outside mirror, passenger	25	Water valve, A/C	62
Heated rear window	28,68	Window lift front	48,49,57
Heated spray nozzles	52	Window lift rear	57,71
Heated steering wheel	66	Windscreen washer system	49,52,59
Horn	5,55		
Immobilizer	14,67		
Instrument cluster	10,34,43		
Inside mirror electrochromic	24,67		

Fuse No.	Replacement f.														
Amperes	Fuse														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	-	-	-	-	5	5	5	-	5	5	5	7,5	-	5	5

Fuse No.	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
Amperes	40	50	60	15	5	5	30	10	5	20	20	20	20	30	5	40	30	30

Fuse No.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
Amperes	-	-	-	-	-	-	-	5	5	5	5	10	5	5	7,5	5	5	5	5

Fuse No.	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71
Amperes	25	20	15	5	7,5	7,5	30	25	30	7,5	7,5	-	30	10	5	30	5	30	30

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Fig. 3: Identifying Fuses (2004 to Sept 2005)
 Courtesy of BMW OF NORTH AMERICA, INC.

Fuse No.	Replacement f.			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Amperes	Fuse			-	-	-	-	5	5	5	-	5	5	5	7,5	-	5	5

Fuse No.	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
Amperes	40	50	60	15	5	5	30	10	5	20	20	20	20	30	5	40	30	30

Equipment	Fuse No.	Equipment	Fuse No.
A/C auxiliary water pump	62	Electric fan	37
Adaptive light control	23,58	Electric seat heating	12,61
Adjustment driver seat	65	Engine control	27,29,30,22
Adjustment passenger seat	70	Folding outside mirror	57
Airbag	11	Front fog light	38
Air conditioner	28,62,63	Fuel pump	34,54
Automatic gearbox diesel	56	Garage door opener	24
Blower	50	Glove box light	52
Brake light	9	Hand lamp	52
Central locking system	49,52,60	Headlight cleaning	51
Central locking system		Heated outside mirror, passenger	25
Japan/Korea	52,60,67	Heated rear window	28,68
CD changer	42	Heated spray nozzles	52
Cigarette lighter	47	Heated steering wheel	66
Cigarette lighter (Australia)	26,47	Horn	5,55
Clutch switch	9	Immobilizer	14,67
Diesel fuel heater	36	Instrument cluster	10,34,43
DSC 4-wheel drive	12,33,35,40,53	Inside mirror electrochromic	24,67

Fuse No.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
Amperes	-	-	-	-	-	-	5	5	5	5	5	10	5	5	7,5	5	5	5	5

Fuse No.	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71
Amperes	25	20	15	5	7,5	7,5	30	25	30	7,5	7,5	-	30	10	5	30	5	30	30

Equipment	Fuse No.	Equipment	Fuse No.
Interior light	49,52	Side airbag	11
Light module	9,32	Socket	47
Make-up mirror light	6	Speed control	9
Navigation	7,42	Starter interlock	14
On-board computer	9	Telephone	7,39
On-board Diagnose II	30,43	Thiefproofing system	49,67
On-board monitor	42	Trailer coupling	44
Outside mirror	31,57	Transfer gear	26
Panoramic sunroof	46	TV	42
Parking aid	24	Tyre pressure	69
Passenger comp./trunk lighting	52	Voice input system	7
Radio	7,41	Water valve, A/C	62
Rain sensor	15	Window lift front	48,49,57
Rear wiper	15,45	Window lift rear	51,71
Reversing light	27	Windscreen washer system	49,52,59
Secondary air pump	36		
Servotronic	69		
Shifting gate illumination	40		

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Fig. 4: Identifying Fuses (Oct 2005 to 2010)
 Courtesy of BMW OF NORTH AMERICA, INC.

POWER DISTRIBUTION

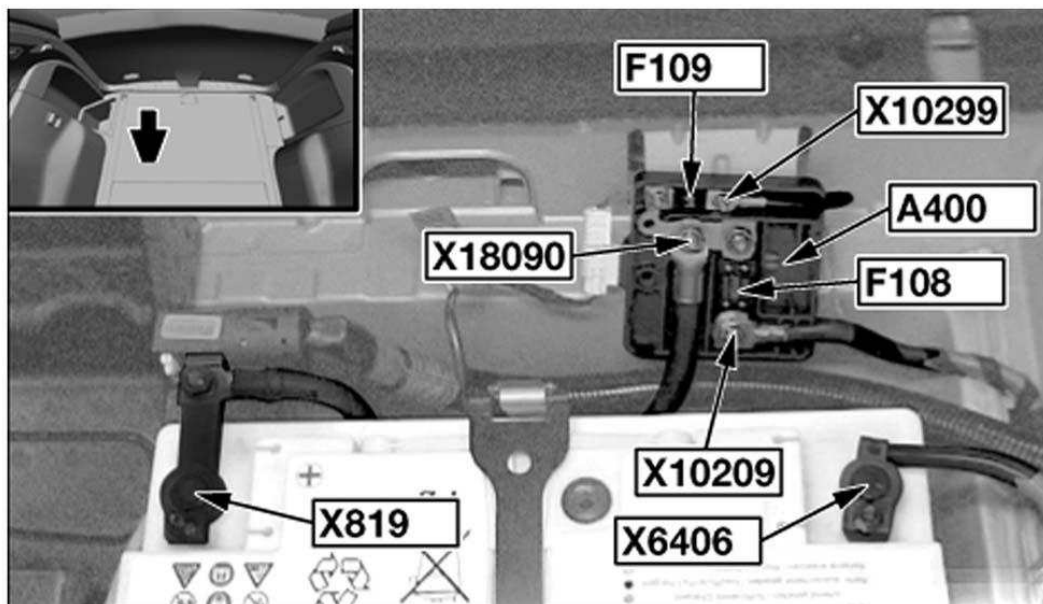
For location of power distribution (A41), see **Fig. 2**. Power distribution contains the following fuses:

- F102 - 80 Amp - B+ Potential Distributor
- F104 - 100 Amp - Preheating Control Module
- F105 - 50 Amp - Ignition Switch
- F106 - 50 Amp - Light Switch Cluster, Ignition Switch
- F107 - 50 Amp - Light Switch Cluster, Trailer Module

REAR FUSE BOX (A400)

For location, see **Fig. 5**. Rear fuse box (A400) contains the following fuses:

- F108 - 250 Amp - Power Distribution
- F109 - 60 Amp - Rear Fuse Holder



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Fig. 5: Locating Rear Fuse Box

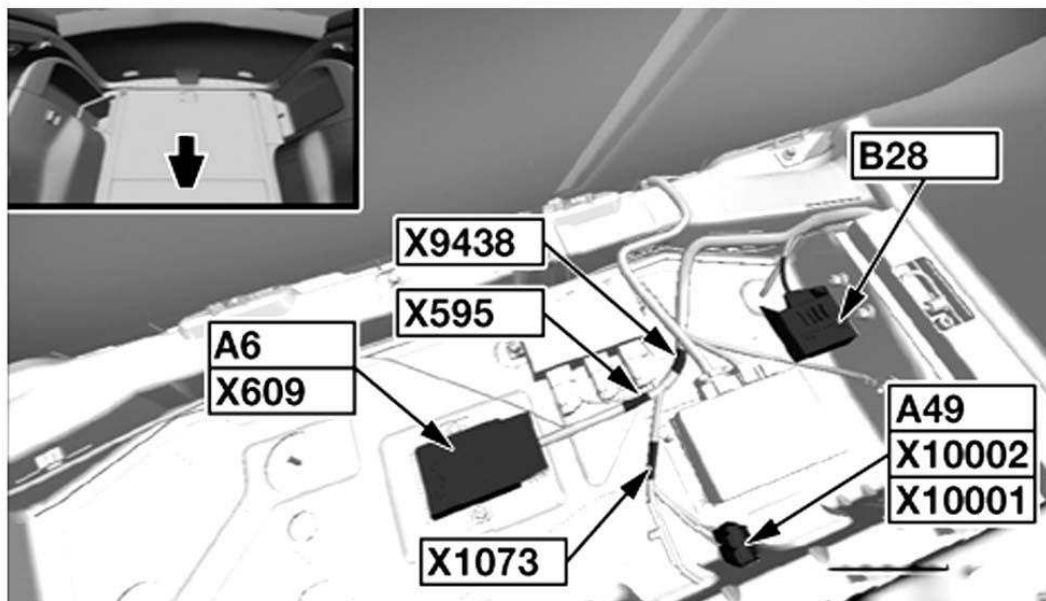
Courtesy of BMW OF NORTH AMERICA, INC.

REAR FUSE HOLDER (A49)

For location, see **Fig. 6**. Rear fuse holder (A49) contains the following fuses:

- F80 - 30 Amp - Transfer Box Control Module

- F81 - 30 Amp - Amplifier



G00315121

Fig. 6: Locating Rear Fuse Holder

Courtesy of BMW OF NORTH AMERICA, INC.

ACCESSORIES AND EQUIPMENT

General Electrical System - SI Techniques - X3

INTERIOR MIRROR WITH DIGITAL COMPASS

E70, E83, E90, E91, E92, E93



Fig. 1: Interior Mirror With Digital Compass
Courtesy of BMW OF NORTH AMERICA, INC.

INTRODUCTION

A digital compass in the interior mirror is offered as an optional extra (option 4NA) for the following BMW vehicles: 3 Series and X3 and X5.

- > **Up to 09/2006**

A small LC display at top right in the interior mirror indicates the point of the compass in which the direction of travel is pointing: e.g. **SW** for South West.

- > **From 09/2006**

The display is effected with transmitted light technology. An LC display (window) is no longer needed. The display can be deactivated.

The compass offers an additional benefit especially in the USA. In large cities the streets are frequently arranged according to the points of the compass. The points of the compass are also marked on signposts.

The compass also makes orientation in European cities easier.

NOTE: Option 4NA only in conjunction with option 430 or 431.

Option 4NA "Interior mirror with digital compass" is offered only in conjunction with the following option:

- Option 430 "Interior mirror and exterior mirrors with automatic antiglare control"
- Option 431 "Interior mirror with automatic antiglare control"

Option 4NA **cannot** be combined with option 449 "Interior mirror with toll function for Japan".

Option 4NA **cannot** be combined with option 802 "Korea version".

Option 4NA **cannot** be combined with option 5AC "Main-beam assistant".

BRIEF DESCRIPTION OF COMPONENTS

The following components deliver signals for the digital compass:

- **Magnetic field sensor**
 - **> up to 09/2006**

The magnetic field sensor is installed in the mirror base. The magnetic field sensor measures the current alignment of the magnetic field. The signal is sent to the control electronics for the compass in the interior mirror.

- **> from 09/2006**

The magnetic field sensor is on the PCB in the interior mirror.

- **Control electronics for the compass**

The interior mirror is electrically connected to the roof control panel (FZD).

The control electronics for the compass are integrated into the board for the interior mirror. The signals from the magnetic field sensor are received by the control electronics. The LCD display is activated directly by the control electronics.

The following components are controlled:

- **Display in interior mirror**

- **> up to 09/2006**

The LC display (window) is situated at top right in the interior mirror.

The points of the compass are presented digitally on the LCD display (LCD: Liquid Crystal Display). The display is divided into eight compass points.

- **> from 09/2006**

The point of the compass is displayed in transparent light technology in the interior mirror as well. The display is likewise situated at top right in the interior mirror. The display is divided into 8 points of the compass.

SYSTEM FUNCTIONS

The following system functions for the digital compass are described:

- Display
- Brightness control of display
- Adjustment of magnetic field zones and calibration
- from 09/2006: Further adjustments
- up to 09/2006: Fault display

Display

The 8 points of the compass are digitally displayed by abbreviations.

- **> From 09/2006**

The display is available in English and German (delivery status: English LHD)

N: North

NE: North East

E: East

SE: South East

S: South

SW: South West

W: West

NW: North West

The changeover between displays is carried out as follows:

- The current vehicle position is the center of a 360° circle.
- The eight points of the compass divide these 360° into sixteen 22.5° segments.
- The display changes over if the direction of travel changes by more than 22.5°.

Brightness control of display

2 photocells in the electrochromic interior mirror record the surrounding brightness (1 photocell for the surrounding brightness coming from the front, 1 photocell for the surrounding brightness coming from the rear).

The photocells deliver the signals for the display brightness control.

The brightness of the display is adjusted by the interior mirror control electronics to suit the surrounding brightness.

Adjustment of magnetic field zones and calibration

The worldwide magnetic field zones are permanently stored in the interior mirror. The magnetic field zones represent the deviations in relation to an ideal magnetic field for earth. The orientation "North" is precisely determined by the magnetic field zones.

The current magnetic field zone may be adjusted according to the geographic location. For example, Germany is located in magnetic field zone "8".

A vehicle has its own magnetic field. This makes it possible for the magnetic field sensor to measure an overlapping of the magnetic field with the earth's magnetic field. This overlapping is "worked out" by calibrating the compass.

A changed magnetic field is normally calibrated "automatically".

The vehicle's magnetic field may change under the following special circumstances:

- Powerful vibration during an accident
- Very large external magnetic field - e.g. if a vehicle passes under a train when travelling through an underpass

However, a manual calibration may speed up the automatic calibration.

For procedure to be followed when setting the magnet field zones as well as manual calibration: see notes for service staff.

from 09/2006: Further adjustments

Different time-based adjustment menus can be obtained by means of the adjustment button:

- 0 to 3 seconds: Display ON/OFF
- 3 to 6 seconds: Adjustment of magnetic field zones (0 - 15)
- 6 to 9 seconds: Calibration (C)
- 9 to 12 seconds: Left-hand drive or right-hand drive (L or R)
- 12 to 15 seconds: English or German (E or O)

Release the adjustment button when the correct menu is obtained. Select values in the menu by pressing briefly.

After approx. 5 seconds the value is stored and the menu is automatically exited.

up to 09/2006: Fault display

The LC matrix for the LCD display lights up completely if a system fault develops. A fault is displayed under the following conditions:

- If the vehicle is highly magnetised (2,200-2,500 milligauss), the measuring range of the magnetic field sensor will be exceeded.
- If a fault develops in the circuitry of the magnetic field sensor.

NOTE: regarding the physical unit "gauss".

Gauss is the unit of measurement for magnetic flux density.

Preconditions for activation

At terminal 15 ON, the display is activated with a test run.

- > **Up to 09/2006**

During this process, the LC matrix lights up completely (approx. 3 seconds). The digital compass is then switched on. There is no switch for turning off the LCD display at terminal 15 ON.

BUS STRUCTURES

All models from E38 and MINI

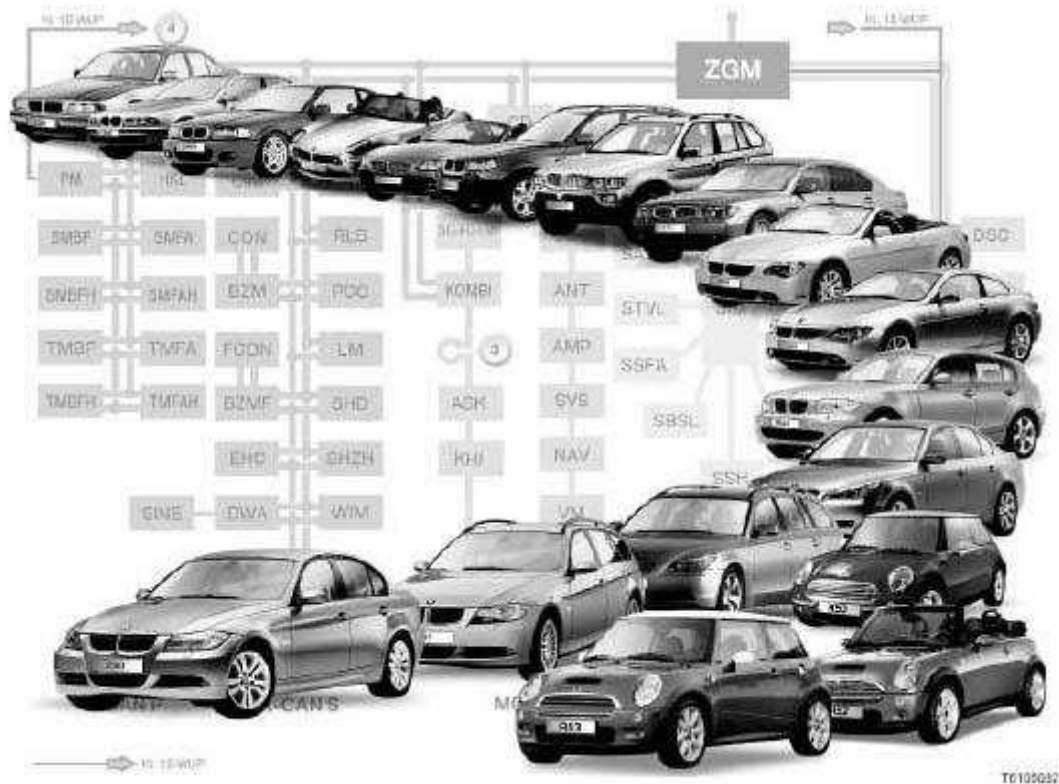


Fig. 2: Bus Structures
 Courtesy of BMW OF NORTH AMERICA, INC.

INTRODUCTION

In the vehicles of today, components and control units are networked by means of data buses. Data buses are capable of transmitting messages and signals.

The connected control units only read off those messages and signals that are of relevance to their operation.

Most buses are CAN buses (CAN: Controller Area Network).

A fibre-optic cable is used for navigation and entertainment: The MOST bus (MOST = "Media Oriented System Transport").

It has its own data wire for diagnosis: the diagnostics cable, also known as the "K-line"

This SI Technology bulletin (SBT) contains system overviews of bus structures for the following model series:

- E38 (7-Series, manufacturing period from 1994 to 2001)
- E39 (5-Series, manufacturing period from 1995 to 2003)
- E46 (3-Series, manufacturing period from 1997 to 2005)
- E52 (Z8, manufacturing period from 1999 to 2003)
- E53 (X5, start of series production 2001)

- E60, E61, E63, E64
 - > E60, E61, E63, E64 from 09/2005:
 - > E60, E61, E63, E64 from 03/2005 until 09/2005:
 - > E60, E61, E63, E64 until 03/2005:
- E65, E66
 - > E65 and E66 from 03/2005:
 - > E65 and E66 from 03/2004 until 03/2005:
 - > E65 and E66 until 03/2004:
- E70 (X5, start of series production 2006)
- E83 (X3, start of series production 2004)
- E85, E86
 - > E85 (Z4), start of series production 2002 until 01/2006:
 - > E85, E86 from 01/2006:
- E87 (1-Series, start of series production 2004)
- E90, E91, E92, E93 (3-Series, start of series production 2005)
- R50, R52, R53 (MINI and MINI Convertible, start of series production 2001)
- R56 (start of series production 2006)

This SI Technology bulletin (SBT) also contains a section with frequently asked questions.

NOTE: Abbreviations for control unit names

In the overviews of bus structures, all diagnosis and programming control units are indicated by abbreviations.

The abbreviated names of the control units are listed in alphabetical order and explained in a separate section "Abbreviations" in the SI Technology bulletin (SBT).

The following control units are numbered:

- Control units that **cannot** be programmed and **cannot** be encoded and which **do not** appear in the quick test.

These control units do not have an abbreviation, just a number.

- Control units with control unit designation from the time before electrical system 2000:

Besides the abbreviation, these control units have a number for entering in the table.

On the history of control unit designations:

Since the start of series production of the E65 (electrical system 2000), the control unit designations have been harmonised. Earlier model series have varying control unit designations.

For technical reasons associated with the system, these control units have not been renamed.

This is because: These control unit designations appear in the quick test on the BMW diagnosis system.

BUSES AND CONTROL UNITS IN THE E60, E61, E63, E64

In the E60, the K-CAN S and K-CAN P from the E65, E66 have been combined to form the K-CAN.

This means the E60 has the following buses: **byteflight** , K-CAN, MOST, F-CAN, PT-CAN plus a local CAN (for the engine control system).

The central interface for exchanging data between buses is the safety and gateway module (SGM).

NOTE: Modifications to the bus structures for the E60 as from 09/2005

From September 2005, the bus structures of the E60 are modified as follows:

- No **byteflight** data bus

The SZL control unit is connected to the PT-CAN and no longer to the **byteflight** .

As before, the SZL control unit is connected to the F-CAN.

Following control units are dropped together with the **byteflight** :

- SBSL: B-pillar satellite, left
- SBSR: B-pillar satellite, right
- TMBF: Door module, front-passenger
- TMFA: Door module, driver

- ACSM is added.

The crash safety system is controlled by a new control unit:

ACSM: crash safety module

The ACSM control unit is on the K-CAN.

("ACSM" = Advanced Crash Safety Module or Management)

- ALBBF and ALBFA are added.

2 new control units for the active backrest width adjustment are added on the PT-CAN.

ALBBF: Active seat back width, front passenger seat

ALBFA: Active seat back width, driver's seat

- CA is added.

A control unit for comfort access is added on the K-CAN.

CA: Comfort Access

- KGM is added.

As of September 2005, the data interface for the buses is the body-gateway module (KGM). The previous data interface for the buses, the safety and gateway module (SGM) has been dropped.

The following functions are integrated in the KGM control unit:

- Data interface for buses
- Outside door handle electronics
- Vehicle center satellite
- micro-power module

- IBS: Intelligent battery sensor

The IBS is connected via the bit-serial data interface (BSD) to the engine control unit. The IBS has been part of the power supply on the BMW 5-Series since start of series production.

- FLA is added.

A new control unit for the main-beam assistant is added on the K-CAN:

FLA: Main-beam assistant

- For US vehicles: IBOC is added.

For US vehicles, a control unit is added to the MOST for analogue and digital radio reception.

IBOC: Digital tuner US

- For Korea vehicles: KNAV is added.

A control unit for the navigation system is added for vehicle in Korea.

KNAV: Korea navigation system

The KNAV control unit is connected to the MOST.

- A new control unit for the night vision assistant is added on the K-CAN:

NVE: night vision electronics

- MPM dropped.

No micro-power module (MPM) on the K-CAN. The KGM control unit performs the functions of the MPM.

- For US vehicles: RDC is added.

For US vehicles, a new control unit added on the K-CAN for monitoring tire pressure has been.

RDC: tire pressure control

- > E60, E61, E63, E64 from 09/2005: Buses and control units:

NOTE: Modifications to the bus structures for the E60 as from 03/2005

From March 2005, the bus structures of the E60 are modified as follows:

- AHL discontinued:

From March 2005, the AHL control unit (adaptive headlights) is integrated into the light module. The light module is connected to the K-CAN and the PT-CAN.

- The VTG is now also integrated: For the E60 and E61, an all-wheel drive vehicle is available. The control unit for the xDrive on the E60 and E61 is known as the VTG: Transfer case.

- > E60, E61, E63, E64 from 03/2005 until 09/2005: Buses and control units:

NOTE: Original version: Buses and control units on E60, E61 E63, E64 up to 03/2005

To support the workshops, a description of the previous version of the bus structures on the E60 is also provided:

- > E60, E61, E63, E64 up to 03/2005: Buses and control units:

BUSES AND CONTROL UNITS IN THE E65 AND E66

The main buses in the E65 and E66 are called: K-CAN P, K-CAN S, MOST, **byteflight** , Local CAN, PT-CAN.

NOTE: Modifications to the bus structures for the E65 and E66 from 03/2005

From March 2005, the AHL control unit (adaptive headlights) is integrated into the light module. The light module is connected to the K-CAN S and the PT-CAN.

- > E65 and E66 from 03/2005: Buses and control units:

NOTE: Predecessor version: Buses and control units on E65, E66 from 03/2004

To support the workshops, a description of the predecessor version of the bus structures on the E65 and E66 is also provided:

The key modification compared to the original version of the bus structures on the E65 and E66 is:

SIM and ZGM have been combined to create the SGM. The SGM is the central data interface for all buses and control units.

(SIM: safety and information module)

(ZGM: central gateway module)

(SGM: safety and gateway module)

- > E65 and E66 from 03/2004 to 03/2005: Buses and control units:

NOTE: Original version: Buses and control units on E65, E66 up to 03/2004

To support the workshops, the original version of the bus structures on the E65 and E66 is also available:

In the original version, the E65, E66 had the two control units SIM and ZGM.

- SIM: safety and information module

The SIM was the data interface for the control units on the **byteflight** data bus.

- ZGM: Central gateway module

The ZGM is the central data interface for all buses and control units.

- > E65 and E66 up to 03/2004: Buses and control units:

BUSES AND CONTROL UNITS IN THE E70

The important buses in the E70 are called: K-CAN, MOST, PT-CAN, F-CAN, FlexRay.

FlexRay is a new communication system that offers extremely efficient, real time data transfer between the electrical and mechatronic components in the vehicle. FlexRay has a data transfer rate of 10 MBit/s.

FlexRay is used for data exchange between the VDM control unit and the shock absorber satellites.

CHAMP: On the US national version, instead of the multi-audio system controller (M-ASK), the Central Headset And Multimedia Platform (CHAMP) operates as the BMW "Professional" radio. In contrast to M-ASK, CHAMP **does not** have a navigation system.

- > E70: Buses and control units

BUSES AND CONTROL UNITS IN THE E87

The important buses in the E87 are called: K-CAN, MOST, PT-CAN and F-CAN.

The MOST, the innovation in the bus structure on the E65 and E66, is now also used in the E87.

The central interface for data transmission is the junction box electronics (JBE) in the junction box.

- > E87: Buses and control units

BUSES AND CONTROL UNITS ON THE E90, E91, E92, E93

The most important buses on the E90 are: K-CAN, MOST, PT-CAN, F-CAN.

The new feature is that the footwell module (FRM) is connected to the PT-CAN. This is because:

- The adaptive headlights are integrated into the footwell module. The adaptive headlights need the high-speed PT-CAN.
- The longitudinal dynamics management sends the signal for the brake light on the PT-CAN.

Compared with the E87, some new control units are connected to the F-CAN, e.g. LDM and ACC (LDM: longitudinal dynamic management; ACC: active cruise control).

- > E90, E91, E92, E93: Buses and control units:

PANORAMA GLASS SUNROOF

E53, E61, E83, E91



TE102094

Fig. 3: Panorama Glass Sunroof
Courtesy of BMW OF NORTH AMERICA, INC.

INTRODUCTION

The fully automatic Panorama glass sunroof consists of 2 glass sunroofs and a 2-piece sliding visor. The front glass sunroof works like a sliding/tilting sunroof, the rear glass sunroof is a tilting glass sunroof. The Panorama glass sunroof is actuated in the usual way by its own control unit.

- > E53, E83
- > E61
- > E91

The Panorama glass sunroof is available as special equipment (option 402).

BRIEF DESCRIPTION OF COMPONENTS

The following components supply the input signals for the Panorama glass sunroof:

- **Panorama glass sunroof switch**

The switch is located in the control unit in the roof console.

The switch can be moved in 3 directions (pushed forwards, pushed backwards, pushed upwards).

- **Hall sensors in Panorama glass sunroof drive**

There are 2 Hall sensors integrated in each of the two electric motors for the Panorama glass sunroof. The Hall sensors detect the motor speed. The signals are forwarded to the SHD control unit. These signals enable the control unit to recognize the position of the two glass sunroofs and of the 2-piece sliding visor. Moreover, the closing speed of each electric motor is used to calculate the closing force for the two glass sunroofs and for the sliding visor.

The control units involved in the functions of the Panorama glass sunroof are as follows:

- **SHD control unit (control unit for Panorama glass sunroof)**

The SHD control unit controls all the electrical functions of the Panorama glass sunroof.

- **GM: General module 3 (E53) or general module 5 (E83)**

The general module controls the convenience opening or closing function of the Panorama glass sunroof. The general module forwards the request (from the remote control, for example) to the SHD control unit via the body bus.

- **CAS: Car Access System (E61, E91)**

The CAS controls the convenience opening or closing function of the Panorama glass sunroof. The CAS forwards the request (from the remote control, for example) to the SHD control unit via the Body CAN.

- **CA: Comfort Access**

Option 322 "Comfort Access" allows convenience closing of the Panorama glass sunroof without actively using the ID transmitter.

- **LSZ: Light switch cluster (E53, E83)**

The light switch cluster sends the SHD control unit the request to switch on the locating light via the body bus (terminal 58g).

- **LM: Light module (E61)**

The light module sends the SHD control unit the request to switch on the locating light via the Body CAN (terminal 58g).

- **FRM: Footwell module (E91)**

The footwell module sends the SHD control unit the request to switch on the locating light via the Body CAN (terminal 58g).

- **FZD: Roof control panel (E91)**

The roof control panel picks up the signals from the switch for the Panorama glass sunroof. In addition, the FZD control unit also converts the signal into a CAN message. The CAN message is forwarded to the

SHD control unit via the K-CAN.

- **KOMBI: Instrument cluster**

The instrument cluster sends the road speed signal to the SHD control unit.

- > via the K-bus (body bus) on the **E53, E83**
- > via the K-CAN (Body CAN) on the **E61, E91**

The signal is needed to extend and retract the wind deflector and to adjust the closing force limitation.

The following components are actuated for the purposes of the functions of the Panorama glass sunroof:

- **Panorama glass sunroof drive**

The drive consists of 2 DC motors with reduction gearing. One motor operates the two glass sunroofs, the other motor the sliding visor and the wind deflector.

- **Wind deflector**

The wind deflector is extended to reduce noises inside the vehicle when the sliding/tilting glass sunroof is open. The wind deflector automatically extends depending on the road speed.

- **2-piece sliding visor**

When driving with the Panorama glass sunroof tilted ("vent" position), a suction effect develops on the 2-piece sliding visor. This suction effect can lead to noise disturbance.

- > E53, E61, E83:

To minimize the suction effect, the rear piece of the 2-piece sliding visor is opened approximately 3 cm.

- > E91 :

The 2-piece sliding visor moves back approx. 5 cm and forms an opening at the front.

SYSTEM FUNCTIONS

The Panorama glass sunroof comprises the following functions:

- Opening and closing
- Convenience opening and closing
- Emergency closing
- Anti-trap function (limits closing force)
- Safety functions

Opening and closing

The functions for opening and closing are as follows:

- Manual opening or closing

Push the switch for the Panorama glass sunroof backwards to the first resistance point to open it, or forwards to close it.

The glass sliding/tilting sunroof (front glass sunroof) keeps moving as long as the switch remains pushed.

- Automatic opening or closing

- Automatic opening:

Press the switch for the Panorama glass sunroof beyond the pressure point. The Panorama glass sunroof is partially opened automatically. That means: Depending on the initial position of the Panorama glass sunroof, the sliding visor is first opened fully. Then, if the switch is again pressed beyond the pressure point, the glass sliding/tilting sunroof is opened. When it is opened, the sliding/tilting glass sunroof automatically moves to the comfort position (sliding/tilting glass sunroof approx. 3/4 open). The switch must be pushed again to completely open the glass sliding/tilting sunroof.

- Automatic closing:

The closing procedure is a reverse of the above. When the comfort position is reached during closing, the closing operation is interrupted and must be restarted.

- Automatic opening or closing with a double click

Press the button for the Panorama glass sunroof beyond the pressure point to "Open" or "Close" twice within the space of 2 seconds. The Panorama glass sunroof completely opens or closes automatically. When this happens, the sliding visor and the sliding/tilting glass sunroof open or close together. However, the sliding visor always moves out-of-line with the sliding/tilting glass sunroof. This ensures that the sliding visor is always slightly more open than the sliding/tilting glass sunroof as the sliding/tilting glass sunroof is opened or closed.

- Tilt

- Push the switch for the Panorama glass sunroof upwards until it reaches its mechanical stop. The front glass sliding/tilting sunroof and the rear tilting glass sunroof are automatically lifted from every other position as long as the switch remains pushed.

- Press the switch for the Panorama glass sunroof up twice within the space of 2 seconds. The Panorama glass sunroof moves to the "Vent" position, regardless of the starting position. ("Vent" position means: both glass sunroofs are fully tilted, the rear section of the 2-piece sliding visor is opened approx. 3 cm.)

NOTE: Automatic closing is not possible if the anti-trap function fails.

Automatic closing is not possible if the anti-trap function fails (on account of defective Hall sensor, for example). Closing is then only possible with the mechanical emergency mode.

Any fault data is then stored in the SHD control unit.

Convenience opening and closing

The controls that can be used for this purpose are as follows:

- Button on remote control (radio-control key)

Press the button on the remote control to "unlock" or "lock" and hold it in this position until the Panorama glass sunroof reaches the desired position.

- Door lock on driver's door

Use the mechanical key to turn the lock in the driver's door to the position for unlocking or locking, and hold it in this position until the Panorama glass sunroof reaches the desired position.

- Driver-side outside door handle and passenger-side outside door handle

If the vehicle is equipped with Comfort Access (CA), **convenience closing** can be started using the outside door handle electronics in the bow handle.

The convenience opening/convenience closing function is stopped if the command is cancelled.

Emergency closing

Emergency closing is a function for deliberate closure of the Panorama glass sunroof without anti-trap function (closing-force limitation). Emergency closing may be necessary if someone attempts to reach into the interior of the car or if mechanical difficulty is experienced in closing the Panorama glass sunroof.

Emergency closing can be activated when the car is stopped or travelling at a speed up to 16 km/h.

To activate emergency closing:

Push the switch for the Panorama glass sunroof in the "close" direction until it reaches its mechanical stop and hold it there. The Panorama glass sunroof is closed with maximum force and maximum speed without anti-trap function.

If the Panorama glass sunroof is blocked, the electric motor continues to run until the overheating protection is activated.

Anti-trap function (closing-force limitation)

WARNING: Note initialization

The Panorama glass sunroof has to be initialized in order for the anti-trap function to work correctly. The Panorama glass sunroof has to be initialized by service staff.

The anti-trap function is active over the entire range of movement in the closing direction.

The anti-trap function works as follows:

- The sliding/tilting glass sunroof and/or the sliding visor is opened approx. 20 cm.
- When closing from the "tilt" position, the sunroof will return to the "tilt" position.

Anti-trap function does not in principle prevent trapping; instead, it limits the maximum permissible force applied to the trapped object (by limiting the closing force).

To prevent impermissibly high closing forces, there are 2 Hall sensors integrated in each of the electric motors. The speed of closure can be measured on the basis of the signals from these two Hall sensors.

The closing force is calculated from the speed of closure.

The mechanical forces involved change with ambient temperature and as a result of ageing. For this reason, the closing forces required are adapted during the closing process.

Automatic closing is not possible if the anti-trap function fails (on account of defective Hall sensor, for example). Closing is then only possible with the mechanical emergency mode.

SAFETY FUNCTIONS

- **Maximum motor ON time**

If a motor runs in a single direction for longer than 15 seconds, the SHD control unit will deactivate the drive.

- **Overheating protection**

The heating up of the electric motors is computed in the SHD control unit. The outside temperature is available as a temperature signal (via the body bus or CAN). Moreover, there is a temperature sensor on the board of the SHD control unit. After a certain temperature threshold is reached the overheating protection is activated. The drive is switched off.

- **Emergency operation**

In emergency mode, the Panorama glass sunroof can only be moved in small steps.

Emergency mode is possible in the following conditions:

- Encoding of the SHD control unit incorrect

- Implausible signal from a Hall sensor
- Initialization incomplete

NOTE: Mechanical emergency mode is possible

In case of an electrical defect, emergency mode of the Panorama glass sunroof is available.

There is no emergency mode for the sliding visor.

ELECTRICAL

General Electrical System - Special Tools - X3

61 GENERAL ELECTRICAL SYSTEM

61 0 021 FUSE LINK FF 3.15 A / 500 V

Note: For analog/digital multimeter M 2005, M 2007, M2008

Storage location: H 107

Order number: 61 0 021

Fuse link FF 3.15 A / 500 V

61 0 200 CRIMPING SET (BASIC TOOL)

Minimum set: Measuring and testing equipment

Note: Consisting of case + basic crimping tool

Series: E30, E30/C, E30tou, E31, E32, E32/3, E34, E34tou, E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E81, E82, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53, R55, R56, RR1, RR2

SI number: 02 02 05 (194)

Order number: 61 0 200

Crimping set (basic tool)

Consisting of:

1 = 61 0 201 Plastic case

Note: As storage system for complete set.

2 = 61 0 202 Crimping tool

Note: Basic tool for assorted matrices (crimping insert set)

3 = 61 0 203 Allen key

Note: For securing individual matrices in crimping tool

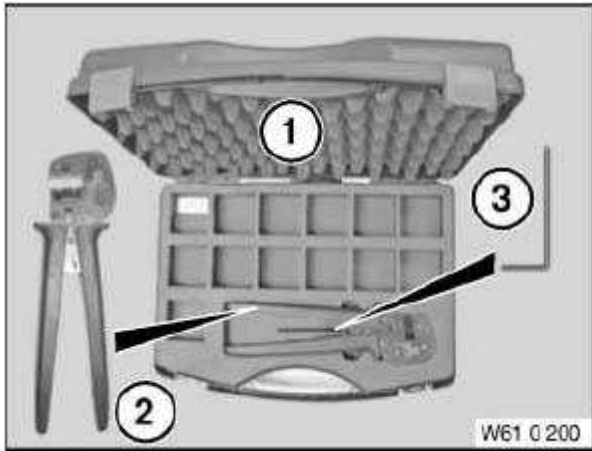


Fig. 1: Crimping Set (61 0 200)

Courtesy of BMW OF NORTH AMERICA, INC.

61 0 210 MATRIX LSK 8

In conjunction with: 61 0 202 (crimping tool)

Note: (crimping insert set for load current contact 8)

SI number: 02 02 05 (194)

Order number: 61 0 210

Matrix LSK 8

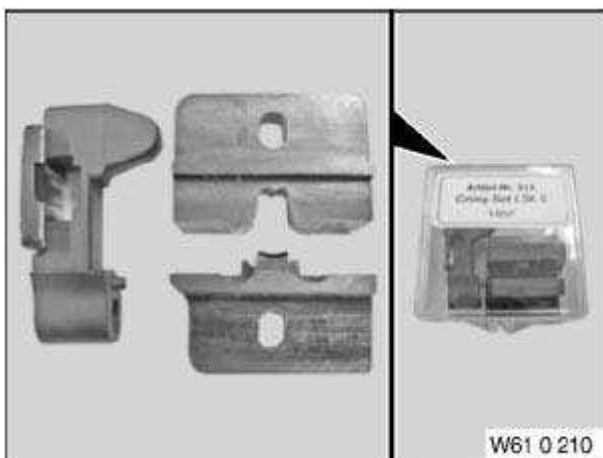


Fig. 2: Matrix LSK 8 (61 0 210)

Courtesy of BMW OF NORTH AMERICA, INC.

61 0 220 MATRIX FOR SLK 2.8

In conjunction with: 61 0 202 (crimping tool)

Note: (crimping insert set for load contact tube 2.8)

SI number: 02 02 05 (194)

Order number: 61 0 220

Matrix for SLK 2.8

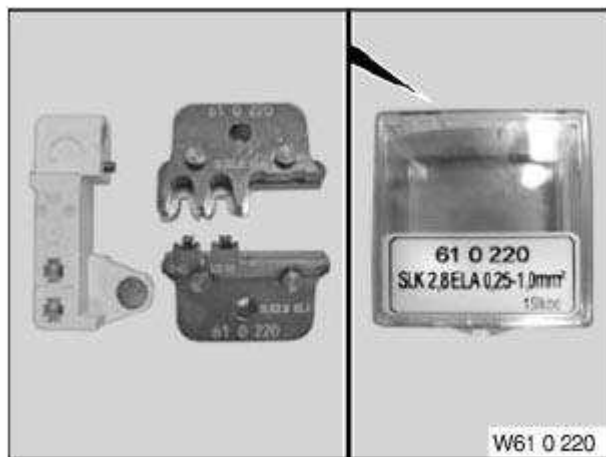


Fig. 3: Matrix For SLK 2 (61 0 220)

Courtesy of BMW OF NORTH AMERICA, INC.

61 0 230 STENCIL FOR CONTACTS "DFK 40" AND "MAK 8"

In conjunction with: 61 0 202 (crimping tool)

Note: For crimping contacts when replacing passenger compartment fuse box (up to model year 09/2005)

Series: E46, E65, E66, E67, E70, E81, E82, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53, R55, R56, RR1, RR2

SI number: 02 07 05 233

Order number: 61 0 230

Stencil for contacts "DFK 40" and "MAK 8"

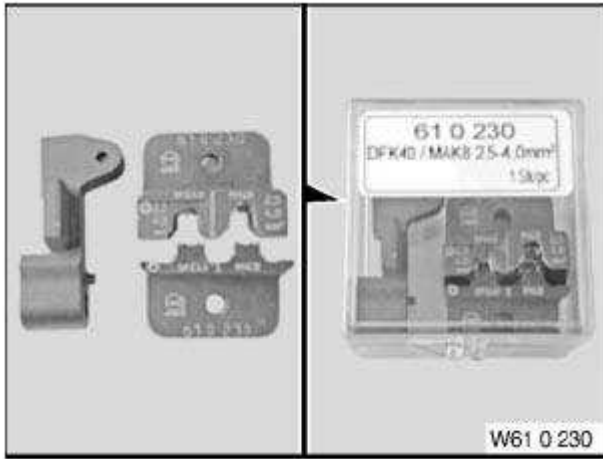


Fig. 4: Stencil For Contacts DFK 40 And MAK 8 (61 0 230)
Courtesy of BMW OF NORTH AMERICA, INC.

61 0 300 RELEASING TOOL (COMPLETE KIT)

Minimum set: Measuring and testing equipment

Note: Replaces from 09/2005 special tool 61 1 150. From 06/2006 extended by tools 61 0 325 - 61 0 331.

Series: E30, E30/C, E30tou, E31, E32, E32/3, E34, E34tou, E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E68, E70, E81, E82, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53, R55, R56, RR1, RR2

SI number: 2 05 05 (217)

Order number: 61 0 300

Releasing tool (complete kit)

Consisting of:

1 = 61 0 301 Release tool for round contacts (diameter 1.5)

Note: Replaces from 09/2005 special tool 61 1 131

2 = 61 0 302 Replacement sleeve D=1.5

Note: Replaces from 09/2005 special tool 61 1 157

In conjunction with: 61 3 301

3 = 61 0 303 Release tool for round systems with D=2.5

Note: Replaces from 09/2005 special tool 61 1 132

4 = 61 0 304 Replacement sleeve (D=2.5)

Note: Replaces from 09/2005 special tool 61 1 156

5 = 61 0 305 Release tool for round contacts (D=3.5)

Note: Replaces from 09/2005 special tool 61 1 133

6 = 61 0 306 Replacement sleeve (D=3.5) for 61 0 305

Note: Replaces from 09/2005 special tool 61 1 155

7 = 61 0 307 Release tool for socket-side round contacts (D=2.5)

8 = 61 0 308 Replacement sleeve for special tool 61 0 307 (D=2.5)

9 = 61 0 309 Release tool for pin-side round contact (D=1.5) manufacturer: Kostal

Note: Replaces from 09/2005 special tool 61 1 139

10= 61 0 311 Replacement sleeve for special tool 61 0 309

Note: Replaces from 09/2005 special tool 61 1 154

11= 61 0 312 Release tool for flat spring contact with a detent lug (1.6 mm)

Note: Replaces from 09/2005 special tool 61 1 134

12= 61 0 313 Release tool for flat spring contacts with a snap-in pin (1.9 mm)

Note: Replaces from 09/2005 special tool 61 1 137

13= 61 0 314 Release tool for flat spring contact with a snap-in pin (2.7 mm)

Note: Replaces from 09/2005 special tool 61 1 135

14= 61 0 315 Release tool for flat spring contacts with double snap-in pin "Micro-Timer 2"

Note: Replaces from 09/2005 special tool 61 1 151

15= 61 0 316 Release tool for flat spring contacts with double snap-in pin "SPT 4.8" "JPT 2.8"

Note: Replaces from 09/2005 special tool 61 1 136

16= 61 0 317 Release tool for LSK 8

Note: Replaces from 09/2005 special tool 61 1 200

17= 61 0 318 Release tool for "Maxi Power Timer 9.5"

Note: Replaces from 09/2005 special tool 61 1 180

18= 61 0 319 Release tool for sensor laminated contacts ("SLK2.8")

Note: Replaces from 09/2005 special tool 61 1 148

19= 61 0 321 Release tool for sensor laminated contacts with unlocking element ("SLK 2.8")

20 = 61 0 322 Release tool for mini laminated contact ("MLK 1.2 mm")

21 = 61 0 323 Release tool for flat spring contacts with a detent lug (MQS)

Note: Replaces from 09/2005 special tool 61 1 152

22 = 61 0 324 Release tool for secondary locking

Note: Universal tool for damage-free opening/removal of secondary locks

23 = 61 0 329 Case with foam inlay without tools

Note: Storage system for release tools from set 61 0 300

24 = 61 0 325 Release tool "JPT"

25 = 61 0 326 Release tool "MQS"

Note: For releasing all micro contacts

26 = 61 0 327 Plug-in aid

Note: For inserting contacts (0.64 - 1.2 mm) in housing

27 = 61 0 328 Plug-in aid

Note: For inserting contacts (2.8 - 4.8 mm) in housing

28 = 61 0 331 Release tool "SLK 5.8"

Note: For releasing "SLK 5.8 mm" contacts



Fig. 5: Releasing Tool (61 0 300)

Courtesy of BMW OF NORTH AMERICA, INC.

61 1 150 RELEASING TOOL KIT

Note: For circular connector / press-out tool - Contains kits 61 1 130, 61 1 140 and 61 1 180 Replaced by special tool 61 0 300 from 09/2005.

Series: E12, E21, E23, E24, E28, E30, E31, E32, E34, E36, E38, E39, E46, E52, E53, E65, E66, E83, E85, R50, R53, RR1

Storage location: K 106

Order number: 61 1 150

Releasing tool kit

Consisting of:

61 1 151 Press-out tool

Note: For Power timer contacts / AMP and Bosch Replaced by special tool 61 0 315 from 09/2005.

61 1 152 Press-out tool

Note: For Micro timer contacts Replaced by special tool 61 0 323 from 09/2005.

61 1 153 Releasing tool

Note: For retaining tab of relay holder

61 1 154 Replacement sleeve dia. 1.5 mm for 61 1 139

Note: Order number was temporarily assigned for case inlay in 8/95 on delivery of case Replaced by special

tool 61 0 311 from 09/2005.

61 1 155 Replacement sleeve dia. 3.5 mm for 61 1 133

Note: Replaced by special tool 61 0 306 from 09/2005.

61 1 156 Replacement sleeve dia. 2.5 mm for 61 1 132

Note: Replaced by special tool 61 0 304 from 09/2005.

61 1 157 Replacement sleeve dia. 1.5 mm for 61 1 131

Note: Replaced by special tool 61 0 302 from 09/2005.

61 1 158 Case with inlay

Note: Replaced by special tool 61 0 329 from 09/2005.

61 1 159 Operating instructions

61 1 131 Press-out tool

Note: Replaced by special tool 61 0 301 from 09/2005

61 1 132 Press-out tool

Note: For 2.5 mm round contacts Replaced by special tool 61 0 303 from 09/2005.

61 1 133 Press-out tool

Note: For 3.5 mm round contacts Replaced by special tool 61 0 305 from 09/2005.

61 1 134 Press-out tool

Note: For Mini flat spring contacts Replaced by special tool 61 0 312 from 09/2005.

61 1 135 Press-out tool

Note: For standard flat spring contacts Replaced by special tool 61 0 314 from 09/2005.

61 1 136 Press-out tool

Note: For Power timer contacts (G & H) Replaced by special tool 61 0 316 from 09/2005.

61 1 137 Press-out tool

Note: For timer contacts Replaced by special tool 61 0 313 from 09/2005.

61 1 138 Socket wrench

Note: For telltale lamps (instrument cluster)

61 1 139 Press-out tool

Note: Slotted sleeve for Kostal round contacts with dia. 1.5 mm Replaced by special tool 61 0 311 from 09/2005.

61 1 141 Releasing tool

Note: For D 2.5 / ELA, 4-pin, round

61 1 142 Releasing tool

Note: For D 2.5 / ELA, 7-pin, round

61 1 143 Releasing tool

Note: For D 2.5 / ELA, 12 -pin, round

61 1 144 Releasing tool

Note: For D 2.5 / ELA, 25 -pin, round

61 1 145 Releasing tool

Note: For D 1.5 / ELA, 10 -pin, round

61 1 149 Replacement blades

Note: For press-out tool 61 1 148

61 1 148 Press-out tool for SLK

Note: SLK = sensor laminated contacts Replaced by special tool 61 0 319 from 09/2005.

61 1 180 Press-out tool

Note: For load current contacts Replaced by special tool 61 0 318 from 09/2005.

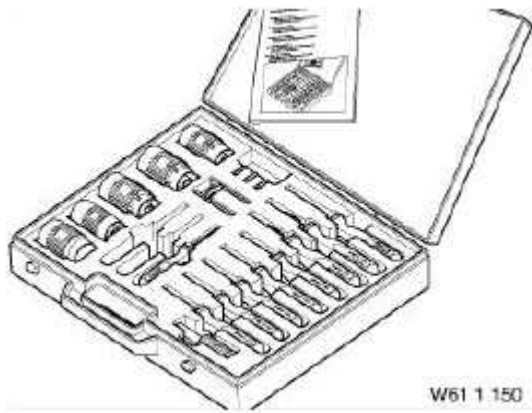


Fig. 6: Releasing Tool Kit (61 1 150)

Courtesy of BMW OF NORTH AMERICA, INC.

61 1 180 REMOVAL TOOL

Minimum set: Mechanical tools

Note: For load current contacts

Series: All models

SI number: 20600(636)

Order number: 61 1 180

Removal tool

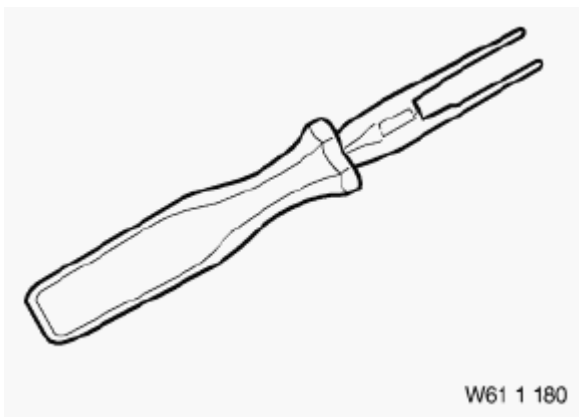


Fig. 7: Removal Tool (61 1 180)

Courtesy of BMW OF NORTH AMERICA, INC.

61 1 190 PLIERS

Note: For insulation displacement connectors for repairing ribbon cables

Series: E60, E61, E63, E64, E65, E66, E67, E81, E82, E83, E86, E87, E90, E91, E92, R50, R52, R55, R56, RR1, RR2

SI number: 1 14 01 (766)

Order number: 61 1 190

Pliers

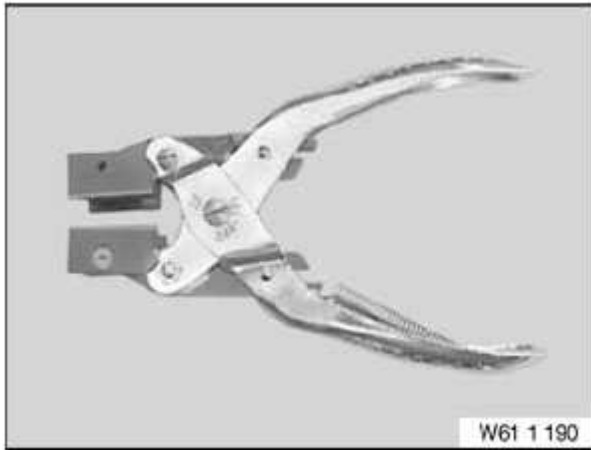


Fig. 8: Pliers (61 1 190)

Courtesy of BMW OF NORTH AMERICA, INC.

61 1 350 SET OF ASSEMBLY TOOLS

Note: For removing and installing socket in transmission connector on automatic transmission

Transmission: 4 HP 22, 4 HP 24

Storage location: I 103

Order number: 61 1 350

Set of assembly tools

Consisting of:

1 = 61 1 351 Removal tool

2 = 61 1 352 Fitting drift

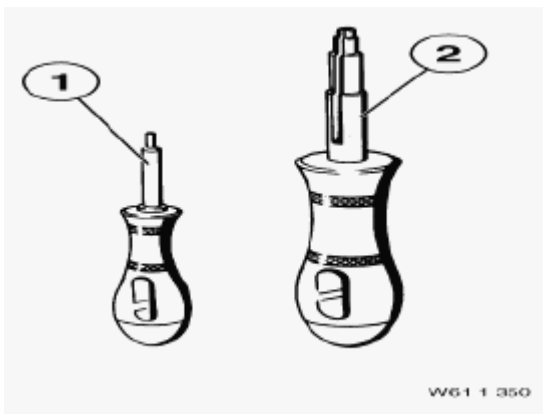


Fig. 9: Set Of Assembly Tools (61 1 350)
Courtesy of BMW OF NORTH AMERICA, INC.

61 1 410 SET OF DIS TEST PRODS

Series: E12, E21, E23, E24, E28, E30, E31, E32, E34, E36, E38, E39, E39tou, E46, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53, RR1

Storage location: H 107

Order number: 61 1 410

Set of DIS test prods

Consisting of:

1 = 61 1 411 Clip SAGK4-K, red

1 = 61 1 421 Clamping test probe XB/100, black

2 = 61 1 412 Clip SAGK4-K, black

3 = 61 1 413 Clip SAGK4, red

4 = 61 1 414 Clip SAGK4, black

5 = 61 1 415 Clip XDK-1033, red

6 = 61 1 416 Clip XDK-1033, black

7 = 61 1 417 Test probe SPP4-S, red

8 = 61 1 418 Test probe SPP4-S, black

9 = 61 1 419 Clamping test probe XB/100, red

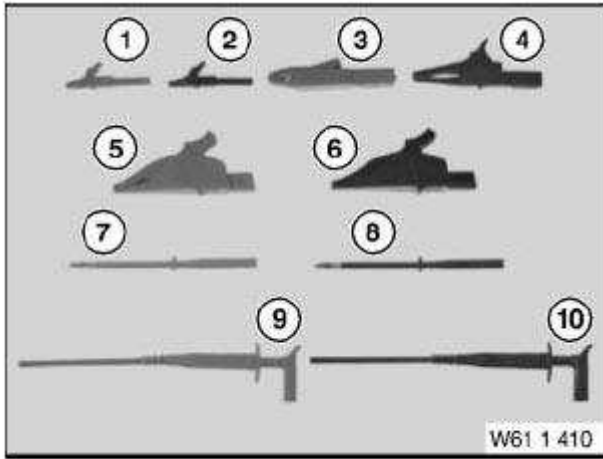


Fig. 10: Set Of DIS Test Prods (61 1 410)
 Courtesy of BMW OF NORTH AMERICA, INC.

61 2 250 V-ADAPTER LEAD (RAIL PRESSURE SENSOR)

Minimum set: Measuring and testing equipment

Note: For system check of rail pressure control for common-rail diesel engines. Also suitable for connection to: Crank-/camshaft sensor, boost pressure sensor, particulate filter pressure sensor, swirl flap actuator, oil level sensor etc.

Series: E39, E46, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E83, E85, E86, E87, E90, E91, E92, E93

SI number: 02 01 06 283

Order number: 61 2 250

V-adapter lead (rail pressure sensor)

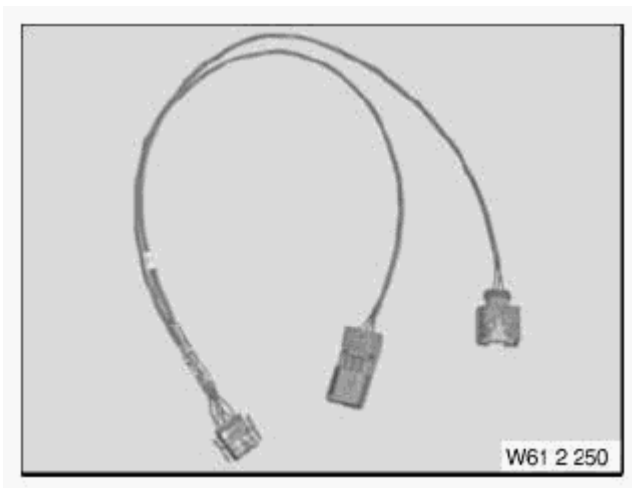


Fig. 11: V-Adapter Lead (61 2 250)

Courtesy of BMW OF NORTH AMERICA, INC.

61 2 410 BATTERY TRICKLE CHARGER

Note: Will in future be replaced by the battery trickle charger "Acctiva easy". Order number 81 39 0 409 468 (Europe version) and 81 39 0 409 471 (USA version)

Series: E12, E21, E23, E24, E28, E30, E30/C, E30tou, E31, E32, E32/3, E34, E34tou, E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E83, E85, E87, R50, R52, R53, RR1

Storage location: Single

SI number: 2 02 00 (545)

Order number: 61 2 410

Battery trickle charger

Consisting of:

1 = 61 2 411 Trickle charger

Note: Including connection cable (ribbon cable) for cigarette lighter socket

3 = 61 2 413 Adapter cable

Note: for direct connection to battery or terminal point

9 = 61 2 419 Operating instructions

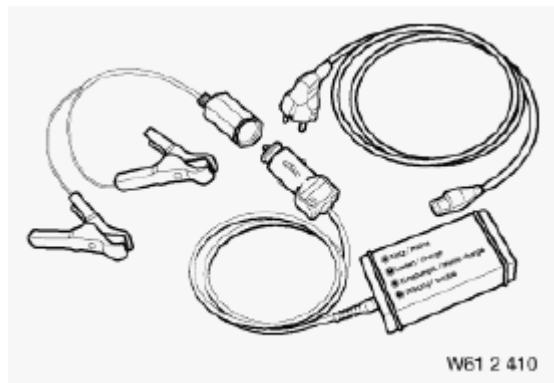


Fig. 12: Battery Trickle Charger (61 2 410)

Courtesy of BMW OF NORTH AMERICA, INC.

61 2 440 SYSTEM CONNECTING CABLE (COUNTRY-SPECIFIC)

Note: System connecting cable for battery trickle charger 61 2 410

Order number: 61 2 440

System connecting cable (country specific)

Consisting of:

1 = 61 2 441 System connecting cable (country specific)

Note: Algeria / Armenia / Belarus / Belgium / Brazil / Denmark / Dubai / Egypt / Finland / France / Germany / Greece / Korea / Luxembourg / Martinique / Morocco / Norway / Saudi Arabia / Sweden / Spain and others

2 = 61 2 442 System connecting cable (country specific)

Note: Australia / New Zealand

3 = 61 2 443 System connecting cable (country specific)

Note: Italy

4 = 61 2 444 System connecting cable (country specific)

Note: Bahrain / Brunei Dar es Salaam / England / Hong Kong / India / Kuwait / Nigeria / Northern Ireland / Oman / Qatar / Singapore / Sri Lanka (Ceylon)

5 = 61 2 445 System connecting cable (country specific)

Note: Switzerland

6 = 61 2 446 System connecting cable (country specific)

Note: Argentina / Barbados / Canada / China / Guam / Honduras / Jamaica / Mexico / Panama / Philippines / Tahiti / Taiwan / USA

7 = 61 2 447 System connecting cable (country specific)

Note: Japan

61 3 080 V-ADAPTER LEAD FOR TRANSFER CASE - ECU E83 (8-PIN)

Minimum set: Measuring and testing equipment

Note: For checking function of engine at transfer box (X3)

Series: E83

SI number: 02 08 03 (045)

Order number: 61 3 080

V-adapter lead for transfer case - ECU E83 (8-pin)

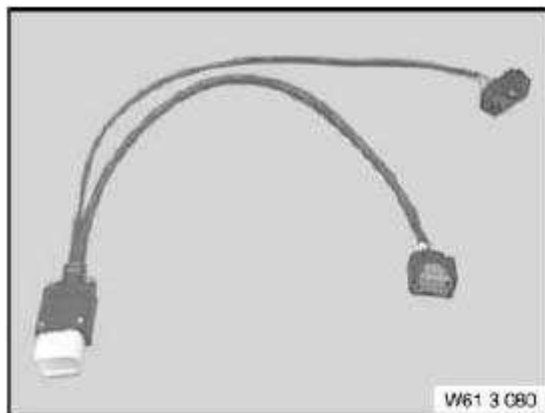


Fig. 13: V-Adapter Lead For Transfer Case - ECU E83 (61 3 080)
Courtesy of BMW OF NORTH AMERICA, INC.

61 3 090 V-ADAPTER LEAD DXC CONTROL UNIT E83 (6 -PIN)

Minimum set: Measuring and testing equipment

Note: For checking function of DXC control unit in X3

Series: E83

SI number: 02 08 03 (045)

Order number: 61 3 090

V-adapter lead DXC control unit E83 (6 - pin)

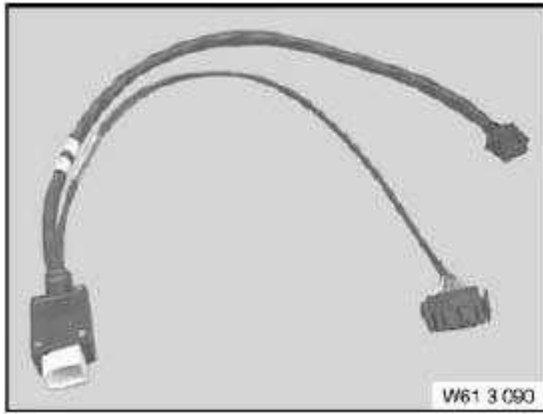


Fig. 14: V-Adapter Lead DXC Control Unit E83 (61 3 090)
Courtesy of BMW OF NORTH AMERICA, INC.

61 3 130 I-ADAPTER LEAD AIRBAG CONTROL UNIT E83 (75-PIN)

Minimum set: Measuring and testing equipment

In conjunction with: Test box 61 4 380

Note: For checking function of airbag control unit in X3

Series: E83

SI number: 02 08 03 (045)

Order number: 61 3 130

I-adapter lead airbag control unit E83 (75-pin)

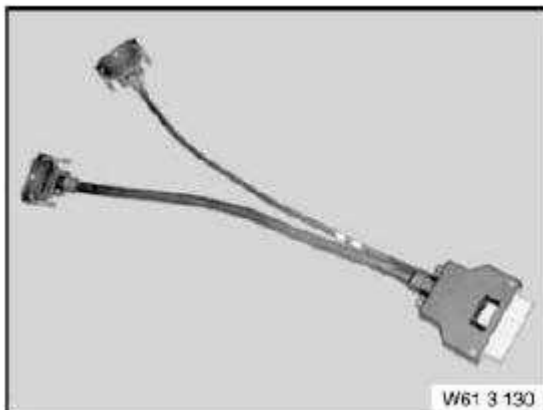


Fig. 15: I-Adapter Lead Airbag Control Unit E83 (61 3 130)
Courtesy of BMW OF NORTH AMERICA, INC.

61 3 300 REMOVAL TOOL

Minimum set: Mechanical tools

Note: For removing ring antenna at ignition lock

Series: E30/C, E30tou, E31, E32, E32/3, E34, E34tou, E36, E36/2, E36/3, E36/5, E36/C, E38, E38/3, E39, E39tou, E46, E52, E53, E60, E61, E63, E64, E83, E85, E86, R50, R52, R53

SI number: 1 17 97 (228)

Order number: 61 3 300

Removal tool

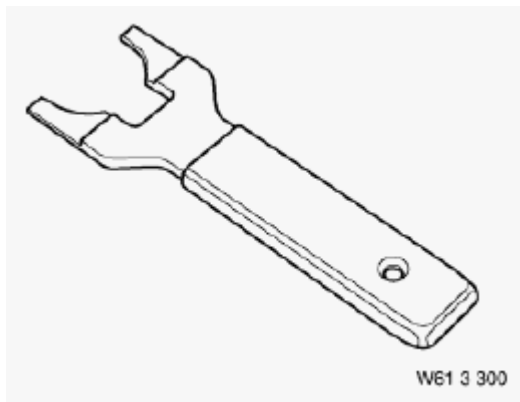


Fig. 16: Removal Tool (61 3 300)

Courtesy of BMW OF NORTH AMERICA, INC.

61 4 300 ADAPTER LEAD FOR OBD SOCKET

Note: For connecting diagnosis system to OBD socket from 06/2000.

Storage location: Single

SI number: 2 04 00 (561)

Order number: 61 4 300

Adapter lead for OBD socket

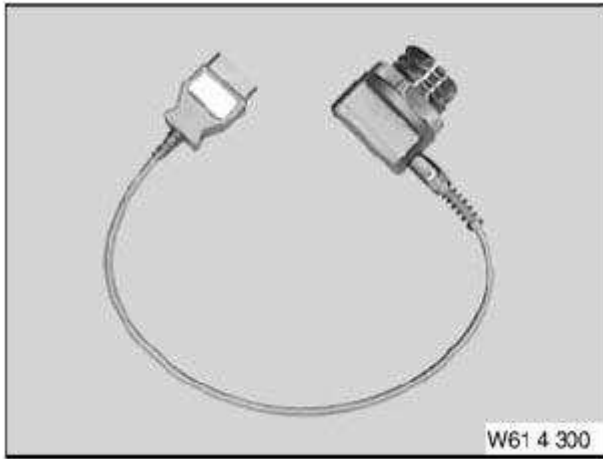


Fig. 17: Adapter Lead For OBD Socket (61 4 300)
Courtesy of BMW OF NORTH AMERICA, INC.

61 4 320 CRIMPING SET WITH PLIERS

Minimum set: Measuring and testing equipment

Note: For repairing fibre optics conductors and cables. Universal crimp head 61 4 328 added as from 06/2006.

Series: E12, E21, E23, E24, E28, E30, E30/C, E30tou, E31, E32, E32/3, E34, E34tou, E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E68, E70, E81, E82, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53, R55, R56, RR1, RR2

SI number: 1 14 01 (766)

Order number: 61 4 320

Crimping set with pliers

Consisting of:

1 = 61 4 321 Pliers without crimping head

2 = 61 4 322 Crimping head

Note: For stripping insulation and cutting fibre optic cable to length

3 = 61 4 323 Crimping head

Note: For crimping fibre optic cable contacts

4 = 61 4 324 Crimping head

Note: For crimping MQS contacts

5 = 61 4 325 Crimping head

Note: For crimping MPQ contacts

6 = 61 4 326 Substitute blade

Note: For face-cutting fibre optic cables

7 = 61 4 327 Substitute blade

Note: With tool for replacing blade in cable stripping unit. Must be ordered separately, not included in 61 4 320 delivery specification!

8 = 61 4 328 Universal crimping head

Note: For crimping contacts (without seal) and cable cross-sections of 0.35 - 2.5 mm.

In conjunction with: in conjunction with 61 4 321

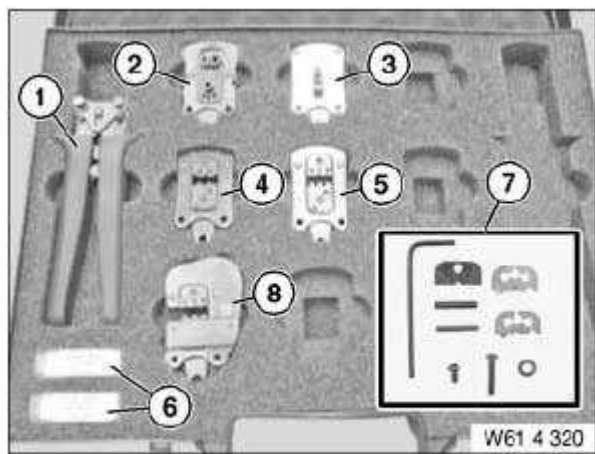


Fig. 18: Crimping Set With Pliers (61 4 320)
Courtesy of BMW OF NORTH AMERICA, INC.

61 4 370 V-ADAPTER LEAD (2-PIN), ZERO-CODED

Minimum set: Measuring and testing equipment

Note: Can be used on different plug housings in engine wiring harness (e.g. from Kostal - "SLK 2.8", Tyco "Junior-Power-Timer" or Bosch) with different codings.

Series: E34, E34tou, E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E83, E85, E87, E90, E91, R50, R52, R53, RR1

SI number: 02 01 05 186

Order number: 61 4 370

V-adapter lead (2-pin), zero-coded

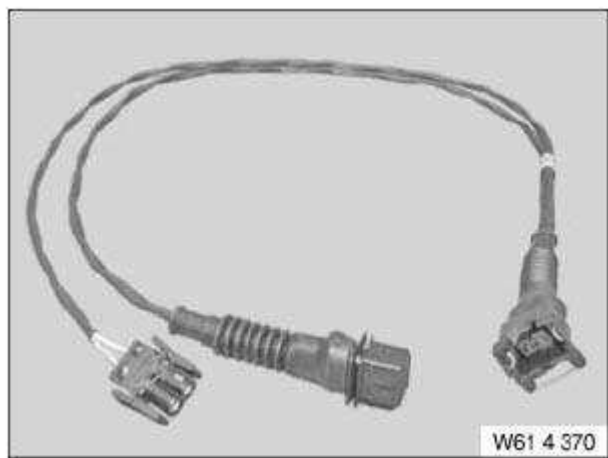


Fig. 19: V-Adapter Lead (2-Pin), Zero-Coded (61 4 370)
Courtesy of BMW OF NORTH AMERICA, INC.

61 4 380 MEASURING BOX, 105-PIN, COMPLETE

Minimum set: Measuring and testing equipment

Note: For connecting all adapter cables with 61- to 105-pin plug connections

Series: E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53, R56, RR1

Storage location: G 110, S 205, U 202, U 205

SI number: 2 04 01(710)

Order number: 61 4 380

Measuring box, 105-pin, complete

Consisting of:

1 = 61 4 381 Measuring box, 105-pin

Note: Without accessories

2 = 61 4 382 Test lead, black

Note: 2 mm system, lead length: 750 mm

3 = 61 4 383 Test lead, red

Note: 2 mm system, lead length: 750 mm

4 = 61 4 384 Test lead set

Note: 2/4 mm system, lead length: 200 mm

5 = 61 4 385 Earth/ground cable

Note: For shield pick-off, lead length: 1.5 m



W61 4 380

Fig. 20: Measuring Box, 105-Pin, Complete (61 4 380)
Courtesy of BMW OF NORTH AMERICA, INC.

61 4 390 MEASURING BOX, 60-PIN

Minimum set: Measuring and testing equipment

Note: For connecting all adapter cables with 27 - to 60-pin plug connections

Series: E12, E21, E23, E24, E28, E30, E30/C, E30tou, E31, E32, E32/3, E34, E34tou, E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E83, E85, E87, E90, E91, E92, E93, R50, R52, R53, R56, RR1

Storage location: T 210

SI number: 2 02 98(308)

Order number: 61 4 390

Measuring box, 60-pin



Fig. 21: Measuring Box, 60-Pin (61 4 390)
Courtesy of BMW OF NORTH AMERICA, INC.

61 6 060 UNIVERSAL WIPER ARM PULLER

Minimum set: Mechanical tools

Note: For removing windscreen wiper arm from drive shaft

Series: E12, E21, E23, E24, E28, E30, E30/C, E30tou, E31, E32, E32/3, E34, E34tou, E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E81, E82, E83, E85, E86, E87, E90, E91, RR1, RR2

Storage location: B40

SI number: 1 10 99 (433)

Order number: 61 6 060

Universal wiper arm puller

Consisting of:

1 = 61 6 061 Basic body

2 = 61 6 062 Claw, left/right

3 = 61 6 063 Spindle

4 = 61 6 064 Thrust piece

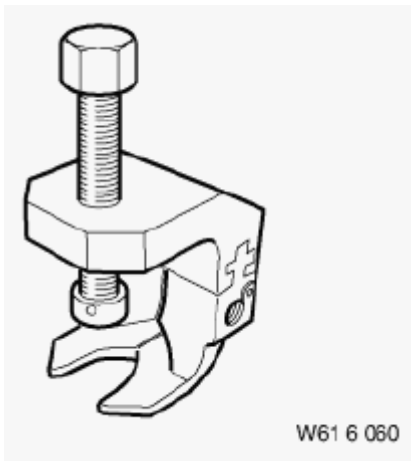


Fig. 22: Universal Wiper Arm Puller (61 6 060)
Courtesy of BMW OF NORTH AMERICA, INC.

61 6 100 ANGLE MEASURING INSTRUMENT

Minimum set: Mechanical tools

Note: For measuring contact/approach angle of wiper blades to window (angle when setting wiper arms)

Series: E36, E39, E46, E52, E53, E60, E61, E63, E64, E65, E66, E67, E68, E70, E81, E82, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53, R55, R56, RR1, RR2

SI number: 1 21 05 220

Order number: 61 6 100

Angle measuring instrument



Fig. 23: Angle Measuring Instrument (61 6 100)
Courtesy of BMW OF NORTH AMERICA, INC.

61 6 210 WIPER ARM PULLER

Minimum set: Mechanical tools

Series: E52, E53, E60, E61, E63, E64, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53

SI number: 1 01 05 (172)

Order number: 61 6 210

Wiper arm puller



Fig. 24: Wiper Arm Puller (61 6 210)

Courtesy of BMW OF NORTH AMERICA, INC.

61 8 081 ADDITIONS TO REPAIR KIT I

Note: Order through BMW EPC (Electronic Parts Catalogue), (order numbers: 12 52 1 706 059" 12 52 1 706 068" 12 52 1 706 069" 61 13 1 352 607" 61 31 1 378 942)

Storage location: K 108

Order number: 61 8 081

Additions to repair kit I

61 8 082 ADDITIONS TO REPAIR KIT II

Note: Order through BMW EPC (Electronic Parts Catalogue), (order numbers: 61 13 1 368 534" 61 13 1 369 747" 61 13 1 374 225" 61 13 1 378 722)

Storage location: K 108

Order number: 61 8 082

Additions to repair kit II

61 8 083 ADDITIONS TO REPAIR KIT III

Note: Order through BMW EPC (Electronic Parts Catalogue), (order numbers: 61 13 1 378 110" 61 13 1 378 130" 61 13 1 378 136" 61 13 1 378 137" 61 13 1 378 138" 61 13 1 378 139" 61 13 1 378 908" 61 13 1 378 944" 61 13 1 378 987)

Storage location: K 108

Order number: 61 8 083

Additions to repair kit III

61 9 040 SET OF TOOLS FOR REPAIR KIT IV

Series: E12, E21, E23, E24, E28, E30, E31, E32, E34, E36, E38, E39, E46, E52, E53, E60, E61, E63, E64, E65, E83, E85, E87, E90, E91, E92, R50, R52, R53

Storage location: K 108

SI number: 2 02 92(505)

Order number: 61 9 040

Set of tools for repair kit IV

Consisting of:

1 = 61 9 041 Hand pliers without crimper

2 = 61 9 042 Crimper

Note: For crimping butt connectors and contact sleeves for strip connectors

3 = 61 9 043 Cable stripper with wire cutter

4 = 61 9 044 Crimper

Note: For crimping antenna connector (antenna cable/radio plug connection)

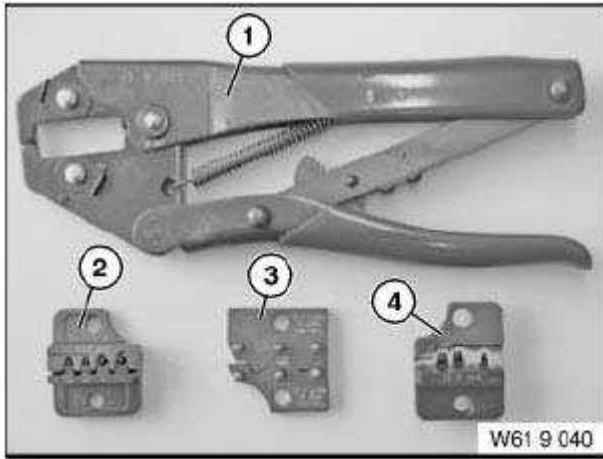


Fig. 25: Set Of Tools For Repair Kit IV (61 9 040)
Courtesy of BMW OF NORTH AMERICA, INC.

61 9 045 FEMALE DIE

In conjunction with: 61 9 041 Crimping tool

Note: For crimping 2.5 mm (dia.) sleeves

Order number: 61 9 045

Female die

ACCESSORIES AND EQUIPMENT

General Electrical System - Technical Data - X3

11 WIRING HARNESS

61 11 WIRING HARNESS SECTIONS (REPAIR CONNECTOR IN DIS) E83

TECHNICAL DATA - WIRING HARNESS SECTIONS (REPAIR CONNECTOR DIS) E83

Front left	X18985, X18986 (connect unpinned lines to light switch centre A3a)
Front right	X18987, X18988, X18993
Rear right	X11590, X11591
Rear Lid	X19030

61 WINDSCREEN WIPERS

61 61 WINDSCREEN WIPERS E83 /

TECHNICAL DATA - WINDSCREEN WIPERS E83

Adjustment dimension - right windscreen wiper arm	Millimetres	66.0 ±3 mm
Adjustment dimension - left windscreen wiper arm	Millimetres	61.0 ±3 mm
Contact angle - right windscreen wiper blade	Degrees	85.2° ± 1
Contact angle - left windscreen wiper blade	Degrees	85.4° ±1
Adjustment dimension - rear window wiper arm	Millimetres	29.0 ± 3 mm

ACCESSORIES AND EQUIPMENT

General Electrical System - Tightening Torques - X3

12 AUXILIARY CABLE

61 12 AUXILIARY CABLES/LEADS

AUXILIARY CABLES/LEADS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Battery positive lead to distributor, luggage compartment	E60 / E61 / E63 / E64 / E65 / E66 / E70 / E83 / E90 / E91 / E92 / E93	M8		15 Nm
2AZ Battery positive lead to connector, engine compartment partition wall	E83	M8		19 Nm
3AZ Battery positive lead to connection support point, luggage compartment floor	E60 / E61 / E63 / E64 / E65 / E66 / E70 / E85 / E86 / E90 / E91 / E92 / E93	M8		15 Nm
4AZ Battery positive lead to engine compartment B+ terminal	E70 / E81 / E82 / E85 / E86 / E87 / E90 / E91 / E92 / E93	M8		15 Nm
	E70 / E81 / E82 / E85 / E86 / E87 / E90 / E91 / E92 / E93	M6		8 Nm
5AZ Battery negative lead to body	E70 / E85 / E86 / E93	M8		15 Nm

21 BATTERY WITH TERMINAL

61 21 BATTERY WITH TERMINAL

BATTERY WITH TERMINAL - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Positive battery lead, negative battery lead, safety battery terminal, IBS (screw connection from above)	E38 / E39 / E46 / E53/E60/E61/ E63 / E64 / E65 / E66 / E67 / E70 / E81 / E82 / E83 / E85 / E86 / E87 / E90 / E91 / E92 / E93	M6		5 Nm
	E38 / E39	M8		15 Nm
2AZ Distribution box	E60 / E61 / E63 / E64/E70/E81/ E82 / E87 / E90 / E91 / E92 / E93	M8		15 Nm
	E60 / E61 / E63 / E64	M6		5 Nm
3AZ Fuse box	E85 / E86	M8		15 Nm
	E85 / E86	M6		8 Nm
	E85 / E86	M5		5 Nm

4AZ Positive cable to distributor, safety battery terminal	E46 / E53 / E60 / E61 / E63 / E64 / E65 / E66 / E67 / E70 / E81 / E82 / E83 / E85 / E86 / E87/ E90/ E91/ E92 / E93	M8		15 Nm
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31 SWITCH

61 31 SWITCH

SWITCH - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Ignition starter switch	E60 / E61 / E63 / E64			0.4 Nm
2AZ Reversing light switch	E36 / E38 / E39 / E46 / E53 / E60 / E61 / E63 / E64 / E81 / E82 / E83 / E85 / E86 / E87 / E90 / E91 / E92 / E93	M12		16 Nm
3AZ Trim, gear selector switch	E70	M4		2 Nm
4AZ Gear selector switch	E70	M5		5 Nm
5AZ Controller	E70	M4		1.5 Nm
6AZ Gear selector switch	E60 / E61	M6 x 12		7.5 Nm
7AZ Emergency release to gear selector switch	E60 / E61	4 x 12		1.6 Nm

61 WINDSCREEN WIPERS

61 61 WINDSHIELD WIPERS

WINDSHIELD WIPERS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Wiper motor mounting to wiper console	E31 LHD / E38	M6		7.5 Nm
	E31 RL / E36			10 Nm
	E39			12 Nm
2AZ Stop for park position to wiper console	E31			15 Nm
3AZ Wiper contact pressure motor to wiper console	E31 / E32 / E34 / E38 to 04/98			6.5 Nm
4AZ Motor crank to wiper motor	E38	M8		21 Nm
	E36 / E39	M8		27 Nm

5AZ Wiper shaft nut to body	E31 / E36 / E32 / E34			12 Nm
	E46 / E83			10 Nm
6AZ Holder to firewall	E31 / E46 / E83	M6		10 Nm
Wiper bracket to firewall	E36 Coup / E38 / E39			10 Nm
7AZ Upper cowl panel support	E31	M4		5 Nm
8AZ Wiper support bracket to firewall	E36			10 Nm
9AZ Wiper support bracket to wiper console	E36			10 Nm
10AZ Wiper arms				
Driver's side	E31/E39			40 Nm
	E38 from 04/98			25 Nm
	E46 / E83			30 Nm
Driver's side without ADV (contact pressure adjustment)	E32 / E34 E36 / E38 to 04/98			25 Nm
Driver's side with ADV (contact pressure adjustment)	E32 / E34			21 Nm
	E38 to 04/98			40 Nm
Passenger's side	E31 / E32 / E34 / E36 / E38 / E39			25 Nm
	E46 / E83			30 Nm

62 REAR WINDOW WIPER

61 62 TAILGATE WINDOW WIPER

TAILGATE WINDOW WIPER - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Wiper pivot bearing to rear window	E34 / Touring			5 Nm
	E39/Touring, E46 / Touring, E61			10 Nm
	E91	M6		7.5 Nm
2AZ Wiper bracket to rear lid (rubber mount)	E34 / Touring			5 Nm
	E36 / Compact / Touring			10 Nm
3AZ Wiper motor to console	E34 / Touring			13 Nm
4AZ Motor crank to wiper motor	E34 / Touring			13 Nm
5AZ Wiper arm to wiper pivot bearing	E34, E36 / Compact / Touring, E39 / Touring, E61			13 Nm
	E46 / Touring			9.5 Nm
	E46 / Compact			11 Nm

	E83			12 Nm
	E81 / E87, E91	M8		9.5 Nm
6AZ Washer jet to rear lid	E34 / Touring			10 Nm
7AZ Rear window button to rear window	E39 / Touring			7 Nm
	E46 / Touring, E61, E91			9.5 Nm
8AZ Wiper motor to rear lid	E46 / Compact / Touring, E39 / Touring, E61, E83, E87 / E81, E91			10 Nm

ENGINE

Cooling System - Operating Fluids

1.0 GENERAL INFORMATION ON LONG-TERM ANTIFREEZE AND CORROSION INHIBITORS

The cooling system of BMW cars must only be filled with reputable brand name ethylene glycol long-term antifreeze having corrosion inhibitors that are compatible with aluminum radiators.

Coolants must fulfill four basic requirements.

- Guarantee sufficient cooling.
- Protect various metals (gray cast iron, steel, aluminum alloys, brass, copper and solder) against corrosion.
- Prevent excessive silicate gel precipitation, which may cause clogging of the cooling system.
- Guarantee operation of cooling system in winter (prevent freezing of coolant) and in summer by boosting the boiling point.

The quality or grade of a long-term antifreeze and corrosion inhibitor is very important to be able to protect metal (gray cast iron, steel, aluminum alloys, brass, copper and solder) in the cooling system against corrosion. It guarantees full operation of the cooling system in winter and also increases the boiling point at high outside temperatures and under heavy loads.

INITIAL FILLING IN FACTORY

The factory fills the cooling system for protection against freezing, for the U.S. and Canada, down to -34°F (-37°C). This means an antifreeze ratio of 50% antifreeze and 50% water. In severely cold areas, the antifreeze can be increased to 60% which provides freezing protection down to -62°F (-52°C). Do not exceed a 60% ratio of antifreeze. The specified antifreeze ratio is important, since an insufficient amount would impair antifreezing and corrosion inhibiting protection. An excessive amount would not improve freezing protection, but instead reduce freezing protection.

CHANGE INTERVALS

Regular checking of coolant concentration is part of Inspection I or II. for change intervals.

LIFETIME COOLANT

The BMW engine coolant has a lifetime rating, except when the cooling system requires repairs. Drained coolant is not to be re-used. Top up with new coolant.

REMARKS AND LIMITATIONS

Only tap water of drinking quality with the following properties may be used as coolant.

DRINKING QUALITY SPECIFICATION

Appearance	-	colorless, clear
Residue	-	without suspended matter
pH value	-	6.5 - 8.0
Total hardness	-	max. 357 PPM Calcium Carbonate
Chloride content	-	max. 100 mg/l
Sulfate content	-	max. 100 mg/l

The antifreeze concentration in a cooling system should be checked before the beginning of winter. When determining the mixture concentration it is important to make sure that there is sufficient protection against freezing.

A hydrometer (radiator antifreeze tester) is required for correct determination of antifreeze concentration. The composition of long-term antifreezes and corrosion inhibitors differs between manufacturers.

BMW Anti-Freeze/Coolant contains no nitrites or phosphates and has been formulated to prevent excessive silicate drop out. Order the 1gallon container under BMW Part No. 82 14 1 467 704.

NOTE: Do not mix BMW Anti-Freeze/Coolant with different antifreezes which contain nitrites and/or phosphates and a high silicate formulation.

2.0 COOLANT ADDITIVES

No aftermarket coolant additives, including but not limited to those which provide additional corrosion inhibition or seal off minor leaks are approved by BMW.

Use of non-approved coolant additives may cause reduced heat transfer from the cylinder head to the coolant and the formation of hot spots. This can cause the burning through of cylinder head gaskets and/or cracking of the cylinder head.

BMW NA cannot accept the liability for the resulting effects and consequential damage caused by the use of coolant additives.

ENGINE

Cooling System - Repair Instructions - X3

00 COOLANT, CHECKING COOLING SYSTEM

00 57 072 RETROFITTING SUPPLEMENTARY OIL COOLER (HIGH-SPEED SCOPE OPTION SA840) (N52K)

Necessary preliminary tasks:

- Read out fault memory of DME control unit
- Switch off ignition
- Remove underbody protection, see **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION** .
- Replace front left wheel arch trim and replace dust lip
- Replace front left trim grille, see **51 11 185 REMOVING AND INSTALLING/REPLACING SIDE GRILLE IN BUMPER TRIM (FROM 09/2006)** .
- If necessary, replace left crashbox, see **51 11 770 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT DEFORMATION ELEMENT FOR FRONT BUMPER** .
- Remove air filter housing, see **13 71 000 REMOVING AND INSTALLING/REPLACING INTAKE FILTER HOUSING (N52K)** .
- Release servo reservoir, see **32 41 250 REMOVING AND INSTALLING/REPLACING FLUID RESERVOIR FOR POWER STEERING (M54, N46, N52)** .
- Remove alternator, see **12 31 020 REMOVING AND INSTALLING OR REPLACING ALTERNATOR (N52, N52K, N51, N53)** .
- Remove heater bulkhead, see **51 71 080 REMOVING AND INSTALLING/REPLACING HEATER BULKHEAD** .
- Drain coolant, see **17 00 005 Draining and adding coolant (N52K)**.
- Remove oil pressure switch , remove oil filter housing

Mount full-flow oil filter and connection housing for oil lines.

Installation:

Tightening torque: 11 42 3AZ, see **11 42 OIL FILTER ELEMENT WITH CONNECTIONS** .

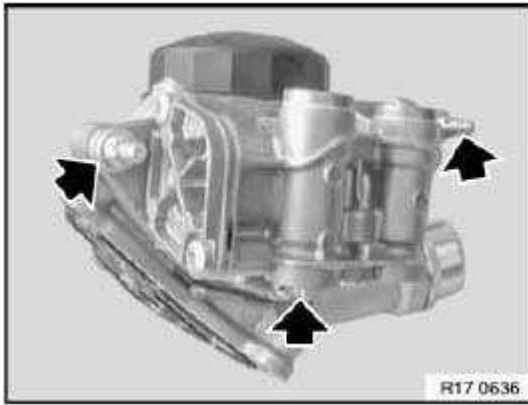


Fig. 1: Locating Mount Full-Flow Oil Filter And Connection Housing For Oil Lines
Courtesy of BMW OF NORTH AMERICA, INC.

Mount oil filter housing on crankcase.

To facilitate mounting, remove coolant connection.

Installation:

Tightening torque: 11 42 2AZ, see **11 42 OIL FILTER ELEMENT WITH CONNECTIONS** .



Fig. 2: Locating Mount Oil Filter Housing On Crankcase
Courtesy of BMW OF NORTH AMERICA, INC.

Mount oil pressure switch on new filter housing.

Installation:

Tightening torque 12 61 2AZ.



Fig. 3: Locating Mount Oil Pressure Switch On Filter Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Mount sealing rings on oil supply and return lines.

Mount oil lines on filter housing (M8x28 screw).

Installation:

Lubricate sealing rings lightly with oil.

Tightening torque: 17 22 5AZ, see **17 22 OIL COOLER PIPES** .

Secure oil lines with pre-installed rubber grommet.

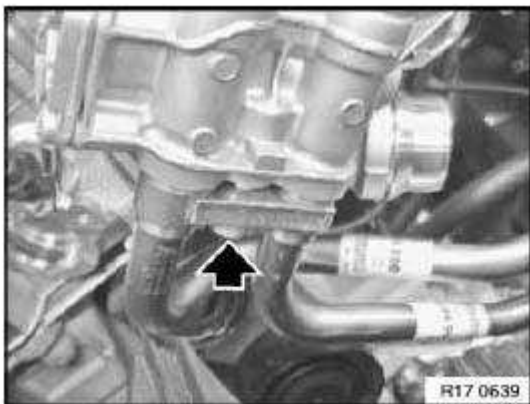


Fig. 4: Locating Mount Sealing Rings On Oil Supply And Return Lines
Courtesy of BMW OF NORTH AMERICA, INC.

Remove underbody protection bracket.

Mount holding frame for engine oil cooler on crashbox.

There must be 2 press-in nuts for the radiator bracket on the crashbox, otherwise replace crashbox.

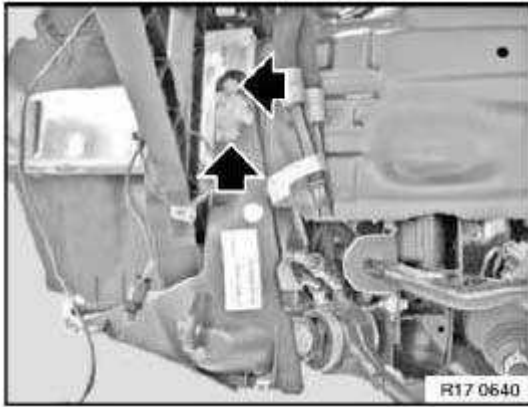


Fig. 5: Locating Underbody Protection Bracket
Courtesy of BMW OF NORTH AMERICA, INC.

Mount engine oil cooler on oil cooler bracket (M8x35 screw).

Installation:

Tightening torque: 17 21 2AZ, see **17 21 ENGINE OIL COOLER** .

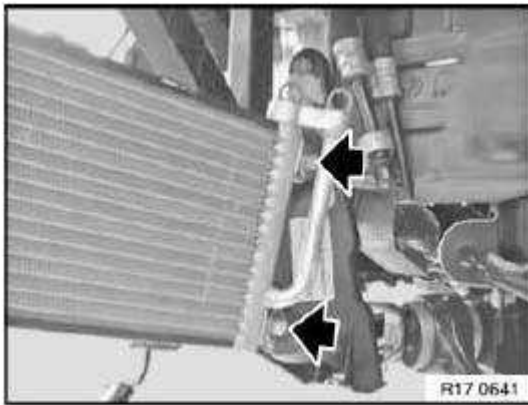


Fig. 6: Locating Mount Engine Oil Cooler On Oil Cooler Bracket (M8X35 Screw)
Courtesy of BMW OF NORTH AMERICA, INC.

Mount wheel arch cooler bracket with vibration damper (rubber element).

Installation:

Tightening torque: 17 21 3AZ, see **17 21 ENGINE OIL COOLER** .

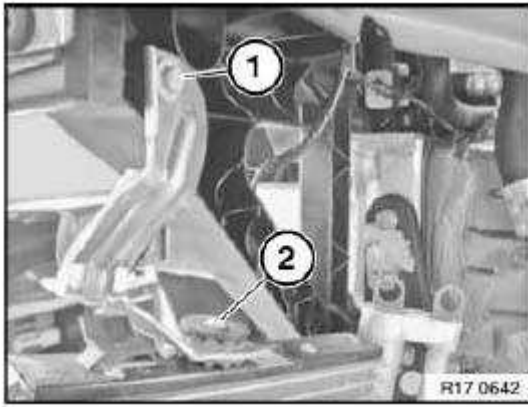


Fig. 7: Mount Wheel Arch Cooler Bracket With Vibration Damper
Courtesy of BMW OF NORTH AMERICA, INC.

Mount sealing rings on oil supply and return lines.

Mount oil lines on engine oil cooler housing (M8x30 screw).

Installation:

Lubricate sealing rings lightly with oil.

Tightening torque: 17 22 5AZ, see **17 22 OIL COOLER PIPES** .

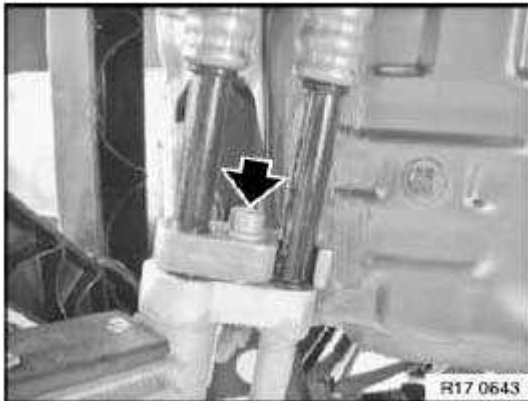


Fig. 8: Locating Mount Sealing Rings On Oil Supply And Return Lines
Courtesy of BMW OF NORTH AMERICA, INC.

Mount wheel arch cover.

Mount dust lip.

Mount oil cooler protective grille in wheel arch cover.



Fig. 9: Mount Wheel Arch Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Mount air duct on engine oil cooler.

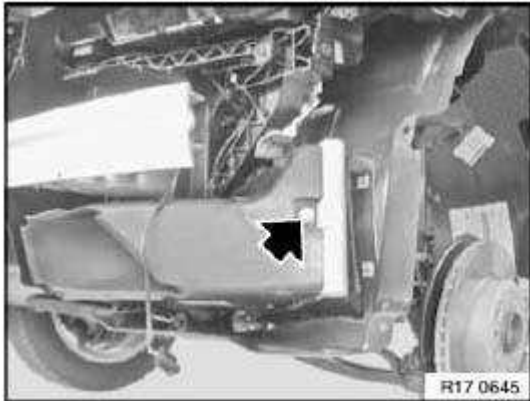


Fig. 10: Locating Mount Air Duct On Engine Oil Cooler
Courtesy of BMW OF NORTH AMERICA, INC.

Replace closed cover in left bumper trim with grille panel.



Fig. 11: Locating Bumper Trim With Grille Panel
Courtesy of BMW OF NORTH AMERICA, INC.

Remove coolant hose between coolant pump, coolant radiator and oil-water heat exchanger.

Install coolant hose between coolant pump and coolant radiator.

Push hose onto coolant pump up to mechanical stop.

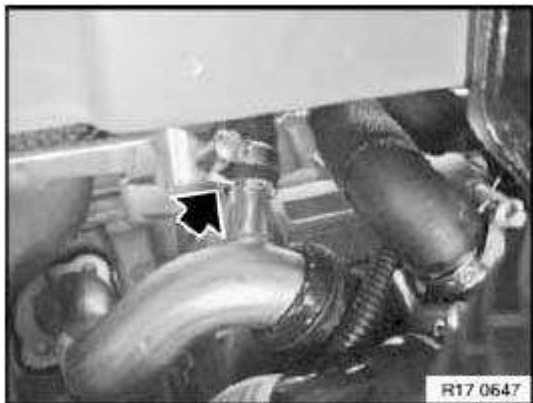


Fig. 12: Locating Coolant Hose Between Coolant Pump, Coolant Radiator And Oil-Water Heat Exchanger
Courtesy of BMW OF NORTH AMERICA, INC.

Add final details to vehicle

Fill coolant and engine oil systems

The oil fill quantity is increased after installation of the supplementary cooler by 0.5 l.

NOTE: Now clear the fault memory.

17 00 ... INSTRUCTIONS FOR WORKING ON COOLING SYSTEM

WARNING: Danger of scalding! Work on the cooling system should only be carried out when the engine has cooled down.

IMPORTANT: Wear protective gloves and goggles.

IMPORTANT: Lifetime coolant filling:

Never reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be drained and refilled.

In the case of other removal work involving the draining of partial quantities of coolant, replace these quantities which have been drained with new coolant.

IMPORTANT: Open cooling system only when it has cooled down.
Opening the cooling system while hot can result in air entering the system
This can cause overheating with permanent damage to the engine.

IMPORTANT: When working on the oil, coolant or fuel circuit, protect the alternator against contamination.
Cover alternator with suitable materials.
Failure to comply with this procedure may result in an alternator malfunction.

IMPORTANT: Do not fill coolant expansion tank over MAX level as overfilling will cause the coolant to overflow. This may give rise to traces of residual coolant on the expansion tank or in the engine compartment and wrongly suggest possible leakages.

Recycling

Catch and dispose of drained coolant.

Observe country-specific waste-disposal regulations.

NOTE: Tightening torque, hose clamps: 17 00 1AZ, see 17 00 COOLANT .

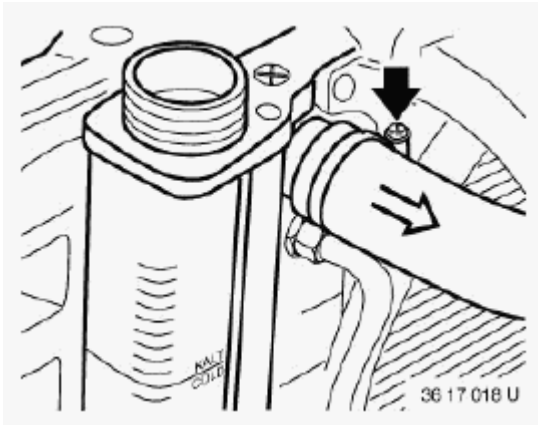


Fig. 13: Locating Hose Clamps
Courtesy of BMW OF NORTH AMERICA, INC.

Instructions for disassembly/assembly of coolant hose fast-release couplings

Disassembly of fast-release coupling

Withdraw lock (1/2), disconnect hose.

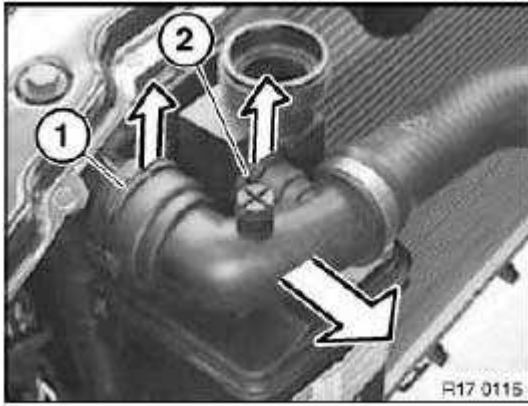


Fig. 14: Disconnecting Hose And Withdraw Lock
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check O-rings (1).

Do not coat O-rings (1) with antiseize agent.

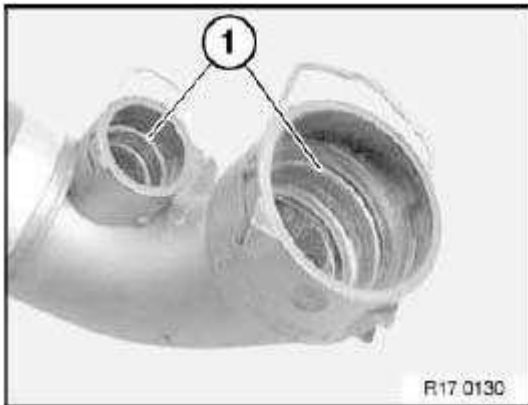


Fig. 15: O-rings
Courtesy of BMW OF NORTH AMERICA, INC.

Assembly of fast-release coupling

Press in lock (1) before installing fast-release coupling.

Push on hose.

Fast-release coupling must clearly snap audibly into place.

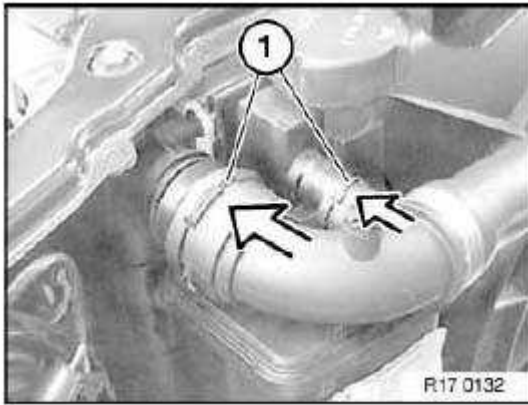


Fig. 16: Pushing Hose

Courtesy of BMW OF NORTH AMERICA, INC.

17 00 005 DRAINING AND ADDING COOLANT (N52K)

Necessary preliminary tasks:

- Remove underbody protection, see **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION** .

WARNING: Danger of scalding!

Only carry out work on cooling system after engine has cooled down.

Recycling:

Catch and dispose of drained coolant.

Observe country-specific waste-disposal regulations.

Open cap (1) on coolant expansion tank.



Fig. 17: Coolant Expansion Tank And Cap

Courtesy of BMW OF NORTH AMERICA, INC.

E83:

Open drain plug (1) on radiator.

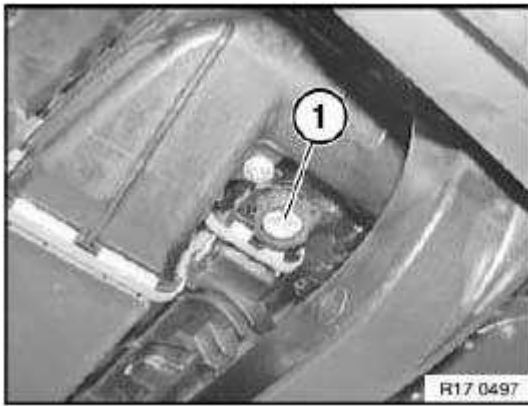


Fig. 18: Drain Plug On Radiator

Courtesy of BMW OF NORTH AMERICA, INC.

Open vent screw (1).

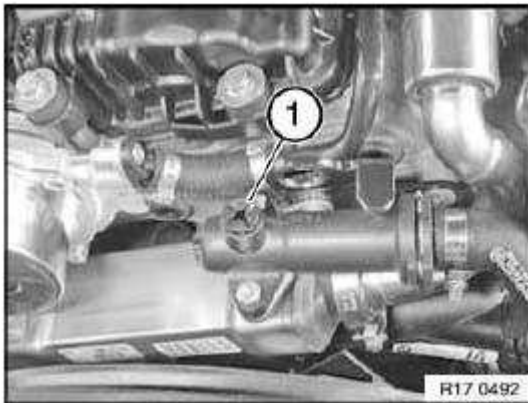


Fig. 19: Vent Screw

Courtesy of BMW OF NORTH AMERICA, INC.

Use only recommended coolant.

Operating Fluids MG17.

NOTE: Adhere to the following work sequence when adding coolant.

- Switch ignition on
- Seat heating to maximum temperature and fan to low speed (heater valves are opened and auxiliary water

- pump starts up).
- Slowly fill expansion tank with coolant.
 - Close vent screw after bubble-free coolant emerges or after filling up to max. cold fill level.

Vent cooling system.

17 00 009 CHECKING COOLING SYSTEM FOR LEAKS (M54, N46, N52)

Special tools required:

See **17 COOLING SYSTEM** .

- 17 0 101
- 17 0 105
- 17 0 106

WARNING: Danger of scalding!
Only perform this work after engine has cooled down.

NOTE: Illustrations feature the E85.

Checking pressure drop in cooling system:

Open cap on coolant expansion tank. Fit special tools 17 0 101 / 17 0 105.

Build up gauge pressure , wait approx. 2 minutes.

Cooling system is impervious to leaks if pressure drop is max. 0.1 bar.

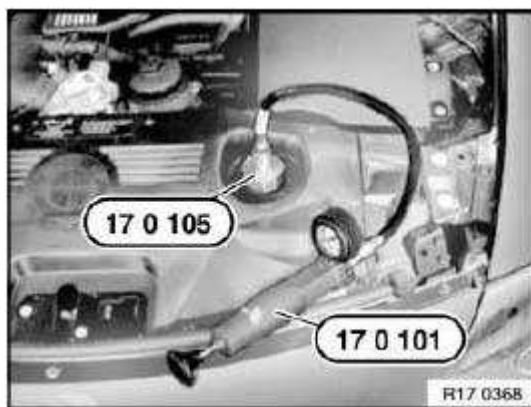


Fig. 20: Special Tool (17 0 105) And (17 0 101)
Courtesy of BMW OF NORTH AMERICA, INC.

Checking pressure relief valve in cap:

Screw cap (1) onto special tool 17 0 106.

Build up pressure with special tool (hand pump) 17 0 101; observe pressure gauge to ascertain when opening pressure is achieved.

Compare opening pressure of pressure relief valve.

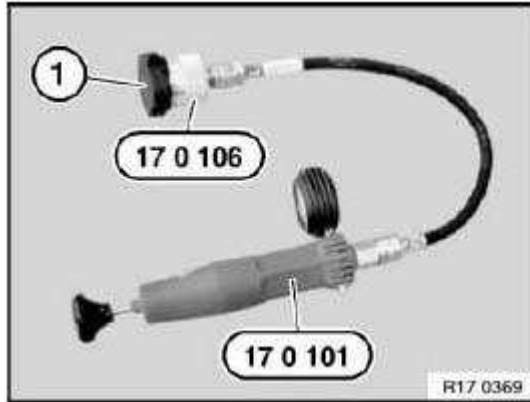


Fig. 21: Special Tool (17 0 106) And (17 0 101)
Courtesy of BMW OF NORTH AMERICA, INC.

17 00 009 CHECKING COOLING SYSTEM FOR WATER LEAKS

Special tools required:

See **17 COOLING SYSTEM** .

- 17 0 101
- 17 0 113
- 17 0 114

WARNING: Danger of scalding!
Only perform this work after engine has cooled down.

Checking pressure drop in cooling system:

Open cap on coolant expansion tank. Fit special tools 17 0 101 / 17 0 113.

Build up gauge pressure , wait approx. 2 minutes.

Cooling system is impervious to leaks if pressure drop is max. 0.1 bar.

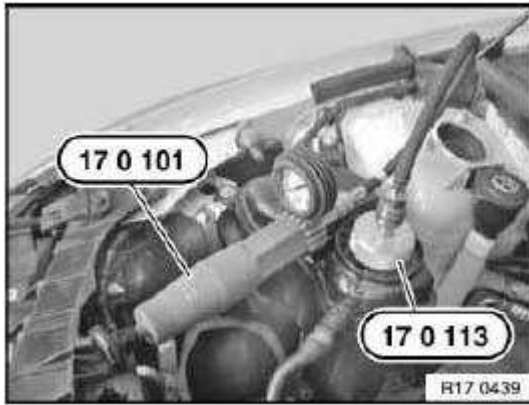


Fig. 22: Special Tool (17 0 101) And (17 0 113)
Courtesy of BMW OF NORTH AMERICA, INC.

Checking pressure relief valve in cap:

NOTE: While the vehicle is driven at high outside temperatures, the design may cause the pressure relief valve in the cap to open slightly and air together with dissolved coolant to escape. This coolant vapor condenses on the surface of the expansion tank and leaves traces when the vehicle has cooled down. These traces do not indicate whether the cap is defective or not. When the vehicle has been parked up for an extended period of time, the residual escaping coolant can cause the pressure relief valve in the cap to stick; therefore check the cap again 2 to 3 times.

Replace the cap only after you have checked three times and there is an incorrect opening pressure.

Checking pressure relief valve in cap:

Screw cap (1) onto special tool 17 0 114.

Build up pressure with special tool (hand pump) 17 0 101; observe pressure gauge to ascertain when opening pressure is achieved.

Compare opening pressure of pressure relief valve.

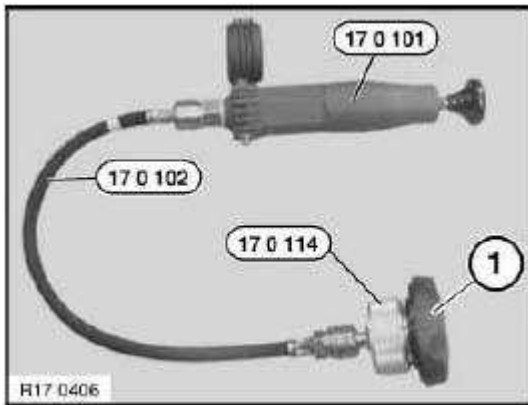


Fig. 23: Special Tool (17 0 101), (17 0 102) And (17 0 114)
Courtesy of BMW OF NORTH AMERICA, INC.

17 00 039 VENTING COOLING SYSTEM AND CHECKING FOR LEAKS

WARNING: Danger of scalding!
Only perform these tasks on an engine that has cooled down.

Necessary preliminary tasks:

Draining coolant:

The procedure is described in the section Draining and adding coolant. See **17 00 005 Draining Off And Topping Up Coolant.**

NOTE: Use only recommended coolant.

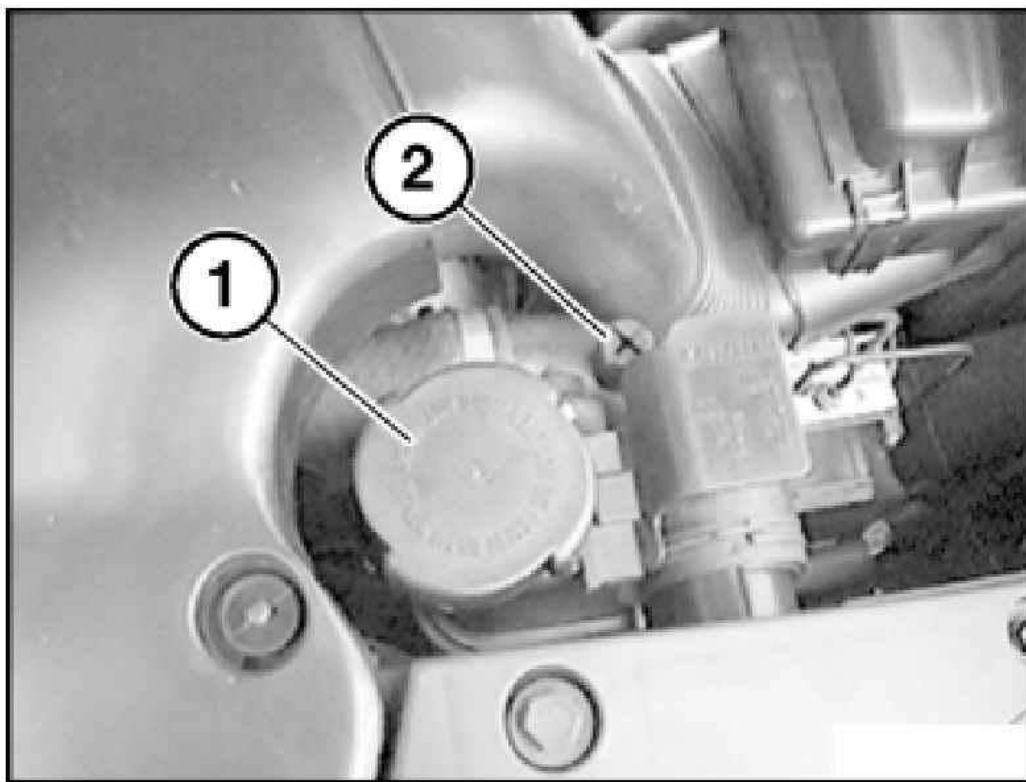
IMPORTANT: Fill coolant expansion tank up to lower edge of filler neck with recommended coolant. Pour in coolant slowly. Close vent screw (2) when bubble-free coolant emerges. Close cap on expansion tank. Do not open the coolant expansion tank cap during the venting procedure.

Adding coolant:

To ensure the cooling system is properly vented, it is absolutely essential to follow the steps below:

1. Open cap (1) on coolant expansion tank.
2. Open vent screw (2). Connect battery charger. Switch on ignition.
3. Set heater control to maximum temperature. Activate "Automatic" button, then reduce fan to lowest setting.
4. Press accelerator pedal for 10 seconds to floor. Engine must not be started.
5. The venting procedure is started when the accelerator pedal is pressed and takes approx. 12 minutes.

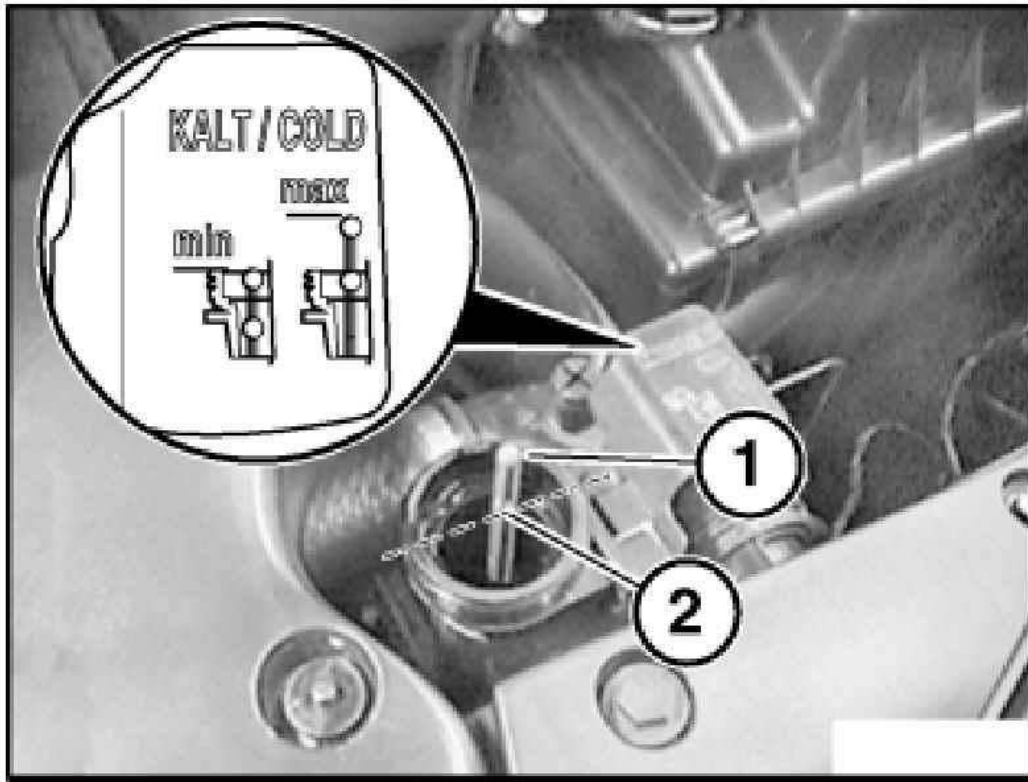
6. Check cooling system for leaks.



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Fig. 24: Opening Coolant Expansion Tank Cap
Courtesy of BMW OF NORTH AMERICA, INC.

7. If the venting procedure has to be carried out several times, allow DME to drop completely (ignition key removed for approx. 3 minutes), then repeat from step 3.



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Fig. 25: Locating Expansion Tank Coolant Filling Mark (E 65/E 66 Shown) (1 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

Checking coolant level:

CAUTION: Check coolant level at a maximum coolant temperature of 30°C.

NOTE: If ambient temperature exceeds 30°C, allow engine to cool down at least to ambient temperature.

Open cap carefully.

Fluid level is O.K. when top edge of coolant expansion tank is between both markings (1 and 2) on float needle.

Minimum cold fill level:

- Upper edge of coolant expansion tank is level with marking (1).

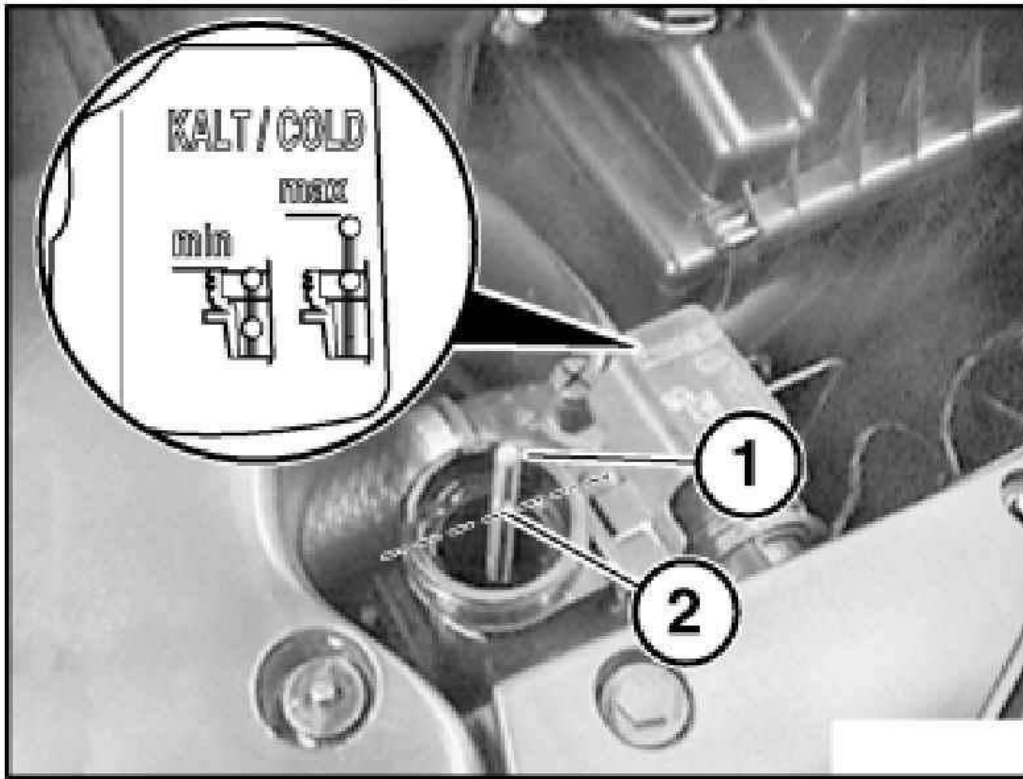
Maximum cold fill level:

- Upper edge of coolant expansion tank is level with marking (2).

If necessary, top up coolant.

NOTE: Tank mark indicates the fluid level at approx. 20°C.

Check cooling system for leaks. See 17 00 009 Checking Cooling System For Leaks (M54).



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Fig. 26: Locating Expansion Tank Coolant Filling Mark (E 65/E 66) (2 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

10 RADIATOR, EXPANSION TANK, PIPES

17 00 009 CHECKING COOLING SYSTEM FOR LEAKS (M54, N46, N52)

Special tools required:

See 17 COOLING SYSTEM .

- 17 0 101
- 17 0 105
- 17 0 106

WARNING: Danger of scalding!
Only perform this work after engine has cooled down.

NOTE: Illustrations feature the E85.

Checking pressure drop in cooling system:

Open cap on coolant expansion tank. Fit special tools 17 0 101 / 17 0 105.

Build up gauge pressure , wait approx. 2 minutes.

Cooling system is impervious to leaks if pressure drop is max. 0.1 bar.

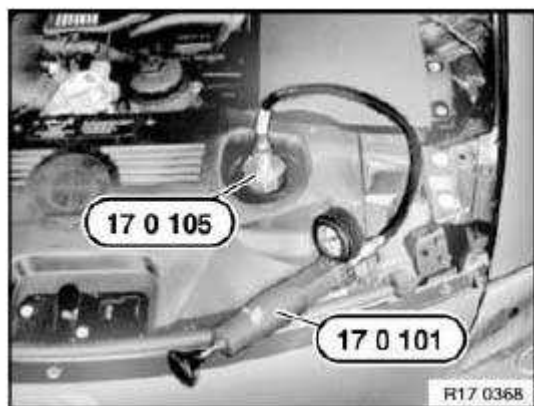


Fig. 27: Special Tool (17 0 105) And (17 0 101)
Courtesy of BMW OF NORTH AMERICA, INC.

Checking pressure relief valve in cap:

Screw cap (1) onto special tool 17 0 106.

Build up pressure with special tool (hand pump) 17 0 101 ; observe pressure gauge to ascertain when opening pressure is achieved.

Compare opening pressure of pressure relief valve.

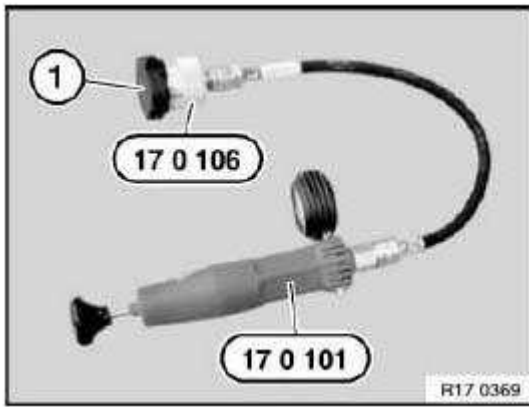


Fig. 28: Special Tool (17 0 106) And (17 0 101)
Courtesy of BMW OF NORTH AMERICA, INC.

17 00 009 CHECKING COOLING SYSTEM FOR WATER LEAKS

Special tools required:

See **17 COOLING SYSTEM** .

- 17 0 101
- 17 0 113
- 17 0 114

WARNING: Danger of scalding!
Only perform this work after engine has cooled down.

Checking pressure drop in cooling system:

Open cap on coolant expansion tank. Fit special tools 17 0 101 / 17 0 113.

Build up gauge pressure , wait approx. 2 minutes.

Cooling system is impervious to leaks if pressure drop is max. 0.1 bar.

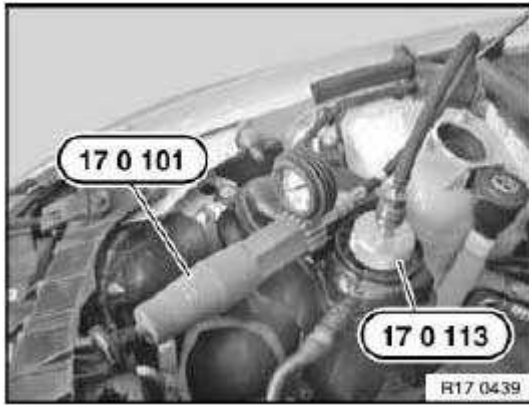


Fig. 29: Special Tool (17 0 101) And (17 0 113)
Courtesy of BMW OF NORTH AMERICA, INC.

Checking pressure relief valve in cap:

NOTE: While the vehicle is driven at high outside temperatures, the design may cause the pressure relief valve in the cap to open slightly and air together with dissolved coolant to escape. This coolant vapor condenses on the surface of the expansion tank and leaves traces when the vehicle has cooled down. These traces do not indicate whether the cap is defective or not. When the vehicle has been parked up for an extended period of time, the residual escaping coolant can cause the pressure relief valve in the cap to stick; therefore check the cap again 2 to 3 times.

Replace the cap only after you have checked three times and there is an incorrect opening pressure.

Checking pressure relief valve in cap:

Screw cap (1) onto special tool 17 0 114.

Build up pressure with special tool (hand pump) 17 0 101 ; observe pressure gauge to ascertain when opening pressure is achieved.

Compare opening pressure of pressure relief valve.

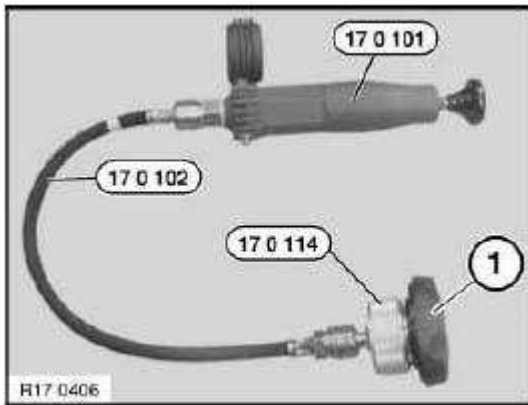


Fig. 30: Special Tool (17 0 101), (17 0 102) And (17 0 114)
 Courtesy of BMW OF NORTH AMERICA, INC.

11 ENGINE RADIATOR WITH ATTACHMENT

00 57 072 RETROFITTING SUPPLEMENTARY OIL COOLER (HIGH-SPEED SCOPE OPTION SA840) (N52K)

Necessary preliminary tasks:

- Read out fault memory of DME control unit
- Switch off ignition
- Remove underbody protection, see **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION** .
- Replace front left wheel arch trim and replace dust lip
- Replace front left trim grille, see **51 11 185 REMOVING AND INSTALLING/REPLACING SIDE GRILLE IN BUMPER TRIM (FROM 09/2006)** .
- If necessary, replace left crashbox, see **51 11 770 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT DEFORMATION ELEMENT FOR FRONT BUMPER** .
- Remove air filter housing, see **13 71 000 REMOVING AND INSTALLING/REPLACING INTAKE FILTER HOUSING (N52K)** .
- Release servo reservoir, see **32 41 250 REMOVING AND INSTALLING/REPLACING FLUID RESERVOIR FOR POWER STEERING (M54, N46, N52)** .
- Remove alternator, see **12 31 020 REMOVING AND INSTALLING OR REPLACING ALTERNATOR (N52, N52K, N51, N53)** .
- Remove heater bulkhead, see **51 71 080 REMOVING AND INSTALLING/REPLACING HEATER BULKHEAD** .
- Drain coolant, see **17 00 005 Draining and adding coolant (N52K)**.
- Remove oil pressure switch , remove oil filter housing

Mount full-flow oil filter and connection housing for oil lines.

Installation:

Tightening torque: 11 42 3AZ, see **11 42 OIL FILTER ELEMENT WITH CONNECTIONS** .

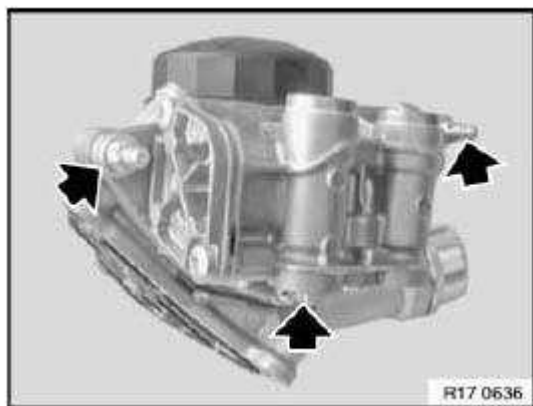


Fig. 31: Locating Mount Full-Flow Oil Filter And Connection Housing For Oil Lines
Courtesy of BMW OF NORTH AMERICA, INC.

Mount oil filter housing on crankcase.

To facilitate mounting, remove coolant connection.

Installation:

Tightening torque: 11 42 2AZ, see **11 42 OIL FILTER ELEMENT WITH CONNECTIONS** .



Fig. 32: Locating Mount Oil Filter Housing On Crankcase
Courtesy of BMW OF NORTH AMERICA, INC.

Mount oil pressure switch on new filter housing.

Installation:

Tightening torque 12 61 2AZ.



Fig. 33: Locating Mount Oil Pressure Switch On Filter Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Mount sealing rings on oil supply and return lines.

Mount oil lines on filter housing (M8x28 screw).

Installation:

Lubricate sealing rings lightly with oil.

Tightening torque: 17 22 5AZ, see **17 22 OIL COOLER PIPES** .

Secure oil lines with pre-installed rubber grommet.

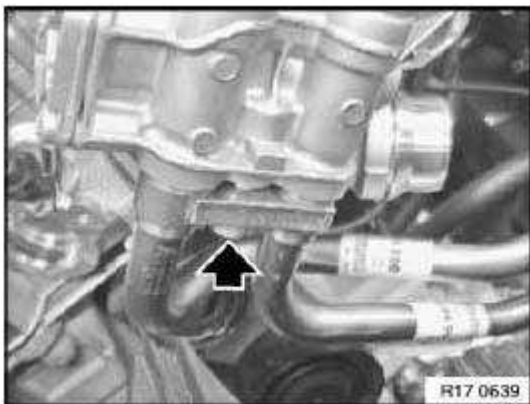


Fig. 34: Locating Mount Sealing Rings On Oil Supply And Return Lines
Courtesy of BMW OF NORTH AMERICA, INC.

Remove underbody protection bracket.

Mount holding frame for engine oil cooler on crashbox.

There must be 2 press-in nuts for the radiator bracket on the crashbox, otherwise replace crashbox.

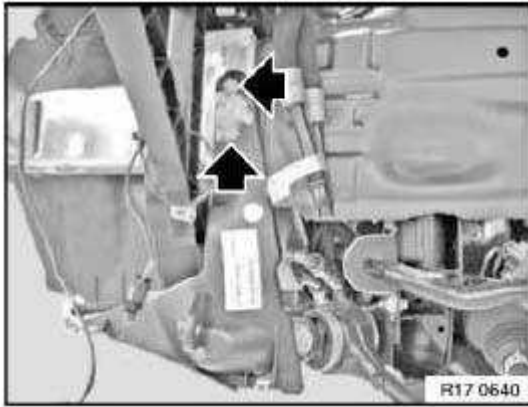


Fig. 35: Locating Underbody Protection Bracket
Courtesy of BMW OF NORTH AMERICA, INC.

Mount engine oil cooler on oil cooler bracket (M8x35 screw).

Installation:

Tightening torque: 17 21 2AZ, see **17 21 ENGINE OIL COOLER** .

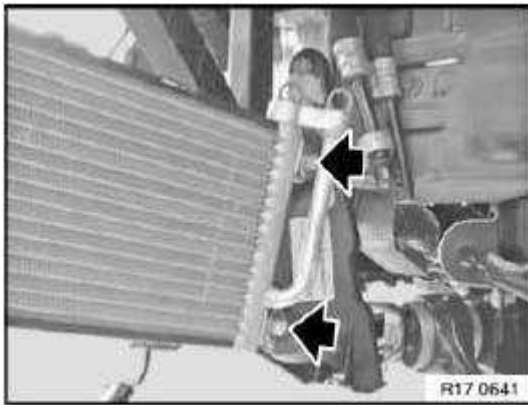


Fig. 36: Locating Mount Engine Oil Cooler On Oil Cooler Bracket (M8X35 Screw)
Courtesy of BMW OF NORTH AMERICA, INC.

Mount wheel arch cooler bracket with vibration damper (rubber element).

Installation:

Tightening torque: 17 21 3AZ, see **17 21 ENGINE OIL COOLER** .

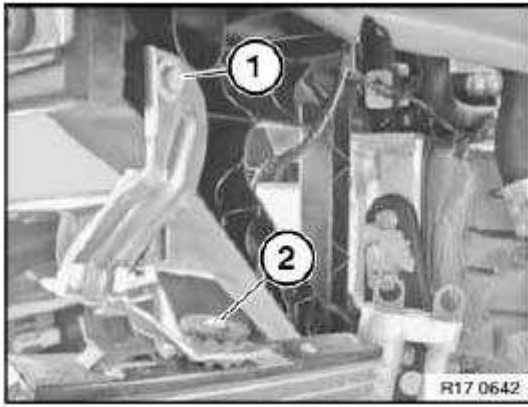


Fig. 37: Mount Wheel Arch Cooler Bracket With Vibration Damper
Courtesy of BMW OF NORTH AMERICA, INC.

Mount sealing rings on oil supply and return lines.

Mount oil lines on engine oil cooler housing (M8x30 screw).

Installation:

Lubricate sealing rings lightly with oil.

Tightening torque: 17 22 5AZ, see **17 22 OIL COOLER PIPES** .

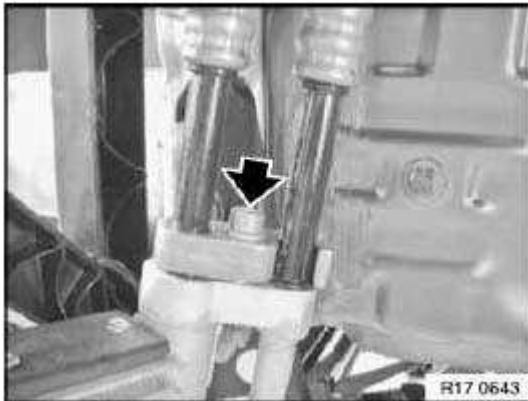


Fig. 38: Locating Mount Sealing Rings On Oil Supply And Return Lines
Courtesy of BMW OF NORTH AMERICA, INC.

Mount wheel arch cover.

Mount dust lip.

Mount oil cooler protective grille in wheel arch cover.



Fig. 39: Mount Wheel Arch Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Mount air duct on engine oil cooler.

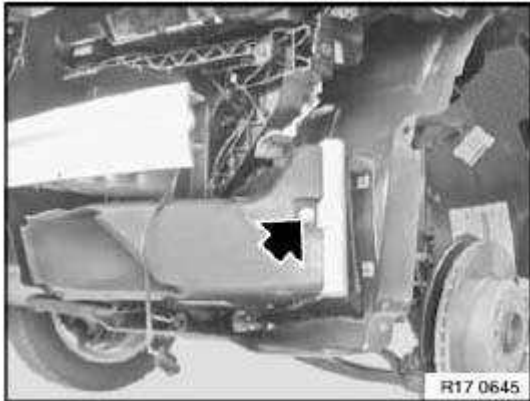


Fig. 40: Locating Mount Air Duct On Engine Oil Cooler
Courtesy of BMW OF NORTH AMERICA, INC.

Replace closed cover in left bumper trim with grille panel.

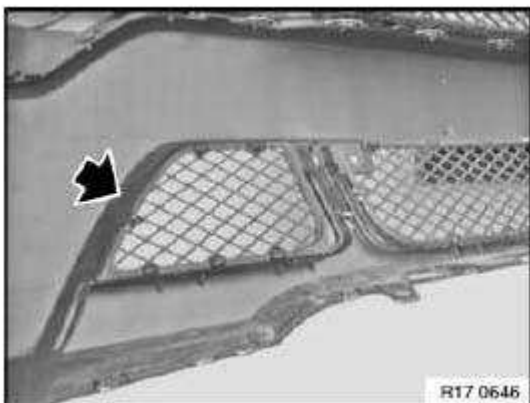


Fig. 41: Locating Bumper Trim With Grille Panel
Courtesy of BMW OF NORTH AMERICA, INC.

Remove coolant hose between coolant pump, coolant radiator and oil-water heat exchanger.

Install coolant hose between coolant pump and coolant radiator.

Push hose onto coolant pump up to mechanical stop.

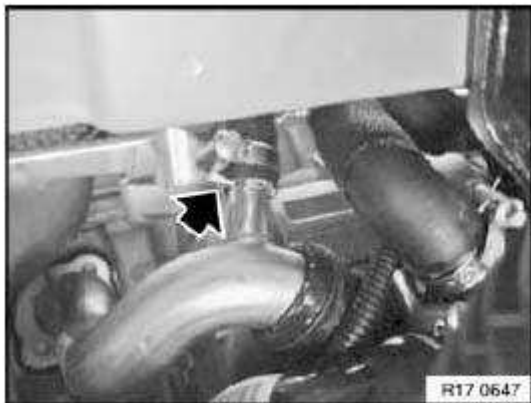


Fig. 42: Locating Coolant Hose Between Coolant Pump, Coolant Radiator And Oil-Water Heat Exchanger
Courtesy of BMW OF NORTH AMERICA, INC.

Add final details to vehicle

Fill coolant and engine oil systems

Data oil fill quantity

The oil fill quantity is increased after installation of the supplementary cooler by 0.5 l.

Adapt DME data status

NOTE: Now clear the fault memory.

17 11 035 REPLACING FAN COWL WITH ELECTRIC FAN (N52K)

Necessary preliminary tasks:

- Read out fault memory of DME control unit
- Switch off ignition
- Remove intake duct

Lever out expander rivet.

Unlock plug (1) and remove.

Release screw (2).

Lift out fan cowl (3) with electric fan.

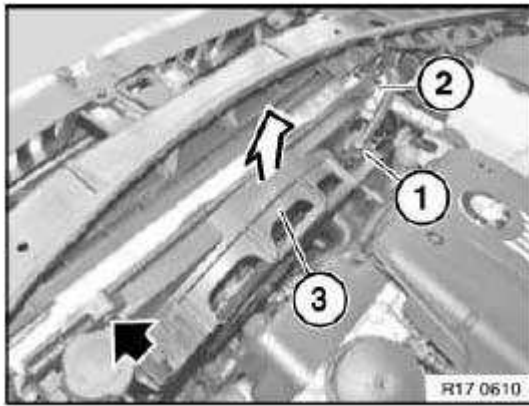


Fig. 43: Removing Electric Fan, Expander Rivet And Plug
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Now clear the fault memory.

17 11 046 REMOVING AND INSTALLING / REPLACING MODULE CARRIER

Necessary preliminary tasks:

- Remove **power steering cooling loop**
- If necessary, slacken A/C condenser and secure against damage and against falling down. Refer to Remove A/C condenser. See **64 53 550 REMOVING AND INSTALLING OR REPLACING CAPACITOR FOR THE HEATING AND AIR CONDITIONING SYSTEM** .

Release expander rivet and remove left module carrier (1). Installation: Rubber mounts fall out easily, ensure correct installation position.

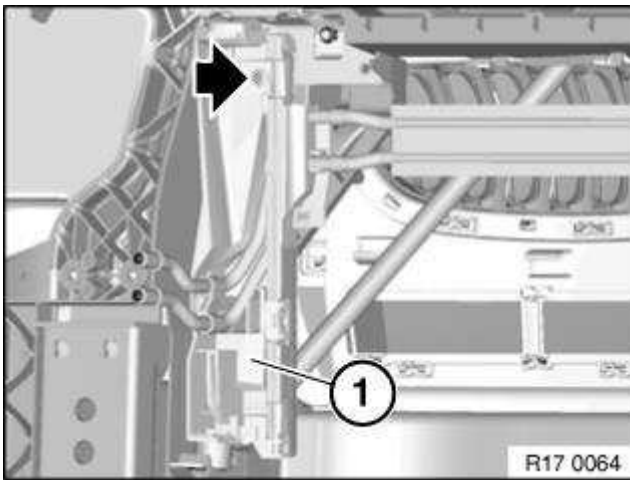


Fig. 44: Release Expander Rivet And Remove Left Module Carrier
Courtesy of BMW OF NORTH AMERICA, INC.

Remove right module carrier (1). Make sure rubber mount is in correct installation position.

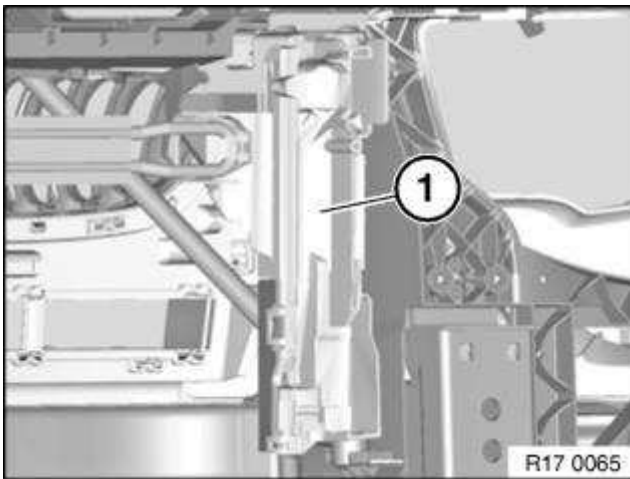


Fig. 45: Remove Right Module Carrier (1)
Courtesy of BMW OF NORTH AMERICA, INC.

When replacing module carrier: Convert **power steering cooling loop**.

17 11 100 REMOVING AND INSTALLING/REPLACING COOLANT EXPANSION TANK (M54, N46)

WARNING: Danger of scalding!
Only perform this work after engine has cooled down.

Necessary preliminary tasks:

- Follow instructions for working on cooling system, see **17 00 ... Instructions for working on cooling system**.
- E83: Remove intake duct

- Remove fan cowl
- Drain coolant, see **17 00 005 Draining and adding coolant (N52K)**.

Unfasten plug connection (1) and disconnect.

Withdraw lock (2).

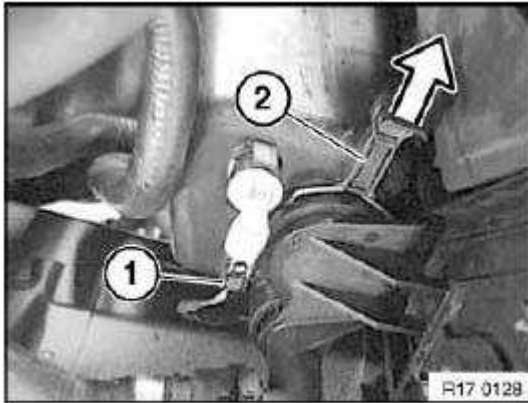


Fig. 46: Disconnecting Plug Connection And Withdraw Lock
Courtesy of BMW OF NORTH AMERICA, INC.

Pull locks (1 and 2) upwards and detach coolant hose from radiator/coolant expansion tank.

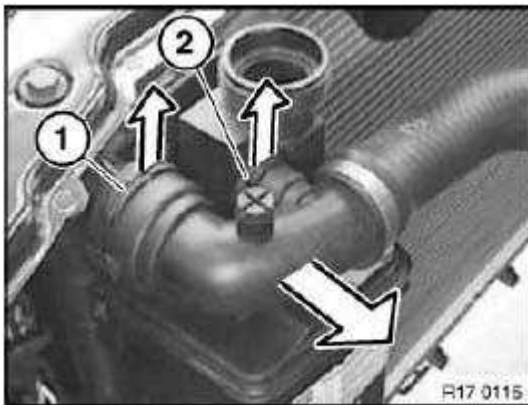


Fig. 47: Disconnecting Hose And Withdraw Lock
Courtesy of BMW OF NORTH AMERICA, INC.

Pull lock (1) upwards and detach coolant hose from coolant expansion tank.

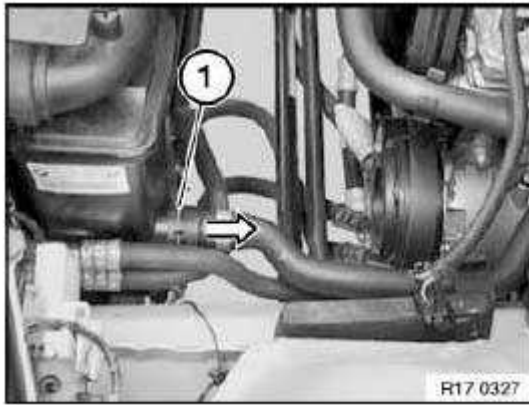


Fig. 48: Pulling Lock Coolant Hose From Coolant Expansion Tank
Courtesy of BMW OF NORTH AMERICA, INC.

Illustration with radiator removed.

Pull coolant expansion tank upwards slightly out of carrier plate and pull out lower connection piece. Then tilt expansion tank to rear and remove.

Installation:

Check sealing rings. Do not under any circumstances coat sealing rings with antiseize agent before installation.

Retaining lug must engage in opening on carrier plate.

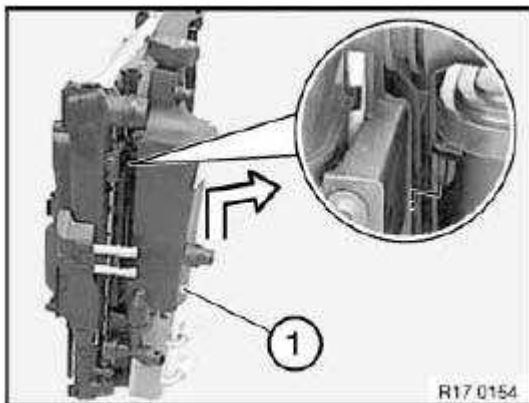


Fig. 49: Pulling Coolant Expansion Tank
Courtesy of BMW OF NORTH AMERICA, INC.

17 11 100 REMOVING AND INSTALLING/REPLACING COOLANT EXPANSION TANK (M57TU, M57T2, M47T2)

Necessary preliminary tasks:

- Drain coolant, see **17 00 005 Draining and adding coolant (N52K)**.

Detach coolant hoses (1) and (3).

Unclip hose (2).

Disconnect connector (4).

Unfasten screws.

Remove expansion tank (5).

Installation:

Insert locating pin in rubber grommet.

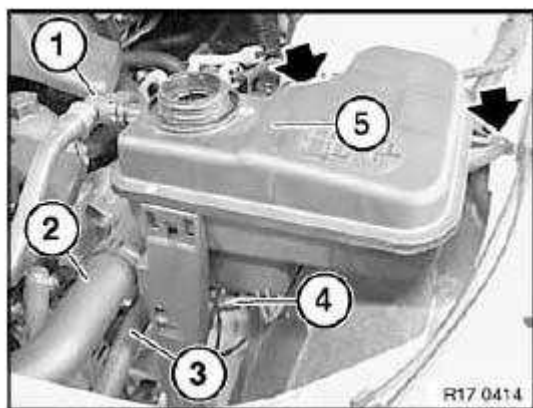


Fig. 50: Locating Coolant Hoses, Connector And Expansion Tank
Courtesy of BMW OF NORTH AMERICA, INC.

17 11 370 REMOVING AND INSTALLING/REPLACING COOLING LOOP FOR POWER STEERING

WARNING: Danger of scalding!

Only perform this work after engine has cooled down.

IMPORTANT: When working on the oil, coolant or fuel circuit, you must protect the alternator against contamination.

Cover alternator with suitable materials.

Failure to comply with this procedure may result in an alternator malfunction.

NOTE: After completing this operation, check fluid level in tank of power steering system, see 32 13 006 BLEEDING POWER STEERING UNIT .

Remove radiator.

Lift out expansion rivet (1).

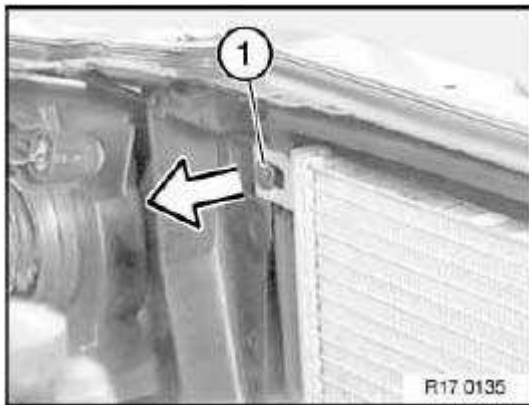


Fig. 51: Lifting Expansion Rivet

Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew bolt (1).

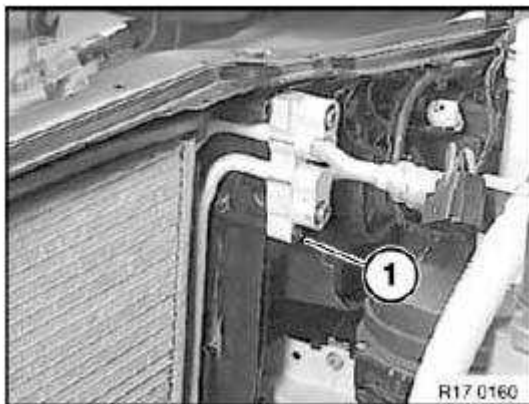


Fig. 52: Bolt

Courtesy of BMW OF NORTH AMERICA, INC.

Remove A/C condenser towards rear top from fixtures.

Tilt condenser towards engine, taking care not to damage condenser.

NOTE: **Lines of A/C system remain connected to condenser.**

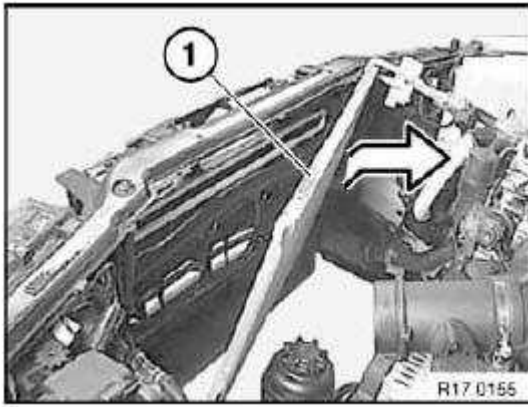


Fig. 53: Removing A/C Condenser Top From Fixtures
 Courtesy of BMW OF NORTH AMERICA, INC.

Press lines (1) in direction of cooling loop, pull black locking ring towards rear. Keep locking ring pressed and detach lines (1) from cooling loop.

IMPORTANT: Catch and dispose of emerging fluid.

Press lock (2). Pull cooling loop (3) of power steering towards rear out of module carrier.

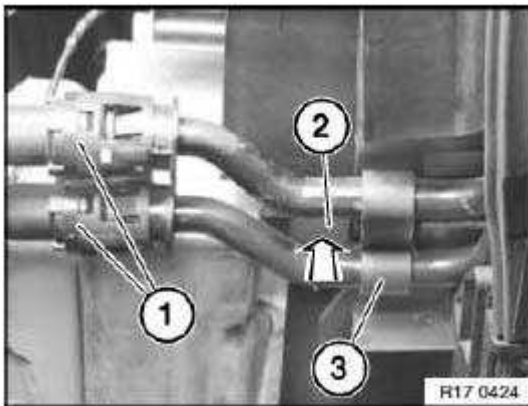


Fig. 54: Pulling Cooling Loop Of Power Steering
 Courtesy of BMW OF NORTH AMERICA, INC.

21 OIL COOLER

17 21 500 FLUSHING OIL COOLER WITH LINES (AUTOMATIC TRANSMISSION)

Special tools required:

See **17 COOLING SYSTEM** .

- 17 2 018

- 17 2 019

NOTE: **Carry out the work steps listed when:
Fitting a new or replacement transmission
Flushing can only be carried out with the automatic transmission removed.**

Procedure:

Automatic transmission removed.

Connect appropriate adapters (see description below) to oil lines exiting from automatic transmission.

Connect the connecting line 17 2 019 from the oil collection unit with the quick-release coupling.

Connect drain line 17 2 018 using quick-release coupling.

Feed open end of drain line into a suitable collection container.

Using oil collection unit, flush approx. 1 liter of transmission fluid through oil lines and oil cooler.

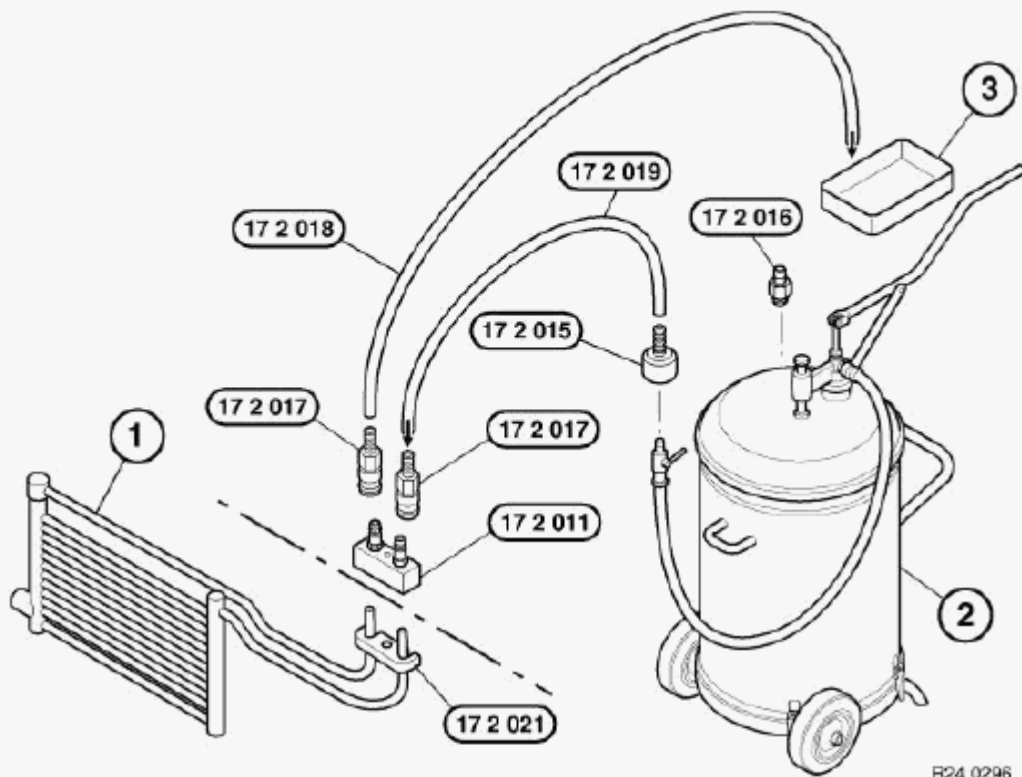
Reposition quick-release couplings.

Flush oil lines/oil cooler in opposite direction with approx. 1 liter of transmission fluid.

Disconnect quick-release couplings, remove adapters.

NOTE: **Dispose of flushing oil properly; do not under any circumstances reuse it.**

Arrangement of flushing device for transmissions A5S 310Z, A5S 560Z, A5S 360R/390R, A4S 200R, A5S 325Z, GA6HP26Z



R24 0296

- 1) Transmission -oil cooler with lines
- 2) Oil collection unit
- 3) Oil drip tray

17 2 011 Adapter for connecting transmission -side oil cooler lines (1)

17 2 015 Connection for oil collection unit (2), manufacturer: Deutsche Tecalemit or

17 2 016 Connection for oil collection unit (2), manufacturer: Horn

17 2 017 Quick -release coupling (2 pieces)

17 2 018 Hose to oil drip tray (3)

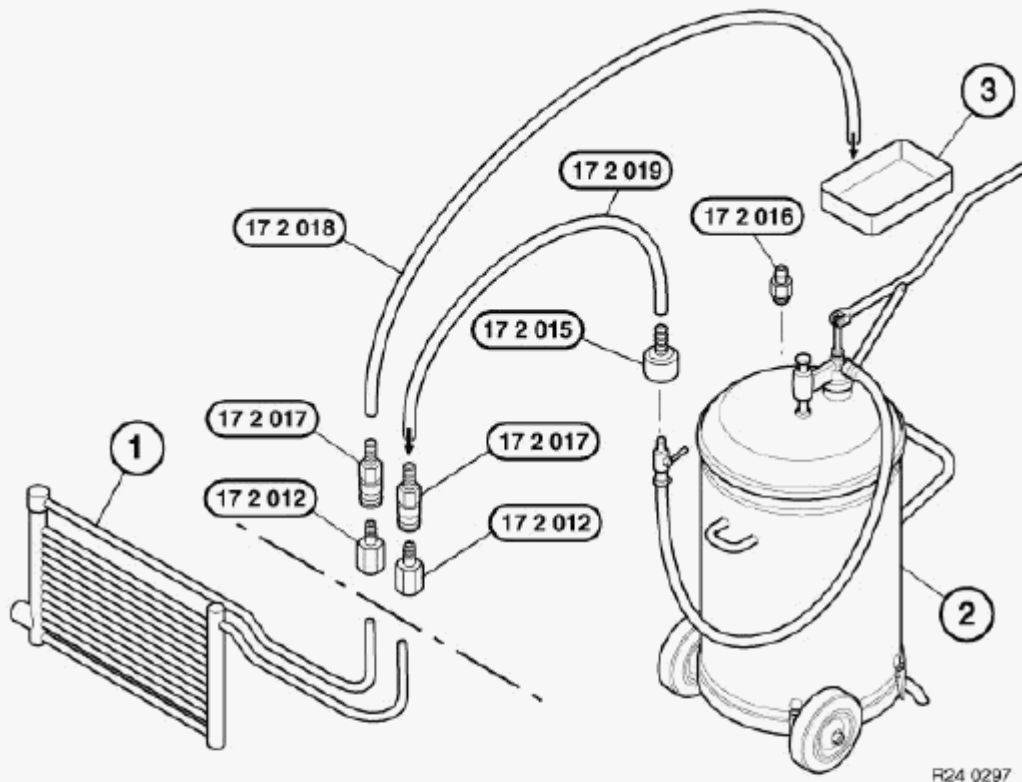
17 2 019 Hose to oil collection unit (2)

17 2 021 Mounting plate for adapter 17 2 011 for transmissions A5S 325Z, GA6HP26Z

Fig. 55: Flushing Device For Transmissions

Courtesy of BMW OF NORTH AMERICA, INC.

Arrangement of flushing device for transmission A4S 310R



R24 0297

- 1) Transmission-oil cooler with lines
- 2) Oil collection unit
- 3) Oil drip tray

17 2 012 Adapters (2 x) for connecting transmission-side oil cooler lines (1)

17 2 015 Connection for oil collection unit (2), manufacturer: Deutsche Tecalemit or

17 2 016 Connection for oil collection unit (2), manufacturer: Horn

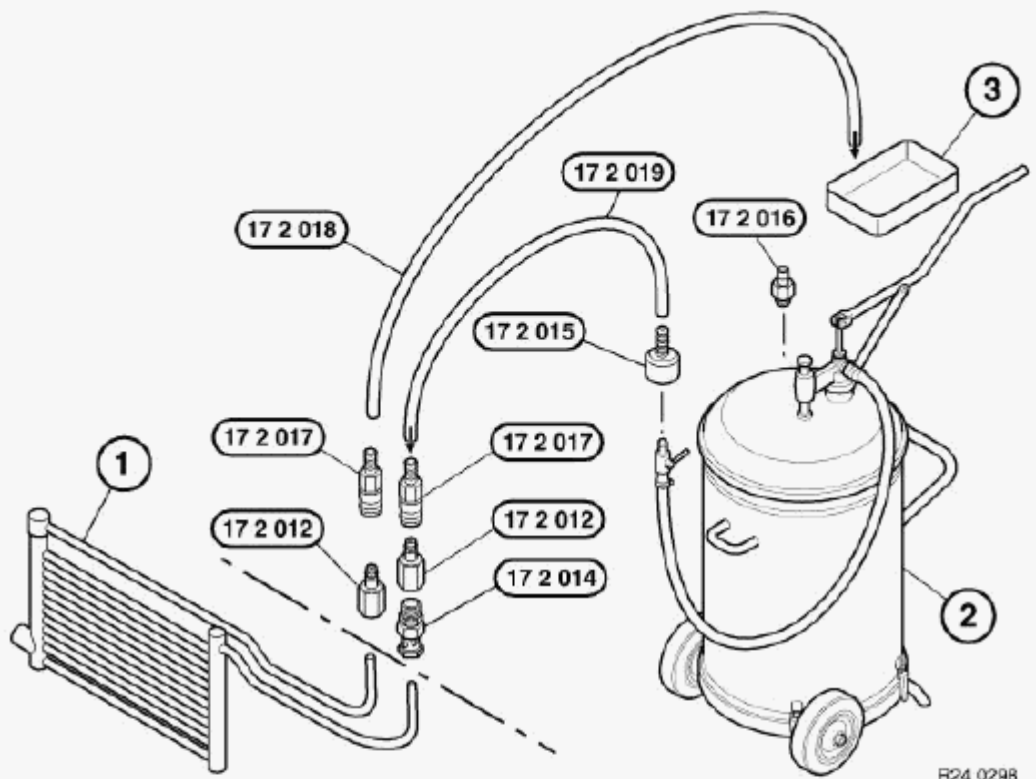
17 2 017 Quick-release coupling (2 pieces)

17 2 018 Hose to oil drip tray (3)

17 2 019 Hose to oil collection unit (2)

Fig. 56: Arrangement Of Flushing Device For Transmission (A4S 310R)
Courtesy of BMW OF NORTH AMERICA, INC.

Arrangement of flushing device for transmission A4S 300J



R24 0298

- 1) Transmission-oil cooler with lines
- 2) Oil collection unit
- 3) Oil drip tray

17 2 012 Adapters (2 x) for connecting transmission-side oil cooler lines (1)

17 2 014 Banjo bolt for connecting transmission-side oil cooler lines (1)

17 2 015 Connection for oil collection unit (2), manufacturer: Deutsche Tecalemit or

17 2 016 Connection for oil collection unit (2), manufacturer: Horn

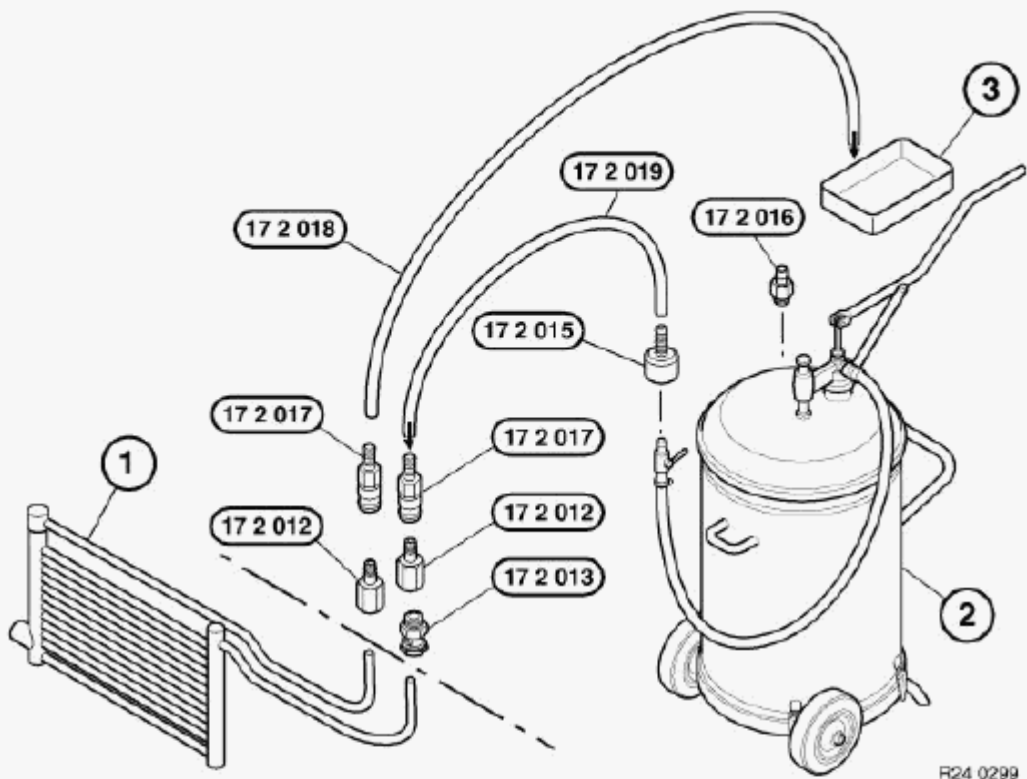
17 2 017 Quick-release coupling (2 pieces)

17 2 018 Hose to oil drip tray (3)

17 2 019 Hose to oil collection unit (2)

Fig. 57: Arrangement Of Flushing Device For Transmission (A4S 300J)
Courtesy of BMW OF NORTH AMERICA, INC.

Arrangement of flushing device for transmission A5S 440Z



R24 0299

- 1) Transmission-oil cooler with lines
- 2) Oil collection unit
- 3) Oil drip tray

17 2 012 Adapters (2 x) for connecting transmission-side oil cooler lines (1)

17 2 013 Banjo bolt for connecting transmission-side oil cooler lines (1)

17 2 015 Connection for oil collection unit (2), manufacturer: Deutsche Tecaletit or

17 2 016 Connection for oil collection unit (2), manufacturer: Horn

17 2 017 Quick-release coupling (2 pieces)

17 2 018 Hose to oil drip tray (3)

17 2 019 Hose to oil collection unit (2)

Fig. 58: Arrangement Of Flushing Device For Transmission (A5S 440Z)

Courtesy of BMW OF NORTH AMERICA, INC.

22 OIL COOLER LINES

00 57 072 RETROFITTING SUPPLEMENTARY OIL COOLER (HIGH-SPEED SCOPE OPTION SA840) (N52K)

Necessary preliminary tasks:

- Read out fault memory of DME control unit

- Switch off ignition
- Remove underbody protection, see **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION** .
- Replace front left wheel arch trim and replace dust lip
- Replace front left trim grille, see **51 11 185 REMOVING AND INSTALLING/REPLACING SIDE GRILLE IN BUMPER TRIM (FROM 09/2006)** .
- If necessary, replace left crashbox, see **51 11 770 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT DEFORMATION ELEMENT FOR FRONT BUMPER** .
- Remove air filter housing, see **13 71 000 REMOVING AND INSTALLING/REPLACING INTAKE FILTER HOUSING (N52K)** .
- Release servo reservoir, see **32 41 250 REMOVING AND INSTALLING/REPLACING FLUID RESERVOIR FOR POWER STEERING (M54, N46, N52)** .
- Remove alternator, see **12 31 020 REMOVING AND INSTALLING OR REPLACING ALTERNATOR (N52, N52K, N51, N53)** .
- Remove heater bulkhead, see **51 71 080 REMOVING AND INSTALLING/REPLACING HEATER BULKHEAD** .
- Drain coolant, see **17 00 005 Draining and adding coolant (N52K)**.
- Remove oil pressure switch , remove oil filter housing

Mount full-flow oil filter and connection housing for oil lines.

Installation:

Tightening torque: 11 42 3AZ, see **11 42 OIL FILTER ELEMENT WITH CONNECTIONS** .

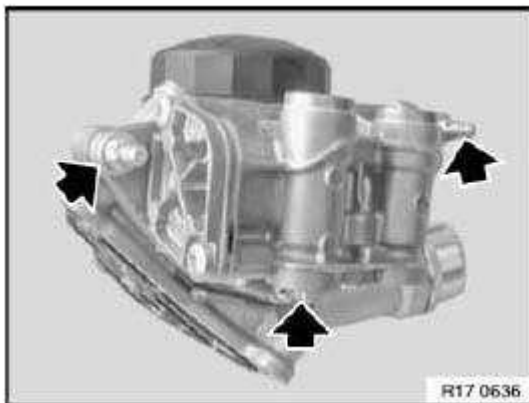


Fig. 59: Locating Mount Full-Flow Oil Filter And Connection Housing For Oil Lines
 Courtesy of BMW OF NORTH AMERICA, INC.

Mount oil filter housing on crankcase.

To facilitate mounting, remove coolant connection.

Installation:

Tightening torque: 11 42 2AZ, see **11 42 OIL FILTER ELEMENT WITH CONNECTIONS** .



Fig. 60: Locating Mount Oil Filter Housing On Crankcase
Courtesy of BMW OF NORTH AMERICA, INC.

Mount oil pressure switch on new filter housing.

Installation:

Tightening torque 12 61 2AZ.



Fig. 61: Locating Mount Oil Pressure Switch On Filter Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Mount sealing rings on oil supply and return lines.

Mount oil lines on filter housing (M8x28 screw).

Installation:

Lubricate sealing rings lightly with oil.

Tightening torque: 17 22 5AZ, see 17 22 OIL COOLER PIPES .

Secure oil lines with pre-installed rubber grommet.

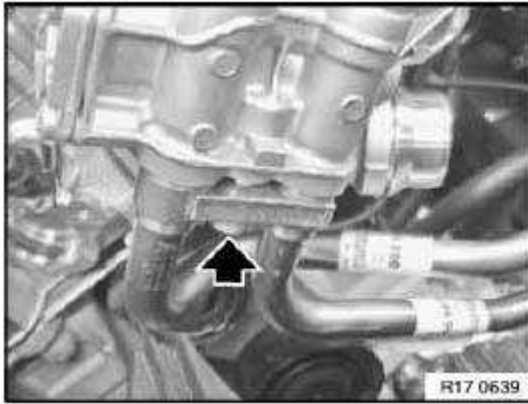


Fig. 62: Locating Mount Sealing Rings On Oil Supply And Return Lines
Courtesy of BMW OF NORTH AMERICA, INC.

Remove underbody protection bracket.

Mount holding frame for engine oil cooler on crashbox.

There must be 2 press-in nuts for the radiator bracket on the crashbox, otherwise replace crashbox.

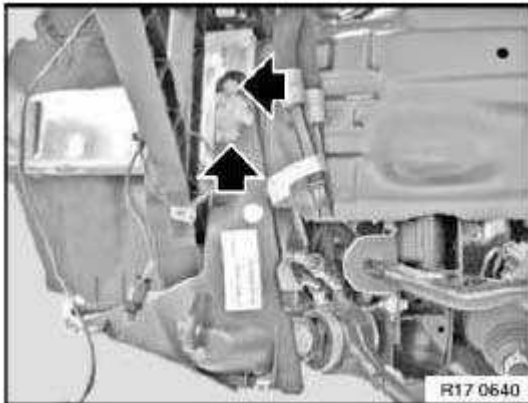


Fig. 63: Locating Underbody Protection Bracket
Courtesy of BMW OF NORTH AMERICA, INC.

Mount engine oil cooler on oil cooler bracket (M8x35 screw).

Installation:

Tightening torque: 17 21 2AZ, see 17 21 ENGINE OIL COOLER .

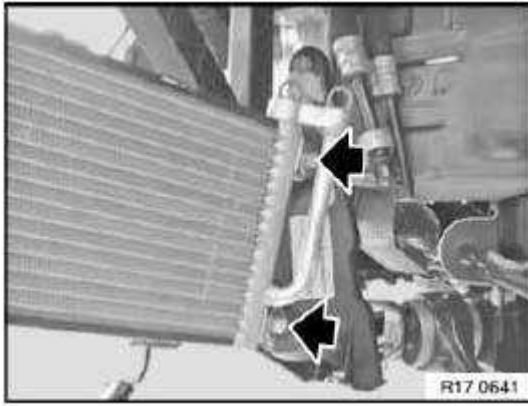


Fig. 64: Locating Mount Engine Oil Cooler On Oil Cooler Bracket (M8X35 Screw)
Courtesy of BMW OF NORTH AMERICA, INC.

Mount wheel arch cooler bracket with vibration damper (rubber element).

Installation:

Tightening torque: 17 21 3AZ, see **17 21 ENGINE OIL COOLER** .

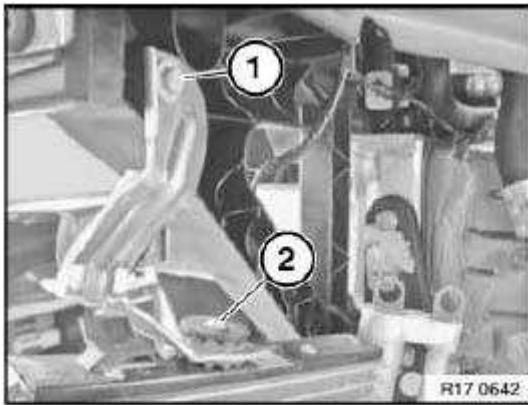


Fig. 65: Mount Wheel Arch Cooler Bracket With Vibration Damper
Courtesy of BMW OF NORTH AMERICA, INC.

Mount sealing rings on oil supply and return lines.

Mount oil lines on engine oil cooler housing (M8x30 screw).

Installation:

Lubricate sealing rings lightly with oil.

Tightening torque: 17 22 5AZ, see **17 22 OIL COOLER PIPES** .

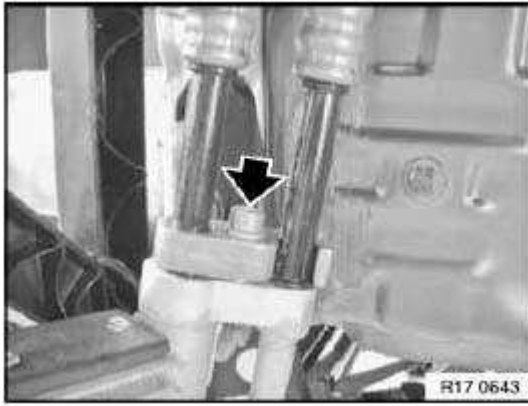


Fig. 66: Locating Mount Sealing Rings On Oil Supply And Return Lines
Courtesy of BMW OF NORTH AMERICA, INC.

Mount wheel arch cover.

Mount dust lip.

Mount oil cooler protective grille in wheel arch cover.



Fig. 67: Mount Wheel Arch Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Mount air duct on engine oil cooler.

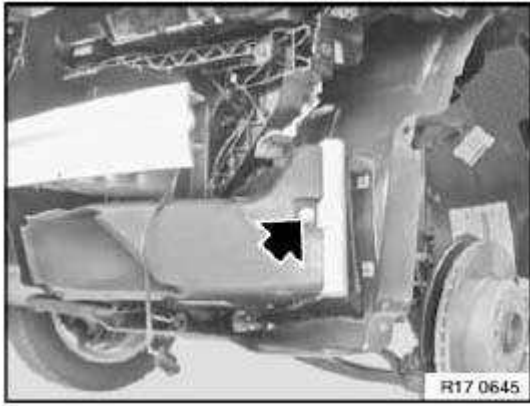


Fig. 68: Locating Mount Air Duct On Engine Oil Cooler
Courtesy of BMW OF NORTH AMERICA, INC.

Replace closed cover in left bumper trim with grille panel.



Fig. 69: Locating Bumper Trim With Grille Panel
Courtesy of BMW OF NORTH AMERICA, INC.

Remove coolant hose between coolant pump, coolant radiator and oil-water heat exchanger.

Install coolant hose between coolant pump and coolant radiator.

Push hose onto coolant pump up to mechanical stop.

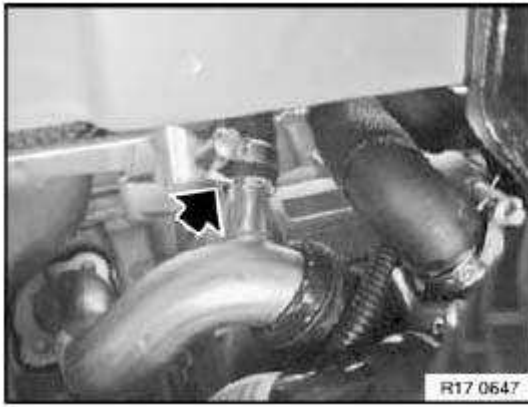


Fig. 70: Locating Coolant Hose Between Coolant Pump, Coolant Radiator And Oil-Water Heat Exchanger

Courtesy of BMW OF NORTH AMERICA, INC.

Add final details to vehicle

Fill coolant and engine oil systems

Data oil fill quantity

The oil fill quantity is increased after installation of the supplementary cooler by 0.5 l.

Adapt DME data status

NOTE: Now clear the fault memory.

17 21 500 FLUSHING OIL COOLER WITH LINES (AUTOMATIC TRANSMISSION)

Special tools required:

See **17 COOLING SYSTEM** .

- 17 2 018
- 17 2 019

**NOTE: Carry out the work steps listed when:
Fitting a new or replacement transmission
Flushing can only be carried out with the automatic transmission removed.**

Procedure:

Automatic transmission removed.

Connect appropriate adapters (see description below) to oil lines exiting from automatic transmission.

Connect the connecting line 17 2 019 from the oil collection unit with the quick-release coupling.

Connect drain line 17 2 018 using quick-release coupling.

Feed open end of drain line into a suitable collection container.

Using oil collection unit, flush approx. 1 liter of transmission fluid through oil lines and oil cooler.

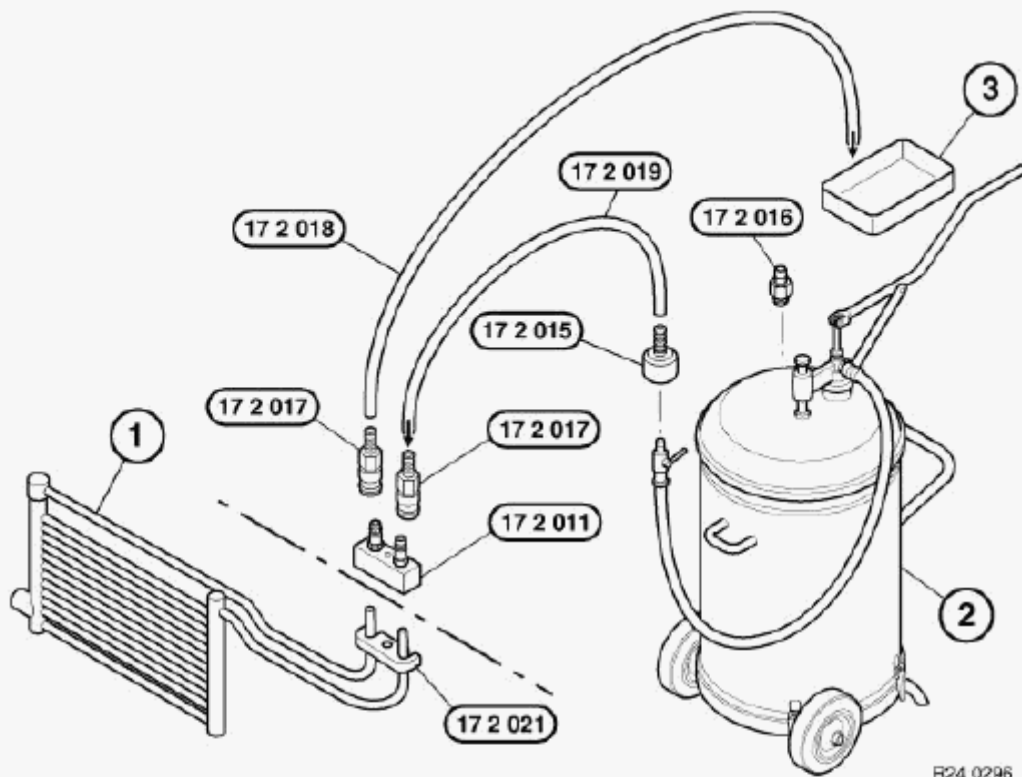
Reposition quick-release couplings.

Flush oil lines/oil cooler in opposite direction with approx. 1 liter of transmission fluid.

Disconnect quick-release couplings, remove adapters.

NOTE: Dispose of flushing oil properly; do not under any circumstances reuse it.

Arrangement of flushing device for transmissions A5S 310Z, A5S 560Z, A5S 360R/390R, A4S 200R, A5S 325Z, GA6HP26Z



- 1) Transmission-oil cooler with lines
- 2) Oil collection unit
- 3) Oil drip tray

17 2 011 Adapter for connecting transmission -side oil cooler lines (1)

17 2 015 Connection for oil collection unit (2), manufacturer: Deutsche Tecalemit or

17 2 016 Connection for oil collection unit (2), manufacturer: Horn

17 2 017 Quick-release coupling (2 pieces)

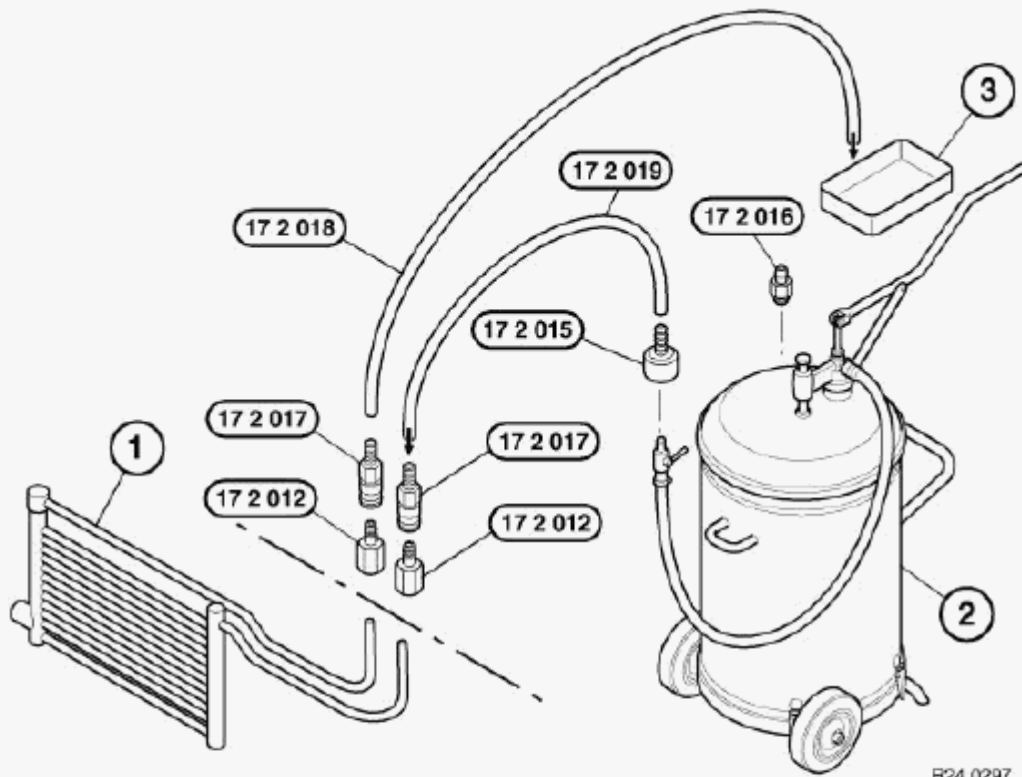
17 2 018 Hose to oil drip tray (3)

17 2 019 Hose to oil collection unit (2)

17 2 021 Mounting plate for adapter 17 2 011 for transmissions A5S 325Z, GA6HP26Z

Fig. 71: Arrangement Of Flushing Device For Transmissions
 Courtesy of BMW OF NORTH AMERICA, INC.

Arrangement of flushing device for transmission A4S 310R



R24 0297

- 1) Transmission -oil cooler with lines
- 2) Oil collection unit
- 3) Oil drip tray

17 2 012 Adapters (2 x) for connecting transmission-side oil cooler lines (1)

17 2 015 Connection for oil collection unit (2), manufacturer: Deutsche Tecaletit or

17 2 016 Connection for oil collection unit (2), manufacturer: Horn

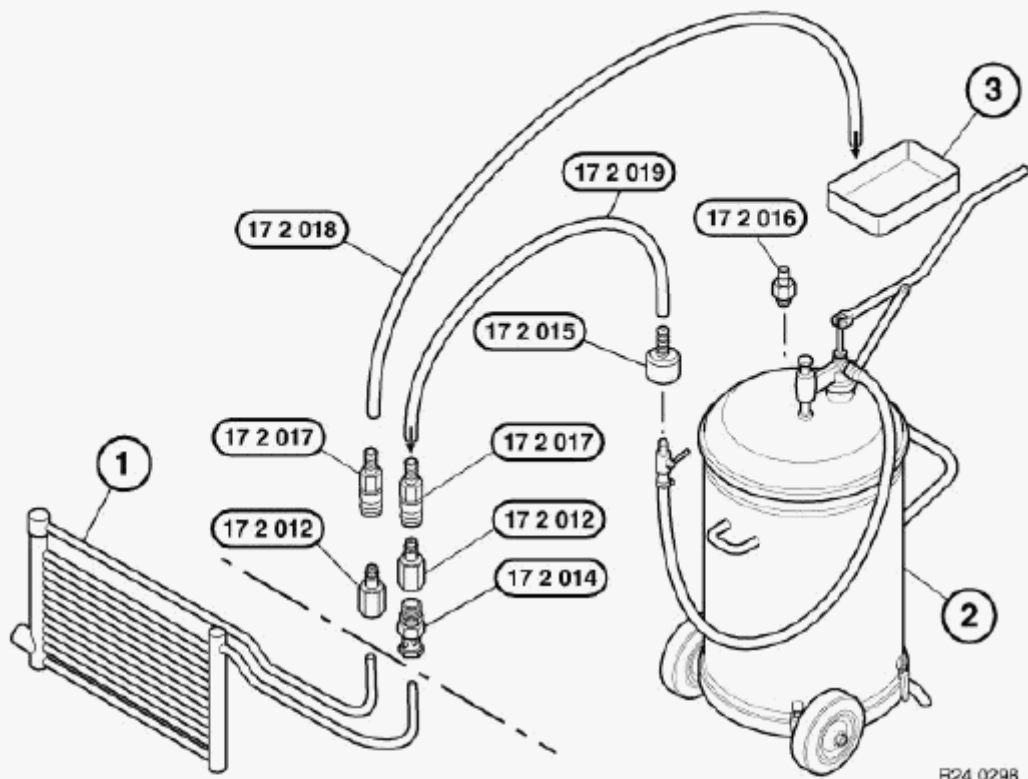
17 2 017 Quick -release coupling (2 pieces)

17 2 018 Hose to oil drip tray (3)

17 2 019 Hose to oil collection unit (2)

Fig. 72: Arrangement Of Flushing Device For Transmission (A4S 310R)
Courtesy of BMW OF NORTH AMERICA, INC.

Arrangement of flushing device for transmission A4S 300J



1) Transmission-oil cooler with lines

2) Oil collection unit

3) Oil drip tray

17 2 012 Adapters (2 x) for connecting transmission-side oil cooler lines (1)

17 2 014 Banjo bolt for connecting transmission-side oil cooler lines (1)

17 2 015 Connection for oil collection unit (2), manufacturer: Deutsche Tecalemit or

17 2 016 Connection for oil collection unit (2), manufacturer: Horn

17 2 017 Quick-release coupling (2 pieces)

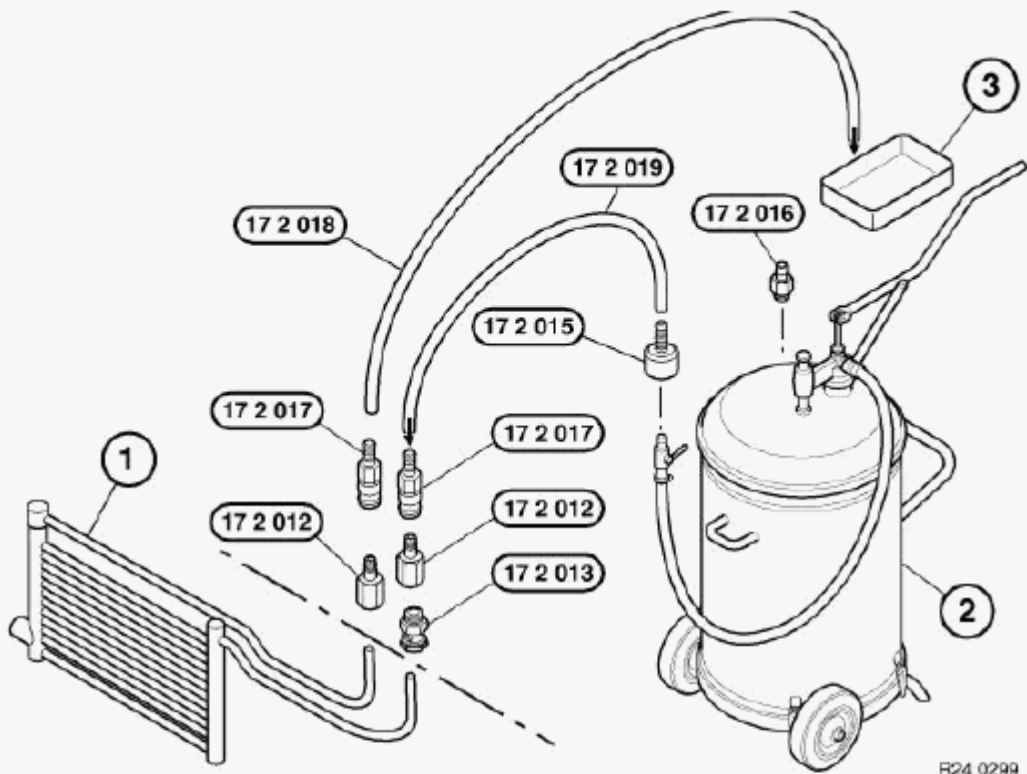
17 2 018 Hose to oil drip tray (3)

17 2 019 Hose to oil collection unit (2)

Fig. 73: Arrangement Of Flushing Device For Transmission (A4S 300J)

Courtesy of BMW OF NORTH AMERICA, INC.

Arrangement of flushing device for transmission A5S 440Z



R24 0299

- 1) Transmission-oil cooler with lines
- 2) Oil collection unit
- 3) Oil drip tray

17 2 012 Adapters (2 x) for connecting transmission-side oil cooler lines (1)

17 2 013 Banjo bolt for connecting transmission-side oil cooler lines (1)

17 2 015 Connection for oil collection unit (2), manufacturer: Deutsche Tecalemit

17 2 016 Connection for oil collection unit (2), manufacturer: Horn

17 2 017 Quick-release coupling (2 pieces)

17 2 018 Hose to oil drip tray (3)

17 2 019 Hose to oil collection unit (2)

Fig. 74: Arrangement Of Flushing Device For Transmission (A5S 440Z)
Courtesy of BMW OF NORTH AMERICA, INC.

ENGINE

Cooling System - Special Tools - X3

17 COOLING SYSTEM

17 0 000 TESTER

Note: For checking cooling system for leaks and function of pressure relief valve in radiator cap. Replaced by 17 0 100

Storage location: A43, C17

Order number: 17 0 000

Tester

Consisting of:

1 = 17 0 001 Adapter

Note: For checking pressure relief valve in radiator cap / model series: all, except E28

2 = 17 0 002 Tester without adapter

Note: Pressure range 0...2.5 bar / model series: all, except E28

3 = 17 0 003 Screw neck

Note: For screw-on radiator caps (normal thread) / model series: E28, E30, E31, E32 Engine: all, except M51

4 = 17 0 004 Adapter

Note: For screw-on radiator caps (normal thread) / model series: E28, E30, E32 / Engine: M51

5 = 17 0 005 Screw neck

Note: For screw-on radiator caps (buttress thread) / model series: E31, E32, E34, E36, E38, E39

7 = 17 0 007 Adapter

Note: For checking expansion tank cap / model series: E31, E32, E34, E36, E38, E39

8 = 17 0 008 Pressure hose

9 = 17 0 009 Adapter for radiator expansion tank

Note: Model series: E36 / Model: M3 US Engine W10

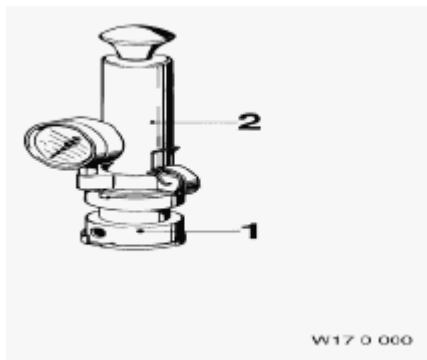


Fig. 1: Tester (17 0 000)

Courtesy of BMW OF NORTH AMERICA, INC.

17 0 030 PLIERS

Minimum set: Mechanical tools

Note: For releasing fasteners on transmission oil cooler

Series: E46, E53, E60, E61, E63, E64, E65, E66, E70, E81, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53, RR1

Storage location: B46

SI number: 1 14 01 (766)

Order number: 17 0 030

Pliers

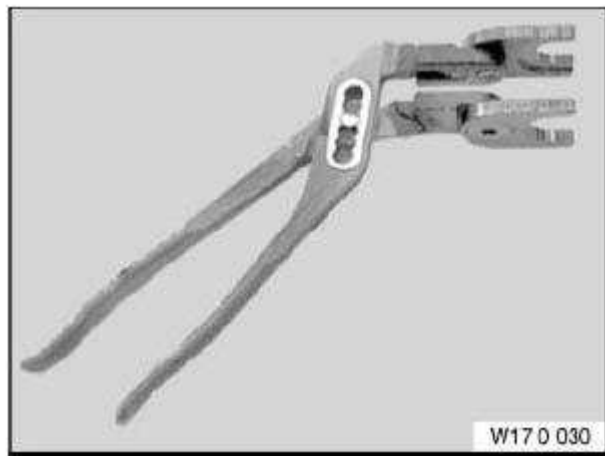


Fig. 2: Pliers (17 0 030)

Courtesy of BMW OF NORTH AMERICA, INC.

17 0 100 TESTER

Minimum set: Mechanical tools

Note: For checking engine cooling system for water leaks. For checking radiator cap.

Series: E12, E21, E23, E24, E28, E30, E30/C, E30tou, E31, E32, E32/3, E34, E34tou, E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E68, E70, E81, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53, R56, RR1, RR2

SI number: 01 07 02 (884)

Order number: 17 0 100

Tester

Consisting of:

1 = 17 0 101 Pump

2 = 17 0 102 Hose with quick-connect coupling

3 = 17 0 103 Adapter

Note: For radiator cap (normal thread)

4 = 17 0 104 Adapter

Note: For radiator cap (normal thread)

5 = 17 0 105 Adapter

Note: For radiator cap (sawtooth thread)

6 = 17 0 106 Adapter

Note: For radiator cap (sawtooth thread)

7 = 17 0 107 Adapter

Note: For radiator cap R50 / W10

8 = 17 0 108 Adapter

Note: For radiator cap R50 / W10

9 = 17 0 109 Adapter

Note: For radiator connection R53/W11, R50/W17 Adapter corresponds to 17 0 051

10 = 17 0 111 Adapter

Note: For radiator cap R53/W11, R50/W17 Adapter corresponds to 17 0 052

11= 17 0 112 Case

12 = 17 0 113 Adapter

Note: For radiator cap Model series: E60, E61, E63, E64 SI no.: 1 08 03 (988)

13 = 17 0 114 Adapter

Note: For radiator cap Model series: E60, E61, E63, E64 SI no.: 1 08 03 (988)

14 = 17 0 115 Adapter

Note: For radiator cap Model series: N12, N14

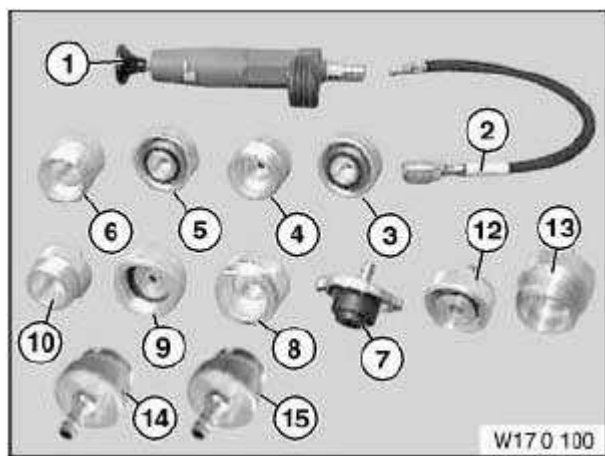


Fig. 3: Tester (17 0 100)

Courtesy of BMW OF NORTH AMERICA, INC.

17 0 130 SET OF ADAPTERS

In conjunction with: 17 0 101, 17 0 102

Note: For connecting adapters from 17 0 000 to pump 17 0 101 and hose 17 0 102.

SI number: 01 07 02 (884)

Order number: 17 0 130

Set of adapters

Consisting of:

1 = 17 0 131 Adapter

Note: For connecting pump 17 0 101 and hose 17 0 102 to adapter from 17 0 000

2 = 17 0 132 Hose with coupling connection

Note: For connecting pump 17 0 101 to adapter 17 0 007

3 = 17 0 133 Hose clamp

Note: For hose 17 0 132

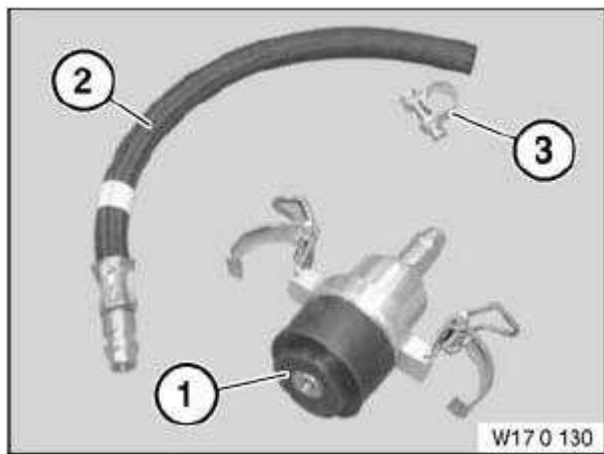


Fig. 4: Set Of Adapters (17 0 130)

Courtesy of BMW OF NORTH AMERICA, INC.

17 2 010 SET OF ADAPTERS

Note: For oil dispensers for flushing oil coolers of automatic transmissions

Transmission: A4S 310R, A5S 300J, A5S 310Z, A5S 325Z, A5S 360R, A5S 390G, A5S 440Z, A5S 560Z, GA6 HP19Z, GA6 HP26Z, GA6 HP32Z

SI number: 1 12 96(103)

Order number: 17 2 010

Set of adapters

Consisting of:

1 = 17 2 011 Adapter

Note: For connecting oil cooler lines to oil dispensing unit - transmission: A5S 310Z, A5S 560Z, A5S 325Z

In conjunction with: 17 2 015, 17 2 016, 17 2 017, 17 2 018, 17 2 019

1 = 17 2 021 Retaining plate

Note: For Adapter 17 2 011 transmission: A5S 325Z

2 = 17 2 012 Adapter (2 x)

Note: For connecting oil cooler lines to oil dispensing unit - transmission: A4S 310R

In conjunction with: 17 2 015, 17 2 016, 17 2 017, 17 2 01, 17 2 018, 17 2 019

3 = 17 2 013 Banjo bolt (2 x)

Note: M18x1.5 thread with nut and seal for connecting oil cooler lines to oil dispensing unit-transmission: A5S 440Z

In conjunction with: 17 2 012, 17 2 015, 17 2 016, 17 2 017, 17 2 018, 17 2 019

4 = 17 2 014 Banjo bolt (2 x)

Note: M16x1.5 thread with nut, seal and threaded piece for connecting oil cooler lines to oil dispensing unit-transmission: A5S 300J

In conjunction with: 17 2 012, 17 2 015, 17 2 016, 17 2 017, 17 2 018, 17 2 019

5 = 17 2 015 Connecting piece

Note: For Tecalemit oil dispensing unit

6 = 17 2 016 Connecting piece

Note: For Horn oil dispensing unit

7 = 17 2 017 Coupling (2 x)

8 = 17 2 018 Hose, long

9 = 17 2 019 Hose, short

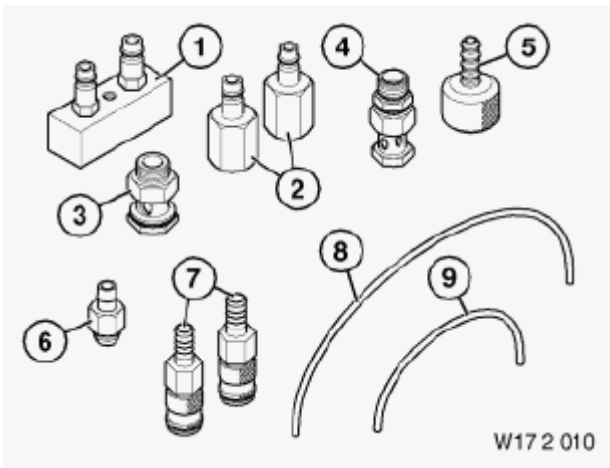


Fig. 5: Set Of Adapters (17 2 010)
Courtesy of BMW OF NORTH AMERICA, INC.

ENGINE

Cooling System - Technical Data - X3

COOLING SYSTEM

Cooling System - Technical Data

Coolant Volume		
with integrated air conditioner MT	Litres	10.0
with integrated air conditioner AT	Litres	10.2
Test pressure for cooling system (gauge pressure)	bar	1.5

17 11 RADIATOR AND MOUNTING PARTS E65 / E70 / N62 / N62TU / N52 / N52K

Radiator and Mounting Parts - Technical Data

Cap for cooling system		
Pressure relief valve opens at overpressure to ambient pressure	pressure bar	2
Vacuum valve must open at latest at partial vacuum to ambient pressure	pressure bar	.1
Test pressure, coolant radiator (gauge pressure)	pressure bar	2

ENGINE

Cooling System - Tightening Torques - X3

00 COOLANT, CHECKING COOLING SYSTEM

17 00 COOLANT

COOLANT - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Hose clamps to coolant hoses 32 ... 48 mm dia.	All			2.5 Nm
2AZ Bleed screw (WAF 8) to thermostat housing	All, without E46			8 Nm
Plastic bleed screws to coolant lines	E46			2 -0.5/+ 1 Nm
3AZ Level switch (WAF 30) to coolant expansion tank	All			3 Nm
4AZ Bleed screw to water valve or auxiliary water pump	E90 / E91			3.5 Nm

11 ENGINE RADIATOR WITH ATTACHMENT

17 11 RADIATOR AND MOUNTING PARTS

RADIATOR AND MOUNTING PARTS TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Radiator to body				
self-tapping screw	All	B6.3		9 Nm
	All	M6		10 Nm
2AZ Drain plug to radiator	All			2.5 Nm
3AZ Temperature switch to radiator (91 °C / 99 °C) max.	All			15 Nm
4AZ Expansion tank to body	All			9 Nm
	M57TU / E65			4 Nm
5AZ Radiator on module carrier	E46			4 + 1 Nm
6AZ Retaining plate, expansion tank, to radiator	E46			4 + 1 Nm
7AZ Fan cowl on radiator	E46			4 + 1 Nm

8AZ Plug in radiator (temperature switch omitted)	E36/7 / M54	M14 x 1.5		15 Nm
9AZ Mounting plate to radiator	M57TU / E65			4.5 Nm
10AZ Radiator bracket	All			2.5 Nm

21 OIL COOLER

17 21 ENGINE OIL COOLER

ENGINE OIL COOLER - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Engine oil cooler to body	All			14 Nm
Oil cooler vapor extraction guide to trim panel	E36 / M3	B4.8		4 Nm

17 21 ENGINE OIL COOLER

ENGINE OIL COOLER - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Transmission oil-water heat exchanger to front axle carrier	N52	M6x35		8 Nm
2AZ Engine oil cooler to holder	N52	M8x35		12 Nm
3AZ Engine oil cooler to holder	N52	Oval-head screw		3 Nm

22 OIL COOLER LINES

17 22 OIL COOLER PIPES

OIL COOLER PIPES - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
5AZ Cap nut on transmission oil cooler (on radiator) and on transmission	All	M18 x 1.5		20 Nm
	5HP30	M22 x 1.5		28 Nm
6AZ Oil lines on transmission				
Hollow bolt	All	M16 x 1.5		37 Nm
7AZ Oil lines on transmission oil cooler	A 5 S 300 J			28 Nm
Hollow bolt	All	M14 x 1.5		27 Nm
8AZ Screw-in fitting on transmission	All	M14 x 1.5 und M16 x 1.5		37 Nm

9AZ Oil hose on oil pipe	E23			28 Nm
10AZ Oil pipe bracket on radiator	E23			2 Nm
11AZ Oil pipe bracket on body	E23			6.5 Nm
12AZ Oil cooler on transmission	5HP30			10 Nm
13AZ Transmission oil cooler line to transmission	N42	M8		21 Nm

17 22 OIL COOLER PIPES

OIL COOLER PIPES - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Transmission oil cooler line to transmission	N52K	M8x28		20 Nm
2AZ Transmission oil cooler line to oil sump	N52K	M6		10 Nm
3AZ Transmission oil cooler line to transmission sump	N52K	M6x35		8 Nm
4AZ Transmission oil cooler line to transmission oil-water heat exchanger	N52K	M6x35		8 Nm
5AZ Engine oil cooler lines to oil module/engine oil cooler	N52K	M8		20 Nm

40 AUXILIARY ELECTRICAL FAN

17 40 ADDITIONAL FAN (ELECTRIC)

ADDITIONAL FAN (ELECTRIC) TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Electric auxiliary fan on fan cowl	E46			6 Nm
2AZ Electronics for auxiliary fan on fan cowl	E46			6 Nm

ENGINE

Engine - Operating Fluids

1.0 GENERAL INFORMATION

The specified engine oil is extremely important for the operation and service life of an engine.

Engine oil requirements will depend on the engine design, operating conditions, oil change intervals and, in the case of diesel engines, the fuel grade.

A modern engine oil provides more than just a lubrication function. The following qualities are required:

GOOD WEAR PROTECTION AND FRICTION REDUCTION

Frictional losses will lead to a reduction of engine power and efficiency. An approved engine oil will minimize frictional losses. Excessive wear will lead to a reduction in service life (e.g. wear of bearings, piston rings, cam lobes) or to mechanical failure.

LIMITED TENDENCY TO PRODUCE COMBUSTION RESIDUE

During engine operation, a limited amount of oil enters the combustion chamber, where it is burned. Combustion residues or deposits, which build up in the combustion chamber, lead to unwanted increases in compression and promote surface ignition ("pinging"). Any approved engine oil will help prevent such a condition.

FAVORABLE VISCOSITY TEMPERATURE BEHAVIOR

Viscosity is the tendency of oil to resist flowing. Engine oil, when cold, should be thin enough so that the engine can be cranked over. Hot oil should be thick enough to maintain proper lubrication.

ANTI-FOAMING

The oil is forcefully mixed with air during engine operation. Heavy foaming will lead to impaired lubrication and reduction in oil flow rate. To prevent foaming, antifoaming additives are mixed with the oil.

GOOD CORROSION INHIBITION

The engine oil must prevent corrosion on engine components under all circumstances. Corrosion and rust inhibitors are added to displace water and acids from metal surfaces so that oil coats them.

MIXING ABILITY/COMPATIBILITY

It must be possible to mix all engine oils with each other, even synthetic with mineral oils, without causing any incompatibility problems. A further requirement is the compatibility with all materials contacted by oil, in particular oil seals, hoses and paint.

GOOD THERMAL CONDUCTIVITY/GOOD COOLING PROPERTY

Engine oil makes an important contribution to the cooling of an engine. It must transfer heat from friction surfaces, and combustion heat away from affected areas. The oil absorbed heat is carried back to the oil pan where it is transferred to the surrounding air.

GOOD DISPERSANT/DETERGENT QUALITIES

To limit or slow down the formation of combustion deposits and acidic components, together with abrasive particles and dirt from the intake air, good engine oils contain a detergent additive. Deposits of carbon and dirt are loosened and suspended in the oil, being drained away at the next oil change.

OXIDATION INHIBITORS AND AGING STABILITY

Oxidation can be described as the oxygen absorption of hydrocarbons formed in the oil. The results of oxidation have a negative impact on viscosity causing corrosion on certain metals and the formation of sludge. Inhibitors are added to prevent oxidation from occurring. A good engine oil must maintain its stability during the required oil change intervals.

Good Lubricating Oil Must:

1. Lubricate moving parts to minimize wear.
2. Lubricate moving parts to minimize loss from friction.
3. Remove heat from engine parts by acting as a cooling agent.
4. Absorb shocks between bearings and other engine parts, reducing engine noise and extending engine life.
5. Form a good seal between piston rings and cylinder walls.
6. Act as a cleaning agent.

2.0 GRADING OF OILS

VISCOSITY NUMBER

A method of classifying an oil by number, based on its resistance to flow at a high temperature.

These numbers are usually prefixed by SAE which is the abbreviation for the Society of Automotive Engineers. A lower SAE Number (i.e. SAE 5W) indicates a thinner oil with a higher flow rate, for use at lower temperatures. A higher SAE Number (i.e. SAE 30) indicates a thicker oil with a slower flow rate, for use at higher temperatures.

MULTIGRADE OILS

A multigrade, or multiviscosity oil has the qualities of a lower number oil at low temperatures and those of a higher number oil at high temperatures. Multigrade oils have numbers such as SAE 5W-30 and SAE 10W-40. For reliable engine performance in all temperature ranges mineral based engine oil viscosity must be matched to the temperature range at which the vehicle will be operated.

SINGLE GRADE OILS

A single grade viscosity oil has a limited temperature/viscosity range compared with multigrade oils. Due to the limited temperature/viscosity range of these oils they are no longer used in BMW engines and thus no longer listed in the BMW Engine Oil Temperature/Viscosity Table.

OIL CLASSIFICATIONS

A method of classifying oil was jointly developed by the SAE, API (American Petroleum Institute), and ASTM (American Society for Testing and Materials). Engine oils are rated according to two engine use categories:

C = Compression Ignition (i.e. CC)

Compression Ignition (C) oils are those that are used for diesel engines. The current service ratings for diesel-engine lubricating oils are: CA, CB, CC, CD, CE, CF and CG. The oils differ in their properties and in the additives they contain.

S = Spark Ignition (i.e. SE)

Spark Ignition (S) oils are those that are used for gasoline engines. The current service ratings for gasoline-engine lubricating oils are: SA, SB, SC, SD, SE, SF, SG, SH and SJ. These oils differ in their properties and in the additives they contain.

Another method of classifying minimum performance standards for gasoline-fueled engine oils has been developed through ILSAC (International Lubrication Standardization Approval Committee). Oils that meet ILSAC GF-1 performance standards must have a "starburst" certification mark displayed on the print of the oil product packaging.

3.0 ENGINE OIL REQUIREMENTS AND SPECIFICATIONS

APPROVED ENGINE OILS

- For BMW gasoline engines with two valves per cylinder, all reputable multiple grade engine oils* which meet or exceed the API classification of SH. (Combination with diesel oil specifications CD or CE quality classifications are also permitted, e.g. SH/CE etc.)

For BMW gasoline engines with four valves per cylinder, only reputable multiple grade engine oils* which meet or exceed the API classification of SH. (Combination with diesel oil specifications CD or CE quality classifications are also permitted, e.g. SH/CE etc.)

- For BMW turbocharged diesel engines, all reputable multiple grade engine oils* which meet or exceed the API classification CD/CE.

*Engine oil may be mineral or synthetic based.

Special Oils category has been replaced by BMW **High Performance Synthetic** Engine Oil (5W-30). It eliminates the need for seasonal oil changes since it covers all ambient temperature ranges.

BMW of North America has introduced a line of exclusively formulated High Performance Engine Oils which exceed existing international quality specifications (SAE/CCMC) for motor oils. BMW part numbers are:

ENGINE OIL REQUIREMENTS AND SPECIFICATIONS

SAE 5W-30 (SJ/CF) BMW High Performance Synthetic Oil	1 quart	Part No. 07 51 0 017 866
SAE 15W-40 (SJ/CF) BMW High Performance Mineral Oil	1 quart	Part No. 07 51 0 017 868

Motorsport Engines

E46 M3 / S54E36 M roadster, M coupe / S54 from start of production

E39 M5 / S62 Up to 3/2000

E52 Z8 / S62 Up to 3/2000

E60 M5 / S85 From start of production

E63 M6 From start of production

E64 M6 From start of production

E85 Z4 M Coupe / Z4 M Roadster From start of production

BMW High Performance Synthetic Oil Castrol RS SAE 10W-60 also called Castrol TWS Motorsport SAE 10W-60 Synthetic Oil Part No. 07 51 0 009 420 (1quart)

E39 M5 / S62 From 3/2000

E52 Z8 / S62 From 3/2000

BMW High Performance Synthetic Oil SAE 5W-30 Part No. 07 51 0 017 866 Or BMW High Performance Synthetic Oil Castrol RS SAE 10W-60 also called Castrol TWS Motorsport SAE 10W-60 Synthetic Oil Part No. 07 51 0 009 420 (1quart)

BMW High Performance Synthetic Oil 5W-30 and 10W-60 offer several benefits over conventional mineral based oils.

SUPERIOR THERMAL STABILITY

The synthetic based oil resists thickening at very low ambient temperatures providing improved flow, lubrication and less internal engine resistance during cold starts.

Under high heat conditions, the oil resists thermal breakdown/shearing which causes a loss of lubrication quality compared with conventional oils.

SUPERIOR LUBRICATION THROUGHOUT THE LIFE OF THE OIL

Compared to conventional engine oils, BMW High Performance Synthetic Oil is better able to keep engine combustion contaminants in suspension and is less susceptible to the harmful effects of oxidation.

The oil resists sludge buildup thus allowing extended oil change intervals. Synthetic based oils also have a lower volatility which makes them less susceptible to evaporation thereby reducing oil consumption.

This oil has been durability tested on BMW engines and supplies superior lubrication under all operating conditions and over the extended BMW oil change intervals.

4.0 ENGINE OIL CHANGE INTERVALS

With the introduction of the 1999 Model Year vehicles BMW has introduced an extended oil change interval of approximately 15,000 miles (depending on engine operating conditions) on most models.

To coincide with the increased oil change interval, BMW has also introduced "BMW High Performance Synthetic Oil" which must be used on all 1999 Model Year vehicles (except E36 318ti, 323is/iC, 328is/iC, M3, M Roadster and M Coupe models) whenever a service is necessary to avoid engine damage.

NOTE: Only if it is necessary to top up the engine oil between oil changes is it permissible to use synthetic low viscosity engine oils which conform to the API classification SJ or higher.

A label in the engine compartment states the oil specifications and refers to the BMW website (www.bmwusa.com) and toll free number (1-800-831-1117) for additional information.



Fig. 1: Identifying Label In Engine Compartment States
Courtesy of BMW OF NORTH AMERICA, INC.

BMW High Performance Synthetic Engine Oil may also be used on Model Year 1999 E36 (3-Series and M models) as well as Model Year 1998 and earlier BMW models.

The oil change intervals should not be extended due to the greater durability of a fully synthetic engine oil. The engine oil and filter should always be changed as per the vehicle's Service Interval Indicator when the "Oil Service" or the "Inspection" display appears regardless of the type of oil being used.

BMW mineral-based High Performance engine oil is also offered for model year 1998 and earlier BMW

models. However, for reliable engine performance in all temperature ranges mineral-based engine oil viscosity must be matched to the temperature range at which the vehicle will be operated. See Engine Oil Temperature/Viscosity Table below.

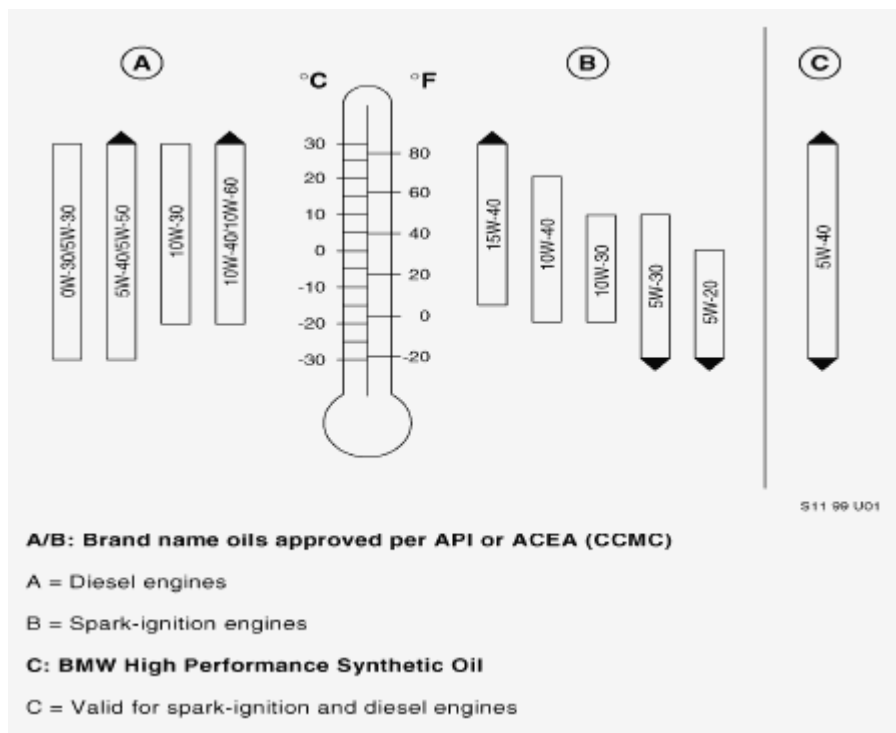


Fig. 2: Identifying BMW Engine Oil Temperature/Viscosity Table
 Courtesy of BMW OF NORTH AMERICA, INC.

Other Oil Changes For Cars Without Service Indicator:

MODEL YEAR/MILLAGE REFERENCE

Model Year(s)	Mileage
1980 and later	7,500
1975 thru 1979	6,500
1974 or earlier	4,000

Including oil filter. However, at least twice annually, preferably before and after the winter season.

Under severe driving conditions it is recommended to increase the number of oil services.

5.0 CONDITION BASED SERVICE

Models: E90, 91, 92, E60, E61, E63, E64 E65, E66

Condition Based Service measures, monitors, and determines the required maintenance of several service items independent from each other. This technology prompts the customer to bring the vehicle for service whenever one of the CBS items requires maintenance or replacement. CBS strikes a compromise between too frequent

maintenance and too rigid service intervals that call for the replacement of service items which may still have substantial remaining useful life. CBS also details the recommended, due, and overdue required maintenance during and after the BMW Vehicle Maintenance Program Agreement. Thus, CBS allows BMW customers to experience a technology that makes service more convenient, transparent and structured.

6.0 ENGINE OIL ADDITIVES

The use of engine oil additives is not recommended and not necessary on BMW engines. Instead, it is mandatory to use BMW High Performance Synthetic Oil in 1999 model year and later BMW models and recommended to use either BMW High Performance Synthetic Oil, BMW High Performance Mineral Oil or one of today's highly advanced brand name lubricating oils conforming to API classification SH or higher in 1998 and earlier BMW models.

7.0 BREAK-IN INSTRUCTIONS

During the break-in period of a new engine or parts of a reconditioned engine (new bearings, crankshaft, pistons, etc.) BMW engines do not require special break-in oils.

All of the multiple grade engine oils can be used, as long as they conform with BMW specifications.

8.0 N52, N52KP AND N54 FRONT AND REAR RADIAL SEAL SEALANT

When replacing the front or rear radial crankshaft seals on new generation 6 cylinder engines, a special Loctite® sealant must be applied to fill the seal grooves at the bedplate seam. Follow the appropriate repair instruction in TIS:

RA 11 14 005 - Front radial crankshaft seal replacement

RA 11 14 151 - Replacing crankshaft radial seal (rear)

All special tools required to perform these repairs have been sent out through the automatic tool shipment program and are listed in S.I. Bulletin 04 01 06.

Required Materials:

P/N 83 19 7 536 051 - Loctite® 128357 sealant compound\

P/N 83 19 7 515 683 - Loctite® 171000 primer

P/N 83 19 7 515 684 - Stamp

10.0 LUBRICANT FOR OXYGEN SENSOR

Apply Bostik NEVER-SEEZ® (Part No. NSBT-16) to threads of oxygen sensor.

11.0 OIL CONSUMPTION

All engines normally consume a certain amount of oil. This is necessary in order to properly lubricate the cylinder walls, pistons, piston rings etc. In addition, engines with less than 6,000 miles will generally consume additional oil because the components are not fully seated. Therefore, oil consumption complaints received prior to 6,000 miles cannot be considered.

Once a new or rebuilt engine has accumulated 6,000 miles this procedure should be used if there is a drastic change in the oil consumption rate (i.e. the oil consumption rate triples) under similar driving conditions or if the oil consumption rate exceeds 1 qt. per 750 miles at any time..

All Motorsport Engines:

Due to their increased output and maximum engine speeds, these engines are allowed a maximum consumption of 2.5 quarts per 1,000 miles.

13.0 OPERATING FLUIDS TABLE AND ALTERNATE SUPPLIERS

OPERATING FLUIDS TABLE AND ALTERNATE SUPPLIERS

BMW Part Number	Description / Application	3M	Wurth	Loctite	CRC
11 12 1 262 571 ⁽¹⁾	Silicone Sealant	8661		80050/PX66BR	
81 12 9 400 086 ⁽¹⁾	Hylogrip/Loctite 270 Thread Sealant		8932700	21438	
	Secures and seals bolts, studs, nuts, threaded inserts, screw plugs against impact and vibration. Fastens ball, roller and sliding bearings onto shafts or in housings, with play up to 0.25mm. Quick setting.				
	Oil filter flange bolt				
81 22 9 400 243 ⁽¹⁾	Sealer Low viscosity, non-hardening, removeable. For sealing off against mineral oils, grease, gases, air and many chemicals. Application: from-40°C to approx. 200°			Permatex 3D Aviation Form a Gasket 80017	

<p>81 22 9 400 339</p>	<p>C. Tacking cylinder gasket - Hylomar SQ32M Sealant Universal sealing compound, applicable by brush. For sealing interfaces between surfaces that require excellent temperature resistance and sealing elasticity. Material: Polyester- urethane mixture.</p>			
<p>81 22 9 407 394⁽¹⁾</p>	<p>Loctite 380 Epoxy Cement</p> <p>Black cyanacrylate adhesive for joining metals, rubber, PVC.</p>	<p>8155</p>	<p>8934103</p>	<p>38050</p>
<p>81 22 9 400 794⁽¹⁾</p>	<p>Copper Paste</p> <p>Multi-purpose grease for all detachable joints at high temperatures and corrosive conditions, also after long operating periods. Able to withstand high pressures, protection against undesired weld contact, seizure and corrosion, active adhesion properties, effective as lubricant and separator up to 1100°C.</p> <p>Applications: parts subject to high temperatures, such as bolts and flanges on exhaust system, engine, disk brakes, etc.</p>	<p>8945</p>		<p>3046010</p>

81 22 9 407 439 ⁽¹⁾	07 58 9 062 376 ⁽¹⁾	Silicone Sealer 8670 8661		81157/PX16B 80050/PX66BR	
		A black colored silicone-based sealant for large areas. Resists temperatures up to 250°C. For engine or gearbox; particularly suitable for sealing the timing case on M70 engine, and eliminating oil seepage from E36 M42 cylinder head.			
81 22 9 407 760 ⁽¹⁾	Engine Cleaner Spray Fast acting cleaner for dirty engines and engine parts. Does not attack painted, rubber, or plastic parts.	8899	890923	80043	14045
N/A	Lubro Moly Lecksucher Intake and vacuum system leak detector.				
N/A	J-B Weld Repairs pitting in cylinder head sealing surfaces.				
N/A	Bostik Never-Seez Thread lubricant for oxygen sensors.				

(1) *These items are no longer available through BMW NA Parts Department.

ENGINE

Engine - SI Techniques - X3, X5 (6-Cyl.)

11 ENGINE

VS-42 je

Bauruppe/Group: 11

welweit

Datum/Date: 02/2005

11 02 05 (130)

VACUUM SUPPLY

All models



T1105013

Fig. 1: Vacuum Supply System
Courtesy of BMW OF NORTH AMERICA, INC.

INTRODUCTION

Vacuum is principally used for the brake booster.

The vacuum in the inlet pipe depends on the varying engine load.

Diesel engines do not normally have any vacuum in the inlet pipe. Vacuum on diesel engines is provided by a pump that generates the required vacuum.

On spark-ignition engines with Valvetronic, the throttle valve is almost always open when driving. This means that there is a lower low air pressure in the intake manifold.

Spark-ignition engines with low vacuum in the inlet pipe also have a pump that generates additional vacuum.

BRIEF DESCRIPTION OF COMPONENTS

The following components are involved in the vacuum supply system:

- **Mechanical vacuum pump**

A mechanic vacuum pump is fitted to diesel engines and spark-ignition engines with Valvetronic.

The vacuum pump is mechanically driven by the engine, e.g. via the exhaust camshaft.

- **Suction-jet pump**

As a rule, the suction-jet pump boosts the vacuum in the inlet pipe.

- **Electric vacuum pump**

On some engines, an electric vacuum pump is fitted for additional vacuum supply.

In certain temporary operating situations, the vacuum in the inlet pipe may be too low. In such cases, the inlet pipe vacuum cannot be adequately boosted by the suction-jet pump. In these situations, the electric vacuum pump ensures that sufficient vacuum is available.

Reason: After a cold start, an operating situation occurs in which there is very little inlet pipe vacuum due to the higher load. The electric vacuum pump is actuated for a certain time. This ensures that the brake is sufficiently boosted when maneuvering.

After a cold start, the DME will actuate the electric vacuum pump **once only** for max. 60 seconds.

The electric vacuum pump is actuated in the following situations:

- Engine-running signal from DME
- Coolant temperature below 60 °C

The electric vacuum pump is a vane-cell pump.

- **Throttle valve**

The throttle valve changes the cross-sectional area of the inlet pipe. This creates an inlet pipe vacuum behind the throttle valve, especially in overrun mode.

- **DME or DDE: Digital engine electronics or digital diesel electronics**

The DME or DDE actuates the components needed for system functions (e.g. solenoid valves, electric switching valves, electropneumatic pressure converters).

SYSTEM FUNCTIONS

The system functions of the vacuum system are described using the following examples:

- Power assist for brakes
- Actuation of exhaust flaps
- Adjustment of variable turbine geometry
- Actuation of controlled damping mounts
- Exhaust gas recirculation
- Drawing off of blow-by gases from crankcase
- Blowing out activated charcoal filter

Power assist for brakes

The brake booster amplifies the force exerted at the brake pedal. To do this, the brake booster stores part of the vacuum generated by the engine. The vacuum then amplifies the force generated by pressure on the brake pedal.

Actuation of exhaust flap

A controlled electropneumatic exhaust flap is fitted in the exhaust system. The exhaust flap enhances active sound-damping. The exhaust flap is closed by vacuum.

Adjustment of variable turbine geometry

The variable turbine geometry controls the boost pressure via adjustable guide vanes. The guide vanes are actuated by vacuum.

Actuation of controlled damping mounts

In the basic setting, there is no vacuum at the control component of the mount. The bypass in the mount is closed. Hydraulic fluid flows back and forth through a ring channel between the upper and lower chambers in the mount. The mount acts like a conventional hydraulic bearing. The mount has hard damping. If a vacuum is applied to the mount's control component, the bypass will open. The hydraulic fluid then flows back and forth between the chambers through a larger cross-sectional area. The mount has softer damping.

Exhaust gas recirculation

With exhaust gas recirculation, part of the exhaust gas is taken from behind the exhaust manifold. This is then fed back into the engine through the intake air duct. The exhaust gas recirculation pipe is located at the inlet to the intake manifold.

If a vacuum is applied to the exhaust gas recirculation valve, the exhaust gas recirculation pipe will open. The level of vacuum is determined by the opening in the exhaust gas recirculation valve.

Exhaust gases flow through a connecting pipe to the exhaust manifold and into the intake manifold.

Drawing off of blow-by gases from crankcase

The crankcase ventilation system uses vacuum to bleed the blow-by gases out of the engine block. Blow-by gases are the small portion of the cylinder fill that passes by the piston rings and into the crankcase during compression. If the blow-by gases are not bled from the engine block through the crankcase ventilation system, they will accumulate in the crankcase. The blow-by gases would then apply pressure on the pistons from below. This would have a negative effect on the downward movement of the pistons in the intake stroke and operating stroke.

Blowing out activated charcoal filter

The fuel tank vent hose is connected to an activated charcoal filter. Vapors from the fuel tank are collected in the activated charcoal filter. The activated charcoal filter is connected to the intake manifold by a pipe. A fuel evaporation control valve is fitted in this pipe. When the fuel evaporation control valve is opened, the vacuum in the manifold draws in fresh air. At the same time, the fresh air blows out the fuel vapors collected in the activated charcoal filter.

ENGINE

Engine - Special Tools - X3

11 ENGINE

11 0 240 COUPLING

In conjunction with: 11 0 222, 11 0 226, 11 0 227, 11 0 225

Note: For adapting test probes to pressure gauge 11 0 162

Engine: All models

Order number: 11 0 240

Coupling

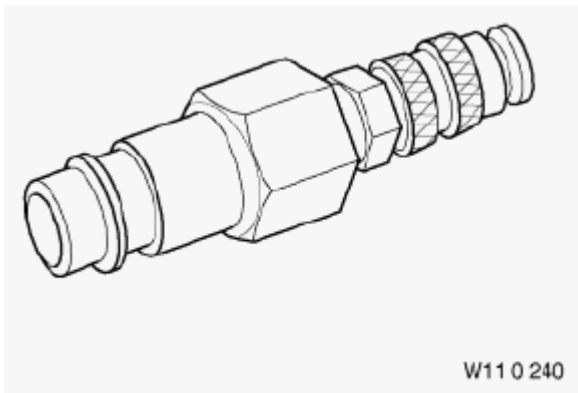


Fig. 1: Coupling (11 00 240)

Courtesy of BMW OF NORTH AMERICA, INC.

11 0 250 ENGINE SUPPORT

Minimum set: Mechanical tools

Note: For preventing inclination of engine (removing transmission, removing and installing engine mounts, etc.).

Series: E83

Storage location: C47, C48

SI number: 1 24 03 (040)

Order number: 11 0 250

Engine support

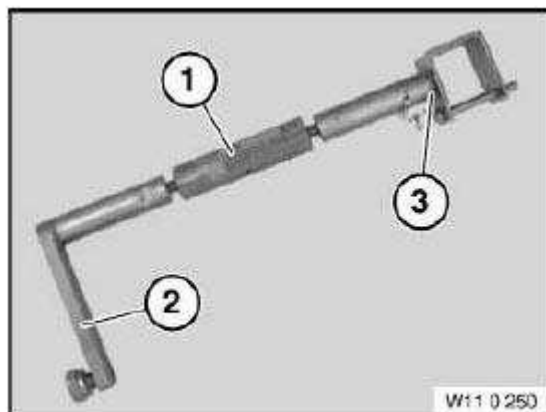


Fig. 2: Engine Support (11 0 250)

Courtesy of BMW OF NORTH AMERICA, INC.

11 4 190 1-4" EXTENSION PIECE

Minimum set: Mechanical tools

In conjunction with: 11 3 390, 00 2 050

Note: M73 For removing and installing pedal travel sensor M60 Pretensioning timing chain E53 Mounting airbag control unit

Series: All models

Storage location: B6

SI number: 1 06 94(801)

Order number: 11 4 190

1/4" extension piece

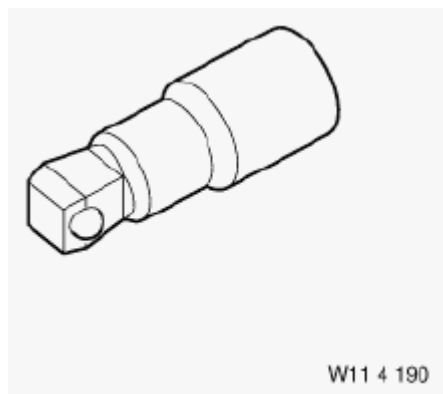


Fig. 3: Extension Piece (11 4 190 1-4")
Courtesy of BMW OF NORTH AMERICA, INC.

11 5 461 INSTALLATION HOLDER

Order number: 11 5 461

Installation holder

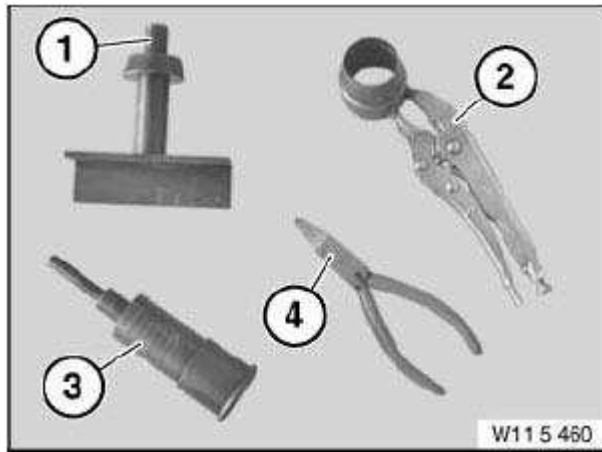


Fig. 4: Installation Holder (11 5 461)
Courtesy of BMW OF NORTH AMERICA, INC.

11 5 462 INSTALLATION PLIERS

Order number: 11 5 462

Installation pliers

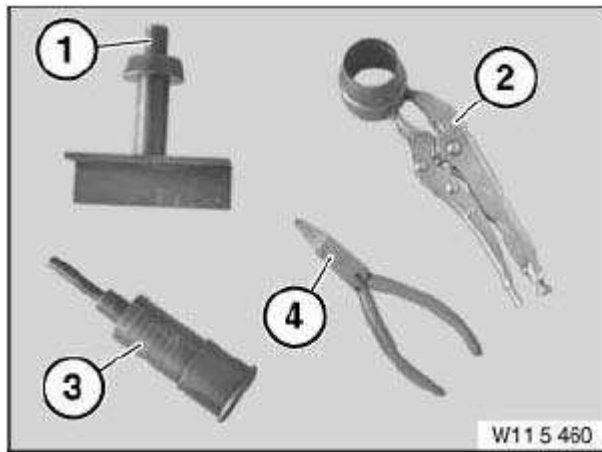


Fig. 5: Installation Holder (11 5 461)
Courtesy of BMW OF NORTH AMERICA, INC.

11 5 463 INSTALLATION DRIFT

Order number: 11 5 463

Installation drift

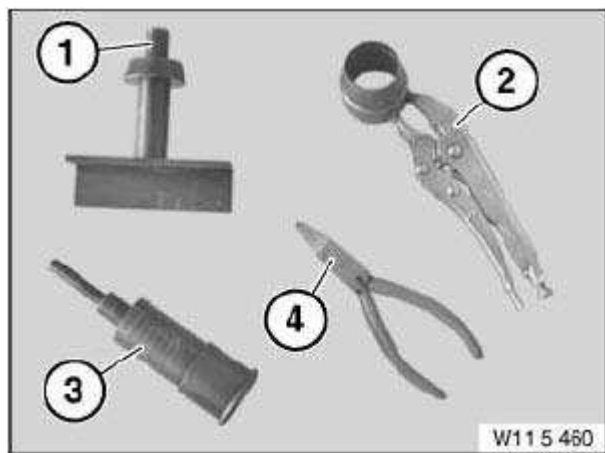


Fig. 6: Installation Holder (11 5 461)

Courtesy of BMW OF NORTH AMERICA, INC.

11 5 464 REMOVAL PLIERS

Order number: 11 5 464

Removal pliers

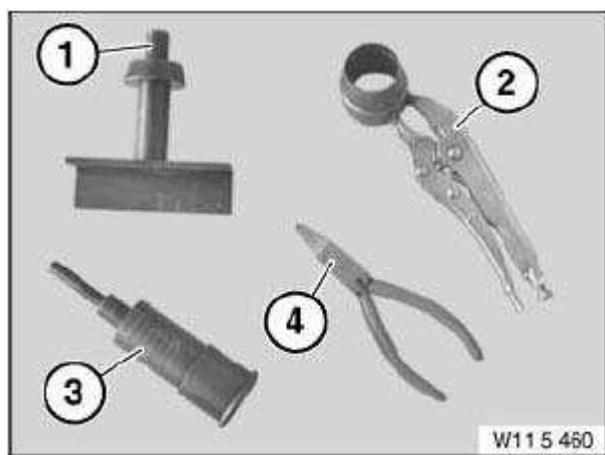


Fig. 7: Installation Holder (11 5 461)

Courtesy of BMW OF NORTH AMERICA, INC.

11 9 811 HOLDER

Order number: 11 9 811

Holder

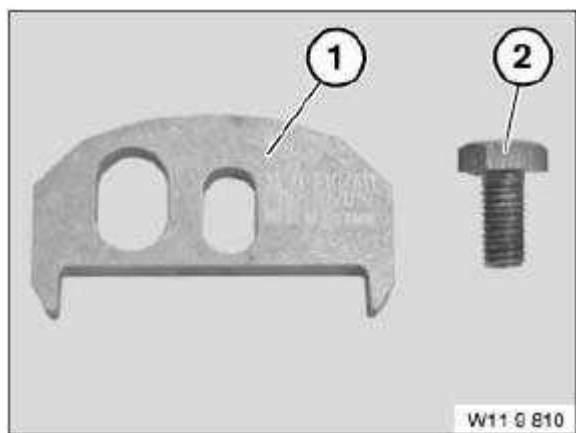


Fig. 8: Holder (11 9 811)

Courtesy of BMW OF NORTH AMERICA, INC.

11 9 812 SCREW

Order number: 11 9 812

Screw

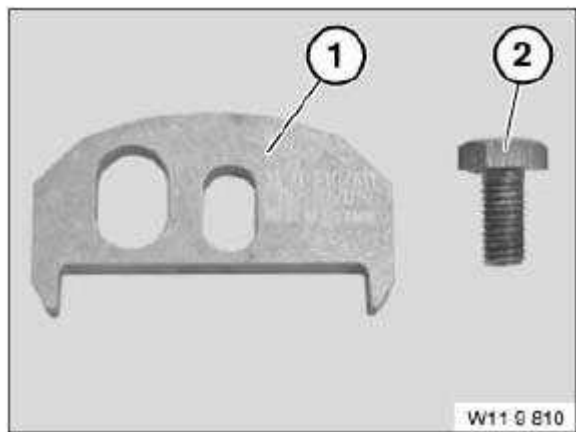


Fig. 9: Holder (11 9 811)

Courtesy of BMW OF NORTH AMERICA, INC.

ENGINE

Engine - Technical Data - X3

00 ENGINE, GENERAL

11 00 ENGINE IN GENERAL N52K B25

TECHNICAL DATA - ENGINE GENERAL N52K B25

Cylinder		6
Bore O	mm	82
Stroke	mm	79
Effective displacement	cm ³	2497
Compression ratio	:1	11
Max. permissible engine speed	rpm	6500±50
Permissible constant speed	rpm	6300
Compression pressure: Minimum and maximum values depending on position of Valvetronic.		9 ... 18
Compression pressure: Maximum deviation of all cylinders to each other.	bar	2

11 00 ENGINE IN GENERAL N52K B30

TECHNICAL DATA - ENGINE GENERAL N52K B30

Cylinder		6
Bore O	mm	85
Stroke	mm	88
Effective displacement	cm ³	2996
Compression ratio	:1	10.7
Max. permissible engine speed	rpm	6550±50
Permissible constant speed	rpm	6300
Compression pressure: Minimum and maximum values depending on position of Valvetronic.		9 ... 18
Compression pressure: Maximum deviation of all cylinders to each other.	bar	2

11 00 ENGINE IN GENERAL N52K B30

TECHNICAL DATA - ENGINE GENERAL N52K B30

Cylinder		6
Bore O	mm	85
Stroke	mm	88
Effective displacement	cm ³	2996

Compression ratio	:1	10.7
Max. permissible engine speed	rpm	6550±50
Permissible constant speed	rpm	6300
Compression pressure: Minimum and maximum values depending on position of Valvetronic.		9...18
Compression pressure: Maximum deviation of all cylinders to each other.	bar	2

11 ENGINE BLOCK

11 11 ENGINE BLOCK, CYLINDER CRANKCASE N52K B25

TECHNICAL DATA - ENGINE BLOCK, CYLINDER CRANKCASE N52K B25

Bore Z stage 0 ⁽¹⁾	mm	82.000 ^{+0.014}
Bore Z stage 00 ⁽¹⁾	mm	
Bore Z stage 1 ⁽¹⁾	mm	82.250 ^{+0.014}
Permitted out-of-round of cylinder bore ⁽¹⁾	mm	0.005
Permitted conicity of cylinder bore ⁽¹⁾	mm	0.010
Permissible total wear tolerance between piston and cylinder (engine operated)	mm	0.150
⁽¹⁾ new status or recondition		

11 11 ENGINE BLOCK, CYLINDER CRANKCASE N52K B30

TECHNICAL DATA - ENGINE BLOCK, CYLINDER CRANKCASE N52K B30

Bore Z stage 0 ⁽¹⁾	mm	85.000 ^{+0.014}
Bore Z stage 00 ⁽¹⁾	mm	
Bore Z stage 1 ⁽¹⁾	mm	85.250 ^{+0.014}
Permitted out-of-round of cylinder bore ⁽¹⁾	mm	0.005
Permitted conicity of cylinder bore ⁽¹⁾	mm	0.010
Permissible total wear tolerance between piston and cylinder (engine operated)	mm	0.150
⁽¹⁾ new status or recondition		

12 CYLINDER HEAD WITH COVER

11 12 CYLINDER HEAD WITH COVER N52K B25

TECHNICAL DATA - CYLINDER HEAD WITH COVER N52K B25

Cylinder head height: Original dimension	mm	112.000 ± 0.050
Machining limit	mm	111.700 ± 0.050
Valve guides are not available as replacement parts.		

Inside diameter of installed valve guide		
Original inlet valve	mm	5.000 ^{+0.012}
Original exhaust valve	mm	6.000 ^{+0.012}
Tilt clearance, maximum (wear between valve and valve guide)	mm	0.500

11 12 CYLINDER HEAD WITH COVER N52K B30

TECHNICAL DATA - CYLINDER HEAD WITH COVER N52K B30

Cylinder head height: Original dimension	mm	112.000 ± 0.050
Machining limit	mm	111.700 ± 0.050
Valve guides are not available as replacement parts.		
Inside diameter of installed valve guide		
Original inlet valve	mm	5.000 ^{+0.012}
Original exhaust valve	mm	6.000 ^{+0.012}
Tilt clearance, maximum (wear between valve and valve guide)	mm	0.500

11 12 CYLINDER HEAD WITH VALVE SEAT COVER N52K B25

TECHNICAL DATA - CYLINDER HEAD WITH VALVE SEAT COVER N52K B25

Valve seat angle	°	45
Correction angle: outer	°	15
Correction angle: inner	°	60
Valve seat width: Inlet	mm	1.0 ^{+0.1}
Valve seat width: Exhaust	mm	1.2 ^{+0.1}
Z Valve seat		
Valve seat surface: Outside dia. inlet	mm	27.7 ^{+0.1}
Valve seat surface: Outside dia. exhaust	mm	26.6 ^{+0.1}

11 12 CYLINDER HEAD WITH VALVE SEAT COVER N52K B30

TECHNICAL DATA - CYLINDER HEAD WITH VALVE SEAT COVER N52K B30

Valve seat angle	°	45
Correction angle: outer	°	15
Correction angle: inner	°	60
Valve seat width: Inlet	mm	1.0 ^{+0.1}
Valve seat width: Exhaust	mm	1.2 ^{+0.1}
Z Valve seat		
Valve seat surface: Outside dia. inlet	mm	27.7 ^{+0.1}

Valve seat surface: Outside dia. exhaust	mm	26.6 ^{+0.1}
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21 CRANKSHAFT WITH BEARING

11 21 CRANKSHAFT AND BEARINGS N52K B25

TECHNICAL DATA - CRANKSHAFT AND BEARINGS N52K B25

Ground sizes of main bearing journals		main bearing journal
Original (designation S1)	mm	55.998 ... 55.993
Original (designation S2)	mm	55.992 ... 55.987
Original (designation S3)	mm	55.986 ... 55.981
Crankshaft bearing clearance, radial	mm	0.020 ... 0.046
Max. permitted runout at center crankshaft journal	mm	0.150

11 21 CRANKSHAFT AND BEARINGS N52K B25

TECHNICAL DATA - CRANKSHAFT AND BEARINGS N52K B25

Grinding stages, crankshaft guide bearing		
Standard	mm	24.0 F8
Crankshaft axial play	mm	0.060 ... 0.250

11 21 CRANKSHAFT AND BEARINGS N52K B25

TECHNICAL DATA - CRANKSHAFT AND BEARINGS N52K B25

Ground sizes of conrod bearing journals		
Standard	mm	50.000 ^{-0.007} _{-0.027}
Radial conrod bearing play	mm	0.025 ... 0.070

11 21 CRANKSHAFT AND BEARINGS N52K B25

TECHNICAL DATA - CRANKSHAFT AND BEARINGS N52K B25

Ground sizes of main bearing journals		main bearing journal
Original (designation S1)	mm	55.998...55.993
Original (designation S2)	mm	55.992...55.987
Original (designation S3)	mm	55.986...55.981
Grinding stage 1 (designation B1)	mm	55.748...55.742
Grinding stage 1 (designation B2)	mm	55.742...55.737
Grinding stage 1 (designation B3)	mm	55.737...55.731
Grinding stage 2 (designation C1)	mm	55.498...55.492
Grinding stage 2 (designation C2)	mm	55.492...55.487
Grinding stage 2 (designation C3)	mm	55.487...55.481
Crankshaft bearing clearance, radial	mm	0.020...0.046

Max. permitted runout at center crankshaft journal	mm	0.150
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11 21 CRANKSHAFT AND BEARINGS N52K B30

TECHNICAL DATA - CRANKSHAFT AND BEARINGS N52K B30

Ground sizes of main bearing journals		Guide bearing journal
Original (designation S1)	mm	64.998 ... 64.993
Original (designation S2)	mm	64.992 ... 64.987
Original (designation S3)	mm	64.986 ... 64.981
Crankshaft bearing clearance, radial	mm	0.020 ... 0.046
Max. permitted runout at center crankshaft journal	mm	0.150

11 21 CRANKSHAFT AND BEARINGS N52K B30

TECHNICAL DATA - CRANKSHAFT AND BEARINGS N52K B30

Grinding stages, crankshaft guide bearing		
Standard	mm	24.0 F8
Crankshaft axial play	mm	0.060 ... 0.250

11 21 CRANKSHAFT AND BEARINGS N52K B30

TECHNICAL DATA - CRANKSHAFT AND BEARINGS N52K B30

Ground sizes of conrod bearing journals		
Standard	mm	50.000 ^{-0.007} _{-0.027}
Radial conrod bearing play	mm	0.025 ... 0.070

11 21 CRANKSHAFT AND BEARINGS N52K B30

TECHNICAL DATA - CRANKSHAFT AND BEARINGS N52K B30

Ground sizes of main bearing journals		Guide bearing journal
Original (designation S1)	mm	64.998...64.993
Original (designation S2)	mm	64.992...64.987
Original (designation S3)	mm	64.986...64.981
Grinding stage 1 (designation B1)	mm	64.748...64.742
Grinding stage 1 (designation B2)	mm	64.742...64.737
Grinding stage 1 (designation B3)	mm	64.737...64.731
Grinding stage 2 (designation C1)	mm	64.498...64.492
Grinding stage 2 (designation C2)	mm	64.492...64.487
Grinding stage 2 (designation C3)	mm	64.487...64.481
Crankshaft bearing clearance, radial	mm	0.020...0.046
Max. permitted runout at center crankshaft journal	mm	0.150

23 VIBRATION DAMPER

11 23 VIBRATION DAMPER N52K B25

TECHNICAL DATA - VIBRATION DAMPER N52K B25

Max. permitted radial runout	mm	0.100
Max. permitted axial runout	mm	0.100

11 23 VIBRATION DAMPER N52K B30

TECHNICAL DATA - VIBRATION DAMPER N52K B30

Max. permitted radial runout	mm	0.100
Max. permitted axial runout	mm	0.100

24 CONNECTING ROD WITH BEARING

11 24 CONNECTING RODS AND BEARINGS N52K B25

TECHNICAL DATA - CONNECTING RODS AND BEARINGS N52K B25

Z Large connecting rod eye (without bearing)	mm	53.600 ^{+0.016}
Conrod bushing: Inside diameter	mm	20.000 ^{+0.013} +0.004
Permissible total deviation of connecting rods in one engine (without bearing shells)	g	± 5

11 24 CONNECTING RODS AND BEARINGS N52K B30

TECHNICAL DATA - CONNECTING RODS AND BEARINGS N52K B30

Z Large connecting rod eye (without bearing)	mm	53.600 ^{+0.016}
Conrod bushing: Inside diameter	mm	20.000 ^{+0.013} +0.004
Permissible total deviation of connecting rods in one engine (without bearing shells)	g	± 5

25 PISTON WITH RINGS AND PIN

11 25 PISTONS WITH RINGS AND PINS N52K B25

TECHNICAL DATA - PISTONS WITH RINGS AND PINS N52K B25

Piston and pin are paired to each other - replace together only.		
Measuring point "A" (position)	mm	10
Piston diameter at measuring point "A"		

Original (new dimension)	mm	81.985 ^{±0.014}
Repair stage (new dimension)	mm	%
Oversize (new dimension)	mm	82.235 ^{±0.014}
Piston installation clearance (piston new)	mm	0.000...0.043
Piston installation clearance (piston worn)	mm	0.020...0.047
Permissible total wear tolerance between piston and cylinder (engine operated)	mm	0.150

11 25 PISTONS WITH RINGS AND PINS N52K B25

TECHNICAL DATA - PISTONS WITH RINGS AND PINS N52K B25

1st groove		
End clearance	mm	0.180 ... 0.330
Axial play	mm	0.020 ... 0.060
2nd groove		
End clearance	mm	0.300 ... 0.500
Axial play	mm	0.020 ... 0.060
3rd groove		
End clearance	mm	cannot be measured
Axial play	mm	cannot be measured

11 25 PISTONS WITH RINGS AND PINS N52K B30

TECHNICAL DATA - PISTONS WITH RINGS AND PINS N52K B30

Piston and pin are paired to each other - replace together only.		
Measuring point "A" (position)	mm	14
Piston diameter at measuring point "A"		
Original (new dimension)	mm	84.990 ^{±0.010}
Repair stage (new dimension)	mm	%
Oversize (new dimension)	mm	85.240 ^{±0.010}
Piston installation clearance (piston new)	mm	0.000...0.034
Piston installation clearance (piston worn)	mm	0.020...0.047
Permissible total wear tolerance between piston and cylinder (engine operated)	mm	0.150

11 25 PISTONS WITH RINGS AND PINS N52K B30

TECHNICAL DATA - PISTONS WITH RINGS AND PINS N52K B30

1st groove		
End clearance	mm	0.150 ... 0.300
Axial play	mm	0.020 ... 0.070
2nd groove		
End clearance	mm	0.300 ... 0.500

Axial play	mm	0.020 ... 0.060
3rd groove		
End clearance	mm	cannot be measured
Axial play	mm	cannot be measured

31 CAMSHAFT

11 31 CAMSHAFT N52K B25

TECHNICAL DATA - CAMSHAFT N52K B25

Guide bearing (width)	mm	20.000+0.052
Radial play	mm	0.054...0.099
Axial play	mm	0.020...0.162

11 31 CAMSHAFT N52K B30

TECHNICAL DATA - CAMSHAFT N52K B30

Guide bearing (width)	mm	20.000 ^{+0.052}
Radial play	mm	0.054...0.099
Axial play	mm	0.020...0.162

34 VALVES WITH SPRINGS

11 34 VALVES WITH SPRINGS N52K B25

TECHNICAL DATA - VALVES WITH SPRINGS N52K B25

Plate dia.		
Inlet	mm	32.2 ^{±0.05}
Exhaust	mm	27.0 ^{±0.1}
Stem Z		
Inlet	mm	5.0 ^{-0.1} -0.06
Exhaust	mm	6.0 ^{-0.1} -0.06

11 34 VALVES WITH SPRINGS N52K B30

TECHNICAL DATA - VALVES WITH SPRINGS N52K B30

Plate dia.		
Inlet	mm	34.2 ^{±0.05}
Exhaust	mm	29.0 ^{±0.1}
Stem Z		

Inlet	mm	5.0 ^{-0.1} -0.06
Exhaust	mm	6.0 ^{-0.1} -0.06

40 OIL SUPPLY

11 40 OIL SUPPLY N52K B25

TECHNICAL DATA - OIL SUPPLY N52K B25

Oil change volume with oil filter	ltr.	6.5
Oil change volume with oil filter for auxiliary engine oil cooler	ltr.	7.0

11 40 OIL SUPPLY N52K B30

TECHNICAL DATA - OIL SUPPLY N52K B30

Oil change volume with oil filter	ltr.	6.5
Oil change volume with oil filter for auxiliary engine oil cooler	ltr.	7.0

41 OIL PUMP WITH FILTER AND DRIVE

11 41 OIL PUMP WITH STRAINER AND DRIVE N52K B25

TECHNICAL DATA - OIL PUMP WITH STRAINER AND DRIVE N52K B25

Oil pressure at idle (engine at normal operating temperature)	min	bar 1.5
Control pressure (engine at normal operating temperature)	bar	4.0 ... 6.0

11 41 OIL PUMP WITH STRAINER AND DRIVE N52K B30

TECHNICAL DATA - OIL PUMP WITH STRAINER AND DRIVE N52K B30

Oil pressure at idle (engine at normal operating temperature)	min bar	1.5
Control pressure (engine at normal operating temperature)	bar	4.0 ... 6.0

ENGINE

Engine - Tightening Torques - X3, X5 (6-Cyl.)

11 ENGINE BLOCK

11 11 CRANKCASE

CRANKCASE - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Hexagon screws (14 x) Bedplate to crankcase.	N52K	M10 x 100	Replace screws. Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	20 Nm
			Torque angle	70 °
2AZ ASA screws (25 x) Bedplate to crankcase. The end faces of the aluminium screw heads are painted blue.	N52K	M10 x 27	Replace screws. Thread repairs exclusively with aluminium Helicoil threaded insert. Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	15 Nm
			Torque angle	90 °
3AZ ASA screws (4x) Bedplate to crankcase. The end faces of the aluminium screw heads are painted blue.	N52K	M8 x 37	Replace screws. Thread repairs exclusively with aluminium Helicoil threaded insert. Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	8 Nm
			Torque angle	90 °
4AZ ASA screws (2x) Bedplate to crankcase. The end faces of the aluminium screw heads are painted blue.	N52K	M10 x 41	Replace screws. Thread repairs exclusively with aluminium Helicoil threaded insert. Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	15 Nm
			Torque angle	90 °
5AZ Oil spray nozzles (6 x) Oil spray nozzles in crankcase.	N52K	M8 x 1		12 Nm
6AZ Plug (1 x) Coolant drain to crankcase. The end faces of the aluminium screw heads are painted blue.	N52K	M14 x 1.5	Replace screw and sealing ring. Thread repairs are not permitted!	50 Nm
7AZ Plug				

(1 x) Assembly opening to crankcase. The end faces of the aluminium screw heads are painted blue.	N52K	M22 x 1.5	Replace screw. Thread repairs are not permitted!	50 Nm
8AZ Plug (1 x) Assembly opening to bedplate. The end faces of the aluminium screw heads are painted blue.	N52K	M16 x 1.5	Replace screw. Thread repairs are not permitted!	27 Nm

12 CYLINDER HEAD WITH COVER

11 12 CYLINDER HEAD WITH CYLINDER HEAD COVER

CYLINDER HEAD WITH CYLINDER HEAD COVER - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ ISA screws (cylinder head bolts) (10 x) Cylinder head to crankcase.	N52K	M10 x 125	Replace screws. Tighten screws from inside outwards. Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	30 Nm
			1st angle of rotation	90 °
			2. Angle of rotation	90 °
			3. Angle of rotation	45 °
2AZ ISA screws (cylinder head bolts) (1 x M9 x 95) (3 x M9 x 125) Cylinder head to crankcase.	N52K	M9	Replace screws. Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	30 Nm
			1st angle of rotation	90 °
			2. Angle of rotation	omitted
			3. Angle of rotation	45 °
3AZ Al screw (1 x) Cylinder head to crankcase. The end faces of the aluminium screw heads are painted blue.	N52K	M9 x 30	Replace screw. Thread repairs exclusively with aluminium Helicoil threaded insert. Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	10 Nm
			Torque angle	90 °
4AZ ASA screws (3 x) Cylinder head to crankcase. The end faces of the aluminium screw heads are painted blue.	N52K	M9 x 70	Replace screws. Thread repairs exclusively with aluminium Helicoil threaded insert. Jointing torque and angle of rotation must be observed without fail.	

			Jointing torque	10 Nm
			Torque angle	135 °
5AZ ASA screws (15 x M7 x 33.5 round) (1 x M7 x 33.5 oval) (1 x M7 x 35) (2 x M7 x 36) Hexagon screw (1 x M7 x 46) Studs (2 x M7 x 75) Cylinder head cover to cylinder head.	N52K	M7		9 Nm
6AZ Fillister head screws (4 x) Ignition coil cover to cylinder head cover.	N52K	M6 x 20		4 Nm
7AZ ISA screws (12 x) Bearing cap of eccentric shaft to cylinder head.	N52K	M6 x 30.5		9 Nm
8AZ Seal plugs (3 x) Seal, oil channel, in cylinder head.	N52K	M16 x 1.5	Thread must be oiled.	40 Nm
9AZ Towing eye (1 x) Towing eye to cylinder head.	N52K	M16	Use towing eye exclusively with M16 thread. Use towing eye for engine transportation only.	30 Nm

11 12 CYLINDER HEAD WITH COVER

CYLINDER HEAD WITH COVER - TIGHTENING TORQUES

	Type	thread	tightening specification	Measure
11AZ Cylinder head cover	All	M6		10 Nm
	All	M7		15 Nm
	M21	M8		15 Nm
12AZ Oil trap to cylinder head cover	M21	M8		17 Nm
13AZ Timing case to cylinder head	All	M7		15 Nm
	All	M8		20 Nm
14AZ Plug for oil channel (microencapsulated)	M47/M57	M12 x 1.5		20 Nm
15AZ Vent plugs to cylinder head (coolant)	M67			2 Nm

13 OIL SUMP

11 13 OIL PAN

OIL PAN - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
Optional extra designation: SA205 = Automatic transmission				
1AZ Plug (1 x) Oil drain to oil sump.	N52K	M12 x 1.5	Replace sealing ring.	25 Nm
2AZ ASA screws (20 x) Oil sump (aluminium) to bedplate. The end faces of the aluminium screw heads are painted blue.	N52K	M8 x 26	Replace screws. Thread repairs exclusively with aluminium Helicoil threaded insert. Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	8 Nm
			Torque angle	90 °
3AZ ASA screws (5 x M8 x 112) (3 x M8 x 92) Oil sump (aluminium) to bedplate. The end faces of the aluminium screw heads are painted blue.	N52K	M8	Replace screws. Thread repairs exclusively with aluminium Helicoil threaded insert. Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	8 Nm
			Torque angle	180 °
4AZ ASA screws (7 x) Oil deflector to bedplate. The end faces of the aluminium screw heads are painted blue.	N52K	M6 x 20	Replace screws. Thread repairs exclusively with aluminium Helicoil threaded insert. Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	4 Nm
			Torque angle	90 °
5AZ ASA screws (3 x) Transmission to oil sump.	N52K	M8 x 50		19 Nm
6AZ Hexagon nuts (2 x) Holder, transmission oil cooler line, to oil sump for vehicles with optional extra SA205.	N52K	BM6		8 Nm
7AZ Hexagon nut (1 x) Holder, coolant hose, to oil sump.	N52K	M6		9 Nm
8AZ Hexagon screw (1 x) Holder, coolant hose, to oil sump.	N52K	M10 x 18		21 Nm

11 14 TRANSMISSION CLOSING PLATE

TRANSMISSION CLOSING PLATE - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ ASA screws (4 x) Transmission cover plate to crankcase. The end faces of the aluminium screw heads are painted blue.	N52K	M6 x 16	Replace screws. Thread repairs exclusively with aluminium Helicoil threaded insert. Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	4 Nm
			Torque angle	45 °

21 CRANKSHAFT WITH BEARING

11 21 CRANKSHAFT AND BEARINGS

CRANKSHAFT AND BEARINGS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Increment wheel on crankshaft	S54	M5 10.9	Replace screws	
			Jointing torque	5.0 Nm
			Torque angle	45 °
Increment wheel on crankshaft		M5 10.9	Replace screws	13 Nm
Increment wheel on crankshaft		M5 8.8	Replace screws	5.5 Nm

11 21 CRANKSHAFT AND BEARINGS

CRANKSHAFT AND BEARINGS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Hexagon screw (central screw) (1 x) Hub of vibration damper to crankshaft.	N52K	M16 x 80	Replace screw. Screw and thread are lightly oiled. Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	100 Nm
			Torque angle	360 °

22 FLYWHEEL

11 22 FLYWHEEL

FLYWHEEL - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Hexagon screws				

(6 x) Flywheel to crankshaft for vehicles with SA205 (automatic transmission).	N52K	M12 x 25.5	Replace screws. Jointing torque and final tightening must be observed without fail.	
			1. Jointing torque	30 Nm
			2. Final tightening	125 Nm
2AZ ISA screws (6 x) Flywheel to crankshaft for vehicles without SA205 (automatic transmission).	N52K	M12 x 25	Replace screws.	120 Nm

23 VIBRATION DAMPER

11 23 VIBRATION DAMPER

VIBRATION DAMPER - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
3AZ Belt pulley/vibration damper to hub	S38 / B36	M8 10.9		34 Nm
	N40 / N42 / N45 / N46 / S38 / B38	M8 10.9		34 Nm
	All / others	M8		22 Nm
4AZ Belt pulley to vibration damper	S38 / B35	M8 8.8		22 Nm
	S50	M8 8.8		22 Nm
5AZ Sprocket with hub or hub to crankshaft	M40	M16 x 1.5	Replace screw	310 Nm
	M42 / M43 / M43TU / M44	M16 x 1.5	Replace screw	330 Nm
6AZ Hub to crankshaft	N40 / N42 / N45 / N46	M16 x 1.5	Replace screw	300 Nm

11 23 VIBRATION DAMPER

VIBRATION DAMPER - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ ASA screws (6 x) Vibration damper to hub.	N52K	M8 x 16		35 Nm

24 CONNECTING ROD WITH BEARING

11 24 CONNECTING RODS AND BEARINGS

CONNECTING RODS AND BEARINGS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ ASA screws (connecting rod bolts) (12 x) Connecting rod bearing cap to connecting rod.	N52K	M8 x 47	Replace screws. Screws washed and oiled. Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	20 Nm
			Torque angle	70 °

28 V-RIBBED BELT WITH TENSIONER

11 28 RIBBED V-BELT WITH TENSION AND DEFLECTION SYSTEM

RIBBED V-BELT WITH TENSION AND DEFLECTION SYSTEM - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ ASA screw (1 x) Belt tensioner to crankcase. The end faces of the aluminium screw heads are painted blue.	N52K / Not for E70 N52K B30	M11 x 65	Replace screw. Thread repairs are not permitted! Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	25 Nm
			Torque angle	90 °
2AZ ASA screw (1 x) Belt tensioner with deflection pulley to crankcase. The end faces of the aluminium screw heads are painted blue.	E70 N52K B30	M11 x 99	Replace screw. Thread repairs are not permitted! Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	25 Nm
			Torque angle	90 °
3AZ Hexagon screw (1 x) Deflection pulley to alternator.	N52K	M10 x 45		40 Nm

31 CAMSHAFT

11 31 CAMSHAFT

CAMSHAFT - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ ASA screws (15 x) Upper and lower bearing banks of exhaust camshaft to cylinder head.	N52K	M7 x 70	Insert screws dry. Tighten screws from inside outwards. Jointing torque and angle of rotation must be observed without fail.	

			Jointing torque	8 Nm
			Torque angle	60 °
2AZ ISA screws (14 x) Bearing cap of inlet camshaft to cylinder head.	N52K	M6 x 30.5		9 Nm
3AZ ASA screws (2 x) Timing chain module to cylinder head.	N52K	M6 x 35		9 Nm
4AZ Bearing pin (1 x) Timing chain module to crankcase.	N52K	M8		20 Nm
5AZ Bearing pin (1 x) Timing chain module to cylinder head.	N52K	M7		14 Nm
6AZ Chain tensioner (1 x) Chain tensioner to cylinder head.	N52K	M22 x 1.5	Replace sealing ring.	55 Nm
7AZ Plug (1 x) Assembly opening to cylinder head.	N52K	M18 x 1.5		25 Nm

36 VARIABLE CAMSHAFT TIMING

11 36 VARIABLE CAMSHAFT CONTROL VANOS

VARIABLE CAMSHAFT CONTROL VANOS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Hexagon screws (central bolts) (2 x) VANOS with sensor gear to inlet and exhaust camshafts.	N52K	M10 x 94	Replace screws. Grip inlet and exhaust camshafts at dihedron when tightening. Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	20 Nm
			Torque angle	180 °
2AZ Non-return valve (2 x) Non-return valve for VANOS to cylinder head	N52K	M14 x 1.5	Replace sealing ring.	13 Nm
3AZ Hexagon screws (2 x) Inlet and exhaust solenoid valve with holder to cylinder head.	N52K	M6 x 12	Replace support and sealing rings.	9 Nm

37 VARIABLE VALVE GEAR

11 37 VARIABLE VALVE GEAR

VARIABLE VALVE GEAR - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ ASA screws (11 x) Guide block to timing case.	N52K	M6 x 23	Only one screw (inside) plus the oil spray nozzle are fitted on cylinder no. 3.	10 Nm
2AZ ASA screws (6 x) Torsion spring to cylinder head.	N52K	M6 x 20		10 Nm
3AZ ASA screws (2 x on cylinder head) (1 x on cylinder head cover) Electric servomotor to cylinder head and to cylinder head cover.	N52K	M6 x 16	<ol style="list-style-type: none"> 1. Join screws hand-tight to cylinder head. 2. Join screw hand-tight to cylinder head cover. 3. Jointing torque on cylinder head. 4. Jointing torque on cylinder head cover. 	10 Nm
4AZ ASA screw (1 x) Oil spray nozzle to guide block.	N52K	M6 x 30	Oil spray nozzle is fitted on cylinder no. 3 (outside).	10 Nm
5AZ Stop screw (1 x) Stop screw of eccentric shaft to cylinder head.	N52K	M6		10 Nm

41 OIL PUMP WITH FILTER

11 41 OIL PUMP WITH STRAINER AND DRIVE

OIL PUMP WITH STRAINER AND DRIVE - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
Optional extra designation: SA203 = All-wheel drive				
1AZ ASA screws (2 x with optional extra SA203) (3 x without optional extra SA203) Suction pipe to bedplate. The end faces of the aluminium screw heads are painted blue.	N52K	M6 x 30	<p>Replace screws. Thread repairs exclusively with aluminium Helicoil threaded insert. Jointing torque and angle of rotation must be observed without fail.</p>	
			Jointing torque	4 Nm
			Torque angle	100 °
2AZ ASA screw (1 x) Oil pump to bedplate.	N52K	M8 x 123	<p>Replace screw. Thread repairs exclusively with aluminium Helicoil threaded insert.</p>	

The end faces of the aluminium screw heads are painted blue.			Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	10 Nm
			Torque angle	180 °
3AZ ASA screws (2 x) Oil pump to bedplate. The end faces of the aluminium screw heads are painted blue.	N52K	M8 x 31	Replace screws. Thread repairs exclusively with aluminium Helicoil threaded insert. Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	10 Nm
			Torque angle	90 °
4AZ ASA screw (1 x) Chain module to crankcase. The end faces of the aluminium screw heads are painted blue.	N52K	M6 x 16	Replace screw. Thread repairs are not permitted! Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	4 Nm
			Torque angle	45 °
5AZ ASA screws (2 x) Chain module to oil pump. The end faces of the aluminium screw heads are painted blue.	N52K	M6 x 16	Replace screws. Thread repairs exclusively with aluminium Helicoil threaded insert. Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	4 Nm
			Torque angle	45 °
6AZ Fillister head bolt (1 x) Sprocket wheel to oil pump.	N52K	M8 x 20	Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	20 Nm
			Torque angle	45 °

42 OIL FILTER AND LINES

11 42 OIL FILTER ELEMENT WITH CONNECTIONS

OIL FILTER ELEMENT WITH CONNECTIONS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Oil filter cap (1 x) Oil filter cap to oil-filter housing.	N52K		Replace sealing ring.	25 Nm
2AZ ASA screws (1 x M8 x 28) (1 x M8 x 43) (1 x M8 x 78)	N52K	M8	Replace seal.	22 Nm

Oil filter housing to cylinder head.				
3AZ Tapping screws (3 x)	N52K	M8 x 20	Replace seal.	16 Nm
Oil/water heat exchanger to oil filter housing.				

51 WATER PUMP WITH DRIVE

11 51 ELECTRIC WATER PUMP WITH DRIVE

ELECTRIC WATER PUMP WITH DRIVE - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ ASA screws (3 x) Electric water pump to crankcase. The end faces of the aluminium screw heads are painted blue.	N52K / Not for E70 N52K B30	M8 x 32	Replace screws. Thread repairs exclusively with aluminium Helicoil threaded insert. Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	10 Nm
			Torque angle	90 °
2AZ ASA screws (3 x) Electric water pump to crankcase. The end faces of the aluminium screw heads are painted blue.	E70 N52K B30	M8 x 28	Replace screws. Thread repairs exclusively with aluminium Helicoil threaded insert. Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	10 Nm
			Torque angle	90 °

53 THERMOSTAT AND CONNECTIONS

11 53 COOLANT THERMOSTAT WITH CONNECTIONS

COOLANT THERMOSTAT WITH CONNECTIONS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Hexagon screws (2 x) Coolant thermostat to electric water pump.	N52K	M6 x 25		9 Nm
2AZ ASA screws (2 x) Feed line (from electric water pump) to crankcase.	N52K	M6 x 16	Replace sealing ring and seal.	9 Nm
3AZ Hose clamp (1 x) Feed line (from crankcase) to electric	N52K	L42-48		3 Nm

water pump.				
4AZ Hose clamps (2 x) Coolant hose between oil-water heat exchanger and feed line.	N52K	L18-24		3 Nm
5AZ Hose clamps (2 x) Coolant hose between coolant thermostat and electric water pump.	N52K	L42-48		3 Nm
6AZ Hose clamp (1 x) Coolant hose (from cylinder head) to coolant thermostat.	N52K	L23-35		3 Nm
7AZ Hexagon screws (2 x) Coolant hose (from coolant thermostat) to cylinder head.	N52K	M6 x 25		9 Nm
8AZ ASA screw (1 x) Spacer to cylinder head.	N52K	M6 x 12		8 Nm
9AZ ASA screws (2 x) Dual bracket to crankcase. The end faces of the aluminium screw heads are painted blue.	N52K	M6 x 16	Replace screws. Thread repairs exclusively with aluminium Helicoil threaded insert. Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	4 Nm
			Torque angle	45 °

61 INTAKE MANIFOLD

11 61 INTAKE MANIFOLD

INTAKE MANIFOLD - TIGHTENING TORQUES

	Type	thread	tightening specification	Measure
1AZ Intake manifold on cylinder head	All	M8		22 Nm
	All	M7		15 Nm
	All	M6		10 Nm
2AZ Soundproofing hood to holder	M60/1 / M60/2 / M62	M6		8 Nm

11 61 AIR INTAKE MANIFOLD

AIR INTAKE MANIFOLD - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Hexagon screws (4 x)	N52K	M7 x 50		15 Nm

Air intake manifold to cylinder head.				
2AZ Hexagon nuts (3 x) Air intake manifold to cylinder head.	N52K	AM7 (to DIN 439)		15 Nm

62 EXHAUST MANIFOLD

11 62 EXHAUST MANIFOLD

EXHAUST MANIFOLD - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Exhaust manifold to cylinder head Coat screw connections with CRC copper paste	All	M6	Replace nuts	10 Nm
	M50 / M52 / M52TU / M54 / M56 / S52 / S50 US	M7	Replace nuts	20 Nm
	All / others	M7	Replace nuts	15 Nm
	M10	M8	Upper row of staybolts installed with bolt cement	
				23 Nm
	M21	M8		12 Nm
			Replace nuts Retighten after 2000 km Slacken nuts by a 1/4 turn	
				12 Nm
	M41 / M47 / M47TU / M51 / M57 / M57TU	M8	Replace nuts	20 Nm
	All / others	M8	Replace nuts	23 Nm

66 VACUUM PUMP

11 66 VACUUM PUMP

VACUUM PUMP - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ ISA flat mushroom head screws 10.9 (3 x) Vacuum pump to crankcase.	N52K	M6 x 40		10 Nm
2AZ ISA screw (1 x)	N52K	M10 x 30		66 Nm

Sprocket wheel to vacuum pump.

72 AIR PUMP, LINES AND CONTROL VALVE

11 72 AIR PUMP, LINES AND CONTROL VALVES

AIR PUMP, LINES AND CONTROL VALVES - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Secondary air valve to cylinder head	N52K	M6		8 Nm
2AZ Secondary air pump to mounting bracket/pump carrier	N52K	M6		8 Nm
3AZ Intake hose / intake line to body	N52K	M6		8 Nm

78 EMISSION CONTROL, OXYGEN SENSOR

11 78 EXHAUST GAS CONTROL, LAMBDA CONTROL SENSOR / LAMBDA MONITOR SENSOR

EXHAUST GAS CONTROL, LAMBDA CONTROL SENSOR / LAMBDA MONITOR SENSOR - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Lambda control sensor LSU 4.9 Lambda monitor sensor LSF 4.2	N52K	M18 x 1.5		50 Nm
2AZ ASA screws (2 x) Bracket, lambda control sensors, to cylinder head.	N52K	M6 x 12		8 Nm
3AZ Hexagon screw (1 x) Bracket, lambda monitor sensors, side, to transmission.	N52K / Not for E6x and E85	M8 x 16		19 Nm
4AZ Bracket, plug connection, lambda monitor sensors, bottom, to transmission.	N52K			

ENGINE

Engine And Gearbox - Repair Instructions - X3

11 ENGINE SUSPENSION

22 11 001 REPLACING RIGHT ENGINE MOUNT (N52K)

Necessary preliminary tasks:

- Remove right engine support arm, see [22 11 100 Replacing right engine support arm \(N52K\)](#).

Release screws (1) and remove engine mount (2).

Tightening torque, see 1AZ in [22 11 ENGINE SUSPENSION](#) .

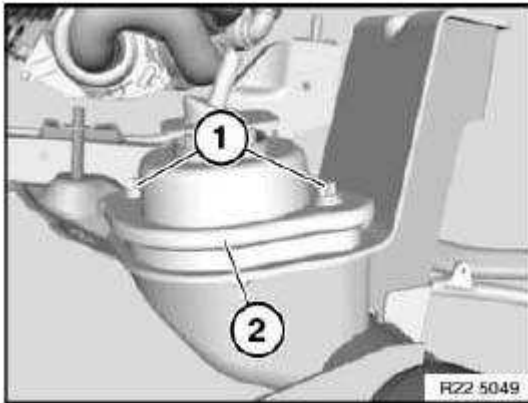


Fig. 1: Engine Mount

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Ensure lug (1) is correctly located.

Engine mount designations:

Right engine mount

- Even component number

Left engine mount

- Odd component number

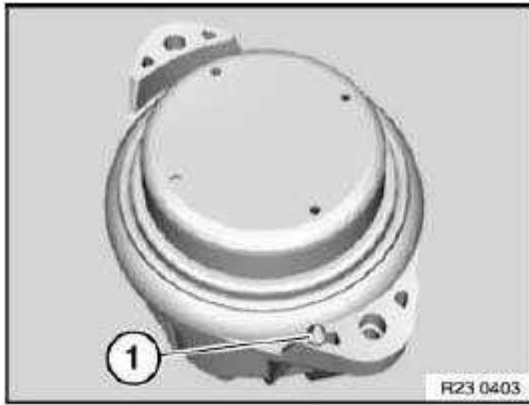


Fig. 2: Lug

Courtesy of BMW OF NORTH AMERICA, INC.

22 11 011 REPLACING LEFT ENGINE MOUNT (N52K)

Necessary preliminary tasks:

- Remove left engine support arm, see **22 11 110 Replacing left engine support arm (N52K)**.

Release screws (1) and remove engine mount (2).

Tightening torque, see 1AZ in **22 11 ENGINE SUSPENSION** .

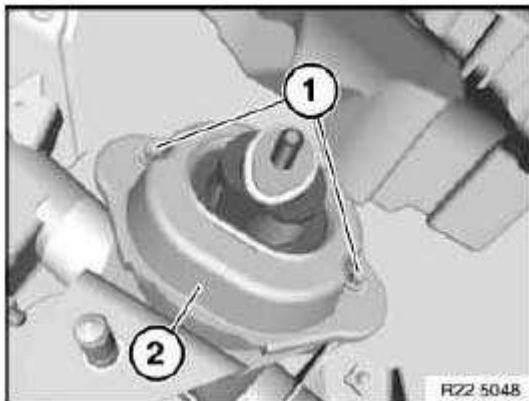


Fig. 3: Engine Mount

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Note installation position.

Threaded pin (1) must point outwards.

Engine mount designations:

Right engine mount

- Even component number

Left engine mount

- Odd component number

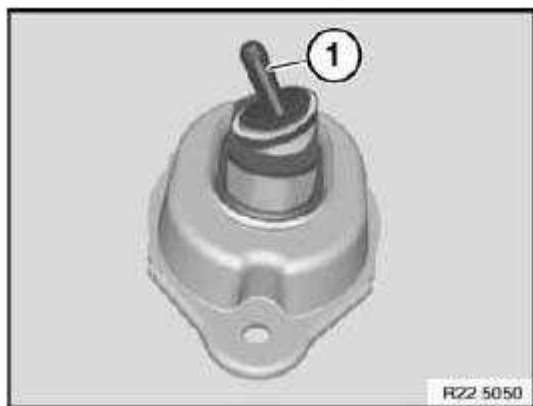


Fig. 4: Threaded Pin

Courtesy of BMW OF NORTH AMERICA, INC.

22 11 100 REPLACING RIGHT ENGINE SUPPORT ARM (N52K)

Necessary preliminary tasks:

- Secure engine in installation position, see **11 00 670 SECURING ENGINE IN INSTALLATION POSITION (N52)** .
- Remove the reinforcement plate, see **31 10 010 REMOVING AND INSTALLING/REPLACING REINFORCEMENT PLATE** .

Release screws.

Remove engine support arm (1).

Tightening torque 3AZ, see **22 11 ENGINE SUSPENSION** .

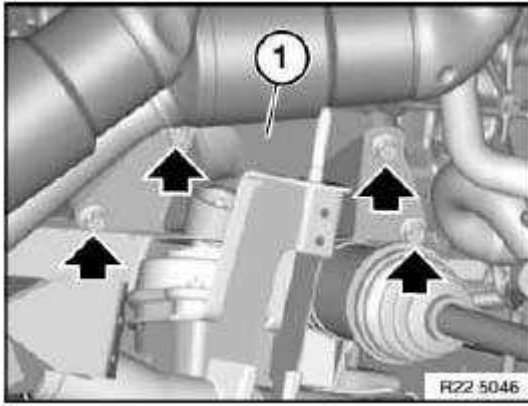


Fig. 5: Engine Support Arm

Courtesy of BMW OF NORTH AMERICA, INC.

22 11 110 REPLACING LEFT ENGINE SUPPORT ARM (N52K)

Necessary preliminary tasks:

- Secure engine in installation position, see **11 00 670 SECURING ENGINE IN INSTALLATION POSITION (N52)** .
- Remove the reinforcement plate, see **31 10 010 REMOVING AND INSTALLING/REPLACING REINFORCEMENT PLATE** .

Disconnect connector (1).

Detach oil line (2) from engine support arm.

Release screws and remove engine support arm (3).

Tightening torque, see 3AZ in **22 11 ENGINE SUSPENSION** .

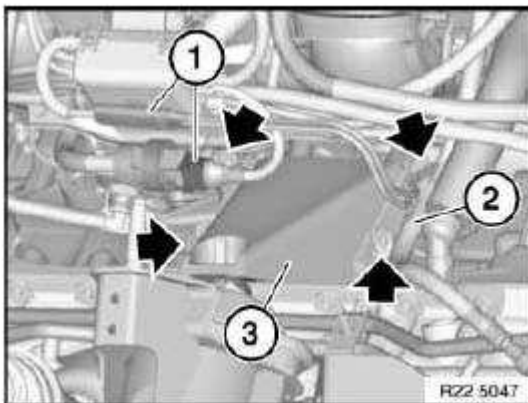


Fig. 6: Connector, Oil Line And Engine Support Arm

Courtesy of BMW OF NORTH AMERICA, INC.

31 TRANSMISSION SUSPENSION, MANUAL TRANSMISSION

22 31 001 REPLACING RUBBER MOUNT FOR TRANSMISSION MOUNTING

Special tools required:

See 22 1 010 SET OF TOOLS .

- 22 1 011
- 22 1 014
- 22 1 016
- 22 1 021
- 33 3 144

Necessary preliminary tasks:

- Remove complete exhaust system, see 18 00 020 REMOVING AND INSTALLING COMPLETE EXHAUST SYSTEM (M54) .
- Remove heat shield
- Support transmission with hydraulic lifter.

Unfasten screws and remove transmission cross-member.

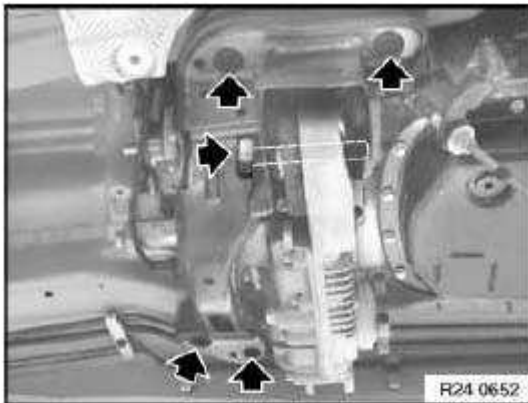


Fig. 7: Transmission Cross-Member Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Position special tool 22 1 016 on opening (2) and twist in screw (3) hand-tight against housing.

Pull out rubber mount with special tools 22 1 011 / 33 3 144 and nut (1).

Nut (1) = M 12x1.5 nut

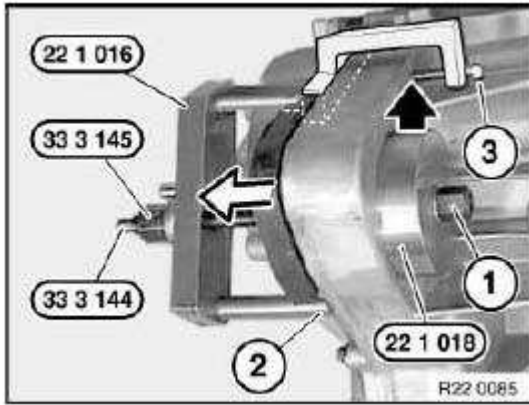


Fig. 8: Pulling Out Rubber Mount
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Arrow on rubber mount must point to arrow on housing.

Coat housing bore and rubber mount with Circolight.

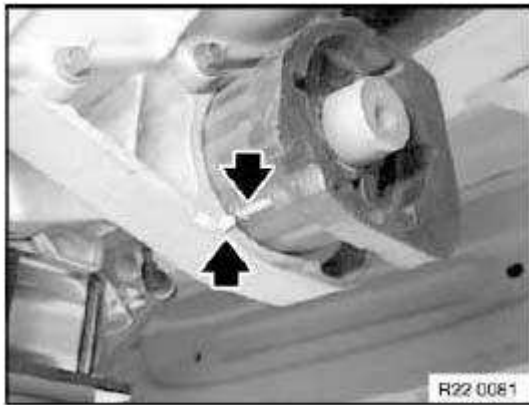


Fig. 9: Arrow On Rubber Mount And Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool 22 1 014 with pins into openings of rubber mount.

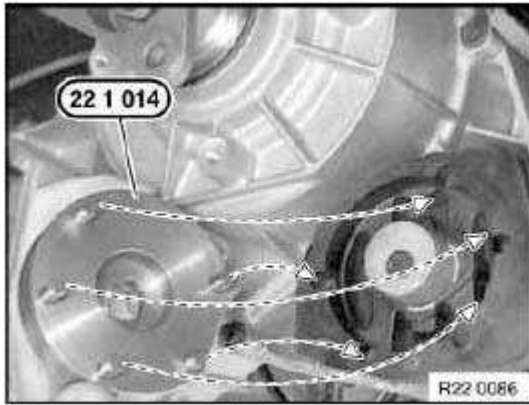


Fig. 10: Special Tool 22 1 014
Courtesy of BMW OF NORTH AMERICA, INC.

Draw in rubber mount with special tools 22 1 014 / 22 1 021 / 33 3 144 and nut (1).

Nut (1) = M12x1.5

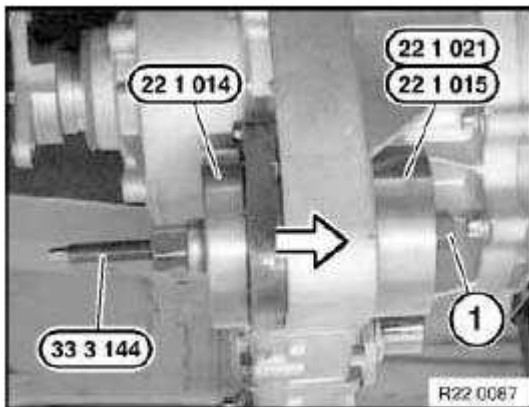


Fig. 11: Installing Rubber Mount
Courtesy of BMW OF NORTH AMERICA, INC.

22 31 050 REPLACING CROSS-MEMBER FOR TRANSMISSION MOUNTING

Operation is identical to **22 31 001 Replacing rubber mount for transmission mounting.**

22 31 050 REPLACING CROSS-MEMBER FOR TRANSMISSION MOUNTING

Operation is identical to **22 31 001 Replacing rubber mount for transmission mounting.**

32 TRANSMISSION SUSPENSION, AUTOMATIC TRANSMISSION

22 31 001 REPLACING RUBBER MOUNT FOR TRANSMISSION MOUNTING

Special tools required:

See **22 1 010 SET OF TOOLS** .

- 22 1 011
- 22 1 014
- 22 1 016
- 22 1 021
- 33 3 144

Necessary preliminary tasks:

- Remove complete exhaust system, see **18 00 020 REMOVING AND INSTALLING COMPLETE EXHAUST SYSTEM (M54)** .
- Remove heat shield
- Support transmission with hydraulic lifter.

Unfasten screws and remove transmission cross-member.

Tightening torque 10AZ, see **27 00 TRANSFER BOX IN GENERAL** .

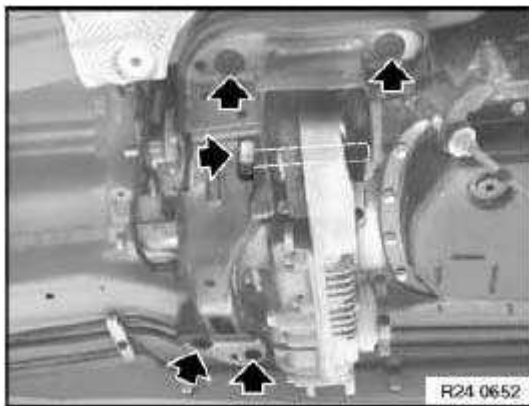


Fig. 12: Transmission Cross-Member Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Position special tool 22 1 016 on opening (2) and twist in screw (3) hand-tight against housing.

Pull out rubber mount with special tools 22 1 011 / 33 3 144 and nut (1).

Nut (1) = M 12x1.5 nut

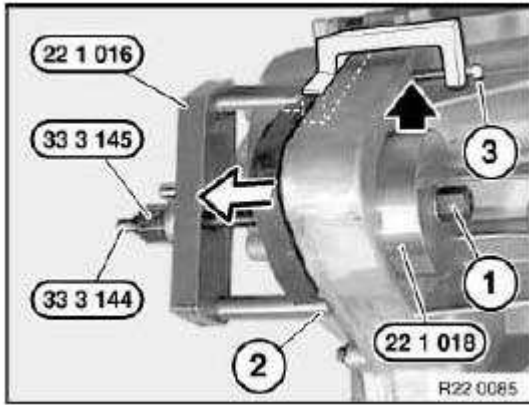


Fig. 13: Pulling Out Rubber Mount
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Arrow on rubber mount must point to arrow on housing.

Coat housing bore and rubber mount with Circolight.

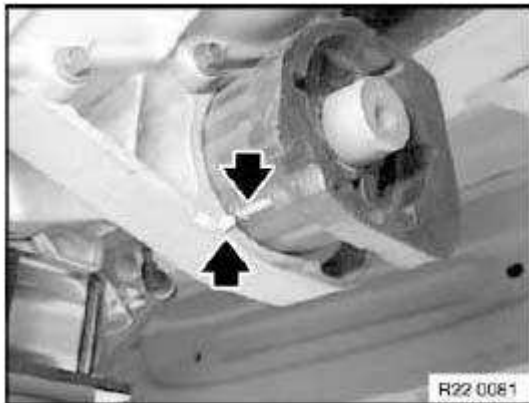


Fig. 14: Arrow On Rubber Mount And Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool 22 1 014 with pins into openings of rubber mount.

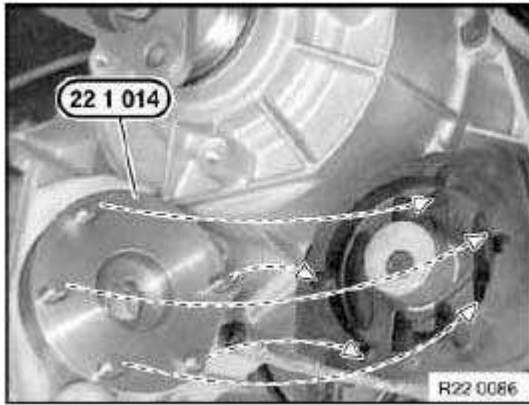


Fig. 15: Special Tool 22 1 014
Courtesy of BMW OF NORTH AMERICA, INC.

Draw in rubber mount with special tools 22 1 014 / 22 1 021 / 33 3 144 and nut (1).

Nut (1) = M12x1.5

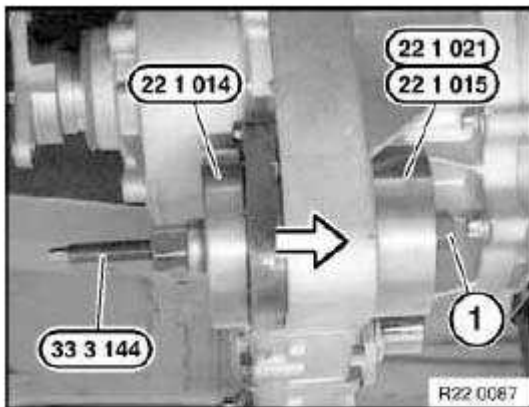


Fig. 16: Installing Rubber Mount
Courtesy of BMW OF NORTH AMERICA, INC.

22 32 001 REPLACING RUBBER MOUNT FOR TRANSMISSION MOUNTING

Special tools required:

See **22 1 010 SET OF TOOLS** .

- 22 1 011
- 22 1 014
- 22 1 016
- 22 1 021
- 33 3 144

Necessary preliminary tasks:

- Remove complete exhaust system, see **18 00 020 REMOVING AND INSTALLING COMPLETE EXHAUST SYSTEM**
- Remove heat shield
- Support transmission with hydraulic lifter.
- Remove transfer case, see **27 10 010 REMOVING AND INSTALLING TRANSFER CASE (ATC 400 X-DRIVE)** .

Position special tool 22 1 016 on opening (2) and twist in screw (3) hand-tight against housing.

Pull out rubber mount with special tools 22 1 011 / 33 3 144 and nut (1).

Nut (1) = M 12x1.5 nut

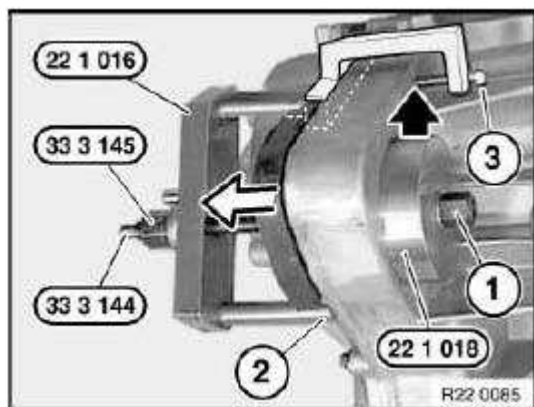


Fig. 17: Pulling Out Rubber Mount
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Arrow on rubber mount must point to arrow on housing.

Coat housing bore and rubber mount with Circolight.

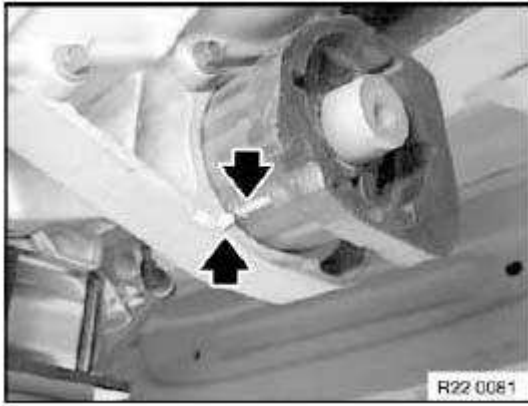


Fig. 18: Arrow On Rubber Mount And Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool 22 1 014 with pins into openings of rubber mount.

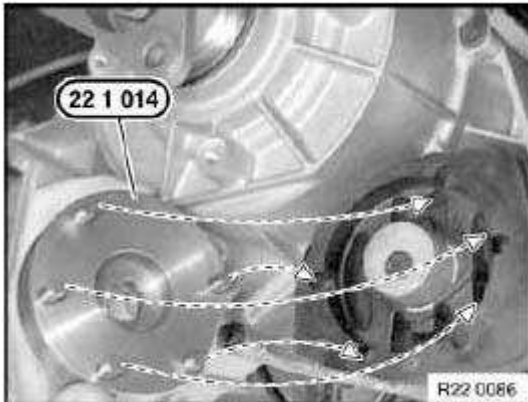


Fig. 19: Special Tool 22 1 014
Courtesy of BMW OF NORTH AMERICA, INC.

Draw in rubber mount with special tools 22 1 014 / 22 1 021 / 33 3 144 and nut (1).

Nut (1) = M12x1.5

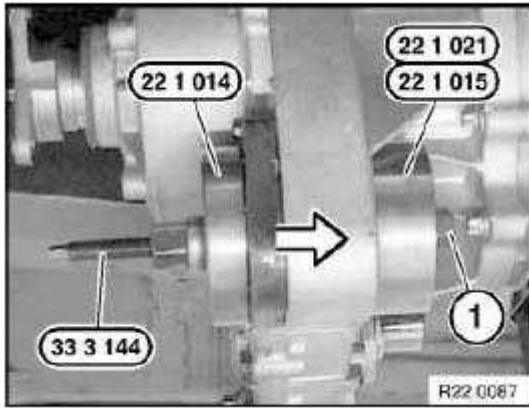


Fig. 20: Installing Rubber Mount

Courtesy of BMW OF NORTH AMERICA, INC.

22 32 050 REPLACING CROSS-MEMBER FOR TRANSMISSION MOUNTING

Operation is identical to **Replacing rubber mount for transmission mounting.**

ENGINE

Engine and Gearbox Suspension - Special Tools - X3

22 ENGINE AND GEARBOX SUSPENSION

22 1 010 SET OF TOOLS

Minimum set: Mechanical tools

In conjunction with: 33 3 144

Note: For removing and installing transfer box rubber mount 22 1 018 for E67 and RR

Series: E46/16, E53, E60, E61, E67, E70, E83, E90, E91, E92, RR1

Storage location: B41, C34, C35, C47

SI number: 1 15 99 (483)

Order number: 22 1 010

Set of tools

Consisting of:

3 = 22 1 013 Thrust piece

Note: For installing transfer case rubber mount - model series: E53

4 = 22 1 014 Thrust piece

Note: For installing transfer box rubber mount - model series: E46/16, E83

5 = 22 1 015 Washer

Note: Model series: E46/16

6 = 22 1 016 Bridge

Note: For removing transfer box rubber mount. Model series: E46/16, E83

7 = 22 1 017 Nut

Note: For installing and removing transfer box rubber mount - model series: E46/16

8 = 22 1 018 Sleeve

Note: For removing transfer box rubber mount - model series: E53, E83, E90

9 = 22 1 019 Washer

Note: For installing transfer box rubber mount - Model series: E53

10 = 22 1 021 Washer

Note: For installing rubber mount in transfer box: ATC400 Model series: E83

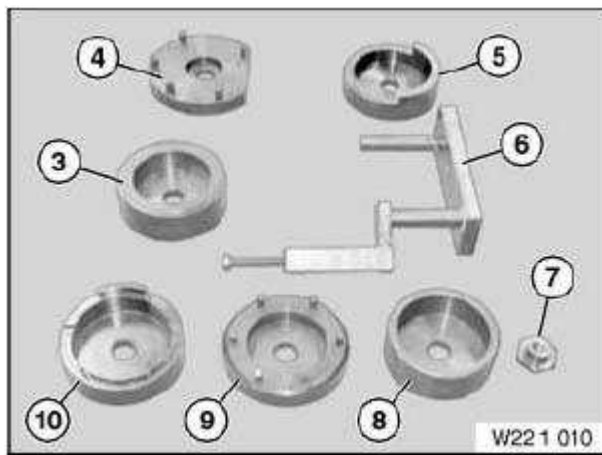


Fig. 1: Identifying Set Of Tools (22 1 010)

Courtesy of BMW OF NORTH AMERICA, INC.

ENGINE

Engine and Gearbox Suspension - Tightening Torques - X3

11 ENGINE SUSPENSION

22 11 ENGINE SUSPENSION

ENGINE SUSPENSION - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Engine mount to front axle support	E52 / E85 / E86			42 Nm
	E60 / E61 / E63 / E64 / E65 / E66 / E67 / E92	M8-8		19 Nm
	E60/N54, E60/ N53, N52, E61 / N53, N52, N54	M8-8		21 Nm
	E53	M8-10.9		30 Nm
	E87 / E90 / E91 / E92 / E93 / E70 / E83 / E81	M8 10.9		28 Nm
	E70 / E83	M10		38 Nm
2AZ Engine mount to engine support arm	E60 / E61 / E63 / E64 / E65 / E66 / E67 / E53 / E83 / E87 / E90 / E91 / E92 / E93 / E70 / E81	M10 10.9		56 Nm
	E65 / E66 / E67	M12 10.9		100 Nm
	E70 / E83	M12		68 Nm
	E85 / E86 / E52			42 Nm
	E92	M10		38 Nm
3AZ Engine support arm to engine	E60 / E61 / E63 / E64 / E65 / E66 / E67 / E83 / E87 / E90 / E91 / E70 / E81 / E92 / E93	M10 8.8		38 Nm
	E60 / 61 N52 / E63 / 64 N52 / E83 / 85 N52 / E86 N52 / E87 / 90 N52 / E91 N52 / E65 N52 / E92 N51 / N52 / E70 N52	M12	Aluminium screws marked blue must be replaced	
			1. Jointing torque	34 Nm
			2. Angle of rotation	90 °
			3. Angle of rotation	20 °
	E60 / E61 / E65 / E66 / E67	M8 8.8		19 Nm
	E85 / E83	M8 8.8		21 Nm
	E53 (N62 / M54)			38 Nm
	E53 (M57)			65 Nm

	E92 / E90 (N54)	M12		66 Nm
	E60(N53) / E61 (N53) / E87 (N52K) / E81 (N52K)		1. Jointing torque	34 Nm
			2. Angle of rotation	100 °
			marked blue must be replaced	
	E60 (N54)	M12		66 Nm
4AZ Engine mount to mounting bracket	E65 / E60 / E61 / E63 / E64	M8 8.8		21 Nm
5AZ Mounting bracket to front axle carrier	E65 / E60 / E61 / E63 / E64	M8-8		21 Nm
6AZ Vibration damper to engine carrier	E70			19 Nm
7AZ Reinforcement plate to front axle carrier	E90 / E91 / E92	M8		19 Nm
8AZ Support angle to engine mount or front axle carrier	E90 / E91 / E92	M8		19 Nm

32 TRANSMISSION MOUNTS

22 32 TRANSMISSION MOUNTS

TRANSMISSION MOUNTS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Bolt to transmission cross-member	E60 / E65 / E66 / E67			30 Nm
2AZ Transmission support block to transmission	E60 / E61 / E65 / E66 / E67 / E85 / E86 / E63 / E64 / E87 / E90 / E91 / E92 / E93 / E81	M10x35 M10x32.5	ASA screw Isa flat-head screw	38Nm 48 Nm
3AZ Transmission mount to transmission / transmission cross-member	E60 / E61 / E63 / E64 / E67 / E85 / E86 / E87 / E90 / E91 / E92 / E93 / E81	M8		19 Nm
4AZ Transmission cross-member to body	E85 / E86 / E46 / E83	M8 8.8		21 Nm
	E60 / E61 / E63 / E64 / E67 / E87 / E90 / E91 / E92 / E93 / E81			19 Nm
	E53	M10		41 Nm
	E70	M10		38 Nm
5AZ Transmission cross member to rubber mounts	E46 / E53 / E83	M12		74 Nm
	E70	M12		68 Nm

6AZ Vibration damper to transmission cross-member	E60, E61	M10	38 Nm
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ELECTRICAL

Engine Electrical System - Special Tools - X3

12 ENGINE ELECTRICAL SYSTEM

12 1 305 ZERO-CODED COVER CAP FOR 52-PIN TEST BOX (12 1300/304)

Note: New plugs in E61/E61/E63 and E64 on SGM control unit Cover cap 12 1 300/305 for diagnosis on wiring harness. From 08/2004 cover cap will be supplied with test box.

SI number: 2 07 04 (138)

Order number: 12 1 305

Zero-coded cover cap for 52-pin test box (12 1300/304)

12 7 060 ANTISTATIC MAT (ESD)

Note: ESD (Electro Static Discharge) For protection against ESD during repairs to electronic components. (Replaces the sub-number 12 7 192 from Eprom tool kit 12 7 190)

Series: E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E81, E82, E83, E85, E87, E90, E91, R50, R52, R53, R55, R56, RR1

SI number: 2 06 04 (128)

Order number: 12 7 060

Antistatic mat (ESD)

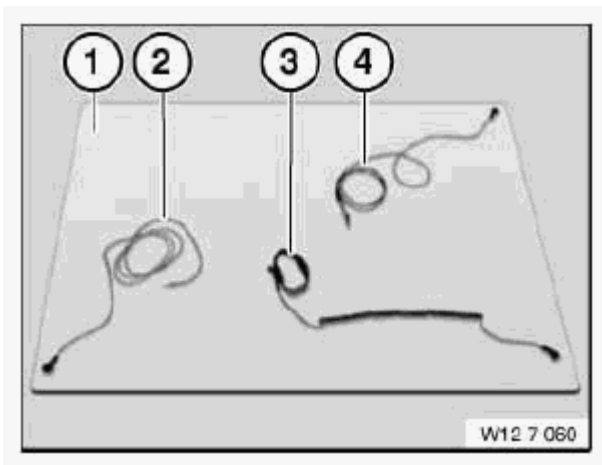


Fig. 1: Antistatic Mat (ESD) (12 7 060)

Courtesy of BMW OF NORTH AMERICA, INC.

12 7 121 COUNTERHOLDER WRENCH

In conjunction with: Socket

Note: Alternator N42 engine

Order number: 12 7 121

Counterholder wrench

12 7 122 SOCKET

In conjunction with: Counterholder wrench

Note: Hazet 8808 lg10

SI number: 1 28 03 (051)

Order number: 12 7 122

Socket

12 7 190 EPROM TOOLS / ID MARKING

Note: Set no longer available. Antistatic mat can be ordered using number 12 7 060.

Storage location: J 101

Order number: 12 7 190

Eprom tools / ID marking

Consisting of:

1 = 12 7 191 Eprom puller pliers

Note: No longer available. Antistatic mat can be ordered using special tool number 12 7 060.

2 = 12 7 192 Antistatic mat

Note: Is replaced by main number 12 7 060.

12 7 200 SET OF TOOLS

Note: For opening & closing control unit box

Storage location: J 106

Order number: 12 7 200

Set of tools

Consisting of:

1 = 12 7 201 Pliers

Note: For bending open tab washers

2 = 12 7 202 Lever

Note: For bending tab washers

3 = 12 7 203 Pliers

Note: For closing tab washers

4 = 12 7 204 Torx socket T20

5 = 12 7 205 Torx socket T10

6 = 12 7 206 Fine pen

Note: Black, waterproof

8 = 12 7 208 Slotted screwdriver 2 mm

9 = 12 7 209 Straightening tool

Note: For Eprom connections

12 7 210 CONTROL UNIT SEAL

Storage location: J 106

Order number: 12 7 210

Control unit seal

Consisting of:

1 = 12 7 211 Seal marks

2 = 12 7 212 Hole punch

Note: For seal mark dating

ENGINE

Engine Electrical System - Tightening Torques - X3

12 IGNITION WIRES, SPARK PLUGS

12 12 SPARK PLUGS

SPARK PLUGS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Spark plugs (ungreased)	All	M12x1.25		23 ± 3 Nm
	All	M14x1.25		30 ± 3 Nm

14 ELECTRONIC SWITCHING OR CONTROL UNIT

12 14 ELECTRONIC SHIFT UNITS OR CONTROL UNITS

ELECTRONIC SHIFT UNITS OR CONTROL UNITS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Knock sensor	N52, N52K, N51, N53	M8x31	Replace screws	
			Jointing torque	10 Nm
			Torque angle	90 °
2AZ Pulse generator for crankshaft	N52, N52K, N51, N53	M6x16	Replace screws	
			Jointing torque	3 Nm
			Torque angle	45 °
3AZ Pulse generator for inlet camshaft	N52, N52K, N51, N53	M6x16		9 Nm
4AZ Pulse generator for exhaust camshaft	N52, N52K, N51, N53	M6x16		9 Nm

31 ALTERNATOR WITH DRIVE AND MOUNT

12 31 ALTERNATOR WITH DRIVE AND MOUNTING PARTS

ALTERNATOR WITH DRIVE AND MOUNTING PARTS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Wires to alternator				
Terminal D+	M10/M20			5 Nm
	All / others	M6		7 Nm
Terminal B+	S38 / B38			8 Nm

	All / others	M8		13 Nm
2AZ Pulley	All			45 Nm
3AZ Pulley (ribbed drive belt)	Alternator with cooling jacket			80 Nm
	all others			70 Nm
	N42, N46 Valeo			75 Nm
	N42, N46 Bosch			65 Nm
4AZ Rear holder	All			3.5 Nm
5AZ Fillister head screw for wire holder	All			3.5 Nm
6AZ Alternator on bearing block	M40/M42 / M43 / M44			43 Nm
7AZ Alternator to crankcase	N42, N46, N62	M8		21 Nm
8AZ Belt pulley (ribbed V-belt) with freewheel (Ina) fitted to Bosch and Valeo alternators	N42, N43			80 Nm

12 31 ALTERNATOR WITH DRIVE AND MOUNTING PARTS

ALTERNATOR WITH DRIVE AND MOUNTING PARTS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
2AZ Alternator to crankcase	N52, N52K, N51, N53	M8x82	Replace screws	
			Jointing torque	10 Nm
			Torque angle	180 °

32 REGULATOR

12 32 REGULATOR

GOVERNOR - TIGHTENING TORQUES

	Type	thread	tightening specification	Value
1AZ Regulator switch	All	M4		2 Nm
	All	M5		4 Nm

41 STARTER WITH MOUNTING

12 41 STARTER MOTOR WITH MOUNTING

STARTER MOTOR WITH MOUNTING - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Starter motor mounting to crankcase	N52, N52K, N51, N53	M10x85	Replace screw	

			Jointing torque	20 Nm
			Torque angle	180 °
2AZ Starter motor mounting to crankcase	N52, N52K, N51, N53	M10x30	Replace screw	
			Jointing torque	20 Nm
			Torque angle	90 °
3AZ Battery positive lead to starter	N52, N52K, N51, N53	M8		13 Nm

42 STARTER LEAD

12 42 STARTER LINE

STARTER LINE - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Battery positive terminal in/on distribution box	E63 / E65 / E90 / E91 / E87 / E83	M8		21 Nm
	E60 / E61	M8		14 Nm

12 42 STARTER LINE

STARTER LINE - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Starter line to jump-start connection point	N52, N52K, N51, N53	M8		19 Nm
2AZ Starter line to jump-start connection point	E70 / N52K	M8		13 Nm

12 42 WIRES TO STARTER

WIRES TO STARTER - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Battery positive terminal in/on distribution box	E32 / E34 / E31 / E36 / E46 / E87 / E90 / E85 / E86 / E81	M8		20 Nm
	E39 / M57	M8		11 Nm
	E38 / M67	M8		11 Nm
	E46 / M47TU	M8		11 Nm
	E60 / N62	M8		15 Nm
	E65 / N62 / N73	M8		15 Nm
2AZ Wiring harness on distributor	E36 / M41	M8		10 Nm

52 CONNECTORS PLUGS, LOOM

12 52 PLUG CONNECTIONS, TERMINALS, LOOSE PARTS

PLUG CONNECTIONS, TERMINALS, LOOSE PARTS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Wiring harness to cylinder head	N52	M6		8 Nm
2AZ Cable duct to cylinder head cover	N52, N54, N53	M6	Replace screws	
			Jointing torque	4 Nm
			Torque angle	90 °
3AZ Ground cable to crankcase (electr. coolant pump)	N52, N54, N52K, N51, N53	M8	Replace screws	
			Jointing torque	8 Nm
			Torque angle	45 °

61 OIL PRESSURE/OIL TEMPERATURE GAUGE

12 61 ENGINE OIL PRESSURE, ENGINE OIL TEMPERATURE, OIL CONDITION DISPLAY

ENGINE OIL PRESSURE, ENGINE OIL TEMPERATURE, OIL CONDITION DISPLAY - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Engine oil pressure switch/engine oil temperature sensor	N52, N52K, N51, N54, N53	M12x1.5		
			Jointing torque	20 Nm
			Torque angle	16 °
2AZ Oil condition sensor for engine oil	N52, N52K, N51, N54, N53	M6	Jointing torque 2 Nm	8.5 Nm

12 61 OIL PRESSURE, OIL TEMPERATURE, OIL LEVEL DISPLAY

OIL PRESSURE, OIL TEMPERATURE, OIL LEVEL DISPLAY - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Oil-pressure switch/oil-temperature switch	All	M12x1.5		27 Nm
2AZ Level switch for engine oil	N62 / N73 / M67TU		Jointing torque 2 Nm	8.5 Nm
3AZ Oil pressure switch	N46	M12x1.5		27 Nm
4AZ Level sensor to oil sump	N46	M6		9 Nm

62 COOLANT TEMPERATURE

12 62 COOLANT TEMPERATURE

COOLANT TEMPERATURE - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Temperature sensor to water flange (glow time/coolant temperature gauge)	M21			18 Nm
	M51			13 Nm
2AZ Temperature switch (5.5 °C/17 °C) to fuel filter/cylinder head	M21			18 Nm
3AZ Coolant temperature sensor (2-pin plug-in connection)	S38 / S50			13 Nm
	S85	M12/1.52		13.5 Nm
	All / others			20 Nm
4AZ Remote thermometer sensor (2-pin plug-in connection)	All			20 Nm
Remote thermometer sensor (4-pin plug-in connection)	M62			16 Nm
	S62	M12x1.5		14 Nm
5AZ Remote thermometer sensor on coolant flange	S50			18 Nm
6AZ Temperature sensor - air	S38 / S50			13 Nm
7AZ Temperature sensor - oil	S38 / S50			13 Nm

72 SENSOR FOR CONTROL UNIT

12 72 SENDERS FOR CONTROL UNIT

SENDERS FOR CONTROL UNIT - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Lever to pedal value sender	E32 / E34 / E31 / E36			9 Nm
2AZ Pedal value sender to pedal console	E32 / E34 / E31			5 Nm

90 CONTROL UNIT BOX

12 90 CONTROL UNIT HOUSING

CONTROL UNIT HOUSING - TIGHTENING TORQUES

			Tightening	
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	Type	Thread	specification	Measure
1AZ Assembly of upper and lower sections	E32 / E34 / E36			5 Nm
2AZ Center section to body	E32 / E34			3 Nm
3AZ Control unit holder in E box	E36			5 Nm
4AZ Control unit box cover	E38 / E39 / E52			4 Nm
	E46			6 Nm
	E53 / E36/7 / E54			3 Nm
5AZ Electronics box to firewall	E65	Plastic screw		6 Nm

ENGINE

Engine Mechanical - Repair Instructions - X3, X5 (6-Cylinder)

00 ENGINE, GENERAL

ENGINE IDENTIFICATION

Drive in engine numbers at marked surface with impact tool.

M47 / M47TU / M47T2

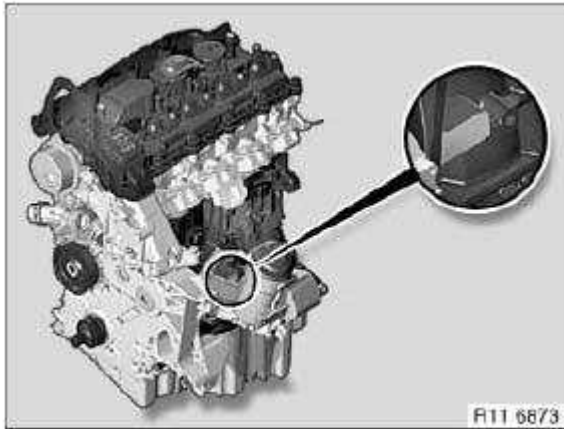


Fig. 1: M47 / M47TU / M47T2 Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

M57 / M57TU / M57T2

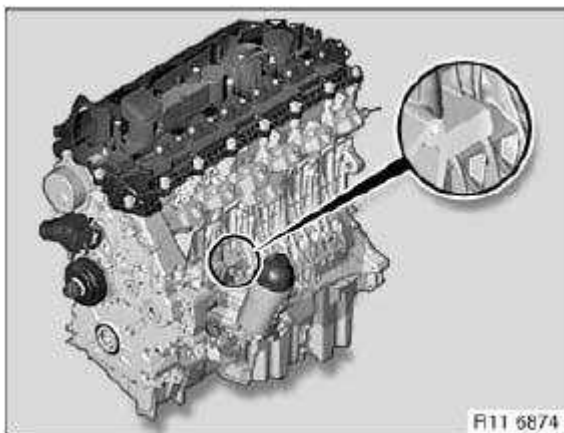


Fig. 2: M57 / M57TU / M57T2 Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

M67 / M67TU

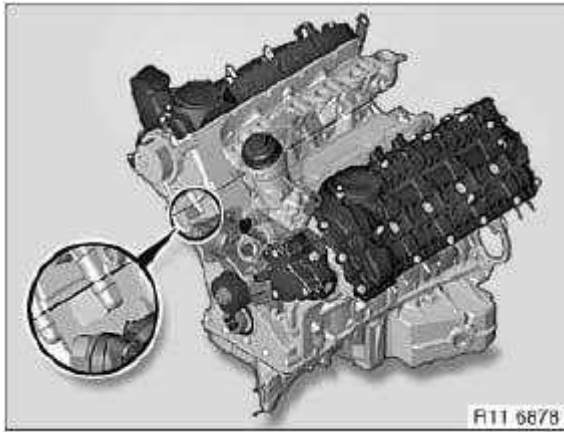


Fig. 3: M67 / M67TU Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

N47

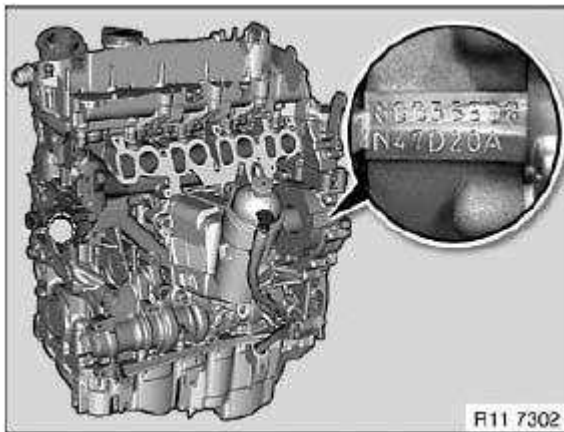


Fig. 4: N47 Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

M52 / M52TU

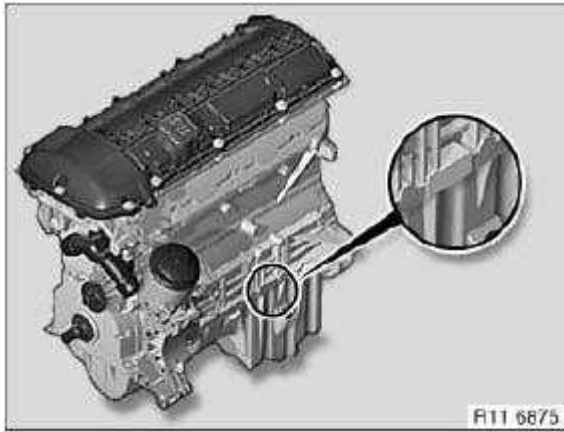


Fig. 5: M52 / M52TU Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

M54

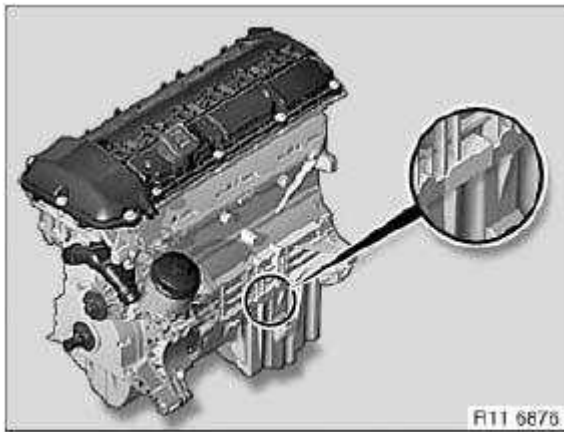


Fig. 6: M54 Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

M56

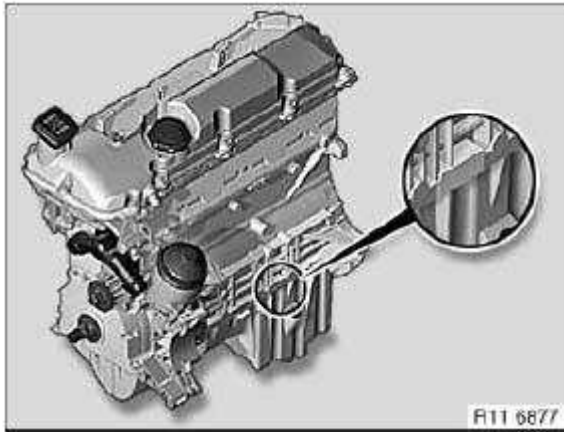


Fig. 7: M56 Engine Identification

Courtesy of BMW OF NORTH AMERICA, INC.

N40 / N45

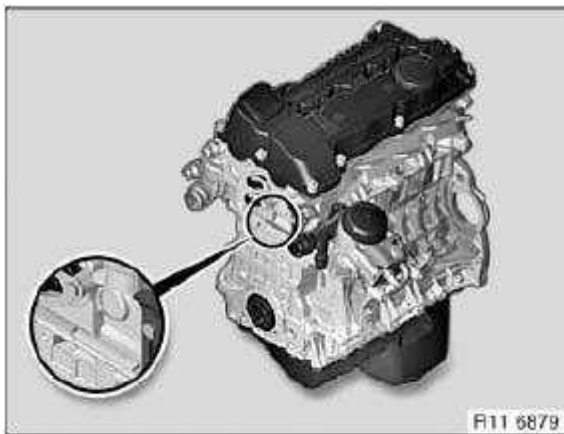


Fig. 8: N40 / N45 Engine Identification

Courtesy of BMW OF NORTH AMERICA, INC.

N42 / N46 / N46T

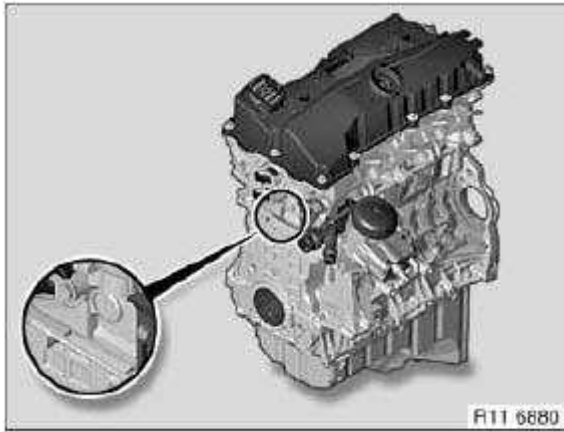


Fig. 9: N42 / N46 / N46T Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

N51 / N52 / N52K / N53 / N54

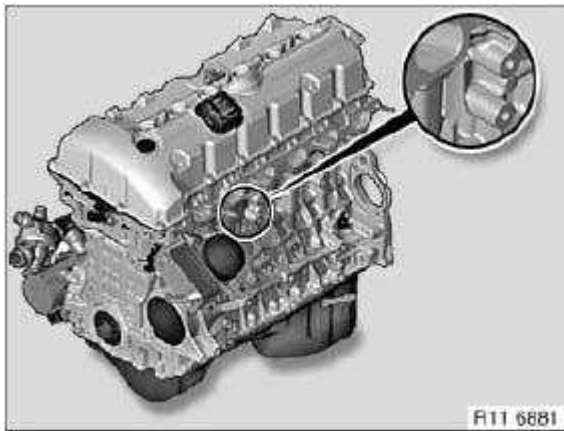


Fig. 10: N51 / N52 / N52K / N53 / N54 Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

N62

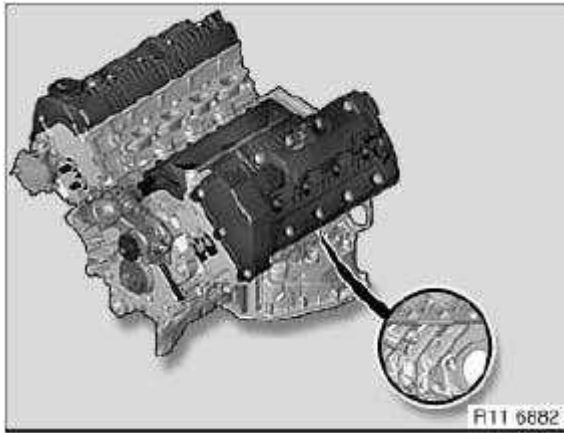


Fig. 11: N62 Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

N73

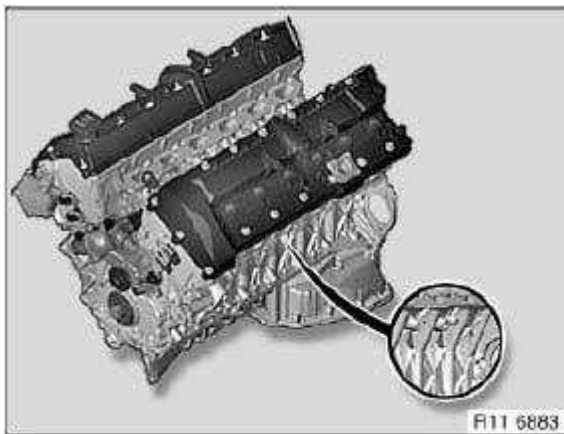


Fig. 12: N73 Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

S54

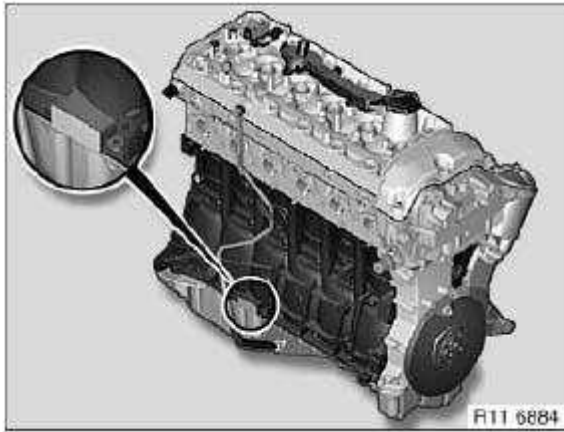


Fig. 13: S54 Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

S85

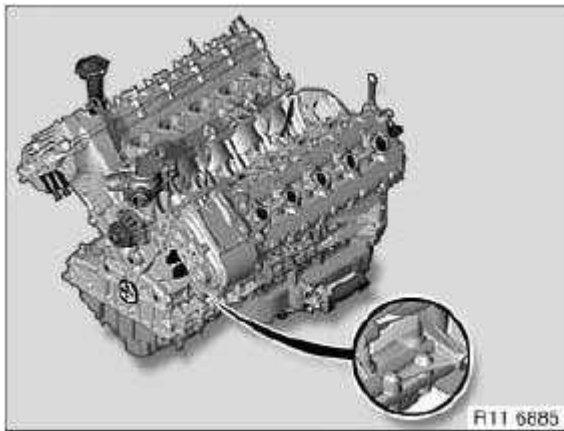


Fig. 14: S85 Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

W10 / W11

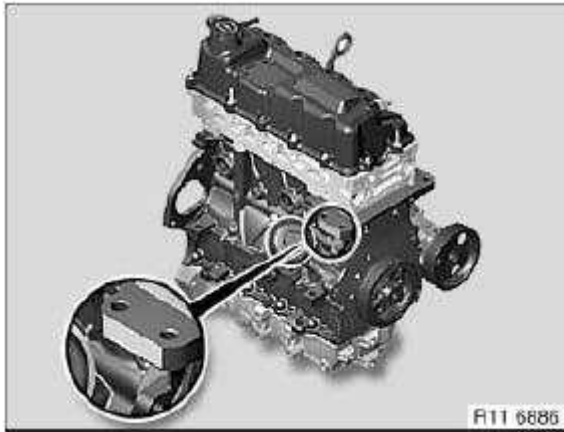


Fig. 15: W10 / W11 Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

W17

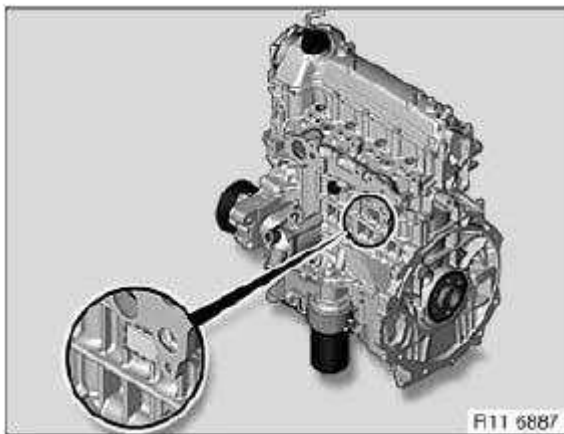


Fig. 16: W17 Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

MOUNTING ENGINE ON ASSEMBLY STAND (N52K)

Special tools required:

- **00 1 450 ASSEMBLY STAND**
- 11 3 370
- 11 4 440
- 11 9 261
- 11 9 265

IMPORTANT: Aluminum screws/bolts must be replaced each time they are released. The end faces of aluminum screws/bolts are painted blue for the purposes of reliable identification. Jointing torque and angle of rotation must be observed without fail (risk of damage) .

Necessary preliminary tasks:

- Remove engine

Bolt engine or engine block with steel bolts (1) and aluminum bolts (2) to special tool 11 4 440 .

To release central bolt, bolt on special tools 11 9 261 and 11 9 265 as well.

Mount engine with special tool 11 3 370 to special tool 00 1 450 .

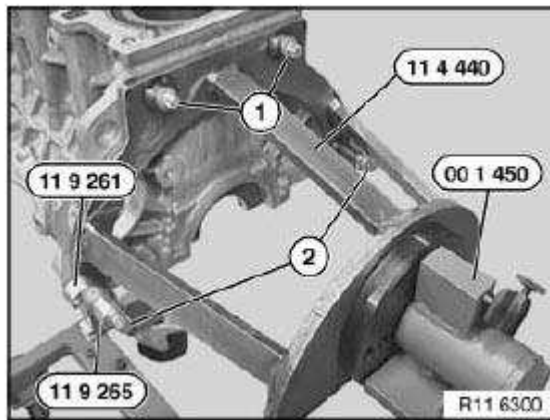


Fig. 17: Engine Block With Steel And Aluminum Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

00 00 250 BMW ENGINE OIL SERVICE INCLUDING SUPPLEMENTARY SERVICE (N52K)

Special tools required:

- 11 9 240

Only the engine oil service will be described in these repair instructions.

The supplementary service is made up of the following operations which must be taken from the relevant repair instructions:

- Reset service interval indicator according to factory specification, see **00 00 ... RESETTING SERVICE INTERVAL INDICATOR ACCORDING TO FACTORY SPECIFICATIONS** .
- Replace microfilter for interior ventilation
- Check brake lining thickness, see **34 00 010 CHECKING THICKNESS OF BRAKE PAD** .

- Adjust handbrake/parking brake, see 34 10 014 ADJUSTING HANDBRAKE .
- Parking brake function check

**IMPORTANT: Adhere to exact filling quantities.
Overfilling the engine with engine oil will result in engine damage.**

Checking and drip-off times must be observed.

**IMPORTANT: When working on the engine oil, coolant or fuel circuit, you must always protect the alternator against contamination.
Risk of damage!**

The alternator must therefore be covered with suitable apparatus.

Recycling:

Catch and dispose of drained engine oil in a suitable container.

Observe country-specific waste-disposal regulations.

NOTE: Adhere to the following work steps in sequence:

1. Open oil filter cap.
2. Release screw plug in oil sump.

NOTE: Picture shows the E93 by way of example. Other model series may differ in certain details.

Release oil filter cap with special tool 11 9 240 .

Engine oil flows out of the oil filter housing and back into the oil sump.



Fig. 18: Special Tool (11 9 240)

Courtesy of BMW OF NORTH AMERICA, INC.

Remove and insert oil filter element (1) in direction of arrow.

Installation:

Replace oil filter element (1) and sealing rings (2).

Installation:

Moisten sealing rings (2) with engine oil.

Tightening torque: 11 42 1AZ, see **11 42 OIL FILTER ELEMENT WITH CONNECTIONS** .

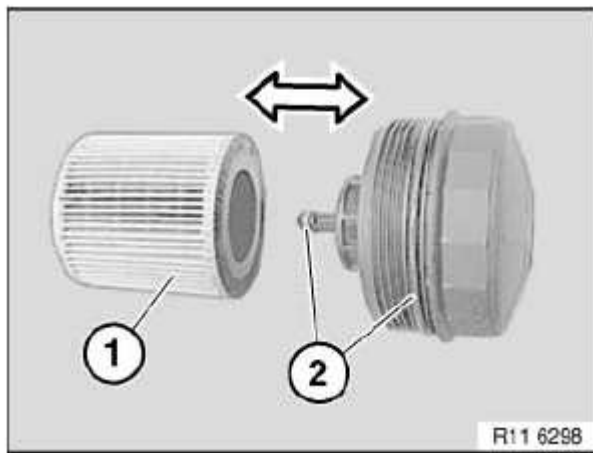


Fig. 19: Sealing Rings

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: For purposes of clarity, the picture shows the assembly underside protection and reinforcement plate removed.

Unclip service opening on reinforcement plate.

Open screw plug (1) in oil sump.

Drain engine oil.

Installation:

Replace sealing ring.

Tightening torque: 11 13 1AZ, see **11 13 OIL PAN** .

Pour in engine oil.

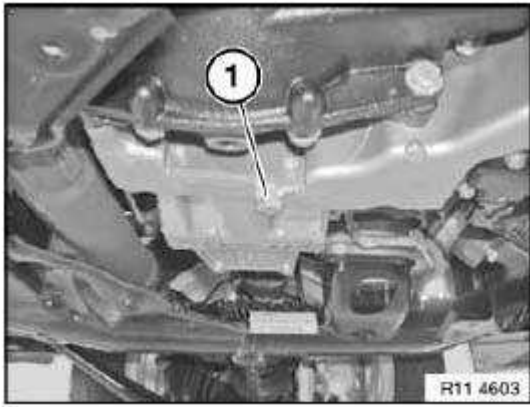


Fig. 20: Screw Plug

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Start engine and run at idle until oil pressure warning lamp goes out.

Turn off engine.

Check oil filter cap and screw plug (1) on oil sump for leaks.

Assemble engine.

Checking engine oil level:

- Park vehicle on a horizontal surface
- Allow engine at normal operating temperature to run for three minutes with increased revs (approx. 1100 RPM)
- Read off engine oil level in instrument cluster or on Control Display
- Top up engine oil if necessary

11 00 REMOVING AND INSTALLING/REPLACING IGNITION COIL COVER (N52K)

Release screws.

Tightening torque: 11 12 6AZ, see **11 12 CYLINDER HEAD WITH CYLINDER HEAD COVER** .

Remove ignition coil cover (1).

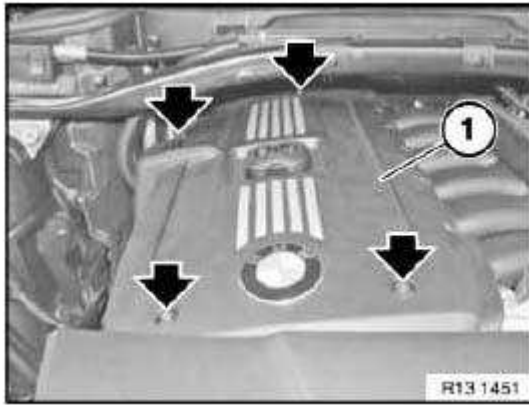


Fig. 21: Ignition Coil Cover

Courtesy of BMW OF NORTH AMERICA, INC.

11 00 670 SECURING ENGINE IN INSTALLATION POSITION (N52)

Special tools required:

- **00 0 200 CROSS MEMBER**
- 00 0 202
- 00 0 204
- 00 0 208
- 11 0 000

WARNING: Danger of injury!

Observe following instructions relating to special tool:

1. Prior to each use, check the special tools for defects, modifications and operational reliability.
2. Damaged/modified special tools must not be used!
3. No changes or modifications may be made to the special tools!
4. Keep special tools dry, clean and free of grease.

Necessary preliminary tasks:

- Secure engine bonnet/hood in service position, see **51 00 ... SERVICE POSITION OF ENGINE HOOD/BONNET (X3)** or **51 00 ... SERVICE POSITION OF ENGINE HOOD/BONNET 9X5)** .
- Remove cover for windscreen cowl panel, see **51 13 115 REMOVING AND INSTALLING/REPLACING COWL PANEL COVER (X3)** or **51 13 116 REMOVING AND INSTALLING/REPLACING COWL PANEL COVER (X5)** .
- Remove microfilter housing
- Remove tension strut on spring strut dome, see **51 71 373 REMOVING AND INSTALLING/REPLACING TENSION STRUT ON SPRING STRUT DOME (X3)** or **51 71 372**

REMOVING AND INSTALLING/REPLACING BOTH TENSION STRUTS ON SPRING STRUT DOMES (X5) .

- Remove acoustic cover
- Remove intake filter housing with rubber gaiter, see **13 71 000 REMOVING AND INSTALLING/REPLACING INTAKE FILTER HOUSING (N52K) (X3)** or **13 71 000 REMOVING AND INSTALLING/REPLACING INTAKE FILTER HOUSING (N52K) (X5)** .

Assemble cross member 00 0 200 with special tools 00 0 202 , 00 0 204 , 00 0 208 .

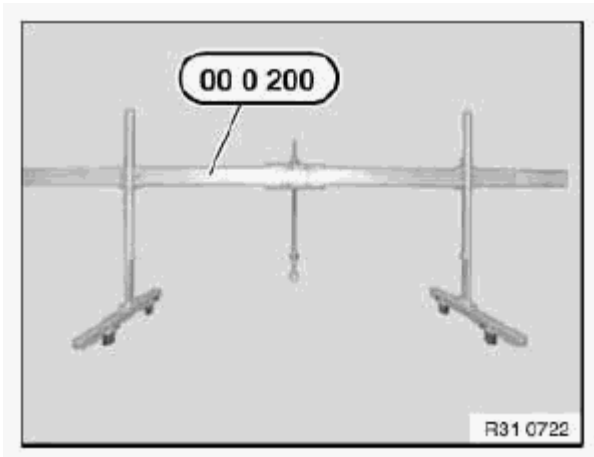


Fig. 22: Special Tool (00 0 200)

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Use towing hook (72 15 8 108 670).

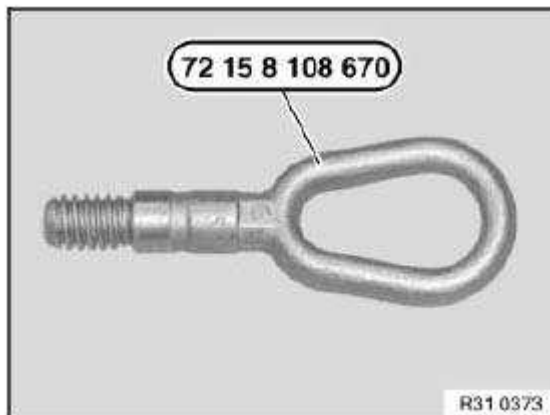


Fig. 23: Towing Hook (72 15 8 108 670)

Courtesy of BMW OF NORTH AMERICA, INC.

Cut open cable tie (2).

Detach quick-release fastener (1) and place vent line (3) to one side.

Installation:

Make sure the quick-release fastener is fitted correctly.

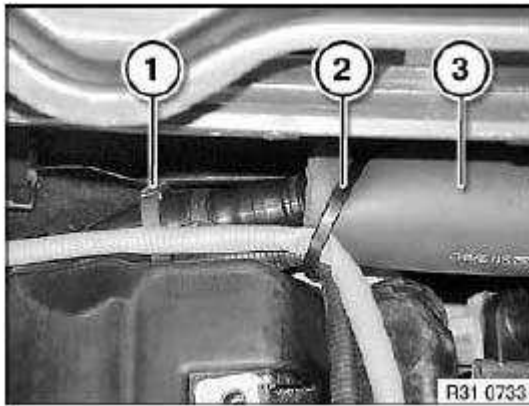


Fig. 24: Open Cable Tie, Quick-Release Fastener And Vent Line
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Avoid a change of engine position in the transverse or longitudinal direction. Always make sure there is sufficient clearance between the engine (or its attachment parts) and the body.

IMPORTANT: Risk of damage!
With the aid of an assistant and the supports (1), place cross member 00 0 200 on the screw connections of the side panels.

Screw in towing hook (2) and tighten down to approx. 30 Nm.

Secure special tool 11 0 000 to spindle 00 0 202 .

Fit suitable chains to special tool 11 0 000 and attach to towing hook (2) or engine lifting eye.

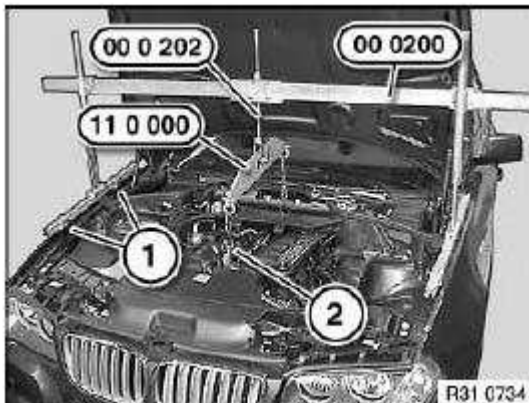


Fig. 25: Special Tools (00 0 202), (00 0 200) And (11 0 000)

Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Danger of injury!
Tighten down all adjusting screws and nuts on cross member 00 0 200 .

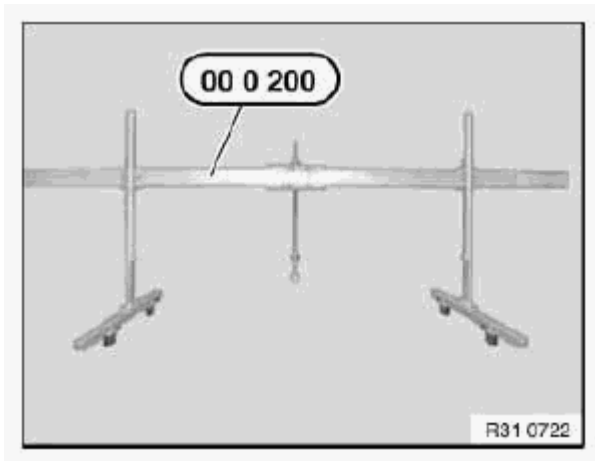


Fig. 26: Special Tool (00 0 200)

Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew nuts (1).

Raise engine approx. 10 mm with cross member.

Installation:

Replace self-locking nuts.

Tightening torque: 22 11 2AZ, see **22 11 ENGINE SUSPENSION** .

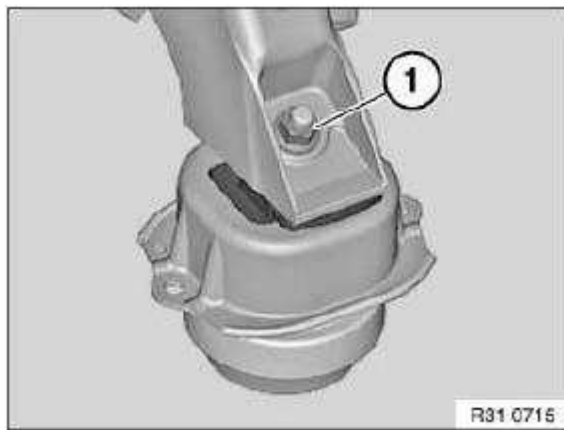


Fig. 27: Cross Member Nut

Courtesy of BMW OF NORTH AMERICA, INC.

12 CYLINDER HEAD WITH COVER

11 12 000 REMOVING AND INSTALLING/SEALING CYLINDER HEAD COVER (N52K)

IMPORTANT: Aluminium-magnesium materials

- No steel screws/bolts may be used due to the threat of electrochemical corrosion.
- A magnesium crankcase requires aluminum screws/bolts exclusively.
- Aluminum screws/bolts must be replaced each time they are released.
- Aluminum screws/bolts are permitted with and without color coding (blue).
- For reliable identification: Aluminum screws/bolts are not magnetic.
- Jointing torque and angle of rotation must be observed without fail (risk of damage).

Necessary preliminary tasks:

- Remove ignition coils. See 12 13 511 REPLACING IGNITION COIL (N52, N52K, N51) .
- Release ignition wiring harness in cylinder head cover area. See 12 51 100 REPLACING WIRING HARNESS SECTION FOR IGNITION COIL (N52K) .
- Remove tension strut.

Unlock and detach vent hose (1). If necessary, pull off metal bracket (2) in direction of arrow. Release screws (3) on electric servomotor. Tightening torque, see 11 37 3AZ in 37 VARIABLE VALVE GEAR .

NOTE: A further screw, which cannot be seen in the picture, must be released under the electric servomotor (4).

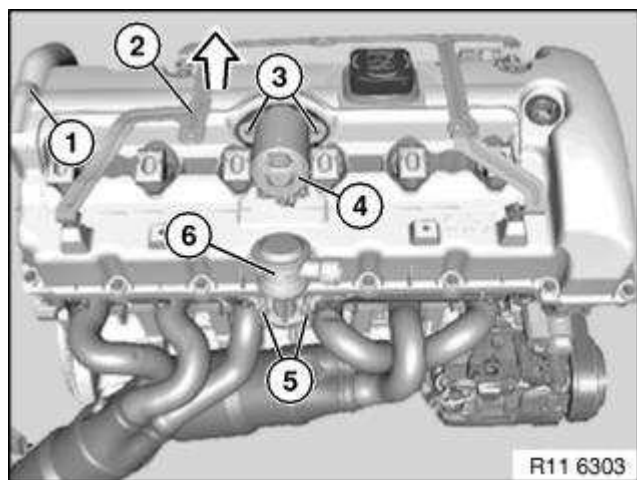


Fig. 28: Pull Off Metal Bracket (2) In Direction Of Arrow
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw on electric servomotor. Tightening torque, see 11 37 3AZ in **37 VARIABLE VALVE GEAR** . Remove servomotor (4) in direction of arrow. If necessary, release nuts (5). Tightening torque, see 11 72 1AZ in **72 AIR PUMP, LINES AND CONTROL VALVE** . If necessary, remove secondary air valve (6).

IMPORTANT: Observe different screw lengths. Installation location of screws (1 and 2) is specified by the different bushing shapes.

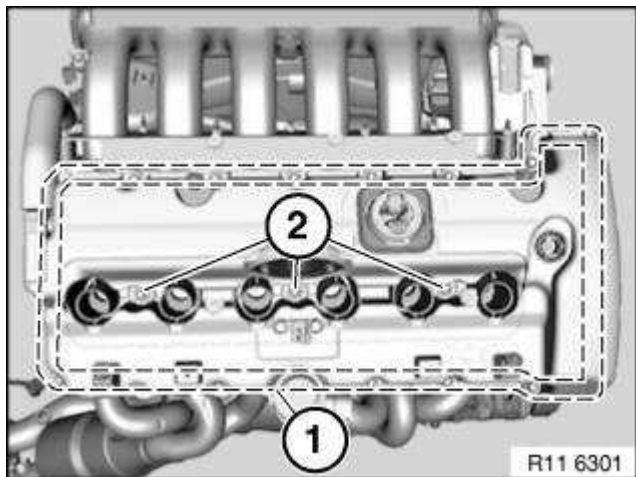


Fig. 29: Installation Location Of Screws (1 And 2) Is Specified By The Different Bushing Shapes
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws in area (1). Tightening torque, see 11 12 5AZ in **12 CYLINDER HEAD WITH COVER** .
Installation: Replace aluminum screws.

Release threaded pin (2). Tightening torque, see 11 12 5AZ in **12 CYLINDER HEAD WITH COVER** .
Installation: Replace aluminum screws.

Installation: Slotted sleeves (2) for guiding ignition coils in cylinder head cover (1) must be replaced. Remove slotted sleeves (2).

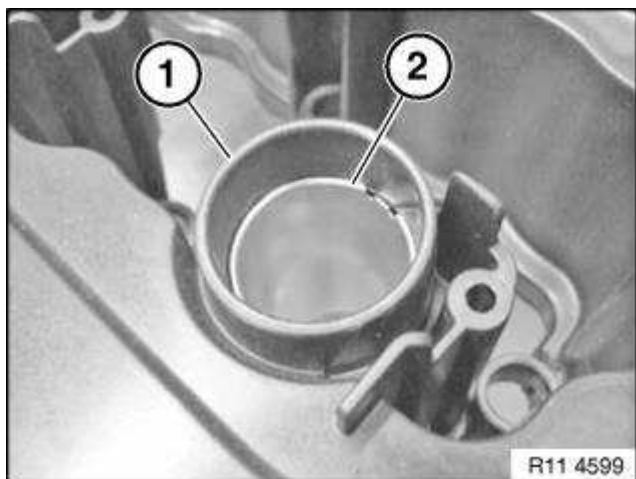


Fig. 30: Slotted Sleeves (2) For Guiding Ignition Coils In Cylinder Head Cover (1) Must Be Replaced

Courtesy of BMW OF NORTH AMERICA, INC.

Installation: Clean all sealing faces (1 and 2).

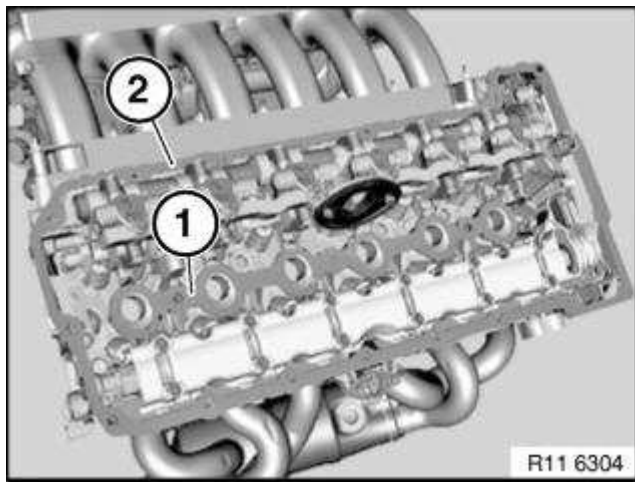


Fig. 31: Clean All Sealing Faces (1 And 2)

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not use any metal-cutting tool

Installation: Replace gaskets (1 and 2).

Assemble engine.

11 12 100 REMOVING AND INSTALLING CYLINDER HEAD (N52K)

Special tools required:

- 11 0 320
- 11 4 420
- 11 4 430
- 11 4 471
- 11 4 472
- 11 8 580

IMPORTANT: Aluminium-magnesium materials.

No steel screws/bolts may be used due to the threat of electrochemical corrosion.

A magnesium crankcase requires aluminum screws/bolts exclusively.

Aluminum screws/bolts must be replaced each time they are released.

The end faces of aluminum screws/bolts are painted blue for the purposes of reliable identification.

Jointing torque and angle of rotation must be observed without fail (risk of

damage).

Necessary preliminary tasks:

- Remove exhaust system, see **EXHAUST SYSTEM COMPLETE** .
- Drain coolant, see **17 00 005 DRAINING AND ADDING COOLANT IN RADIATOR (N52K) (X5)**
or **17 00 005 DRAINING AND ADDING COOLANT (N52K) (X3)** .
- Drain off engine oil
- Remove both exhaust manifolds
- Remove intake air manifold
- Detach coolant hoses from cylinder head
- Remove inlet and exhaust adjustment unit

**IMPORTANT: Fit new cylinder head screws.
Do not wash off bolt coating.
There must be no coolant, water or engine oil in the pocket holes.**

Risk of corrosion and cracking!

Release screws (1).

Unclip timing chain module (2) at junction (3) and remove towards top.

Set down timing chain.

**IMPORTANT: If the timing chain is stowed in the gearcase, the crankshaft must no longer be rotated.
This would cause the timing chain on the crankshaft sprocket wheel to jam or jump.**

Installation:

The timing chain is lifted out with a hook only during assembly.

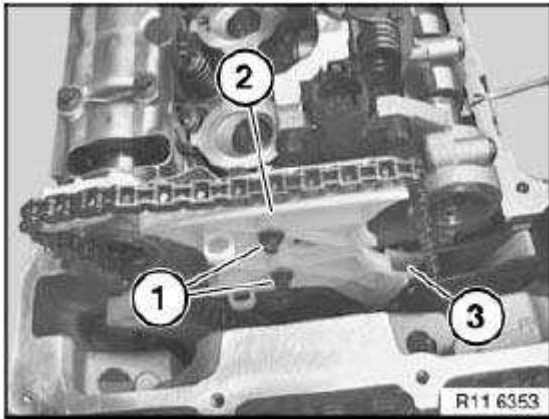


Fig. 32: Timing Chain Module, Junction And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release bolts (2) for eccentric shaft sensor (1).

Remove eccentric shaft sensor (1) towards front.

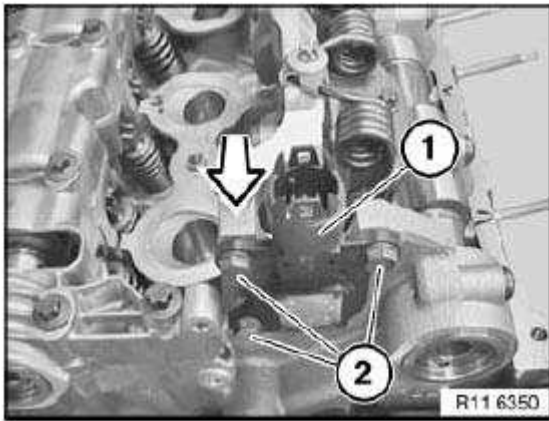


Fig. 33: Removing Eccentric Shaft Sensor
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Screw (1) is not magnetic and must be secured against falling down.

Release screw (1).

Remove magnet wheel (2) towards front.

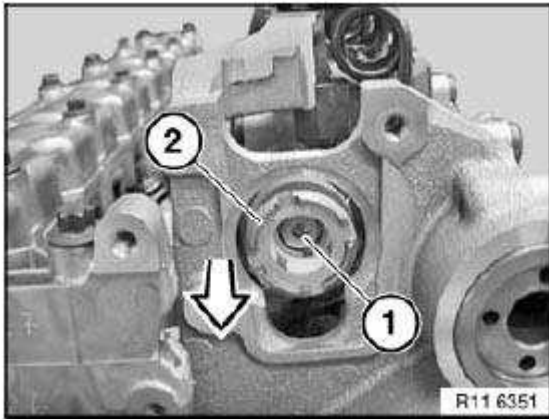


Fig. 34: Removing Magnet Wheel

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Magnet wheel (1) is highly magnetic and must be protected against metal filings/borings.

After removing, place magnet wheel (1) in a plastic bag (2) with a seal.

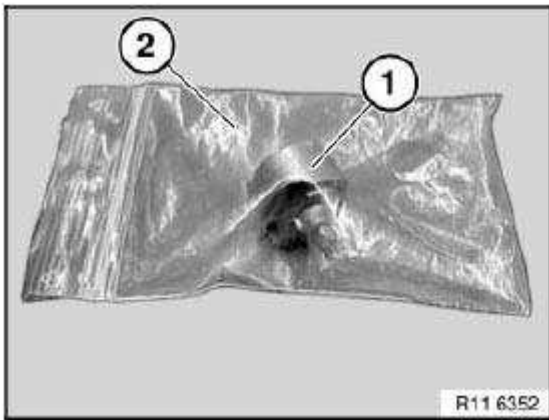


Fig. 35: Magnet Wheel And Plastic Bag

Courtesy of BMW OF NORTH AMERICA, INC.

Pretension eccentric shaft (1) upwards in direction of arrow.

Remove stop screw between 1st and 2nd cylinders.

Tightening torque: 11 37 5AZ, see **11 37 VARIABLE VALVE GEAR** .

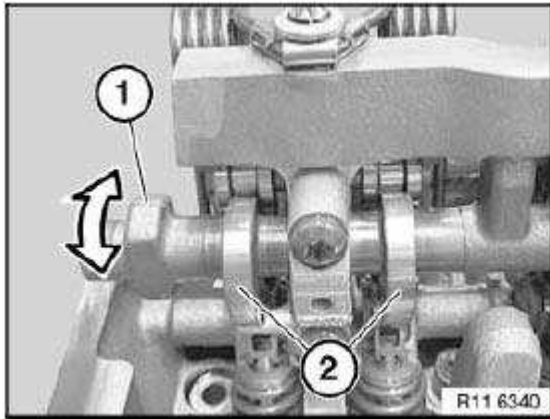


Fig. 36: Eccentric Shaft

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Bolt (2) can only be released when the timing chain module is pressed forward slightly.

IMPORTANT: Secure bolt (2) with a gripper against falling down.

Release screw (2).

Tightening torque: 11 12 3AZ, see **11 12 CYLINDER HEAD WITH CYLINDER HEAD COVER** .

Release screws (1).

Tightening torque: 11 12 4AZ, see **11 12 CYLINDER HEAD WITH CYLINDER HEAD COVER** .

Installation:

Replace aluminum screws.

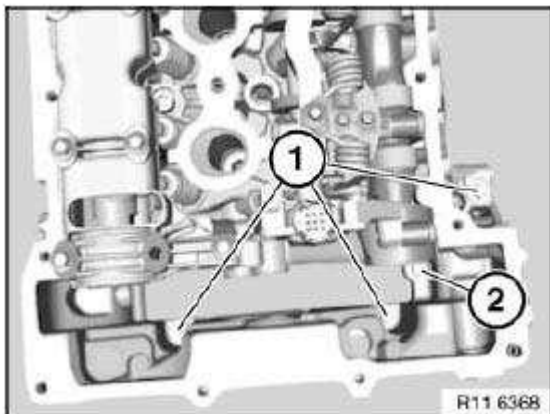


Fig. 37: Bolt

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Observe different bolt heads.

Release M10 cylinder head bolts (1) with special tool 11 8 580 .

Release M9 cylinder head bolts (2) with special tool 11 4 420 .

NOTE: Picture shows inlet and exhaust camshafts removed.

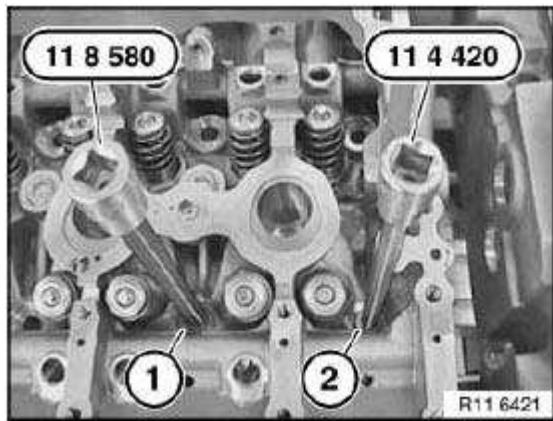


Fig. 38: Special Tools (11 8 580) And (11 4 420)
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Observe different M9 bolt lengths (1 and 3).

Release M9 cylinder head bolts (1 and 3) with special tool 11 4 420 .

Tightening torque: 11 12 2AZ, see **11 12 CYLINDER HEAD WITH CYLINDER HEAD COVER** .

Release M10 cylinder head bolts (2) with special tool 11 8 580 from outside inwards.

Tightening torque: 11 12 1AZ, see **11 12 CYLINDER HEAD WITH CYLINDER HEAD COVER** .

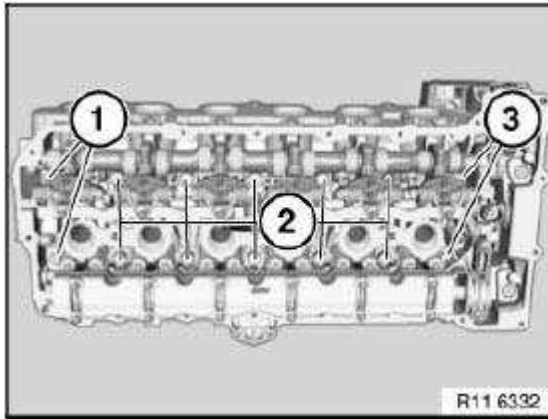


Fig. 39: Cylinder Head Bolts

Courtesy of BMW OF NORTH AMERICA, INC.

**IMPORTANT: All cylinder head bolts (1, 2 and 3) must be replaced.
Jointing torque and angle of rotation must be observed without fail.
Risk of damage!**

Secure special tool 11 0 320 with existing cylinder head cover bolts (1).

Tightening torque: 11 12 5AZ, see **11 12 CYLINDER HEAD WITH CYLINDER HEAD COVER** .

**IMPORTANT: Removing and install cylinder head with a second person helping.
Weight of cylinder head with add-on parts is approx. 40 kg.
Do not rest cylinder head on sealing surface. Risk of damage to valves!**

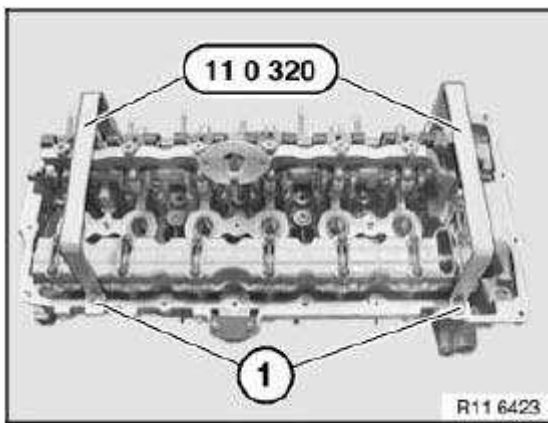


Fig. 40: Special Tool (11 0 320)

Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool 11 4 430 into bores.

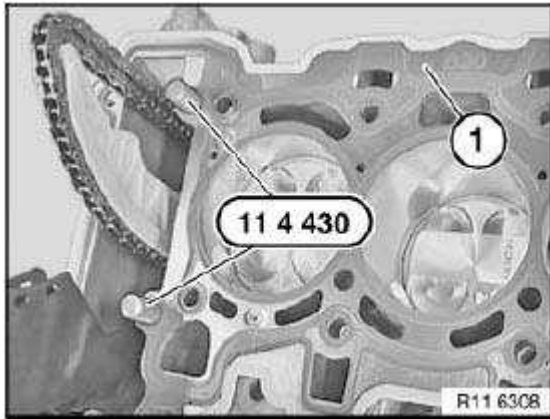


Fig. 41: Special Tool (11 4 430)

Courtesy of BMW OF NORTH AMERICA, INC.

Remove coarse residues on sealing faces with special tool 11 4 471 from cylinder head and crankcase.

IMPORTANT: Do not use any metal-cutting tools.

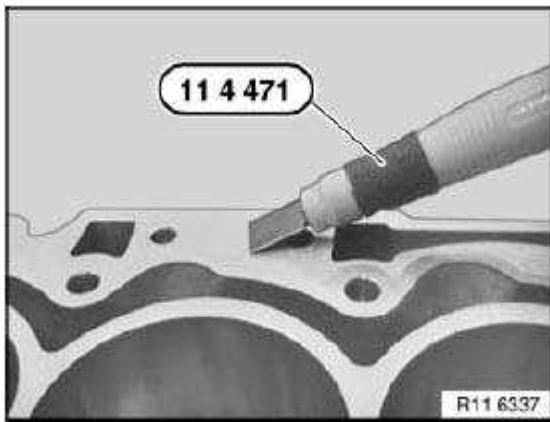


Fig. 42: Special Tool (11 4 471)

Courtesy of BMW OF NORTH AMERICA, INC.

Remove fine residues on sealing faces with special tool 11 4 472 from cylinder head and crankcase.

IMPORTANT: Do not use any metal-cutting tools.

There must be no coolant, water or engine oil in the pocket holes.

Risk of corrosion and cracking!

Clean all pocket holes.

Replace cylinder head gasket.

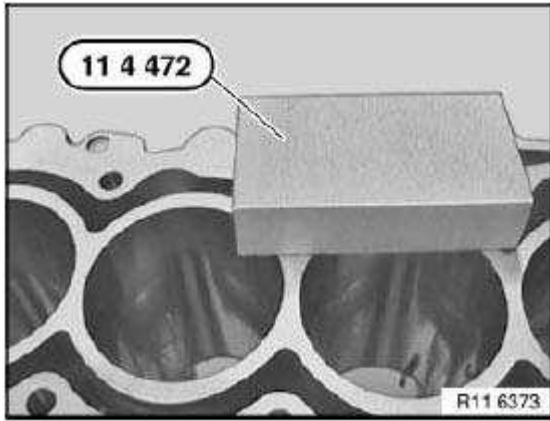


Fig. 43: Special Tool (11 4 472)

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Observe sequence for tightening cylinder head bolts without fail.

Fit new cylinder head screws.

Insert cylinder head bolts (1 to 10) with special tool 11 8 580 .

Tightening torque: 11 12 1AZ, see **11 12 CYLINDER HEAD WITH CYLINDER HEAD COVER .**

Insert cylinder head bolts (11 to 14) with special tool 11 4 420 .

Tightening torque: 11 12 2AZ, see **11 12 CYLINDER HEAD WITH CYLINDER HEAD COVER .**

NOTE: Picture shows inlet and exhaust camshafts removed.

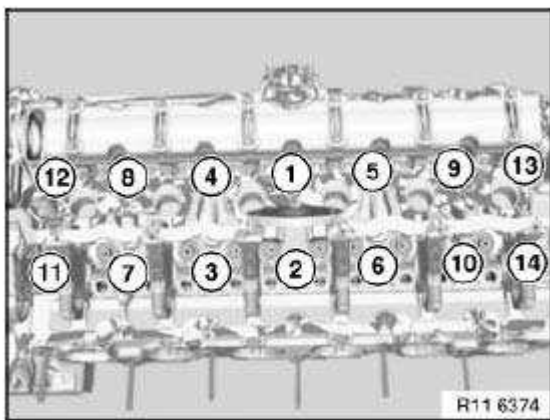


Fig. 44: Cylinder Head Bolts Tightening Sequence

Courtesy of BMW OF NORTH AMERICA, INC.

Observe sequence for tightening cylinder head bolts without fail.

IMPORTANT: The 2nd torsion angle relates only to cylinder head bolts 1 to 10.

Installation:

- Jointing torque:

All cylinder head bolts 1 to 14 to 30 Nm

- 1st angle of rotation:

All cylinder head bolts 1 to 14 to 90°

- 2nd angle of rotation:

Only cylinder head bolts 1 to 10 to 90°

- 3rd angle of rotation:

All cylinder head bolts 1 to 14 to 45°

Insert bolts (1).

Tightening torque: 11 12 4AZ, see **11 12 CYLINDER HEAD WITH CYLINDER HEAD COVER** .

IMPORTANT: Secure bolt (2) with a gripper against falling down.

Insert bolt (2).

Tightening torque: 11 12 3AZ, see **11 12 CYLINDER HEAD WITH CYLINDER HEAD COVER** .

Installation:

Replace aluminum screws.

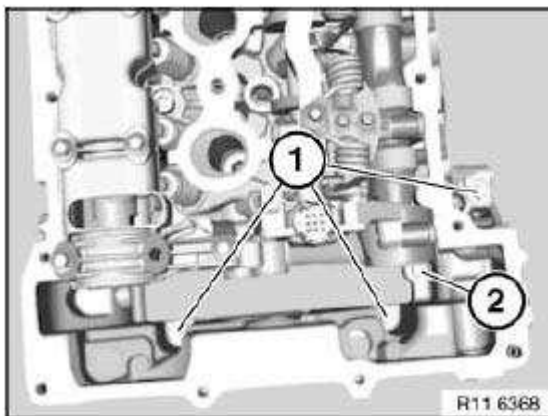


Fig. 45: Bolt

Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 12 101 REPLACING CYLINDER HEAD GASKET (N52K)

Special tools required:

- 11 4 430
- 11 4 470

IMPORTANT: Aluminium-magnesium materials.

No steel screws/bolts may be used due to the threat of electrochemical corrosion.

A magnesium crankcase requires aluminum screws/bolts exclusively.

Aluminum screws/bolts must be replaced each time they are released .

The end faces of aluminum screws/bolts are painted blue for the purposes of reliable identification.

Jointing torque and angle of rotation must be observed without fail (risk of damage) .

Necessary preliminary tasks:

- Remove cylinder head, see **11 12 100 Removing and installing cylinder head (N52K)**.

Insert special tool 11 4 430 into bores.

Remove cylinder head seal.

IMPORTANT: Check marking (1) on cylinder head gasket (B25 or B30).

- **B = petrol/gasoline engine**
- **30= displacement (3 liters)**

Do not mix them up as this will cause engine damage .

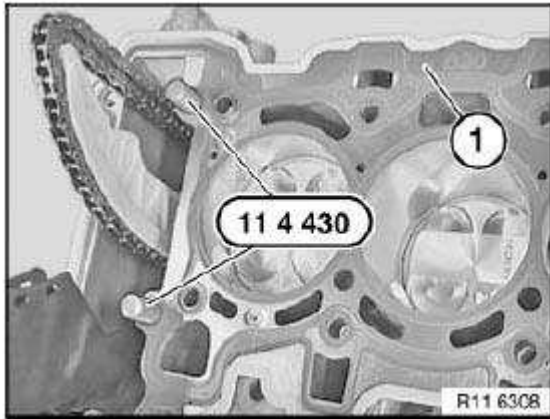


Fig. 46: Special Tool (11 4 430)

Courtesy of BMW OF NORTH AMERICA, INC.

Remove remnants of oil and dirt from pocket holes (1).

**IMPORTANT: Work on sealing face on engine block and on cylinder head with special tool 11 4 470 only.
Do not use any metal-cutting tools.**

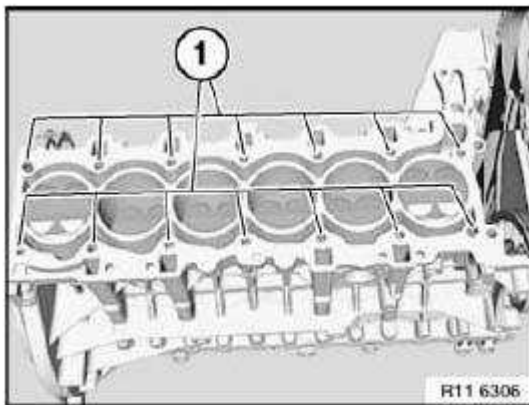


Fig. 47: Pocket Holes

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Rubber coating (2) on cylinder head gasket (3) must not under any circumstances be damaged (electrochemical corrosion).

Cylinder head gasket (3) is a sheet-metal gasket.

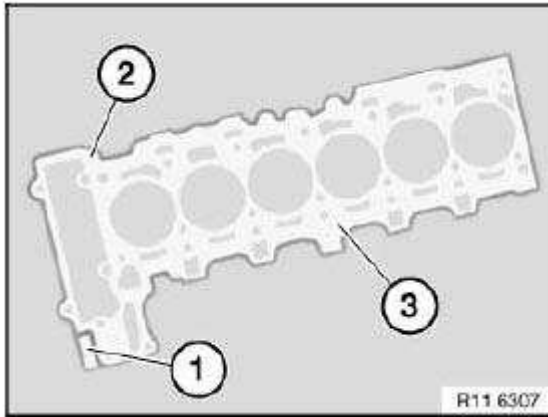


Fig. 48: Rubber Coating And Cylinder Head Gasket
 Courtesy of BMW OF NORTH AMERICA, INC.

Check adapter sleeves (1) for damage and firm seating.

Place cylinder head gasket (2) in direction of arrow on engine block.

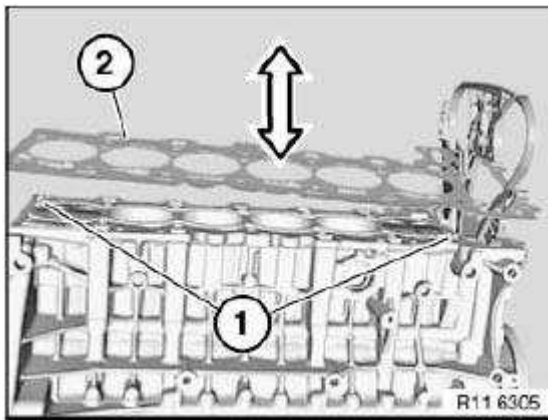


Fig. 49: Cylinder Head Gasket And Adapter Sleeves
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Check cylinder head for deviation from flatness, see 11 12 719 Resurfacing cylinder head sealing face (N52K).
 Check cylinder head for water leaks, see 11 12 729 Checking cylinder head for water leaks (N52K).

Assemble engine.

11 12 719 RESURFACING CYLINDER HEAD SEALING FACE (N52K)

Necessary preliminary tasks:

- Remove cylinder head, see 11 12 100 Removing and installing cylinder head (N52K).

- Remove exhaust camshaft, see [11 31 028 Removing and installing/replacing exhaust camshaft \(N52K\)](#).
- Remove intermediate lever on inlet side, see [11 37 010 Removing and installing/replacing intermediate levers \(N52K\)](#).

Check evenness of cylinder head sealing faces with a standard straight-edge (1).

NOTE: Max. deviation from level (longitudinal) 0.10 mm

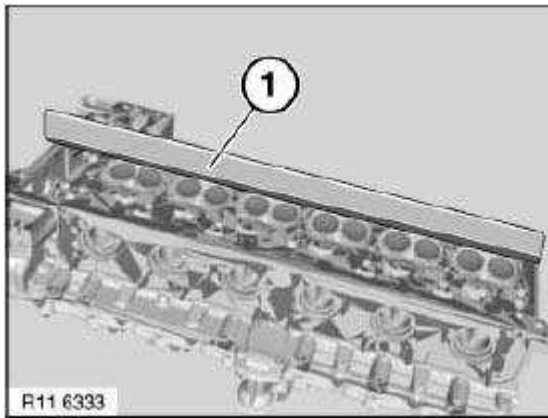


Fig. 50: Standard Straight-Edge On Cylinder Head Sealing Faces
 Courtesy of BMW OF NORTH AMERICA, INC.

Check evenness of cylinder head sealing faces with a standard straight-edge (1).

NOTE: Max. deviation from level (transversal) 0.05 mm

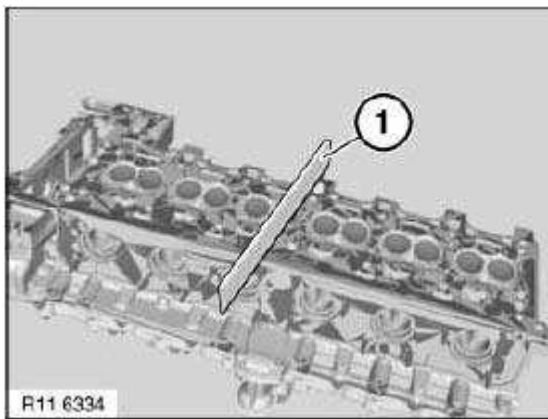


Fig. 51: Standard Straight-Edge On Cylinder Head Sealing Faces
 Courtesy of BMW OF NORTH AMERICA, INC.

Check cylinder head for water leaks, see [11 12 729 Checking cylinder head for water leaks \(N52K\)](#).

Assemble engine.

11 12 729 CHECKING CYLINDER HEAD FOR WATER LEAKS (N52K)

Special tools required:

- 11 4 341
- 11 4 342
- 11 4 344
- 11 4 345

IMPORTANT: Pressure-test cylinder head to max. 3 bar.
Heat cylinder head to 60°.
Check for bubble formation in a water bath.

Necessary preliminary tasks:

- Remove cylinder head, see 11 12 100 Removing and installing cylinder head (N52K).
- Disassemble cylinder head, see 11 34 560 Replacing all valve stem seals (N52K).

NOTE: Observe mounting of special tool 11 4 341 on cylinder.

Secure special tool 11 4 341 with bolts 11 4 345 to 25 Nm.

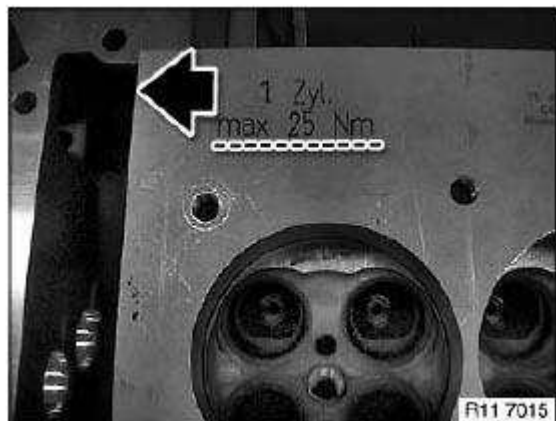


Fig. 52: Cylinder Head

Courtesy of BMW OF NORTH AMERICA, INC.

Install special tool 11 4 341 with special tool 11 4 345 .

Installation:

Cylinder no. 1 is marked.

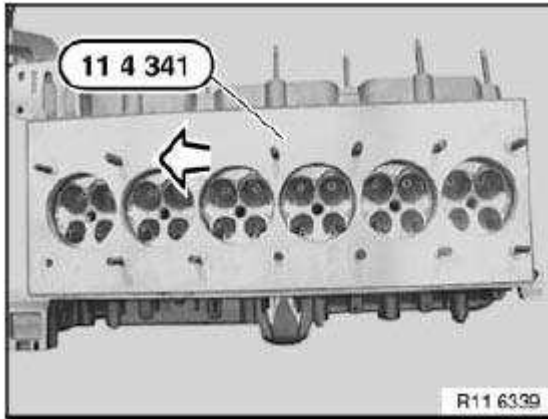


Fig. 53: Special Tool (11 4 341)
Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool 11 4 342 with bolts (1). Screw in knurled screw in direction of arrow.

Sealing flange must rest flat.

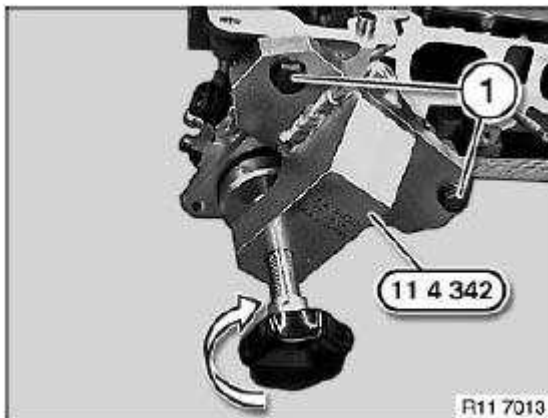


Fig. 54: Special Tool (11 4 342) With Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Secure special tool 11 4 344 with bolts (1).

NOTE: **Compressed air at valve max. 3 bar.**
 Heat cylinder head to 60°.
 Check for bubble formation in a water bath.

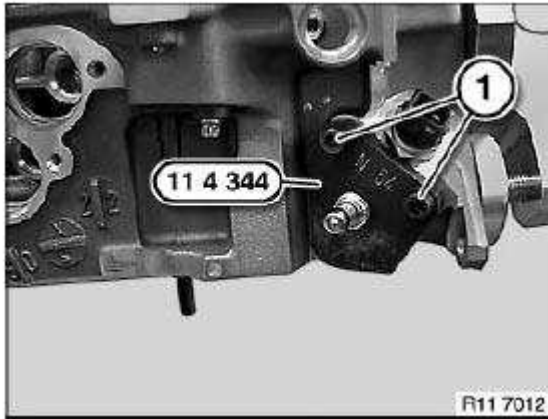


Fig. 55: Special Tool (11 4 344) With Bolts
 Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

13 OIL SUMP

11 13 000 REMOVING AND INSTALLING, SEALING OR REPLACING OIL SUMP (N52K)

IMPORTANT: Aluminium-magnesium materials.

No steel screws/bolts may be used due to the threat of electrochemical corrosion.

A magnesium crankcase requires aluminum screws/bolts exclusively.

Aluminum screws/bolts must be replaced each time they are released.

The end faces of aluminum screws/bolts are painted blue for the purposes of reliable identification.

Jointing torque and angle of rotation must be observed without fail.

Risk of damage!

Necessary preliminary tasks:

- Lower front axle, see **31 11 506 LOWERING/RAISING FRONT AXLE CARRIER (X3)** or **31 11 506 LOWERING/RAISING FRONT AXLE CARRIER (UNIVERSAL LIFTER) (X5)**
- Remove front differential, see **31 50 001 REMOVING AND INSTALLING/REPLACING FRONT DIFFERENTIAL (X3)** or **31 50 001 REMOVING AND INSTALLING/REPLACING FRONT DIFFERENTIAL (X5)**.

Release screw (1) from grounding cable (2) on right bearing block (3).

Lay grounding cable (2) to one side.

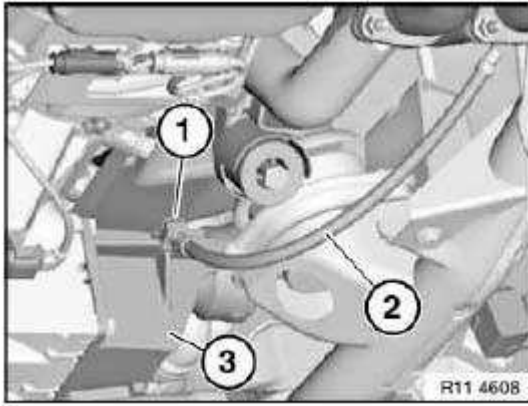


Fig. 56: Grounding Cable, Bearing Block And Screw
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Picture shows an E92 by way of example. Other model series may differ in certain details.

Unclip electric leads (2) of oxygen monitor sensors from holder (3).

Disconnect plug connections (1) of oxygen monitor sensors and lay to one side.

Release bolts (5) on transmission.

Tightening torque: 11 13 5AZ, see **11 13 OIL PAN** .

Disconnect plug connection (4) on oil level sensor.

Lay holder (3) to one side.

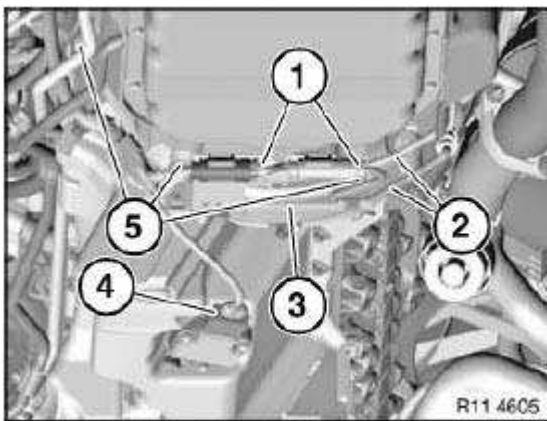


Fig. 57: Plug Connections, Holder, Electric Leads And Bolts
 Courtesy of BMW OF NORTH AMERICA, INC.

For vehicles with optional extra SA205 (automatic transmission):

NOTE: Transmission fluid cooler lines (2) (supply and return) are secured to the oil sump with two holders (3).

If necessary, release oil pump and lay to one side.

Unscrew nuts (1).

Tightening torque: 11 13 6AZ, see 11 13 OIL PAN .

Release holders (3) with transmission fluid cooler lines (2) from oil sump guides.

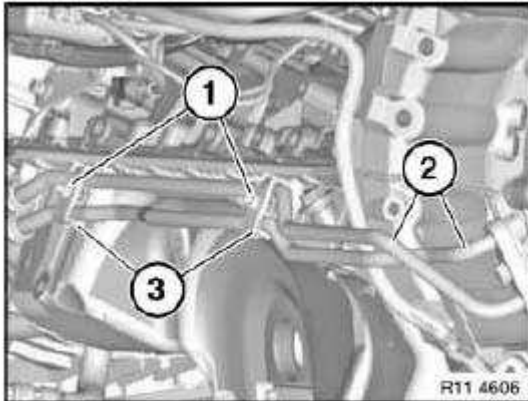


Fig. 58: Fluid Cooler Lines, Holders And Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

For all vehicles:

NOTE: For purposes of clarity, the picture shows the front axle carrier and stabilizer bar removed.

Unscrew nut (3).

Tightening torque: 11 13 7AZ, see 11 13 OIL PAN .

Release screw (2).

Tightening torque: 11 13 8AZ, see 11 13 OIL PAN .

Release both holders with coolant hose (1) from oil sump guide.

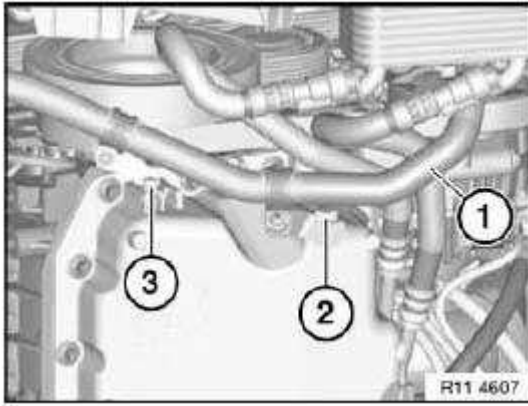


Fig. 59: Coolant Hose, Screw And Nut
 Courtesy of BMW OF NORTH AMERICA, INC.

**IMPORTANT: Bolts of oil sump have different lengths.
 Observe different tightening torques.**

Release bolts along line (1).

Tightening torque: 11 13 2AZ, see 11 13 OIL PAN .

Tightening torque: 11 13 3AZ, see 11 13 OIL PAN .

Installation:

Replace aluminum screws.

If necessary, remove oil level sensor (2) and right bearing block (3).

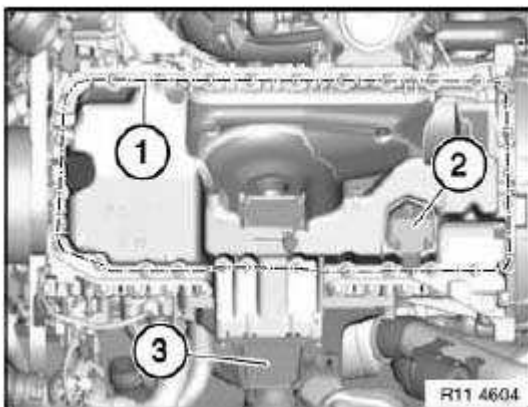


Fig. 60: Oil Level Sensor And Bearing Block
 Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: There must be no adhesive residues in the bedplate retaining threads.

Clean retaining threads.

Installation:

Replace all seals.

Assemble engine.

14 HOUSING COVER

11 14 005 REPLACING FRONT CRANKSHAFT RADIAL SEAL (N52K)

Special tools required:

- 11 9 221
- 11 9 222
- 11 9 223
- 11 9 224
- 11 9 231
- 11 9 232
- 11 9 233

Necessary preliminary tasks:

- Remove VIBRATION DAMPER

IMPORTANT: Do not release central bolt.

If the central bolt is released, the sprocket wheels of the timing chain and the oil pump will no longer be non - positively connected to the crankshaft. Inlet and exhaust camshafts can turn in relation to crankshaft.

Risk of damage!

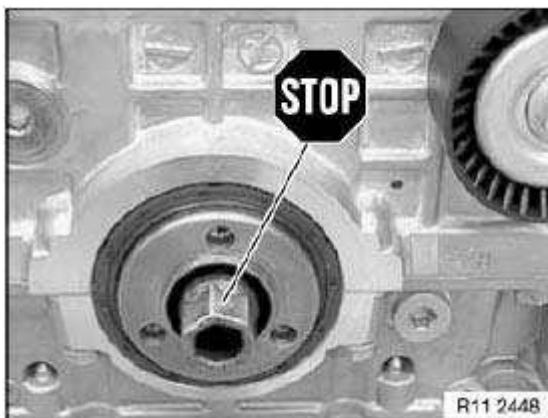


Fig. 61: Central Bolt

Courtesy of BMW OF NORTH AMERICA, INC.

Turn back special tool 11 9 222 .

Push special tool 11 9 221 onto crankshaft.

IMPORTANT: When screws are tightened down (special tool 11 9 224) , crankshaft radial seal is pressed inwards approx. 1 mm and thus slackened for subsequent removal.

Insert screws (special tool 11 9 224) and tighten down to approx. 20 Nm.

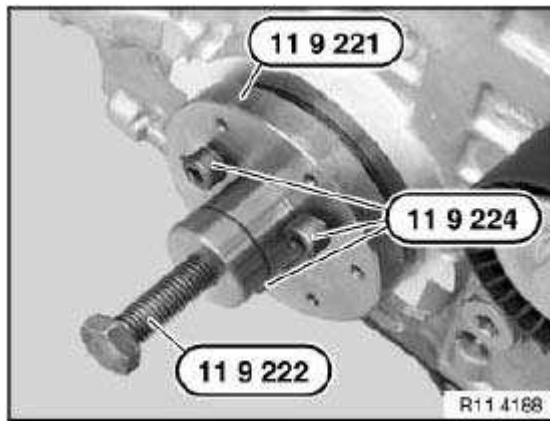


Fig. 62: Special Tools (11 9 221), (11 9 222) And (11 9 224)

Courtesy of BMW OF NORTH AMERICA, INC.

Insert screws (special tool 11 9 223) and screw in until they make contact without play.

IMPORTANT: Do not overload special tool 11 9 223 (metal screws).

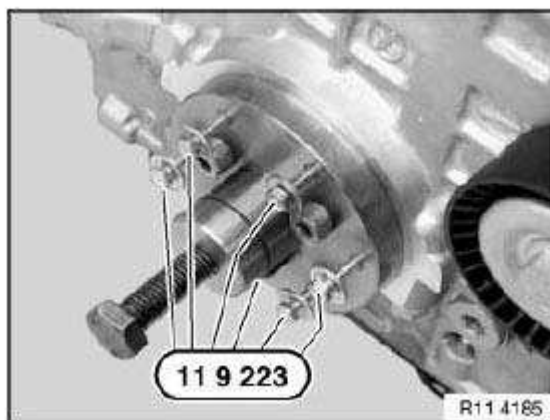


Fig. 63: Special Tool (11 9 223)

Courtesy of BMW OF NORTH AMERICA, INC.

Remove screws (special tool 11 9 224).

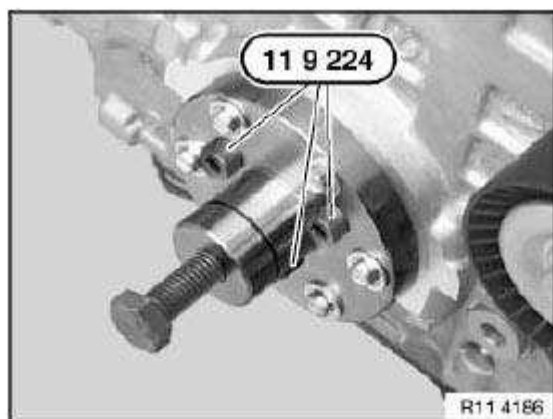


Fig. 64: Special Tool (11 9 224)
Courtesy of BMW OF NORTH AMERICA, INC.

Insert screw (special tool 11 9 222) carefully and slowly withdraw crankshaft radial seal (1).

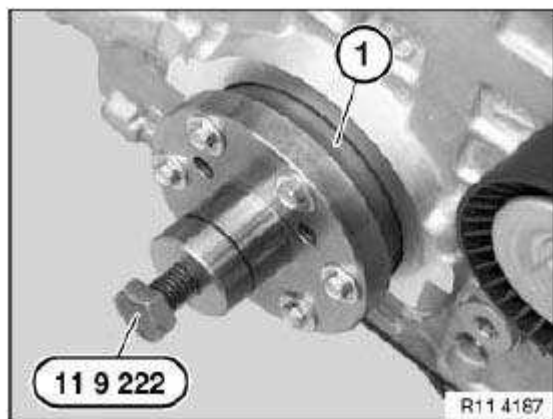


Fig. 65: Special Tool (11 9 222)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Clean sealing surface (1) and degrease thoroughly in area of housing partition.

Apply a light coat of oil to running surface (2) of crankshaft radial seal.

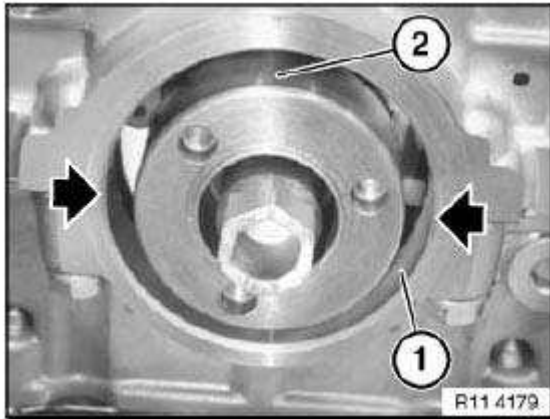


Fig. 66: Sealing And Running Surface
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Support bushing (1) is contained in scope of delivery of crankshaft radial seal (2).
 When crankshaft radial seal (2) is installed, only support bushing (1) may be used as a slip bushing.

Crankshaft radial seal (2) has a groove on both left and right sides.

IMPORTANT: After installation, the grooves must be filled with sealing compound.

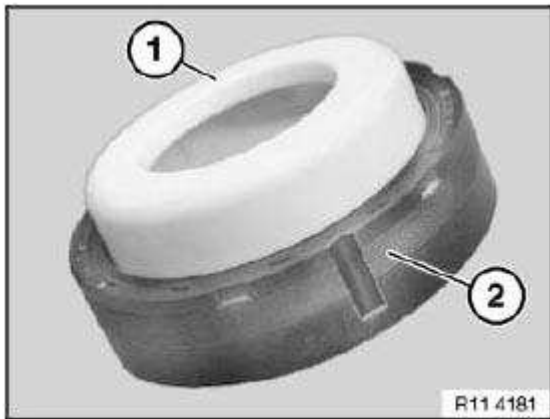


Fig. 67: Crankshaft Radial Seal And Support Bushing
 Courtesy of BMW OF NORTH AMERICA, INC.

Attach support bushing (2) with crankshaft radial seal (1).

Push on crankshaft radial seal (1) in direction of arrow.

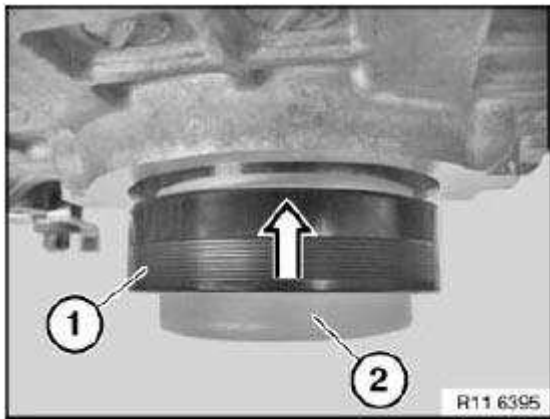


Fig. 68: Pushing Crankshaft Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Pay attention to opening on crankshaft radial seal (1) on left and right.

Remove support bushing (2).

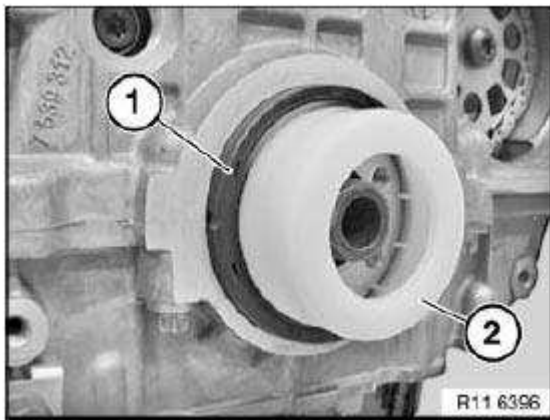


Fig. 69: Crankshaft Radial Seal And Support Bushing
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: The following text describes installation and sealing between the engine block and crankshaft radial seal.
The engine block will not be leakproof at the outside of the crankshaft radial seal if you fail to comply with the individual work steps and the work sequence.

NOTE: The required parts are available from the BMW Parts Service (EPC).

Remove screw caps (1) from injector (2).

Screw on metering needle.

Insert piston for pressing out.

Injector (2) contains the sealing compound Loctite, manufacturer's number 128357.

Bottle (3) contains the primer Loctite, manufacturer's number 171000.

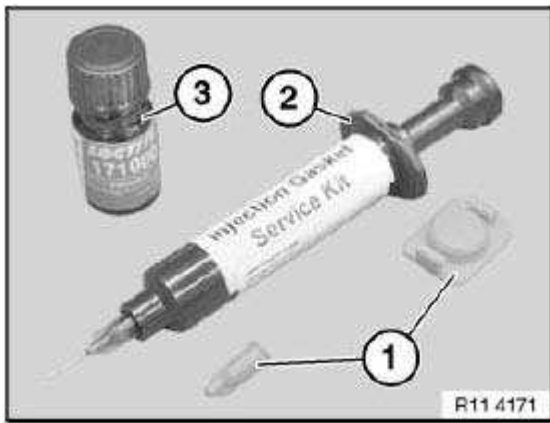


Fig. 70: Screw Caps, Injector And Bottle
Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool 11 9 232 .

Coat both grooves on crankshaft radial shaft seal with Loctite primer, manufacturer's number 171000, and expose to air for approx. one minute.

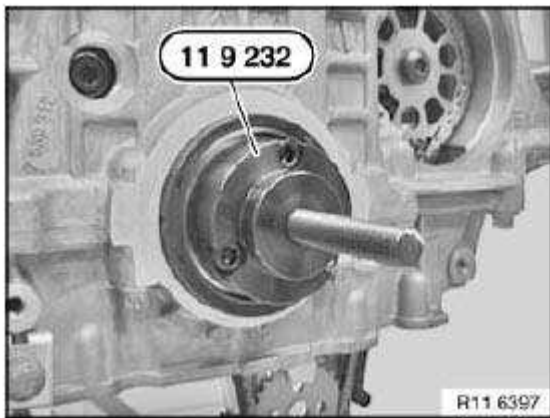


Fig. 71: Special Tool (11 9 232)
Courtesy of BMW OF NORTH AMERICA, INC.

Draw in crankshaft radial seal with special tool 11 9 231 in conjunction with special tool 11 9 233 until flush.

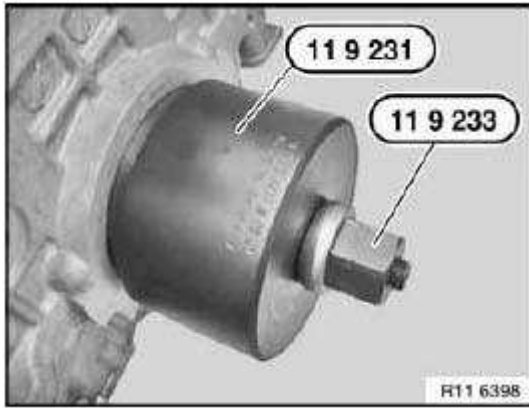


Fig. 72: Crankshaft Radial Seal And Support Bushing
Courtesy of BMW OF NORTH AMERICA, INC.

Before filling with sealing compound:

Moisten brush with Loctite primer, manufacturer's number 171000. Insert brush as far as possible into grooves (1) on crankshaft radial seal in order to coat housing partition on engine block.

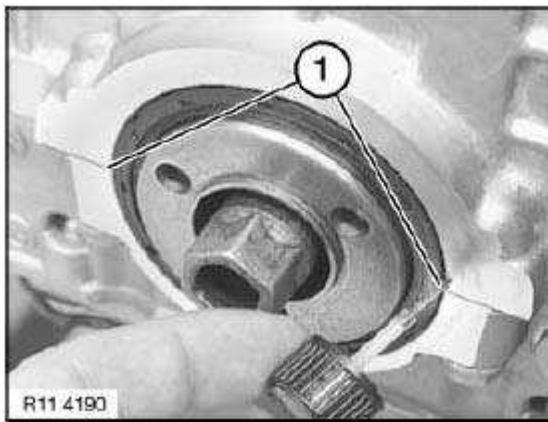


Fig. 73: Grooves On Crankshaft Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Using injector (2), fill both grooves (3) flush with Loctite sealing compound, manufacturer's number 128357.

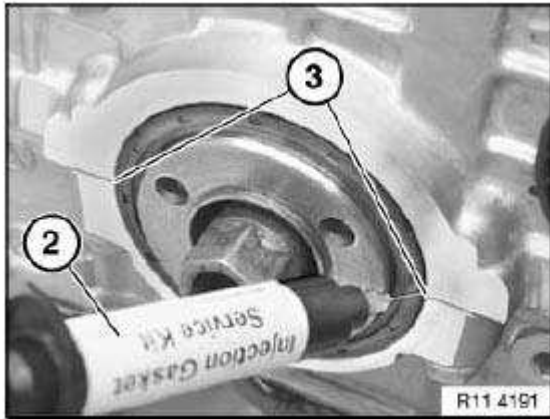


Fig. 74: Injector And Grooves On Crankshaft Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: **Loctite primer, manufacturer's number 171000, binds the Loctite sealing compound, manufacturer's number 128357, and prevents leakage.**

Coat surface of sealing compound in both grooves (1) with Loctite primer, manufacturer's number 171000.

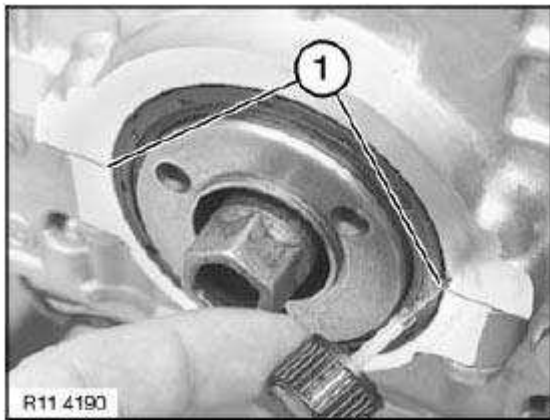


Fig. 75: Grooves On Crankshaft Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 14 010 REPLACING SEALING COVER FOR VACUUM PUMP (N52K)

Special tools required:

- 11 4 361
- 11 4 362
- 11 4 363
- 11 4 364

- 11 9 200

Necessary preliminary tasks:

- Remove fan cowl with electric fan
- Remove alternator drive belt
- Remove drive belt tensioner

NOTE: **The procedure is the same as for the crankshaft radial seal.
Expose removal openings on sealing cover.**

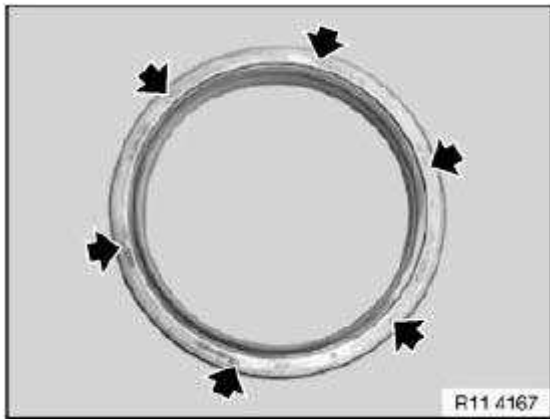


Fig. 76: Locating Openings On Sealing Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Convert special tool 11 9 200 (see illustration).

Screw special tool 11 9 200 onto sealing cover.

NOTE: **Insert screws until flush only with special tool 11 9 200 .**

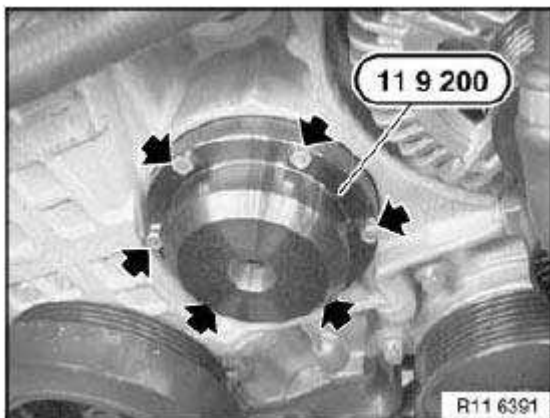


Fig. 77: Special Tool (11 9 200)

Courtesy of BMW OF NORTH AMERICA, INC.

Screw in special tool 11 4 362 .

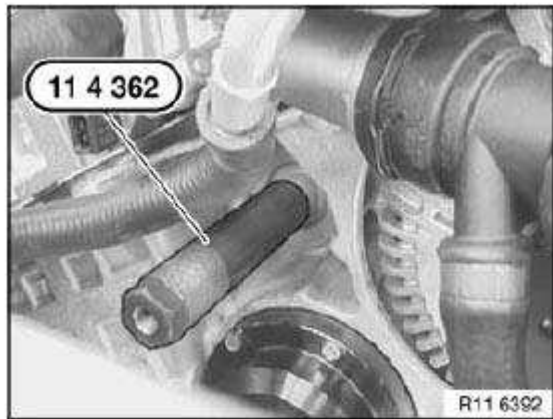


Fig. 78: Special Tool (11 4 362)

Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 11 4 361 to bedplate construction screw connection (see arrow).

Secure with knurled screw (1).

Screw special tool 11 4 364 into special tool 11 9 200 and screw out in direction of arrow.

NOTE: For purposes of clarity, the picture shows the alternator and power steering pump removed.

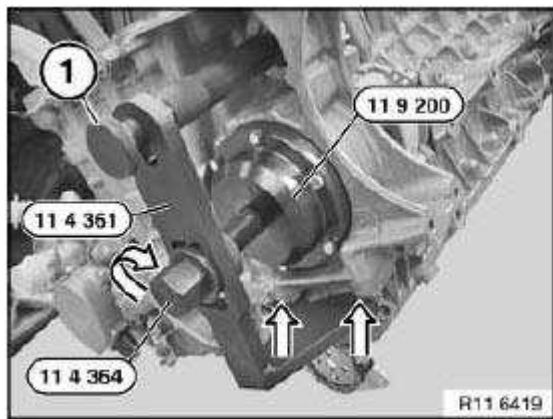


Fig. 79: Special Tools (11 4 361), (11 4 364) And (11 9 200)

Courtesy of BMW OF NORTH AMERICA, INC.

Prepare new sealing cover (1) with special tool 11 9 200 **without** screws.

Screw in sealing cover with special tool 11 4 363 until it is flush.

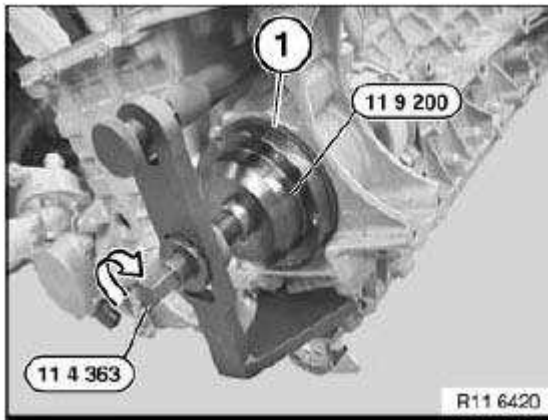


Fig. 80: Special Tools (11 9 200) And (11 4 363)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 14 151 REPLACING CRANKSHAFT RADIAL SEAL (TRANSMISSION SIDE) (N52K)

Special tools required:

- 11 9 181
- 11 9 182
- 11 9 183
- 11 9 184
- 11 9 200

Necessary preliminary tasks:

- Remove transmission
- Remove flywheel, see **11 22 500 Removing and installing/replacing flywheel (N52K)**

NOTE: Crankshaft radial seal has six removal openings for removal with special tool 11 9 200 .

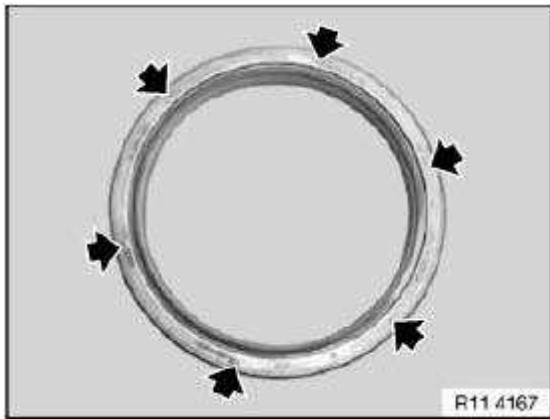


Fig. 81: Locating Openings On Sealing Cover

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: If necessary, remove rubber coating (1) on top side of crankshaft radial seal and expose a removal opening (2) (see illustration).

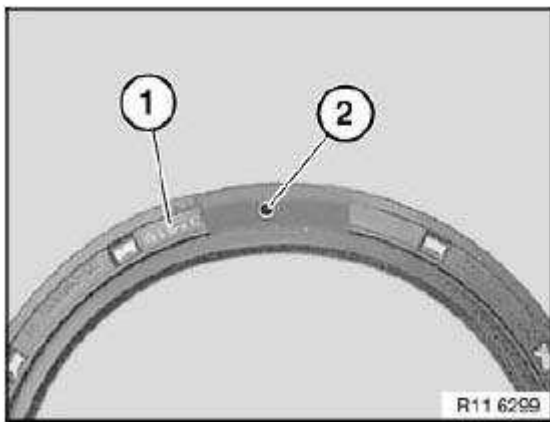


Fig. 82: Rubber Coating And Crankshaft Radial Seal Removal Opening

Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool 11 9 200 . Insert sheet metal screws into removal opening of crankshaft radial seal and fasten without play (do **not** overtighten sheet metal screws).

Screw in spindle (1) slowly and carefully and detach crankshaft radial seal.

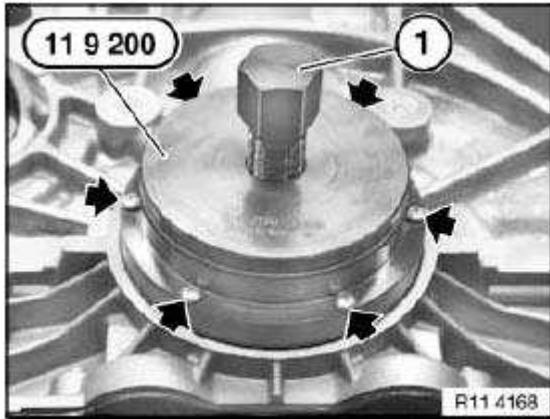


Fig. 83: Special Tool (11 9 200)
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Clean sealing surface (1) and degrease thoroughly in area of housing partition.

Apply a light coat of oil to running surface (2) of crankshaft radial seal.

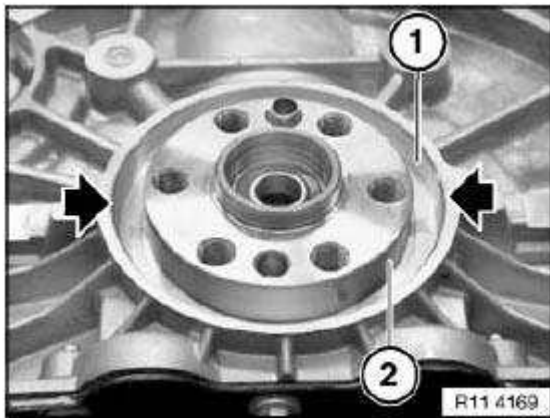


Fig. 84: Sealing And Running Surface Of Crankshaft Radial Seal
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Support bushing (4) is contained in scope of delivery of crankshaft radial seal (1).
 When crankshaft radial seal (1) is installed, only support bushing (4) may be used as a slip bushing.
 Crankshaft radial seal (1) has a groove (2) on both left and right sides.

IMPORTANT: After installation, grooves (2) must be filled with sealing compound.

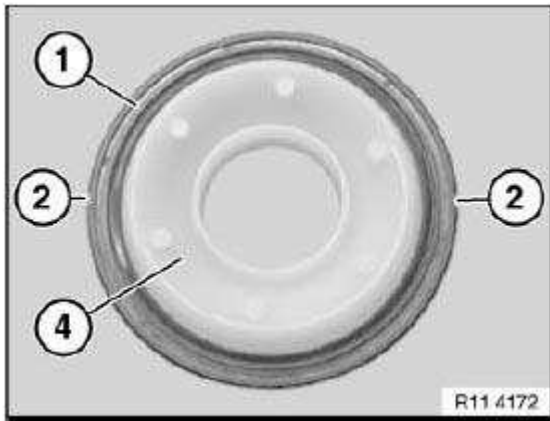


Fig. 85: Bushing, Crankshaft Radial Seal And Grooves
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: The following text describes installation and sealing between the engine block and crankshaft radial seal.
The engine block will not be leakproof at the outside of the crankshaft radial seal if you fail to comply with the individual work steps and the work sequence.

NOTE: The required parts are available from the BMW Parts Service (ETK).
Remove screw caps (1) from injector (2).

Screw on metering needle.

Insert piston for pressing out.

Injector (2) contains the sealing compound Loctite, manufacturer's number 128357.

Bottle (3) contains the primer Loctite, manufacturer's number 171000.

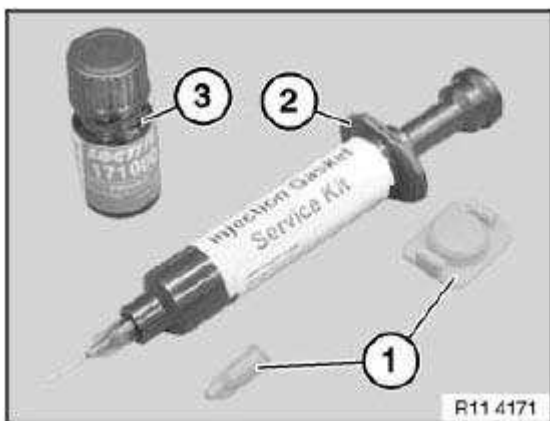


Fig. 86: Screw Caps, Injector And Bottle
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Fit support bushing (4) with crankshaft radial seal (1) on crankshaft.

Align groove (2) centrally to housing partition (3).

Coat both grooves (2) on crankshaft radial seal (1) with Loctite primer, manufacturer's number 171000, and expose to air for approx. one minute.

Push crankshaft radial seal (1) by hand as far as possible onto running surface.

Carefully remove support sleeve (4).

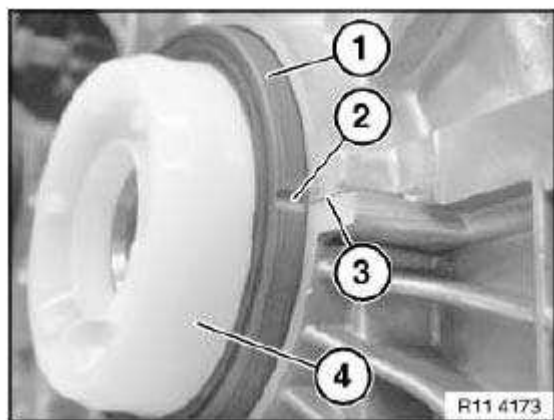


Fig. 87: Support Bushing, Crankshaft Radial Seal With Groove And Housing Partition
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Spacer ring (1) is supplied with radial shaft seal.

Screw special tool 11 9 182 with screws (special tool 11 9 184) to crankshaft.

Fit spacer ring (1) on preassembled radial shaft seal.

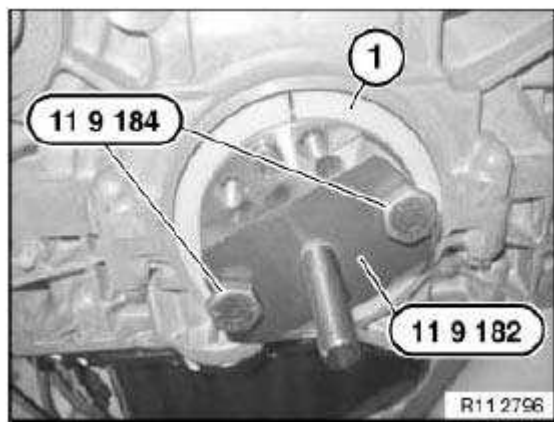


Fig. 88: Special Tools (11 9 184) And (11 9 182)
Courtesy of BMW OF NORTH AMERICA, INC.

Draw in radial shaft seal and spacer ring with special tool 11 9 181 in conjunction with special tool 11 9 183 .
Then remove spacer ring again.

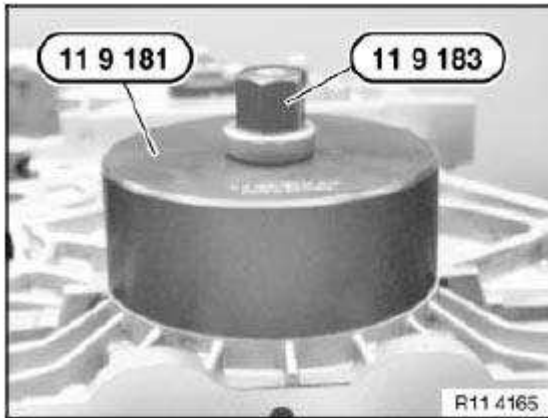


Fig. 89: Special Tools (11 9 181) And (11 9 183)
Courtesy of BMW OF NORTH AMERICA, INC.

Before filling with sealing compound:

Moisten brush with Loctite primer, manufacturer's number 171000. Insert brush as far as possible into grooves (1) on crankshaft radial seal in order to coat housing partition on engine block.

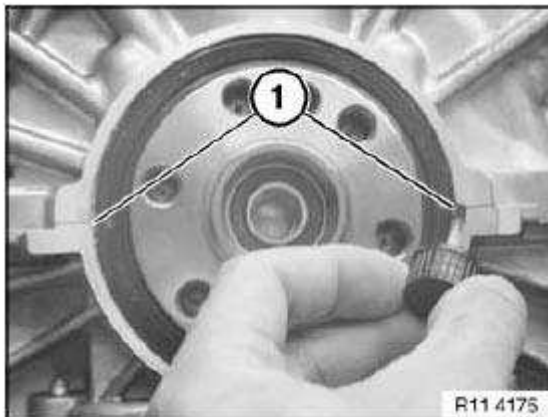


Fig. 90: Grooves On Crankshaft Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Using injector, fill both grooves (1) flush with Loctite sealing compound, manufacturer's number 128357.

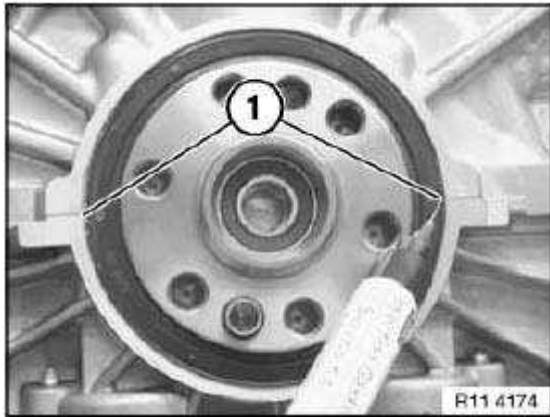


Fig. 91: Grooves With Loctite Primer
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Loctite primer, manufacturer's number 171000, binds the Loctite sealing compound, manufacturer's number 128357, and prevents leakage. Coat surface of sealing compound in both grooves (1) with Loctite primer, manufacturer's number 171000.

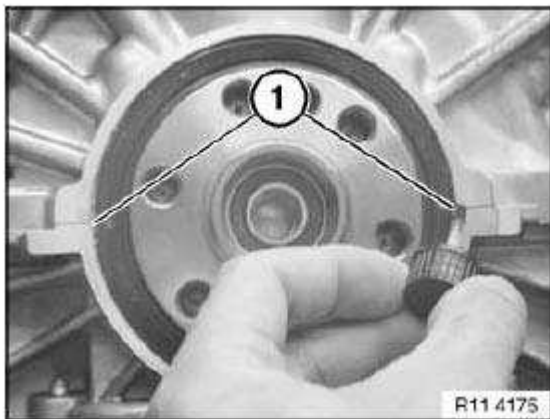


Fig. 92: Grooves On Crankshaft Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

21 CRANKSHAFT WITH BEARING

11 21 500 REPLACING CRANKSHAFT (N52K)

Special tools required:

- **00 2 510 DIAL GAUGE WITH FEELER**
- **00 9 120 TORQUE ANGLE MEASURING DIAL**

- 11 4 370
- 11 4 440
- 11 4 470
- 11 9 360

IMPORTANT: Aluminium-magnesium materials.

No steel screws/bolts may be used due to the threat of electrochemical corrosion.

A magnesium crankcase requires aluminum screws/bolts exclusively.

Aluminum screws/bolts must be replaced each time they are released.

The end faces of aluminum screws/bolts are painted blue for the purposes of reliable identification.

Jointing torque and angle of rotation must be observed without fail (risk of damage) .

Necessary preliminary tasks:

- Remove engine
- Mount engine on assembly stand, see [Mounting engine on assembly stand \(N52K\)](#).
- Remove **VIBRATION DAMPER**
- Remove oil sump
- Remove oil pump, see [11 41 000 Removing and installing/replacing oil pump \(N52K\)](#)
- Remove oil pump/vacuum pump chain module, see [11 41 010 Removing and installing/replacing chain module for oil pump/vacuum pump \(N52K\)](#)
- Remove timing chain module, see [11 31 051 Replacing timing chain \(N52K\)](#)
- Remove cylinder head, see [11 12 100 Removing and installing cylinder head \(N52K\)](#).
- Remove flywheel, see [11 22 500 Removing and installing/replacing flywheel \(N52K\)](#)
- Removing all pistons, see [11 25 530 Removing and installing/replacing all pistons \(N52K\)](#)

Release screws (1).

Tightening torque: 11 13 6AZ, see [11 13 OIL PAN](#) .

Installation:

Replace aluminum screws.

Remove oil deflector (2).

NOTE: Picture shows the screw connection of the oil deflector (2) for vehicles with optional extra SA203 (all-wheel drive).

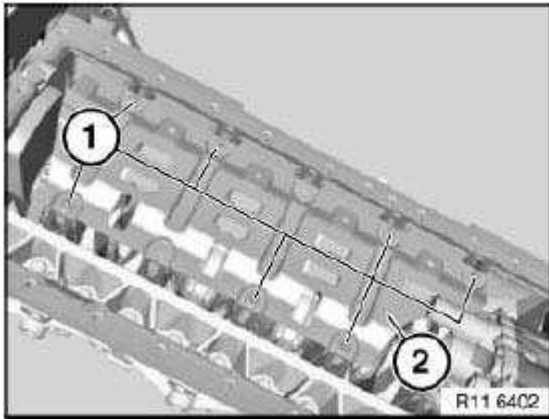


Fig. 93: Oil Deflector And Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque: 11 11 2AZ, see **11 11 CRANKCASE** .

Release screws (2).

Tightening torque: 11 11 3AZ, see **11 11 CRANKCASE** .

Installation:

Replace aluminum screws.

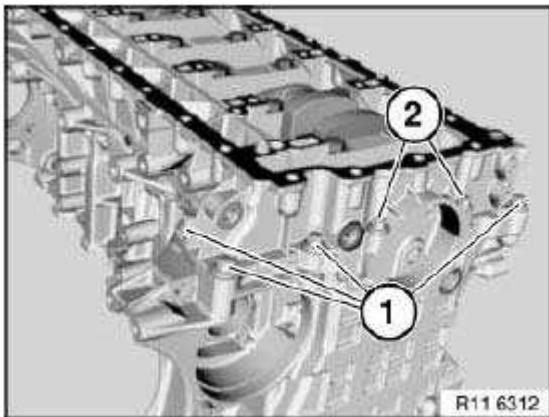


Fig. 94: Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque: 11 11 4AZ, see **11 11 CRANKCASE** .

Release screws (2).

Tightening torque: 11 11 2AZ, see 11 11 CRANKCASE .

Installation:

Replace aluminum screws.

Release steel screws (1 to 14) from outside inwards.

Tightening torque: 11 11 1AZ, see 11 11 CRANKCASE .

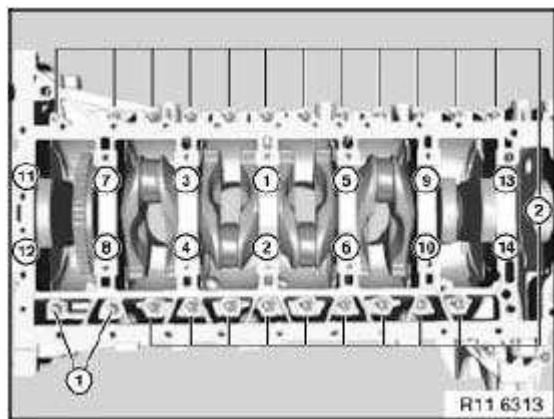


Fig. 95: Crankshaft Bolts Tightening Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque: 11 11 3AZ, see 11 11 CRANKCASE .

Installation:

Replace aluminum screws.

Lift out bedplate.

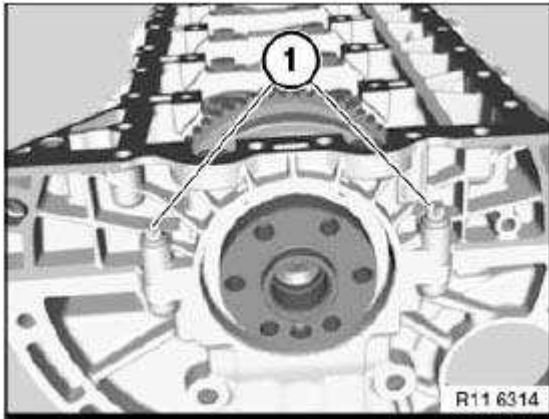


Fig. 96: Bedplate Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Remove crankshaft (1) in direction of arrow.

**IMPORTANT: Remove crankshaft with aid of a second person.
Weight of crankshaft approx. 25 kg.**

Remove bearing shells (2) and guide bearing shell (3), replace if necessary, see **11 21 531 Replacing all main crankshaft bearing shells (N52K)**.

Clean all sealing faces with special tool 11 4 470 .

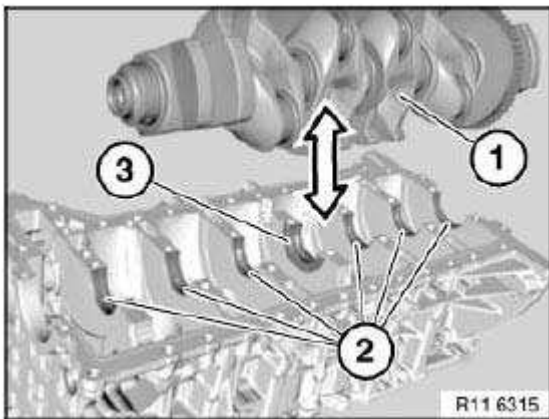


Fig. 97: Bearing Shells

Courtesy of BMW OF NORTH AMERICA, INC.

Check adapter sleeves (1) for damage and secure seating; replace if necessary.

Install all bearing shells, see **11 21 531 Replacing all main crankshaft bearing shells (N52K)**.

Installation:

Lubricate all bearing points with engine oil.

NOTE: Picture shows N46.

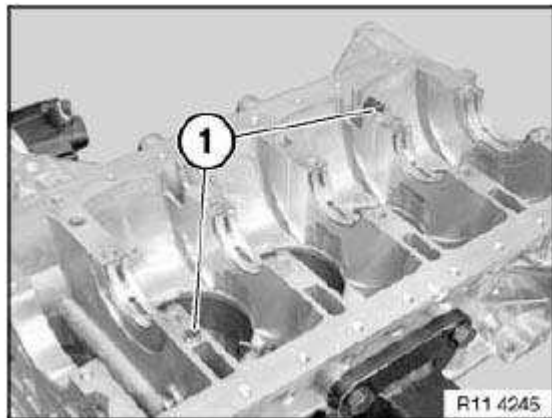


Fig. 98: Adapter Sleeves

Courtesy of BMW OF NORTH AMERICA, INC.

Insert crankshaft (1).

IMPORTANT: Install crankshaft with aid of a second person.
Weight of crankshaft approx. 25 kg.

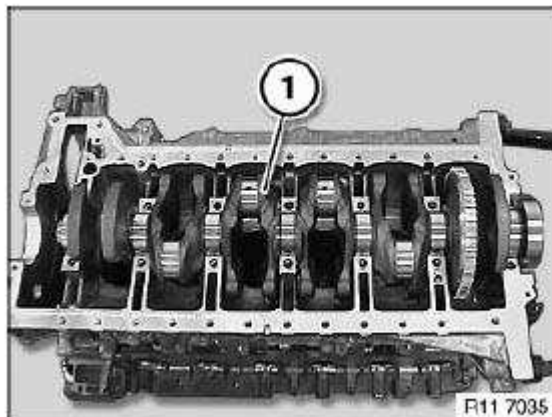


Fig. 99: Crankshaft

Courtesy of BMW OF NORTH AMERICA, INC.

Tighten steel screws (1 to 14) from inside outwards.

Tightening torque: 11 11 1AZ, see **11 11 CRANKCASE** .

Tighten screws (2) from inside outwards.

Tightening torque: 11 11 2AZ, see 11 11 CRANKCASE .

Tighten screws (1).

Tightening torque: 11 11 4AZ, see 11 11 CRANKCASE .

Installation:

Replace aluminum screws.

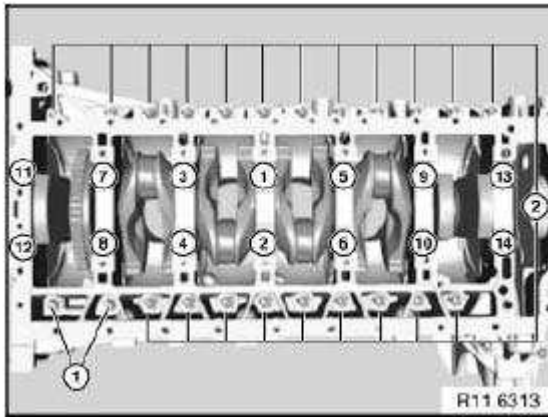


Fig. 100: Crankshaft Bolts Tightening Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten aluminum screws exclusively with special tool 00 9 120 .

IMPORTANT: In the case of aluminum screws, jointing torque and angle of rotation must be observed without fail.

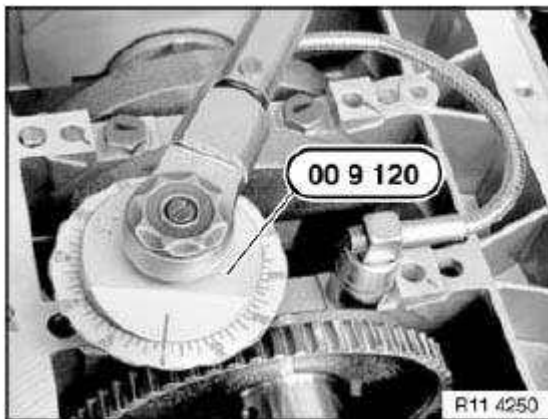


Fig. 101: Special Tool (00 9 120)
Courtesy of BMW OF NORTH AMERICA, INC.

Set up stand with magnetic foot (1) on special tool 11 4 440 .

Set up special tool 00 2 510 on stand.

Position special tool 00 2 510 on crankshaft.

Move crankshaft in direction of arrow.

Determine bearing play .

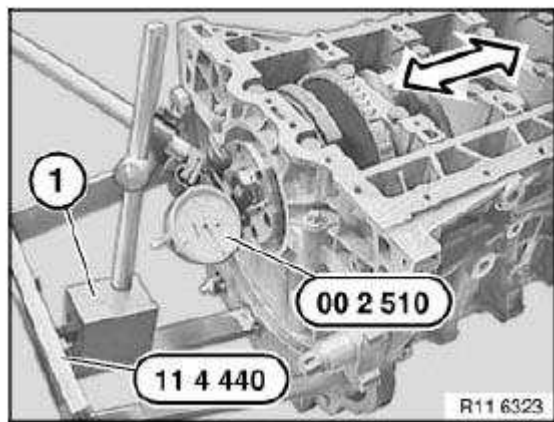


Fig. 102: Moving Crankshaft

Courtesy of BMW OF NORTH AMERICA, INC.

Drive in both nozzles (1) with special tool 11 9 360 on left and right into crankcase.

Installation:

Always replace nozzles (1).

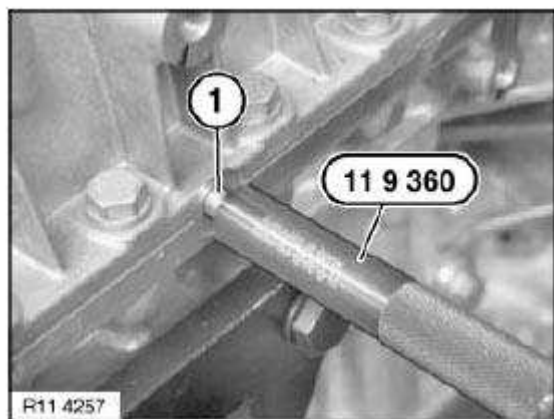


Fig. 103: Nozzles With Special Tool (11 9 360)

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Prepare sealing compound (1) in special tool 11 4 370 .

Screw on nozzle (2) for injecting sealing compound.

Slowly insert sealing compound (1) with special tool 11 4 370 in direction of arrow.

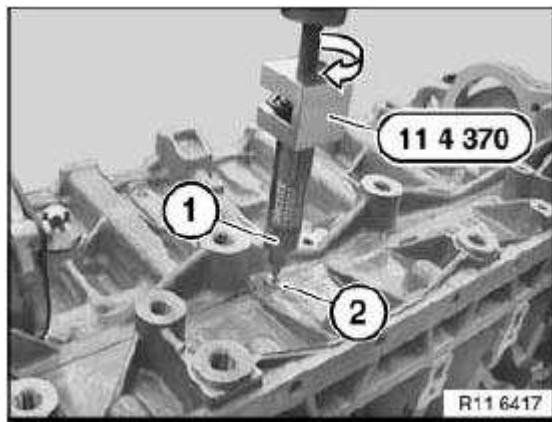


Fig. 104: Inserting Sealing Compound With Special Tool (11 4 370)
Courtesy of BMW OF NORTH AMERICA, INC.

Replace crankshaft radial seal at front, see **11 14 005 Replacing front crankshaft radial seal (N52K)**.

Replace crankshaft radial seal (transmission side), see **11 14 151 Replacing crankshaft radial seal (transmission side) (N52K)**.

Assemble engine.

11 21 505 SEALING THE CRANKCASE'S LOWER PART (N52K)

IMPORTANT: Aluminium-magnesium materials.

No steel screws/bolts may be used due to the threat of electrochemical corrosion.

A magnesium crankcase requires aluminum screws/bolts exclusively.

Aluminum screws/bolts must be replaced each time they are **released**.

Aluminum screws/bolts are permitted with and without color coding (blue).

For reliable identification:

Aluminum screws/bolts are **not magnetic**.

Risk of damage!

Joining torque and angle of rotation must be observed without fail.

IMPORTANT: Changed procedure.

It is not necessary to remove the cylinder head and the crankshaft.

Necessary preliminary tasks

- Remove ENGINE.
- .
- Remove CLUTCH (if fitted). See **21 21 500 REMOVING AND INSTALLING/REPLACING CLUTCH (SAC) (X3)**
- Remove left and right engine support arm
- Remove **OIL SUMP**.

Release screws (1).

Pull out oil pump intake pipe (2).

Tightening torque: 11 13

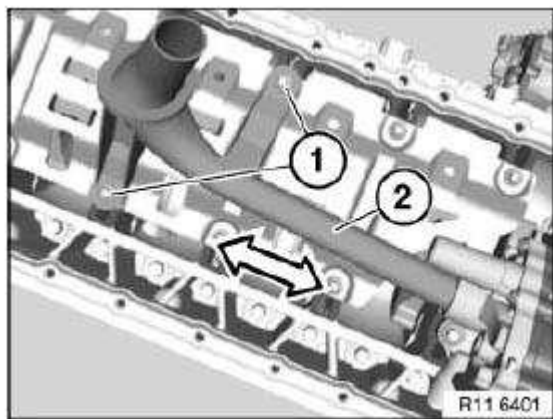


Fig. 105: Removing Intake Pipe

Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque, see 11 13 6AZ in **11 13 OIL PAN** .

Installation:

Replace aluminum screws

Remove oil deflector (2).

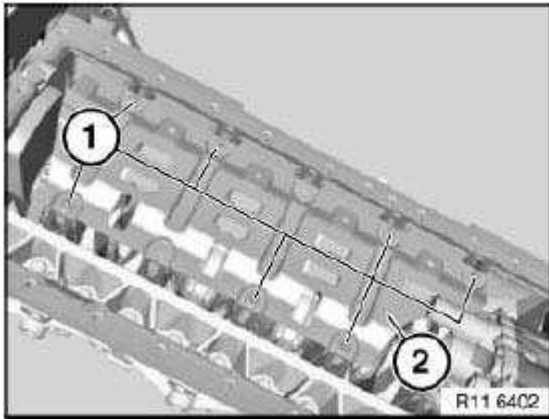


Fig. 106: Identifying Screws And Oil Deflector
 Courtesy of BMW OF NORTH AMERICA, INC.

Secure oil pump sprocket with steel pin 6.0 mm (3) to oil pump.

**IMPORTANT: Release central bolt (2) only together with steel pin 6.0 mm (3).
 Do not remove sprocket.**

Release central bolt (2).

Tightening torque, see 11 41 6AZ in **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

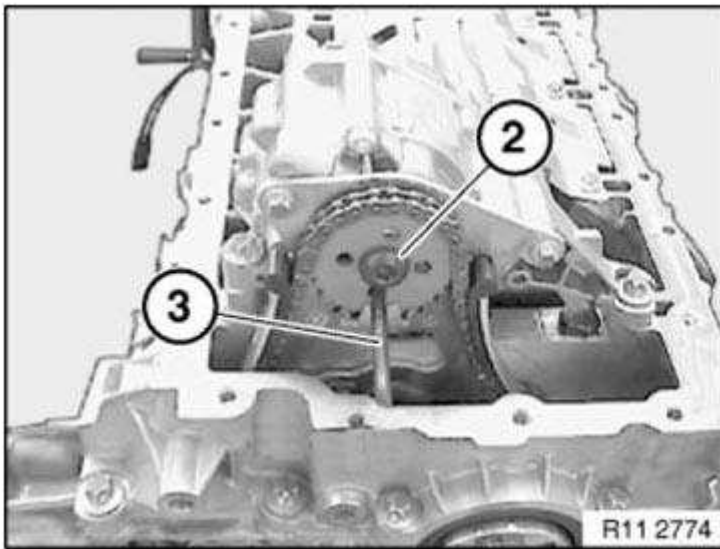


Fig. 107: Identifying Oil Deflector And Screws
 Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws (2).

Tightening torque: see 11 41 5AZ in **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

Installation:

Replace aluminum screws

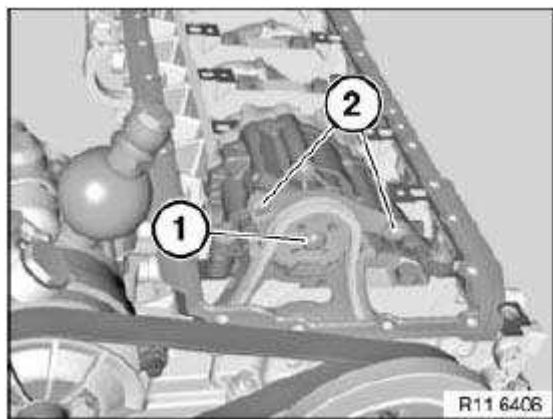


Fig. 108: Identifying Bolt And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Remove screw plug (1) from crankcase at front.

NOTE: **Replace gasket.**

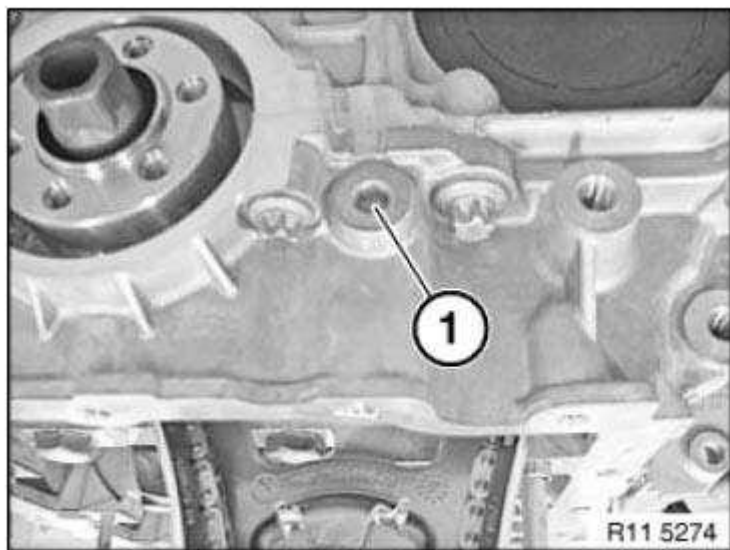


Fig. 109: Identifying Screw Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1) for oil pump triangular drive with special tool **11 8 640** .

NOTE: **It is not necessary to remove the triangular drive.**

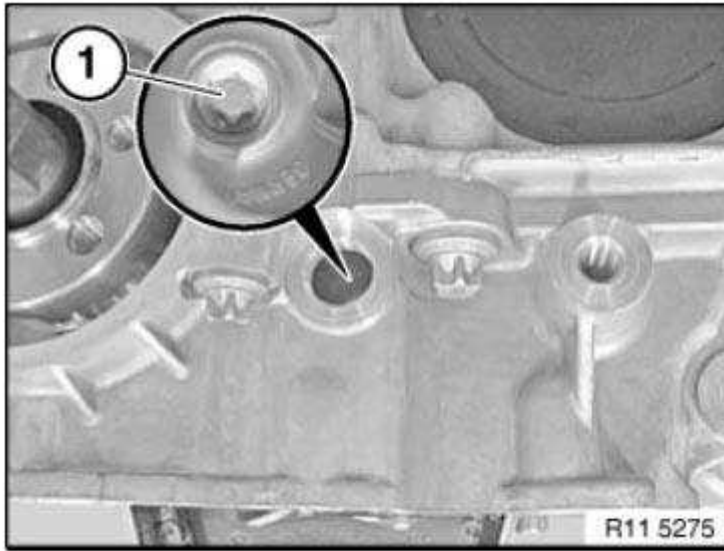


Fig. 110: Identifying Oil Pump Triangular Drive Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Version 1

IMPORTANT: Observe different screw lengths.

Release screws (1).

Tightening torque, see 11 41 2AZ in **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

Tightening torque, see 11 41 3AZ in **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

Installation:

Replace aluminum screws

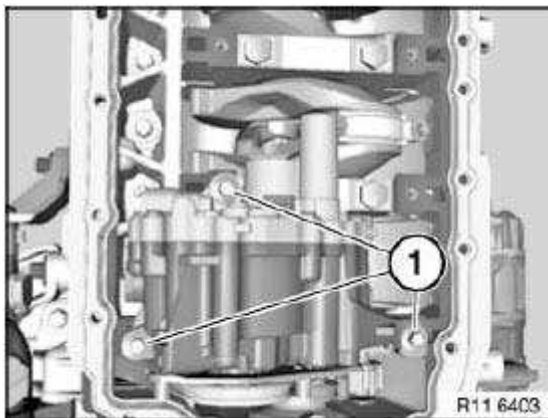


Fig. 111: Identifying Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Version 2

IMPORTANT: Observe different screw lengths.

Release oil pump screws (1).

Tightening torque, see 11 41 2AZ in 11 41 OIL PUMP WITH STRAINER AND DRIVE .

Installation:

Replace aluminum screws

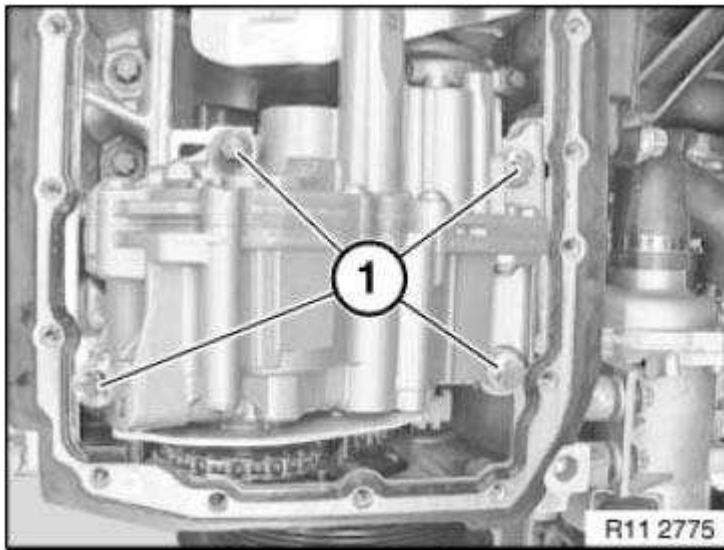


Fig. 112: Identifying Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Detach sprocket (1) in direction of arrow.

NOTE: The chain tensioner pushes the timing chain (3) of the triangular drive upward.

Do **not** remove camshaft sprocket.

Remove oil pump (2) in direction of arrow.

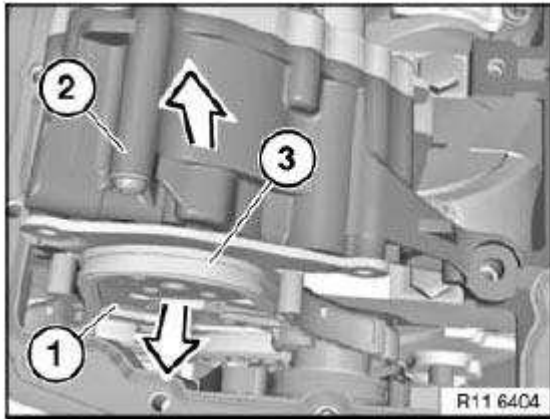


Fig. 113: Pulling Drive Gear
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Check spacer bushings (1) for secure seating and damage; replace if necessary.

Align twin surface (3) on oil pump (2) to sprocket wheel.

Install oil pump (2).

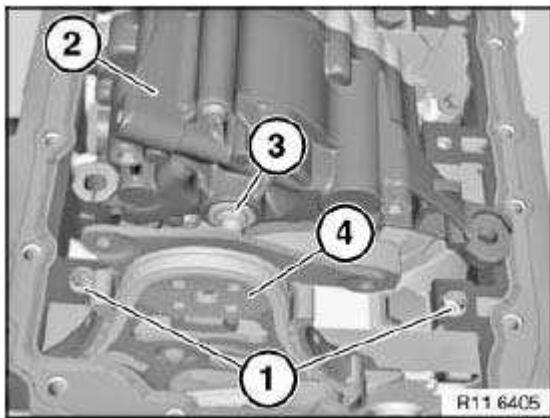


Fig. 114: Identifying Spacer Bushings And Oil Pump
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The special tool bore for the TDC position is located on the inlet side underneath the starter motor.

Rotate engine at central bolt and secure flywheel in position with special tool 11 0 300.

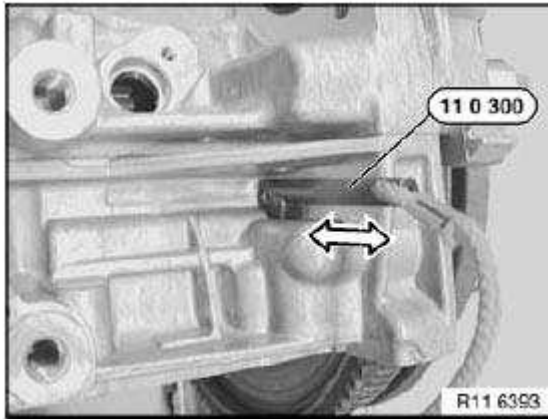


Fig. 115: Securing Crankshaft

Courtesy of BMW OF NORTH AMERICA, INC.

Secure flywheel with special tool (1)

11 9 260 and special tool (2) 11 9 266.

Tightening torque

NOTE: Make sure that the special tool (1) completely engages in the flywheel teeth (see arrow)

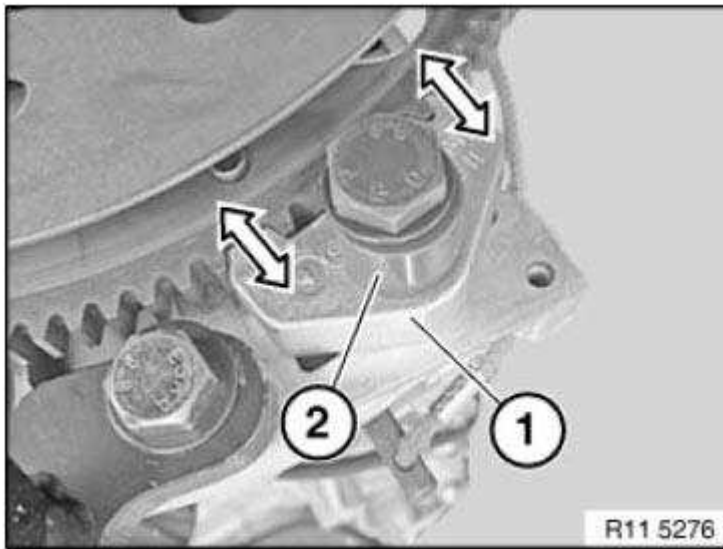


Fig. 116: Securing Flywheel Using Special Tool 11 9 260/11 9 266

Courtesy of BMW OF NORTH AMERICA, INC.

Automatic transmission

Release flywheel bolts (1).

Release special tool (2).

Remove flywheel (3).

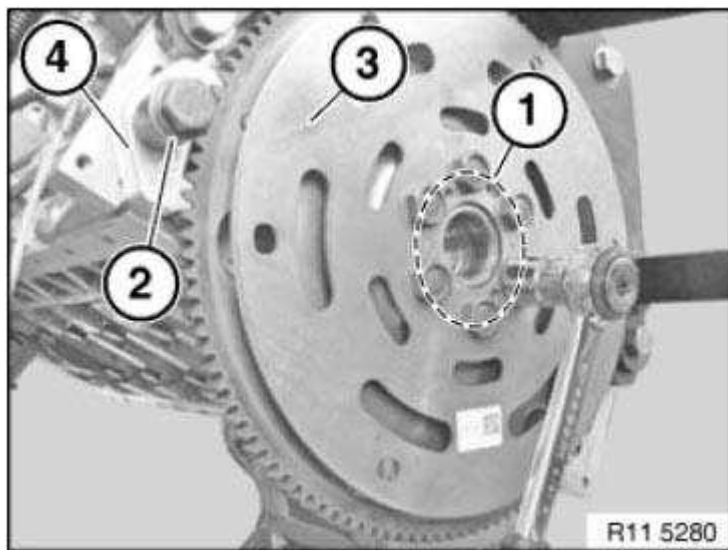


Fig. 117: Identifying Flywheel With Bolts And Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Manual gearbox

IMPORTANT: Position crankshaft at TDC.

Remove dual-mass flywheel.

Secure flywheel with special tool 11 9 260.

Remove VIBRATION DAMPER .

Release flywheel bolts with special tool 11 4 180.

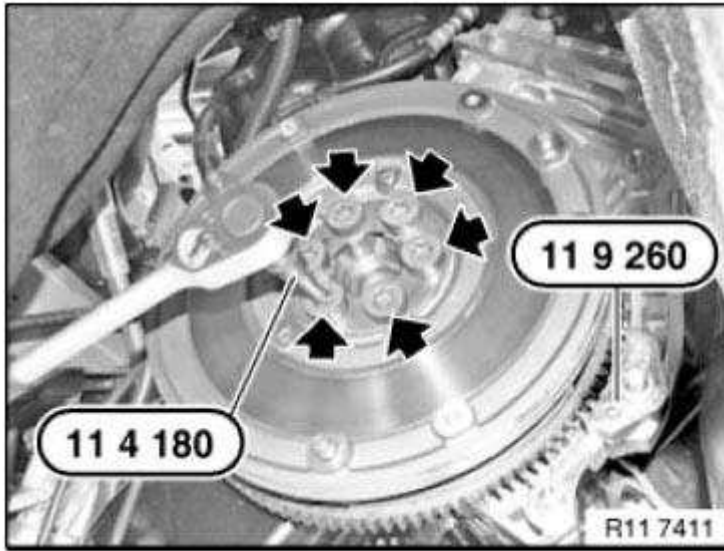


Fig. 118: Removing Flywheel Bolts Using Special Tool 11 4 180
Courtesy of BMW OF NORTH AMERICA, INC.

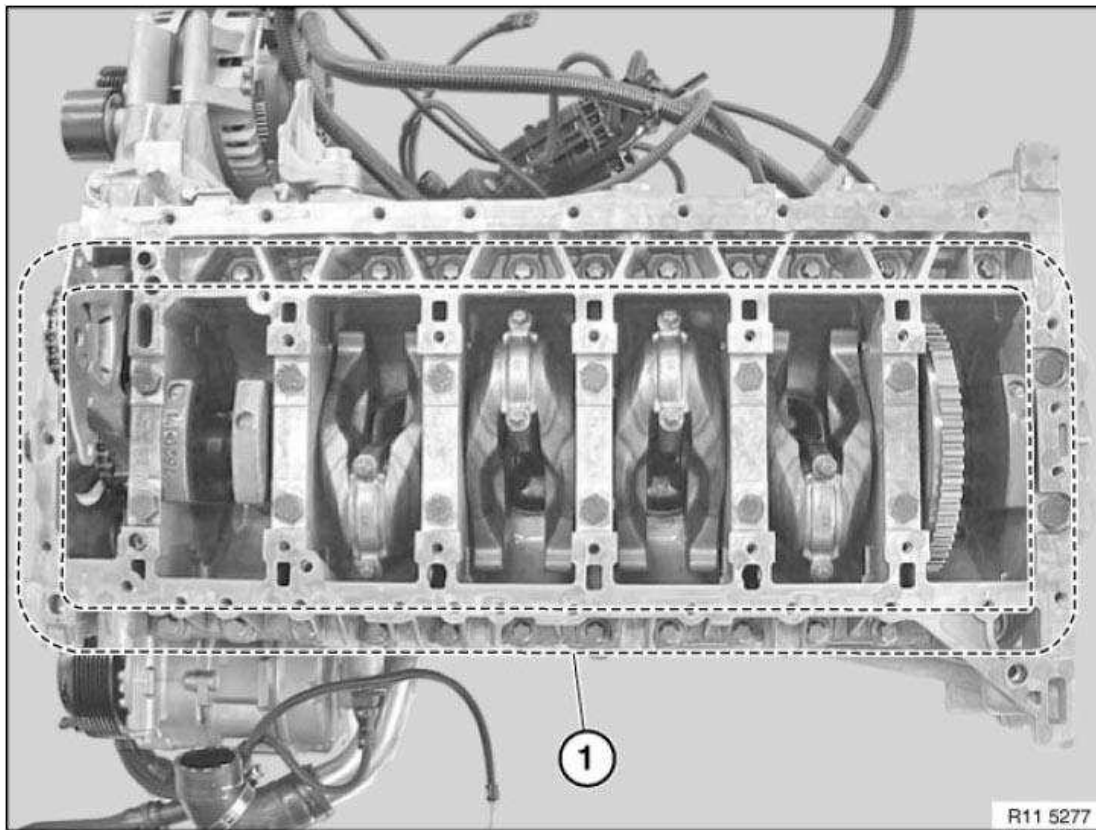


Fig. 119: Identifying Crankshaft Bolt Mounting Area
Courtesy of BMW OF NORTH AMERICA, INC.

Release all crankcase bolts (1) along line (2).

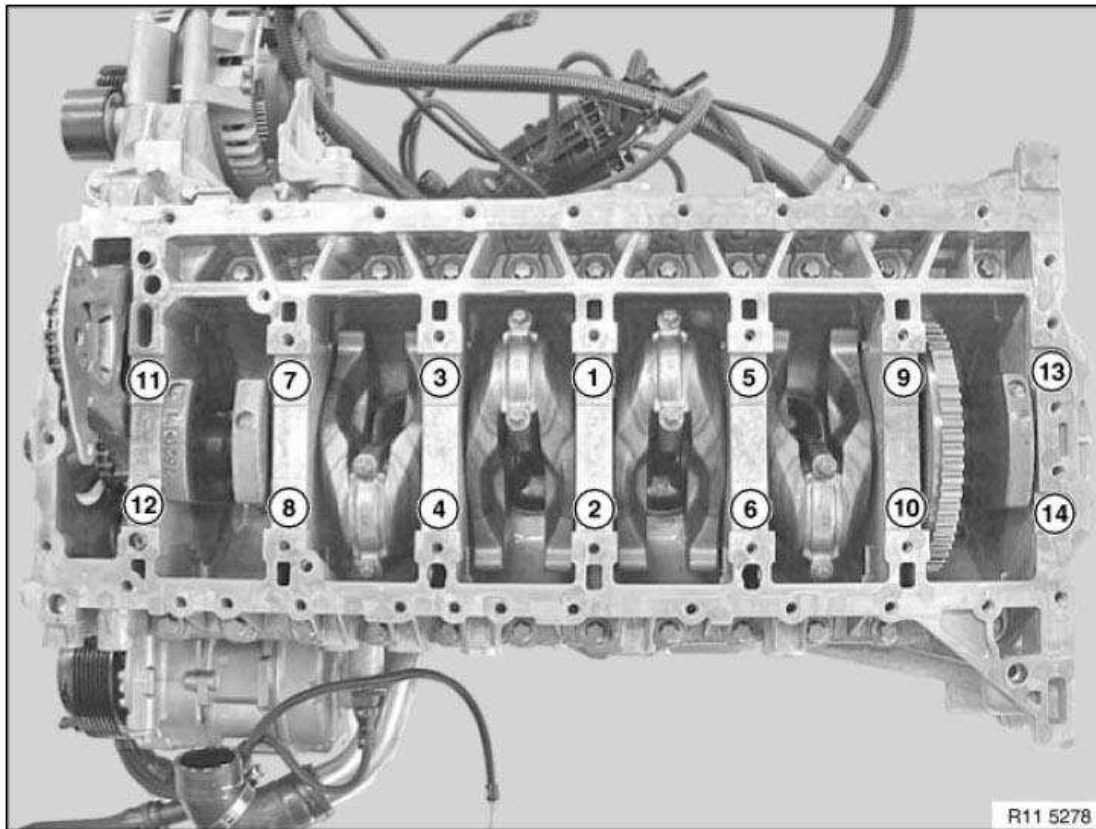


Fig. 120: Identifying Crankshaft Bolt Releasing Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

Release crankcase bolts M10 in sequence 14 to 1.

Release crankcase lower section (1) from crankcase upper section (2) with suitable tool (3)

Remove crankcase lower section (1) upwards.

IMPORTANT: Do not rotate crankshaft without crankcase lower section (1) (risk of damage).

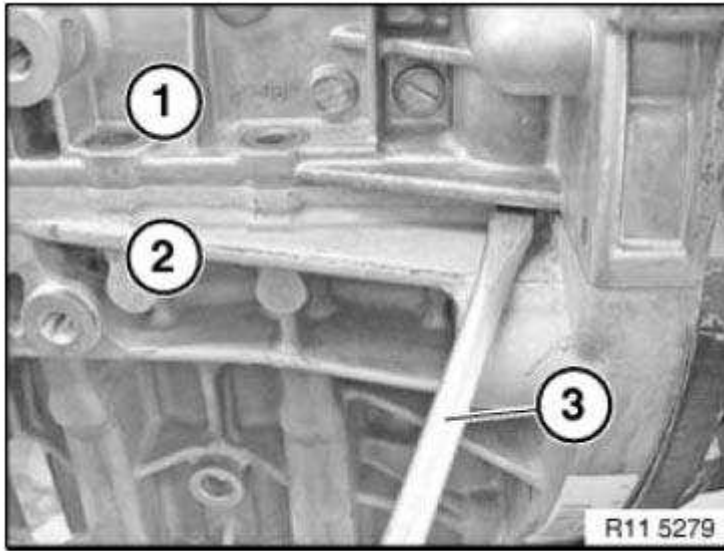


Fig. 121: Removing Crankshaft (Lower Section And Upper Section) Using Tool
Courtesy of BMW OF NORTH AMERICA, INC.

**IMPORTANT: Timing chain is pre-tensioned.
Do not raise crankshaft.**

Carefully remove radial shaft seal (1).

Catch escaping engine oil with a cloth (2).

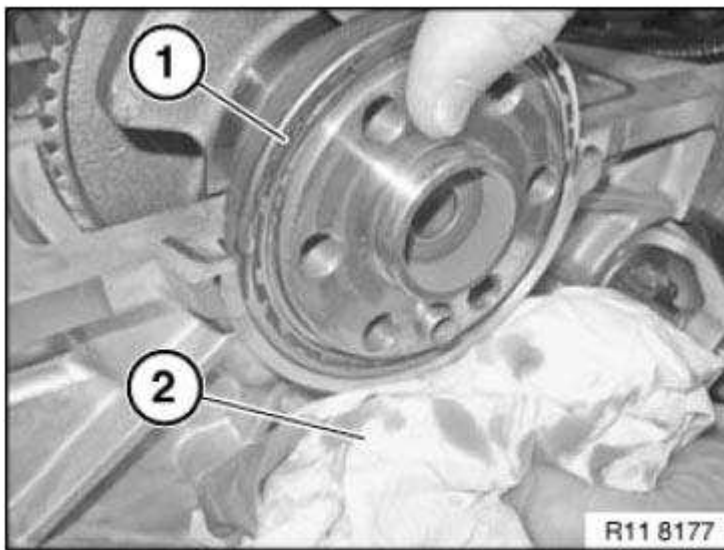


Fig. 122: Removing Radial Shaft Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Carefully remove radial shaft seal (1) towards front.

Catch escaping engine oil with a cloth (2).

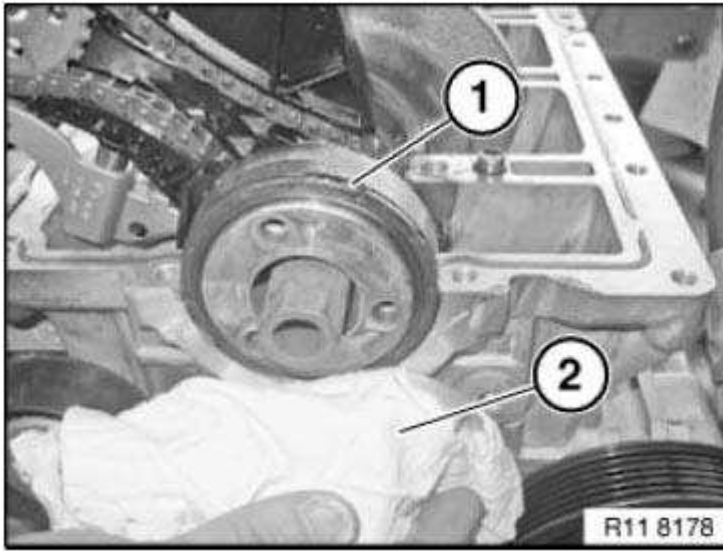


Fig. 123: Catching Escaping Engine Oil Using Cloth
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Protect crankcase against sealant residues with a cloth (1).

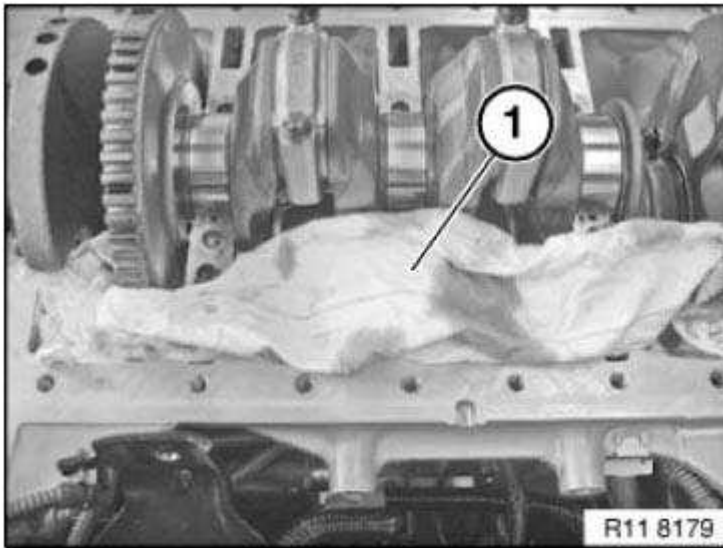


Fig. 124: Protecting Crankcase Against Sealant Residues Using Cloth
Courtesy of BMW OF NORTH AMERICA, INC.

Remove sealant residues (1) with special tool 11 4 470.

Remove injector nozzles (2) for liquid sealing compound on left and right.

Installation:

Replace injector nozzles (2).

Clean all threads with compressed air.

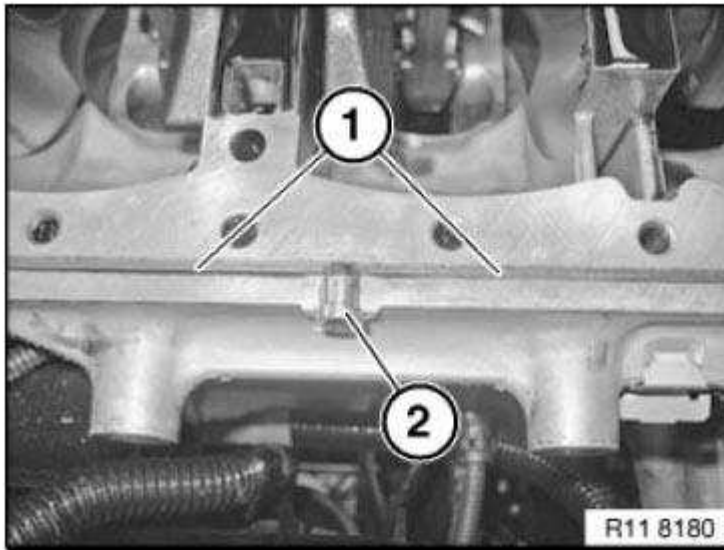


Fig. 125: Identifying Injector Nozzle And Sealant Residue
Courtesy of BMW OF NORTH AMERICA, INC.

Position crankcase lower section (1) on crankcase upper section.

Screw in all M10 crankcase bolts.

Joint all M10 crankcase bolts (1) to 20 Nm from inside outwards.

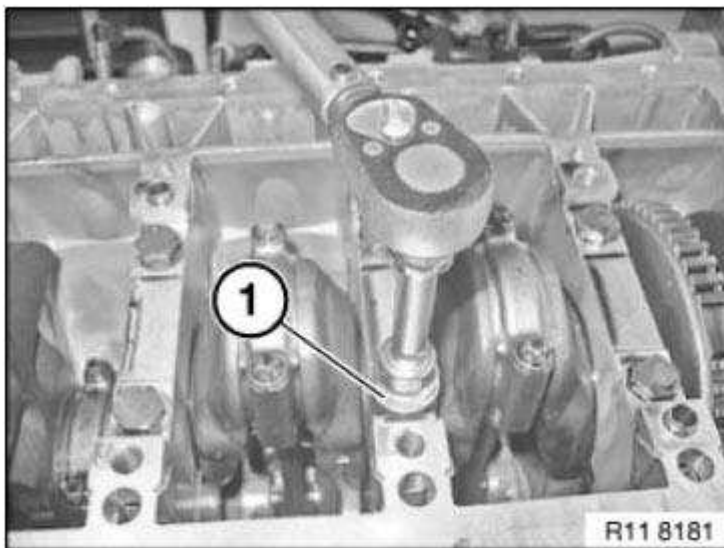


Fig. 126: Screwing In All M10 Crankcase Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Identify all M10 crankcase bolts with a colored marking (1) for checking.

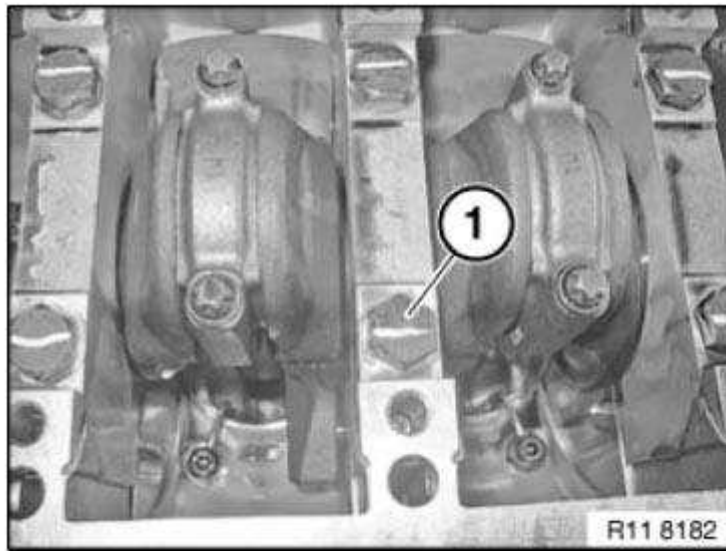


Fig. 127: Identify M10 Crankcase Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

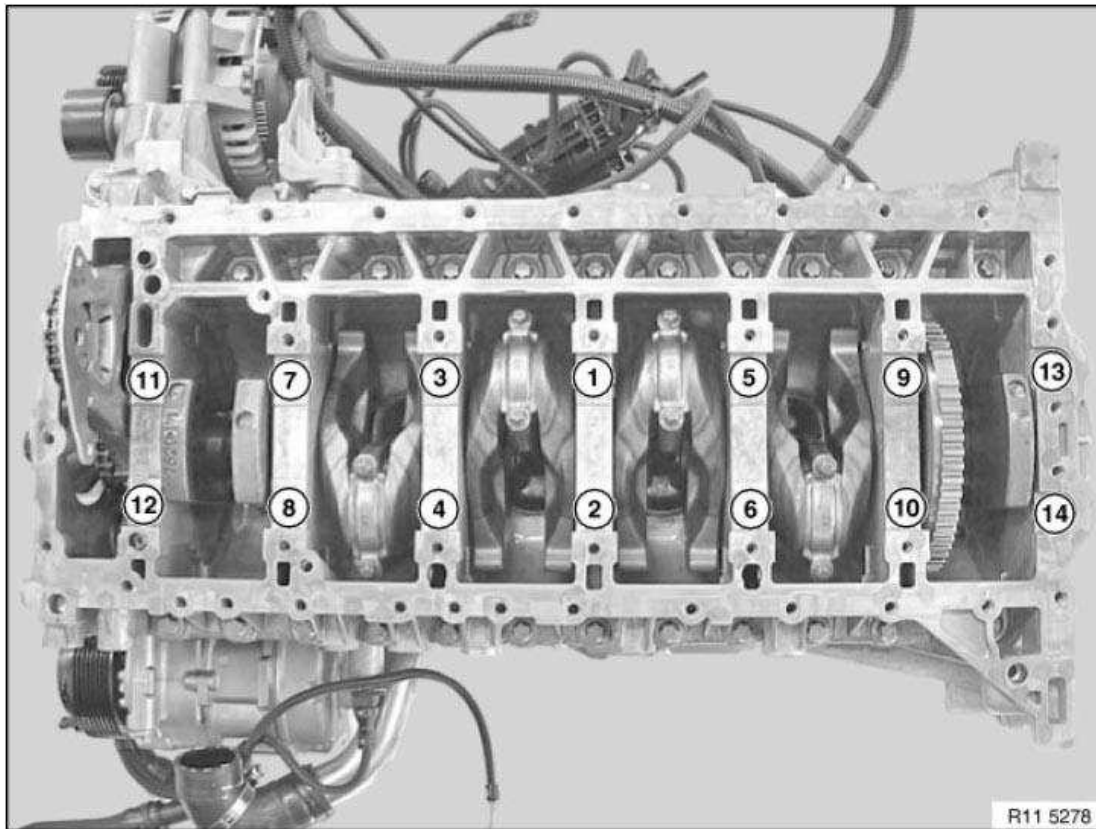


Fig. 128: Identifying Crankcase Bolts Tightening Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

Secure crankcase bolts M10 in sequence 1 to 14 with special tool 00 9 120.

Tightening torque 11 11 1AZ, see **11 11 CRANKCASE**

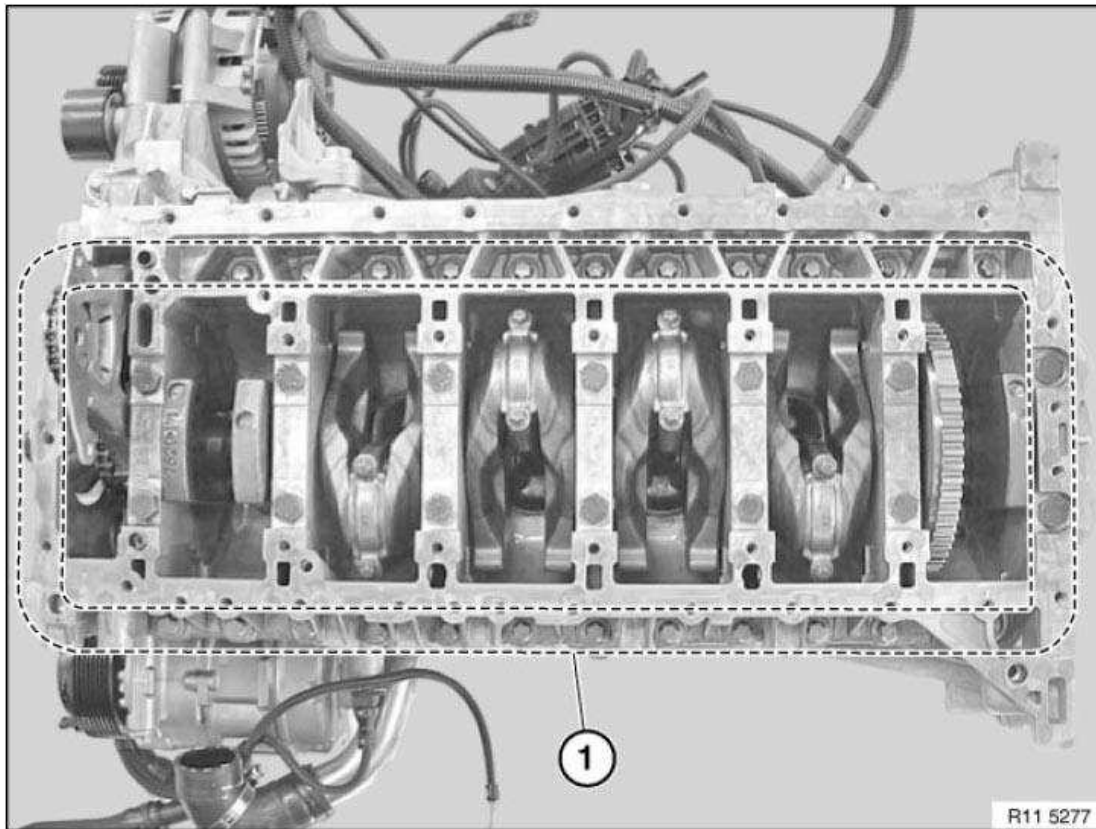


Fig. 129: Identifying Crankcase Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Insert all crankcase bolts (1).

IMPORTANT: Observe different lengths and sizes of the bolts.

Tightening torque 11 11 2, 3 and 4AZ, see 11 11 CRANKCASE

Tighten screw (1) for oil pump triangular drive with special tool 11 8 640 .

NOTE: Replace screw.

Tightening torque, see 11 41 4 AZ in 11 41 OIL PUMP WITH STRAINER AND DRIVE .

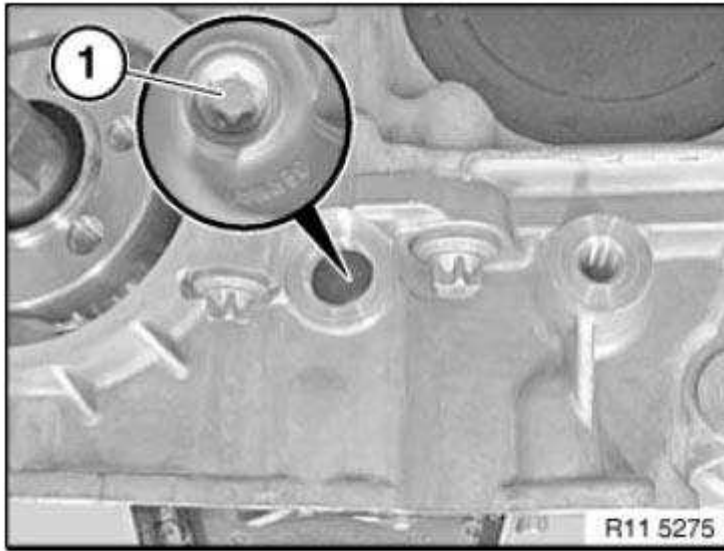


Fig. 130: Identifying Oil Pump Triangular Drive Mounting Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten screw plug on front of crankcase.

Tightening torque, see 11 11 8 AZ in **11 11 CRANKCASE** .

Installation:

Replace sealing ring.

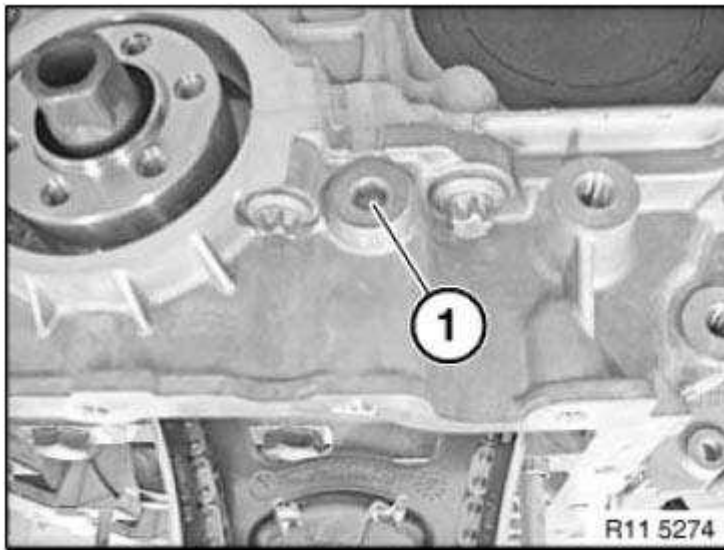


Fig. 131: Identifying Screw Plug On Crankcase
Courtesy of BMW OF NORTH AMERICA, INC.

Prepare radial shaft seal (1) on special tool 11 8 220.

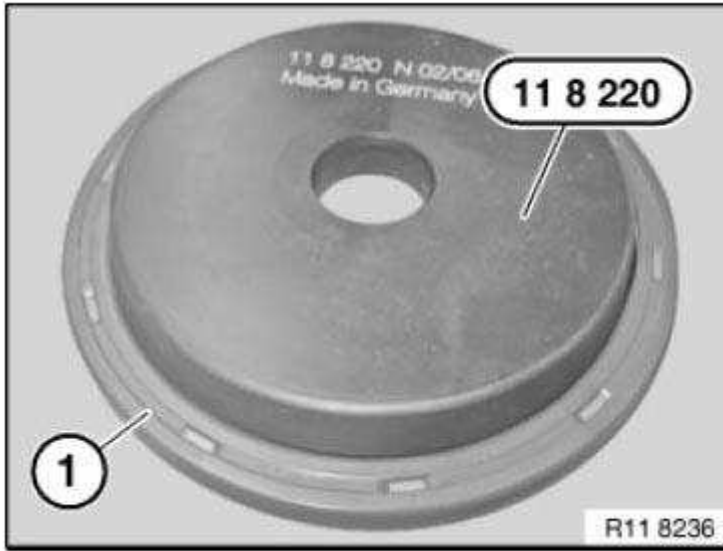


Fig. 132: Identifying Radial Shaft Seal On Special Tool 11 8 220
Courtesy of BMW OF NORTH AMERICA, INC.

Position radial shaft seal (1) with special tool 11 8 220 on the crankshaft.

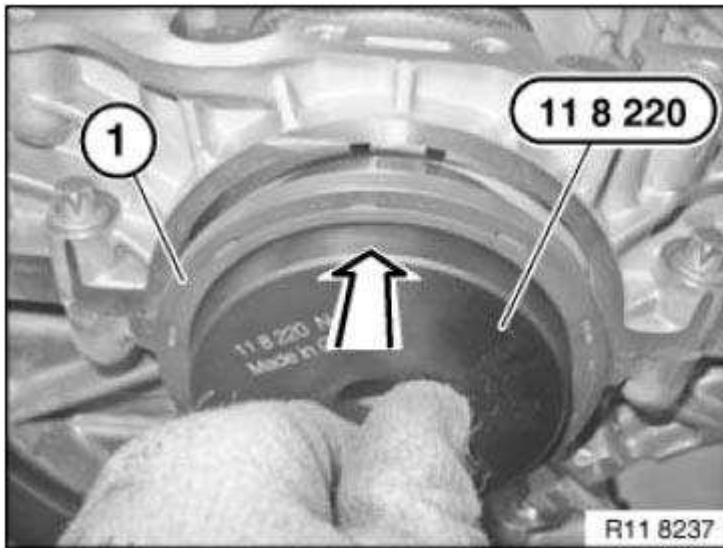


Fig. 133: Positioning Radial Shaft Seal Using Special Tool 11 8 220 On Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Brush radial shaft seal (1) over the special tool 11 8 220.

Move radial shaft seal (1) parallel up against the crankcase.

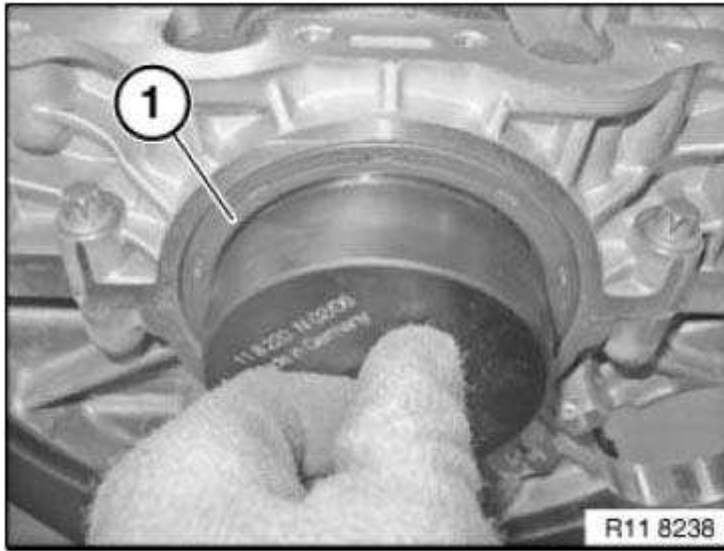


Fig. 134: Moving Radial Shaft Seal Parallel Up Against Crankcase
Courtesy of BMW OF NORTH AMERICA, INC.

Screw special tool 11 9 182 with screws (special tool 11 9 184) to crankshaft.

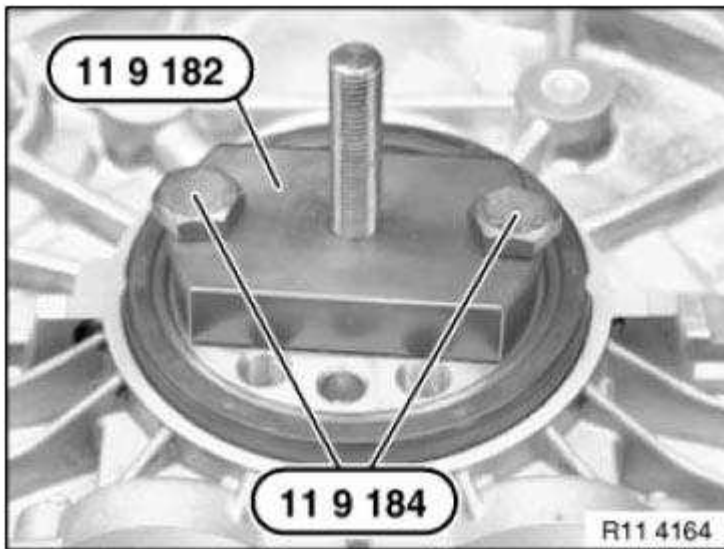


Fig. 135: Screwing Special Tool 11 9 182 With Screws (Special Tool 11 9 184) To Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Prepare special tool 11 9 181 for installation. Connect special tool 11 9 185 onto special tool 11 8 181.

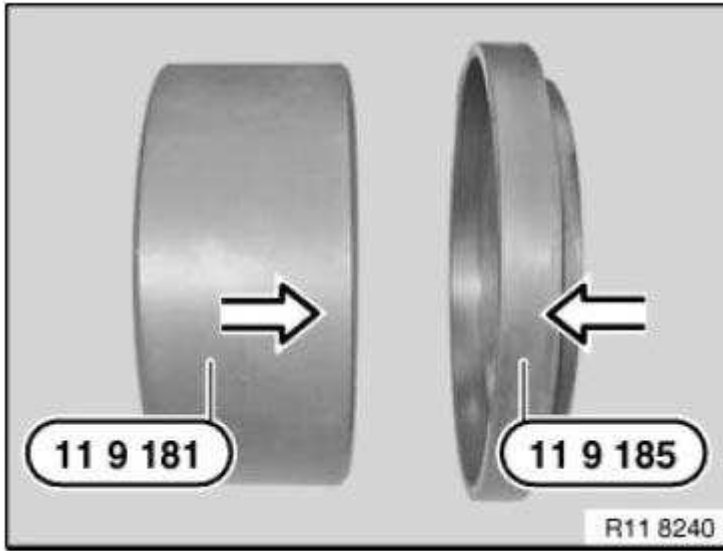


Fig. 136: Connecting Special Tool 11 9 185 Onto Special Tool 11 8 181
Courtesy of BMW OF NORTH AMERICA, INC.

Pull on radial shaft seal with special tool 11 9 181 and 11 9 185 in combination with special tool 11 9 183.

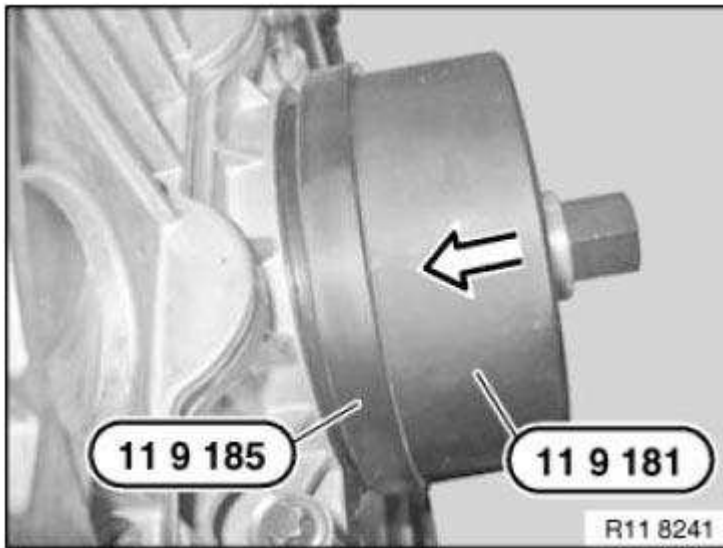


Fig. 137: Pulling Radial Shaft Seal Using Special Tool 11 9 181/11 9 185/11 9 183
Courtesy of BMW OF NORTH AMERICA, INC.

Screw on radial shaft seal with special tool 11 9 183 to limit position.

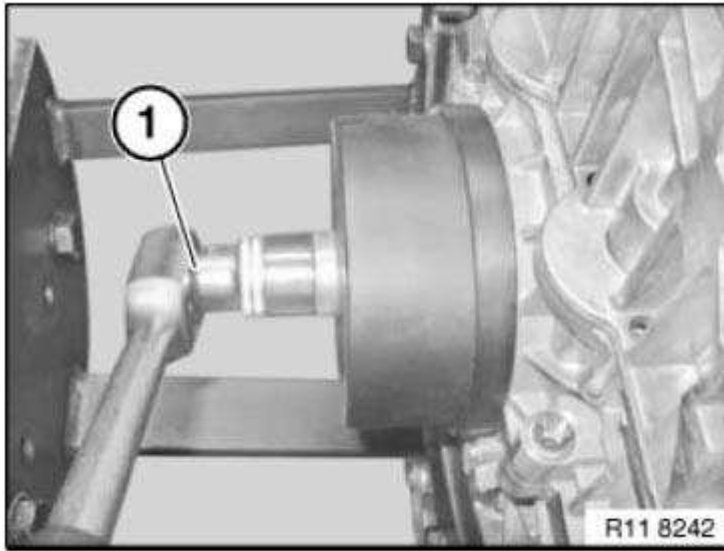


Fig. 138: Screwing On Radial Shaft Seal Using Special Tool 11 9 183
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Clean sealing surface (1) and degrease thoroughly in area of housing partition.

Apply a light coat of oil to running surface (2) of radial seal.

NOTE: **Graphic N42.**

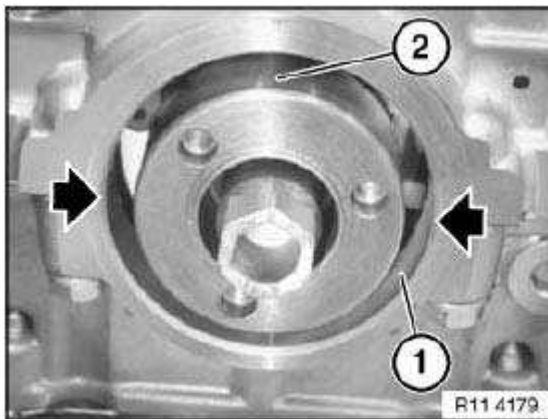


Fig. 139: Identifying Sealing Surface And Running Surface For Crankshaft Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Push radial shaft seal (1) 11 9 235 carefully in direction of arrow on the special tool.

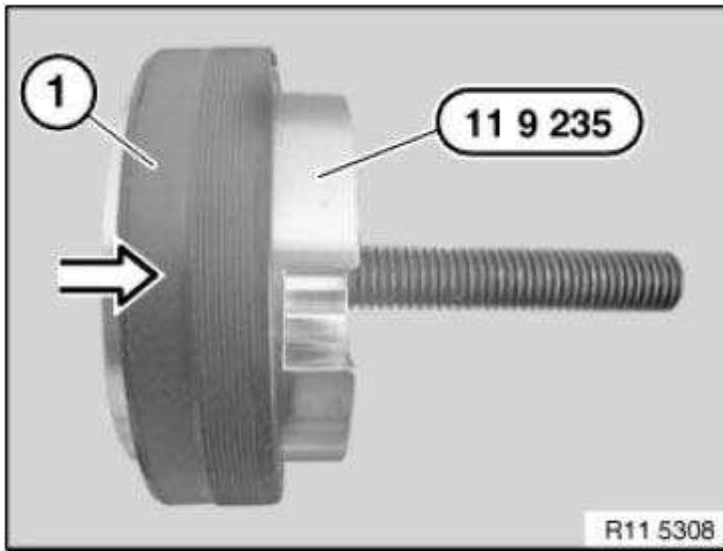


Fig. 140: Pushing Radial Shaft Seal (11 9 235) On Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: 11 9 235 Special tool can only be fastened with
2 opposite bolts.
Determine hole pattern on special tool.

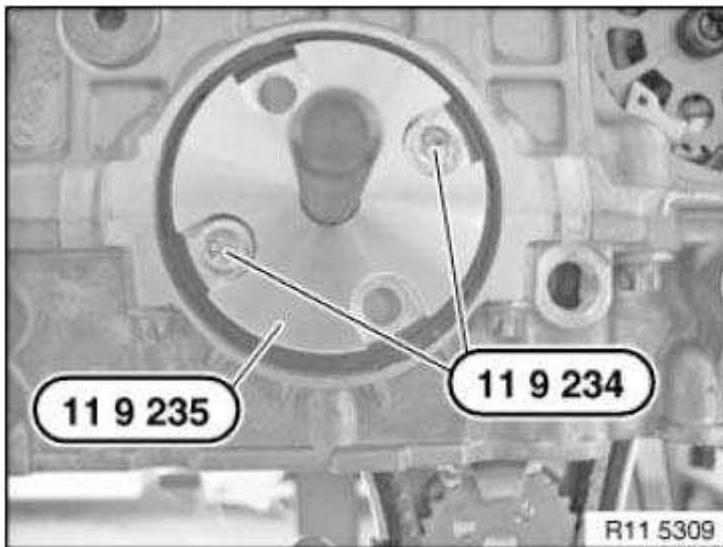


Fig. 141: Mounting Special Tool 11 9 235 With Special Tool 11 9 234 On Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Screw special tool 11 9 235 with special tool 11 9 234 on crankshaft.

Align groove (2) of radial shaft seal (1) centered to the housing partition (3).

IMPORTANT: After installation, the grooves must be filled with sealing compound.

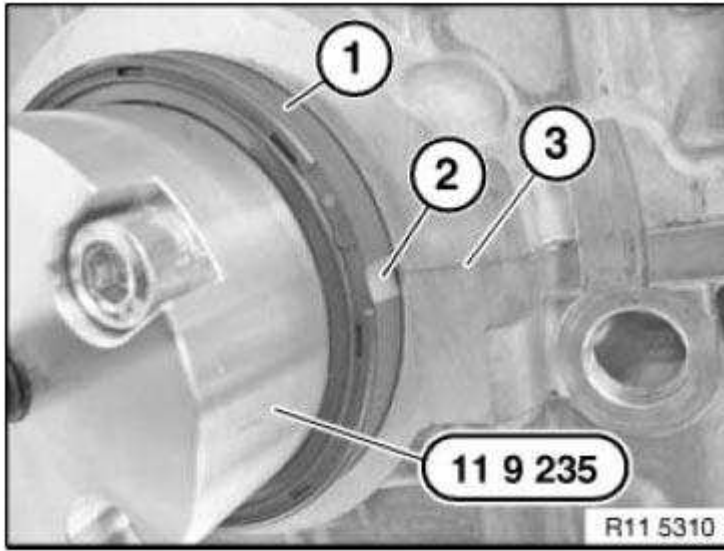


Fig. 142: Identifying Radial Shaft Seal , Housing Partition And Groove
Courtesy of BMW OF NORTH AMERICA, INC.

Draw in radial seal with special tool 11 9 231 in conjunction with special tool 11 9 233 until flush.

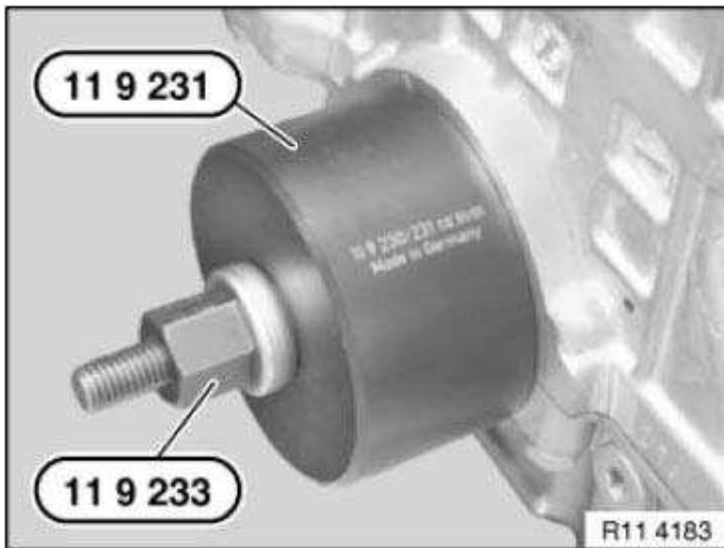


Fig. 143: Inserting Radial Seal With Special Tool 11 9 231 And 11 9 233
Courtesy of BMW OF NORTH AMERICA, INC.

Drive both injector nozzles (1) on left and right with special tool 11 9 360 into crankcase up to stop.

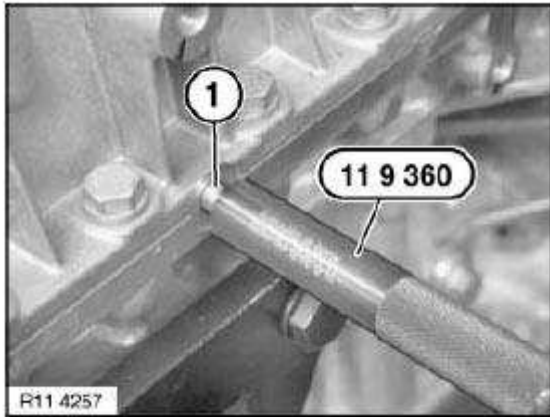


Fig. 144: Inserting Nozzles Using Special Tool 11 9 360
Courtesy of BMW OF NORTH AMERICA, INC.

After fitting both sealing rings, check both sealing ducts for clearance.

Blow compressed air (1) at max. 6 bar into injector nozzle (2).

Compressed air must emerge at both sealing rings on left and right from the outlet bores.

IMPORTANT: If the compressed air does not flow out of all ducts. the crankcase must again be taken apart and cleaned.

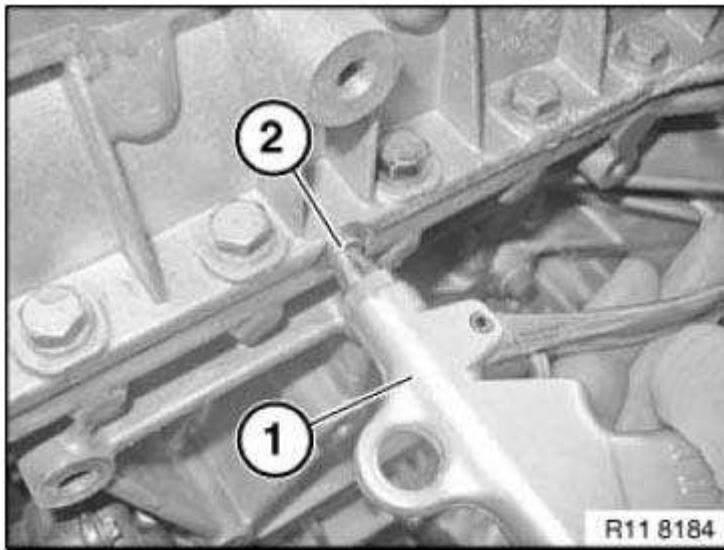


Fig. 145: Blowing Compressed Air Into Injector Nozzle
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Use PRIMER 1.3 AND LIQUID SEAL 1.4.

Prepare liquid sealing compound (1) in special tool 11 4 370.

Injector nozzles for injecting sealing compound are not required.

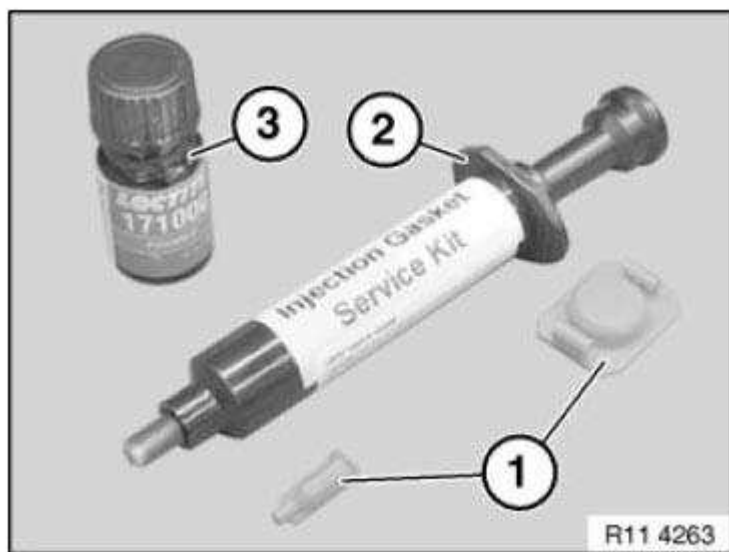


Fig. 146: Identifying Injector With Primer Bottle
Courtesy of BMW OF NORTH AMERICA, INC.

Slowly insert liquid sealing compound (1) with special tool 11 4 370 in direction of arrow.

Liquid sealing compound must emerge at radial shaft seals at front and rear.

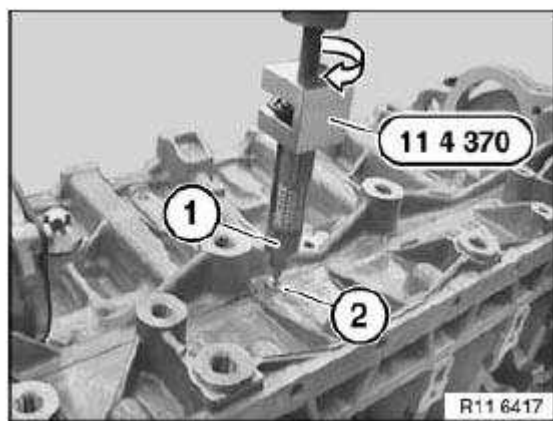


Fig. 147: Inserting Liquid Sealing Compound Using Special Tool 11 4 370
Courtesy of BMW OF NORTH AMERICA, INC.

Stop (seal off) escaping liquid gasket with primer 1.3.

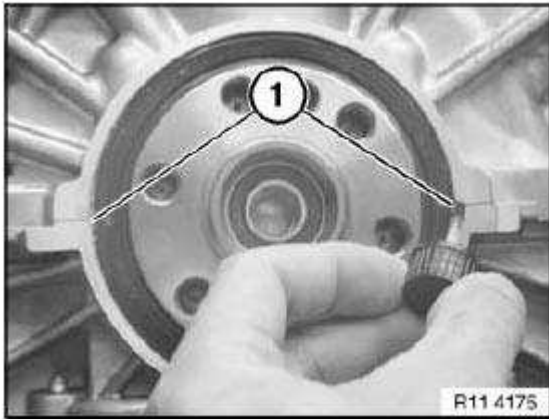


Fig. 148: Coating Surface Of Sealing Compound In Both Grooves Using Loctite Primer
Courtesy of BMW OF NORTH AMERICA, INC.

Stop (seal off) escaping liquid gasket with primer 1.3.

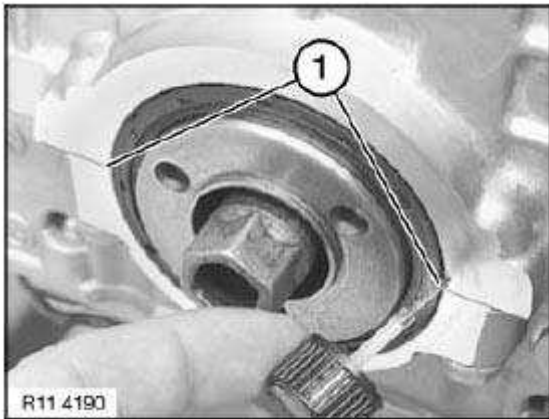


Fig. 149: Sealing Escaping Liquid Gasket With Primer
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 21 531 REPLACING ALL MAIN CRANKSHAFT BEARING SHELLS (N52K)

Special tools required:

- **00 2 590 PLASTIGAGE (5)**
- 11 4 251
- 11 4 252
- 11 4 470

IMPORTANT: Aluminium-magnesium materials.
No steel screws/bolts may be used due to the threat of electrochemical

corrosion.

A magnesium crankcase requires aluminum screws/bolts exclusively. Aluminum screws/bolts must be replaced each time they are released . The end faces of aluminum screws/bolts are painted blue for the purposes of reliable identification.

Jointing torque and angle of rotation must be observed without fail (risk of damage) .

Necessary preliminary tasks:

- Remove crankshaft, see **11 21 500 Replacing crankshaft (N52K)**

Checking position of oil spray nozzles:

Insert special tool 11 4 251 in screw connection of main bearing.

NOTE: Special tool 11 4 252 must be pre-installed at the seventh main bearing.

Check position of oil spray nozzle (2) according to position (1) on special tool 11 4 251 .

If necessary, adjust and secure oil spray nozzle (2).

Tightening torque: 11 11 5AZ, see **11 11 CRANKCASE** .

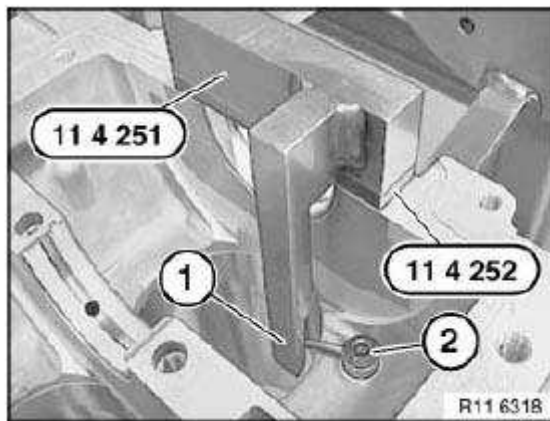


Fig. 150: Oil Spray Nozzle, Special Tools (11 4 251) And (11 4 252)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove bearing shells (2) and guide bearing shell (3).

NOTE: Guide bearing shell (3) is a thrust bearing. Observe bearing classification.

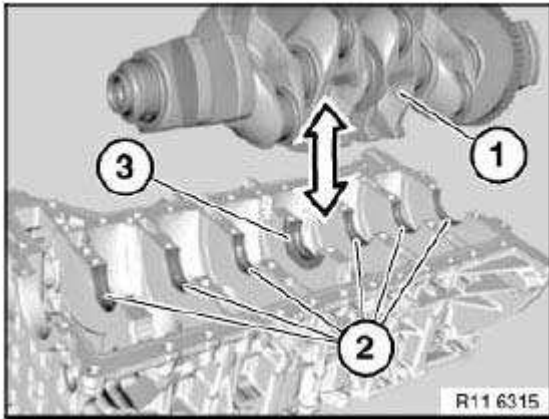


Fig. 151: Bearing Shells
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Bearing shell (1) with lubricant groove must be fitted in crankcase.

Bearing shell (2) without lubricant groove must be fitted in bedplate.

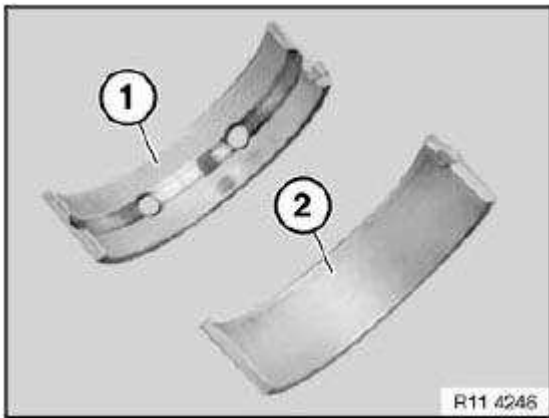


Fig. 152: Bearing Shells
 Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: It is not possible to remachine the crankshaft.

Surface (1) for marking.

Seven-digit part number (2).

Bearing classification (3) on bedplate (see table: values of 1/2/3).

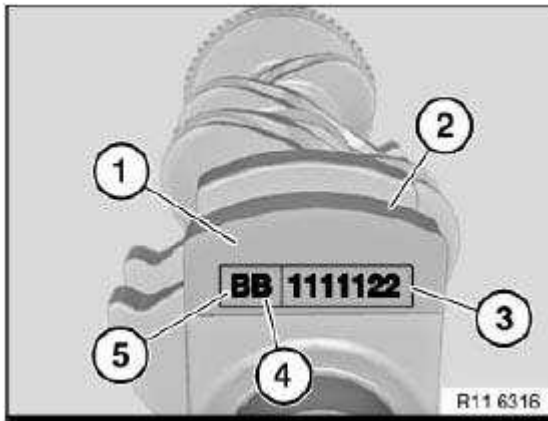


Fig. 153: Bearing Classification On Bedplate
 Courtesy of BMW OF NORTH AMERICA, INC.

Bearing classification (1) on crankcase (see table: values of A/B/C).

Installation:

When all the letters and number code have been determined, the color of the bearing shells must be allocated (see table).

IMPORTANT: Excessively small bearing play will result in engine damage.
The color combination Yellow and Red must not be fitted.
Possible color combinations (see table).

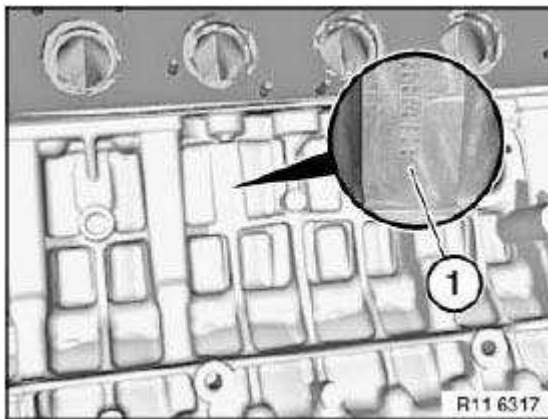


Fig. 154: Bearing Classification On Crankcase
 Courtesy of BMW OF NORTH AMERICA, INC.

BEARING SHELL COLOR COMBINATIONS SPECIFICATION

(A1) Bedplate / Yellow	(B1) Bedplate / Yellow	(C1) Bedplate / Green
(A1) Crankcase / Yellow	(B1) Crankcase / Green	(C1) Crankcase / Green
(A2) Bedplate / Green	(B2) Bedplate / Green	(C2) Bedplate / Green

(A2) Crankcase / Yellow	(B2) Crankcase / Green	(C2) Crankcase / Red
(A3) Bedplate / Green	(B3) Bedplate / Red	(C3) Bedplate / Red
(A3) Crankcase / Green	(B3) Crankcase / Green	(C3) Crankcase / Red

Install bearing shells (2) and guide bearing shell (3).

Installation:

Clean all sealing surfaces.

IMPORTANT: Do not use any metal-cutting tools.

Clean sealing faces with special tool 11 4 470 only.

Determine bearing play with special tool 00 2 590 .

Installation:

All measuring points must be clean and free from oil and grease. If necessary, clean all measuring points.

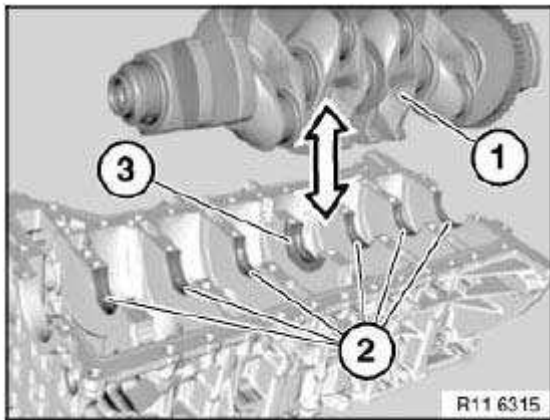


Fig. 155: Bearing Shells

Courtesy of BMW OF NORTH AMERICA, INC.

Use the existing screws to determine the bearing play.

Set up bedplate with bearing shells, see **11 21 500 Replacing crankshaft (N52K)**.

Remove bedplate.

Read off bearing play at width of flattened plastic thread and measurement scale.

Installation:

Remove plastic thread.

Apply a light coat of oil to bearing shells and crankshaft.

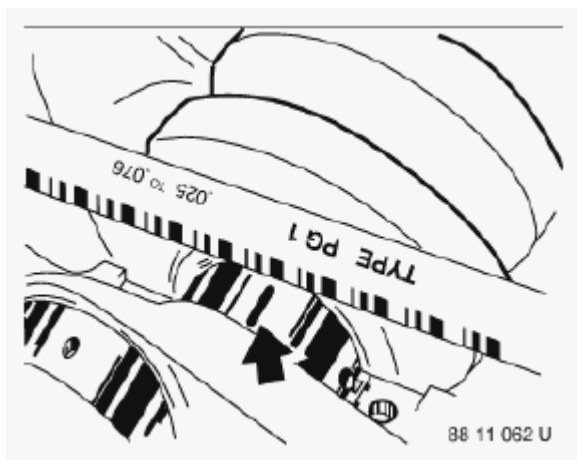


Fig. 156: Reading Bearing Play At Width Of Flattened Plastic Thread And Measurement Scale
Courtesy of BMW OF NORTH AMERICA, INC.

Install bedplate **11 21 500 Replacing crankshaft (N52K)**.

Assemble engine.

11 21 571 REPLACING ROLLER BALL BEARING IN CRANKSHAFT (N52K)

Necessary preliminary tasks

- Remove clutch.

Remove guide bearing with special tool 11 2 340.



Fig. 157: Removing Guide Bearing Using Special Tool 11 2 340
Courtesy of BMW OF NORTH AMERICA, INC.

Install new thrust bearing and drive firmly home with special tool 11 2 350 in conjunction with special tool 00 5 500.

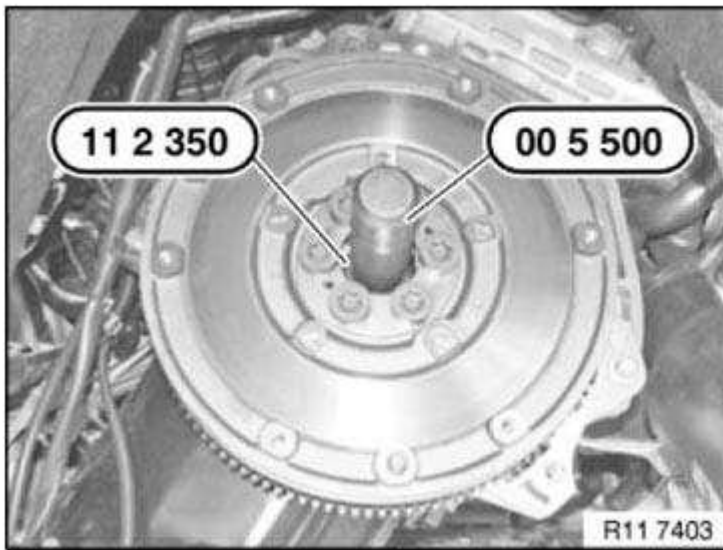


Fig. 158: Installing New Thrust Bearing Using Special Tool 11 2 350 And 00 5 500
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

22 FLYWHEEL

11 22 500 REMOVING AND INSTALLING/REPLACING FLYWHEEL (N52K)

Special tools required:

- 11 4 180
- 11 9 260
- 11 9 265

**IMPORTANT: Aluminum screws/bolts must be replaced each time they are released .
The end faces of aluminum screws/bolts are painted blue for the purposes of
reliable identification.
Jointing torque and angle of rotation must be observed without fail (risk of
damage) .**

Necessary preliminary tasks:

- Remove transmission
- Remove clutch, see **21 21 500 REMOVING AND INSTALLING/REPLACING CLUTCH (SAC)
(X3)** or .

For vehicles with optional extra SA205 (automatic transmission):

Secure flywheel (1) with existing transmission bolt (2) and special tool 11 9 260 .

Installation:

Replace aluminum screws.

Unfasten flywheel screws.

Tightening torque: 11 22 1AZ, see **11 22 FLYWHEEL** .

Installation:

Flywheel (1) is secured with an alignment pin.

Fit new flywheel screws.

Clean all threads for flywheel screws in crankshaft.

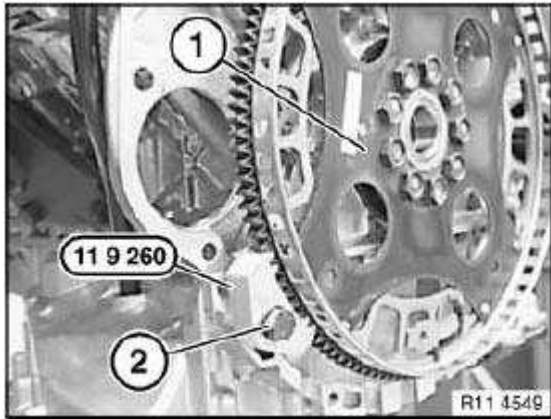


Fig. 159: Special Tool (11 9 260), Flywheel And Transmission Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

For vehicles without optional extra SA205 (automatic transmission):

Secure flywheel with existing transmission bolt (1) and special tools 11 9 260 and 11 9 265 .

Installation:

Replace aluminum screws.

Release flywheel screws with special tool 11 4 180 .

Tightening torque: 11 22 2AZ, see **11 22 FLYWHEEL** .

Installation:

Flywheel is secured with a dowel pin.

Fit new flywheel screws.

Clean all threads for flywheel screws in crankshaft.

Assemble engine.

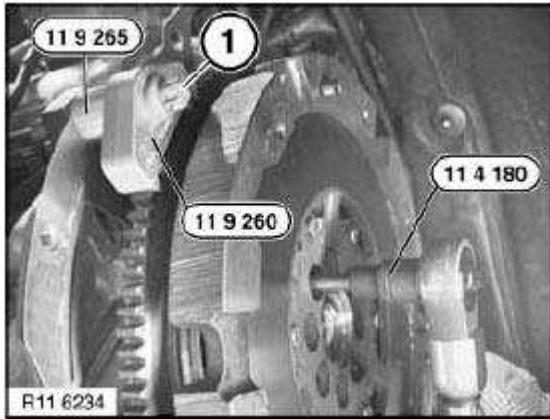


Fig. 160: Special Tools (11 9 260), (11 9 265) And (11 4 180)
 Courtesy of BMW OF NORTH AMERICA, INC.

11 22 513 REPLACING ROLLER BEARING FOR DUAL-MASS FLYWHEEL

Special tools required:

- 21 2 051
- 21 2 052

NOTE: Flywheel removed!

Using hydraulic press (1) and special tool 21 2 051 , press out dual-mass flywheel downwards on engine side.

IMPORTANT: Risk of damage:
 Roller bearing must not be driven out.

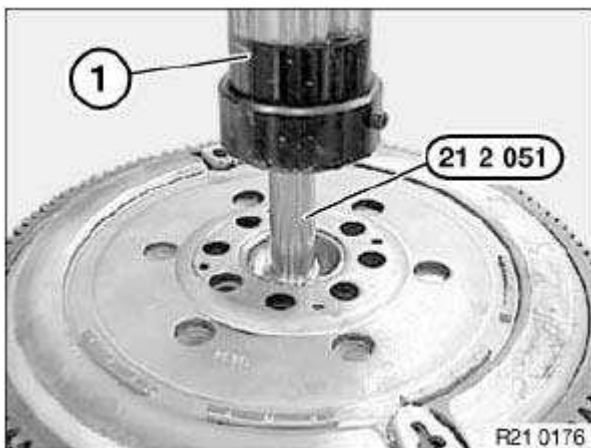


Fig. 161: Hydraulic Press And Special Tool (21 2 051)
 Courtesy of BMW OF NORTH AMERICA, INC.

Push roller bearing (2) onto special tool 21 2 052 .

Using hydraulic press (1), press roller bearing into dual-mass flywheel as far as it will go on clutch side.

IMPORTANT: Risk of damage:

Observe press-in instruction:

- Roller bearing must not be driven in.
- Roller bearing mounting force/travel monitored:

Min. 2000N 1 mm before end of pressing in.

Max. 15000N during entire press-in procedure.

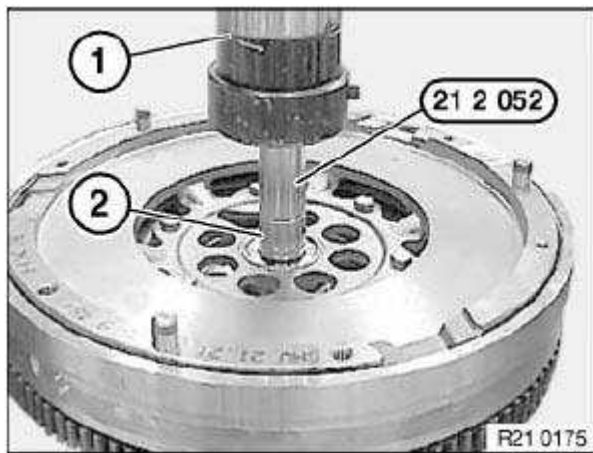


Fig. 162: Hydraulic Press, Roller Bearing And Special Tool (21 2 052)
Courtesy of BMW OF NORTH AMERICA, INC.

1123 VIBRATION DAMPER

11 23 010 REMOVING AND INSTALLING/REPLACING VIBRATION DAMPER (N52K)

Necessary preliminary tasks

- Remove underbody protection **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT ASSEMBLY UNDERSIDE PROTECTION (X5)** or **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION (X3)** .
- Remove alternator drive belt.

Release screws (1).

Tightening torque, see **23 VIBRATION DAMPER** .

Remove vibration damper (2).

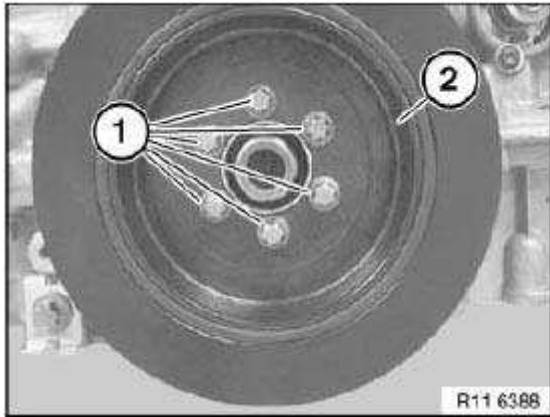


Fig. 163: Identifying Screws And Vibration Damper
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

24 CONNECTING ROD WITH BEARING

11 24 571 REPLACING ALL CONNECTING ROD BEARING SHELLS (N52K)

Special tools required:

- **00 2 590 PLASTIGAGE (5)**
- **00 9 120 TORQUE ANGLE MEASURING DIAL**

IMPORTANT: All crank pins are connected with the crankshaft.

Modified procedure: The colors of the connecting rod bearing shells are the same at the top and bottom.

The Blue / Red connecting rod bearing shell colors are no longer fitted in combination.

Necessary preliminary tasks:

- Remove oil sump

IMPORTANT: All crankshaft crank pins are classified.

Possible classifications per connecting rod at top and bottom:

r: Red

b: Blue

Only **one** color may be fitted per big end bearing cap and connecting rod.

In direction of arrow from (1 to 2) crank pin (1 to 6).

Example:

Possible classification: rbbrrb

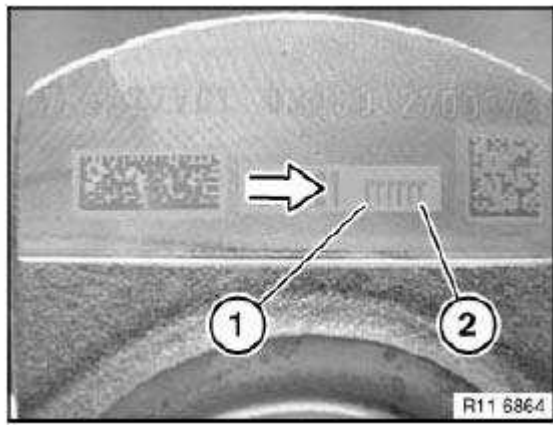


Fig. 164: Connecting Rod Classifications
Courtesy of BMW OF NORTH AMERICA, INC.

Cylinder Classification Red / Red

1. Cylinder Classification Blue / Blue
2. Cylinder Classification Blue / Blue
3. Cylinder Classification Red / Red
4. Cylinder Classification Red / Red
5. Cylinder Classification Blue / Blue

Release conrod bolts (1).

Remove connecting rod bearing cap (2).

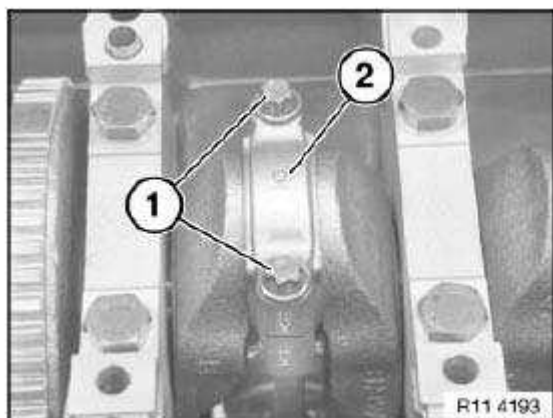


Fig. 165: Conrod Bolts And Connecting Rod Bearing Cap
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage to cylinder wall and to crankshaft.

Gently release connecting rod from crankshaft.

Remove connecting rod bearing shells (1 and 2).

Install new conrod bearing shells.

Installation:

Pay attention to guide lugs during installation.

IMPORTANT: All crankshaft crank pins are classified.

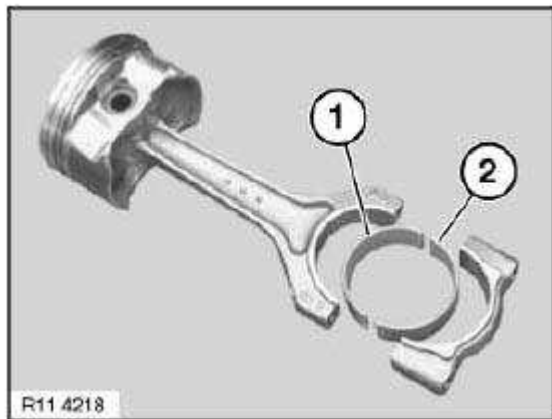


Fig. 166: Connecting Rod Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

In each case insert only one color of connecting rod bearing shell (1 and 2) for each connecting rod.

Check conrod bearing clearance.

Piston in BDC position.

To determine the connecting rod bearing play, make sure that the bearing points are clean and free from oil and grease.

Fit special tool 00 2 590 (Plastigage Type PG 1) to the oil-free crankshaft.

Fit conrod bearing cap so that pairing letters match up.

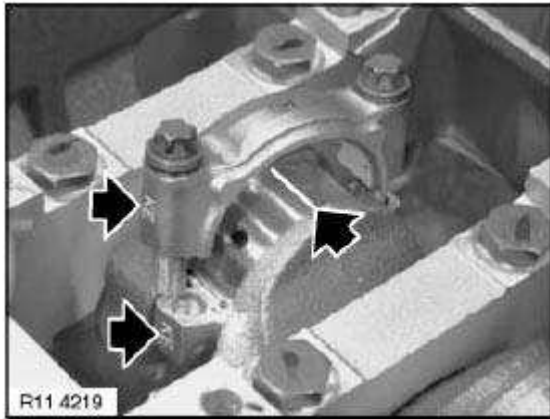


Fig. 167: Locating Conrod Bearing Clearance
 Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not distort conrods or crankshaft.

Use the old conrod bolts to check conrod clearance.

Tighten down conrod bolts with special tool 00 9 120 .

Tightening torque: 11 24 1AZ, see **11 24 CONNECTING RODS AND BEARINGS** .

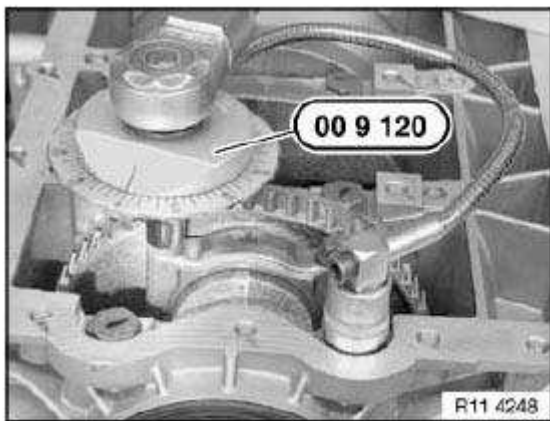


Fig. 168: Special Tool (00 9 120)
 Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew conrod bearing cover. Read off conrod bearing play at width of flattened plastic thread on measurement scale.

Conrod bearing clearance, see **11 24 CONNECTING RODS AND BEARINGS N52K B25** .

- Remove Plastigage
- Coat crankshaft and connecting rod bearing shells with oil

- Install new conrod bolts and tighten down with special tool 00 9 120 .

Tightening torque: 11 24 1AZ, see **11 24 CONNECTING RODS AND BEARINGS** .

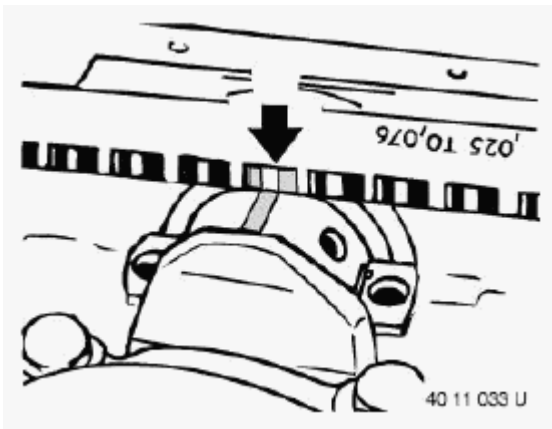


Fig. 169: Reading Conrod Bearing Play At Width Of Flattened Plastic Thread On Measurement Scale
 Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

25 PISTON WITH RINGS AND PIN

11 25 530 REMOVING AND INSTALLING/REPLACING ALL PISTONS (N52K)

Special tools required:

- **00 9 120 TORQUE ANGLE MEASURING DIAL**
- 11 4 491
- 11 4 492
- 11 4 493
- 11 4 494
- 11 6 241
- 11 6 261
- 11 8 330

WARNING: Danger of injury!

Carry out work on piston pin circlip wearing protective goggles only.

IMPORTANT: If piston, connecting rod, big end bearing cap and connecting rod bearing shell are to be reused, they must be installed in the same position.
 Individual replacement of a connecting rod is not permitted. Connecting rods

are classified by weight categories and are only available as a set for all cylinders.

Connecting rod and big end bearing cap are marked with identical pairing letters and must not be mixed up.

Danger of engine damage!

Piston and piston pins are paired and must not be fitted individually.

Necessary preliminary tasks:

- Remove engine
- Mount engine on assembly stand, see **Mounting engine on assembly stand (N52K)**.
- Remove intake air manifold
- Remove cylinder head, see **11 12 100 Removing and installing cylinder head (N52K)**.
- Remove oil sump
- Remove oil pump, see **11 41 000 Removing and installing/replacing oil pump (N52K)**

NOTE: Carefully remove heavy oil carbon residues from the cylinder wall (arrow).

IMPORTANT: Do not use any metal-cutting tools.

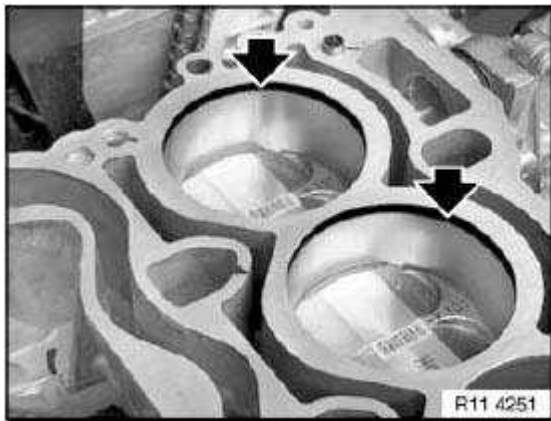


Fig. 170: Locating Cylinder Wall

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Oil spray nozzle (2) must not be maladjusted or bent.
Risk of damage!

Do **not** release screw (1) of oil spray nozzle (2).

If necessary, readjust oil spray nozzle (2), see **11 21 531 Replacing all main crankshaft bearing shells (N52K)**.

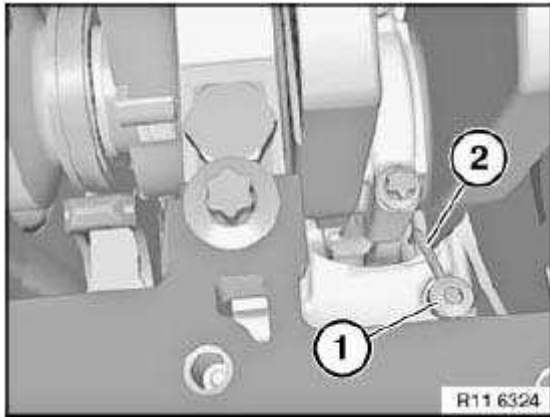


Fig. 171: Spray Nozzle And Screw
 Courtesy of BMW OF NORTH AMERICA, INC.

Release conrod bolts (1).

Tightening torque: 11 24 1AZ, see **11 24 CONNECTING RODS AND BEARINGS** .

Installation:

Replace screws.

Remove conrod bearing cap (2) in direction of arrow.

IMPORTANT: Connecting rod and big end bearing cap (2) are marked with identical pairing letters and must not be mixed up.

Danger of engine damage!

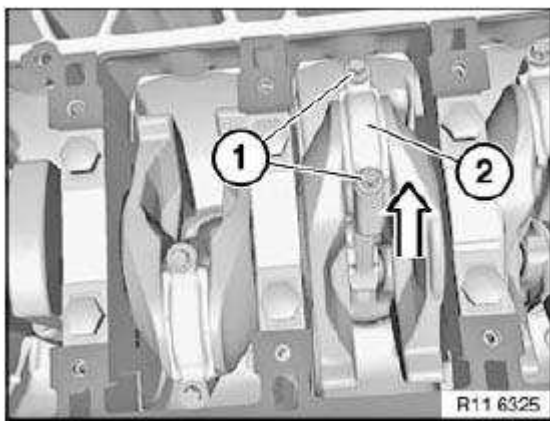


Fig. 172: Removing Conrod Bearing Cap
 Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 11 8 330 to connecting rod.

Press out connecting rod and piston with special tool 11 8 330 to cylinder head side.

NOTE: Special tool 11 8 330 simultaneously serves to prevent connecting rod and piston from falling down.

IMPORTANT: Do not touch the oil spray nozzle when removing the components.
Risk of damage!

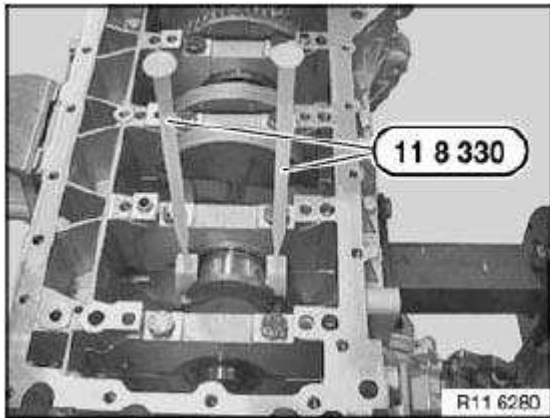


Fig. 173: Special Tool (11 8 330)
Courtesy of BMW OF NORTH AMERICA, INC.

Preliminary work:

Clamp special tool 11 4 491 in vice.

Secure piston (1) with connecting rod to special tool 11 4 491 .

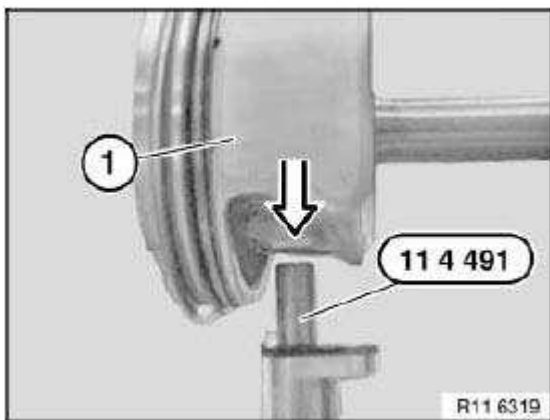


Fig. 174: Securing Piston With Connecting Rod To Special Tool (11 4 491)
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Danger of injury!

Carry out work on piston pin circlip wearing protective goggles only.

WARNING: Protective goggles must be worn.

Lever out piston pin circlip with special tool 11 4 492 in direction of arrow.

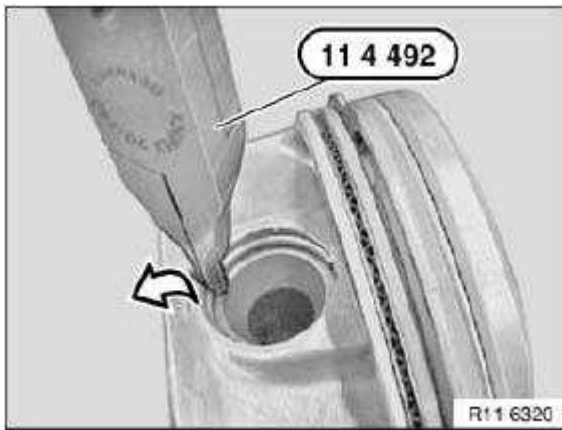


Fig. 175: Removing Piston Pin Circlip With Special Tool (11 4 492)
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, replace connecting rods.

IMPORTANT: Individual replacement of a connecting rod is not permitted. Connecting rods are classified by weight categories and are only available as a set for all cylinders. Existing and new connecting rods must not be installed in mixed combinations.

Installation:

It must be possible for the piston pin to be pressed with minimal force by hand through the small end bushing. There must be no noticeable play.

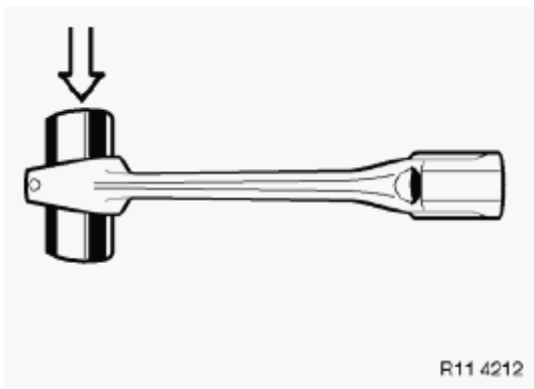


Fig. 176: Installing Piston Pin Into Small End Bushing
Courtesy of BMW OF NORTH AMERICA, INC.

Measure piston installation clearance:

Measure piston diameter with micrometer at measuring point "A" from lower edge of piston and offset by 90° to piston pin axis.

Piston diameter at measuring point "A", see **11 25 PISTONS WITH RINGS AND PINS N52K B25** .

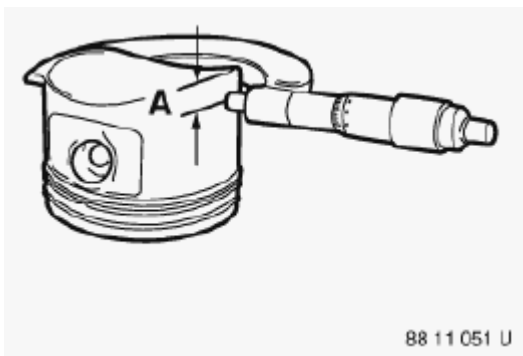


Fig. 177: Measuring Piston Diameter
Courtesy of BMW OF NORTH AMERICA, INC.

Adjust micrometer to cylinder bore of crankcase. Set internal caliper on micrometer to "zero". Measure bottom, center and top of cylinder bore in direction of travel and direction of engine rotation.

Diameter of cylinder bore.

Piston installation clearance.

Total permissible wear tolerance, see **11 25 PISTONS WITH RINGS AND PINS N52K B25**

If necessary, replace piston.

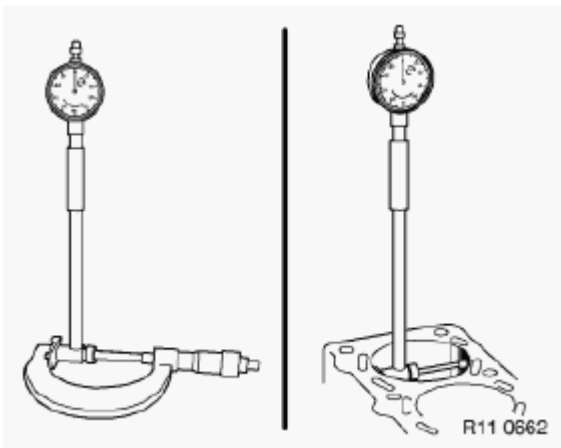


Fig. 178: Measuring Diameter Of Cylinder Bore
 Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Protective goggles must be worn.

Insert piston pin circlip (2) into groove (1) of special tool 11 4 493 .

Move piston pin circlip (2) into installation position.

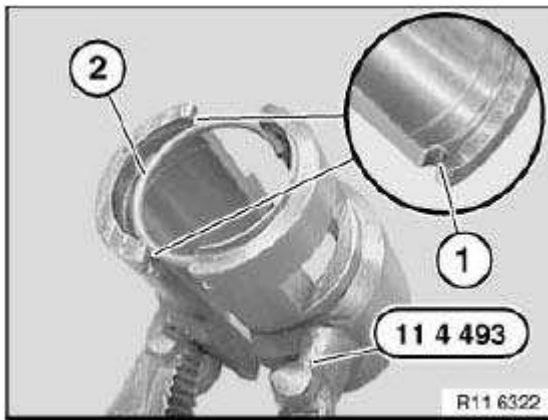


Fig. 179: Piston Pin Circlip And Groove
 Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Protective goggles must be worn.

Guide lug and cutout on special tool 11 4 493 must point to piston crown. Only then can special tool 11 4 494 be correctly fitted.

When special tools 11 4 493 and 11 4 494 are correctly positioned, the piston pin circlip must be driven in with a plastic hammer in the direction of the arrow.

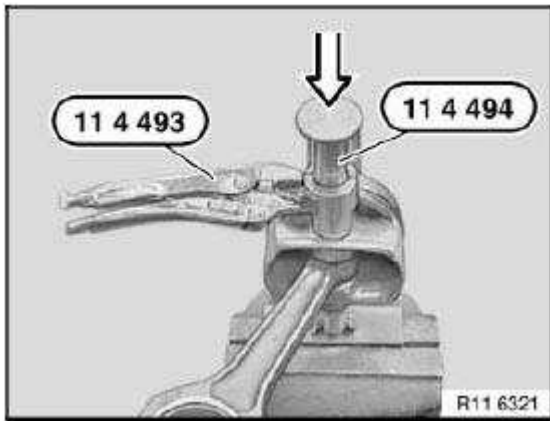


Fig. 180: Installing Piston Pin Circlip

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: For vehicles with B30 engines.

Install all piston rings, see **11 25 671 Replacing piston rings on all pistons (N52K)**.

Install all connecting rod bearing shells, see **11 24 571 Replacing all connecting rod bearing shells (N52K)**.

Coat piston (2) and piston rings with oil.

Pre-install piston (2) in special tool 11 6 261 .

Attach special tool 11 8 330 to connecting rod (1).

Installation:

Check protective lugs on special tool 11 8 330 for correct position and damage.

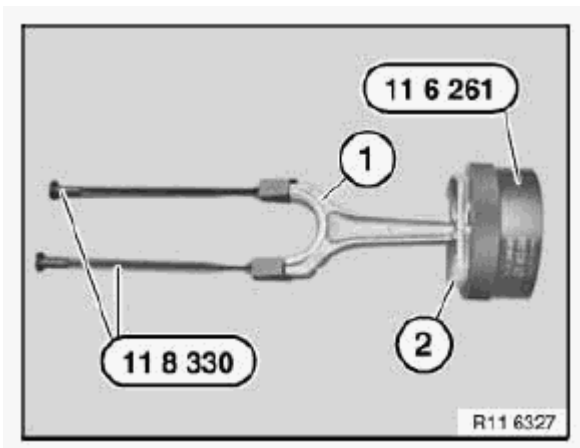


Fig. 181: Connecting Rod, Piston And Special Tools (11 8 330) And (11 6 261)

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: For vehicles with B25 engines.

Install all piston rings, see **11 25 671 Replacing piston rings on all pistons (N52K).**

Install all connecting rod bearing shells, see **11 24 571 Replacing all connecting rod bearing shells (N52K).**

Coat piston (2) and piston rings with oil.

Pre-install piston (2) in special tool 11 6 241 .

Attach special tool 11 8 330 to connecting rod (1).

Installation:

Check protective lugs on special tool 11 8 330 for correct position and damage.

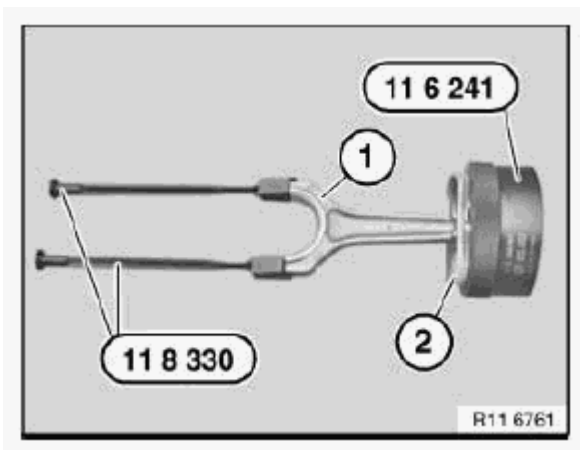


Fig. 182: Connecting Rod, Piston And Special Tools (11 8 330) And (11 6 241)
Courtesy of BMW OF NORTH AMERICA, INC.

Insert piston (1) with connecting rod in cylinder.

IMPORTANT: Do not touch the oil spray nozzle when installing the components.
Risk of damage!
Danger of piston ring failure.

Press in piston (1) at marked points (see arrows) with finger pressure only, do not drive in.

Insert piston (1) so that arrow (2) on piston crown points to camshaft drive.

Press in piston (1) with special tools 11 6 261 / 11 6 241 .

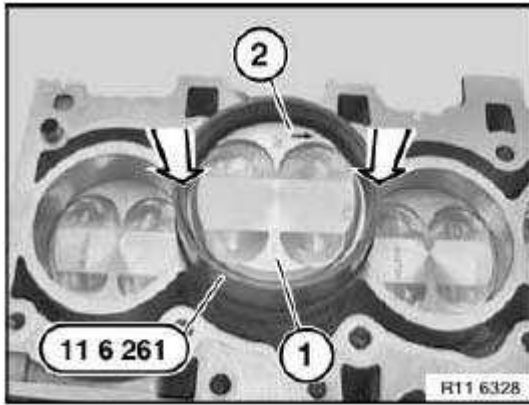


Fig. 183: Pressing Piston With Special Tools (11 6 261)
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Connecting rod and big end bearing cap are marked with identical pairing letters (1) and must not be mixed up. Mixing them up or incorrectly fitting the big end bearing cap on the connecting rod will result in engine damage .

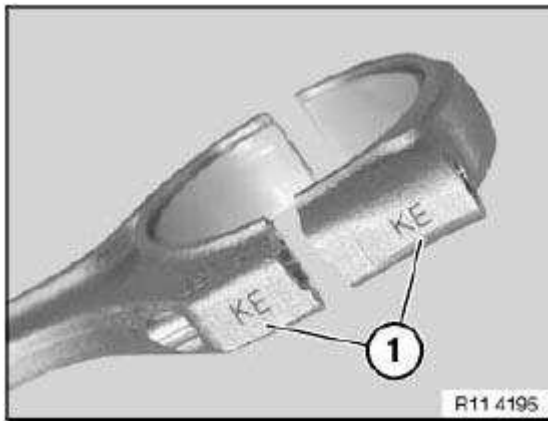


Fig. 184: Connecting Rod Identical Pairing Letters
Courtesy of BMW OF NORTH AMERICA, INC.

Apply a light coat of oil to connecting rod bearing journal. Join connecting rod and connecting rod bearing journal.

Detach special tool 11 8 330 .

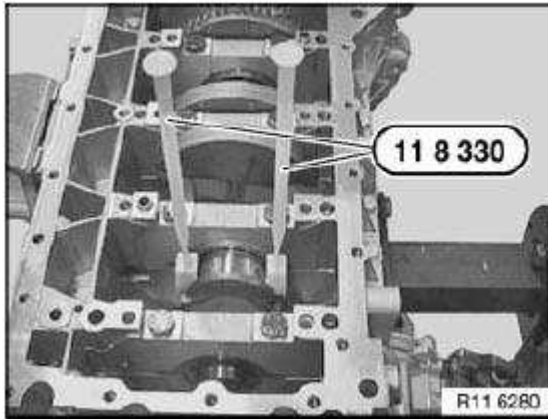


Fig. 185: Special Tool (11 8 330)
Courtesy of BMW OF NORTH AMERICA, INC.

Fit conrod bearing caps (2) so that pairing letters match up.

Installation:

Replace screws.

Install new conrod bolts (1).

**IMPORTANT: Jointing torque and angle of rotation must be observed without fail.
Risk of damage!**

Tightening torque: 11 24 1AZ, see **11 24 CONNECTING RODS AND BEARINGS** .

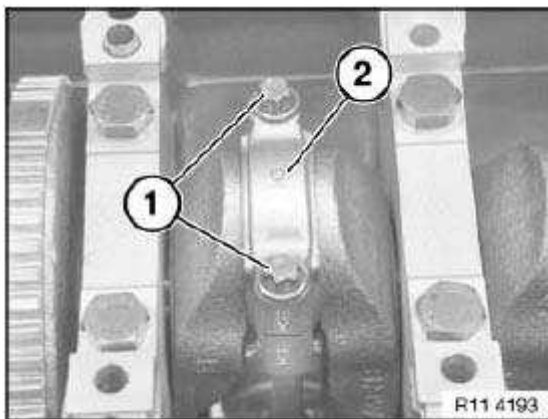


Fig. 186: Conrod Bolts And Connecting Rod Bearing Cap
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, tighten connecting rod bolts to torsion angle with special tool 00 9 120 .

Tightening torque: 11 24 1AZ, see **11 24 CONNECTING RODS AND BEARINGS** .

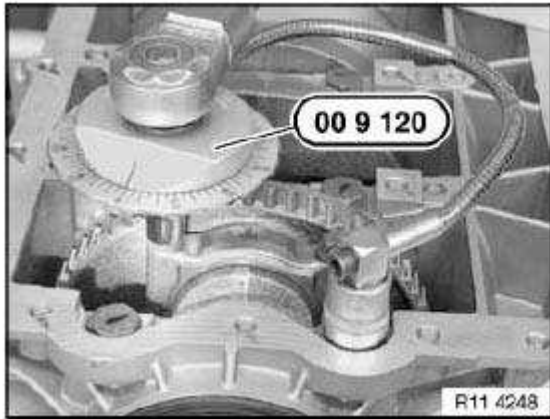


Fig. 187: Special Tool (00 9 120)

Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 25 671 REPLACING PISTON RINGS ON ALL PISTONS (N52K)

Necessary preliminary tasks:

- Removing all pistons, see **11 25 530 Removing and installing/replacing all pistons (N52K)**

Measuring axial clearance of piston rings in piston ring groove.

Technical Data.

NOTE: It is not possible to measure the axial clearance of the U-flex rings.

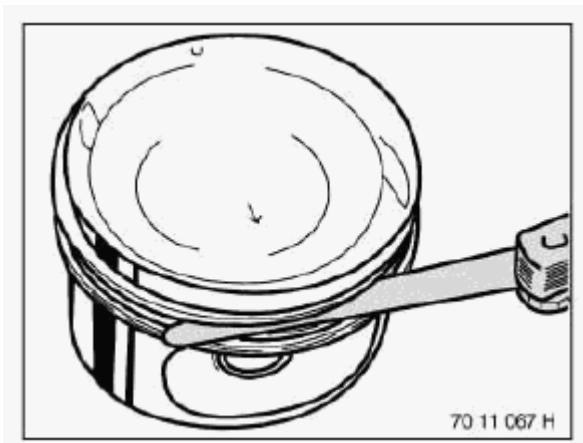


Fig. 188: Measuring Axial Clearance Of Piston Rings In Piston Ring Groove

Courtesy of BMW OF NORTH AMERICA, INC.

Remove plain compression ring and stepped ring upwards with piston ring pliers.

The U-flex ring comprises two steel band rings and a support spring.

NOTE: **The U-flex ring cannot be removed with piston ring pliers.
Put aside all piston rings in correct sequence and installation position.
It might not be possible to find the identification on used piston rings.**

Installation:

New pistons may only be installed together with new piston rings.

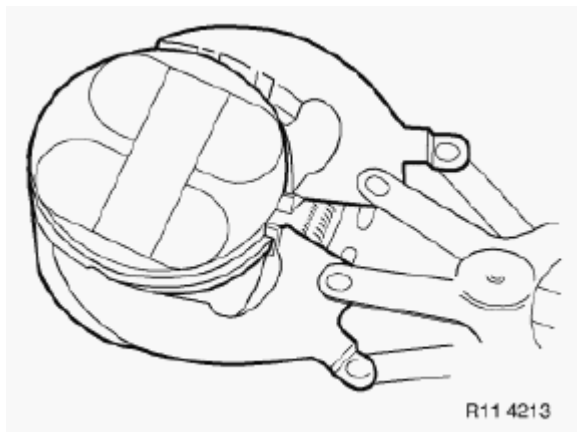


Fig. 189: Removing Plain Compression Ring And Stepped Ring With Piston Ring Pliers
Courtesy of BMW OF NORTH AMERICA, INC.

Determine end clearance with a feeler gauge, see **11 25 PISTONS WITH RINGS AND PINS N52K B25** .

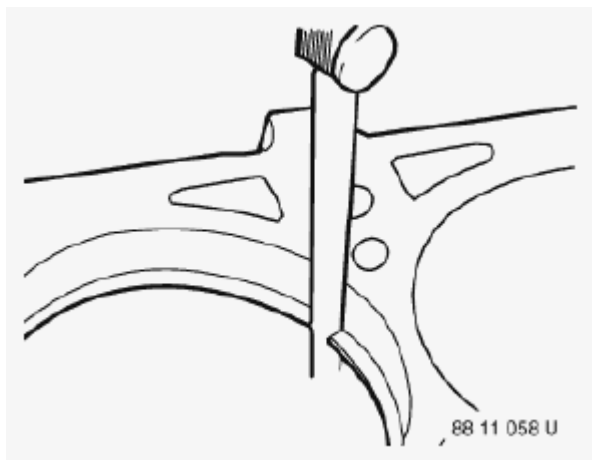


Fig. 190: Measuring Ring End Clearance With Feeler Gauge
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: **Schematic diagram of piston rings.**

Installation:

Piston rings with "TOP" identification must point to piston crown.

1. Plain compression ring
2. Stepped ring "TOP"
3. U-flex ring

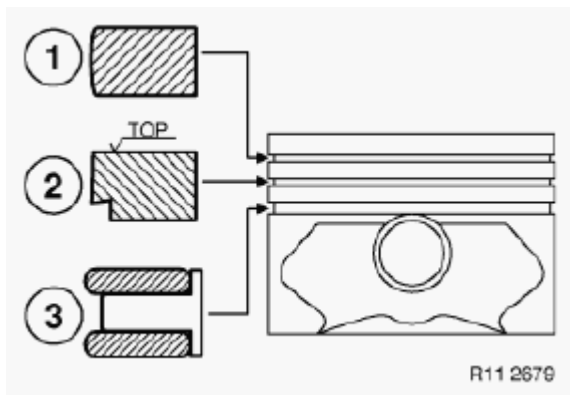


Fig. 191: Piston Rings Installation Position

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The U-flex ring comprises two steel band rings (1) and a support spring (2).

Installation:

Insert support spring (2) into piston ring groove and then fit steel band rings (1) so that contact points are offset by approx. 120°.

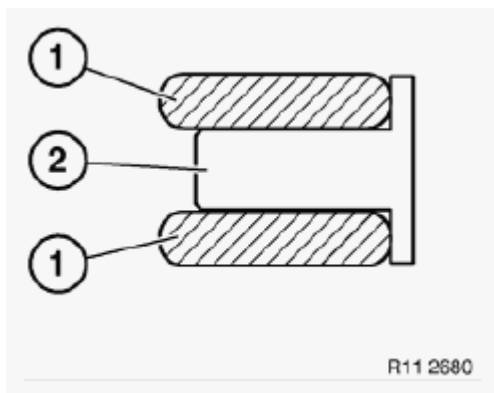


Fig. 192: Support Spring And Steel Band Rings

Courtesy of BMW OF NORTH AMERICA, INC.

The contact points (1) of the piston rings must be arranged offset by approx. 120°. However, the contact points (1) must not be arranged over the piston pin boss.

NOTE: Picture shows N52.

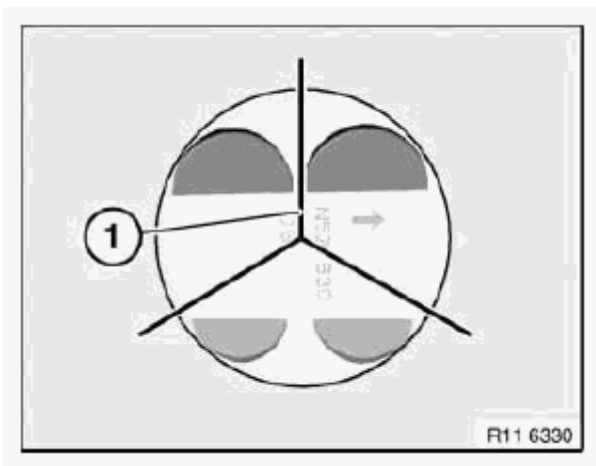


Fig. 193: Contact Points Of Piston Rings
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

28 V-RIBBED BELT WITH TENSIONER / DEFLECT ELEMENT

11 28 010 REPLACING ALTERNATOR DRIVE BELT (N51)

Special tools required:

- 11 3 340

IMPORTANT: Aluminium-magnesium materials.

No steel screws/bolts may be used due to the threat of electrochemical corrosion.

A magnesium crankcase requires aluminum screws/bolts exclusively.

Aluminum screws/bolts must be replaced each time they are released.

The end faces of aluminum screws/bolts are painted blue for the purposes of reliable identification.

Jointing torque and angle of rotation must be observed without fail (*risk of damage*).

Necessary preliminary tasks:

- Remove Fan Cowl with electric fan.

NOTE: Mark the direction of rotation of the drive belt if it is to be reused.

Layout of drive belt.

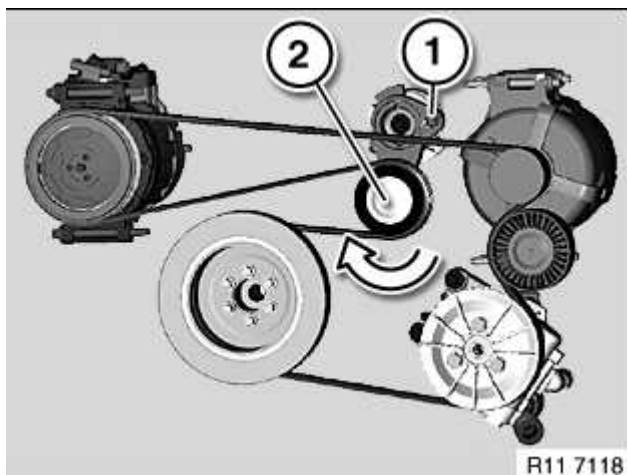


Fig. 194: Drive Belt Tensioner, Mounting Screw And Removal Direction
Courtesy of BMW OF NORTH AMERICA, INC.

Turn belt tensioner (4) in direction of arrow until bore (2) is flush on housing.

Hold belt tensioner (4) under tension.

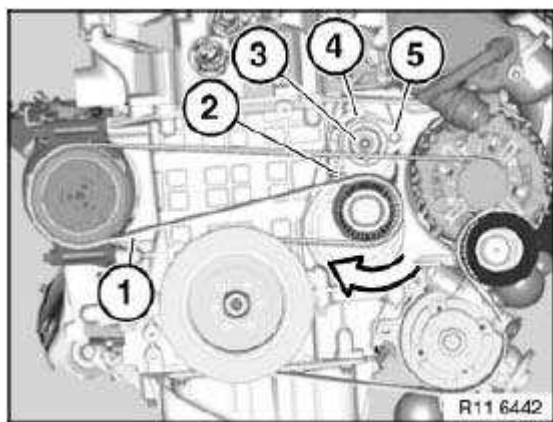


Fig. 195: Belt Tensioner And Bore
Courtesy of BMW OF NORTH AMERICA, INC.

Secure belt tensioner with special tool 11 3 340.

NOTE: Illustration N42.

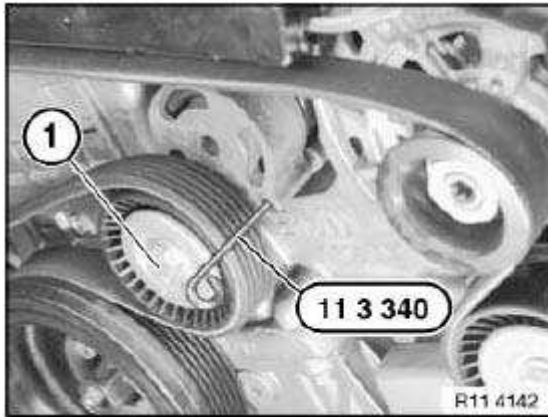


Fig. 196: Special Tool (11 3 340) And Belt Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

Remove drive belt (1) towards top.

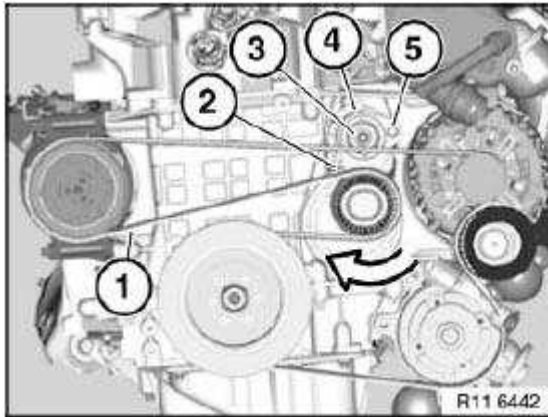


Fig. 197: Identifying Belt Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Installation:

Check that drive belt for is in correct installation position - **risk of damage.**

11 28 010 REPLACING ALTERNATOR DRIVE BELT (N52K)

Special tools required:

- 11 3 340

IMPORTANT: Aluminium-magnesium materials.

No steel screws/bolts may be used due to the threat of electrochemical corrosion.

A magnesium crankcase requires aluminum screws/bolts exclusively.

Aluminum screws/bolts must be replaced each time they are released.

The end faces of aluminum screws/bolts are painted blue for the purposes of reliable identification.

Joining torque and angle of rotation must be observed without fail (*risk of damage*).

Necessary preliminary tasks:

- Remove Fan Cowl with electric fan

NOTE: Mark the direction of rotation of the drive belt if it is to be reused.

Course of E9x drive belt:

Turn belt tensioner (4) in direction of arrow until bore (2) is flush on housing.

Hold belt tensioner (4) under tension.

Load is removed from tensioning pulley.

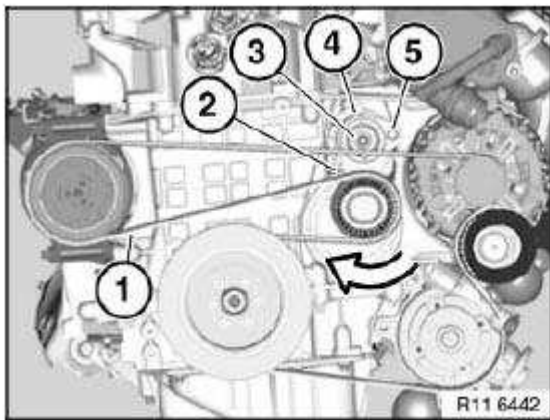


Fig. 198: Belt Tensioner And Bore
Courtesy of BMW OF NORTH AMERICA, INC.

Course of E85 drive belt:

Turn belt tensioner (1) in direction of arrow until bore is flush on housing.

Hold belt tensioner (1) under tension.

Load is removed from tensioning pulley (2).

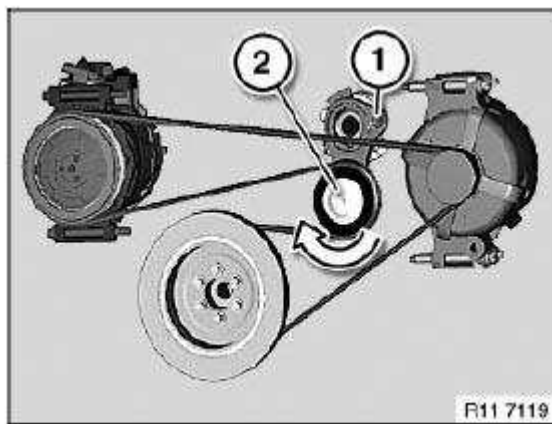


Fig. 199: Belt Tensioner And Tensioning Pulley
Courtesy of BMW OF NORTH AMERICA, INC.

All:

Secure belt tensioner (1) with special tool 11 3 340.

Remove drive belt upwards.

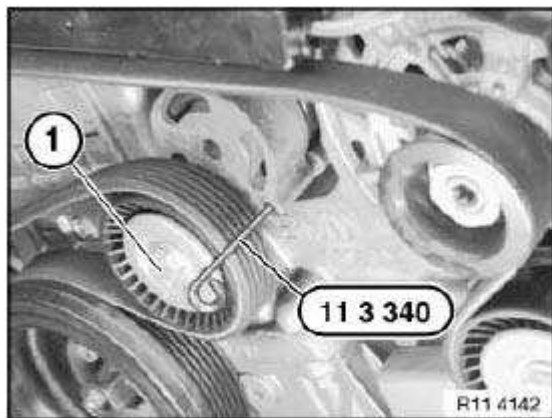


Fig. 200: Special Tool (11 3 340) And Belt Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Installation:

Check that drive belt for is in correct installation position - **risk of damage.**

11 28 020 REPLACING TENSIONING DEVICE FOR ALTERNATOR DRIVE BELT (N51)

Special tools required:

- 11 3 340

IMPORTANT: Aluminium-magnesium materials.

No steel screws/bolts may be used due to the threat of electrochemical corrosion.

A magnesium crankcase requires aluminum screws/bolts exclusively.

Aluminum screws/bolts must be replaced each time they are released .

The end faces of aluminum screws/bolts are painted blue for the purposes of reliable identification.

Jointing torque and angle of rotation must be observed without fail (risk of damage) .

Necessary preliminary tasks:

- Remove Drive Belt.

Remove special tool 11 3 340.

Release screw (3).

For tightening torque refer to 11 28 1AZ in **28 V-RIBBED BELT WITH TENSIONER** .

Installation:

Replace aluminum screws.

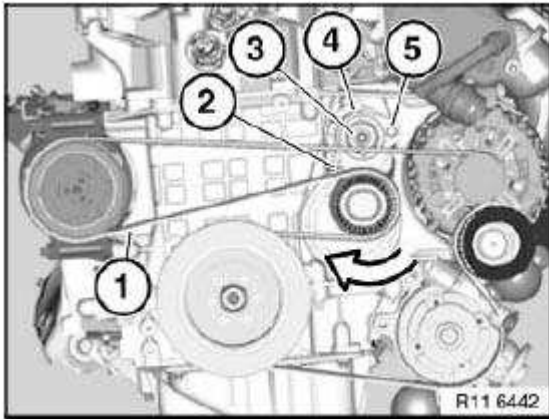


Fig. 201: Belt Tensioner And Belt Tensioner Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 28 020 REPLACING TENSIONING DEVICE FOR ALTERNATOR DRIVE BELT (N52K)

Special tools required:

- 11 3 340

IMPORTANT: Aluminium-magnesium materials.

No steel screws/bolts may be used due to the threat of electrochemical corrosion.

A magnesium crankcase requires aluminum screws/bolts exclusively.

Aluminum screws/bolts must be replaced each time they are released .

The end faces of aluminum screws/bolts are painted blue for the purposes of reliable identification.

Jointing torque and angle of rotation must be observed without fail (risk of damage) .

Necessary preliminary tasks:

- Remove Drive Belt

E9x only:

Remove special tool 11 3 340.

Release screw (3) on belt tensioner (4).

For tightening torque refer to 11 28 1AZ in **28 V-RIBBED BELT WITH TENSIONER** .

Installation:

Replace aluminum screws.

Remove belt tensioner (4).

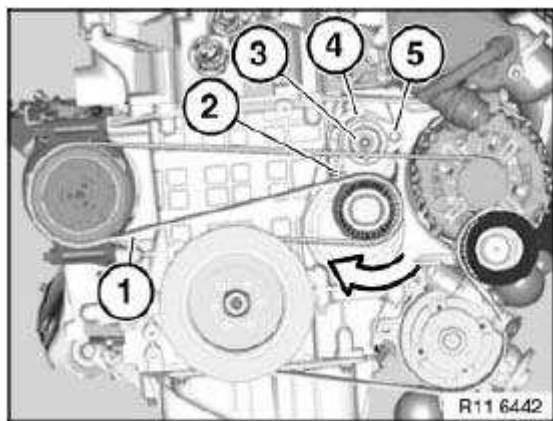


Fig. 202: Belt Tensioner And Belt Tensioner Screw
Courtesy of BMW OF NORTH AMERICA, INC.

E85 only:

Remove special tool 11 3 340.

Release screw on belt tensioner (1).

For tightening torque refer to 11 28 1AZ in **28 V-RIBBED BELT WITH TENSIONER** .

Installation:

Replace aluminum screws.

Remove belt tensioner (1).

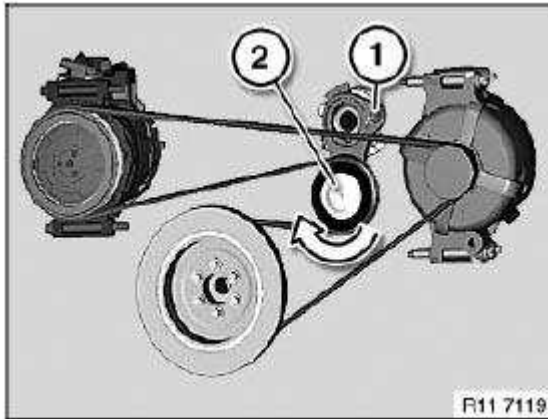


Fig. 203: Belt Tensioner And Drive Belt
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

31 CAMSHAFT

11 31 005 CHECKING TIMING OF CAMSHAFT(S) (N52K)

Special tools required:

- 11 0 300
- 11 4 281
- 11 4 282
- 11 4 283

Necessary preliminary tasks:

- Remove cylinder head cover
- Remove underbody protection. See **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT ASSEMBLY UNDERSIDE PROTECTION (X5)** or **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION (X3)**

Remove fastener (1) in direction of arrow.

Installation:

Install fastener (1) with bore facing outwards.

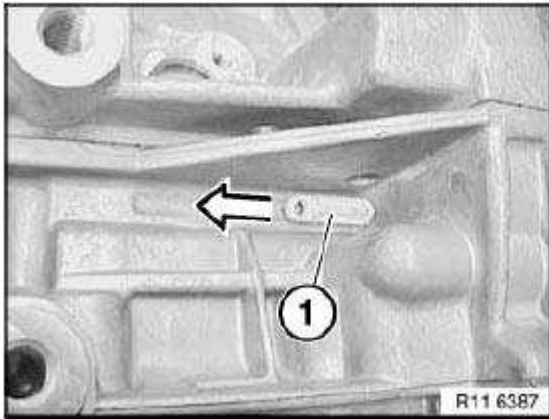


Fig. 204: Fastener

Courtesy of BMW OF NORTH AMERICA, INC.

Rotate crankshaft at central bolt into TDC position.

Slide special tool 11 0 300 in direction of arrow into special tool bore and secure crankshaft.

IMPORTANT: On vehicles with optional extra SA205 (automatic transmission), there is a large bore for the TDC position shortly before the special tool bore. This bore can be confused with the special tool bore.

If the flywheel is secured in the correct special tool bore with special tool 11 0 300 , the engine can no longer be moved at the central bolt.

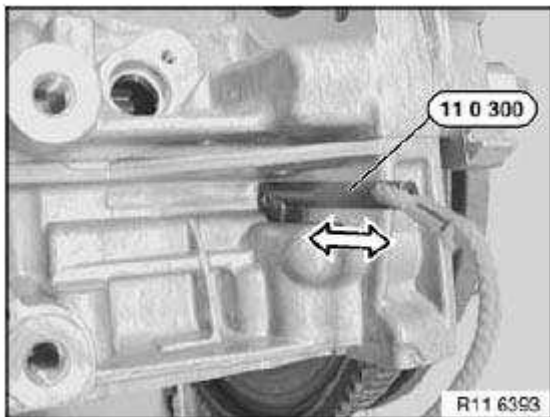


Fig. 205: Securing Crankshaft Using Special Tool (11 0 300)

Courtesy of BMW OF NORTH AMERICA, INC.

With 1st cylinder in firing TDC position, cams of inlet camshaft (1) at 1st cylinder point upwards at an angle.

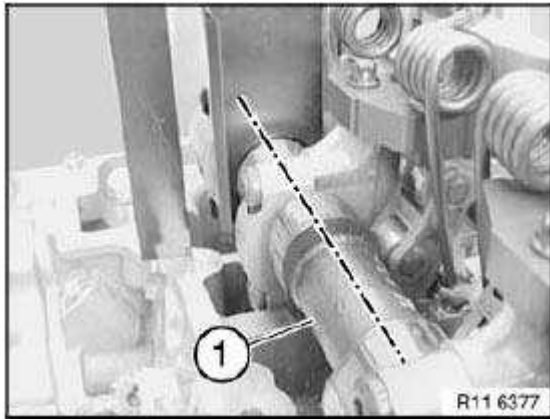


Fig. 206: Inlet Camshaft

Courtesy of BMW OF NORTH AMERICA, INC.

The timings are correct when the part numbers (2) on the inlet and exhaust camshafts (1) point upwards.

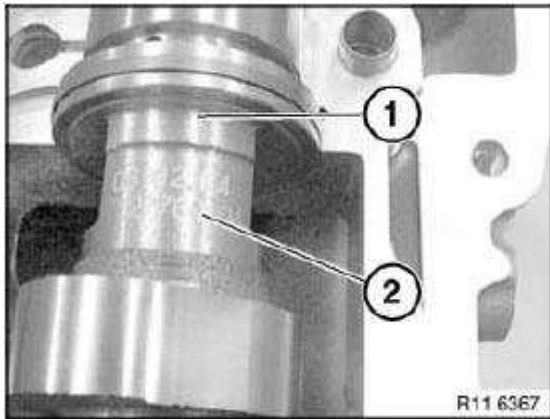


Fig. 207: Part Numbers On Inlet And Exhaust Camshafts

Courtesy of BMW OF NORTH AMERICA, INC.

With 1st cylinder in firing TDC position, cams of exhaust camshaft (3) at 6th cylinder point downwards at an angle.

Cam follower (1) is not actuated.

NOTE: When the engine is installed, the position of the exhaust camshaft (3) for the timing can only be checked with a mirror.

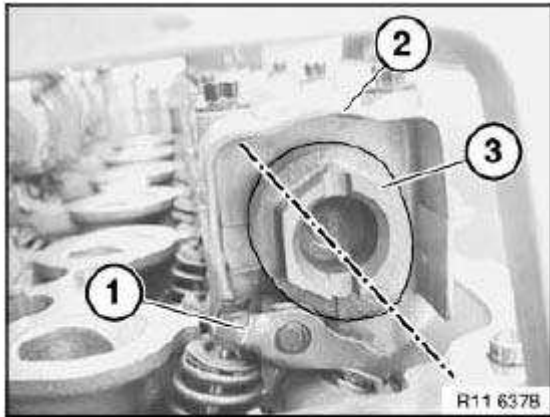


Fig. 208: Exhaust Camshaft And Cam Follower
 Courtesy of BMW OF NORTH AMERICA, INC.

Secure special tool 11 4 283 to cylinder head with bolts (1).

NOTE: Fit special tool 11 4 282 underneath on side of inlet camshaft.
 Mount special tool 11 4 281 on inlet and exhaust camshafts.

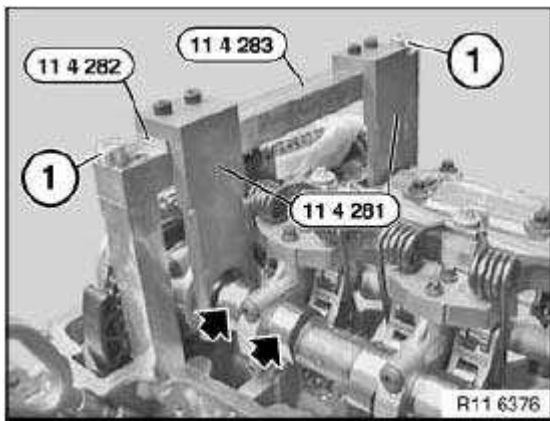


Fig. 209: Cylinder Head Bolts And Special Tools (11 4 282) And (11 4 281)
 Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, adjust valve timing, see **11 31 505 Adjusting timing of camshaft(s) (N52K)**.

Assemble engine.

11 31 025 REMOVING AND INSTALLING/REPLACING INLET CAMSHAFT (N52K)

Special tools required:

- 11 4 281
- 11 4 481

**IMPORTANT: Aluminum screws/bolts must be replaced each time they are released .
The end faces of aluminum screws/bolts are painted blue for the purposes of
reliable identification.
Jointing torque and angle of rotation must be observed without fail (risk of
damage) .**

Necessary preliminary tasks:

- Remove cylinder head cover
- Remove inlet adjustment unit
- Remove intermediate lever, see **11 37 010 Removing and installing/replacing intermediate levers (N52K)**.
- Adjust valve timing, see **11 31 505 Adjusting timing of camshaft(s) (N52K)**.

NOTE: All bearing caps (1 and 2) are marked with numbers from 1 to 6.

Bearing cap (1) is a thrust bearing.

Release screws on bearing caps 1 to 6 (1 and 2).

Tightening torque: 11 31 2AZ, see **11 31 CAMSHAFT** .

Set all bearing caps down in special tool 11 4 481 in a tidy and orderly fashion.

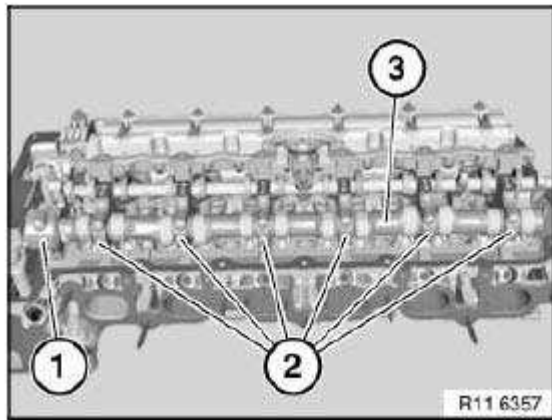


Fig. 210: Bearing Caps

Courtesy of BMW OF NORTH AMERICA, INC.

Remove inlet camshaft (2) towards top.

Installation:

Clean all bearing points and lubricate with oil.

Check plain compression rings (1) for damage and replace if necessary.

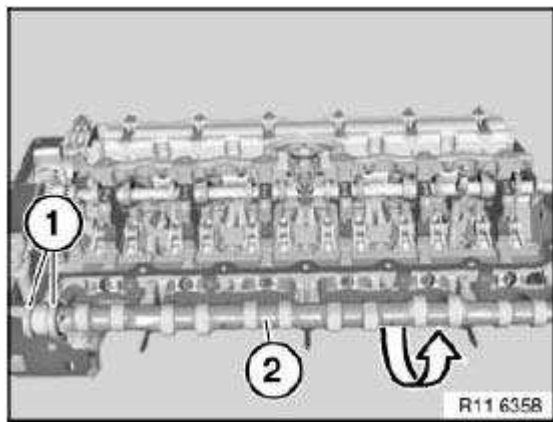


Fig. 211: Removing Inlet Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Plain compression rings (1) are engaged at joint.

Press plain compression rings (1) apart upwards and downwards and removed towards front.

IMPORTANT: Plain compression rings (1) can easily break.

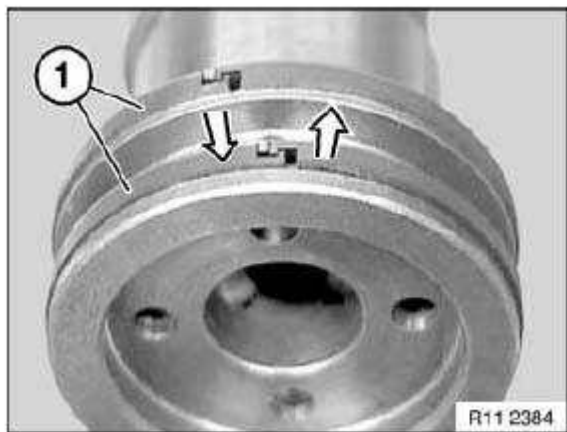
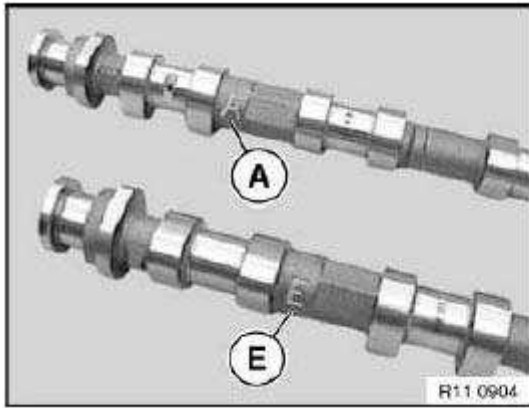


Fig. 212: Removing Plain Compression Rings
Courtesy of BMW OF NORTH AMERICA, INC.

**IMPORTANT: Markings of inlet and exhaust camshafts are different.
Mixing up the inlet and exhaust camshaft will result in engine damage .**



A Exhaust camshaft.
E Inlet camshaft

Fig. 213: Markings Of Inlet And Exhaust Camshafts
Courtesy of BMW OF NORTH AMERICA, INC.

Insert inlet camshaft (1) so that part number on twin surface points upwards.

Position inlet camshaft (1) so that cams point upwards at an angle.

Attach special tool 11 4 281 to twin surface.

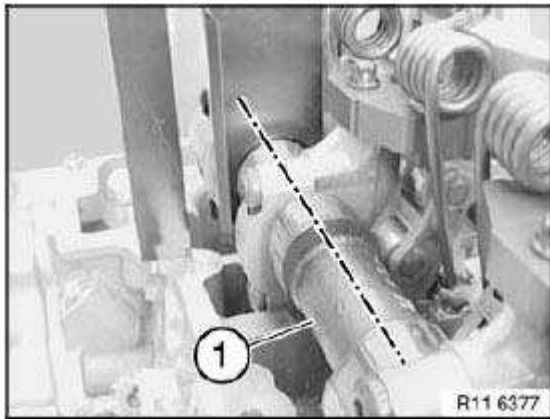


Fig. 214: Inlet Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 31 028 REMOVING AND INSTALLING/REPLACING EXHAUST CAMSHAFT (N52K)

Special tools required:

- 00 9 120
- 11 4 350
- 11 4 461

- 11 4 462
- 11 4 463
- 11 9 000

IMPORTANT: It is absolutely essential to follow an exact procedure for removing and installing the exhaust camshaft.

Risk of damage!

The upper and lower bearing banks must be tensioned with a total of six special tools 11 4 461.

Necessary preliminary tasks:

- Remove cylinder head cover
- Remove exhaust adjustment unit
- Adjust valve timing

The screw connection of the bearing banks must be released from the outside inwards.

Lift out upper and lower bearing banks (1) with exhaust camshaft.

Remove upper bearing bank (1).

Remove exhaust camshaft from lower bearing bank.

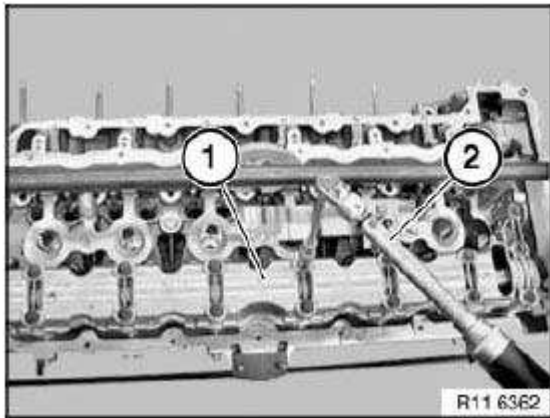


Fig. 215: Upper And Lower Bearing Banks

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Markings of inlet and exhaust camshafts are different.

Mixing up the inlet and exhaust camshaft will result in **engine damage** .

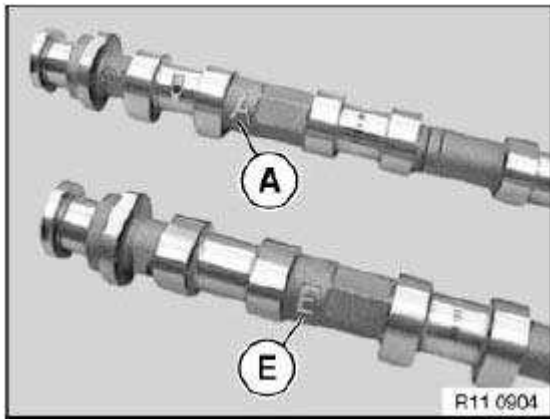


Fig. 216: Markings Of Inlet And Exhaust Camshafts
Courtesy of BMW OF NORTH AMERICA, INC.

Check plain compression rings (1) for damage and replace if necessary.

Plain compression rings (1) are engaged at joint.

Press plain compression rings (1) apart upwards and downwards and removed towards front.

IMPORTANT: Plain compression rings (1) can easily break.

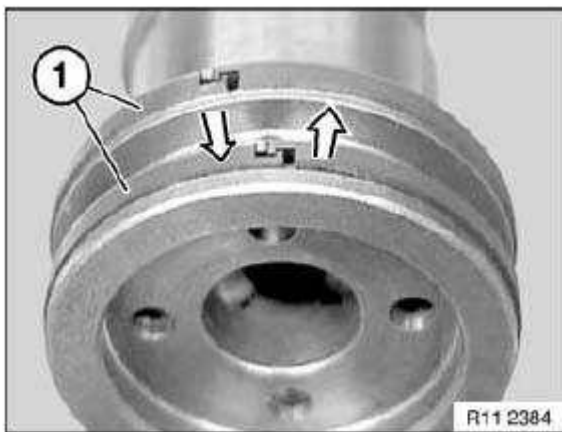


Fig. 217: Removing Plain Compression Rings
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Removal on engine:

Set engine to firing TDC at 1st cylinder.

Removed cylinder head:

When using special tool 11 9 000, it will be necessary to remove the aluminum profile insert.

Mounting bearing bank:

Pre-install special tool 11 4 462 on cylinder no. 2.

Insert special tool 11 4 463 in screw connection of cylinder head cover.

IMPORTANT: Special tool 11 4 463 is a special screw.

Press down cam followers (3) on cylinder no. 2 with spindle nut (2) of special tool 11 4 462.

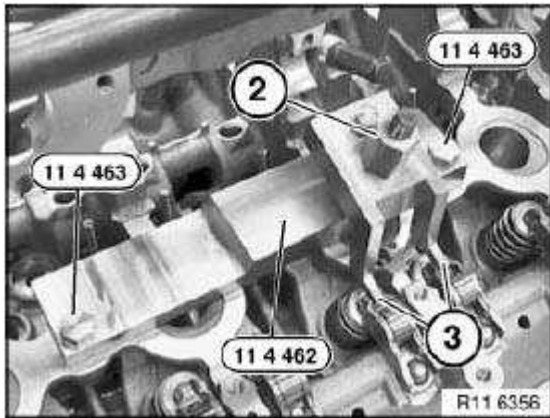


Fig. 218: Cam Followers, Spindle Nut And Special Tools
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Before mounting the exhaust camshaft on the correct cam follower seat (1), pay attention to the hydraulic valve clearance adjustment element and the valve.

Refer to **REMOVING AND INSTALLING/REPLACING ALL CAM FOLLOWERS.**

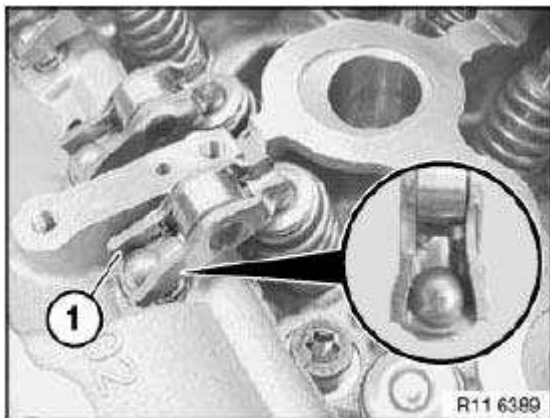


Fig. 219: Cam Follower Seat
Courtesy of BMW OF NORTH AMERICA, INC.

Position lower bearing bank (1) with exhaust camshaft (2) cam followers.

Align exhaust camshaft (2).

Cylinder nos. 2 and 4 are at valve overlap.

Cams (3) on cylinder no. 1 point upwards at an angle.

Part number (4) on twin surface of exhaust camshaft (2) points upwards.

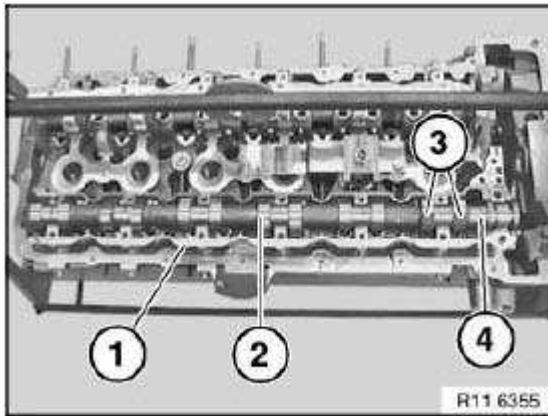


Fig. 220: Lower Bearing Bank, Exhaust Camshaft With Part Number And Cams
Courtesy of BMW OF NORTH AMERICA, INC.

**IMPORTANT: There must be no adhesive residues in the cylinder head tapped holes.
Clean tapped holes.**

Fit upper bearing bank (1).

Insert bolts dry.

Tension down upper bearing bank (1) with exhaust camshaft at bearing points 3 and 5 through a 1/2 bolt turn.

Join exhaust camshaft to upper and lower bearing banks (1) with torque wrench (2) from inside outwards to **8 Nm** .

Release all screws of upper bearing bank (1) from outside inwards by 90°.

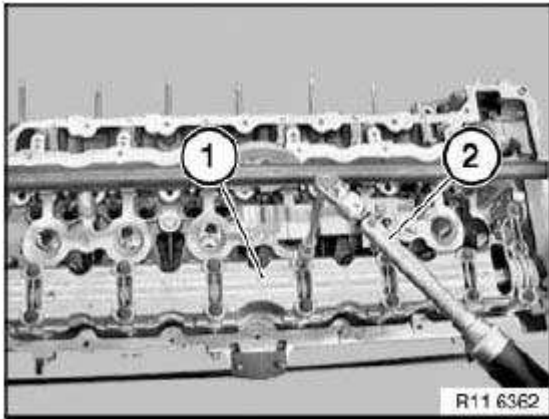


Fig. 221: Upper And Lower Bearing Banks
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Upper and lower bearing banks must be aligned to each other at ground surfaces (1 and 2).

Make sure that the thrust piece and the legs of special tools 11 4 461 rest on the milled surfaces.

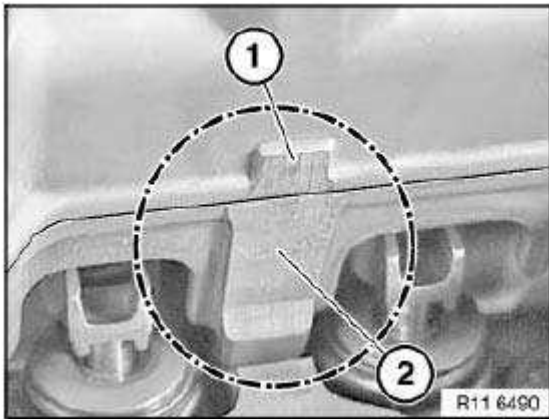


Fig. 222: Ground Surfaces
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Schematic depiction of special tool 11 4 461 at upper bearing bank (1) and lower bearing bank (2).

Pretension all special tools 11 4 461 with special tool 11 4 350 only.

IMPORTANT: Tighten screw (3) on thrust piece to 2 Nm. Risk of damage!

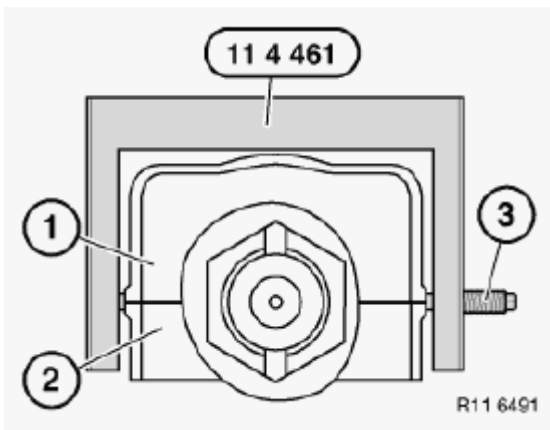


Fig. 223: Screw, Upper And Lower Bearing Bank
Courtesy of BMW OF NORTH AMERICA, INC.

Position special tool 11 4 461 over screw connection of bearing banks.

Make sure that the legs rest exactly on the ground surfaces of the upper bearing bank (2) and lower bearing bank (1).

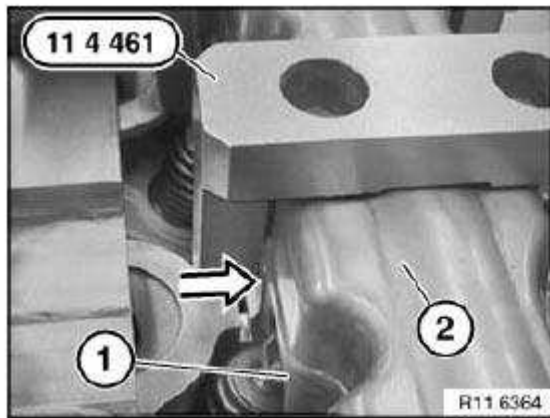


Fig. 224: Special Tool (11 4 461), Upper And Lower Bearing Bank
Courtesy of BMW OF NORTH AMERICA, INC.

Initially tighten screw of special tool 11 4 461 to ground surfaces of upper bearing bank (1) and lower bearing bank (2).

IMPORTANT: Tighten screws on thrust piece to 2 Nm. Risk of damage!

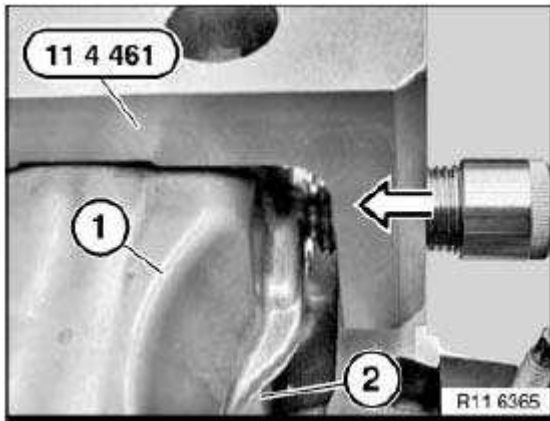


Fig. 225: Tightening Special Tool (11 4 461) Screw On Upper And Lower Bearing Bank Ground Surfaces
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Set special tool 11 4 350 to 2 Nm.
Pretension all special tools 11 4 461 with special tool 11 4 350 only.

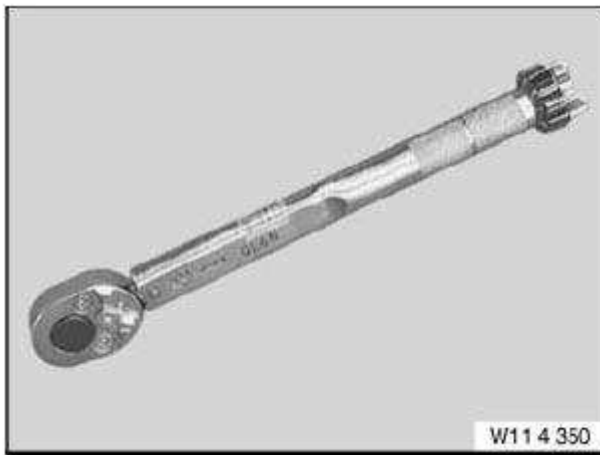


Fig. 226: Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Mount special tools 11 4 461 with screw (1) to inside of cylinder head.

Mount special tool 11 4 461 with screw facing outwards on cylinder no. 2.

Position special tools 11 4 461 so that screw connections (2) of bearing bank are easily accessible.

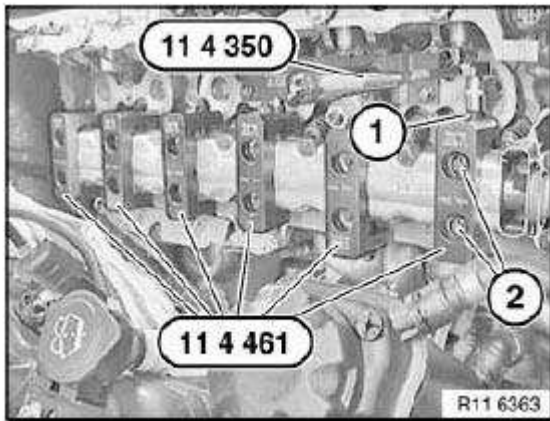


Fig. 227: Special Tools (11 4 461) And (11 4 350)
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten upper and lower bearing banks with special tool 00 9 120.

Tightening torque: 11 31 1AZ, see **11 31 CAMSHAFT** .

IMPORTANT: Remove special tool 11 4 461 only when exhaust camshaft screw connection is completed .

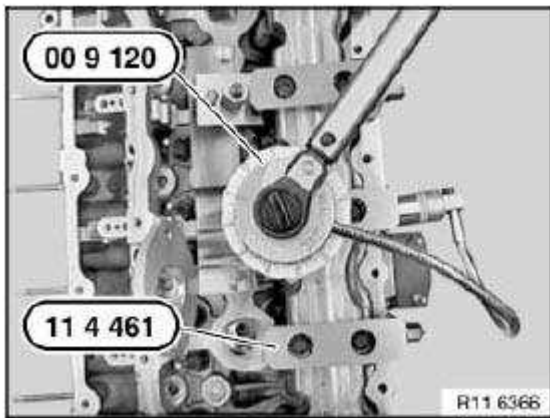


Fig. 228: Special Tools (11 4 461) And (00 9 120)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 31 051 REPLACING TIMING CHAIN (N52K)

Special tools required:

- 00 9 140
- 11 0 300

- 11 4 280
- 11 4 281
- 11 4 282
- 11 4 283
- 11 4 360
- 11 4 362
- 11 5 200
- 11 9 280

Necessary preliminary tasks:

- Remove cylinder head cover
- Remove all spark plugs
- Remove chain tensioner, see **11 31 090 Installing and removing/replacing chain tensioner piston (N52K)**
- Remove crankshaft radial seal at front, see **11 14 005 Replacing front crankshaft radial seal (N52K)**
- Remove drive belt tensioner
- Remove **VIBRATION DAMPER**

Remove fastener (1) in direction of arrow.

Installation:

Install fastener (1) with bore facing outwards.

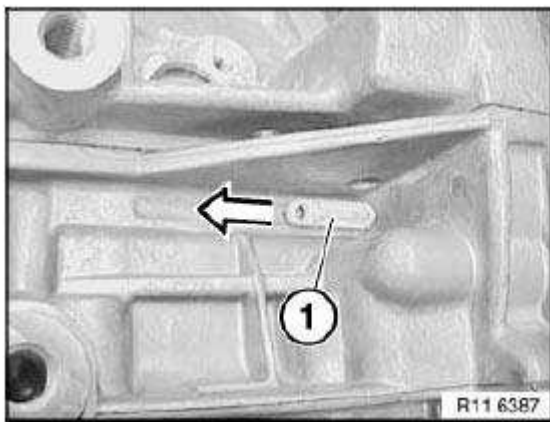


Fig. 229: Fastener

Courtesy of BMW OF NORTH AMERICA, INC.

Rotate crankshaft at central bolt into TDC position.

Slide special tool 11 0 300 in direction of arrow into special tool bore and secure crankshaft.

IMPORTANT: On vehicles with optional extra SA205 (automatic transmission), there is a large bore for the TDC position shortly before the special tool bore. This bore can be confused with the special tool bore.

If the flywheel is secured in the correct special tool bore with special tool 11 0 300 , the engine can no longer be moved at the central bolt.

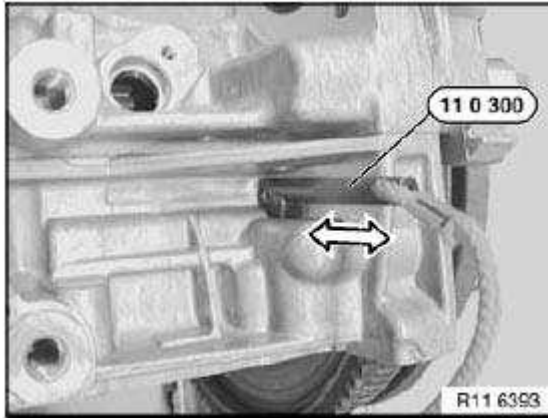


Fig. 230: Securing Crankshaft Using Special Tool (11 0 300)
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not remove special tool 11 0 300 to release central bolt (1).
Employ a second person for gripping when releasing central bolt (1).

Screw special tool 11 9 280 onto hub of vibration damper.

Release central bolt (1).

Tightening torque: 11 21 1AZ, see **11 21 CRANKSHAFT AND BEARINGS** .

Remove hub towards front.

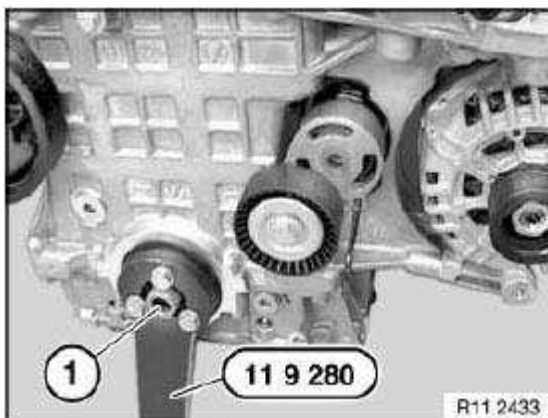


Fig. 231: Central Bolt With Special Tool (11 9 280)
Courtesy of BMW OF NORTH AMERICA, INC.

Open plug (1).

Tightening torque: 11 31 7AZ, see **11 31 CAMSHAFT** .

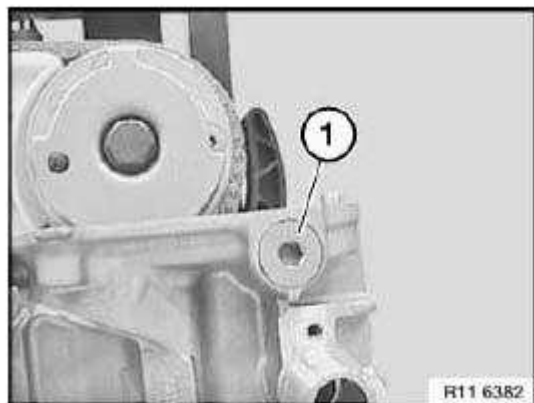


Fig. 232: Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Open plug (1).

Tightening torque: 11 11 7AZ, see **11 11 CRANKCASE** .

Installation:

Replace aluminum screws.

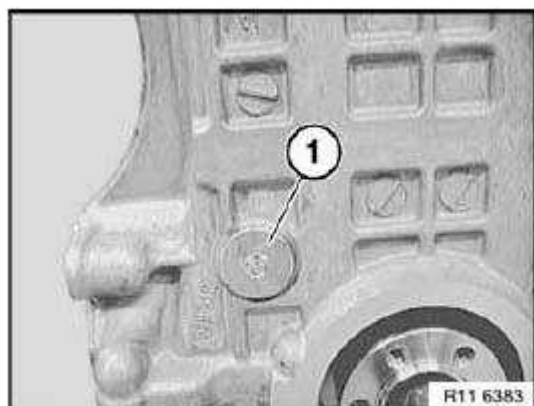


Fig. 233: Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Release bearing pin (1) from timing chain module on cylinder head.

Tightening torque: 11 31 5AZ, see 11 31 CAMSHAFT .

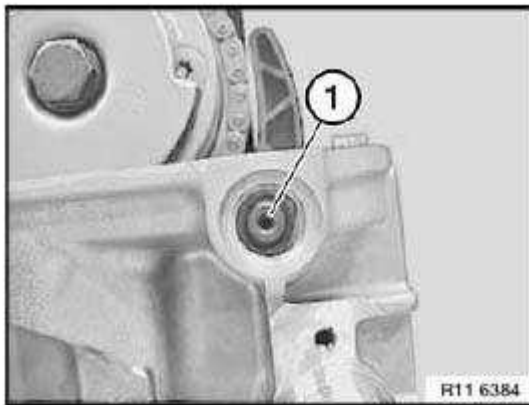


Fig. 234: Bearing Pin

Courtesy of BMW OF NORTH AMERICA, INC.

Release bearing pin (1) from timing chain module on crankcase.

Tightening torque: 11 31 4AZ, see 11 31 CAMSHAFT .

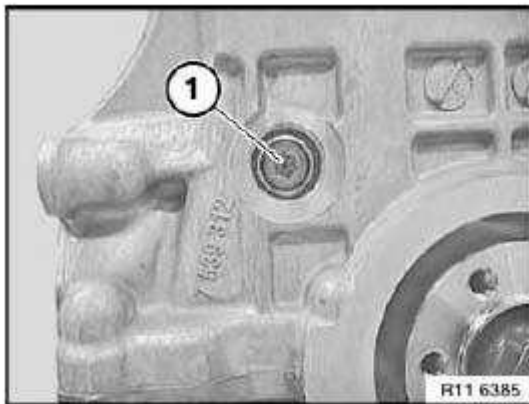


Fig. 235: Bearing Pin

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Install special tool 11 4 280 to release the central bolts on the inlet and exhaust adjustment units.

Secure special tool 11 4 283 to cylinder head with bolts (1).

NOTE: Fit special tool 11 4 282 underneath on side of inlet camshaft.

Mount special tool 11 4 281 on inlet and exhaust camshafts.

Do not remove special tool 11 4 280 .

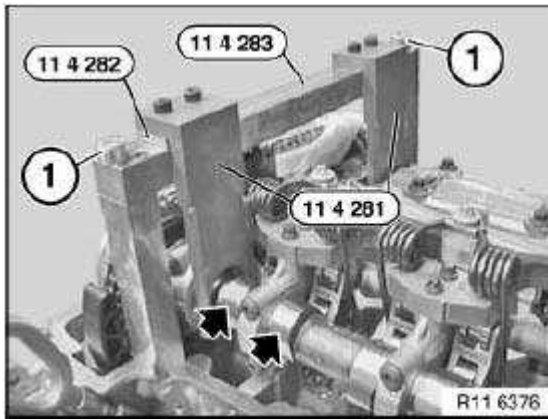


Fig. 236: Cylinder Head Bolts And Special Tools (11 4 282) And (11 4 281)
 Courtesy of BMW OF NORTH AMERICA, INC.

Remove inlet and exhaust adjustment unit.

Release bolts (1) from timing chain module on cylinder head.

Tightening torque: 11 31 3AZ, see **11 31 CAMSHAFT** .

Remove chain module with timing chain and sprocket wheel upwards in direction of arrow.

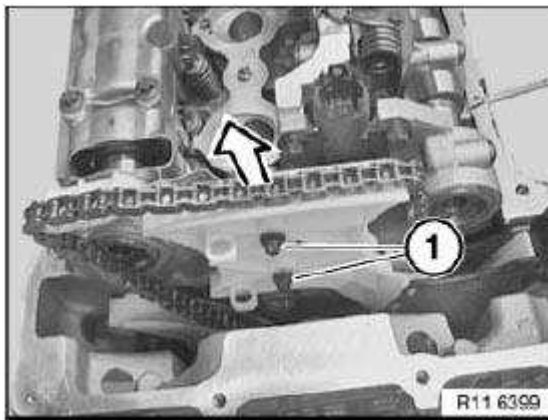


Fig. 237: Removing Timing Chain Module Bolts
 Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Note installation direction of sprocket wheel (2).
 Collar (see arrow) on sprocket wheel (2) points to engine .
 Incorrect assembly will result in engine damage .

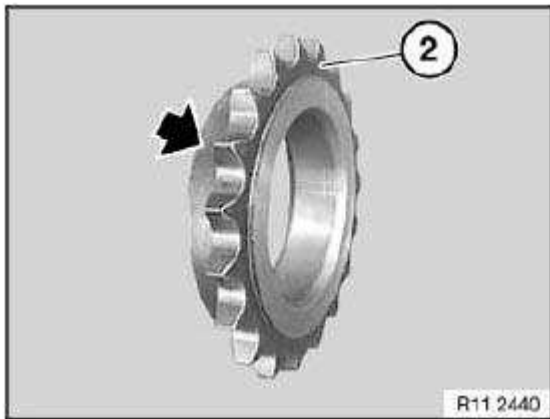


Fig. 238: Collar On Sprocket Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

Pull timing chain (1) upwards until sprocket wheel (2) engages chain guide (3).

Install timing chain (1) and sprocket wheel (2) in this position.

Installation:

Always hold timing chain (1) under tension. Timing chain (1) may jam on chain guide (3).

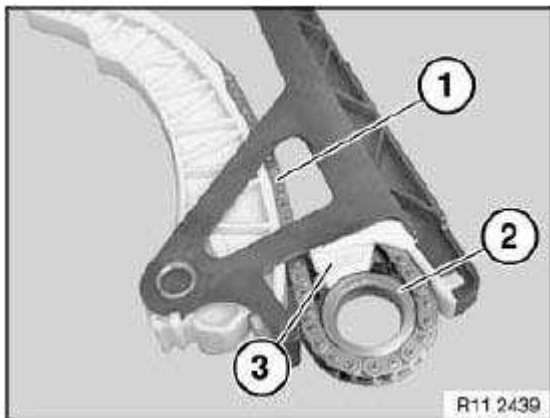


Fig. 239: Timing Chain, Sprocket Wheel And Chain Guide
Courtesy of BMW OF NORTH AMERICA, INC.

Install hub with central bolt.

Tighten down special tool 11 5 200 with screws (1) to hub.

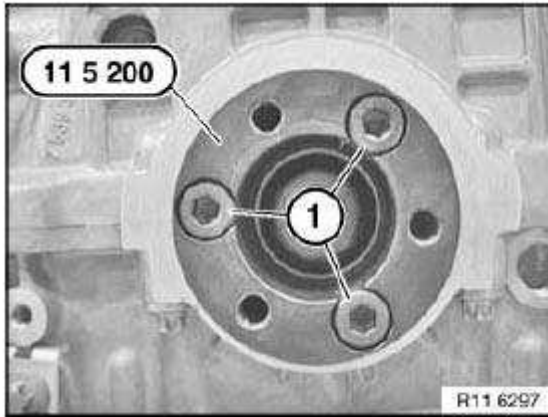


Fig. 240: Screws With Special Tool (11 5 200)
 Courtesy of BMW OF NORTH AMERICA, INC.

Remove tensioner for drive belt.

Screw in special tool 11 4 362 from special tool kit 11 4 360 .

Mount special tool 11 9 280 on 11 5 200 .

Support special tool 11 9 280 on special tool 11 4 362 .

Special tool 11 0 300 secures crankshaft.

Tighten central bolt to jointing torque.

Tightening torque: 11 21 1AZ, see **11 21 CRANKSHAFT AND BEARINGS** .

Mark central bolt and hub with paint.

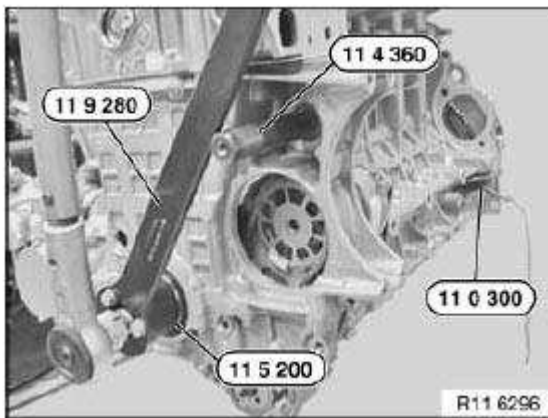


Fig. 241: Special Tools (11 9 280), (11 0 300), (11 4 360) And (11 5 200)
 Courtesy of BMW OF NORTH AMERICA, INC.

Mark special tools with colored line (1).

See picture.

**IMPORTANT: Do not remove the special tool while tightening the central bolt to torsion angle.
Risk of damage!**

If necessary, tighten central bolt to torsion angle with special tool 00 9 140 .

Tightening torque: 11 21 1AZ, see **11 21 CRANKSHAFT AND BEARINGS** .

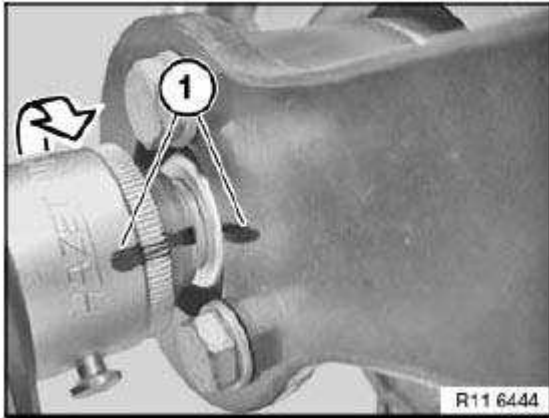


Fig. 242: Marking Special Tools With Colored Line
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten central bolt with a second person helping.

Tightening torque: 11 21 1AZ, see **11 21 CRANKSHAFT AND BEARINGS** .

Install inlet and exhaust adjustment units.

Install chain tensioner, see **11 31 090 Installing and removing/replacing chain tensioner piston (N52K)**.

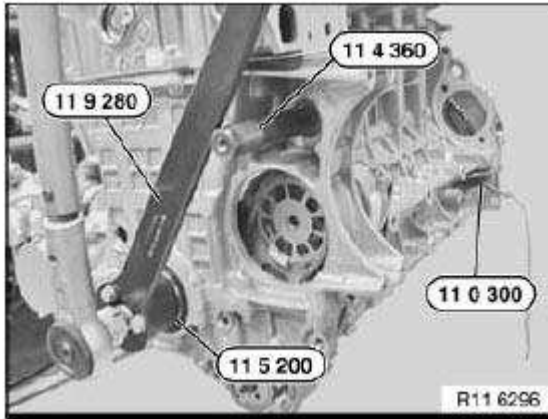


Fig. 243: Special Tools (11 9 280), (11 0 300), (11 4 360) And (11 5 200)
Courtesy of BMW OF NORTH AMERICA, INC.

Crank engine twice.

Check timing, see **11 31 005 Checking timing of camshaft(s) (N52K)**.

If necessary, adjust valve timing, see **11 31 505 Adjusting timing of camshaft(s) (N52K)**.

Assemble engine.

11 31 090 INSTALLING AND REMOVING/REPLACING CHAIN TENSIONER PISTON (N52K)

Release chain tensioner (1).

Tightening torque: 11 31 6AZ, see **11 31 CAMSHAFT** .

**IMPORTANT: Have a cleaning cloth ready. A small quantity of engine oil will emerge after the screw connection has been released.
Make sure no engine oil runs onto belt drive.**

Installation:

No sealing ring is fitted during series-production assembly.

A sealing ring must be fitted by service personnel when the chain tensioner is fitted.

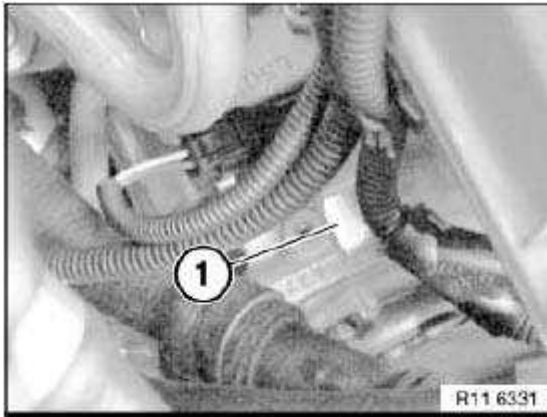


Fig. 244: Chain Tensioner

Courtesy of BMW OF NORTH AMERICA, INC.

If the chain tensioner is reused, its oil chamber must be drained. Place chain tensioner on a level working surface and slowly compress.

Repeat procedure twice.



Fig. 245: Compressing Chain Tensioner On A Level Working Surface

Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 31 505 ADJUSTING TIMING OF CAMSHAFT(S) (N52K)

Special tools required:

- **00 9 120 TORQUE ANGLE MEASURING DIAL**
- **00 9 250 TORSION ANGLE WRENCH WITH FLEXIBLE EXTENSION**
- 11 0 300
- 11 4 280

- 11 4 281
- 11 4 282
- 11 4 283
- 11 4 290
- 11 9 340

Necessary preliminary tasks:

- Remove cylinder head cover

Remove fastener (1) in direction of arrow.

Installation:

Install fastener (1) with bore facing outwards.

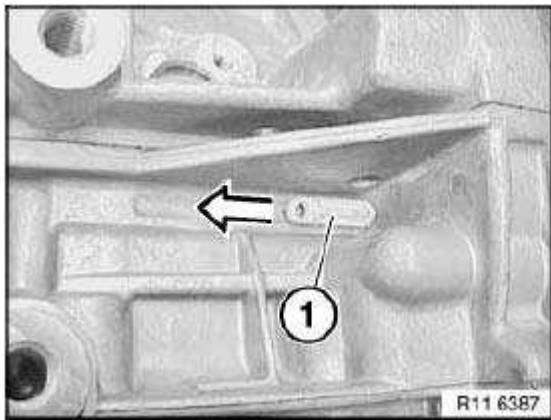


Fig. 246: Fastener

Courtesy of BMW OF NORTH AMERICA, INC.

Rotate crankshaft at central bolt into TDC position.

Slide special tool 11 0 300 in direction of arrow into special tool bore and secure crankshaft.

IMPORTANT: On vehicles with optional extra SA205 (automatic transmission), there is a large bore for the TDC position shortly before the special tool bore. This bore can be confused with the special tool bore.

If the flywheel is secured in the correct special tool bore with special tool 11 0 300 , the engine can no longer be moved at the central bolt.

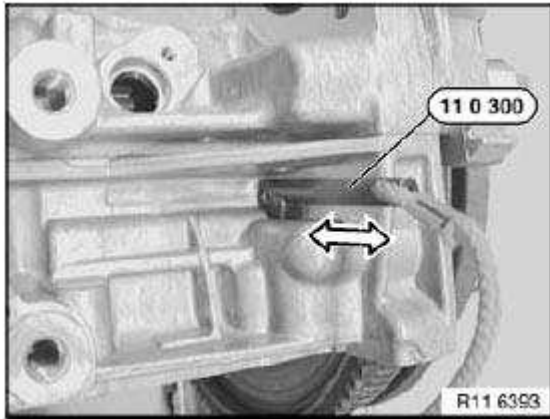


Fig. 247: Securing Crankshaft Using Special Tool (11 0 300)
Courtesy of BMW OF NORTH AMERICA, INC.

With 1st cylinder in firing TDC position, cams of inlet camshaft (1) at 1st cylinder point upwards at an angle.

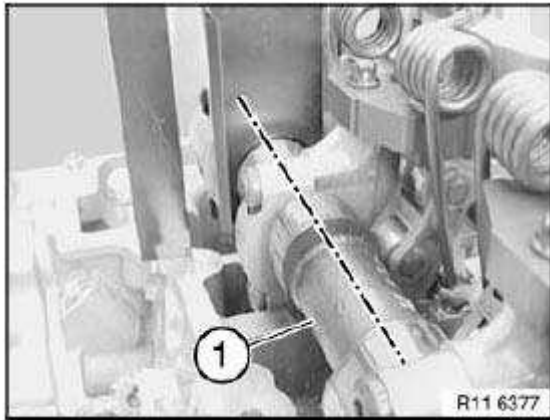


Fig. 248: Inlet Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Part numbers (2) on inlet and exhaust camshafts (1) point upwards.

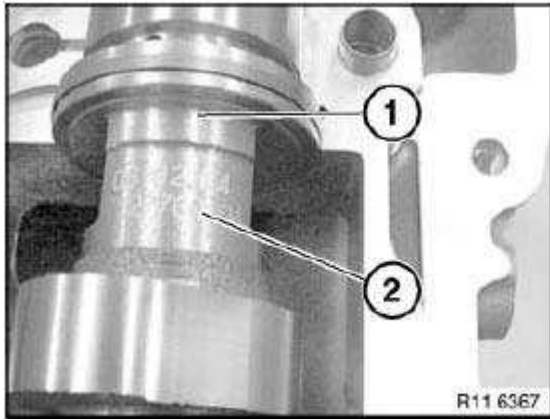


Fig. 249: Part Numbers On Inlet And Exhaust Camshafts
 Courtesy of BMW OF NORTH AMERICA, INC.

With 1st cylinder in firing TDC position, cams of exhaust camshaft (3) at 6th cylinder point downwards at an angle.

Cam follower (1) is not actuated.

NOTE: When the engine is installed, the position of the exhaust camshaft (3) for the timing can only be checked with a mirror.

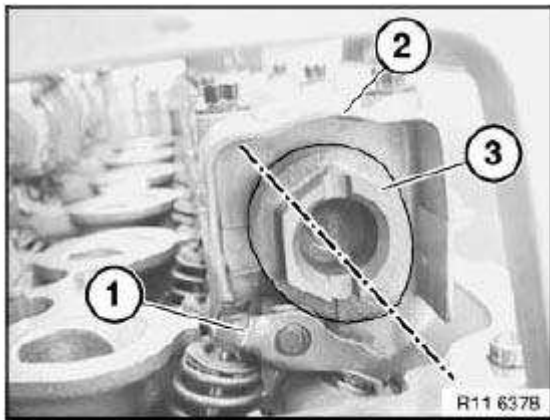


Fig. 250: Exhaust Camshaft And Cam Follower
 Courtesy of BMW OF NORTH AMERICA, INC.

Secure special tool 11 4 283 to cylinder head with bolts (1).

NOTE: Fit special tool 11 4 282 underneath on side of inlet camshaft.

Mount special tool 11 4 281 on inlet and exhaust camshafts.

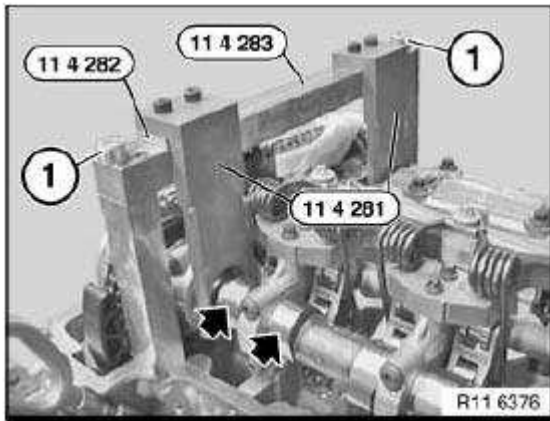


Fig. 251: Cylinder Head Bolts And Special Tools (11 4 282) And (11 4 281)
Courtesy of BMW OF NORTH AMERICA, INC.

Release central bolts (1).

Release central bolts (1) with special tool 11 4 280 only.

Release chain tensioner (2) (have a cleaning cloth ready).

NOTE: **Picture in CAD and does not show special tools.**

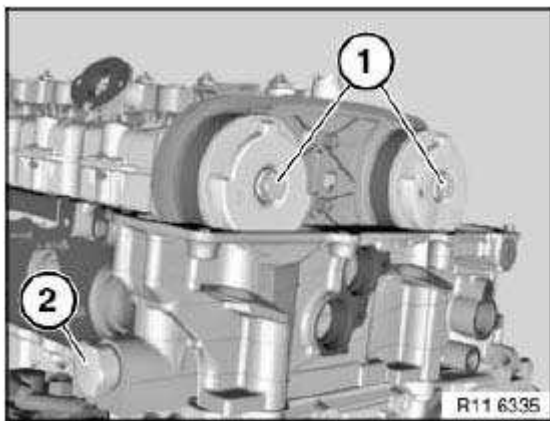


Fig. 252: Central Bolts And Chain Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

Turn sensor gears (2) in direction of arrow until locating pins (1) on special tool 11 4 290 match up.

Slide on special tool 11 4 290 in direction of arrow.

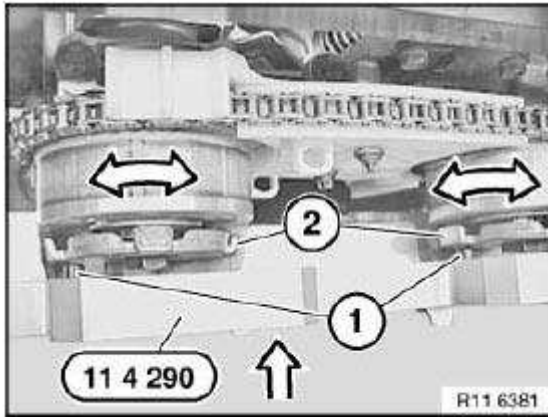


Fig. 253: Sensor Gears, Locating Pins And Special Tool (11 4 290)
 Courtesy of BMW OF NORTH AMERICA, INC.

Secure special tool 11 4 290 with bolts (1).

Screw special tool 11 9 340 into cylinder head.

Pretension timing chain with special tool 00 9 250 to **0.6 Nm** .

Secure both central bolts of inlet and exhaust adjustment units with special tool 00 9 120 to inlet and exhaust camshafts.

Tightening torque: 11 36 1AZ, see **11 36 VARIABLE CAMSHAFT CONTROL VANOS** .

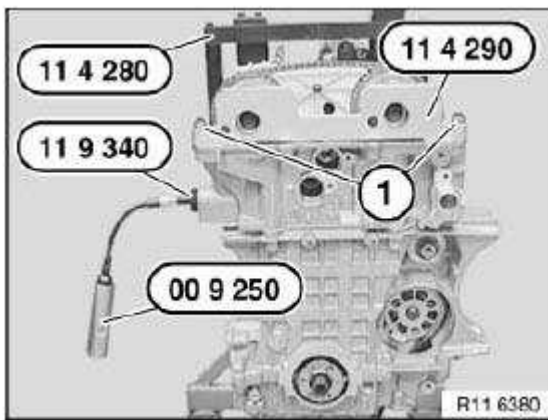


Fig. 254: Special Tools (00 9 250), (11 9 340) And (11 4 290)
 Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

33 ROCKER ARM WITH BEARING MOUNT

11 33 050 REMOVING AND INSTALLING/REPLACING ALL CAM FOLLOWERS (N52K)

Special tools required:

- 11 4 480

Necessary preliminary tasks:

- Remove cylinder head cover
- Remove intermediate lever, see **11 37 010 Removing and installing/replacing intermediate levers (N52K)**.
- Remove exhaust camshaft, see **11 31 028 Removing and installing/replacing exhaust camshaft (N52K)**.

IMPORTANT: Rocker arms (1) are divided into bearing categories.

The tolerance classes are marked according to the picture in numbers from 1 to 5.

Already used rocker arms (1) may only be reused in the same position.

Detach cam followers (1) from HVCA element and remove.

Set down all cam followers (1) in neat order in special tool 11 4 480 .

Installation:

Before installing exhaust camshaft or intermediate levers, make sure cam followers (1) are correctly seated.

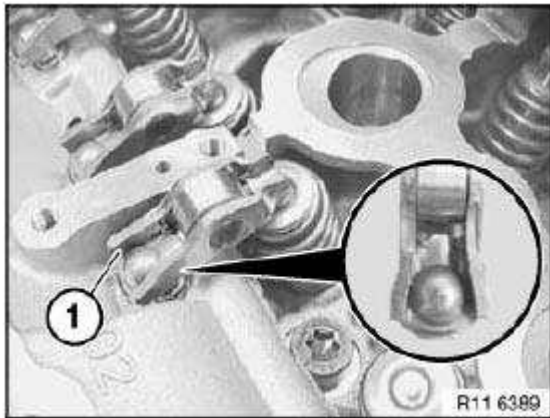


Fig. 255: Cam Follower Seat

Courtesy of BMW OF NORTH AMERICA, INC.

Remove HVCA element (1) in direction of arrow.

Installation:

If the HVCA elements (1) are reused, they must be placed together with the cam followers in neat order in special tool 11 4 480 .

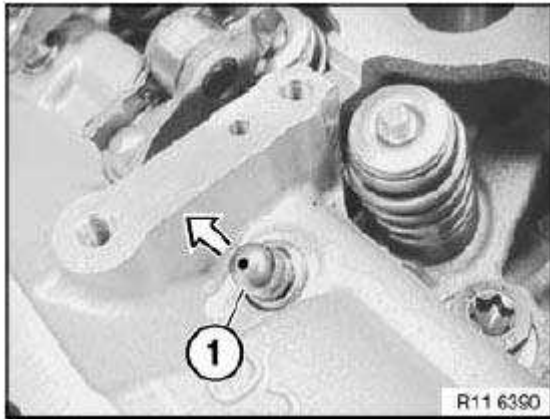


Fig. 256: Removing HVCA Element
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check function of DME; if necessary, readjust uniform mixture distribution.

34 VALVES WITH SPRINGS

11 34 552 REMOVING AND INSTALLING/REPLACING ALL VALVES (N52K)

Special tools required:

- 11 4 480

Necessary preliminary tasks:

- Remove cylinder head, see **11 12 100 Removing and installing cylinder head (N52K)**.
- Remove intermediate lever, see **11 37 010 Removing and installing/replacing intermediate levers (N52K)**.
- Remove eccentric shaft, see **11 37 005 Removing and installing/replacing eccentric shaft (N52K)**.
- Remove inlet camshaft, see **11 31 025 Removing and installing/replacing inlet camshaft (N52K)**.
- Remove exhaust camshaft, see **11 31 028 Removing and installing/replacing exhaust camshaft (N52K)**.
- Remove cam followers, see **11 33 050 Removing and installing/replacing all cam followers (N52K)**.
- Remove valve springs, see **11 34 715 Replacing all valve springs (N52K)**.
- Remove valve stem seals, see **11 34 560 Replacing all valve stem seals (N52K)**.

Arrangement:

1. Valve
2. Valve stem seal with lower spring plate

3. Valve spring
4. Upper spring plate
5. Valve tapers

If the valves are to be reused, they must be placed in neat order in special tool 11 4 480 .

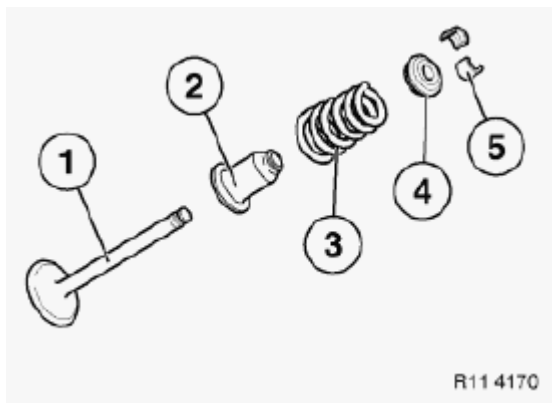


Fig. 257: Upper Spring Plate, Valve Tapers And Spring
 Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check function of DME; if necessary, readjust uniform mixture distribution.

11 34 560 REPLACING ALL VALVE STEM SEALS (N52K)

Special tools required:

- 11 1 480
- 11 6 380

Necessary preliminary tasks:

- Remove cylinder head, see **11 12 100 Removing and installing cylinder head (N52K)**.
- Remove intermediate lever, see **11 37 010 Removing and installing/replacing intermediate levers (N52K)**.
- Remove eccentric shaft, see **11 37 005 Removing and installing/replacing eccentric shaft (N52K)**
- Remove inlet camshaft, see **11 31 025 Removing and installing/replacing inlet camshaft (N52K)**
- Remove exhaust camshaft, see **11 31 028 Removing and installing/replacing exhaust camshaft (N52K)**.
- Remove cam followers, see **11 33 050 Removing and installing/replacing all cam followers (N52K)**

Firmly press special tool 11 1 480 onto old valve stem seals.

Detach valve stem seal from valve stem by turning and simultaneously pulling special tool 11 1 480 .

Installation:

Insert all valves.

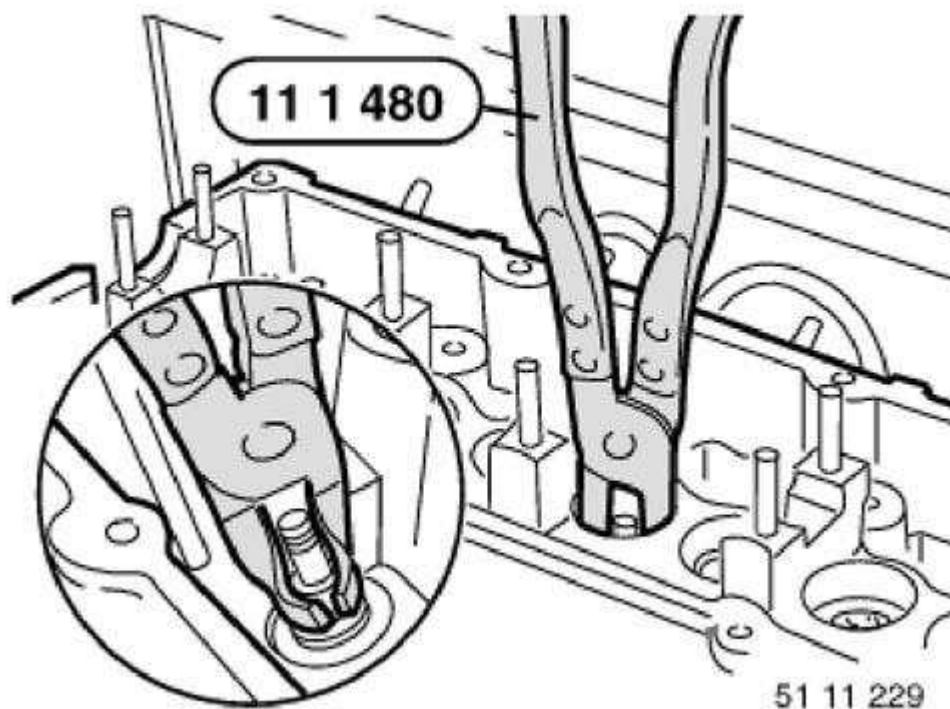


Fig. 258: Special Tool (11 1 480)

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: For use on the N52K engine, special tool 11 6 380 must be remachined according to the picture with a 10 mm dia. drill bit to a depth of B = approx. 23 mm.
This modification has already been taken into account for reordering.

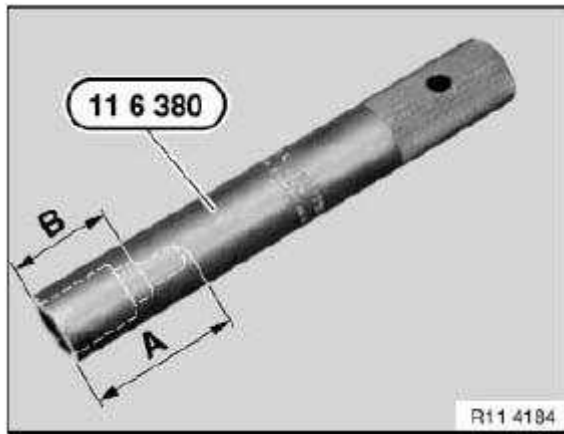


Fig. 259: Special Tool (11 6 380) With Dimensions
Courtesy of BMW OF NORTH AMERICA, INC.

**IMPORTANT: Different diameters at valve stem.
All valve stem seals are color-coded.**

For 5 mm dia. valves, the valve stem seal is marked red or brown.

For 6 mm dia. valves, the valve stem seal is marked green or light green.

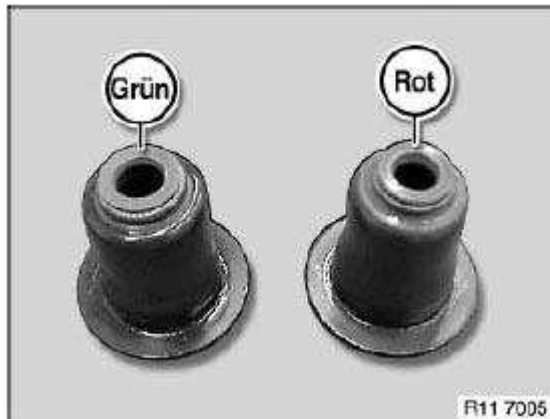


Fig. 260: Valve Stem Seals Color-Coded, Green (Grün), and Red (Rot)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Fit the mounting sleeves (plastic sleeves) contained in the delivery specification on the valve stem end.

Lubricate mounting sleeve.

Press on valve stem seal by hand with special tool 11 6 380 as far as it will go.

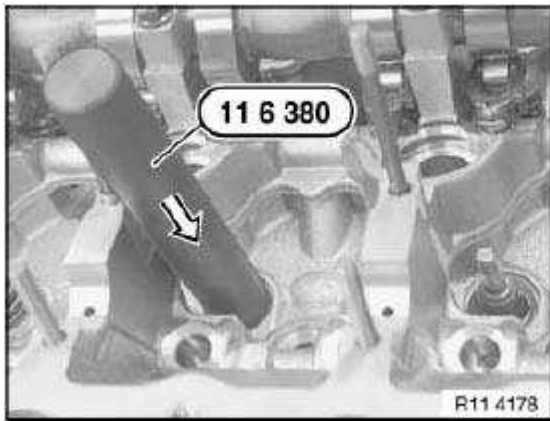


Fig. 261: Special Tool (11 6 380)

Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 34 715 REPLACING ALL VALVE SPRINGS (N52K)

Special tools required:

- 11 0 346
- 11 4 480
- 11 9 000
- 11 9 017

Necessary preliminary tasks:

- Remove cylinder head, see **11 12 100 Removing and installing cylinder head (N52K)**.
- Remove exhaust camshaft, see **11 31 028 Removing and installing/replacing exhaust camshaft (N52K)**.
- Remove intermediate lever, see **11 37 010 Removing and installing/replacing intermediate levers (N52K)**.
- Remove inlet camshaft, see **11 31 025 Removing and installing/replacing inlet camshaft (N52K)**
- Remove cam followers, see **11 33 050 Removing and installing/replacing all cam followers (N52K)**

Place cylinder head on special tool 11 9 000 .

Press down **inlet valves** with special tool 11 9 017 .

Press down **exhaust valves** with special tool 11 0 346 .

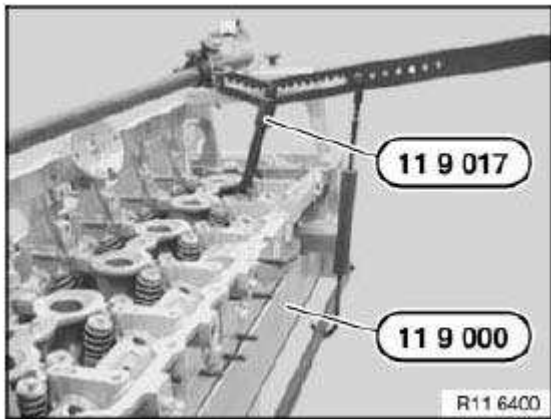
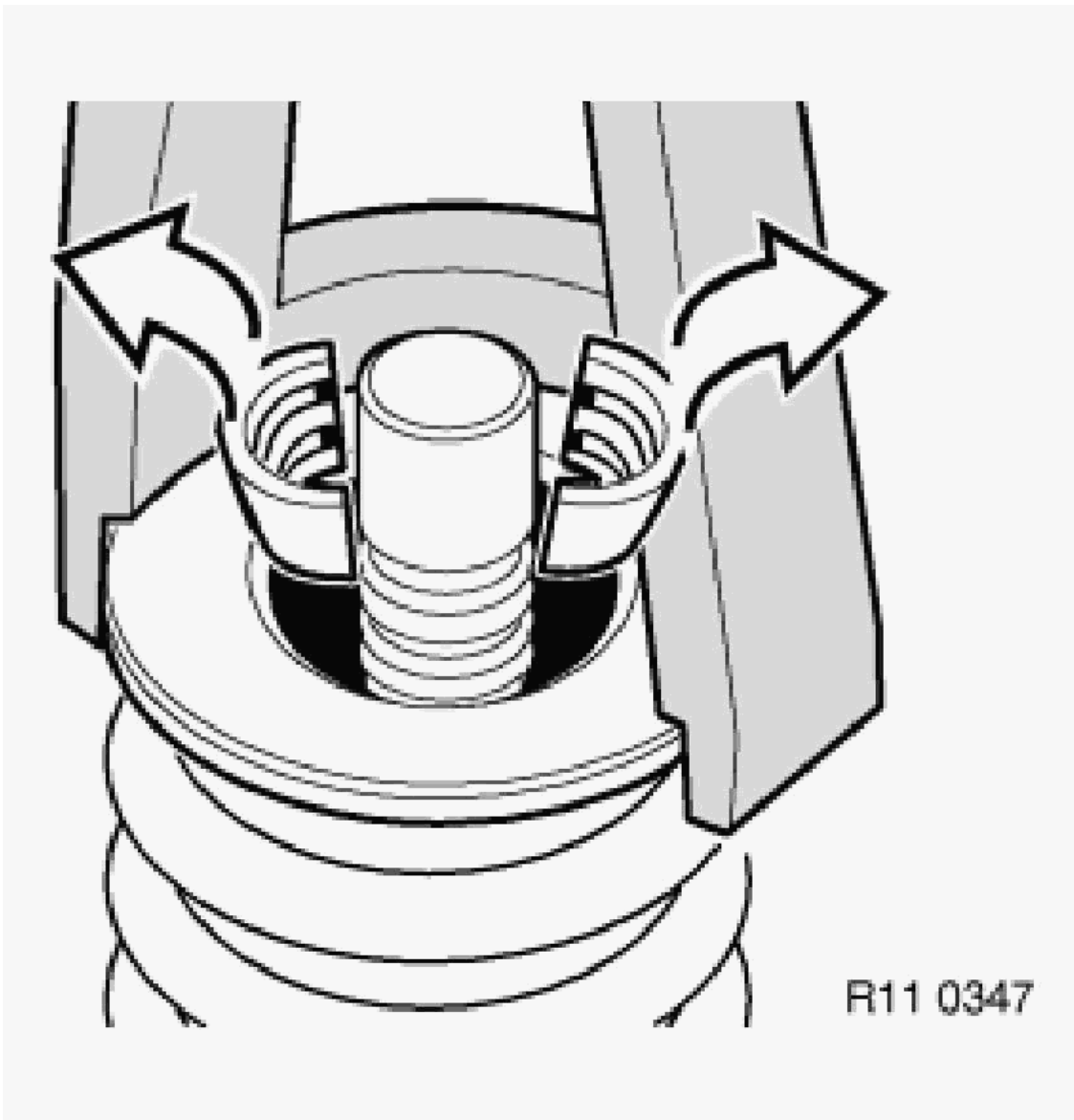


Fig. 262: Special Tool (11 9 017) And (11 9 000)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove valve cotters with a magnet.

Remove valve spring with spring plates.

If the individual components are to be reused, they must be placed in neat order in special tool 11 4 480 .



R11 0347

Fig. 263: Removing Valve Cotters With Magnet
Courtesy of BMW OF NORTH AMERICA, INC.

**IMPORTANT: Incorrect installation possible.
Incorrect installation will result in valve spring breakage.
Risk of mixing up the valve springs for the inlet and exhaust valves.**

The valve spring is color-coded (1) at the lower end.

Install the valve spring so that the larger diameter points to the lower spring plate.

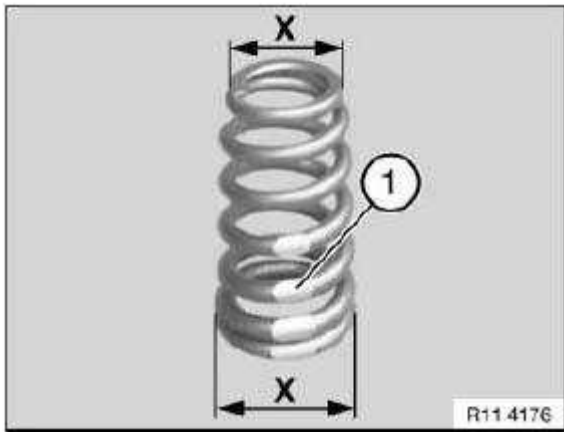


Fig. 264: Valve Spring Color-Coded
Courtesy of BMW OF NORTH AMERICA, INC.

Arrangement:

1. Valve
2. Valve stem seal with lower spring plate
3. Valve spring
4. Upper spring plate
5. Valve tapers

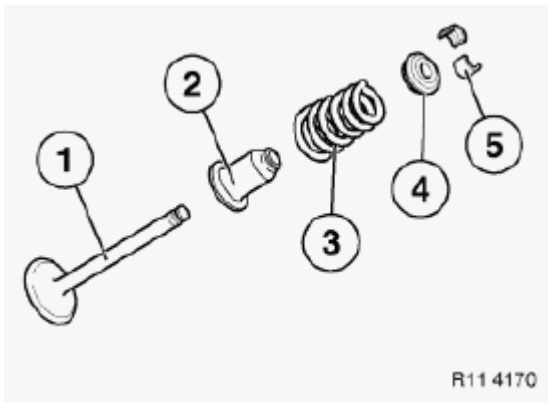


Fig. 265: Upper Spring Plate, Valve Tapers And Spring
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check function of DME; if necessary, readjust uniform mixture distribution.

37 VARIABLE VALVE GEAR

11 37 005 REMOVING AND INSTALLING/REPLACING ECCENTRIC SHAFT (N52K)

Special tools required:

- 11 4 481

Necessary preliminary tasks:

- Remove cylinder head cover
- Remove intermediate lever, see **11 37 010 Removing and installing/replacing intermediate levers (N52K)**.

If necessary, move eccentric shaft (1) on twin surface to minimum lift (2).

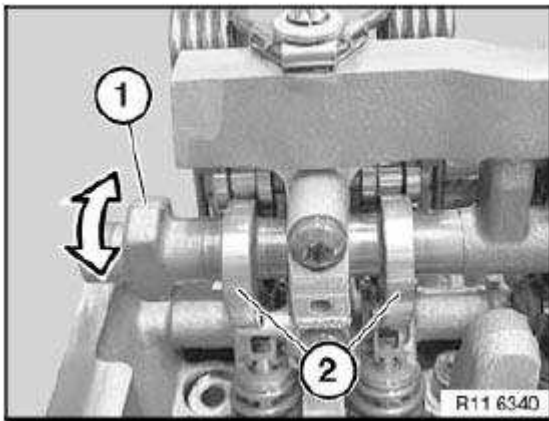


Fig. 266: Eccentric Shaft

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: All bearing caps (1 and 2) of eccentric shaft are marked with numbers from 1 to 6 (1 for 1st cylinder to 6 for 6th cylinder).

Bearing cap 6 (1) is provided with a stop.

Release screws on bearing cap 6 (1).

Release screws on bearing caps 1 to 5 (2).

Set all bearing caps down in special tool 11 4 481 in a tidy and orderly fashion.

Remove eccentric shaft with gentle tilting and turning movements.

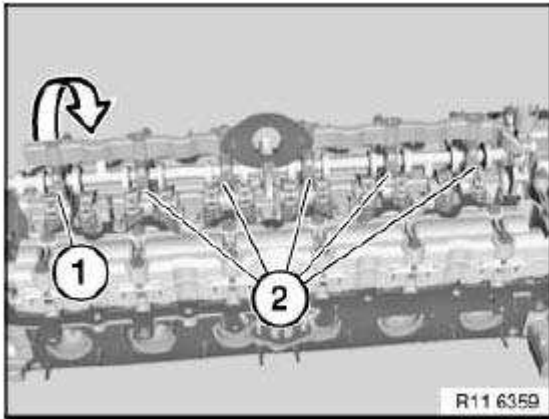


Fig. 267: Bearing Caps

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Screw is not magnetic and must be secured against falling down.

Release screw.

Remove magnet wheel (1).

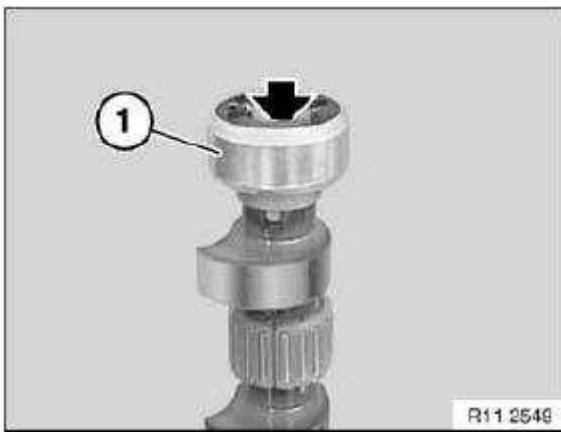


Fig. 268: Magnet Wheel

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Magnet wheel (1) is highly magnetic and must be protected against metal filings/borings.

After removing, place magnet wheel (1) in a plastic bag (2) with a seal.

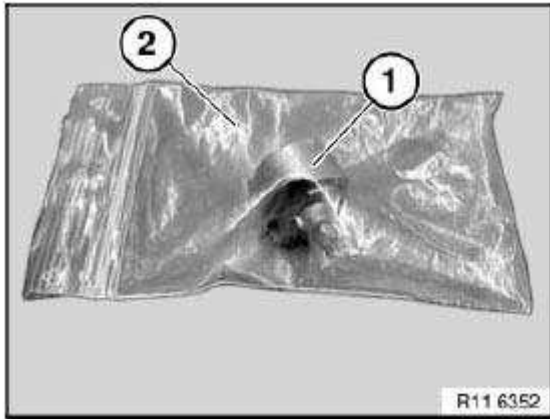


Fig. 269: Magnet Wheel And Plastic Bag
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Needle bearing (1) can break very easily.

Carefully pull needle bearing (1) apart at point of separation.

Remove all needle bearings (1) from eccentric shaft.

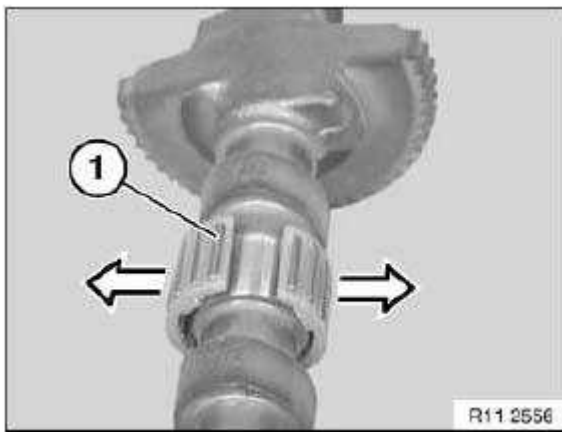


Fig. 270: Removing Needle Bearings From Eccentric Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Install bearing shells (1) as pictured.

NOTE: Always replace bearing shells (1) and needle bearings together.

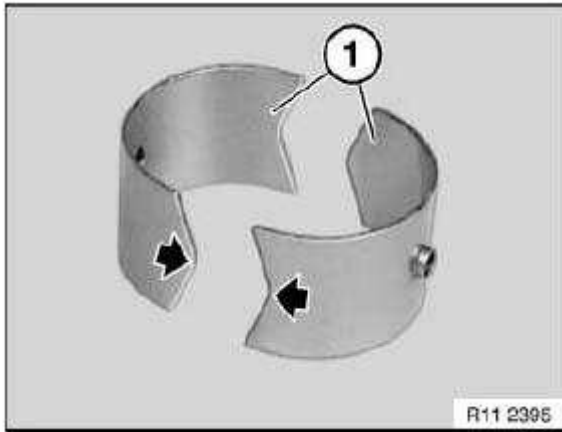


Fig. 271: Bearing Shells

Courtesy of BMW OF NORTH AMERICA, INC.

Install bearing shell (1) with tip facing down (see arrow) in cylinder head.

Install bearing shell (2) with tip facing up in bearing cap.

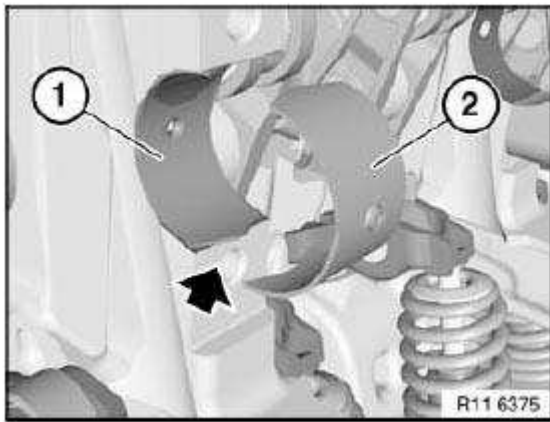


Fig. 272: Bearing Shells

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: All bearing caps (1 and 2) of eccentric shaft are marked with numbers from 1 to 6 (1 for 1st cylinder to 6 for 6th cylinder).

Bearing cap 6 (1) is provided with a stop.

Insert eccentric shaft.

Adjust eccentric shaft on dihedron to minimum stroke.

Fit all bearing caps (1 and 2).

Insert all screws.

Tightening torque: 11 12 7AZ, see **11 12 CYLINDER HEAD WITH CYLINDER HEAD COVER** .

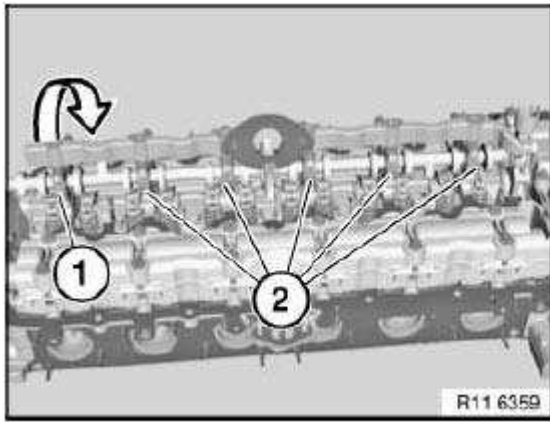


Fig. 273: Bearing Caps

Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 37 010 REMOVING AND INSTALLING/REPLACING INTERMEDIATE LEVERS (N52K)

Special tools required:

- 11 4 270
- 11 4 450
- 11 4 481

**IMPORTANT: Aluminum screws/bolts must be replaced each time they are released .
The end faces of aluminum screws/bolts are painted blue for the purposes of
reliable identification.
Jointing torque and angle of rotation must be observed without fail (risk of
damage) .**

Necessary preliminary tasks:

- Remove cylinder head cover

If necessary, move eccentric shaft (1) on twin surface to minimum lift (2).

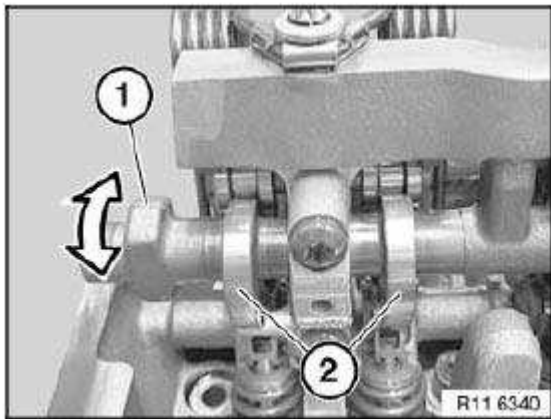


Fig. 274: Eccentric Shaft

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Oil spray nozzle must be removed from 3rd cylinder (make a note of installation position of oil spray nozzle).

Secure special tool 11 4 270 with gripping pliers (3) to guide block (2).

IMPORTANT: Special tool 11 4 270 is only secured to guide block (2).
Adjusting the gripping pliers (3) on special tool 11 4 270 is not permitted. Risk of damage!

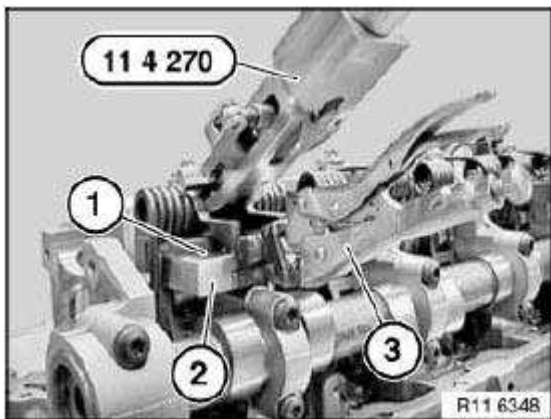


Fig. 275: Special Tool (11 4 270) - Gripping Pliers And Guide Block

Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Risk of injury in event of incorrect use.

IMPORTANT: Improper handling. Risk of damage!

Secure both bearing pins (2) in torsion springs with knurled screw (1) of special tool 11 4 270 .

Press special tool 11 4 270 in direction of arrow as far as it will go.

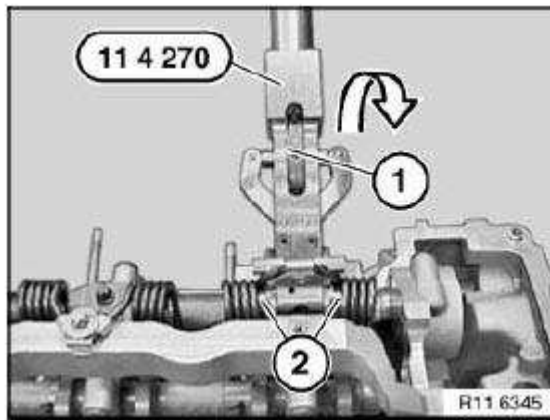


Fig. 276: Securing Bearing Pins In Torsion Springs With Knurled Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (2) of torsion spring.

Tightening torque: 11 37 2AZ, see **11 37 VARIABLE VALVE GEAR** .

To avoid jamming of screw (2) with torsion spring, it is necessary when releasing screw (2) to relieve the pretension on special tool 11 4 270 uniformly.

IMPORTANT: Thread on cylinder head. Risk of damage!

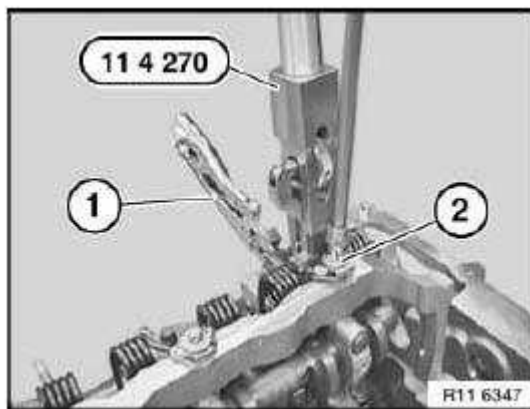


Fig. 277: Torsion Spring Screw And Special Tool (11 4 270)
Courtesy of BMW OF NORTH AMERICA, INC.

Relieve tension on torsion spring (1) with special tool 11 4 270 .

NOTE: Metal lug (2) cannot be disassembled and must not be removed.

Installation:

Replace torsion spring (1) if metal lug (2) is faulty.

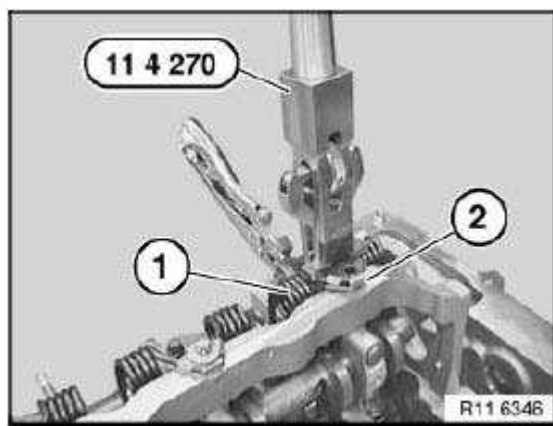


Fig. 278: Special Tool (11 4 270), Torsion Spring And Metal Lug
Courtesy of BMW OF NORTH AMERICA, INC.

Press torsion spring apart at positions (1).

Remove torsion spring towards top.

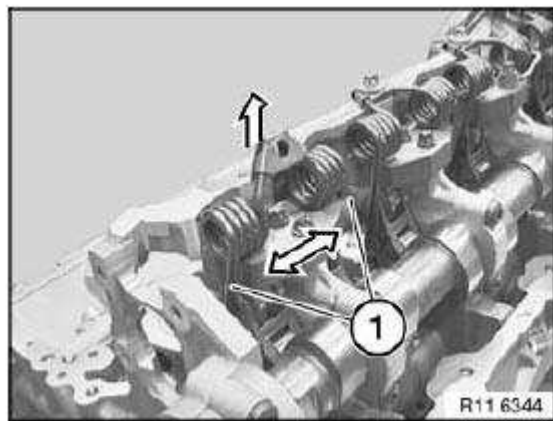


Fig. 279: Removing Torsion Spring
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Uniform distribution must not be changed.
Place all components in clean and neat order in special tool 11 4 481.

All components must be reinstalled in the same positions in an engine which has already been in use.

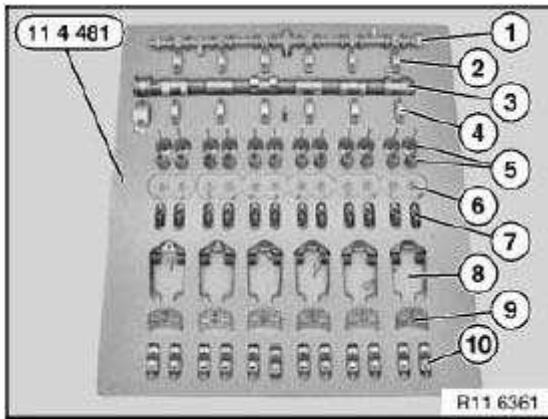


Fig. 280: Torsion Springs, Inlet Camshaft, Guide Blocks And Special Tools (11 4 481)
Courtesy of BMW OF NORTH AMERICA, INC.

1. Eccentric shaft with bearing
2. Bearing caps of eccentric shaft (set out in order)
3. Inlet camshaft
4. Bearing caps of inlet camshaft (set out in order)
5. Inlet valves with valve springs
6. Valve plates and valve cotters
7. Cam followers with HVCA elements (set out in order)
8. Torsion springs
9. Guide blocks (set out in order)
10. Intermediate levers (set out in order)

Release screws (1) on guide block (2).

Tightening torque: 11 37 1AZ, see **11 37 VARIABLE VALVE GEAR** .

Place all guide blocks (2) in neat order in special tool 11 4 481 .

Installation:

Mixing up the guide blocks (2) will cause the engine to suffer idle-speed fluctuations.

This will result in maladjustment of uniform distribution .

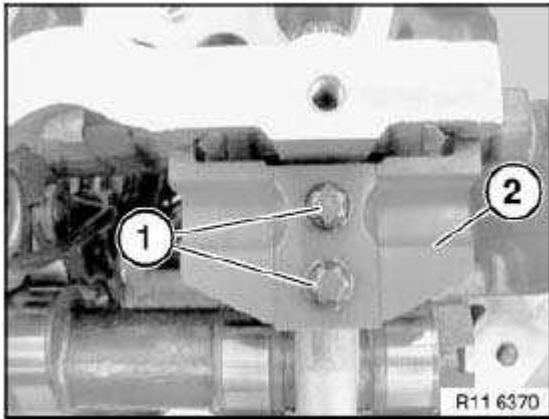


Fig. 281: Screws And Guide Block
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

All contact surfaces (1) of guide block must be clean and free from oil and grease. If necessary, clean contact surfaces (1).

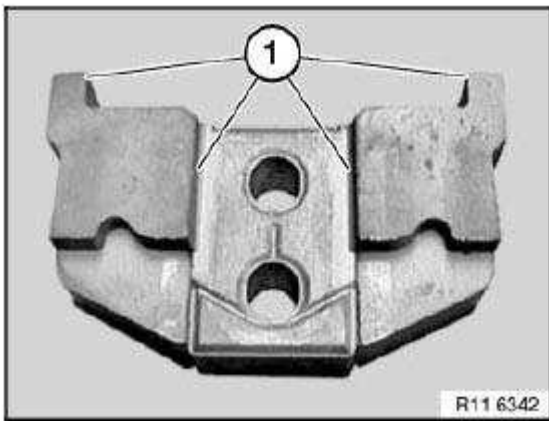


Fig. 282: Guide Block Contact Surfaces
Courtesy of BMW OF NORTH AMERICA, INC.

Lift out intermediate levers (2).

Place all intermediate levers (2) in neat order in special tool 11 4 481 .

Installation:

Mixing up the intermediate levers (2) will cause the engine to suffer idle-speed fluctuations.

Installation:

All contact surfaces (1) must be clean and free from oil and grease. If necessary, clean contact surfaces (1).

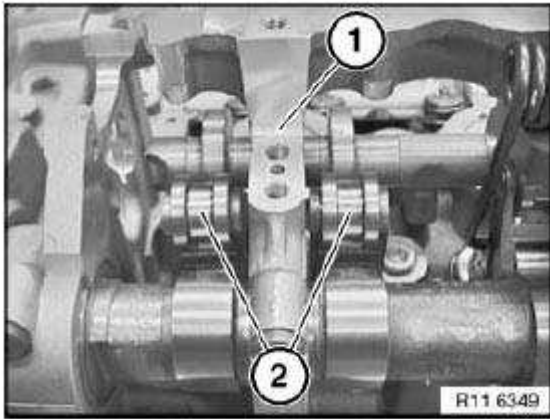


Fig. 283: Contact Surfaces And Intermediate Levers
Courtesy of BMW OF NORTH AMERICA, INC.

All intermediate levers (1) are classified.

All intermediate levers (1) must be reinstalled in the same positions in an engine which has already been in use.

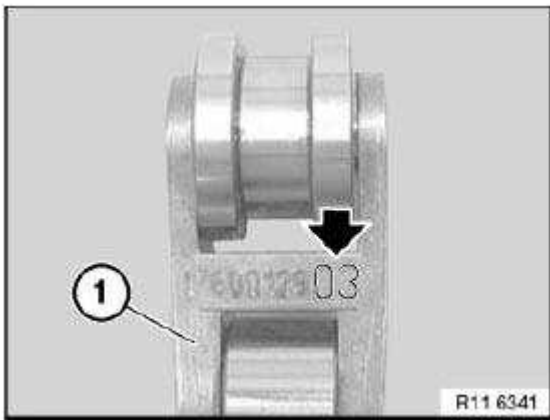


Fig. 284: Intermediate Lever Classification
Courtesy of BMW OF NORTH AMERICA, INC.

**IMPORTANT: Before installing intermediate levers (2), make sure cam followers are correctly positioned.
Risk of damage!**

Install intermediate levers (2).

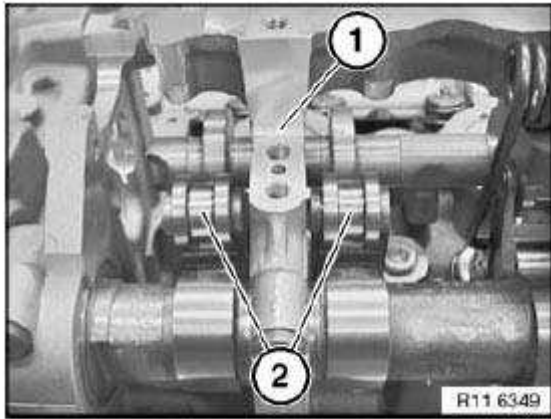


Fig. 285: Contact Surfaces And Intermediate Levers
Courtesy of BMW OF NORTH AMERICA, INC.

Fit guide block (2) cleanly into opening.

Tighten screws (1) hand-tight.

Check that intermediate levers are in correct installation position.

Release screws (1) by a 1/4 turn.

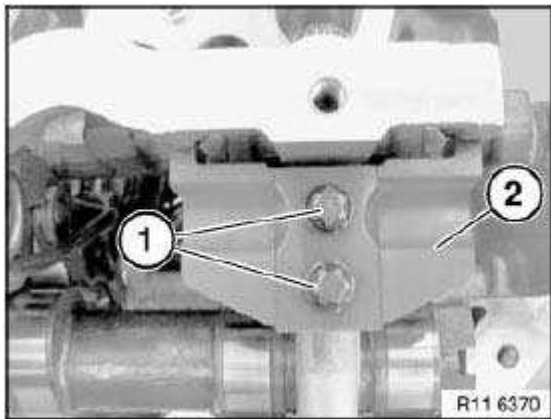


Fig. 286: Screws And Guide Block
Courtesy of BMW OF NORTH AMERICA, INC.

Secure special tool 11 4 450 to bolt connection (1) of eccentric shaft.

Turn eccentric lever (3) on special tool 11 4 450 in direction of arrow.

Guide block is now pretensioned.

Insert screws (2) of guide blocks.

Tightening torque: 11 37 1AZ, see **11 37 VARIABLE VALVE GEAR** .

Installation:

At cylinder no. 3, the guide block can be pre-installed with one screw (internal) only.

Oil spray nozzle is fitted only after torsion spring has been installed.

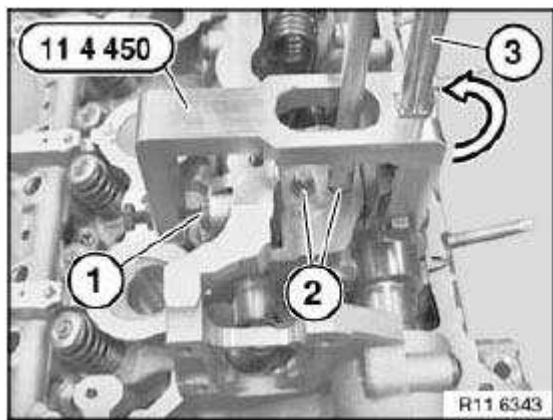


Fig. 287: Turning Eccentric Lever On Special Tool (11 4 450)
Courtesy of BMW OF NORTH AMERICA, INC.

Install torsion spring (2) on guide block.

Installation:

Insert torsion spring (2) in intermediate lever (1) (see arrow).

Check that cam follower (3) is in correct installation position.

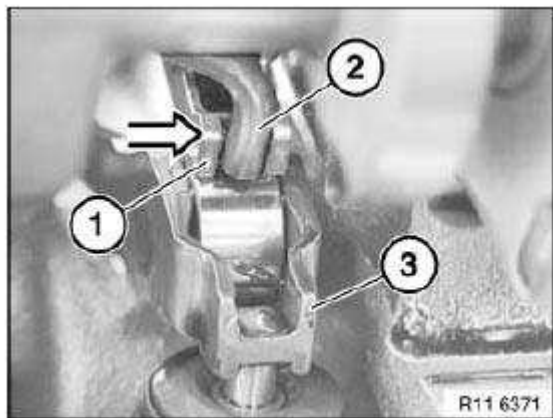


Fig. 288: Inserting Torsion Spring In Intermediate Lever
Courtesy of BMW OF NORTH AMERICA, INC.

Secure special tool 11 4 270 with gripping pliers (3) to guide block (2).

**IMPORTANT: Special tool 11 4 270 is only secured to guide block (2).
Adjusting the gripping pliers (3) on special tool 11 4 270 is not permitted. Risk
of damage!**

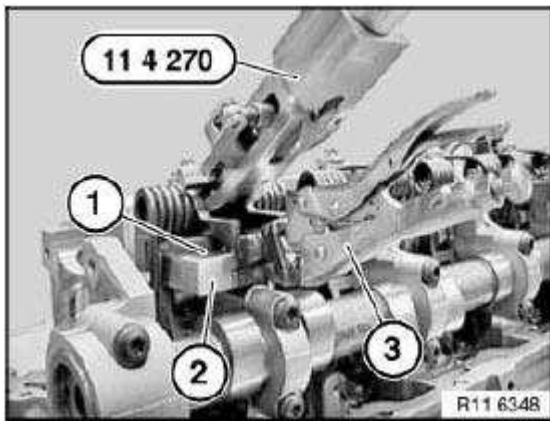


Fig. 289: Special Tool (11 4 270) - Gripping Pliers And Guide Block
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Risk of injury in event of incorrect use.

IMPORTANT: Improper handling. Risk of damage!

Secure both bearing pins (2) in torsion springs with knurled screw (1) of special tool 11 4 270 .

**IMPORTANT: Check torsion spring on intermediate lever to ensure correct installation
position.**

Press special tool 11 4 270 in direction of arrow as far as it will go.

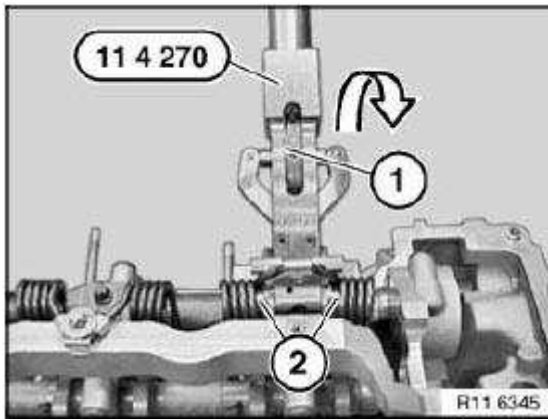


Fig. 290: Securing Bearing Pins In Torsion Springs With Knurled Screw
 Courtesy of BMW OF NORTH AMERICA, INC.

Insert screw (2) of torsion spring.

Tightening torque: 11 37 2AZ, see **11 37 VARIABLE VALVE GEAR** .

To avoid jamming of screw (2) with torsion spring, it is necessary when inserting screw (2) to increase pretension on special tool 11 4 270 uniformly.

IMPORTANT: Thread on cylinder head. Risk of damage!

Remove special tool 11 4 270 .

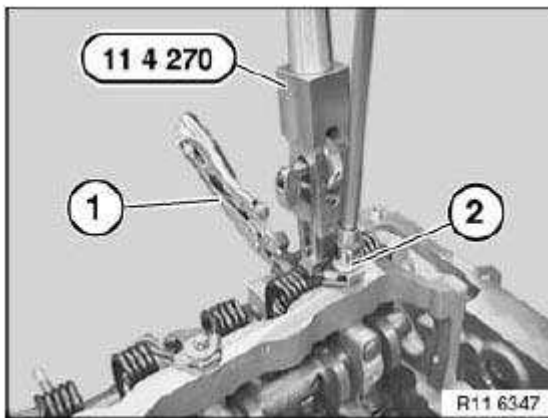


Fig. 291: Torsion Spring Screw And Special Tool (11 4 270)
 Courtesy of BMW OF NORTH AMERICA, INC.

At cylinder no. 3, adjust oil spray nozzle (2) so that oil spray points precisely towards spline teeth (3).

Insert screw (1) with oil spray nozzle (2) (external).

Tightening torque: 11 37 4AZ, see **11 37 VARIABLE VALVE GEAR** .

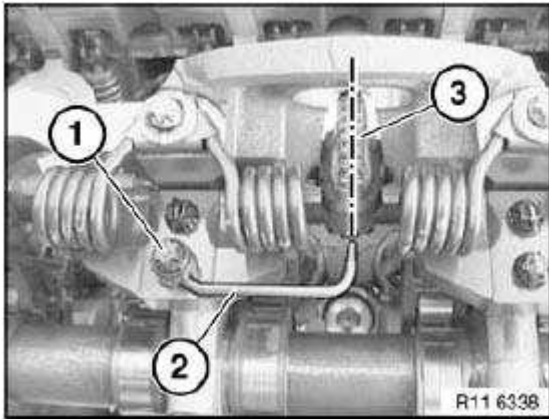


Fig. 292: Screw And Oil Spray Nozzle
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

40 OIL SUPPLY

11 40 000 CHECKING ENGINE OIL PRESSURE (N52, N52K)

IMPORTANT: The regulated oil pump can only be checked and measured with the diagnosis system.

Vehicles with a regulated oil pump have a HYDRAULIC VALVE fitted.

Necessary preliminary tasks

- Remove engine cover.
- Protect drive belt against dirt
- Have a cleaning cloth ready to catch escaping oil

Disconnect plug connection on oil pressure switch (3)

Remove oil pressure switch (3).

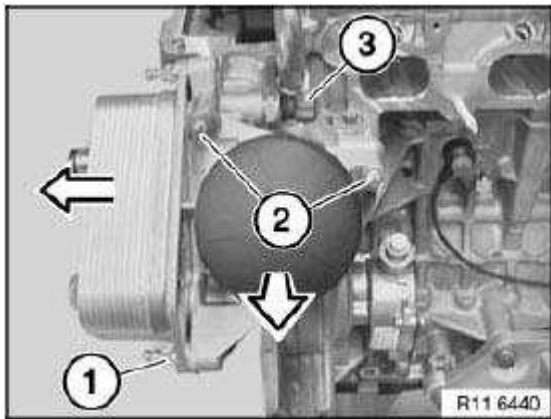


Fig. 293: Releasing Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Screw in special tool 11 4 050 with sealing ring. See **Fig. 294**.

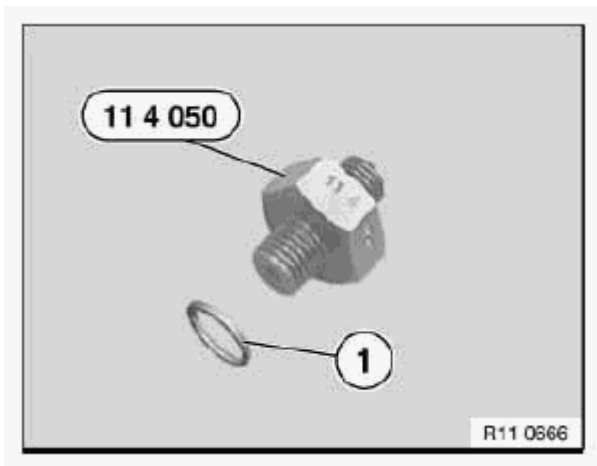


Fig. 294: Identifying Special Tool (11 4 050) And Sealing Ring

Courtesy of BMW OF NORTH AMERICA, INC.

Check engine oil pressure with diagnosis system

Connect special tools 13 6 054 and 13 6 051.

Check engine oil pressure with pressure gauge

Connect special tools 13 3 063 and 13 3 061.

Start engine and check engine oil pressure.

See **41 OIL PUMP WITH FILTER AND DRIVE** .

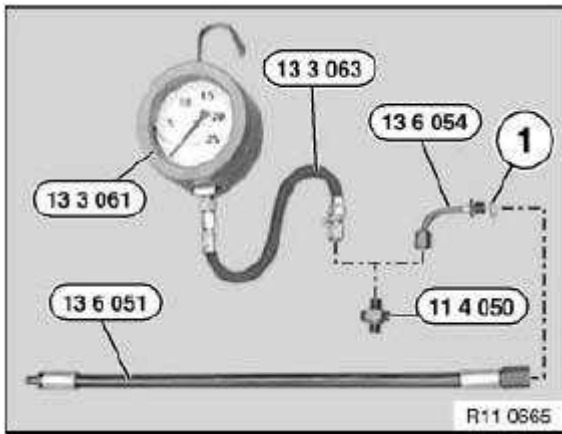


Fig. 295: Checking Engine Oil Pressure
 Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

41 OIL PUMP WITH FILTER AND DRIVE

11 41 000 REMOVING AND INSTALLING/REPLACING OIL PUMP (N52K)

Necessary preliminary tasks:

- Remove oil sump

Release screws (1).

Tightening torque, see 11 41 1AZ in **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

Installation:

Replace aluminum screws.

Remove intake pipe (2) in direction of arrow.

Installation:

Replace sealing ring.

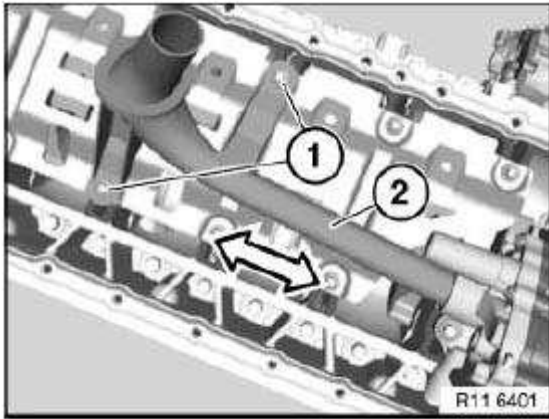


Fig. 296: Removing Intake Pipe

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: To release bolt (1), insert a 6 mm drill bit between sprocket wheel and oil pump housing.

Release bolt (1).

Tightening torque: 11 41 6AZ, see **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

Release screws (2).

Tightening torque: 11 41 5AZ, see **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

Installation:

Replace aluminum screws.

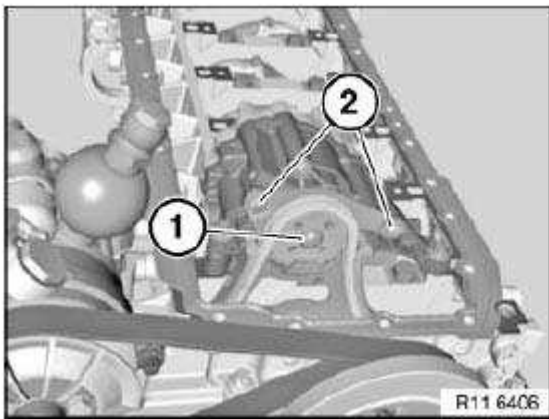


Fig. 297: Bolt And Screw

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Observe different screw lengths.

Release screws (1).

Tightening torque: 11 41 2AZ, see **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

Tightening torque: 11 41 3AZ, see **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

Installation:

Replace aluminum screws.

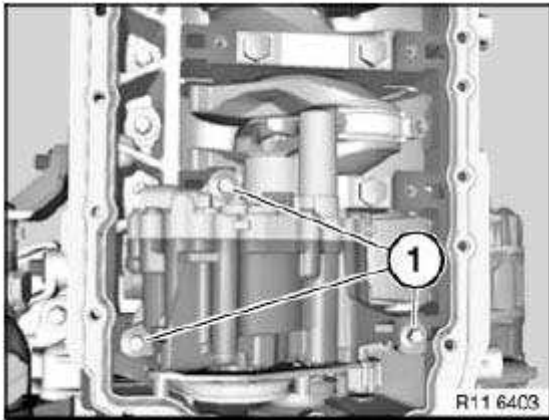


Fig. 298: Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Detach sprocket wheel (1) in direction of arrow.

**NOTE: Chain tensioner presses timing chain (3) upwards.
Do not remove sprocket wheel (1).**

Remove oil pump (2) in direction of arrow.

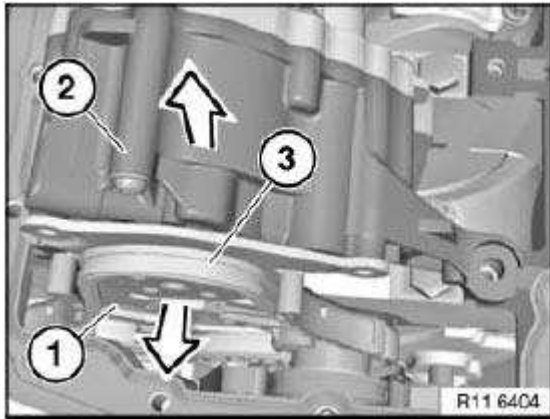


Fig. 299: Removing Sprocket Wheel
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check spacers (1) for secure seating and damage; replace if necessary.

Align twin surface (3) on oil pump (2) to sprocket wheel (4).

Install oil pump (2).

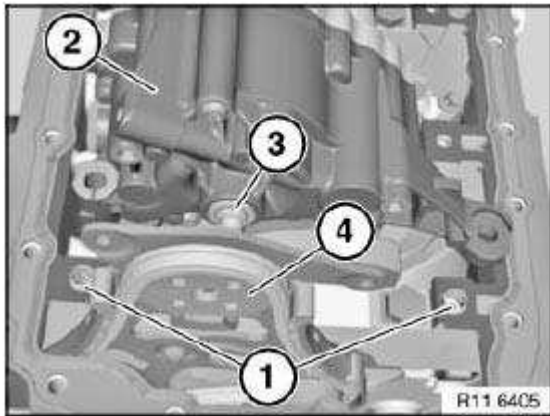


Fig. 300: Spacers, Oil Pump And Sprocket Wheel
 Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 41 010 REMOVING AND INSTALLING/REPLACING CHAIN MODULE FOR OIL PUMP/VACUUM PUMP (N52K)

Special tools required:

- 00 9 140

- 11 0 290
- 11 0 300
- 11 4 120
- 11 4 280
- 11 4 360
- 11 4 362
- 11 4 440
- 11 5 200
- 11 9 280

IMPORTANT: Aluminium-magnesium materials.

No steel screws/bolts may be used due to the threat of electrochemical corrosion.

A magnesium crankcase requires aluminum screws/bolts exclusively.

Aluminum screws/bolts must be replaced each time they are released .

The end faces of aluminum screws/bolts are painted blue for the purposes of reliable identification.

Jointing torque and angle of rotation must be observed without fail (risk of damage) .

Necessary preliminary tasks:

- Remove cylinder head cover
- Remove oil sump
- Remove drive belt
- Remove drive belt tensioner
- Remove **VIBRATION DAMPER**
- Remove sealing cover for vacuum pump

Procedure on installed engine:

Turn sprocket wheel (3) with central bolt at crankshaft into position until special tool 11 0 290 can be secured.

Simultaneously secure special tool 11 0 290 to sprocket wheel (3) and special tool 11 4 362 .

Release screw (2) for sprocket wheel (3).

Tightening torque: 11 66 2AZ, see **11 66 VACUUM PUMP** .

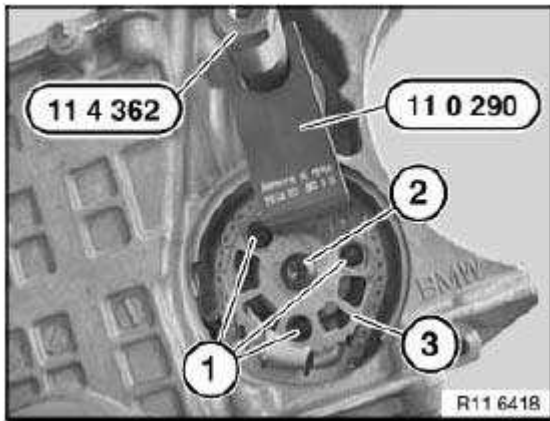


Fig. 301: Special Tool (11 4 362) And (11 0 290), Screw And Sprocket Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

Press timing chain with chain tensioner (1) in direction of arrow.

Disconnect timing chain with special tool 11 4 120 .

Feed out sprocket wheel (3) at hexagon head (4) of vacuum pump.

Installation:

If the chain module is replaced, a mounting bar (2) is already pre-installed.

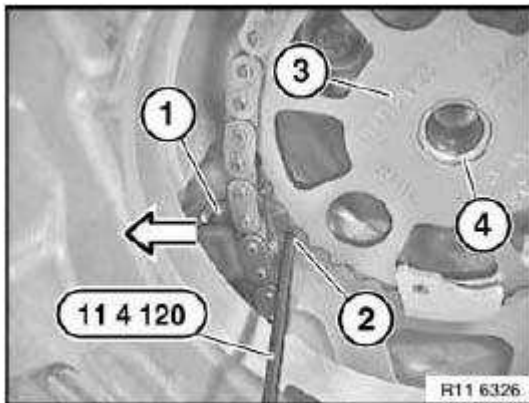


Fig. 302: Pressing Piston With Special Tools (11 6 261)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: To release bolt (1), insert a 6 mm drill bit between sprocket wheel and oil pump housing.

Release screw (1) for sprocket wheel.

Tightening torque: 11 41 6AZ, see **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

Release screws (2) for chain module.

Tightening torque: 11 41 5AZ, see **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

Installation:

Replace aluminum screws.

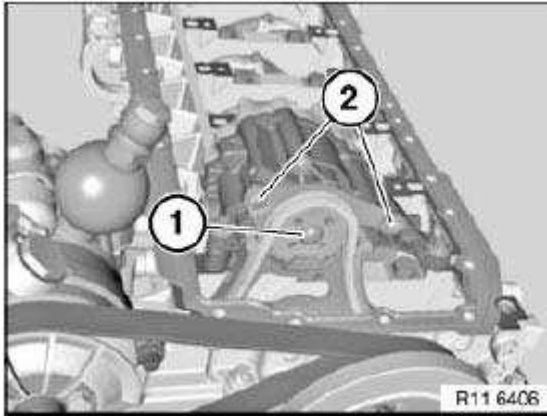


Fig. 303: Bolt And Screw

Courtesy of BMW OF NORTH AMERICA, INC.

Secure crankshaft and camshaft with special tools 11 0 300 and 11 4 280

**IMPORTANT: Do not remove special tools 11 0 300 and 11 4 280 to release central bolt (1).
Employ a second person for gripping when releasing central bolt (1).**

Screw special tool 11 9 280 onto hub of vibration damper.

Release central bolt (1).

Tightening torque: 11 21 1AZ, see **11 21 CRANKSHAFT AND BEARINGS** .

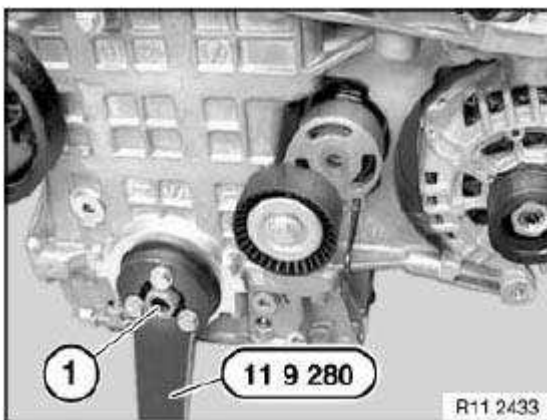


Fig. 304: Central Bolt With Special Tool (11 9 280)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace central bolt (1).

Remove hub (2) towards front.

Installation:

Replace crankshaft radial seal at front, see **11 14 005 Replacing front crankshaft radial seal (N52K)**.

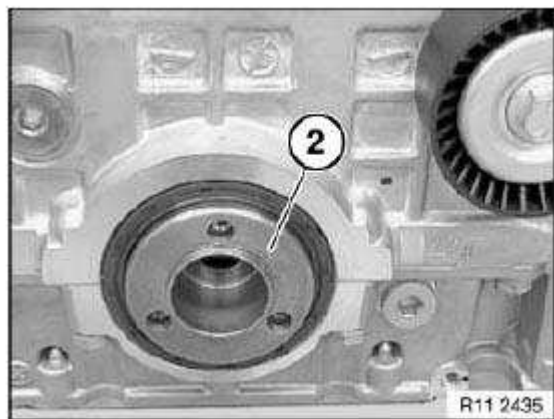


Fig. 305: Hub
Courtesy of BMW OF NORTH AMERICA, INC.

Open screw plug on bedplate.

Tightening torque: 11 11 8AZ, see **11 11 CRANKCASE** .

Installation:

Replace aluminum screws.

Release screw for chain module (1).

Tightening torque: 11 41 4AZ, see **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

Installation:

Replace aluminum screws.

Remove chain module (1) in direction of arrow.

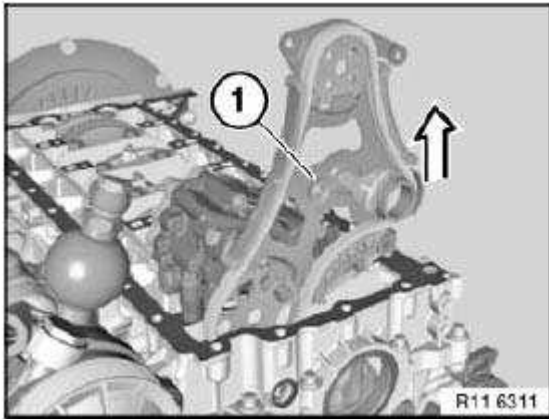


Fig. 306: Removing Chain Module

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Note installation direction of sprocket wheel (2).
Collar (see arrow) on sprocket wheel (2) points to engine .
Incorrect assembly will result in engine damage .

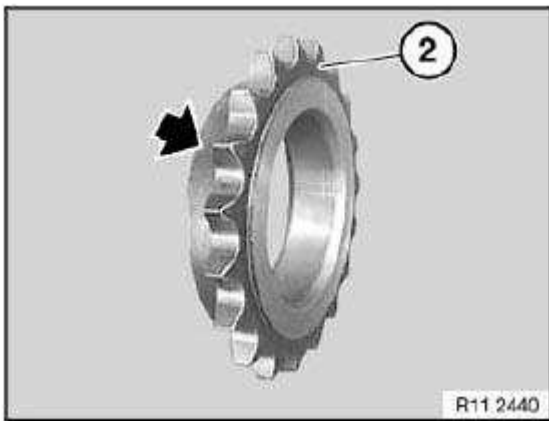


Fig. 307: Collar On Sprocket Wheel

Courtesy of BMW OF NORTH AMERICA, INC.

Procedure on removed engine:

NOTE: Engine is mounted on special tool 11 4 440 .

Release screw (1) for sprocket wheel.

Tightening torque: 11 66 2AZ, see **11 66 VACUUM PUMP** .

Release screw (2) for sprocket wheel.

Tightening torque: 11 41 6AZ, see **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

Release central bolt (3).

Tightening torque: 11 21 1AZ, see **11 21 CRANKSHAFT AND BEARINGS** .

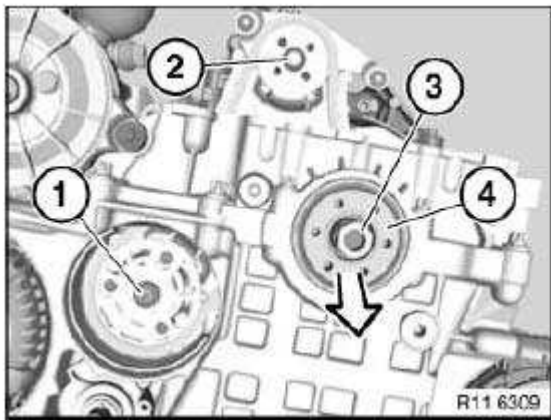


Fig. 308: Releasing Central Bolt

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Mark central bolt (3) with a colored dot.

Replace central bolt (3).

Remove hub (4) towards front.

All:

Install hub with new central bolt.

Tighten down special tool 11 5 200 with screws (1) to hub.

Do **not** remove special tools 11 0 300 and 11 4 280 .

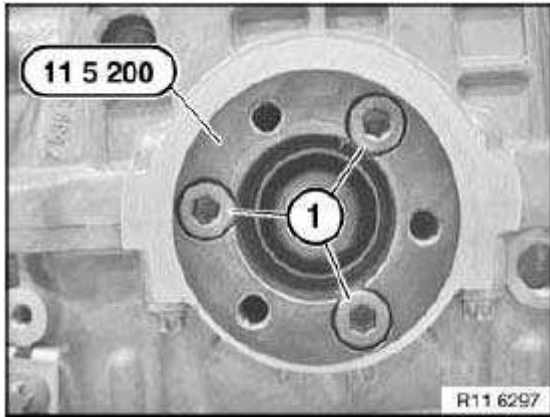


Fig. 309: Screws With Special Tool (11 5 200)
 Courtesy of BMW OF NORTH AMERICA, INC.

Remove tensioner for drive belt.

Screw in special tool 11 4 362 from special tool kit 11 4 360 .

Mount special tool 11 9 280 on 11 5 200 .

Support special tool 11 9 280 on special tool 11 4 362 .

Special tool 11 0 300 secures crankshaft.

Tighten central bolt to jointing torque.

Tightening torque: 11 21 1AZ, see **11 21 CRANKSHAFT AND BEARINGS** .

Mark central bolt and hub with paint.

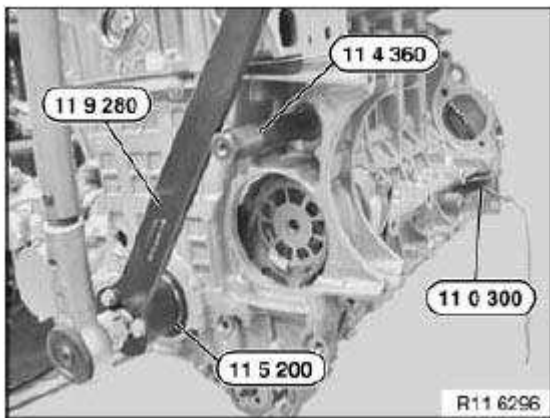


Fig. 310: Special Tools (11 9 280), (11 0 300), (11 4 360) And (11 5 200)
 Courtesy of BMW OF NORTH AMERICA, INC.

Mark special tools with colored line (1).

See picture.

**IMPORTANT: Do not remove the special tool while tightening the central bolt to torsion angle.
Risk of damage!**

If necessary, tighten central bolt to torsion angle with special tool 00 9 140 .

Tightening torque: 11 21 1AZ, see **11 21 CRANKSHAFT AND BEARINGS** .

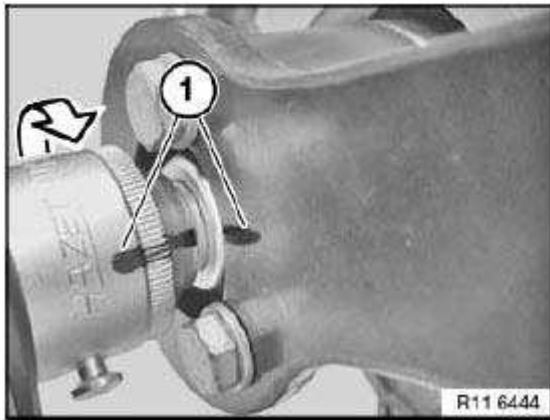


Fig. 311: Marking Special Tools With Colored Line
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace crankshaft radial seal at front, see **11 14 005 Replacing front crankshaft radial seal (N52K)**.

Assemble engine.

11 41 115 REMOVING AND INSTALLING/REPLACING HYDRAULIC VALVE (N52K)

IMPORTANT: Aluminium-magnesium materials.

No steel screws/bolts may be used due to the threat of electrochemical corrosion.

A magnesium crankcase requires aluminum screws/bolts exclusively.

Aluminum screws/bolts must be replaced each time they are **released**.

Aluminum screws/bolts are permitted with and without
color coding (blue).

For reliable identification:

Aluminum screws/bolts are **not magnetic**.

Jointing torque and angle of rotation must be observed without fail (**risk of damage**).

Necessary preliminary tasks

- Remove front underbody protection. See **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT ASSEMBLY UNDERSIDE PROTECTION (X5)** or **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION (X3)**
- Have a cleaning cloth ready to catch escaping oil

Detach plug (1) from hydraulic valve (2).

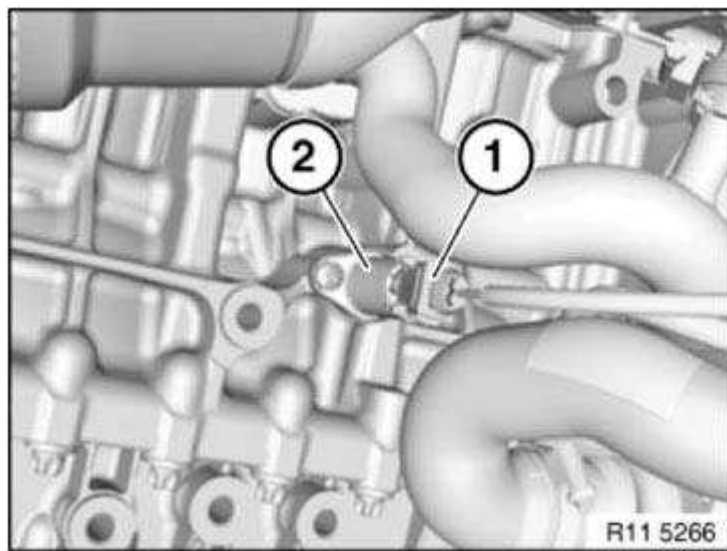


Fig. 312: Identifying Hydraulic Valve With Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1) and remove hydraulic valve (2).

Tightening torque

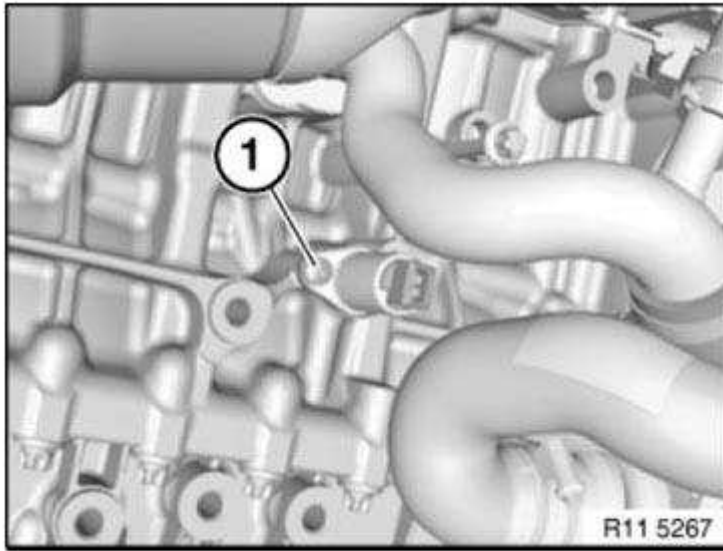


Fig. 313: Identifying Hydraulic Valve With Mounting Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Replace O-ring (1).

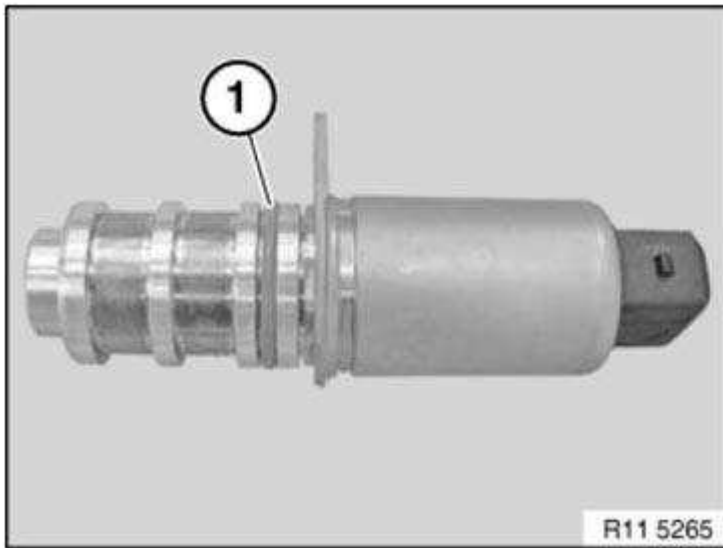


Fig. 314: Identifying O-Ring
Courtesy of BMW OF NORTH AMERICA, INC.

1142 OIL FILTER AND LINES

11 42 020 REMOVING AND INSTALLING/REPLACING FULLFLOW OIL FILTER (N52)

WARNING: Danger of scalding!

Only perform these tasks on an engine that has cooled down.

Recycling

Catch and dispose of drained coolant.

Observe country-specific waste-disposal regulations.

Necessary preliminary tasks

- Drain COOLANT. See **17 00 005 DRAINING AND ADDING COOLANT (N52K) (X3)** or **17 00 005 DRAINING AND ADDING COOLANT IN RADIATOR (N52K) (X5)** .
- Remove intake air **MANIFOLD** .
- Unfasten oil filter cover.
- Protect drive belt against dirt.

Release screw (1).

Tightening torque, see 11 42 2AZ in **11 42 OIL FILTER ELEMENT WITH CONNECTIONS**

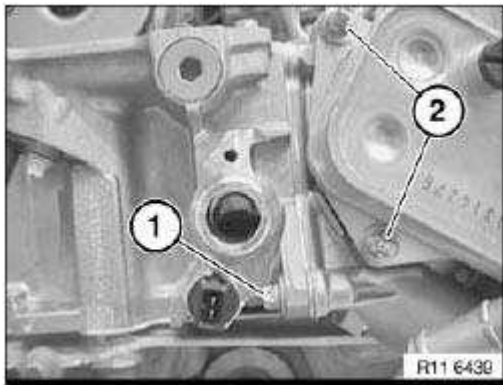


Fig. 315: Identifying Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws (2).

NOTE: Have cleaning cloth ready to catch residual oil.

Tightening torque: see 11 42 2AZ in **11 42 OIL FILTER ELEMENT WITH CONNECTIONS**

Installation:

Replace all seals.

If necessary, replace filter element.

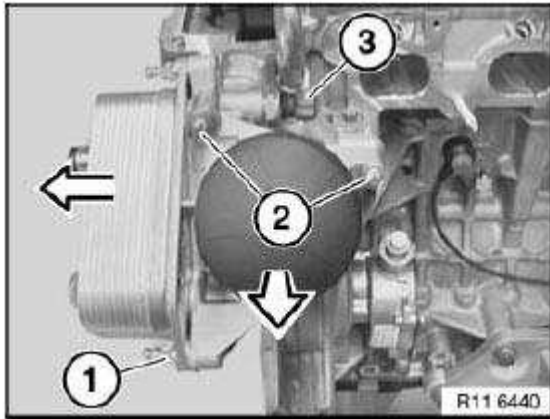


Fig. 316: Releasing Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

NOTE: Protect drive belt against dirt.

Installation:

For VENTING INSTRUCTIONS see **17 00 039 VENTING COOLING SYSTEM AND CHECKING FOR LEAKS (X3)** or **17 00 039 VENTING COOLING SYSTEM AND CHECKING FOR WATER LEAKS (N52K) (X5)**.

51 WATER PUMP WITH DRIVE

11 51 000 REMOVING AND INSTALLING/REPLACING WATER PUMP (N52K)

WARNING: Danger of scalding!

Only perform this work after engine has cooled down.

Recycling:

Catch and dispose of drained coolant in a suitable container.

Observe country-specific waste-disposal regulations.

IMPORTANT: If a water pump that has already been operated is reused, it must be filled with coolant immediately after removal.

Mixture ratio, water : coolant = 1 : 1

Protect plug connections against coolant and contamination.

Cover plug connections with suitable materials.

IMPORTANT: Aluminium-magnesium materials.

No steel screws/bolts may be used due to the threat of electrochemical corrosion.

A magnesium crankcase requires aluminum screws/bolts exclusively.

Aluminum screws/bolts must be replaced each time they are released.

The end faces of aluminum screws/bolts are painted blue for the purposes of reliable identification

Jointing torque and angle of rotation must be observed without fail (risk of damage) .

Necessary preliminary tasks:

- Remove coolant thermostat

Unfasten hose clip (1).

For tightening torque refer to 11 53 5AZ in **11 53 COOLANT THERMOSTAT WITH CONNECTIONS** .

Remove coolant hose.

Unfasten hose clip (2).

For tightening torque refer to 11 53 3AZ in **11 53 COOLANT THERMOSTAT WITH CONNECTIONS** .

Remove coolant hose.

Disconnect plug connection (3).

Release screws (4).

For tightening torque refer to 11 51 1AZ in **11 51 ELECTRIC WATER PUMP WITH DRIVE** .

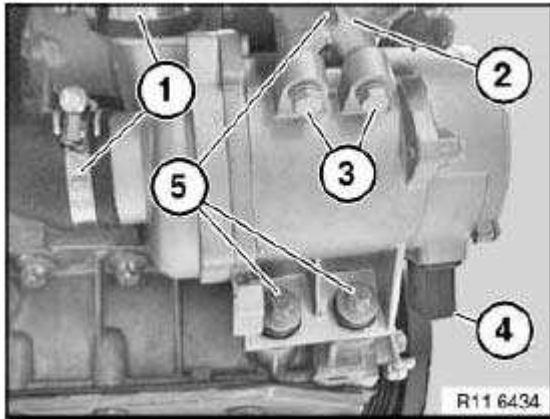


Fig. 317: Plug Connection, Screws And Hoses
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace aluminum screws.

Remove electric water pump (x) via x.

Installation:

If the electric water pump is reused, it must be rotated one turn due to the breakaway torque at the blade wheels.

Assemble engine.

Venting instructions must be observed without fail. . See **17 00 005 DRAINING AND ADDING COOLANT (N52K)** .

53 THERMOSTAT AND CONNECTIONS

11 53 000 REMOVING AND INSTALLING/REPLACING COOLANT THERMOSTAT (N52K)

WARNING: Danger of scalding!

Only perform this work after engine has cooled down.

Recycling

Catch and dispose of drained coolant in a suitable container.

Observe country-specific waste-disposal regulations.

IMPORTANT: Protect plug connections against coolant and contamination.

Cover plug connections with suitable materials.

Necessary preliminary tasks:

- Drain Coolant

NOTE: For purposes of clarity, the picture and text refer to the component when removed.

Unfasten hose clip (1).

For tightening torque refer to 11 53 5AZ in **11 53 COOLANT THERMOSTAT WITH CONNECTIONS** .

Remove coolant hose.

Unfasten hose clip (2).

For tightening torque refer to 11 53 6AZ in **11 53 COOLANT THERMOSTAT WITH CONNECTIONS** .

Remove coolant hose.

Unlock and detach coolant hose (3).

Unlock and detach coolant hose (4).

Disconnect plug connection (5).

Release screws (6).

For tightening torque refer to 11 53 1AZ in **11 53 COOLANT THERMOSTAT WITH CONNECTIONS** .

Remove coolant thermostat (7).

Assemble engine.

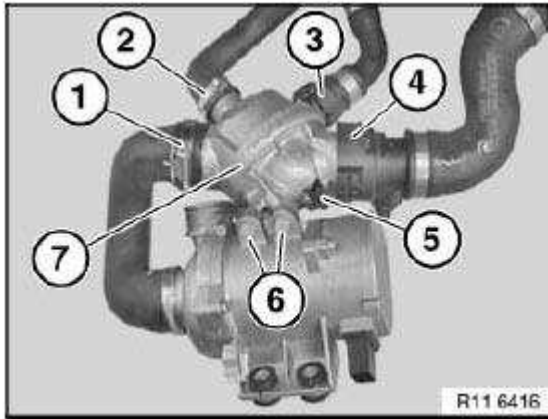


Fig. 318: Hose Clips, Hoses, Screws, Coolant Thermostat And Plug Connection
 Courtesy of BMW OF NORTH AMERICA, INC.

61 INTAKE MANIFOLD

11 61 050 REMOVING AND INSTALLING AIR INTAKE MANIFOLD (N52K)

Necessary preliminary tasks:

- Remove Tension Strut
- Remove Intake Filter Housing
- Remove Ignition Coil Cover

Open holder (2).

Disconnect plug connection (1) under of air intake manifold.

Release both crankcase breathers (3).

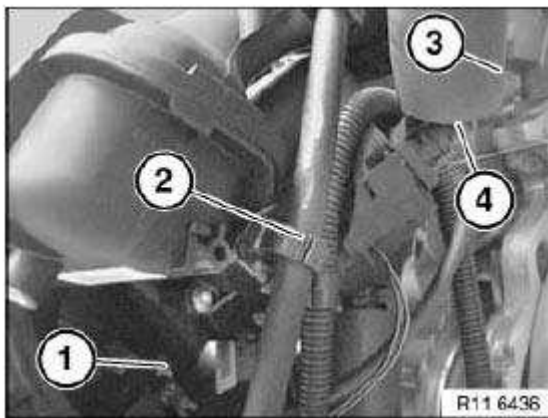


Fig. 319: Crankcase Breathers, Plug Connection And Holder
 Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1).

Disconnect plug connection (3).

Release screws (4).

Detach engine wiring harness (2) from air intake manifold and lay to one side.

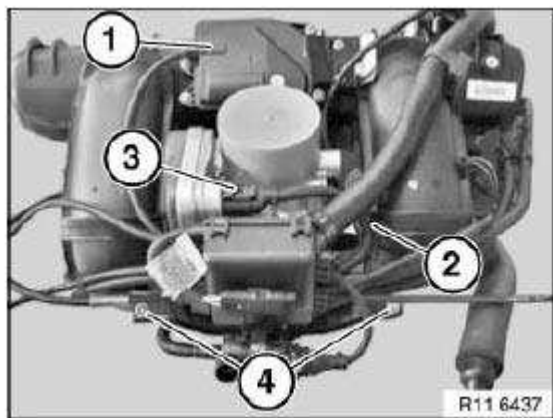


Fig. 320: Engine Wiring Harness, Screws And Plug Connections
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1) on oil pressure switch (2).

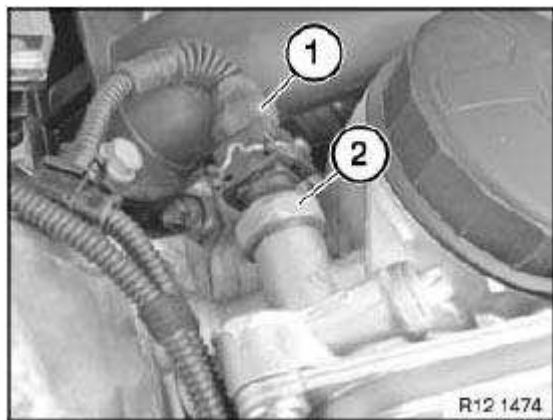


Fig. 321: Plug Connection And Oil Pressure Switch
Courtesy of BMW OF NORTH AMERICA, INC.

Release fuel rail (2) and lay to one side.

NOTE: Do not detach fuel line.

Release screws (1).

For tightening torque refer to 11 61 1AZ in **11 61 AIR INTAKE MANIFOLD** .

Unscrew nuts (3).

For tightening torque refer to 11 61 2AZ in **11 61 AIR INTAKE MANIFOLD** .

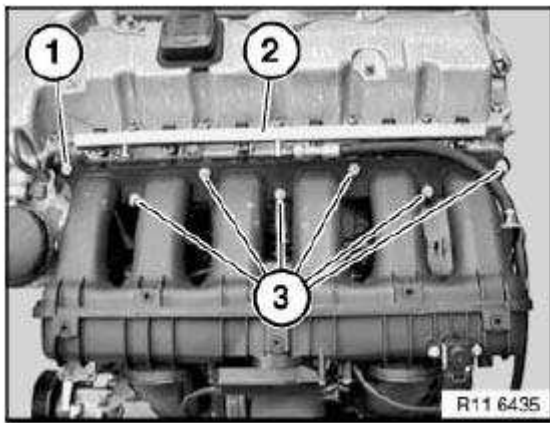


Fig. 322: Fuel Rail, Nuts And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Raise air intake manifold approx. 10 cm.

Disconnect plug connections (1) at bottom.

Release tank vent line behind throttle valve assembly.

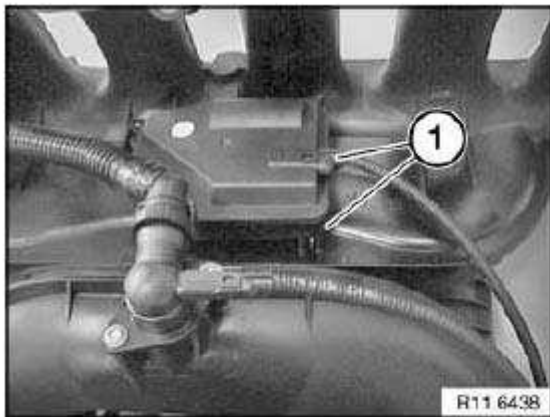


Fig. 323: Plug Connections
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace all seals.

Assemble engine.

62 EXHAUST MANIFOLD

18 40 050 REMOVING AND INSTALLING/REPLACING FRONT EXHAUST MANIFOLD (N52/ N52K/ N51)

Necessary preliminary tasks:

- Remove rear exhaust manifold

NOTE: The oxygen sensors are in danger of being damaged when the exhaust manifolds are removed and installed.

Remove control sensor from cylinders 1 to 3.

Remove monitor sensor from cylinders 1 to 3.

Tightening torque: 11 78 1AZ, see 11 78 EXHAUST GAS CONTROL, LAMBDA CONTROL SENSOR / LAMBDA MONITOR SENSOR .

Unscrew nuts.

Remove exhaust manifold (1).

Installation:

Clean sealing faces and replace seals.

Replace nuts.

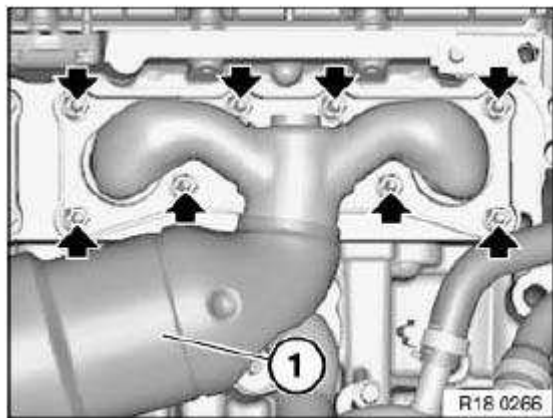


Fig. 324: Locating Exhaust Manifold Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

1166 VACUUM PUMP

11 66 000 REMOVING AND INSTALLING OR REPLACING VACUUM/OIL PUMP (N47 D20 O1)

IMPORTANT: It is possible to remove and install the vacuum oil pump without removing the transmission.

Necessary preliminary work

- Removing oil sump.

Release screws (1).

Remove intake snorkel in direction of arrow.

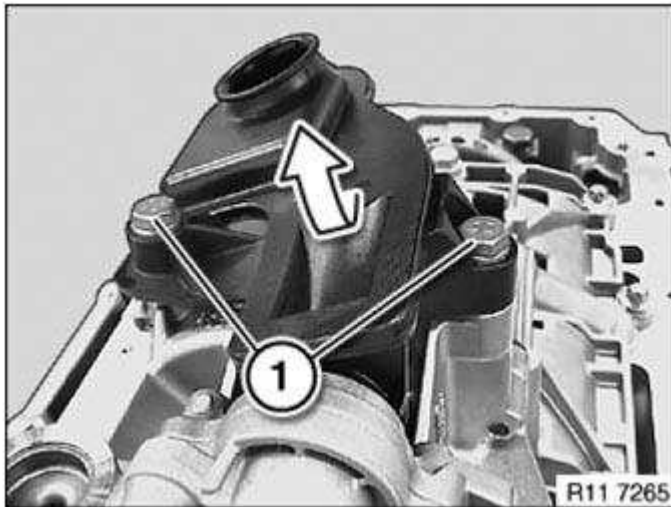


Fig. 325: Removing Intake Snorkel
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

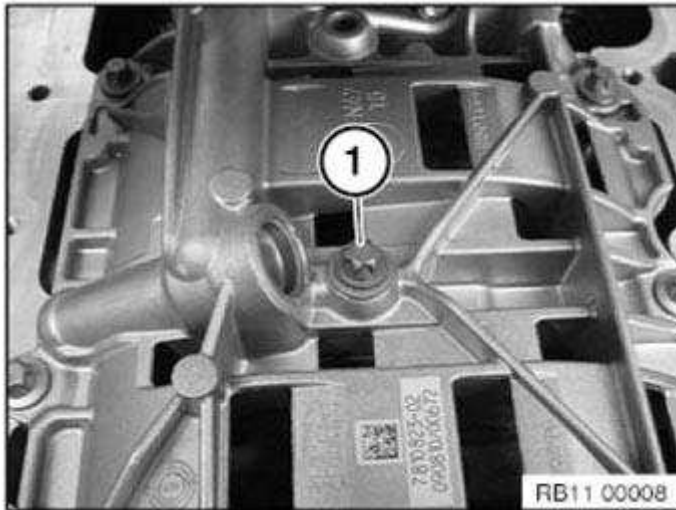


Fig. 326: Identifying Screw

Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Installation note:

Clean and blow out thread

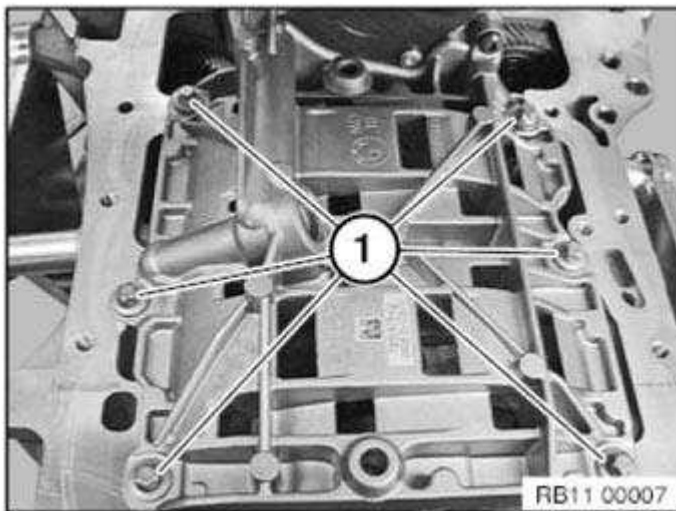


Fig. 327: Identifying Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

When installed, the oil pump chain must be fed out from the sprocket wheel of the oil pump drive gear; the sprocket wheel cannot be removed.

NOTE: Illustration shows gear case cover removed.

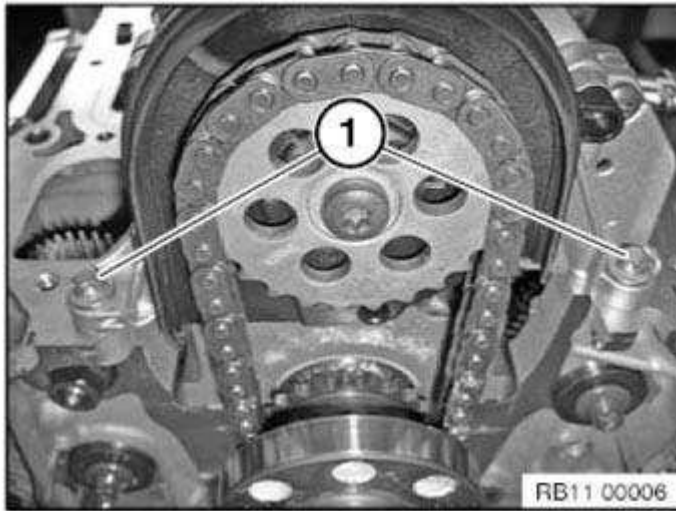


Fig. 328: Identifying Gear Case Cover Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Oil vacuum pump must be fed out at chain drive (1).

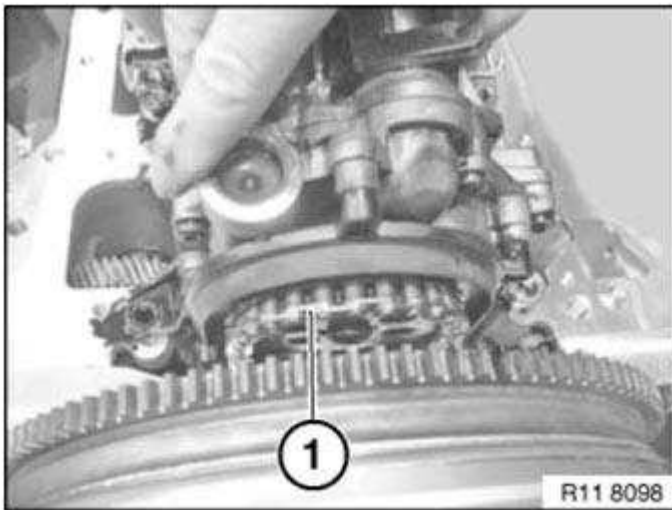


Fig. 329: Identifying Chain Drive
Courtesy of BMW OF NORTH AMERICA, INC.

Feed out oil vacuum pump (1) in direction of arrow and remove.

Installation in reverse sequence.

Installation note:

Clean all sealing surfaces.

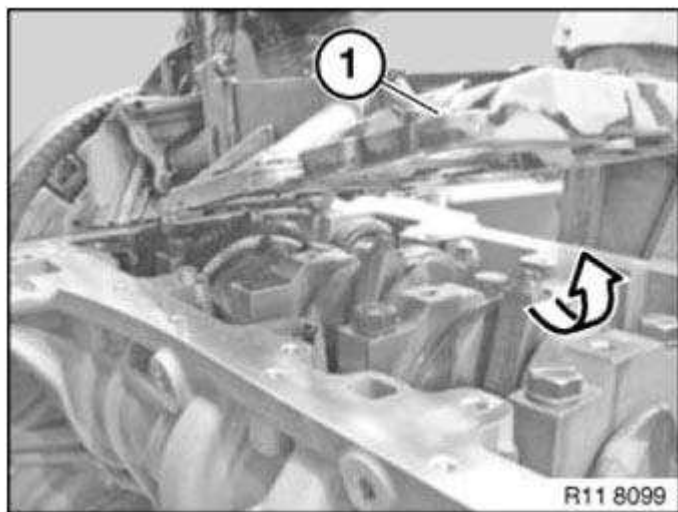


Fig. 330: Removing Oil Vacuum Pump
Courtesy of BMW OF NORTH AMERICA, INC.

Install all screws (1) and tighten down.

Tightening torque, see 11 41 1AZ in **11 41 OIL PUMP WITH STRAINER AND DRIVE**

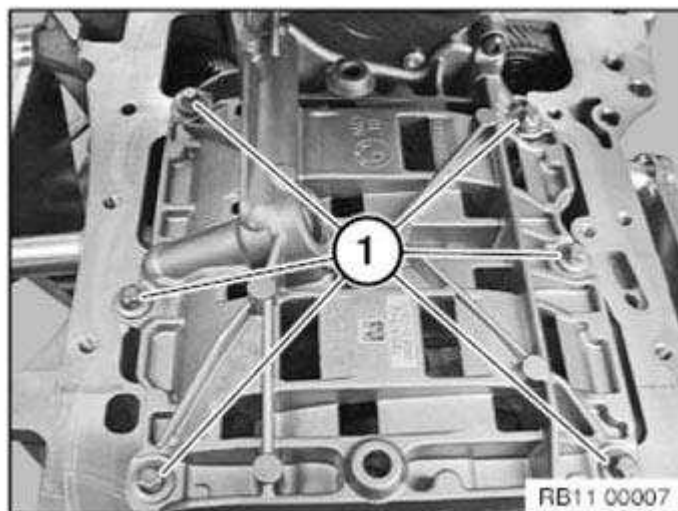


Fig. 331: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Install and tighten down screws (1).

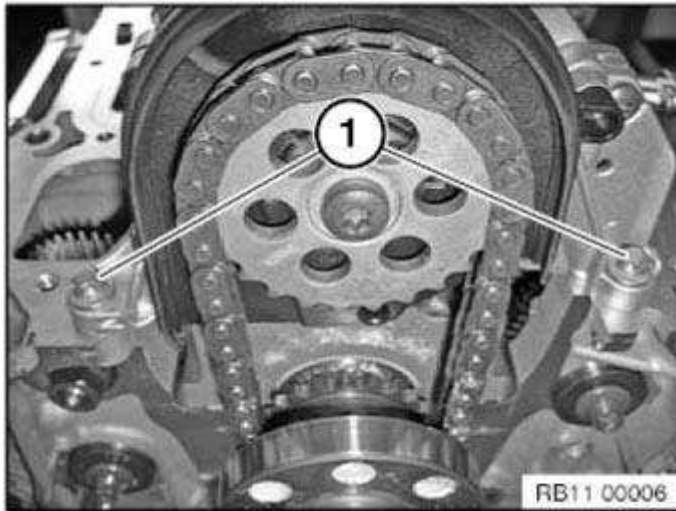


Fig. 332: Identifying Gear Case Cover Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Clean and blow out thread

Insert and secure screw (1).

Secure screw (1) with special tool 00 9 120 .

Tightening torque, see 11 41 2AZ in **11 41 OIL PUMP WITH STRAINER AND DRIVE**

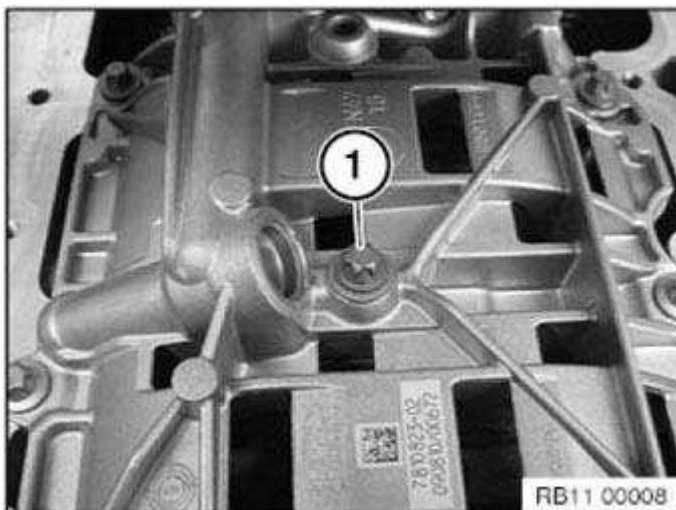


Fig. 333: Identifying Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

1178 EMISSION CONTROL, OXYGEN SENSOR

11 78 513 REPLACING BOTH LAMBDA OXYGEN CONTROL SENSORS (N52K)

WARNING: Risk of burning!

Work should only be carried out on an exhaust system that has cooled down.

Installation note:

The threads of new oxygen control sensors are already coated with Never Seez Compound.

If a oxygen control sensor is to be reused, apply a thin and even coating of Never Seez compound to the thread only.

The part of the lambda control sensor which projects into the exhaust system branch (sensor ceramics) must **not** be cleaned and **not** coated with lubricant.

Lambda control sensor, cylinder nos. 1 to 3

NOTE: The lambda control sensor on the exhaust manifold of cylinder nos. 1 to 3 is accessible from above. The exhaust system does not have to be removed.

Lambda control sensor, cylinder nos. 1 to 3

Necessary preliminary tasks:

- Remove complete exhaust system **EXHAUST SYSTEM (X3)** or **EXHAUST SYSTEM (X5)** .

Disconnect plug connection on oxygen control sensor (1).

Release lambda control sensor (1) on exhaust manifold of cylinder nos. 4 to 6 with special tool 11 4 260.

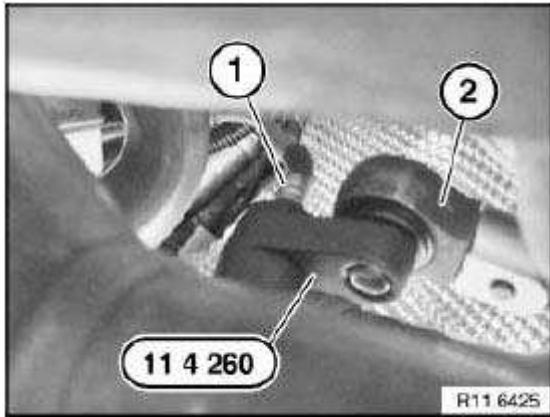


Fig. 334: Removing Lambda Oxygen Control Sensor Using Special Tool 11 4 260
Courtesy of BMW OF NORTH AMERICA, INC.

All:

Installation note:

Cable color of lambda control sensor, cylinders nos. 1 to 3 = black.

Cable color of lambda control sensor, cylinders nos. 4 to 6 = grey.

Tightening torque, see 11 78 1AZ in **78 EMISSION CONTROL, OXYGEN SENSOR** .

Assemble engine.

Check function of DME.

11 78 545 REPLACING BOTH LAMBDA OXYGEN MONITORING SENSORS (N52K)

WARNING: Risk of burning!

Work should only be carried out on an exhaust system that has cooled down.

Necessary preliminary tasks:

- Remove underbody protection. See **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT ASSEMBLY UNDERSIDE PROTECTION (X5)** or **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION (X3)** .

Installation note:

The threads of new lambda monitoring sensors are already coated with Never Seez Compound (refer to BMW Parts Department).

If a lambda monitoring sensor is to be reused, apply a thin and even coating of Never Seez Compound to the thread only.

The part of the lambda monitoring sensor which projects into the exhaust system branch (sensor ceramics) must **not** be cleaned and **not** coated with lubricant.

Disconnect plug connection on lambda monitoring sensor (1).

Release lambda monitoring sensor (1) on exhaust manifold of cylinder nos. 1 to 3 with special tool 11 9 150.

Tightening torque, see 11 78 1AZ in **78 EMISSION CONTROL, OXYGEN SENSOR** .

Installation note:

Cable color of lambda monitoring sensor (1), cylinders nos. 1 to 3 = black.

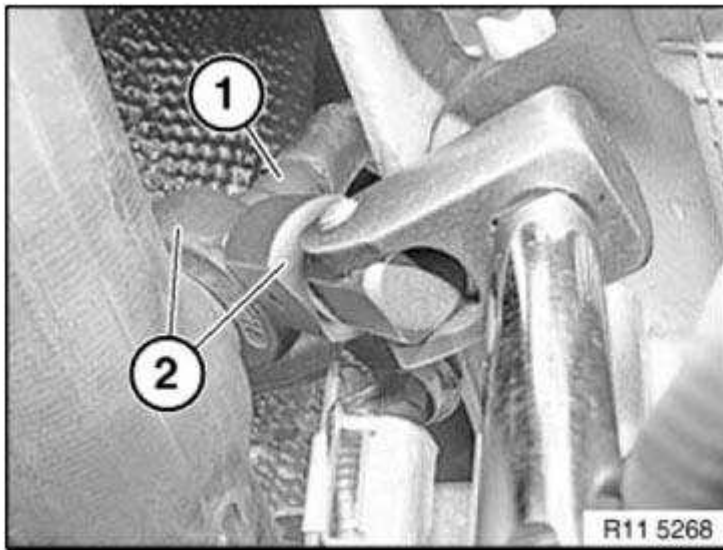


Fig. 335: Removing Lambda Monitoring Sensor Plug Connection Using Special Tool (11 9 150)
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection on lambda monitoring sensor (1).

Release lambda monitoring sensor (1) on exhaust manifold of cylinder nos. 4 to 6 with special tool 11 9 150.

Tightening torque, see 11 78 1AZ in **78 EMISSION CONTROL, OXYGEN SENSOR** .

Installation note:

Cable color of lambda monitoring sensor (1), cylinders nos. 4 to 6 = grey.

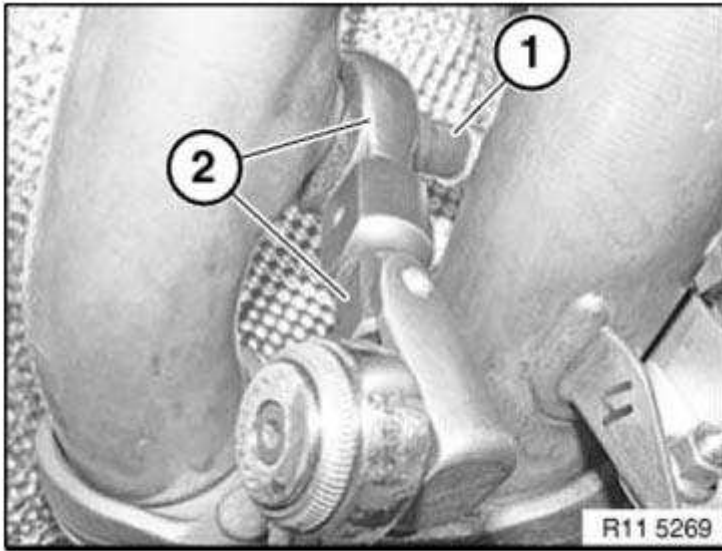


Fig. 336: Removing Lambda Monitoring Sensor Plug Connection Using Special Tool (11 9 150)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check function of DME.

ENGINE

Exhaust System - Operating Fluids

1.0 GENERAL INFORMATION

Detachable joints such as exhaust manifold bolts and exhaust system flange connections can be treated with a grease able to withstand high temperatures and corrosive conditions.

Use Copper Paste (former BMW Part No. 81 22 9 400 794).

BMW PART NUMBER SPECIFICATION

3M	Part No. 8945
CRC	Part No. 3046010

ENGINE

Exhaust System - Tightening Torques - X3

00 EXHAUST SYSTEM, COMPLETE

18 00 EXHAUST ASSEMBLY

EXHAUST ASSEMBLY - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Primary catalytic converter to turbocharger/or jacket pipe to catalytic converter	M57 / M57TU	M10		42 Nm
	M67			15 Nm
	M30 / M70		Tighten down compression spring with nut uniformly to full extent, then slacken by 1.5 turns	10 Nm
	M51		Preload compression springs with nut to 27 ± 1 mm	
	S50	M10		30 Nm
	S54 / ECE	M10		27 Nm
	S54 / US	M10		24 Nm
2AZ Exhaust pipe to flow section	E23			25 Nm
3AZ Clamp for final muffler	All	M8		15 Nm
4AZ Catalytic converter on silencer	E36 / M42 / M43 / M44		Version with compression spring: Evenly preload compression springs with nuts to 30 mm	
5AZ Connection of positive and negative leads to E catalytic converter	M73			5 Nm
6AZ Rear muffler to intermediate muffler	E53	M8		30 Nm
7AZ Vacuum tank to retaining plate	E46 / M54	M8		10 Nm
8AZ Exhaust system to exhaust manifold	M40 / M42 / M43 / M44	M10		45 Nm
9AZ Primary cat. to exhaust system	M57TU / E65			55 Nm

18 00 REAR MUFFLER

REAR MUFFLER - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Chrome panel to rear muffler	E8x,E9x		Screw securing, Powerlok	9.5 Nm

20 EXHAUST SYSTEM

18 20 EXHAUST SYSTEM SUSPENSION

EXHAUST SYSTEM SUSPENSION - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Exhaust system to manifold	N52 / N52K / N51	M10nut		45 Nm
2AZ Preliminary pipe bracket to transmission	N52 / N52K / N51	M8		21 Nm
3AZ Bracket to rear differential	N52 / N46 / M47T2 / M57T2	M12 nut		30 Nm
4AZ Bracket, rear muffler, to support plate	N52 / N52K / N51	M8 nut		21 Nm
5AZ Rear muffler to body	N52 / N52K / N51	M8nut		21 Nm
6AZ Exhaust system to transmission	M47T2	ASAM8 bolt		21 Nm
7AZ Exhaust system to body	N52 / N52K / N51	M8		21 Nm
8AZ Clamp	N52 / N52K / N51			45 Nm

18 20 EXHAUST SYSTEM SUSPENSION

EXHAUST SYSTEM SUSPENSION - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Rear muffler to body	N52K	M8		19 Nm
2AZ Transmission bracket to transfer case	N52K	M8x35		19 Nm
3AZ Transmission bracket to transfer case	N52K	M8		19 Nm

30 EXHAUST PIPE

18 30 EXHAUST PIPE / CATALYTIC CONVERTER, EXHAUST SYSTEM

EXHAUST PIPE / CATALYTIC CONVERTER, EXHAUST SYSTEM - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Hexagon nut to welding stud	N52K		Plastic nut	4 Nm
2AZ Grounding strap, exhaust system	N52K	BM6		9 Nm

40 EXHAUST MANIFOLD

18 40 EXHAUST MANIFOLD

EXHAUST MANIFOLD - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure

1AZ Pipe elbow to cylinder head

N52K M7

20 Nm

ENGINE

Exhaust Systems - Repair Instructions - X3 & X5

EXHAUST SYSTEM COMPLETE

18 00 020 REMOVING AND INSTALLING COMPLETE EXHAUST SYSTEM (M54/N52)

Special tools required:

- 31 2 220

WARNING: Scalding hazard!

Only perform these tasks after exhaust system has cooled down.

Support exhaust system with jack and special tool 31 2 220 and secure against falling out.

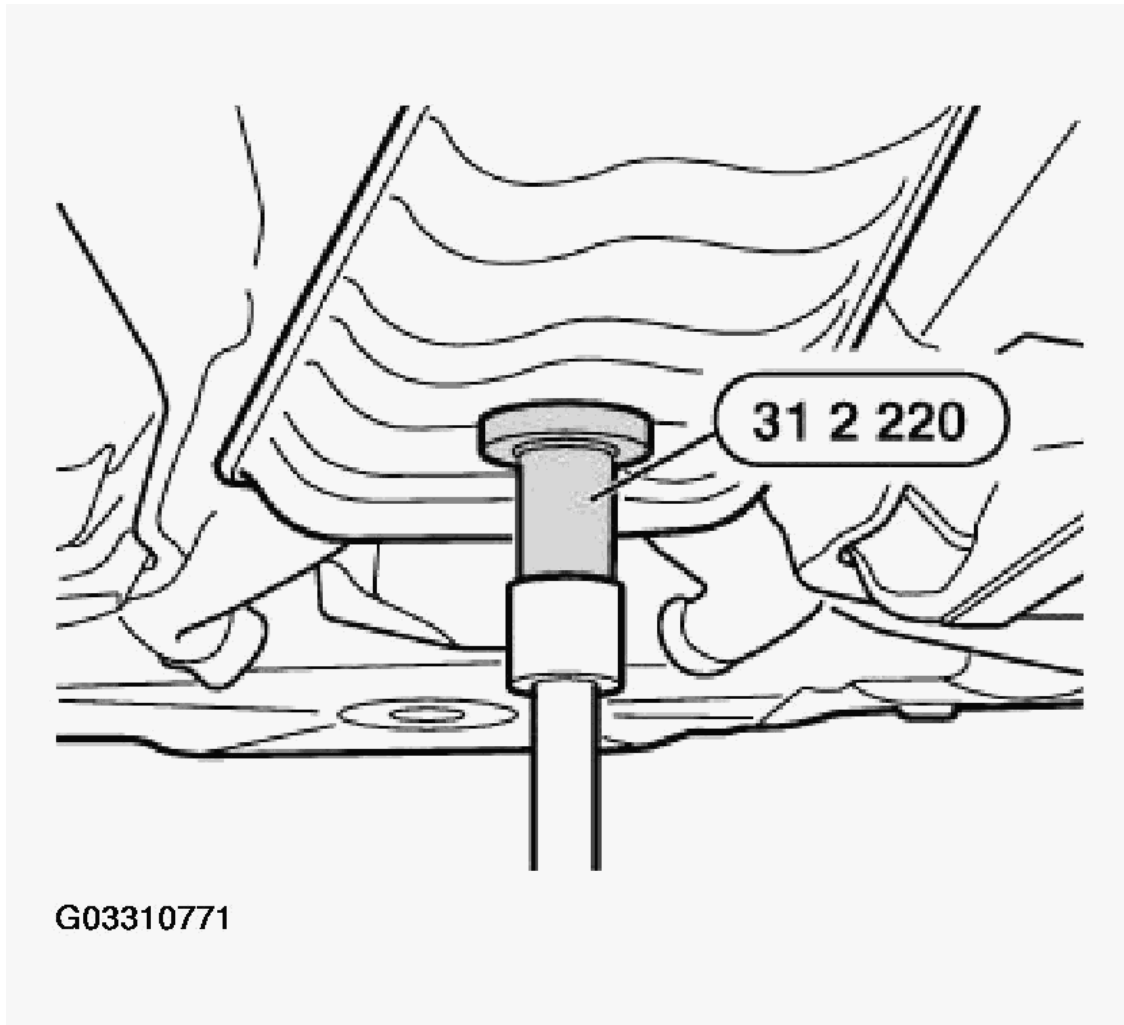
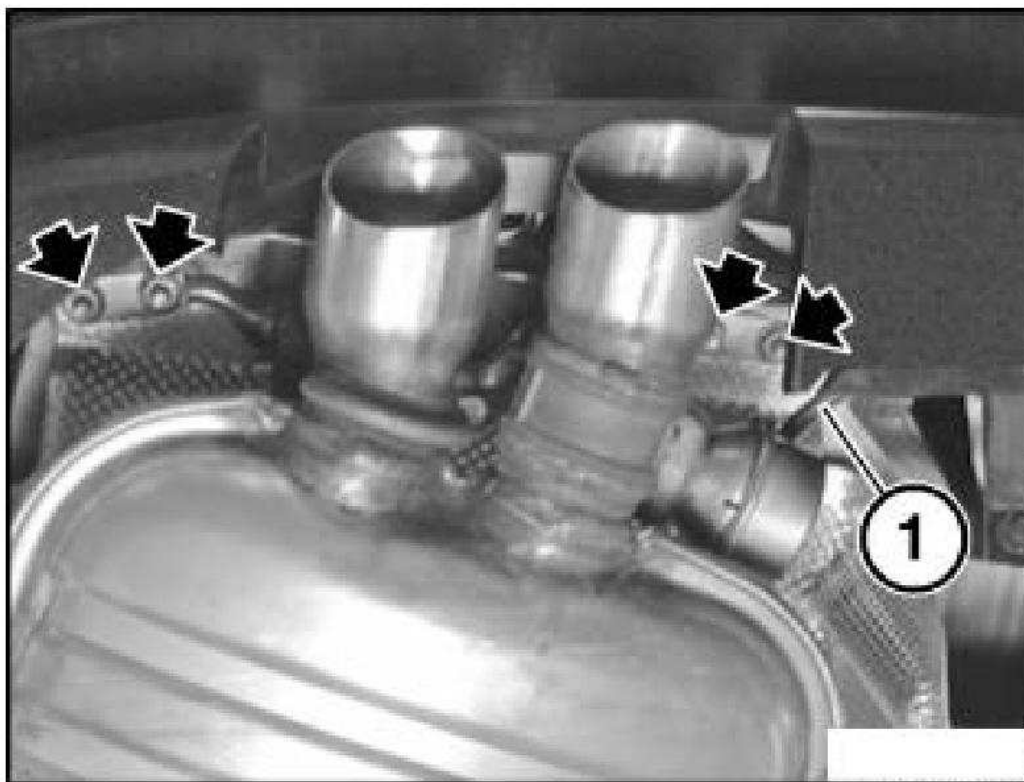


Fig. 1: Supporting Exhaust System

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Removal of the exhaust system must be carried out with the assistance of a second person.

Pull off vacuum hose (1).



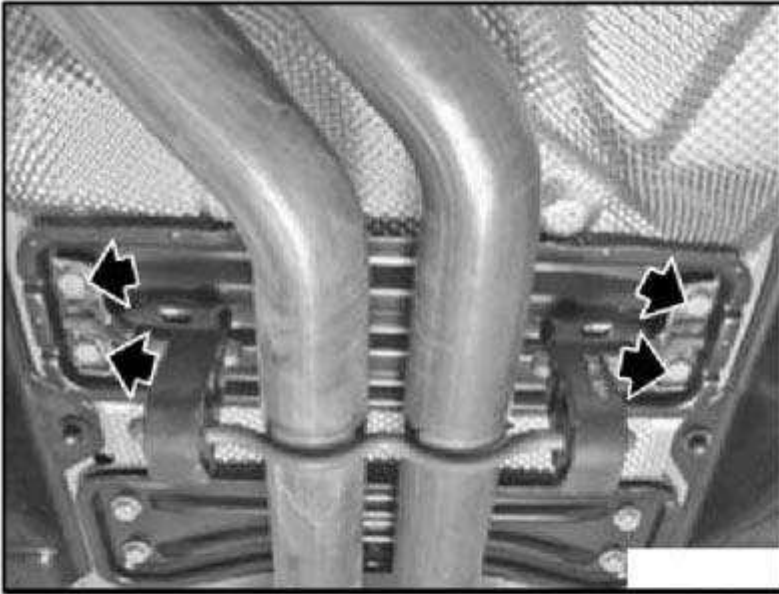
G03310772

Fig. 2: Locating Nuts

Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew nuts.

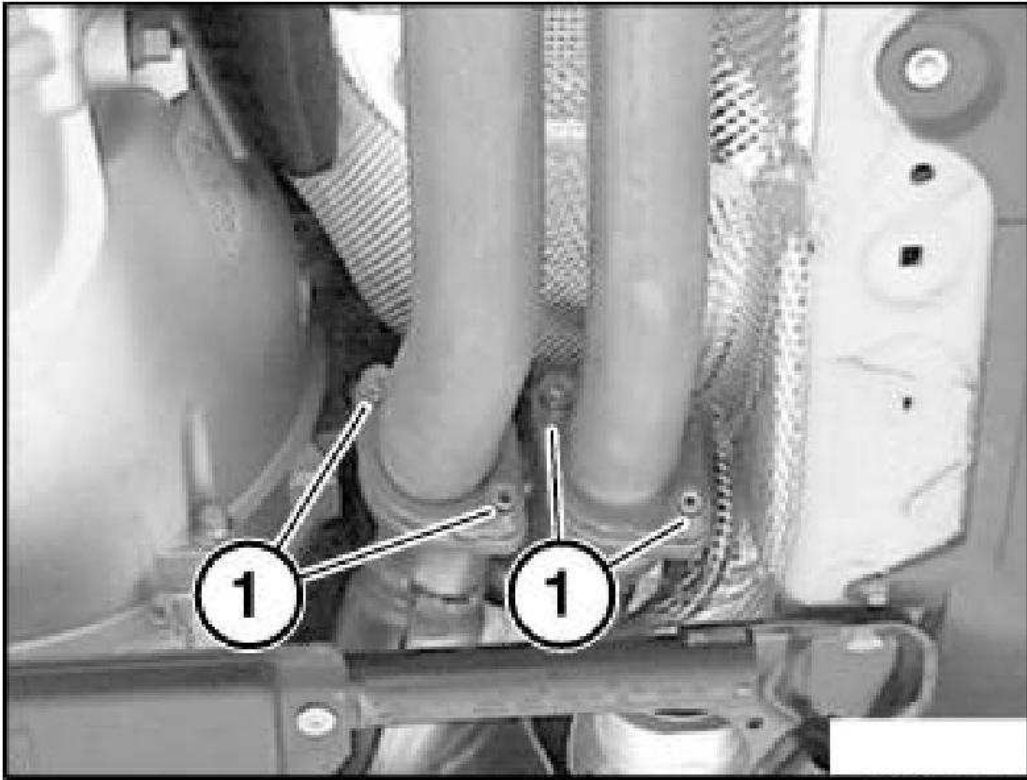
Unfasten screws.



G03310773

Fig. 3: Removing Muffler Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release nuts (1) and remove complete exhaust system.



G03310774

Fig. 4: Removing Complete Exhaust System
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace nuts.

MUFFLERS, PETROL

18 12 030 REPLACING REAR MUFFLER (M54/N52)

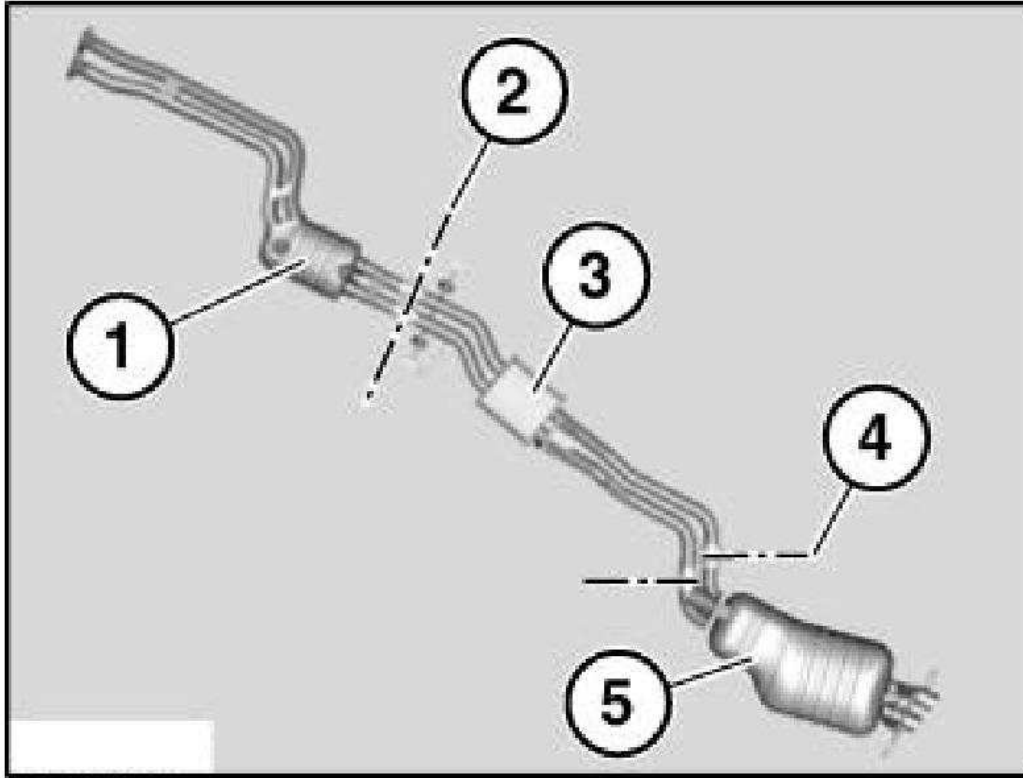
Special tools required:

- 00 2 210

WARNING: Scalding hazard!

Only perform these tasks after exhaust system has cooled down.

Cutting line (4) between center muffler (3) and rear muffler (5).



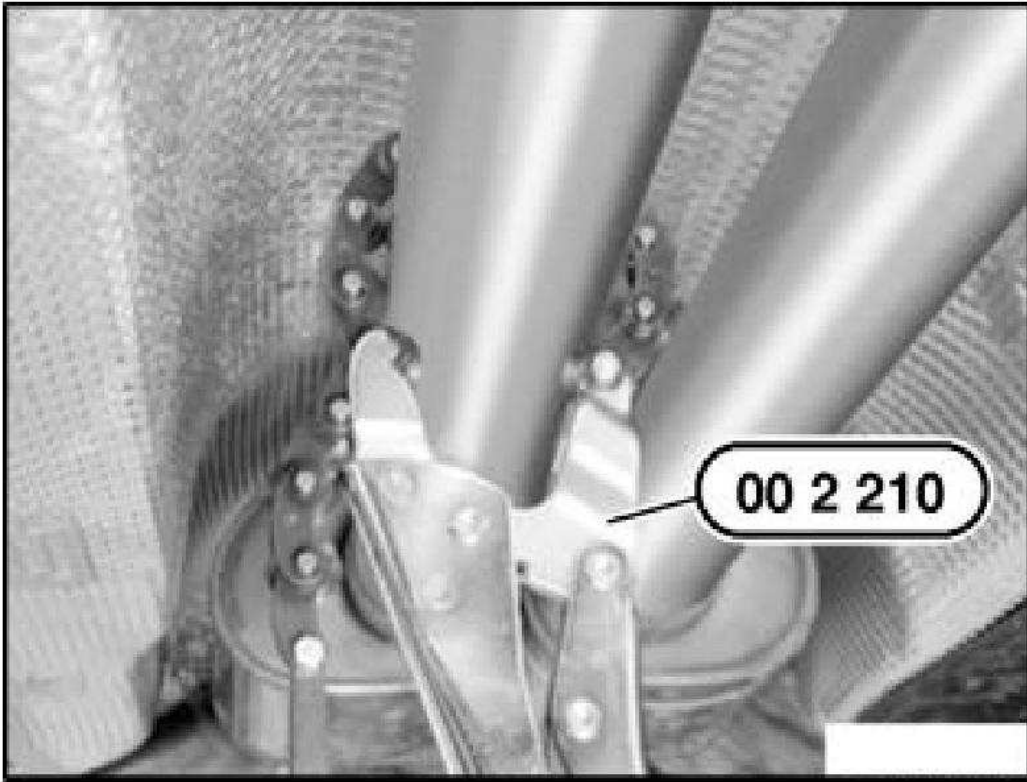
G03310775

Fig. 5: Locating Cutting Line Between Center Muffler And Rear Muffler
Courtesy of BMW OF NORTH AMERICA, INC.

Determine pipe length on new rear muffler (5).

Carry over dimensions to faulty rear muffler (5) and mark cutting line.

Cut exhaust pipe with special tool 00 2 210 at marked points and deburr.

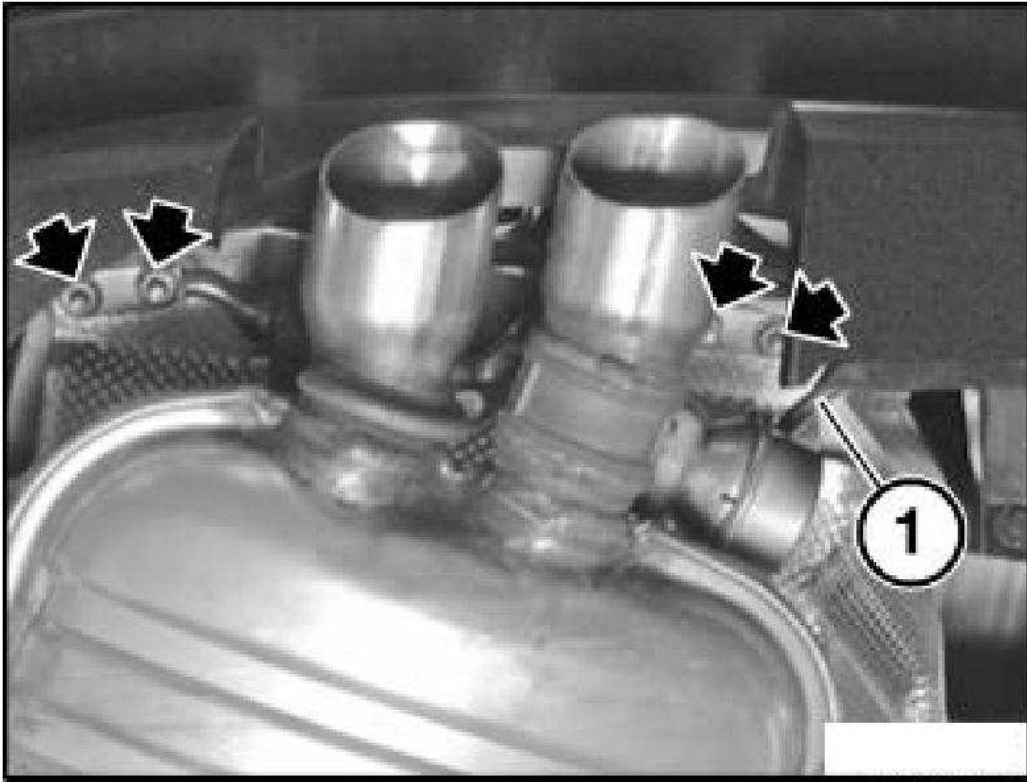


G03310776

Fig. 6: Cutting Exhaust Pipe

Courtesy of BMW OF NORTH AMERICA, INC.

Pull off vacuum hose (1).



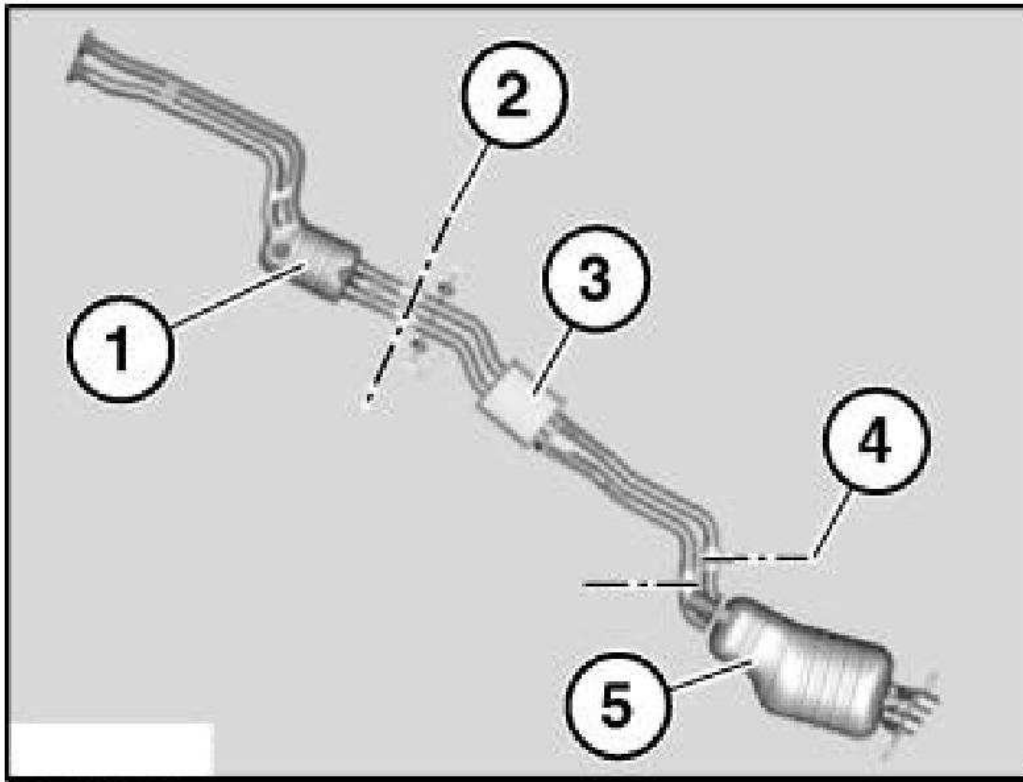
G03310777

Fig. 7: Locating Nuts

Courtesy of BMW OF NORTH AMERICA, INC.

Release nuts and remove rear muffler.

Connect rear muffler (5) using clamping sleeve.



G03310778

Fig. 8: Connecting Rear Muffler

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Align clamping sleeve so that:

- Nuts point downwards.
- Cutting line is in middle of clamping sleeve.
- There is sufficient spacing to adjoining components.

18 12 040 REMOVING AND INSTALLING/REPLACING FRONT MUFFLER (M54/N52)

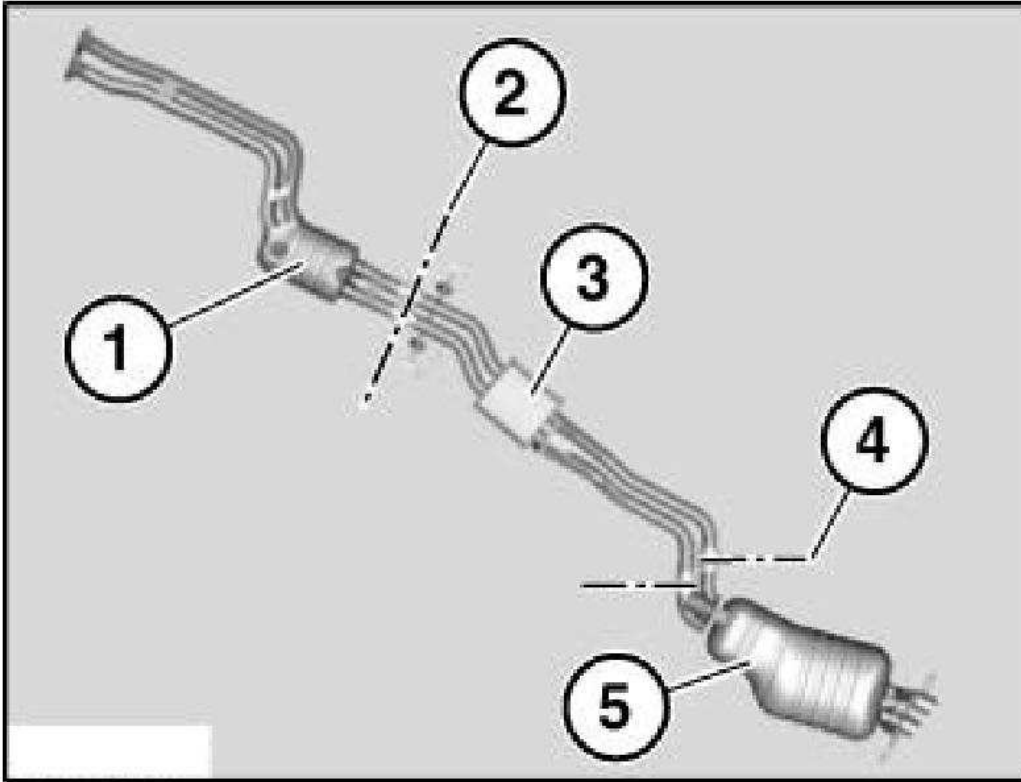
Special tools required:

- 00 2 210

WARNING: Scalding hazard!

These tasks should only be carried out on an exhaust system that has cooled down!

Cutting line (2) between front muffler (1) and center muffler (3).



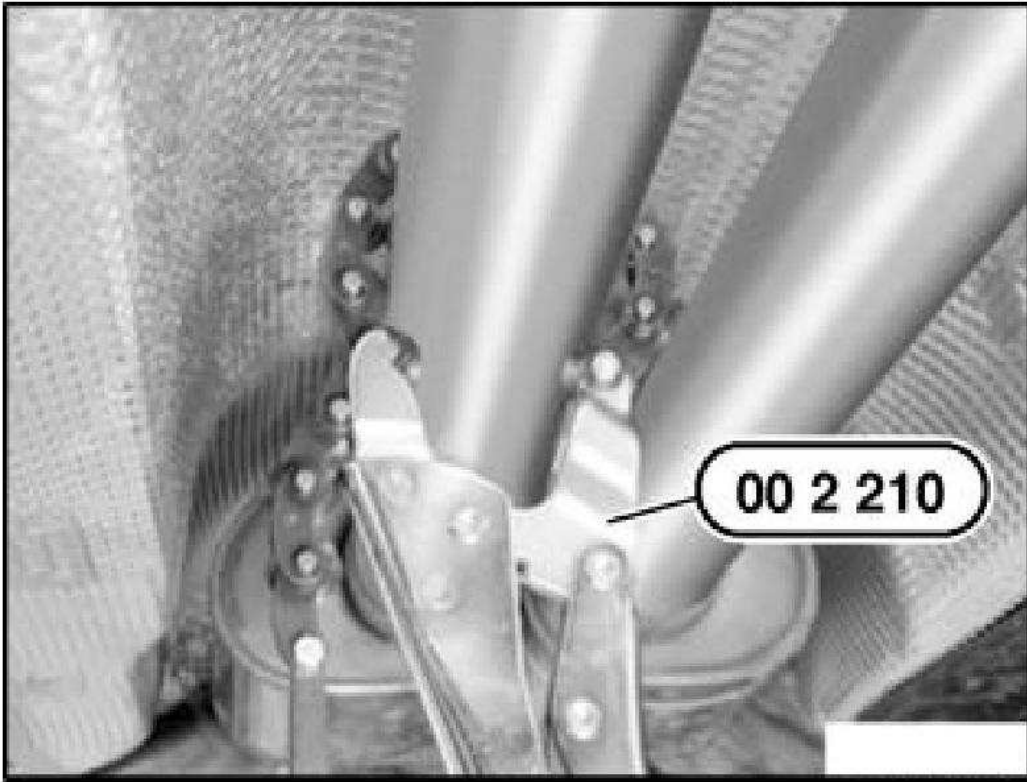
G03310779

Fig. 9: Locating Cutting Line Between Front Muffler And Center Muffler
Courtesy of BMW OF NORTH AMERICA, INC.

Determine pipe length on new front muffler (1).

Carry over dimension to faulty front muffler (1) and mark cutting line.

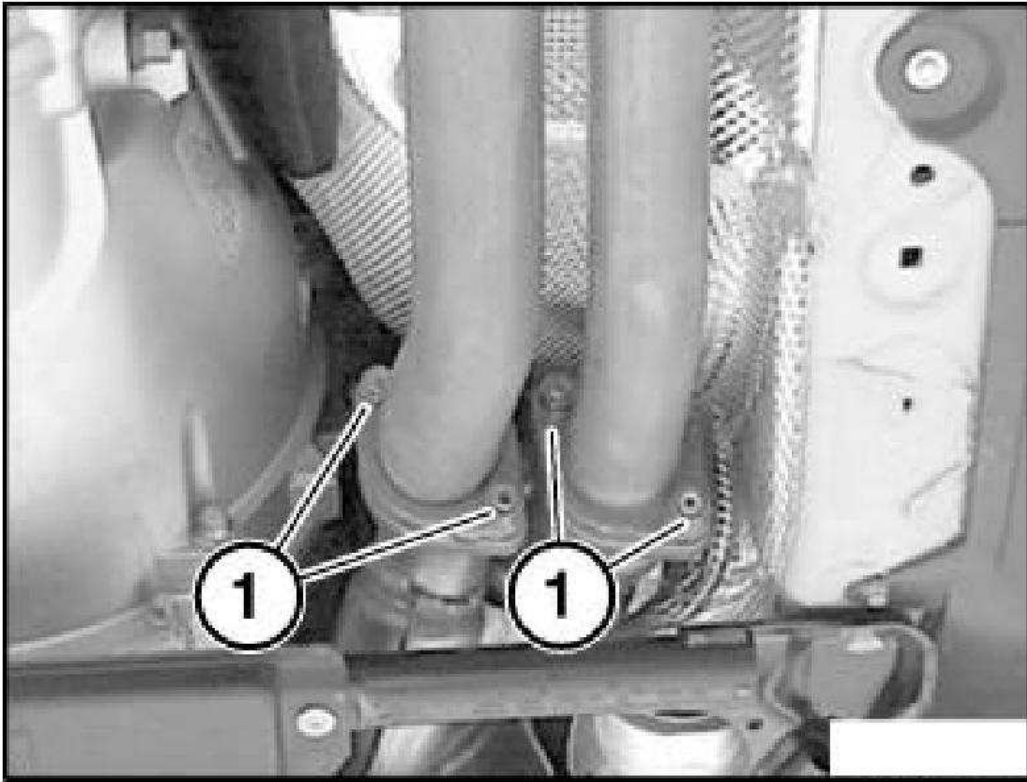
Cut exhaust pipes with special tool 00 2 210 at marked points and deburr.



G03310780

Fig. 10: Cutting Exhaust Pipes
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew nuts (1).



G03310781

Fig. 11: Removing Muffler Nuts

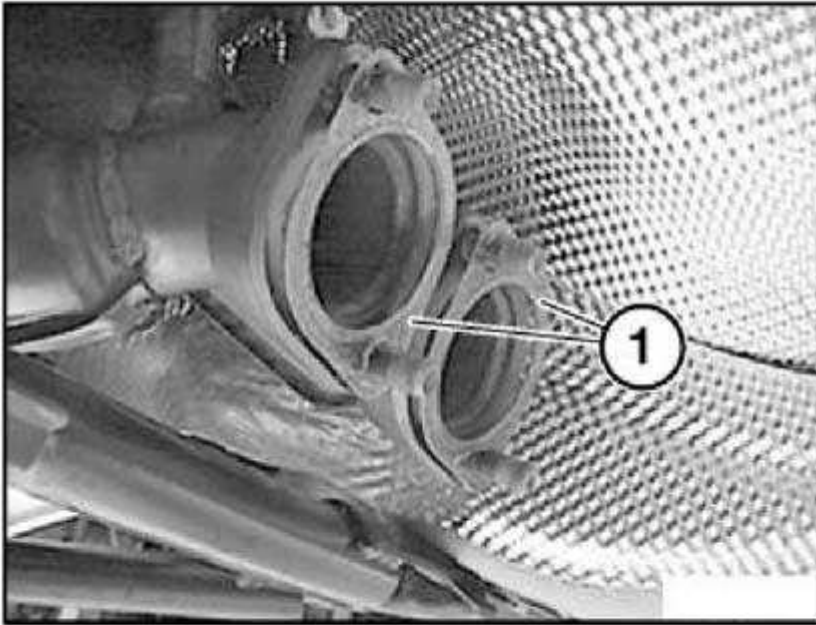
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace self-locking nuts.

Installation:

Replace both seals (1).

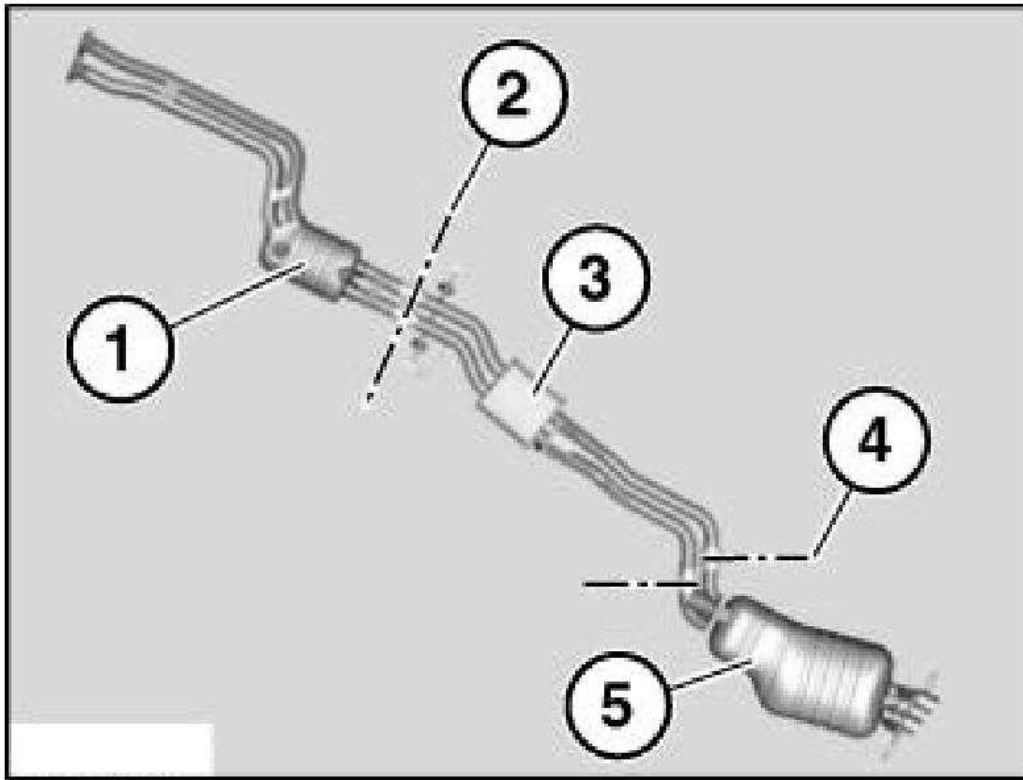


G03310782

Fig. 12: Replacing Seals

Courtesy of BMW OF NORTH AMERICA, INC.

Connect front muffler (1) to center muffler (3).



G03310783

Fig. 13: Connecting Front Muffler To Center Muffler
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Align clamping sleeves so that:

- Nuts point downwards.
- Cutting line is in middle of clamping sleeve.
- There is sufficient spacing to adjoining components.

18 12 045 REPLACING CENTER MUFFLER (M54/N52)

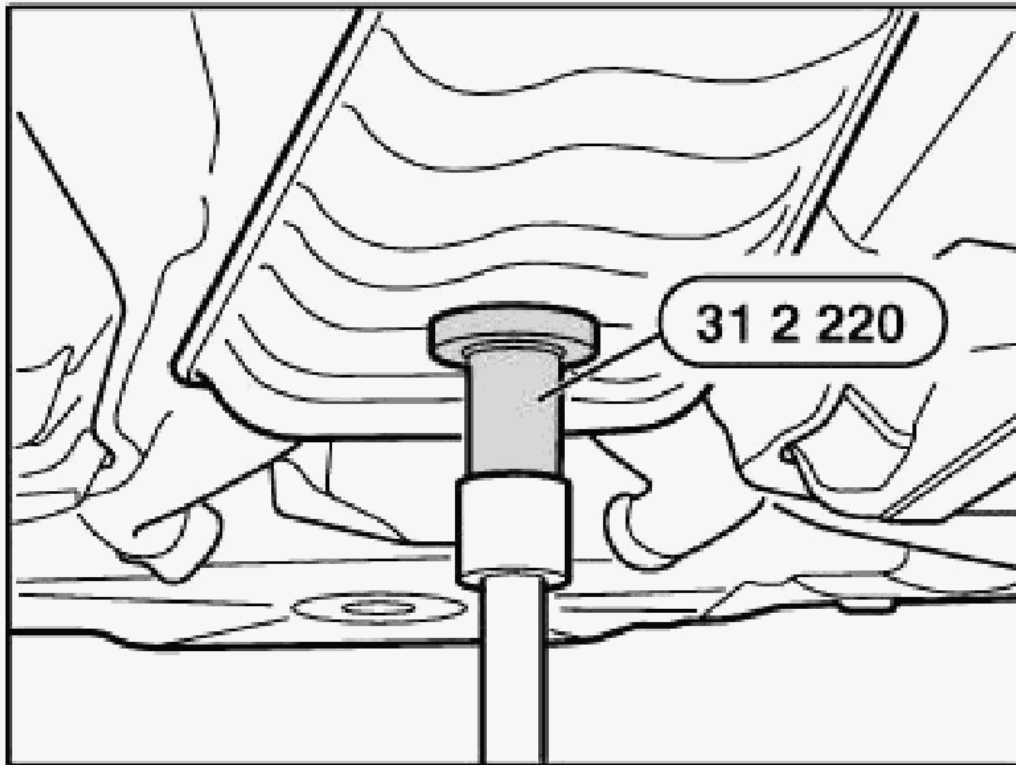
Special tools required:

- 00 2 210
- 31 2 220

WARNING: Scalding hazard!

Only perform these tasks after exhaust system has cooled down.

Support exhaust system with jack and special tool 31 2 220 and secure against falling out.

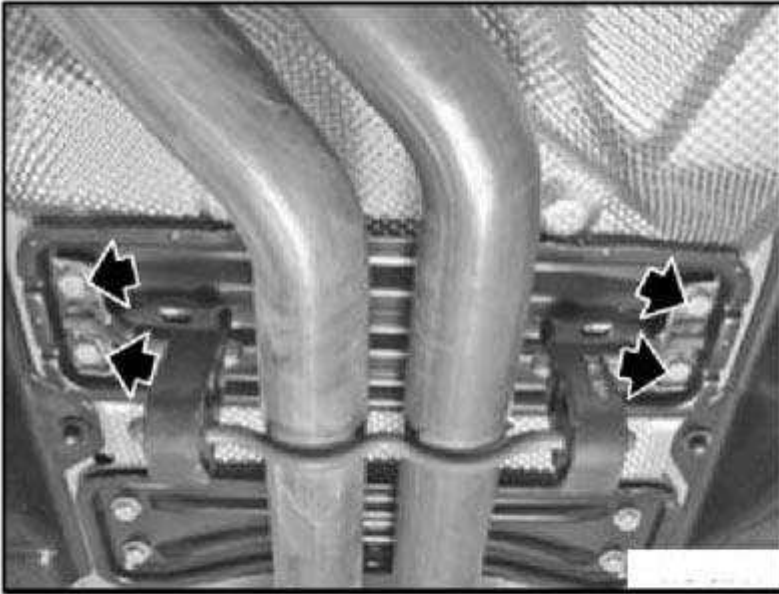


G03310784

Fig. 14: Supporting Exhaust System

Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws.

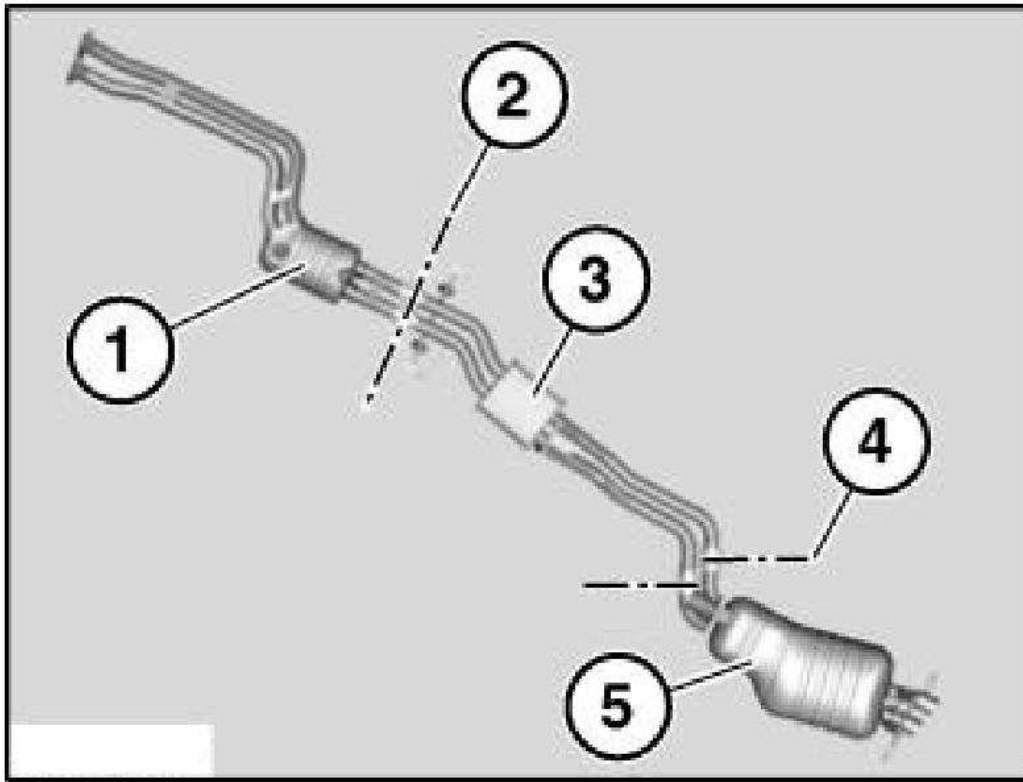


G03310785

Fig. 15: Removing Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Cutting line (2) and (4) between front muffler (1) and rear muffler (5).



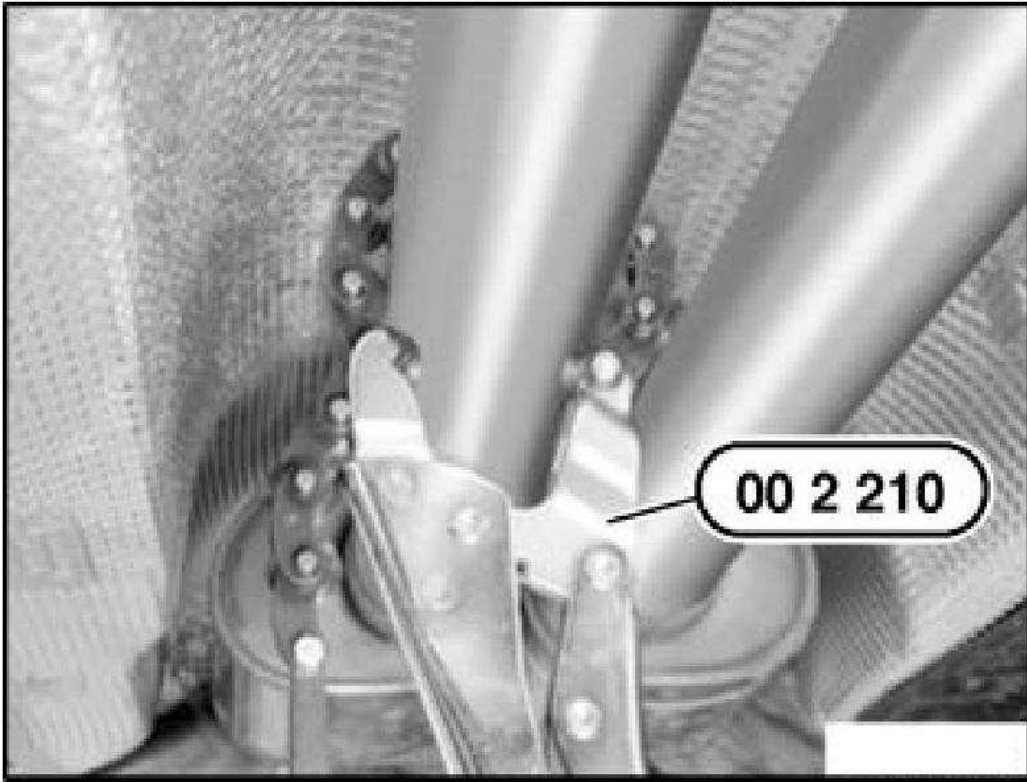
G03310786

Fig. 16: Locating Cutting Line And Between Front Muffler And Rear Muffler
Courtesy of BMW OF NORTH AMERICA, INC.

Determine pipe length on new center muffler (3).

Carry over measurement to faulty center muffler (3) and mark cutting lines.

Cut exhaust pipes with special tool 00 2 210 at marked points and deburr.

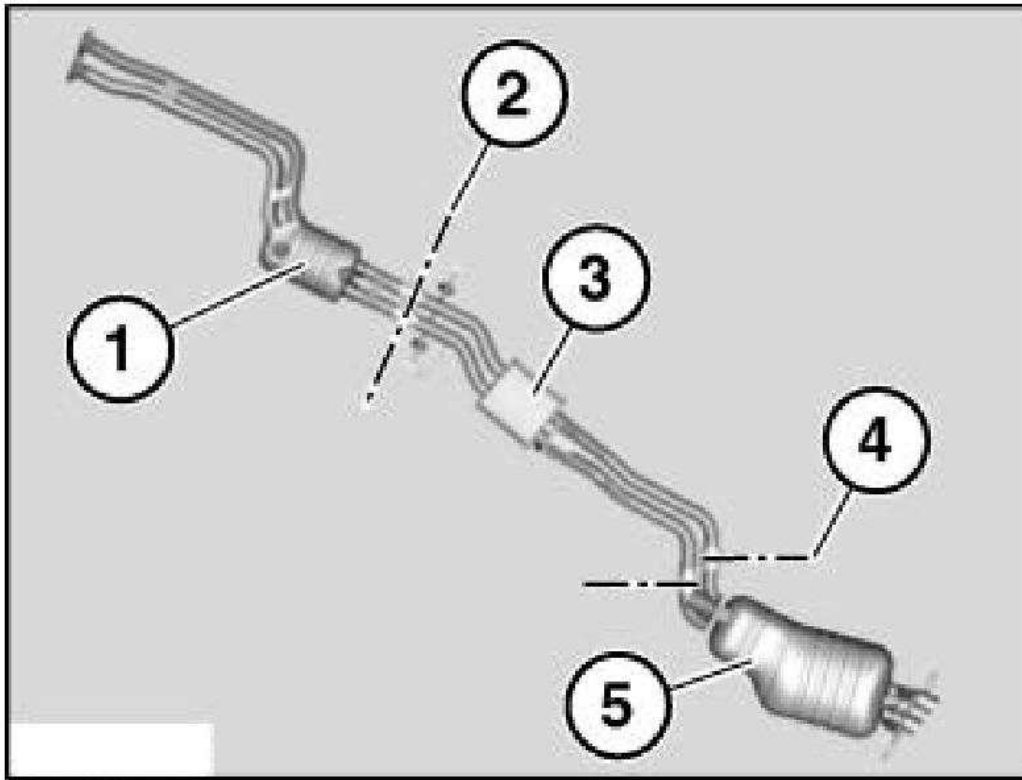


G03310787

Fig. 17: Cutting Exhaust Pipes

Courtesy of BMW OF NORTH AMERICA, INC.

Connect center muffler (3) to front muffler (1) and rear muffler (5).



G03310788

Fig. 18: Connecting Center Muffler To Front Muffler And Rear Muffler
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Align clamping sleeves so that:

- Nuts point downwards.
- Cutting line is in middle of clamping sleeve.
- There is sufficient spacing to adjoining components.

EXHAUST MANIFOLD WITH INTEGRATED CATALYTIC CONVERTER

18 40 050 REMOVING AND INSTALLING/REPLACING FRONT EXHAUST MANIFOLD (M54/N52)

Necessary preliminary tasks:

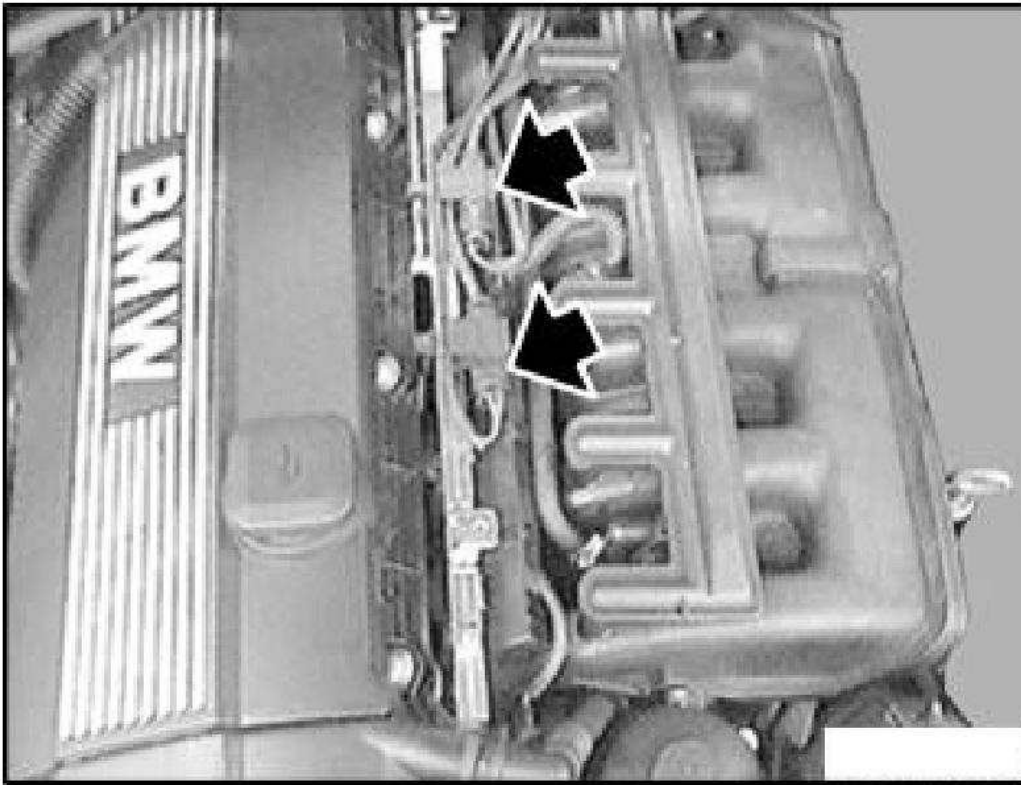
- Secure engine in installation position.

- Remove reinforcement plate
- Remove complete exhaust system, refer to **18 00 020 REMOVING AND INSTALLING COMPLETE EXHAUST SYSTEM**
- Detach grounding cable from body.
- Remove right engine support arm with engine mount
- M54: Remove air pump

NOTE: **The oxygen sensors are in danger of being damaged when the exhaust manifolds are removed and installed.**

Remove front control sensor. Refer to **11 78 511 REPLACING OXYGEN CONTROL SENSOR (CYLINDERS 1-3)**.

Remove cover from fuel injectors.



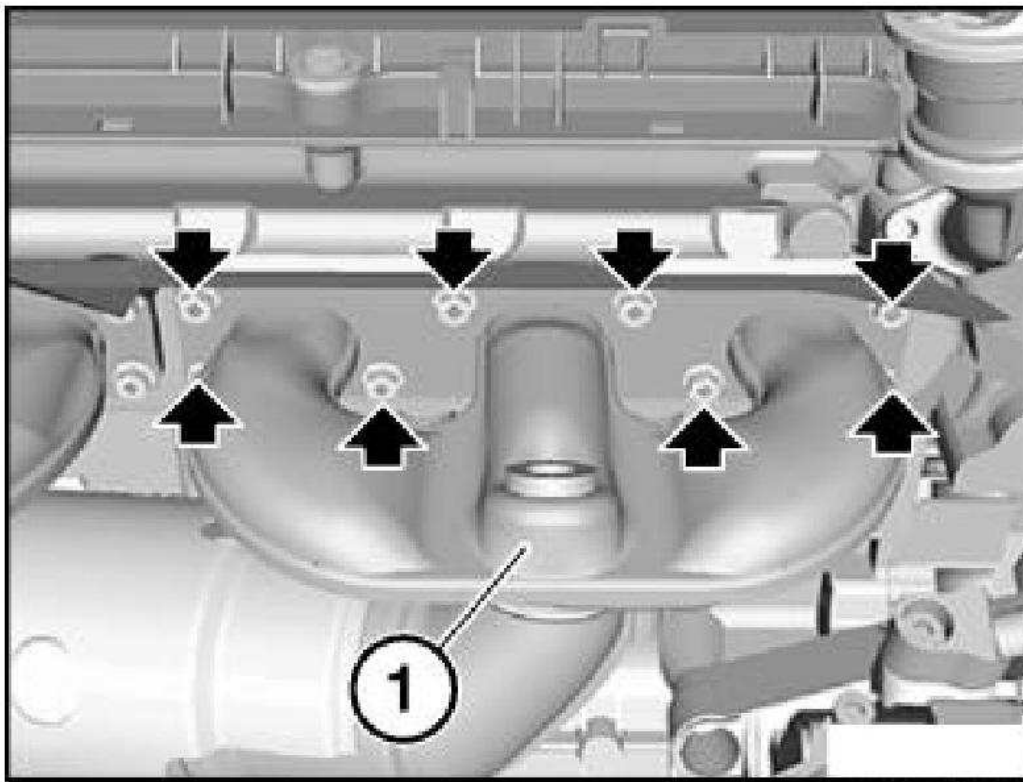
G03310789

Fig. 19: Removing Cover From Fuel Injectors
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Do not mix up monitor sensors for cylinders 1 to 3 and 4 to 6 at plug connection to wiring harness.
Mark plug connections.
Unclip cable from holder. Disconnect plug connection. Unclip cable on rear side of engine from cable guide.

Remove monitor sensor from cylinders 1 to 3. Refer to **11 78 611 REPLACING OXYGEN MONITOR SENSOR (CYLINDERS 1-3)**.

Unscrew nuts.



G03310790

Fig. 20: Removing Exhaust Manifold
Courtesy of BMW OF NORTH AMERICA, INC.

Remove exhaust manifold (1).

Installation:

Clean sealing faces, replace gaskets.

Replace nuts.

Tightening torque 11 62 1AZ. Refer to **ENGINE - TIGHTENING TORQUES** .

18 40 060 REMOVING AND INSTALLING/REPLACING REAR EXHAUST MANIFOLD (M54/N52)

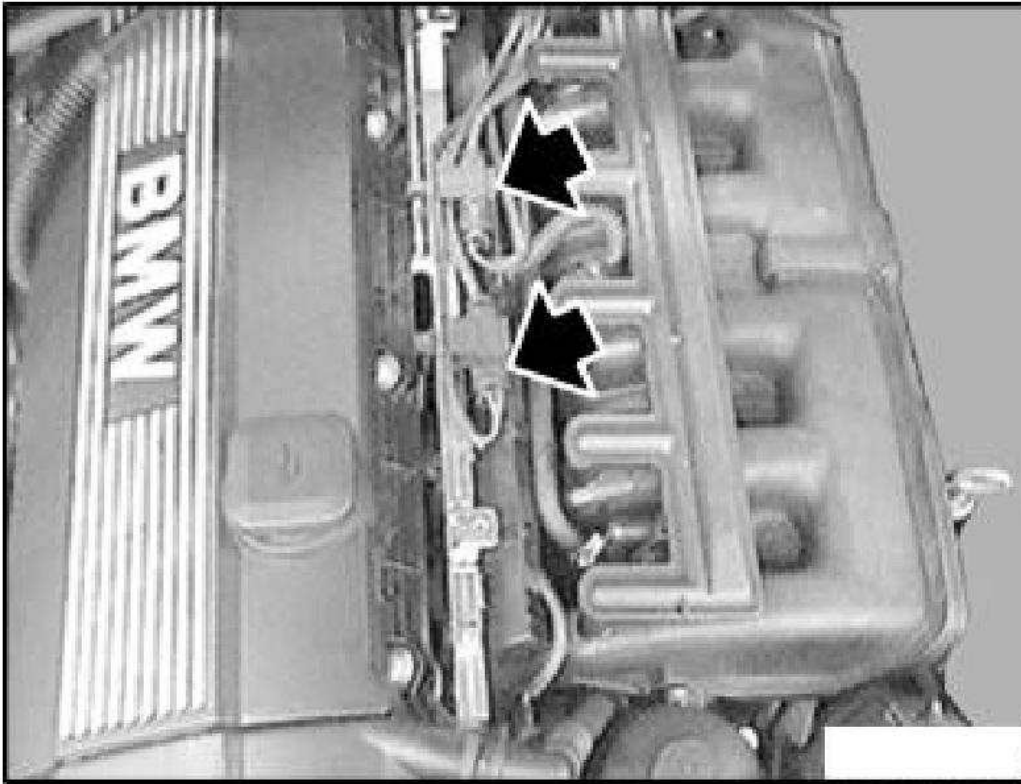
Necessary preliminary tasks:

- Remove reinforcement plate
- Remove complete exhaust system, refer to **18 00 020 REMOVING AND INSTALLING COMPLETE EXHAUST SYSTEM**
- M54: Remove air pump

NOTE: **The oxygen sensors are in danger of being damaged when the exhaust manifolds are removed and installed.**

Remove rear control sensor. Refer to **11 78 512 REPLACING OXYGEN CONTROL SENSOR (CYLINDERS 4-6)** .

Remove cover from fuel injectors.



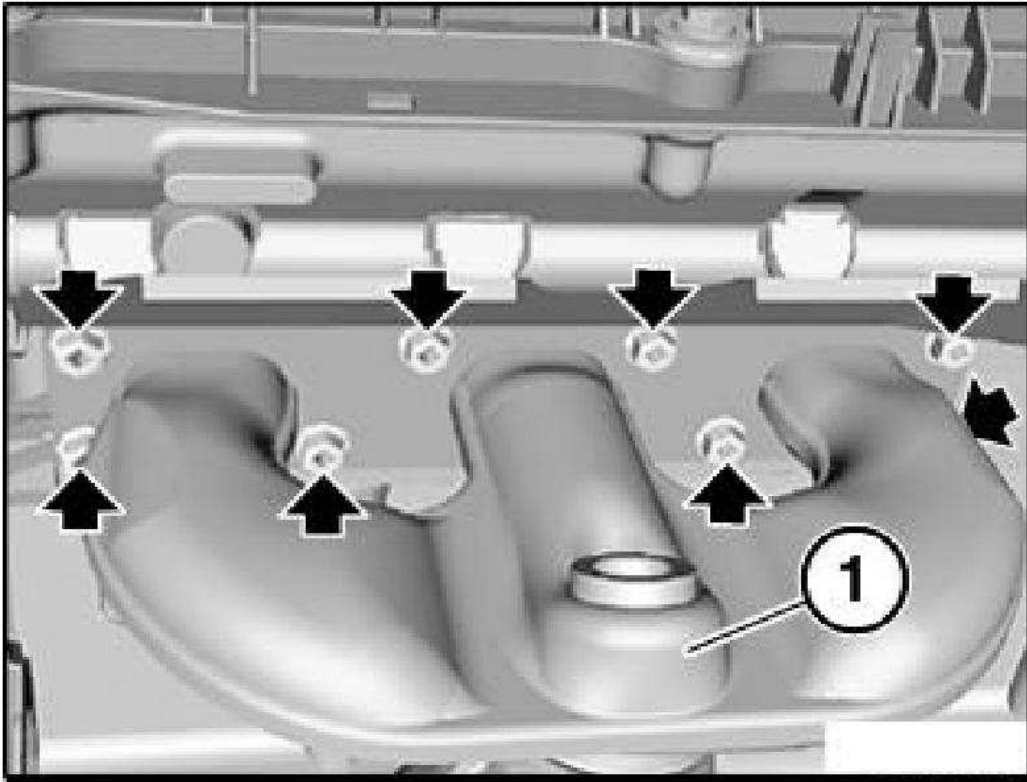
G03310791

Fig. 21: Removing Cover From Fuel Injectors
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Do not mix up monitor sensors for cylinders 1 to 3 and 4 to 6 at plug connection to wiring harness.
Mark plug connections.
Unclip cable from holder. Disconnect plug connection. Unclip cable on rear side of engine from cable guide.

Remove monitor sensor from cylinders 4 to 6. Refer to **11 78 612 REPLACING OXYGEN MONITOR SENSOR (CYLINDERS 4-6)**.

Unscrew nuts.



G03310792

Fig. 22: Removing Exhaust Manifold
Courtesy of BMW OF NORTH AMERICA, INC.

Remove exhaust manifold (1).

Installation:

Clean sealing faces, replace gaskets.

Replace nuts.

Tightening torque, see 11 62 1AZ in **ENGINE - TIGHTENING TORQUES** .

ENGINE

Fuel Supply System - Special Tools - X3

16 FUEL SUPPLY SYSTEM

16 1 020 PIN WRENCH

Minimum set: Mechanical tools

Note: For removing and installing fuel level sensor in fuel tank

Series: E31, E34, E34tou, E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53, R56, RR1, RR2

Storage location: C21

SI number: 1 04 99 (425)

Order number: 16 1 020

Pin wrench

Consisting of:

1 = 16 1 021 Basic wrench

2 = 16 1 022 Attachment (2 x)

Note: Model series: E46, E38, E39, R50, R53

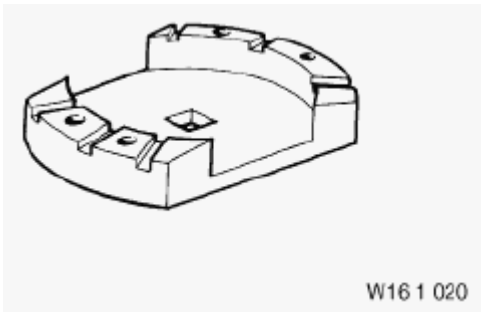


Fig. 1: Pin Wrench (16 1 020)

Courtesy of BMW OF NORTH AMERICA, INC.

16 1 080 HOSE GUIDE

Minimum set: Mechanical tools

Note: For unlocking new fuel tank flap systems with safety lock (incorrect fuelling, diesel/petrol/gasoline)

Series: E46, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53, R56

SI number: 01 16 06 282

Order number: 16 1 080

Hose guide



Fig. 2: Hose Guide (16 1 080)

Courtesy of BMW OF NORTH AMERICA, INC.

16 1 170 TESTER WITH TEST ADAPTER

Note: Leak-testing tank and fuel tank catch

Series: E46, E46/16, E46/2, E46/3, E46/5, E46/C, E60, E61, E63, E64, E65, E66, E67, E70, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53

SI number: 1 10 00 (593)

Order number: 16 1 170

Tester with test adapter

Consisting of:

1 = 16 1 171 Tester

2 = 16 1 172 Test adapter for tank cap

3 = 16 1 173 Test adapter for tank cap

4 = 16 1 174 Test adapter for tank

5 = 16 1 175 Connection hose

6 = 16 1 176 Sealing plug

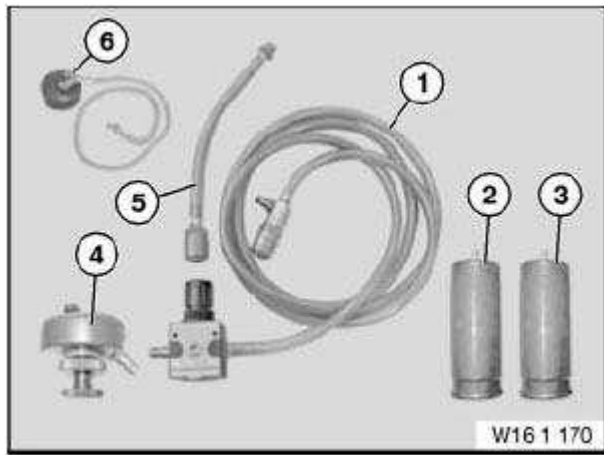


Fig. 3: Tester With Test Adapter (16 1 170)

Courtesy of BMW OF NORTH AMERICA, INC.

ENGINE

Fuel Supply System - Technical Data - X3

11 FUEL TANK WITH MOUNTING

16 11 FUEL TANK AND MOUNTING PARTS E83

TECHNICAL DATA - FUEL TANK AND MOUNTING PARTS E83

Tank volume/reserve	ltr.	67 / 8
Venting: via integrated compensation volume in tank, by carbon canister to intake tract.		

ENGINE

Fuel Supply System - Tightening Torques - X3

11 FUEL TANK WITH MOUNTING

16 11 FUEL TANK AND MOUNTING PARTS

FUEL TANK AND MOUNTING PARTS TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Fuel tank to body (hexagon nut)	E46 / E83	M8	Replace self-locking nuts	19 Nm
	E24	M8		45 Nm
	E30	M8		25 Nm
Tension strap to body (hexagon screw)	E53 / E46 / E85 / E86 / E83	M8		19 Nm
	E24	M8		8 Nm
	E38 / E65 / E66 / E67/E60/E61/ E63 / E64	M8		20 Nm
2AZ Connecting pipe to fuel tank	E30			25 Nm
3AZ Heat shield to fuel tank	E30			8,5 Nm
	E24			1,0 Nm
	E31			3 Nm
4AZ Drain plug to fuel tank	E28 / E30			25 Nm
5AZ Trunk separating wall/retaining bracket to trunk floor	E52	M6		7,8 Nm
6AZ Wheel arch cover to body	E52	M6		3 Nm

12 FUEL TRANSFER, SENSOR FOR GAUGE

16 12 FUEL DELIVERY

FUEL DELIVERY TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Pump assembly to metal-bonded mount	E28 / E30			6,5 Nm
2AZ Holder to fuel pump or fuel reservoir	E28 / E30			6,5 Nm
3AZ Electric connections on fuel pump	E28 / E30			2 Nm
4AZ Electric connections on fuel pump	E28 / E30	M4		1,2 Nm
5AZ Electric connections on fuel pump	E28 / E30	M5		1,6 Nm
6AZ Plastic nut on cover for fuel pipes	E30			2 Nm
7AZ Hose clamps 10-16 mm dia.	E28 / E30			2 Nm

	E65 / E66			1,5 Nm
8AZ Hose clamps 18 mm dia.	E28 / E30			3 Nm
9AZ Hose clamps 37 - 43 mm dia.	E28 / E30			4 Nm
	E52			3 Nm
10AZ Hose clamps 42 - 48 mm dia.	E65 / E66			2 Nm
	E83			4 Nm
11 AZ Fuel filler pipe to body	E46 / E65 / E66 / E67 / E83			4 Nm
	E60 / E61 / E63 / E64	M6		9 Nm
	E85 / E86	M6 8.8		9 Nm
12AZ Feed line to fuel tank	E46 / M56	M14		26±3 Nm
13AZ Vent line from carbon canister to fuel tank	E46 / M56	M24		26±3 Nm
14AZ Fuel tank vent line to fuel filler pipe / purge air line to carbon canister	E46 / M56	M14		26±3 Nm
16AZ Grounding strap, fuel filler pipe to body	E85 / E86	M6 8.8		9 Nm
	E83			8 Nm

13 FUEL VENTILATION

16 13 TANK VENTILATION

TANK VENTILATION TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Fuel vapor venting tank to body	E24			3 Nm
	E30			4,5 Nm
	E39			4,0 Nm
	E38			5,5 Nm
	E53			3,5 Nm
	E65 / E66 / E67			9,0 Nm
2AZ Carbon canister to body	E85 / E86	M8		9 Nm
	E46/E60/E61/ E63 / E64 / E83	M6		9 Nm
3AZ DMTL to holder / carbon canister	E83 / E85 / E86 / E60 / E46 / M56			2 Nm
4AZ Dust filter to holder / carbon canister	E60 / E83 / E46 / M56			2 Nm
	E85 / E86			2 Nm

14 FUEL PUMP

16 14 FUEL PUMP

FUEL PUMP TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Fuel level sensor to suction device	E32			8 Nm
2AZ Sealing ring for fuel tank (service aperture, fuel level sensor, pump unit)				
Plastic sealing ring 26.5 mm high	E34 / E31			40 Nm
Plastic sealing ring 31.5 mm high (new)	E36/E34/E31		First tighten sealing ring by hand 2 turns	55 Nm
Locking ring (metal)	E39 / E52 / E53			35 Nm
	E60 / E61 / E63 / E64 / E65 / E66 / E67			45 ±5 Nm
	E85 / E86,			50 ±10 Nm
	E83			55±5 Nm
3AZ In-tank pump with fill level sensor to tank	E38	M6	Tighten nuts diagonally and evenly.	6,5 Nm
4AZ El. fuel pump control unit to body / holder	E60 / E61 / E63 / E64 / E85 / E86	M6		8 Nm

ENGINE

Fuel System - Operating Fluids

1.0 FUELS FOR GASOLINE ENGINES

Use only unleaded gasoline in vehicles equipped with a catalytic converter.

Fuels containing up to and including 10% of ethanol or other oxygenates with up to 2.8% oxygen by weight, that is, 15% MTBE (methyl tertiary butyl ether) or 3% methanol plus an equivalent amount of co-solvent, will not void the applicable warranties with respect to defects in materials or workmanship.

Although, usage of such alcohol fuel blends may result in driveability, starting, and stalling problems due to reduced volatility and lower energy content of the fuel. Those driveability problems may be especially evident under certain environmental conditions, such as: high or low ambient temperatures and high altitude.

Only specially adapted vehicles (FFV-Flexible Fuel Vehicles) can run on high alcohol fuel blends. BMW, for the various technical and environmental reasons explained below, does not offer FFV models.

Usage of E85, or any other high alcohol content blend (e.g. E30) in BMW vehicles, will cause various driveability complaints (cold start problems, stalling, reduced performance, poor fuel economy, etc.), may cause excessive emissions, and may cause irreversible damage to engine, emission control and fuel delivery systems due to incompatibility of materials with alcohols.

General Notes Regarding E85 Fuel.

E85 fuel contains 85% (by volume) of ethanol and 15% of gasoline. Ethanol can be produced chemically from ethylene or biologically from grains, agricultural wastes, or any organic material containing starch or sugar. In the US, ethanol is mainly produced from corn and is classified as a renewable fuel.

Similar to gasoline, ethanol contains hydrogen and carbon; with additional oxygen molecules build into its chemical chain. This chemical structure makes ethanol's burning process slightly cleaner compared to the gasoline (lower tailpipe emissions).

On the other hand, due to lower carbon content, ethanol provides 27% less energy (for identical volume) than gasoline, resulting in the reduced fuel economy of E85 vehicles (approximately 22% higher consumption). Increased fuel consumption requires the appropriately enlarged fuel tank capacities (usually 30% increase), and the specific DME calibrations for the E85 lower Stoichiometric air/fuel ratio (10 compared to 14.7 for gasoline engines).

E85 fuel volatility is typically lower than gasoline (RVP 6-10 psi, compared to 8-15 psi for gasoline). Lower fuel volatility will reduce vehicle evaporative emissions, but it may cause cold starting problems especially with lower ambient temperatures.

Under certain environmental conditions, mainly lower ambient temperatures, ethanol separates from gasoline/alcohol mixture and absorbs water. The ethanol absorbed water molecules are heavier than gasoline or ethanol, they remain at the bottom of fuel tank and when introduced into combustion process they tend to form

an extremely lean mixture resulting in misfire, rough idle and cold starting problems.

Certain materials, commonly used with gasoline are totally incompatible with alcohols. When these materials come in contact with ethanol, they may dissolve in the fuel, which may damage engine components and may result in poor vehicle driveability.

Some metals (e.g. zinc, brass, lead, aluminum) become degraded by long exposure to ethanol fuel blends. Also, some nonmetallic materials used in automotive industry such as: natural rubber, polyurethane, cork gasket material, leather, polyvinyl chloride (PVC), polyamides, methyl-methacrylate plastics, and certain thermo & thermoset plastics degrade when in contact with fuel ethanol.

In order to safely and effectively operate a motor vehicle running on E85, the vehicle must be compatible with alcohol use. Some manufacturers have developed vehicles called FFV (Flexible Fuel Vehicle) that can operate on any blend of ethanol and gasoline (from 0% ethanol and 100% gasoline, up to 85% ethanol and 15% gasoline). Ethanol FFVs are similar to gasoline vehicles, with main differences in materials used in fuel management and delivery systems, and DME control module calibrations. In some cases, also E85 vehicles require special lubricating oils.

Aftermarket conversions of gasoline-powered vehicles to ethanol-fueled vehicles, although possible, are not recommended due to internal materials and DME software incompatibility, as well, as the high costs of conversion.

TOP TIER DETERGENT GASOLINE

Deposit-control additives have been required by the EPA in all gasoline from 1995, however, since the introduction of the lowest additive concentration (LAC) most gasoline manufacturers have actually reduced the concentration level of detergent additives by up to 50%.

Low content of cleaning additives results in an excessive accumulation of deposits on fuel injectors, the intake valves, the exhaust manifold or inside the combustion chamber. Due to deposits build-up, customers may experience various driveability problems (e.g. cold start problems, rough idle), increased emissions with Service Engine Soon light illumination, reduced engine performance and poor fuel economy.

In order to increase the level of detergent additives in gasoline, the TOP TIER Detergent Gasoline requirements were approved by four automotive companies (BMW, GM, Honda and Toyota).

Usage of the TOP TIER Gasoline will help keep engines cleaner, and will reduce deposits-related concerns.

A number of gasoline retailers have already met the TOP TIER Detergent Gasoline requirements and are offering this product in all octane grades in all of their respective marketing areas. The current TOP TIER Gasoline retailers are: QuickTrip®, ChevronTexaco®; ConocoPhillips®; 76®; Shell®; Entec Stations®; MFA Oil Company®; Kwik Trip®/Kwik Star®; The Somerset Refinery, Inc.®; Aloha Petroleum®; Jiffy Mart®; Mahalo®; Trip-Par Oil Company®. All gasoline outlets carrying the brand of the approved retailer must conform to TOP TIER requirements on products advertised as such.

BMW recommends using TOP TIER Detergent Gasoline of minimum octane rating of AKI 91 and with alcohol content of less than 10% by volume (or any other oxygenates with up to 2.8% of oxygen by weight). Only the exclusive usage of TOP TIER Gasoline provides the full benefit of reducing deposits build-up.

ALCOHOL DETECTION PROCEDURE

Fuel Blends containing a high percentage (10% and above) of alcohol, mainly ethanol, are becoming more commercially available. Usage of E85, or any other high alcohol content blend (e.g. E30) in BMW vehicles, will cause various driveability complaints (cold start problems, stalling, reduced performance, poor fuel economy, etc.), may cause excessive emissions, and may cause irreversible damage to engine, emission control and fuel delivery systems due to incompatibility of materials with alcohols.

In order to correctly diagnose various driveability complaints caused by fuel blends with a high level of ethanol content, BMW is providing you with an alcohol detection test tool.

Distribution of the following tool will be through the Automatic Tool Shipment Program. Additional tools may be purchased through your PDC. All prices on this bulletin are introductory prices and are only valid during the Automatic Tool Shipment.

Procedure

Safety Precautions:

Gasoline is highly flammable; observe normal precautions for working with flammable liquids. Perform all tests away from any source of ignition. A class B fire extinguisher must be available. Wear protective eye protection with side shields and Nitrile rubber gloves for handling syringe. Please adhere to any applicable OSHA regulations when handling Gasoline. Dispose of the mixture according to local, state and federal regulations.

Fill a clean container with gasoline drawn from the fuel system of the affected vehicle then fill another container with water. Only a small amount of fuel is needed to perform the test (5 ounces of each fluid).

Slowly draw 3cc of water into the syringe. Note: To remove air, draw at least 5cc to 6cc of water, invert the syringe and squirt the water out until the top rim of the rubber plunger is at the 3cc mark.

Slowly draw gasoline into the syringe until the fluid reaches the 12cc mark. Place your finger over the tip of the syringe, vigorously shake the syringe for one minute. Relieve built-up pressure by occasionally removing your finger.

Place the syringe on a flat surface with the nozzle pointing up, allow the syringe to stand for one minute.

If alcohol is present in the fuel, it will separate from the gasoline and dissolve in the water.

Empty the syringe and rinse thoroughly with water, allow drying and apply a silicone lubricant to the rubber plunger before storing.

ALCOHOL PERCENTAGE REFERENCE

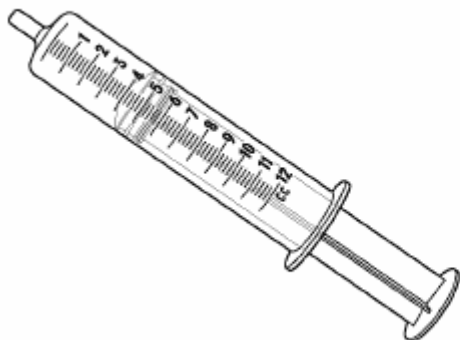
Boundary Line	% Alcohol	Boundary Line	% Alcohol
9.0cc	0%	5.0cc	45%
8.6cc	5%	4.5cc	55%
8.1cc	10%	4.1cc	60%
7.7cc	15%	3.6cc	65%

7.2cc	20%	3.2cc	70%
6.8cc	25%	2.7cc	75%
6.3cc	30%	2.3cc	80%
5.9cc	35%	1.8cc	85%
5.4cc	40%	1.4cc	90%

WARRANTY INFORMATION

Components damage/malfunctions, or any driveability problems caused by use of fuels containing more than 10% ethanol (or other oxygenates with more than 2.8% oxygen by weight) will not be covered under BMW warranties with respect to defects in materials or workmanship. Please document the results found on the vehicle repair order whenever performing this test

Alcohol Detection Test Tool
Order PN 83 30 0 420 667



S13 06 U01

Fig. 1: Identifying Alcohol Detection Test Tool
Courtesy of BMW OF NORTH AMERICA, INC.

ANTI-KNOCK PROPERTIES

The anti-knock value is the quality rating for gasoline and is a requirement for controlled combustion. Anti-knock value is expressed with an octane number. A higher number indicates better anti-knock properties of a gasoline. Internationally approved methods are used to determine the Research Octane Number (RON) and the Motor Octane Number (MON). In the United States the Anti-Knock Index (AKI) is displayed at the gas pumps.

$$AKI = \frac{RON + MON}{2}$$

Fig. 2: Identifying Formula
Courtesy of BMW OF NORTH AMERICA, INC.

BOILING RANGE AND VAPOR PRESSURE

Gasolines must be highly volatile. The boiling range and vapor pressure values are used for evaluation. Gasolines do not have a boiling "point", but rather a boiling "line", since they are produced from a mixture of various hydrocarbon components.

The boiling line (boiling range) and therefore vapor pressure have influence on, for example,

- vapor lock
- starting behavior
- evaporation loss
- transition and driving behavior
- engine oil dilution
- perfect combustion

The boiling range is different for summer and winter gasolines. The vapor pressure test is another means of determining the behavior of a gasoline.

SPECIFIC GRAVITY

The specific gravity is determined by gasoline components. The volume changes with the temperature. Due to the different compositions there are different values for premium grade and regular grade gasolines.

CALORIFIC VALUE

The calorific value expresses the power content of a gasoline. The calorific value of a combustible fuel/air mixture is of prime importance for the power output of engines.

PURITY, COMBUSTION DEPOSITS

Gasolines must be free of contamination. Pumps, jets, injectors, valves and lines must not be clogged or plugged up. Residue and deposits in the intake system and combustion chamber will impair engine operation. The solid residue from evaporation of gasoline provides information on the degree of contamination.

SULFUR CONTENT

The sulfur content of all gasolines should be as low as possible. In this manner there will be less sulfuric acids or sulfur acids in the combustion residue, which would lead to corrosion and sulfuric emissions on an engine running without reaching operating temperature.

1.1 MINIMUM OCTANE AND AKI RATINGS FOR GASOLINE ENGINES

Up to 2005 model year

MINIMUM OCTANE AND AKI RATINGS FOR GASOLINE ENGINES

	Leaded Gasoline Premium Grade	Regular Grade
RON (Research Octane No.)		at least 91.0
MON (Motor Octane No.)		at least 82.7

AKI*		at least 93.0	at least 87.0
		Unleaded Gasoline	
	Premium Grade	Mid-Range	Grade Regular Grade
RON	at least 98.0	at least 95.0	at least 91.0
MON	at least 88.0	at least 85.0	at least 82.5
AKI*	at least 93.0	at least 90.0	at least 87.0

*Anti-Knock Index $AKI = \frac{RON + MON}{2}$

Fig. 3: Identifying Formula

Courtesy of BMW OF NORTH AMERICA, INC.

1.2 SUMMARY OF FUEL GRADE REQUIREMENTS

SUMMARY OF FUEL GRADE REQUIREMENTS

Engine	Vehicle	Model	Model Year	Unleaded Gasoline	
				Regular (AKI at least 87.0)	Premium (AKI at least 93.0)
M10	E30	318i	'84-'85	X	
M20	E30	25e/es	'85-'88	X	
	E30	325i/iX	thru '91	X	
	E30	325iC	thru '93	X	
	E28	528e	thru '88	X	
	E34	525i	'89-'90	X	
M30	E28	535i	'85-'88	X	
	E34	535i	thru '93	X	
	E24	635CSi, L6	thru '89	X	
	E23	735i/iL, L7	thru '87	X	
	E32	735i/iL	thru '92	X	
M42	E30	318i/is/iC	'91-'92		X
	E36	318i/is/iC/ti	thru '95		X
M44	E36	318i, Z3	'96-'98		X
	E36	318is/iC	'96-'97		X
	E36	318ti	'96-'99		X
M50	E36	325i/is	'92		X
	E34	525i/iT	'91-'92		X
M50TU	E36	325i/is	'93-'95		X
	E36	325iC	'94-'95		X
	E34	525i/iT	'93-'95		X
M52	E36	323is/iC	'98-'99		X
	E36	328i	'96-'98		X
	E36	328is/iC	'96-'99		X

	E36	Z3	'97-'98	X
	E39	528i	'97-'98	X
M52TU	E46	323i, 328i	'99-'00	X
	E46	323Ci, 328Ci	'00	X
	E36	Z3 2.3/2.8	'99-'00	X
	E39	528i/iT	'99-'00	X
N52	E60	525i, 530i	'05-present	X
	E61	525xiT, 530xiT	'05-present	X
	E90	325i, 330i	'05-present	X
M54	E36	Z3	'01-'03	X
	E46	325i/Ci/CiCiT	'01-present	X
	E46	325xi/xiT	'01-present	X
	E46	330i/Ci/CiC	'01-present	X
	E46	330xi	'01-present	X
	E39	525i/iT	'01-present	X
	E39	530i	'01-present	X
	E53	X5 3.0i	'01-present	X
	E60	525i, 530i	'03-present	X
	E83	X3	'04-present	X
	E85	Z4	'03-present	X
M60	E34	530i/iT, 540i	'94-'95	X
	E32	740i/iL	'93-'94	X
	E38	740i/iL	'95	X
	E31	840Ci	'94-'95	X
M62	E39	540i	'97-'03	X
	E39	540iT	'99-'03	X
	E38	740i/iL	'96-'01	X
	E31	840Ci	'96-'97	X
	E53	X5	'00-'03	X
N62	E53	X5	'04-'05	X
	E60	545i	'03-'05	X
	E63	645Ci	'04-'05	X
	E64	645CiC	'04-'05	X
	E65	745i	'02-'05	X
	E66	745Li	'02-'05	X
N62TU	E53	X5	'05-present	X
	E60	550i	'03-present	X
	E63	650Ci	'04-present	X
	E65	750i	'05-present	X
	E66	750Li	'05-present	X
M70	E32	750iL	'88-'94	X
	E31	850i/Ci	'91-'94	X
M73	E38	750iL	'95-'01	X

	E31	850Ci	'95-'97	X
N73	E66	760Li	'04-present	X
S14	E30	M3	'88-'91	X
S38	E24	M6	'87-'88	X
	E28	M5	'88	X
	E34	M5	'91-'93	X
S50	E36	M3	'95	X
S52	E36	M3	'96-'99	X
	E36	MZ3	'98-'00	X
S54	E36	MZ3	'01-'02	X
	E46	M3	'01-'02	X
S62	E39	M5	'00-'03	X
	E52	Z8	'00-present	X
S70	E31	850CSi	'94-'95	X

2.0 FUEL SYSTEM CLEANER PLUS

Recent field experiences have shown a significant increase in various driveability complaints due to excessive carbon deposits in engine's combustion chambers, on the intake valves and fuel injectors.

The overall rise in carbon deposits accumulation is generally attributed to poor gasoline quality, namely, low level of cleaning additives and fuel contamination.

TECHNICAL BACKGROUND

Combustion chamber deposit formation is a by-product of the gasoline burning process. Fuel injector and intake valve deposits may become less troublesome with the recently introduced Top Tier Detergent Gasoline deposit control standards, which are exceeding the detergent requirements imposed by the EPA since 1995.

However, vehicles that do not exclusively use a Top Tier Detergent Gasoline, or are regularly driven in severe service conditions, such as stop-and-go traffic, high ambient temperatures, and high altitude can experience performance problems caused by intake system and combustion chamber deposits.

The most common customer complaints may include:

FUEL INJECTORS

Deposits at the injector's tip can impact fuel flow, upsetting the air/fuel mixture ratio.

Symptoms: Hesitation or stumble during acceleration, even loss of power. Poor fuel efficiency. Increased emissions of HC and CO. "Service Engine Soon" light illumination due to intermittent misfire faults, or lean mixture adaptation values

INTAKE VALVES:

Deposits at the valves and on the intake manifold ports can absorb fuel during the warm-up phase, leaning out

the air/fuel mixture ratio. Carbon build-up may disturb mixture flow at low throttle conditions/idle speeds.

Symptoms: Poor driveability, loss of power, unstable/rough idle, increased emissions of HC, CO and NOx. "Service Engine Soon" light illumination due to intermittent misfire faults.

COMBUSTION CHAMBER:

Combustion Chamber Deposit Interference, or CCDI, occurs when there is a contact between carbon deposits on the piston crown and cylinder head. The noise can be confused or misdiagnosed as ping, knock or other noises that could indicate a mechanical failure. CCDI occurs first as a cold start noise that can fade as the engine warms to operating temperature. The noise will reoccur at the next cold start. As deposits build, there is an increase in compression temperature that may cause pre-ignition detonations.

Symptoms: Knocking, pinging, run-on, poor acceleration, octane requirement increase, increased emissions of NOx, engine idle speed surges.

Depending on the manufacturer, fuels may contain various additives such as: oxidation and corrosion inhibitors, metal deactivators, emulsifiers, anti-icing agents & dyes, plus they are required to include some form of an intake system deposit control package. Unfortunately, not all fuels are created equal, and some additive packages are not effective enough to maintain integrity of the intake systems in high performance engines, or engines operating in severe environmental conditions. Even worse, the intake system deposit control additives in some fuels may actually contribute to the combustion chamber deposits accumulation, and to the problems associated with those deposits: knock, run-on and increased emissions of oxides of nitrogen.

RECOMMENDATION

BMW recommends using TOP TIER Detergent Gasoline of minimum octane rating of AKI 91 and with alcohol content of less than 10% by volume (or any other oxygenates with up to 2.8% of oxygen by weight). Only the exclusive usage of TOP TIER Detergent Gasoline provides the full benefit of reducing deposits formation.

If the TOP TIER Detergent Gasoline is unavailable, we recommend BMW Group Fuel System Cleaner Plus (PN 82 14 0 413 341) be added to the gas tank. For optimum cleaning and deposits control, add a 20 fl. oz. bottle every 3,000 miles when refueling.

Regular use of BMW Group Fuel System Cleaner Plus can help address carbon deposits related symptoms listed above. By removing these deposits, an engine may experience restored power, performance and fuel efficiency, a smoother idle running, lower emissions, and reduced octane requirement.

BMW Group Fuel System Cleaner Plus uses polyether amine TECHRON® based technology developed and patented by Chevron. BMW Group Fuel System Cleaner Plus has proven to clean up deposits in fuel injectors, ports & intake valves and reduces the harmful effects of combustion chamber deposits. It helps restore performance lost due to deposit buildup.

Chevron and BMW have run an extensive "no harm" tests with polyether amine technology. When used as directed, it will not harm catalytic converters, oxygen sensors, or any other mechanical components of the engine, or fuel delivery system.

The effectiveness of the additive depends on its presence in the gasoline in large concentrations for short

periods of time. One treatment is usually sufficient, but a second treatment (one 20 oz bottle per each, consecutive full tank of gas) may give additional benefits. To keep your fuel intake system clean, we recommend usage at every 3000 miles.

Additionally, vehicle's fuel sending units equipped with silver plated resistor card/contacts are especially vulnerable to attacks by elemental sulfur and/or hydrogen sulfide found in fuels. Adding BMW Group Fuel System Cleaner Plus immediately upon noticing erratic fuel gauge behavior may, in many cases, restore proper performance due to the additive's ability to remove the harmful sulfur compounds from the sending unit's contact surface. Additionally, BMW Group Fuel System Cleaner Plus can help protect the fuel gauge from future malfunctioning by coating all metal surfaces of the fuel system.

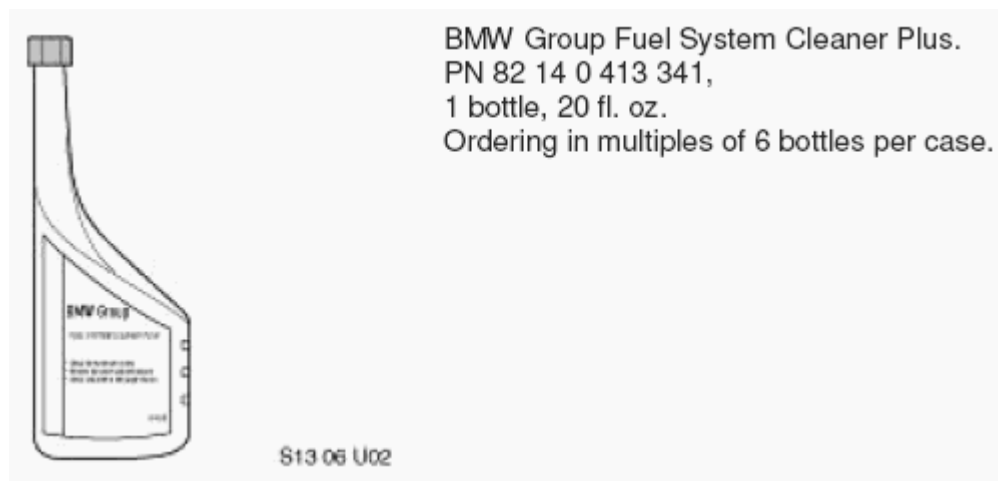


Fig. 4: Identifying BMW Group Fuel System Cleaner Plus
Courtesy of BMW OF NORTH AMERICA, INC.

WARRANTY INFORMATION

Because carbon deposit build-up is related to fuel quality, it cannot be considered as a defect in vehicle's materials or workmanship. Consequently, usage of BMW Group Fuel System Cleaner Plus is not covered under the terms of the BMW New Vehicle Limited Warranty or maintenance plan.

ENGINE

Fuel System - Repair Instructions - X3

00 FUEL PICK-UP, CLEANING SYSTEM

16 00 GENERAL FUNCTION DESCRIPTION FOR FUEL SUPPLY SYSTEMS

Fuel supply systems, spark-ignition engines

Fuel system

The electric fuel pump in the fuel tank generates the pressure in the fuel system which is set by the pressure regulator to a specific level.

Tank venting system

The tank venting system is an enclosed system which is vented via a carbon canister. The carbon is incorporated in the carbon canister as granulate. The large surface of the carbon stores the fuel vapors which occur in the fuel tank. The carbon canister must be regenerated on a regular basis so as to be able to continue storing fuel vapors. Regeneration is performed by way of purging with fresh air via the intake manifold. This process is controlled by the engine control unit.

Fuel supply systems, diesel engines

Fuel system

The electric fuel pump in the fuel tank supplies the engine with fuel. Two types of high-pressure pump are used for cylinder injection.

1. The distributor injection pump supplies each cylinder directly with fuel via the corresponding injection nozzle.
2. The high-pressure pump for the common rail systems generates in the fuel rail the necessary pressure for all the injection nozzles.

In common rail systems, a further pump (inline pump, M57/gear pump, M67) is connected between the high-pressure pump and the electric fuel pump. This pump supports the fuel pump in the fuel tank in the event of a high fuel demand.

Tank venting system

Diesel fuel is non-volatile and therefore a carbon canister is not required. The fuel tank is vented directly to atmosphere.

16 00 ... FUEL SUPPLY SYSTEM (PETROL/GASOLINE)

1. **General**

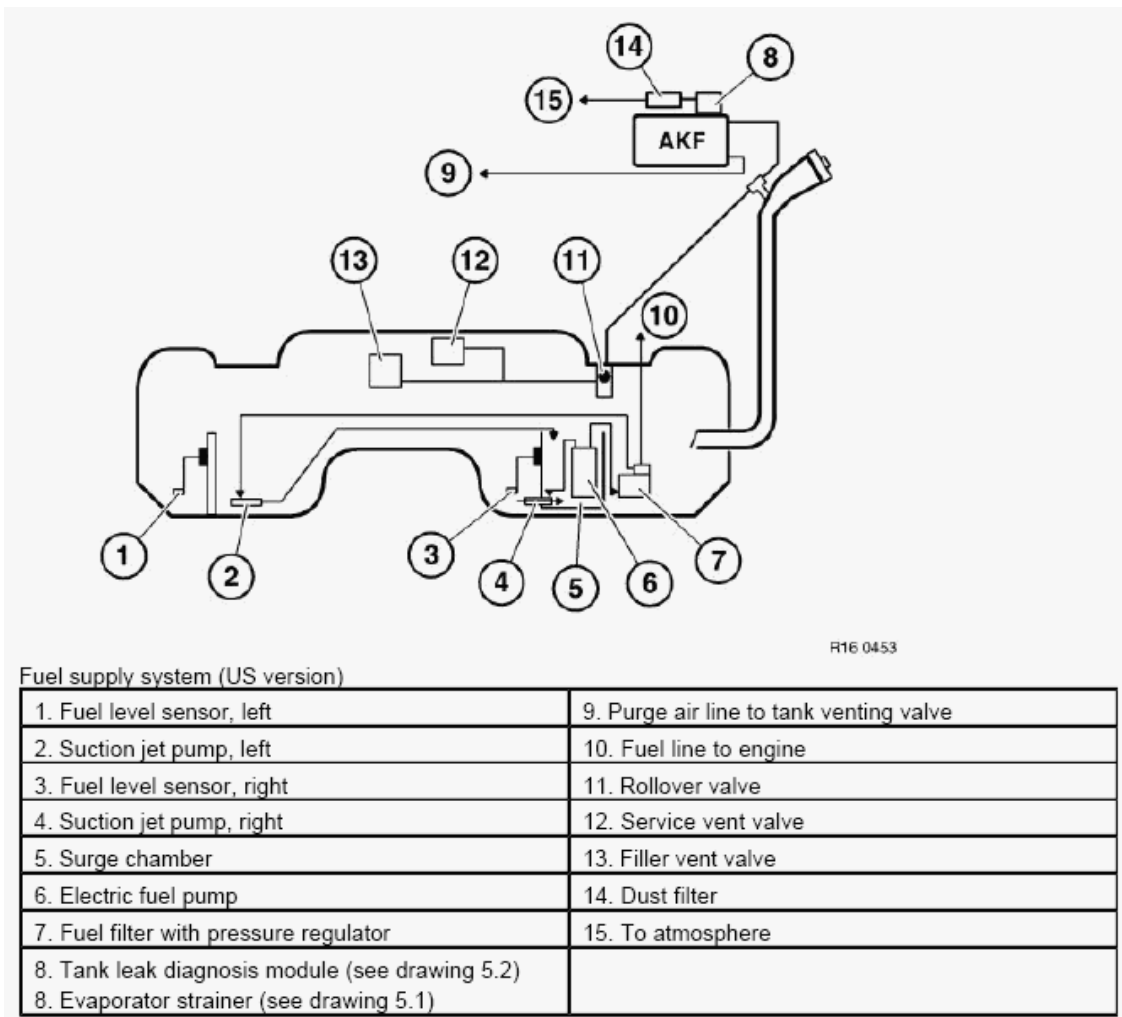


Fig. 2: Identifying Fuel Supply System Components (US Version)
 Courtesy of BMW OF NORTH AMERICA, INC.

3. Function description (see also drawing)

Fuel system

The saddle-shaped fuel tank contains the surge chamber with integrated electric fuel pump on its right side.

The surge chamber ensures that the fuel pump is properly supplied in all vehicle operating states.

The fuel is pumped from the right side of the fuel tank into the surge chamber via the suction jet pump integrated in the surge chamber.

The suction jet pump in the left fuel tank half pumps the fuel through the tank expansion line to the right side of the fuel tank.

The suction jet pump is operated via the fuel feed line.

Return line, pressure regulator and fuel filter are located in the tank.

Fuel supply to engine:

The fuel is routed from the electric fuel pump via the fuel feed line and the fuel filter/pressure regulator unit to the fuel rail.

Pressure regulator and fuel filter are incorporated in a single unit in the tank. There is thus no need for a fuel return line.

The fuel passes through the pressure regulator into the left side of the fuel tank and thereby drives a suction jet pump. This pump repumps the fuel from the left side of the tank to the right side.

The fuel rail is return-free.

Tank venting system (US version):

The fuel tank is vented during refuelling via the refuelling vent line.

Because of its large cross-section, the refuelling vent line directs the displaced volume (fuel vapors) at high speed through the expansion volume to the carbon canister.

The activated carbon retains the fuel contained in the fuel vapors. The cleaned air is discharged to atmosphere via the evaporation line, the tank leak diagnosis module and the dust filter.

During driving, the system tank is vented in the same way via the vent line.

The condensed constituents of the fuel vapors remain in the tank because the tank has an integrated compensating volume.

The refuelling shutoff valve in the fuel tank is closed by the rising fuel if the fuel tank is overfilled. The ventilation function is maintained by a second float valve.

All three valves are designed as rollover valves. This prevents fuel from escaping from the fuel tank in extreme vehicle positions (overturning, inclined position).

The carbon canister is regenerated by purging with fresh air.

The DME control unit opens the tank vent valve. Thus the vacuum pressure of the engine intake manifold is applied at the purge air line. The carbon canister is purged in this way. The fresh air needed for this purpose is supplied via the tank leak diagnosis module and the dust filter. The fuel constituents bound by the activated carbon are flushed out by the supplied air and directed via the purge line to the engine for combustion.

This operation is only possible while the engine is running.

Tank venting system (worldwide):

Refer to Tank venting system (US version) with following differences:

1. Carbon canister has a smaller capacity.
2. No tank leak diagnosis module or dust filter.

Leak diagnosis for tank venting system (US version):

The tank leak diagnosis module (see drawing 5.2) serves to diagnose leakages for the tank venting system within the on - board diagnosis laid down by legislation.

The tank venting system is pressurized and the pressure loss is detected in the event of a leak.

The tank leak diagnosis module is activated by the DME control unit and detects the pressure loss by way of the power consumption of the integrated pump. The air required for this purpose is supplied via the dust filter.

The pressure test line establishes the connection between fuel tank and fuel filler neck. This enables a leak to be detected in the fuel filler pipe - fuel tank cap area.

Determining fill level in fuel tank:

The fuel level is measured by means of lever-type sensors on both sides of the fuel tank. The combination of the determined ohm values from the right and left lever-type sensors produces the actual level in the fuel tank.

4. Service data, fuel system

Fuel pump operating pressure.

16 00 005 DRAINING AND FILLING FUEL TANK

Special tools required:

- 16 1 020
- 16 1 080

IMPORTANT: Observe country-specific safety regulations.

Ensure adequate ventilation in the place of work!

Connect the exhaust and extraction systems to the exhaust tailpipe.

The electric fuel pump must not operate without fuel! After completing repairs but before starting the engine for the first time, fill the fuel tank with min. 5 l fuel through the fuel filler pipe.

Do not damage non-return flap when pulling out extraction hose.

Diesel vehicles:

Before starting the engine for the first time, if the tank has been run dry or drawn off, fill with diesel fuel and turn on ignition for approx. 1 minute. The fuel circuit is thus filled and vented, which results in the engine firing more quickly.

Drawing off fuel:

Start engine and allow to run.

The electric fuel pump runs.

In this way, the fuel is repumped through the suction jet pump from the left to the right side of the fuel tank.

NOTE: Fuel can be drawn out of left and right sides of tank through filler neck, leaving only a small residue. The residual quantity is drawn off through the service opening (on right/left).

Insert special tool 16 1 080 into filler neck.

Special tool 16 1 080 has two different diameters for petrol/gasoline and diesel vehicles!

Slide extraction hose of extractor unit through special tool 16 1 080 into the fuel filler pipe, turning in the process if necessary.

Insertion length of extraction hose: 120-130 cm.

Draw off fuel as much as possible with extractor unit.

Follow drawing off of fuel on fuel gauge in instrument cluster.

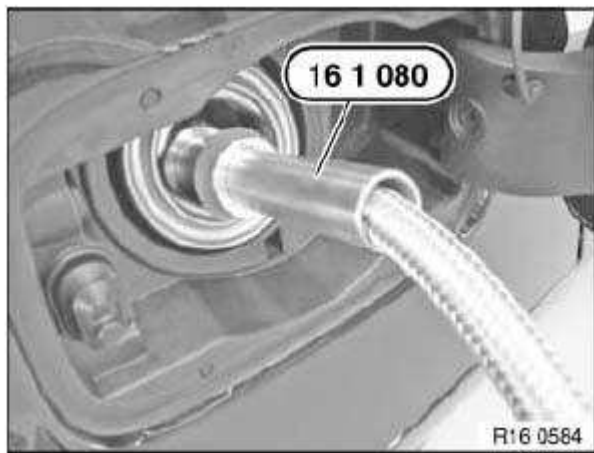


Fig. 3: Special Tool 16 1 080

Courtesy of BMW OF NORTH AMERICA, INC.

Drawing off residual fuel quantity:

IMPORTANT: Ensure car interior is adequately ventilated.
Catch dripping fuel in a suitable container.
Release sealing ring with special tool 16 1 020 and remove cap for service opening (left/right).
Tightening torque: 16 14 2AZ, see 16 14 FUEL PUMP .

Draw off residual fuel quantity through service openings.

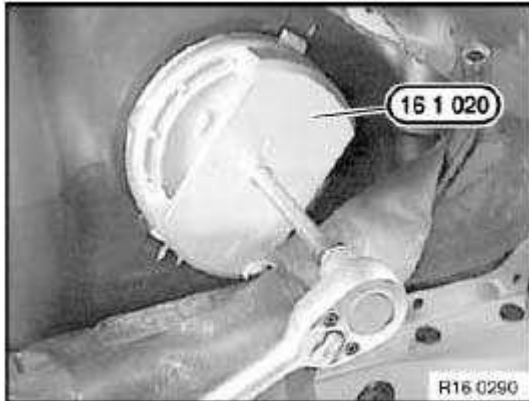


Fig. 4: Special Tool 16 1 020
Courtesy of BMW OF NORTH AMERICA, INC.

Fuel filling:

Insert special tool 16 1 080 into filler neck.

Special tool 16 1 080 has two different diameters for petrol/gasoline and diesel vehicles!

Slide extraction hose of extractor unit approx. 40 cm into fuel filler pipe.

Fill fuel from suction extractor unit.

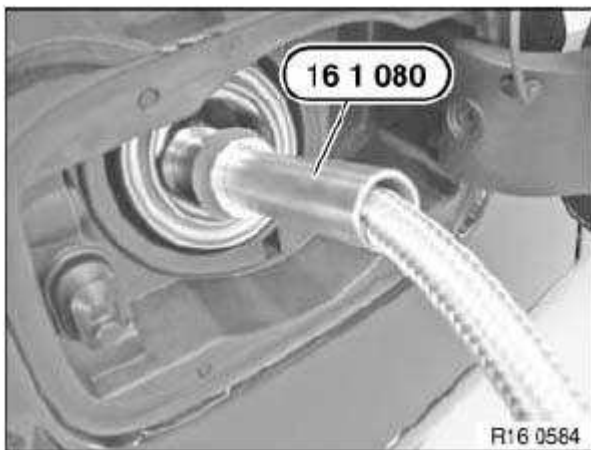


Fig. 5: Special Tool 16 1 080

Courtesy of BMW OF NORTH AMERICA, INC.

Drawing off after fault in suction jet pump:

Draw off right half of tank completely through fuel filler pipe.

Remove cap from left service opening.

Insert extraction hose through service opening in tank, fuel (also residual quantity) can be drawn off.

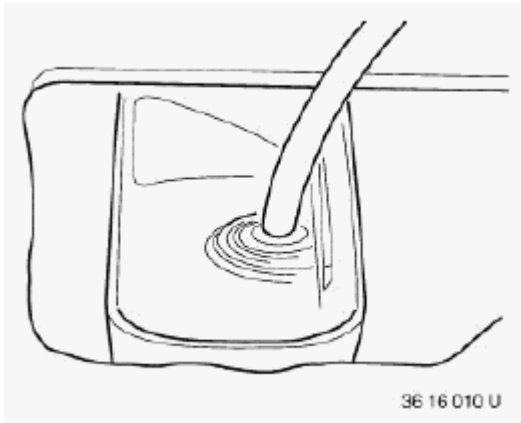


Fig. 6: Extraction Hose

Courtesy of BMW OF NORTH AMERICA, INC.

16 00 510 CONDUCTING LEAK TEST ON FUEL TANK AND TANK VENTING SYSTEM

NOTE: The following procedure is only applicable to vehicles with the tank leak diagnosis module (DMTL).
For vehicles without tank leak diagnosis module:
Pressurize fuel tank and tank venting system.
During the leak test with a leak detector, be sure to follow the operating instructions of the equipment manufacturer.

NOTE: Select "Tank leak diagnosis module (DMTL)" on Diagnosis and Information System (DIS).

- The leak diagnosis pump pressurizes the fuel tank and tank ventilation system for 30 sec.
- If pressure is needed for longer than 30 sec., press "Activate" button again after 30 sec.

IMPORTANT: On vehicles with tank leak diagnosis modules (DMTL), do not work with external pressurization as the tank ventilation system will leak under this condition.
On account of emerging fuel vapors, carry out all work in well ventilated rooms.
Or use a suitable extractor system.

Observe country-specific accident prevention and occupational safety regulations.

The leak test can be carried out with a leak detector. Possible causes may be:

- Tank cap leaking check tank cap pressure relief valve, see **16 11 130 Checking filler cap pressure relief valve.**
- Tank venting lines leaking (fuel tank - carbon canister - tank venting valve).
- Tank vent line leaking (engine compartment).
- Fuel level sensor flange on tank leaking.

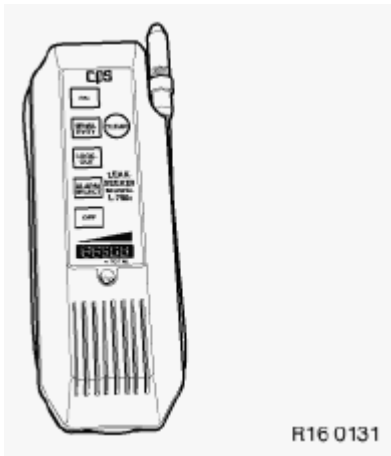


Fig. 7: Leak Detector

Courtesy of BMW OF NORTH AMERICA, INC.

11 FUEL TANK WITH MOUNTING

16 11 030 REMOVING AND INSTALLING/REPLACING FUEL TANK

Special tools required:

See .

- 13 5 281
- 13 5 282

IMPORTANT: After installation of fuel tank/prior to first engine start-up:

- Check ground connection at fuel filler neck to body for continuity. If necessary, clean contact surface between body and fuel filler pipe screw connection.
- Fill fuel tank with min. 5 l fuel.

Necessary preliminary tasks:

- Draw off fuel from fuel tank, see **16 00 005 Draining and filling fuel tank**
- Remove rear seat bench, see **52 26 005 REMOVING AND INSTALLING/REPLACING REAR SEAT (THROUGH-LOADING SYSTEM)** .
- Remove underbody panelling, see **51 47 ... REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT UNDERBODY PANELLING** .
- Remove handbrake Bowden cables, see **34 41 120 REMOVING AND INSTALLING/REPLACING BOTH HANDBRAKE BOWDEN CABLES** .
- Remove complete propeller shaft, see **26 11 000 REMOVING AND INSTALLING PROPELLER SHAFT (CARDAN UNIVERSAL JOINT) COMPLETELY** .

Release screws (1) and remove cover (2) from right side of fuel tank.

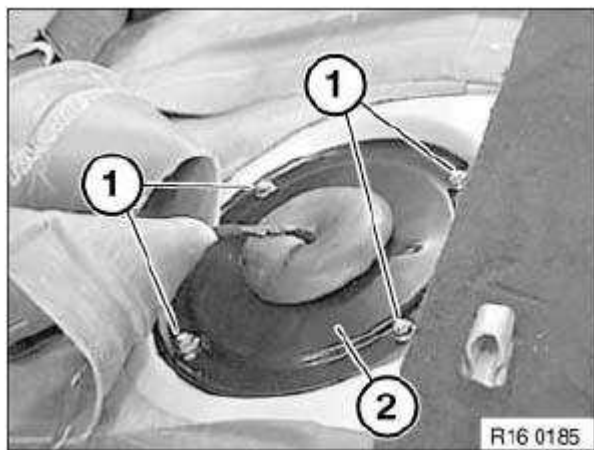


Fig. 8: Cover Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Right side:

Disconnect plug (1) and service vent line (3) from delivery unit.

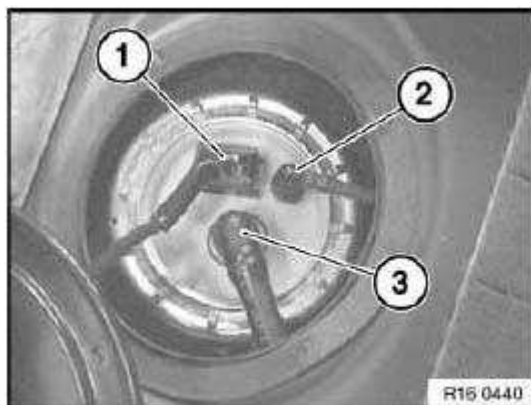


Fig. 9: Plug And Service Vent Line

Courtesy of BMW OF NORTH AMERICA, INC.

Left side (diesel only):

Unlock quick-release fastener (1) and detach vent line.

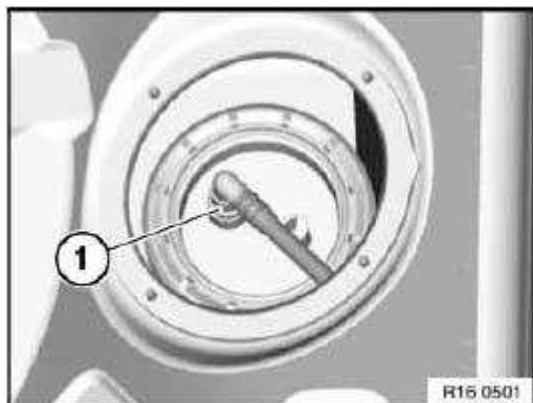


Fig. 10: Quick-Release Fastener

Courtesy of BMW OF NORTH AMERICA, INC.

Release hose clamp (1) and detach fuel filler hose (2).

Installation:

Tightening torque: 16 12 10AZ, see **16 12 FUEL DELIVERY** .

Unclip line (3) from holders.

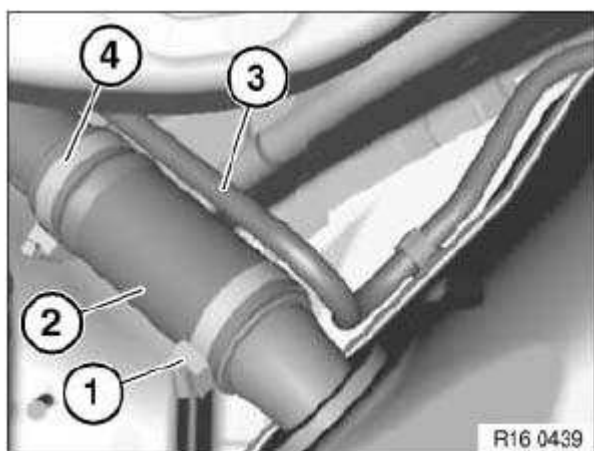


Fig. 11: Hose Clamp And Fuel Filler Hose

Courtesy of BMW OF NORTH AMERICA, INC.

Unlock and disconnect fuel feed line (1).

Unlock and disconnect fuel return line (2).

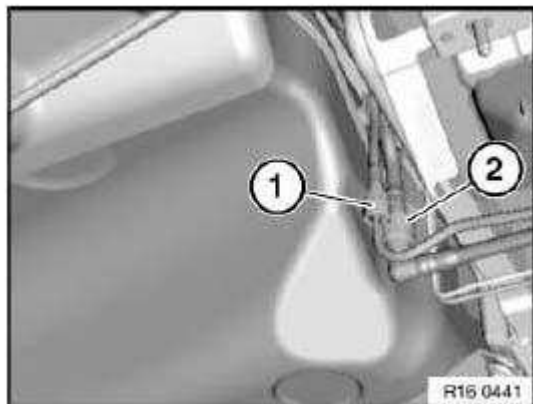


Fig. 12: Fuel Feed Line And Fuel Return Line
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw and unclip lines (1) from holder.

IMPORTANT: Risk of damage: Do not kink lines.

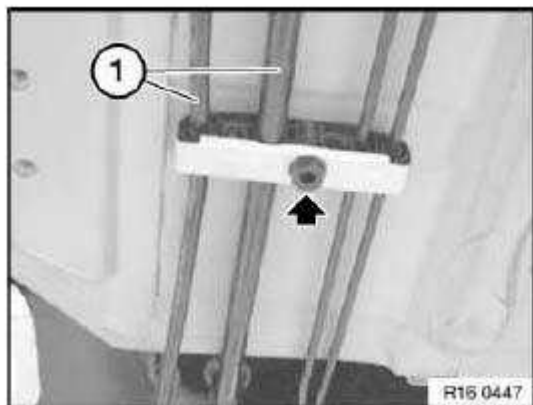


Fig. 13: Fuel Lines
Courtesy of BMW OF NORTH AMERICA, INC.

Seal fuel feed line with special tools 13 5 281 and 13 5 282 .

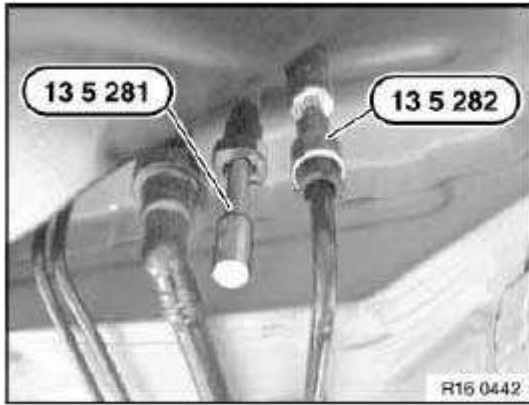


Fig. 14: Special Tools 13 5 281 And 13 5 282
Courtesy of BMW OF NORTH AMERICA, INC.

Heavily support the fuel tank.



Fig. 15: Supporting Fuel Tank
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw.

Installation:

Tightening torque: 16 11 1AZ, see **16 11 FUEL TANK AND MOUNTING PARTS** .

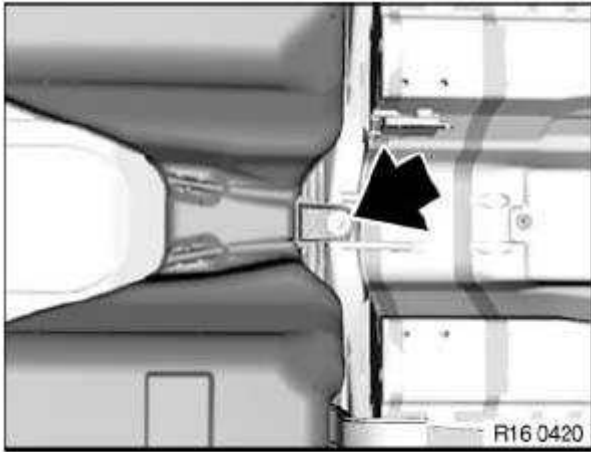


Fig. 16: Locating Screw

Courtesy of BMW OF NORTH AMERICA, INC.

Release screws for tightening straps on left and right and remove tightening straps.

Installation:

Tightening torque: 16 11 1AZ, see **16 11 FUEL TANK AND MOUNTING PARTS** .

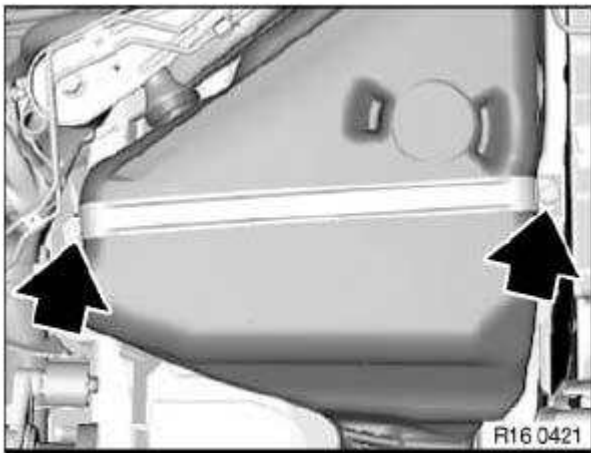


Fig. 17: Locating Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Note rubber mount with spacer bush.

Wide collar on spacer bush points to screw head.

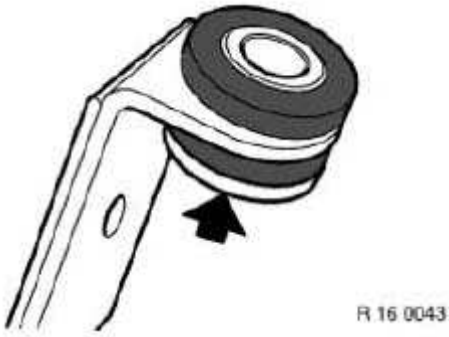


Fig. 18: Locating Rubber Mount Spacer Bush
Courtesy of BMW OF NORTH AMERICA, INC.

Lower tank until line (1) is accessible.

Unclip line (1) from holders.

Remove fuel tank downwards.

**IMPORTANT: Risk of damage: Feed out fuel line (2).
Do not kink fuel line.**

NOTE: Illustration shows: tank removed.

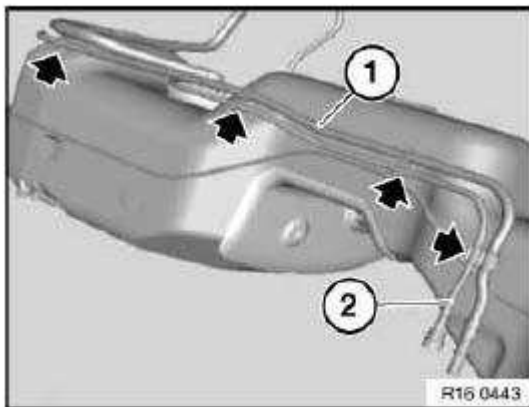


Fig. 19: Fuel Lines
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The following components must be modified when the fuel tank is replaced:

- Left sensor unit
- Right sensor unit
- Fuel lines on tank

16 11 060 REMOVING AND INSTALLING OR REPLACING FUEL FILLER PIPE

Necessary preliminary tasks:

- Remove rear right wheel arch trim, see **51 71 041 REMOVING AND INSTALLING/REPLACING REAR LEFT OR RIGHT WHEEL ARCH COVER** .
- Draw off fuel from fuel tank, see **16 00 005 Draining and filling fuel tank**.

Unhook retaining strap (1) from tank flap.

Open cap and set to one side.

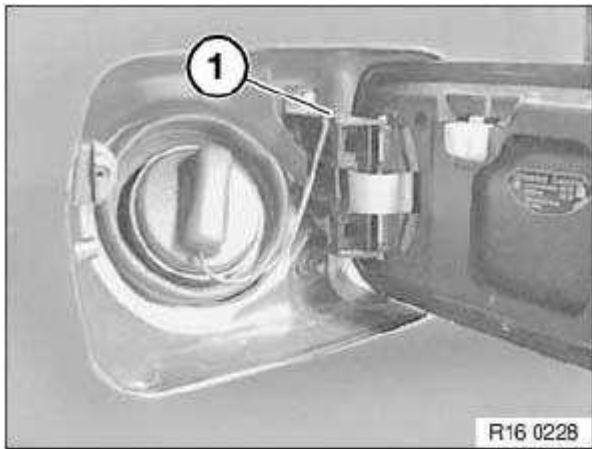


Fig. 20: Retaining Strap

Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten hose clip (4).

Installation:

Replace hose clip.

Tightening torque: 16 12 10AZ, see **16 12 FUEL DELIVERY** .

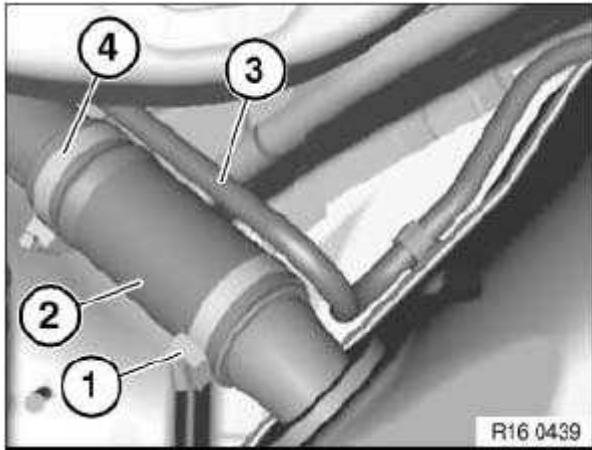


Fig. 21: Hose Clamp And Fuel Filler Hose
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: With petrol/gasoline engine only!

Detach vent line (1) and (2) from fuel filler pipe.

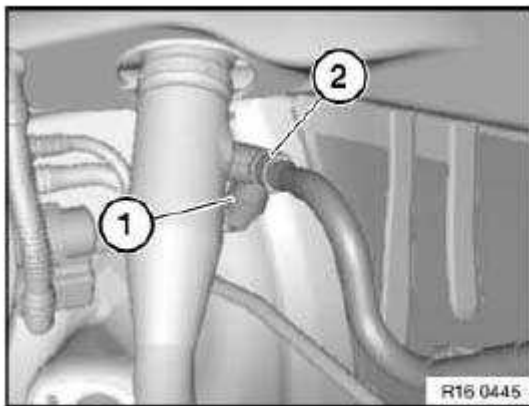


Fig. 22: Vent Lines
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: With diesel engine only!

Unclip vent line (1) from holder on fuel filler pipe (2).

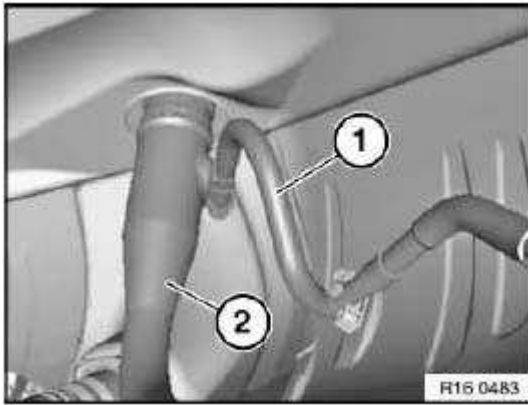


Fig. 23: Vent Line And Fuel Filler Pipe
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew nuts.

Tightening torque: 16 12 11AZ, see **16 12 FUEL DELIVERY** .

Unclip vent line (2) from holder on fuel filler pipe (1).

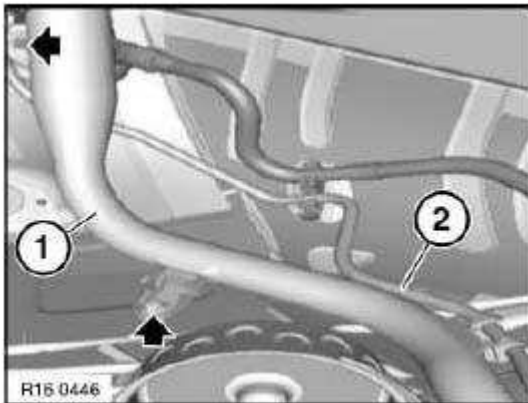


Fig. 24: Vent Line And Fuel Filler Pipe
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew nut (1).

Tightening torque: 16 12 16AZ, see **16 12 FUEL DELIVERY** .

Withdraw fuel filler pipe (2) completely out of rubber gaiter at wheel arch.

Installation:

Make sure rubber gaiter is correctly seated.

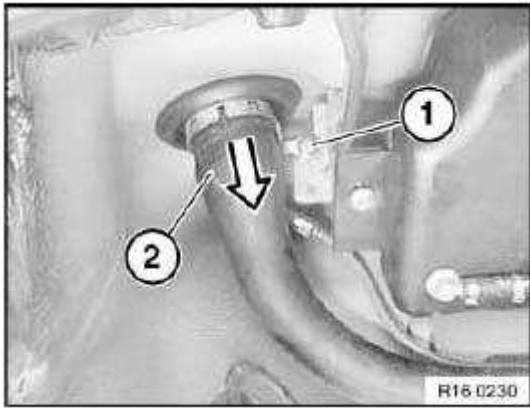


Fig. 25: Removing Fuel Filler Pipe

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Clean **contact surface** on body and grounding lead on fuel filler pipe.

Ground connection must be guaranteed.

16 11 130 CHECKING FILLER CAP PRESSURE RELIEF VALVE

Special tools required:

See , **16 FUEL SUPPLY SYSTEM** .

- 13 3 010
- 16 1 171
- 16 1 172

Set pressure regulator on special tool 16 1 171 fully in " -" direction.

Connect special tool 16 1 171 via compressed air line (1) to workshop/garage compressed air system (8 ... 10 bar).

Connect pressure sensor (2) from Diagnosis and Information System.

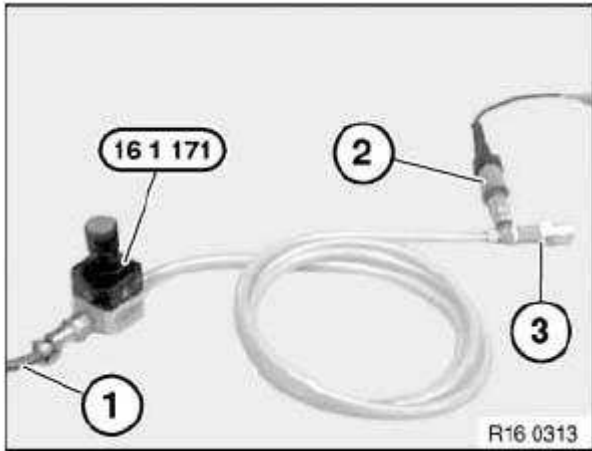


Fig. 26: Special Tool 16 1 171 And Pressure Sensor
Courtesy of BMW OF NORTH AMERICA, INC.

Connect special tool 16 1 172 to fast-release coupling of special tool 16 1 171 .

Install fuel tank cap on special tool 16 1 172 (3).



Fig. 27: Special Tool 16 1 172
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Only the absolute pressure is indicated in the display of the Diagnosis and Information System (DIS). The current ambient air pressure is already displayed without additional pressurization.

Check testing equipment for leaks!

Select "Measurement/ Pressure" function on Diagnosis and Information System (DIS).

Increase pressure by 0.2 bar with pressure regulator on special tool 16 1 171 .

Using special tool 13 3 010 , disconnect supply line from special tool 16 1 171 .

Read off and note down pressure.

Wait 60 secs.

Read off pressure again and compare with starting pressure value.

Measurement evaluation:

FILLER CAP PRESSURE RELIEF VALVE MEASUREMENT EVALUATION

Pressure drop > 0.012 bar	Testing equipment leaking. Check connection points for leaks.
---------------------------	--

Check filler cap pressure relief!

Select "Measurement/ Pressure" function on Diagnosis and Information System (DIS).

Increase pressure by 0.3 bar with pressure regulator on special tool 16 1 171 .

Using special tool 13 3 010 , disconnect supply line from special tool 16 1 171 .

Read off and note down pressure.

Wait 60 secs.

Read off pressure value again and compare with starting pressure value.

Measurement evaluation:

FILLER CAP PRESSURE RELIEF VALVE MEASUREMENT EVALUATION

Pressure drop > 0.012 bar	Filler cap pressure relief valve faulty. Replace fuel tank cap.
---------------------------	--

16 11 350 REPLACING CLAMPING BANDS FOR FUEL TANK

Necessary preliminary tasks:

- Remove **UNDERBODY PANELLING**

IMPORTANT: Secure fuel tank against slipping and falling out.

Heavily support the fuel tank.

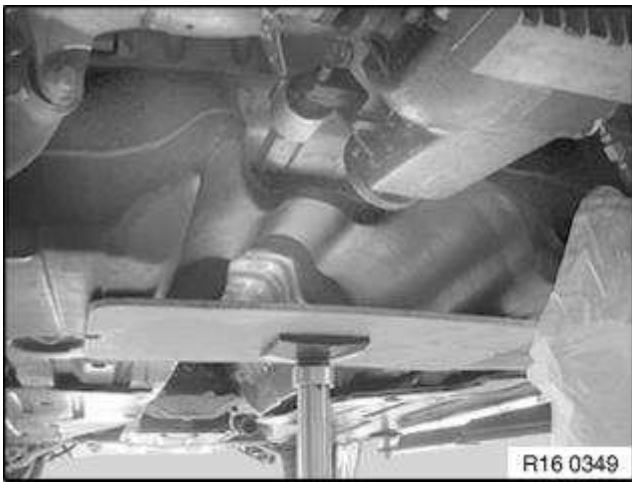


Fig. 28: Heavily Support The Fuel Tank
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) and remove clamping band. Installation: tightening torque, 16 11 1AZ, see **16 11 FUEL TANK AND MOUNTING PARTS** .

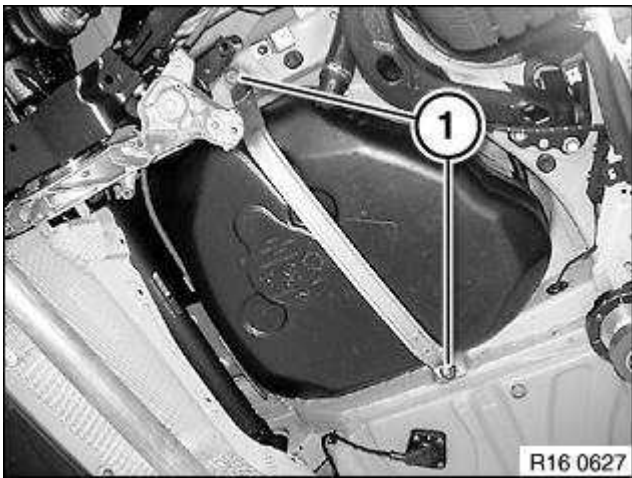


Fig. 29: Release Screws (1) And Remove Clamping Band
Courtesy of BMW OF NORTH AMERICA, INC.

16 11 071 REPLACING RUBBER SLEEVE BETWEEN FUEL FILLER PIPE AND FUEL TANK

Recycling

- Fuel escapes when fuel lines are detached. Have a suitable collecting container ready.
- Catch and dispose of escaping fuel.
- Observe country-specific waste-disposal regulations.

Important

- Ensure adequate ventilation in the place of work!

- Avoid skin contact (wear gloves)!
- Before starting the engine for the first time: Fill fuel tank with at least 5 litres of fuel.

Necessary preliminary tasks:

- Draw off **fuel from fuel tank**
- Remove right underbody panelling. See **51 47 ... REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT UNDERBODY PANELLING** .

Loosen hose clamps (1). Detach rubber sleeve (2) first from fuel filler pipe and then from fuel tank. Installation: Tightening torque 16 12 10AZ, see **16 12 FUEL DELIVERY** .

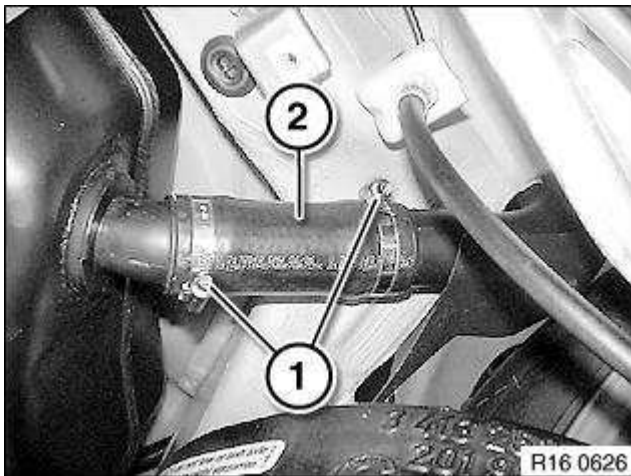


Fig. 30: Detaching Rubber Sleeve

Courtesy of BMW OF NORTH AMERICA, INC.

12 FUEL DELIVERY, SENSOR FOR DISPLAY

16 12 ... CHECKING REPUMPING FUNCTION OF SUCTION - JET PUMP WITH BMW DIAGNOSIS SYSTEM

IMPORTANT: Ensure adequate ventilation in the place of work!

Ensure absolute cleanliness when working on the open fuel tank.

Contaminants in the fuel tank can impair driving operation or may even result in vehicle breakdown!

Catch escaping fuel in a suitable container.

Necessary preliminary tasks:

- Fill level must be less than or equal to 28 l
 - Draw off fuel from fuel tank, see **16 00 005 Draining and filling fuel tank**.
- Pour two to three litres of fuel into the left tank chamber via the flange opening
- Connect diagnosis system

- Path:
 - Brief test KOMBI Instrument cluster
 - Diagnosis control unit functions
 - Diagnosis requests
 - Tank sensor 1, tank sensor 2

NOTE: Tank sensor 1 = right tank sensor
Tank sensor 2 = left tank sensor

Start engine.

Compare display for left and right tank chambers.

Repumping function OK

If fill level of tank sensor 2 (left chamber) is falling (approx. one litre per minute).

Repumping function not OK

If fill level of tank sensor 2 (left chamber) is stable or rising.

16 12 000 REMOVING AND INSTALLING/REPLACING FUEL GAUGE SENSOR (PETROL/GASOLINE, RIGHT, N52)

Special tools required:

See **16 FUEL SUPPLY SYSTEM** , **61 GENERAL ELECTRICAL SYSTEM** .

- 16 1 020
- 61 0 300
- 61 0 307

IMPORTANT: Ensure adequate ventilation in the place of work!
Ensure absolute cleanliness when working on the open fuel tank.
Contaminants in the fuel tank can impair driving operation or may even result in vehicle breakdown!

NOTE:

- **Removed lever-type sensor with cable length of 400 mm must no longer be fitted.**
- **Only lever-type sensor with cable length of 335 mm may be refitted.**

Necessary preliminary tasks:

- Draw off fuel from fuel tank, see **16 00 005 Draining and filling fuel tank.**

- Remove rear seat bench, see **52 26 005 REMOVING AND INSTALLING/REPLACING REAR SEAT (THROUGH-LOADING SYSTEM)** .

Release screws (1) and remove cover (2) from right side of fuel tank.

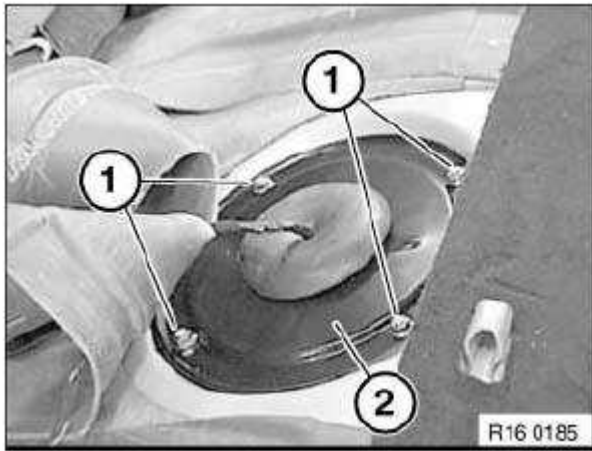


Fig. 31: Cover Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten plug connection (1) and disconnect.

Unlock and disconnect fuel feed line (2).

IMPORTANT:

- **Press the blue button to unlock the quick-release fastener. Then carefully detach fuel feed line vertically upwards.**
- **Do not use any mechanical tools or means to detach the quick-release fastener.**
- **Quick-release fastener must be attached vertically without mechanical tools/means. It must snap audibly into place.**
- **Then carry out a leak test with engine running.**
- **Damaged or leaking quick-release fasteners must be replaced.**

Unlock and detach vent line (3).

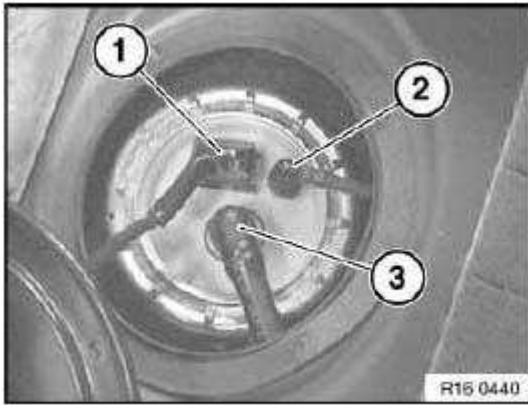


Fig. 32: Plug And Service Vent Line
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw cap with special tool 16 1 020 and remove.

Installation:

Tightening torque: 16 14 2AZ, see **16 14 FUEL PUMP** .

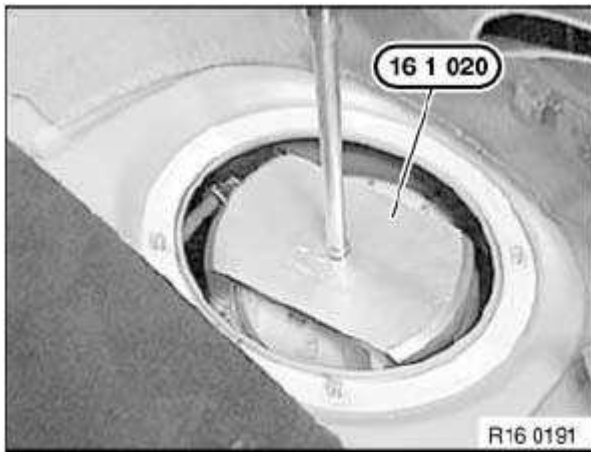


Fig. 33: Special Tool 16 1 020
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Service cap can only be installed in one position.

When installing, make sure lug (1) of service cap engages in corresponding opening (2) on fuel tank.

During torque tightening, notch (3) on screw cap can be clearly heard and felt to engage toothed segment (4) on fuel tank.

Replace rubber gasket.

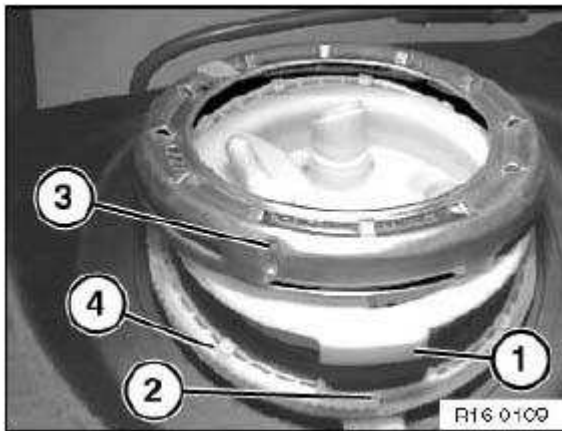


Fig. 34: Service Cap Lug And Notch

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Make sure that tab (1) of adapter ring lies completely in recess (2).

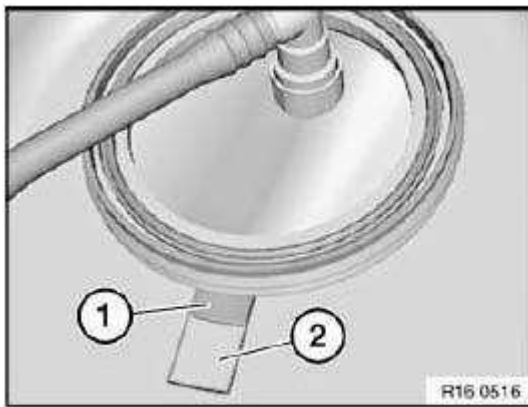


Fig. 35: Tab Of Adapter Ring

Courtesy of BMW OF NORTH AMERICA, INC.

Carefully raise service cap (4).

Unlock and detach fuel line (2).

Unlock and detach vent line (3).

Disconnect connector (1).

IMPORTANT: Carefully release quick-release fasteners and detach.
Make sure quick-release fasteners are correctly engaged.
Test the quick-release fasteners by pulling on them.

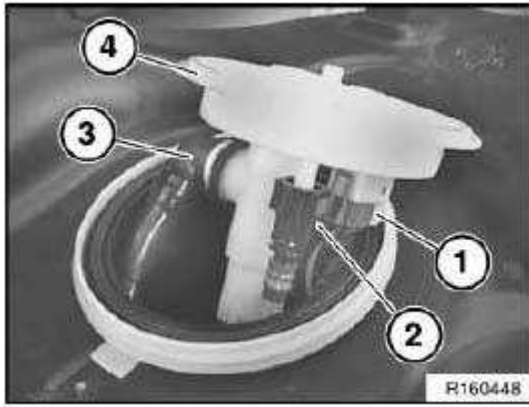


Fig. 36: Service Cap, Fuel Line, Vent Line And Connector
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Cable (1) must be laid in a loop around the corrugated tube (2).

Cable must not restrict freedom of movement of lever-type sensor!

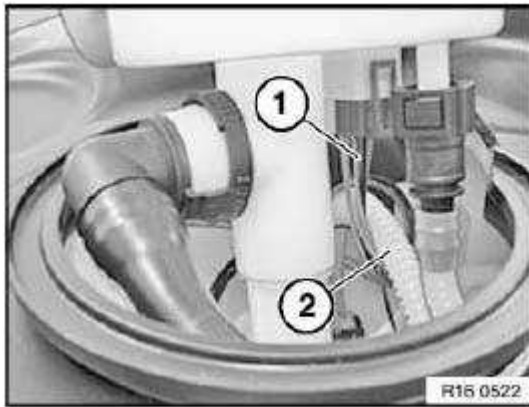


Fig. 37: Cable And Tube
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock and disconnect plug connection (1) using a screwdriver (2).

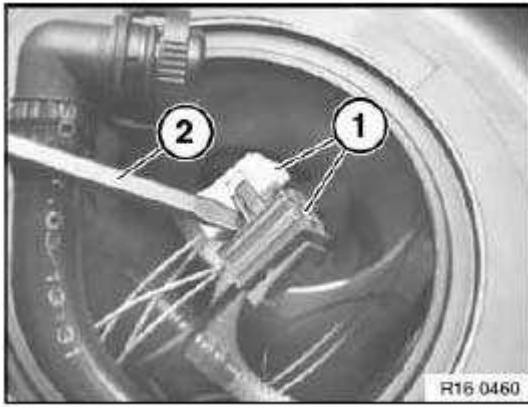


Fig. 38: Plug Connection

Courtesy of BMW OF NORTH AMERICA, INC.

Unpin cables (1) issuing from lever-type sensor on blue plug using special tool 61 0 307 from special tool kit 61 0 300 .

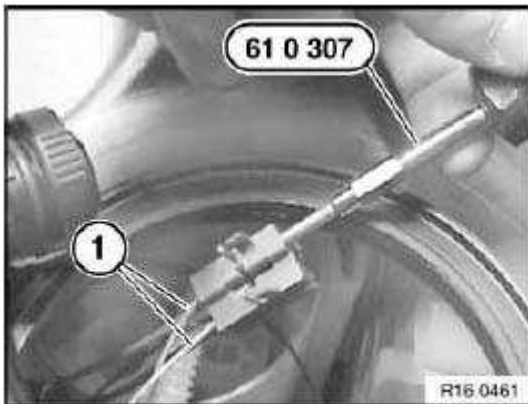


Fig. 39: Cables And Special Tool 61 0 307

Courtesy of BMW OF NORTH AMERICA, INC.

Removing fuel level sensor:

- Disengage cable from guides (3 and 4).
- Carefully pull tab (1) in direction of arrow; at the same time, press tab (2) in direction of arrow and press out fuel level sensor downwards.

IMPORTANT: Risk of damage:

Carefully feed cable out of cable guides (3 and 4). Do not kink cable.

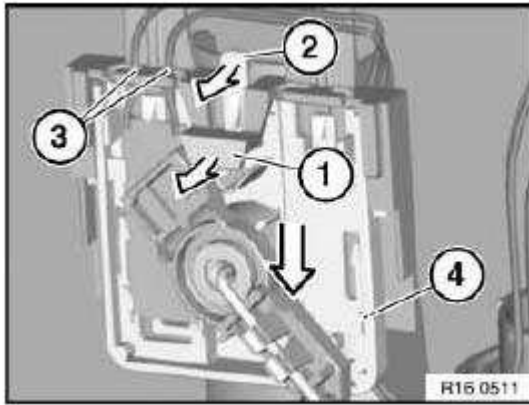


Fig. 40: Pulling Tab

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Observe the following procedure when installing the fuel level sensor.

1. Carefully push fuel level sensor (1) in direction of arrow onto sensor holder (2).
2. Fuel level sensor must snap audibly into place!
3. Carefully feed cable into cable guides (3).

Do not kink cable.

Make sure fuel level sensor is correctly positioned in both guides (see arrows).

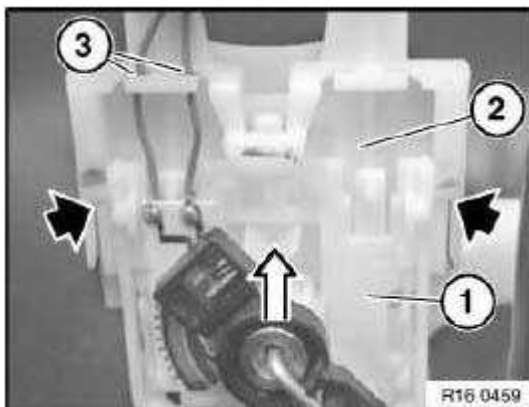


Fig. 41: Pushing Fuel Level Sensor Onto Sensor Holder

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Lay cable (1) through upper loop of tank support (2).

Illustration shows cutaway model:

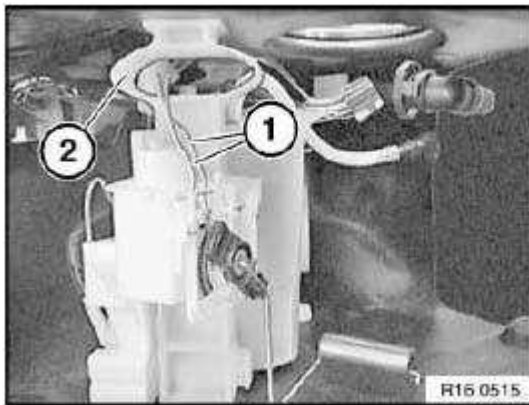


Fig. 42: Cable And Tank Support

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Cable (1) must be laid under line (2) and engaged in cable holder (3).

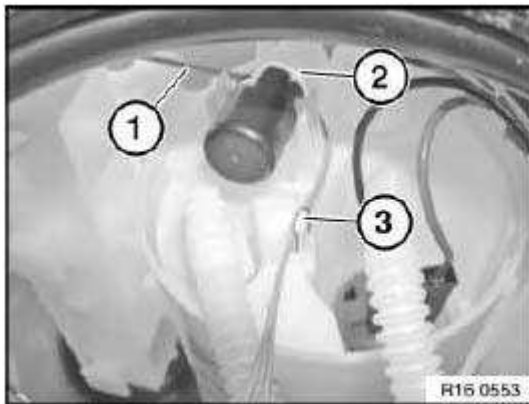


Fig. 43: Cable And Cable Holder

Courtesy of BMW OF NORTH AMERICA, INC.

16 12 001 REMOVING AND INSTALLING/REPLACING FUEL GAUGE SENSOR (PETROL/GASOLINE, LEFT)

Special tools required:

- **16 1 020 PIN WRENCH** .

IMPORTANT: Ensure adequate ventilation in the place of work!

Ensure absolute cleanliness when working on the open fuel tank.

Contaminants in the fuel tank can impair driving operation or may even result

in vehicle breakdown!

Necessary preliminary tasks:

- Draw off fuel from fuel tank, see **16 00 005 Draining and filling fuel tank.**
- Remove rear seat bench, see **52 26 005 REMOVING AND INSTALLING/REPLACING REAR SEAT (THROUGH-LOADING SYSTEM) .**

Release screws (1) and remove cover (2) from left side of fuel tank.

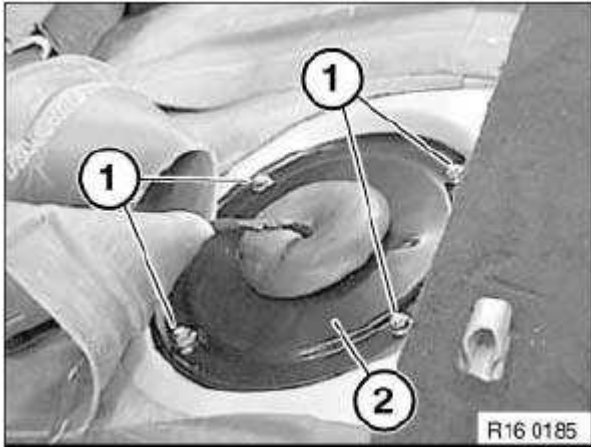


Fig. 44: Cover Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Release screw cap with special tool 16 1 020 and remove.

Installation:

Tightening torque: 16 14 2AZ, see **16 14 FUEL PUMP .**

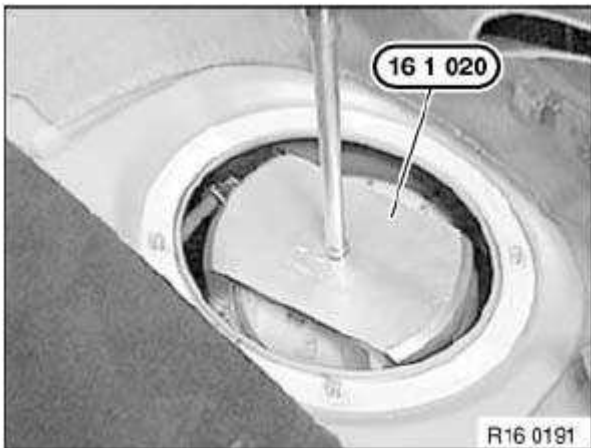


Fig. 45: Special Tool 16 1 020

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Service cap can only be installed in one position.

When installing, make sure lug (1) of service cap engages in corresponding opening on fuel tank.

During torque tightening, notch (3) on screw cap can be clearly heard and felt to engage toothed segment (4) on fuel tank.

Replace rubber gasket.

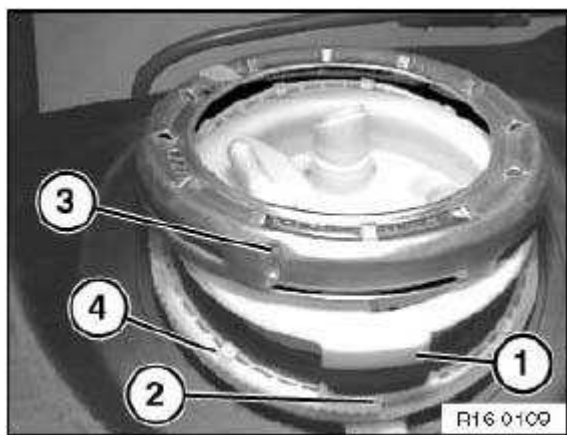


Fig. 46: Service Cap Lug And Notch

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Make sure that tab (1) of adapter ring lies completely in recess (2).

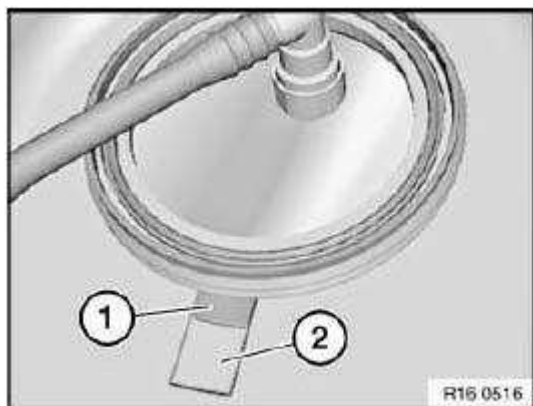


Fig. 47: Tab Of Adapter Ring

Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug (1) from fuel level sensor.

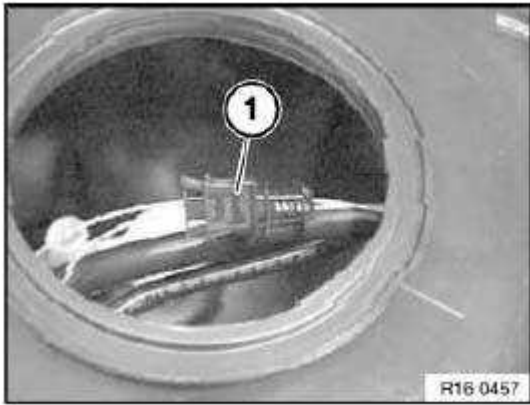


Fig. 48: Plug

Courtesy of BMW OF NORTH AMERICA, INC.

Removing fuel level sensor:

- Disengage cable from guides (3 and 4).
- Carefully pull tab (1) in direction of arrow; at the same time, press tab (2) in direction of arrow and press out fuel level sensor downwards.

IMPORTANT: Risk of damage:

Carefully feed cable out of cable guides (3 and 4). Do not kink cable.

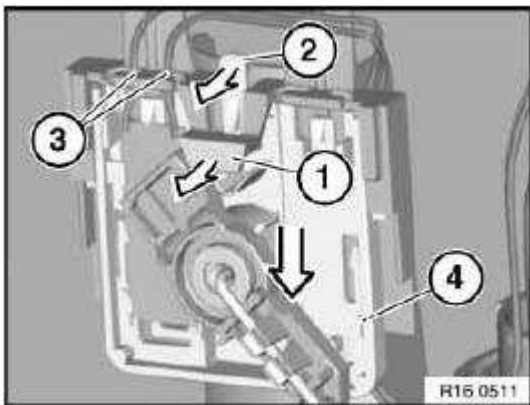


Fig. 49: Pulling Tab

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Observe the following procedure when installing the fuel level sensor.

1. Carefully push fuel level sensor (1) in direction of arrow onto sensor holder (2).

2. Push on fuel level sensor up to end stop. Fuel level sensor must snap audibly into place!
3. Carefully feed cable into cable guide (3). Do not kink cable.

Make sure fuel level sensor is correctly positioned in both guides (see arrow).

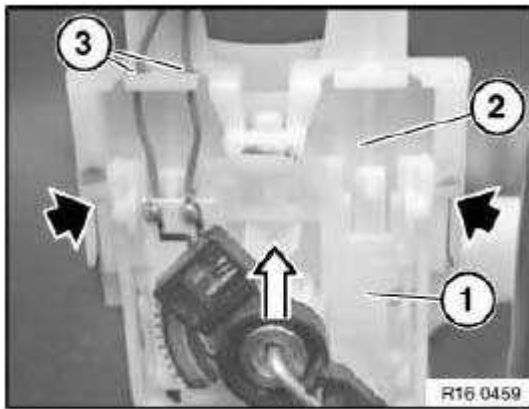


Fig. 50: Pushing Fuel Level Sensor Onto Sensor Holder
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Engage cable (1) in cable guide (2) and lay behind lines (3).

Cable must not restrict freedom of movement of lever-type sensor!

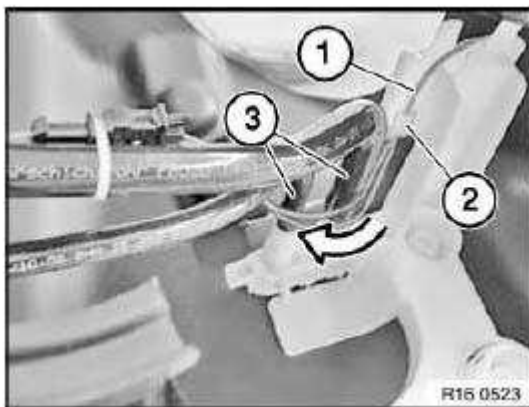


Fig. 51: Engaging Cable In Cable Guide
 Courtesy of BMW OF NORTH AMERICA, INC.

16 12 010 REMOVING AND INSTALLING OR REPLACING CARBON CANISTER

Necessary preliminary tasks:

- Remove rear right wheel. **36 10 300 REMOVING OR INSTALLING FRONT OR REAR WHEEL**

- Remove rear right wheel arch trim. See **51 71 041 REMOVING AND INSTALLING/REPLACING REAR LEFT OR RIGHT WHEEL ARCH COVER** .

Disconnect vent line (1) and (2) from carbon canister (3). Unfasten nut. Tightening torque, see 16 13 2AZ in **16 13 TANK VENTILATION** . Remove carbon canister (3).

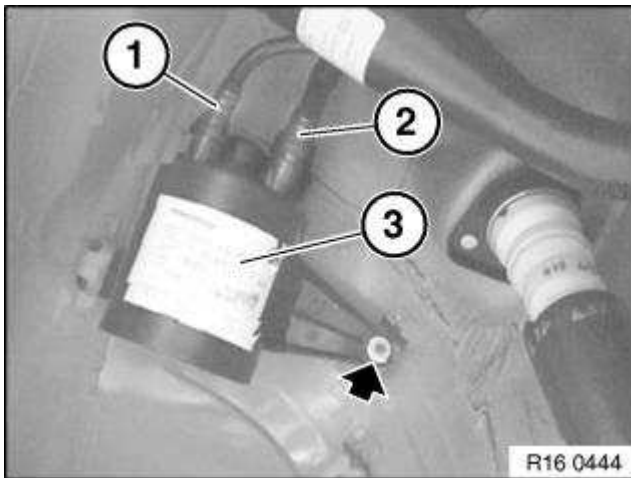


Fig. 52: Disconnect Vent Line (1) And (2) From Carbon Canister (3)
 Courtesy of BMW OF NORTH AMERICA, INC.

16 12 010 REMOVING AND INSTALLING/REPLACING CARBON CANISTER WITH DM-TL (DIAGNOSIS MODULE FOR TANK LEAKAGE)

- Remove rear right wheel. **36 10 300 REMOVING OR INSTALLING FRONT OR REAR WHEEL**
- Remove rear right wheel arch trim. See **51 71 041 REMOVING AND INSTALLING/REPLACING REAR LEFT OR RIGHT WHEEL ARCH COVER** .

Unlock lines (1), (2) and plug (3) and detach:

- Scavenging air line
- Vent line to tank

Release screws (5) and remove carbon canister with DM-TL towards bottom. Tightening torque 16 13 2AZ, see **16 13 TANK VENTILATION** .

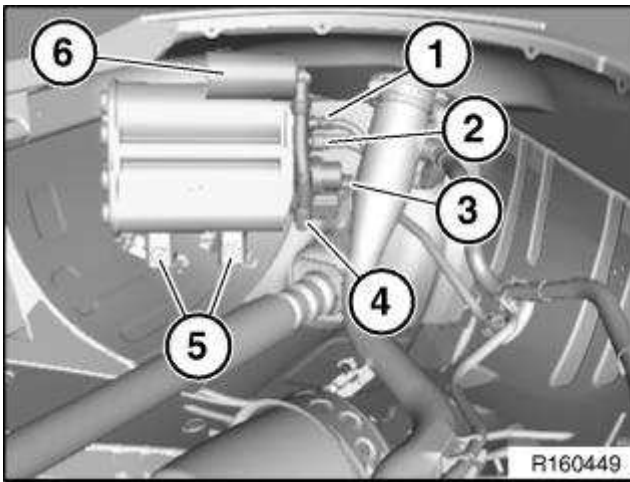


Fig. 53: Removing/Installing Carbon Canister With DM-TL
 Courtesy of BMW OF NORTH AMERICA, INC.

13 FUEL VENTILATION/DEAERATION

16 13 015 REMOVING AND INSTALLING/REPLACING TANK LEAK DIAGNOSIS MODULE

Necessary preliminary tasks:

- Remove carbon canister with DMTL.

Unlock and disconnect line (1) from tank leakage diagnosis module.

Release screws (2).

Tightening torque: 16 13 3AZ, see **16 13 TANK VENTILATION** .

Detach DMTL from carbon canister.

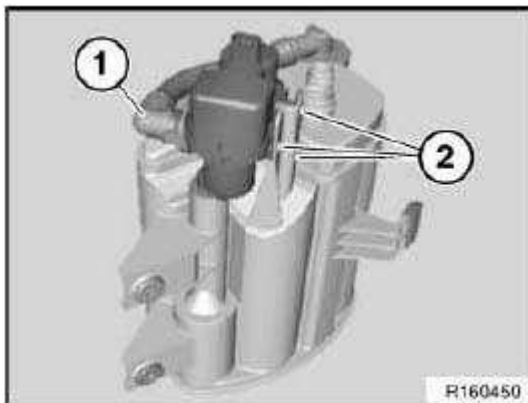


Fig. 54: Fuel Line
 Courtesy of BMW OF NORTH AMERICA, INC.

14 FUEL PUMP

16 14 010 REMOVING AND INSTALLING/REPLACING FUEL PUMP (PETROL/GASOLINE, N52)

Special tools required:

See 16 FUEL SUPPLY SYSTEM , 61 GENERAL ELECTRICAL SYSTEM .

- 16 1 020
- 61 0 300
- 61 0 307

IMPORTANT: Ensure adequate ventilation in the place of work!
Ensure absolute cleanliness when working on the open fuel tank.
Contaminants in the fuel tank can impair driving operation or may even result in vehicle breakdown!

Necessary preliminary tasks:

- Draw off fuel from fuel tank, see 16 00 005 Draining and filling fuel tank.
- Remove rear seat bench, see 52 26 005 REMOVING AND INSTALLING/REPLACING REAR SEAT (THROUGH-LOADING SYSTEM) .

Release screws (1) and remove cover (2) from right side of fuel tank.

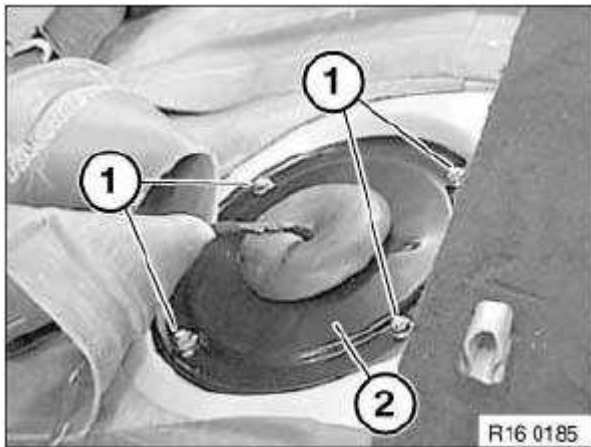


Fig. 55: Cover Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Unlock and detach plug (1), fuel feed line (2) and service vent line (3).

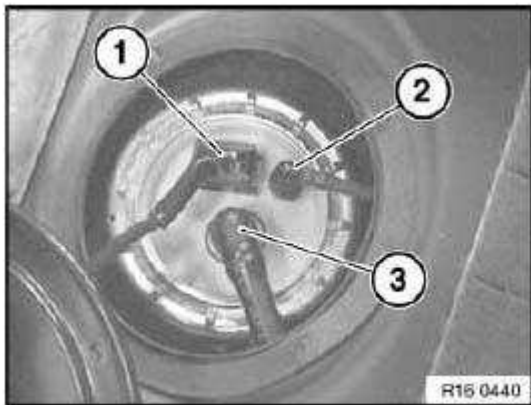


Fig. 56: Plug And Service Vent Line
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw cap with special tool 16 1 020 and remove service cap.

Installation:

Tightening torque: 16 14 2AZ, see **16 14 FUEL PUMP** .

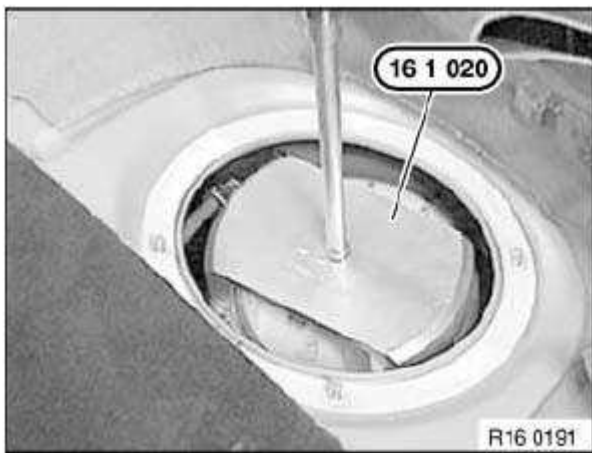


Fig. 57: Special Tool 16 1 020
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Service cap can only be installed in one position.

When installing, make sure lug (1) of service cap engages in corresponding opening (2) on fuel tank.

During torque tightening, notch (3) on screw cap can be clearly heard and felt to engage toothed segment (4) on fuel tank.

Replace rubber gasket.

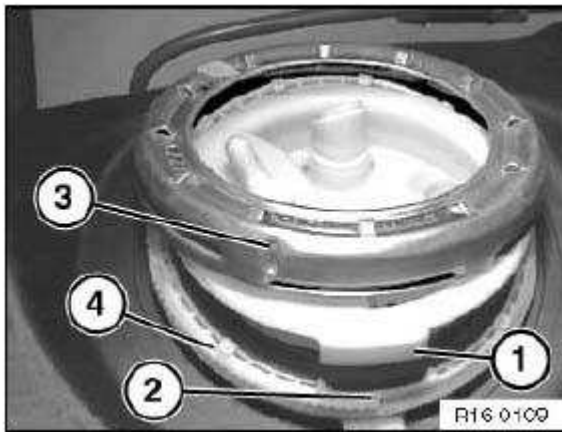


Fig. 58: Service Cap Lug And Notch

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Make sure that tab (1) of adapter ring lies completely in recess (2).

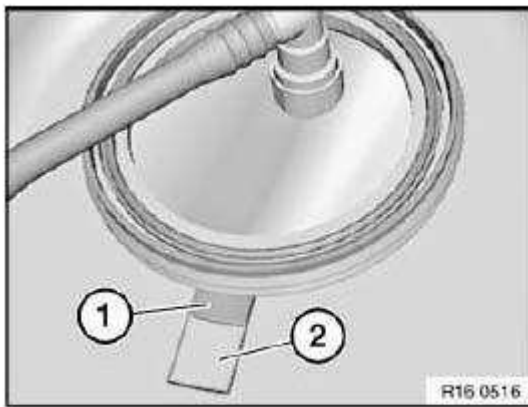


Fig. 59: Tab Of Adapter Ring

Courtesy of BMW OF NORTH AMERICA, INC.

Carefully raise service cap (4) on right.

Unlock and detach fuel line (2).

Detach vent line (3).

Disconnect connector (1).

IMPORTANT: Carefully release quick-release fasteners and detach.
Make sure quick-release fasteners are correctly engaged.
Test the quick-release fasteners by pulling on them.

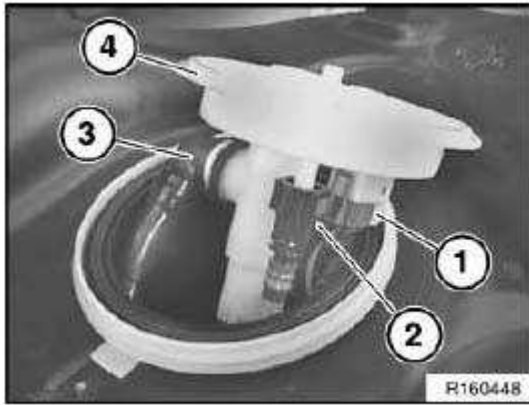


Fig. 60: Service Cap, Fuel Line, Vent Line And Connector
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Cable (1) must be laid in a loop around the corrugated tube (2).

Cable must not restrict freedom of movement of lever-type sensor!

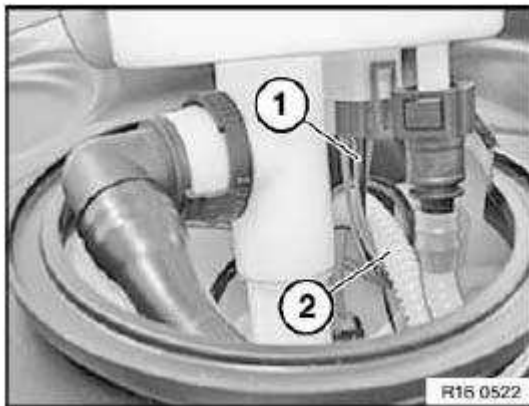


Fig. 61: Cable And Tube
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock and disconnect plug housing (1) using a screwdriver (2).

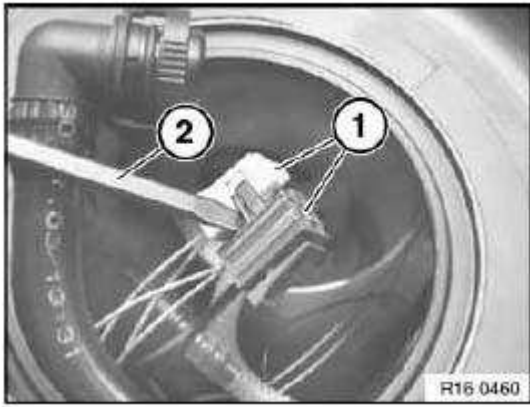


Fig. 62: Plug Connection

Courtesy of BMW OF NORTH AMERICA, INC.

Unpin cables (1) issuing from lever-type sensor on blue plug using special tool 61 0 307 from special tool kit 61 0 300 .

NOTE: **Plug connection on fuel pump must not be disconnected!**
When the fuel pump is replaced, the cables and the blue plug are included in the delivery specification.

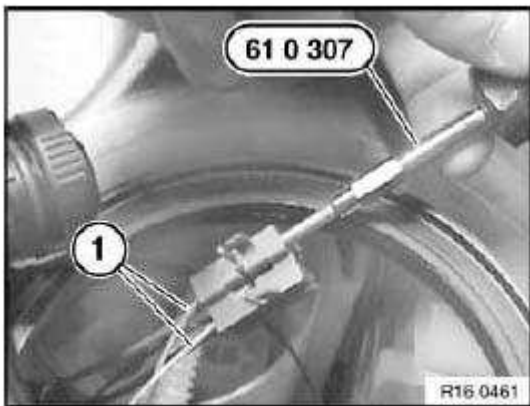


Fig. 63: Cables And Special Tool 61 0 307

Courtesy of BMW OF NORTH AMERICA, INC.

Press retaining lug (2) together simultaneously in direction of arrow and detach fuel line (1) from pressure regulator.

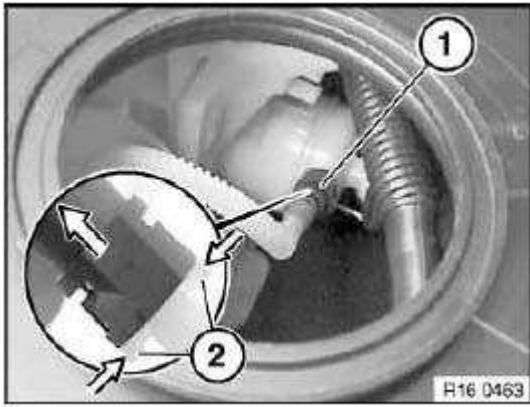


Fig. 64: Pressing Retaining Lug
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock quick-release fastener (1) by pressing both white surfaces and detach.

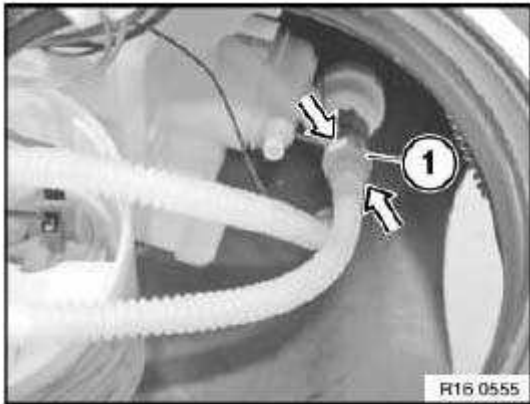


Fig. 65: Unlocking Quick-Release Fastener
Courtesy of BMW OF NORTH AMERICA, INC.

Press retaining lug (1) in direction of arrow towards rear and lift out fuel pump with surge chamber (2).

Installation:

Fuel pump can only be installed in one position.

Make sure lug (4) of mounting engages opening in fuel pump.

Make sure fuel pump (2) is correctly positioned in guides (3).

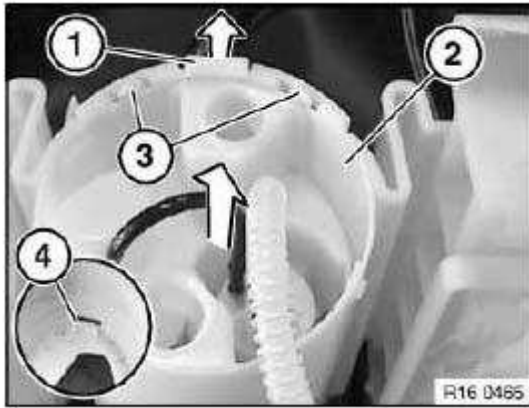


Fig. 66: Pressing Retaining Lug

Courtesy of BMW OF NORTH AMERICA, INC.

16 14 060 REMOVING AND INSTALLING/REPLACING DUST FILTER FOR TANK LEAKAGE DIAGNOSIS MODULE (DM-TL)

Necessary preliminary tasks:

- Remove rear right wheel arch trim. See **51 71 041 REMOVING AND INSTALLING/REPLACING REAR LEFT OR RIGHT WHEEL ARCH COVER** .
- Remove carbon canister.

Disconnect line (2) from DM-TL. Release screw. Tightening torque, see 16 13 4AZ in **16 13 TANK VENTILATION** . Remove dust filter (1) with line (2).

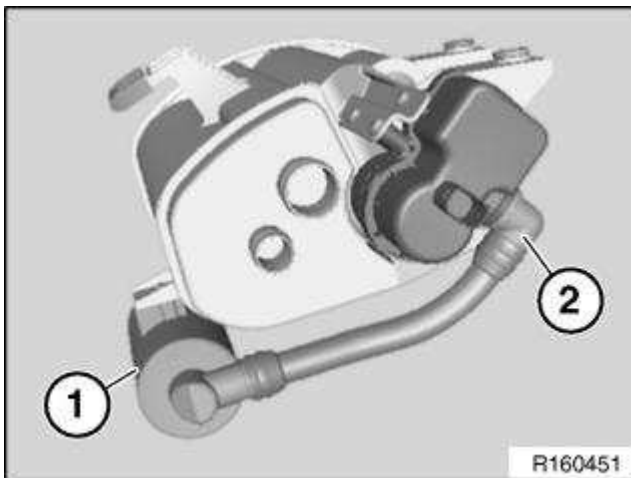


Fig. 67: Disconnect Line (2) From DM-TL

Courtesy of BMW OF NORTH AMERICA, INC.

ENGINE

Ignition System - Repair Instructions - X3

00 TROUBLESHOOTING

12 00 ... INSTRUCTIONS FOR DISCONNECTING AND CONNECTING BATTERY

Observe safety instructions for handling vehicle battery, see 61 00 ... SAFETY INSTRUCTIONS FOR HANDLING VEHICLE BATTERY .

Before disconnecting battery:

Turn off the ignition and other electrical loads/consumers to prevent sparking when reconnecting.

NOTE: If the ignition is not turned off when the battery is disconnected, fault memories may be set in some control units.

IMPORTANT:

- There is a danger of mixing up battery leads: If the battery positive and negative leads are the same color and you are in doubt, follow the polarity to the battery, then mark and cover the leads.
- On vehicles with radio code: After disconnecting the battery, the radio code must be re-entered. Therefore obtain the radio code card from the customer beforehand. Note stored stations and restore them after connecting the battery.
- Stored settings of the on-board computer and clock will also be lost.
- All available central keys must be recoded for cars with first generation infrared transmitter locking systems.

General notes on disconnecting battery:

- Do not disconnect battery leads and leads from alternator and starter motor while engine is running.
- Cars with IBS on battery negative terminal:

Do not under any circumstances pull/lever off pole shoes by force.

Do not under any circumstances release socket-head cap screw of IBS.

- Detach negative lead from car battery and second battery if fitted. Cover battery negative terminal(s) and secure, see 61 20 900 DISCONNECTING AND CONNECTING BATTERY NEGATIVE LEAD .
- When work is carried out on the electrical system, faults may be caused in the fault memories of some control units when the battery is connected.
- When installing battery terminal: Tightening torque: 61 21 1AZ, see 61 21 BATTERY WITH TERMINAL .

After connecting battery:

IMPORTANT: After a power supply interruption some equipment is disabled and must be reactivated.

Likewise, individual settings are lost and must be activated.

Example:

- **Vehicles with build date from 03/2007:**

Teach-in mid-position for power steering

- **If necessary, activate sliding sunroof**
- **If necessary, carry out adjustment of active front steering**
- **If necessary, activate power windows**
- **If necessary, activate mirror with compass**

Vehicles with a two-battery system

Starter and equipment batteries

A two-battery system has a starter battery circuit and an equipment battery circuit. A secondary control unit monitors both battery circuits. Depending on the situation, the battery circuits are connected to or isolated from the secondary control unit via an isolating relay.

Two AGM batteries, whose design and properties are described in AGM batteries , are used as a storage battery.

IMPORTANT: These batteries must not under any circumstances be charged with a voltage in excess of 14.8 V. Rapid programs must not be used either.

Receiving/giving starting assistance via jump start terminal

The engine can be jump-started with an external voltage supply via the jump start terminal on the right side of the engine compartment.

NOTE: **The starter battery is isolated from the alternators when the engine hood/bonnet is open.**

Giving starting assistance via the jump start terminal is thus limited by the capacity of the starter battery when the engine hood/bonnet is open.

Charging starter and equipment batteries via jump start terminal

The starter battery is charged as a matter of priority with a charger connected to the jump start terminal. The voltage at the starter battery is the decisive factor in determining whether the equipment battery is also included in the charging operation. The secondary control unit automatically detects a charging operation at a charging

voltage at the starter battery of greater than or equal to 13.5 V. The isolating relay is closed and thus the equipment battery is connected in parallel. Both batteries are now charged.

Prerequisite:

- Terminal 61 inactive
- Terminal 15 inactive

If terminal 15 becomes "active" during the charging operation, the isolating relay is opened immediately and again only the starter battery is charged.

NOTE: When the engine hood is open, the isolating relay is also opened in normal operation when the engine is running.
A special mode can be set by means of diagnosis for workshop/garage operation. The isolating relay is closed from terminal R in this operating mode. This mode is automatically reset once a distance of 5 km has been driven.

Trickle charging

The increased closed-circuit current consumption can be compensated for via the jump-start connection point with the aid of the "Acctiva easy" battery trickle charger.

IMPORTANT: The cigarette lighter is isolated from the electrical system after terminal R "OFF" on a timed basis (60 mins.), thereby interrupting charging of the equipment battery via the cigarette lighter. This is prevented if the battery master switch (on the right side of the luggage compartment behind the panel) is turned on and off again twice within 2 seconds. (Cigarette light battery charging function).

12 00... INSTRUCTIONS FOR REMOVING AND INSTALLING ELECTRONIC CONTROL UNITS

IMPORTANT:

- Disconnecting the vehicle battery will cancel the fault memories of control units. Consequently, before disconnecting the car's battery, always interrogate the fault memories. Investigate stored faults and, once any faults have been remedied, cancel the fault memory.
- Control unit plugs should only ever be connected and disconnected while the ignition is turned off.
- The removal and installation of components, relays, fuses etc. can cause faults to be stored in fault memories capable of self diagnosis. Always interrogate the fault memories after completing work on the electrical system.
- Investigate stored faults and, once any faults have been remedied, cancel the fault memory.

Comply with the following when replacing the DME/DDE (Digital Motor

Electronics/Digital Diesel Electronics):

- **Always read out hardware/software version of the corresponding control unit with DIS tester.**

Comply with the instructions of the DIS tester on the steps coding and programming.

On vehicles with electronic vehicle immobilization, comply with the instructions of the DIS tester.

- **Each control unit is programmed with certain basic values, which serve as mean values. The control unit receives different input values, depending on engine condition, which are compared with the stored values. The adaptive system compares the input values with the stored map values. The control commands are routed to the relevant actuators.**
- **If, for example, the DME control unit would be without current for a long time (more than an hour), its adaptive system would lose the stored values. When a cleared control unit is restarted or a new control unit is installed, the adaptive system must read in and store the input values of the associated engine as new basic values itself.**
- **This procedure could lead to erratic idling and disturbed overrunning of the engine after starting. Depending on the engine it could require some time before all values are adapted to the engine condition.**
- **Therefore observe the following procedure before replacing or reinstalling a DME/DDE control unit:**
 - 1. If possible before exchanging control unit, run engine up to operating temperature.**
 - 2. Remove the control unit, install a new control unit and operate vehicle at different engine speeds.**

12 13 NOTES ON CHECKING IGNITION SYSTEM

Troubleshooting -> Fault in fuel injection system

-> Spark plug faults

-> Ignition coil faults

-> Further fault patterns with evaluation

-> Additional fault notes for troubleshooting

Oscillograms -> Normal oscillogram

-> Oscillograms of ignition coils from different manufacturers

Check -> Secondary signal for stationary ignition distribution

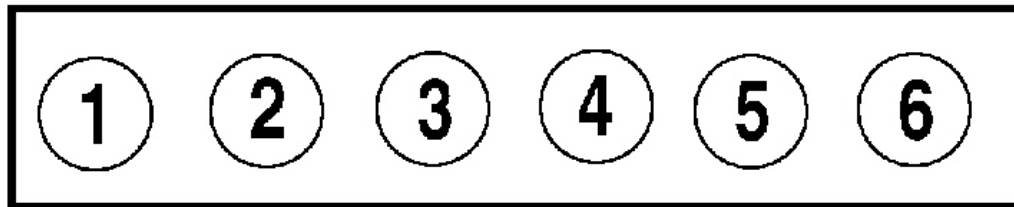
12 IGNITION WIRES, SPARK PLUGS

FIRING ORDER

FIRING ORDER

Application	Firing Order
6-Cylinder	1 - 5 - 3 - 6 - 2 - 4

FIRING ORDER 1-5-3-6-2-4



G00214257

Fig. 1: Firing Order (6-Cylinder)

Courtesy of BMW OF NORTH AMERICA, INC.

12 12 011 REPLACING ALL SPARK PLUGS (N42, N40, N46, N45, N52, N52K, N51)

Special tools required:

See 12 ENGINE ELECTRICAL SYSTEM .

- 12 1 171
- 12 1 200

Necessary preliminary tasks:

- Switch off ignition
- Remove ignition coils, see 12 13 511 Replacing ignition coils (N52, N52K, N51).

Unscrew spark plugs with special tool 12 1 171.

Installation:

Tighten down spark plugs with special tool 12 1 171 and special tool 12 1 200 (torque limiter).

Without special tool 12 1 200 , observe tightening torque.

Tightening torque: 12 12 1AZ, see **12 12 SPARK PLUGS** .

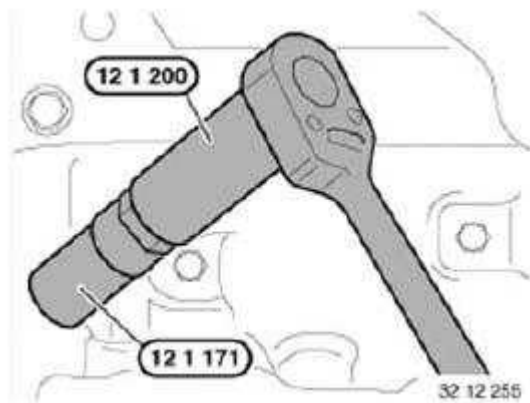


Fig. 2: Special Tool 12 1 171 And 12 1 200
Courtesy of BMW OF NORTH AMERICA, INC.

13 IGNITION COIL

12 13 NOTES ON CHECKING IGNITION SYSTEM

Troubleshooting -> Fault in fuel injection system

-> Spark plug faults

-> Ignition coil faults

-> Further fault patterns with evaluation

-> Additional fault notes for troubleshooting

Oscillograms -> Normal oscillogram

-> Oscillograms of ignition coils from different manufacturers

Check -> Secondary signal for stationary ignition distribution

12 13 511 REPLACING IGNITION COILS (N52, N52K, N51)

Necessary preliminary tasks:

- Read out fault memory of DME control unit.
- Check stored fault messages

- Switch off ignition
- Remove ignition coil cover

Unlock plug retainer of ignition coil (1) and disconnect plug.

Pull ignition coil (1) up and out.

This procedure is applicable to all ignition coils.

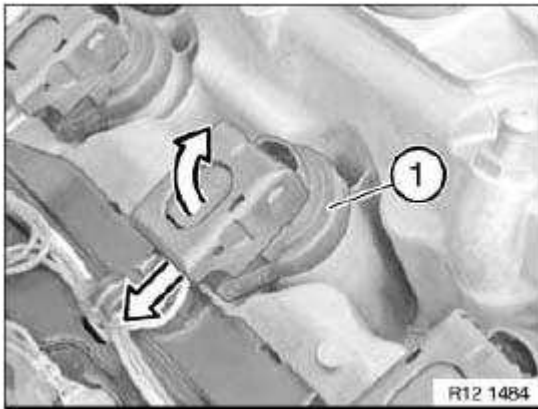


Fig. 3: Pulling Out Ignition Coil

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check that rubber seal of ignition coil (1) is correctly seated.

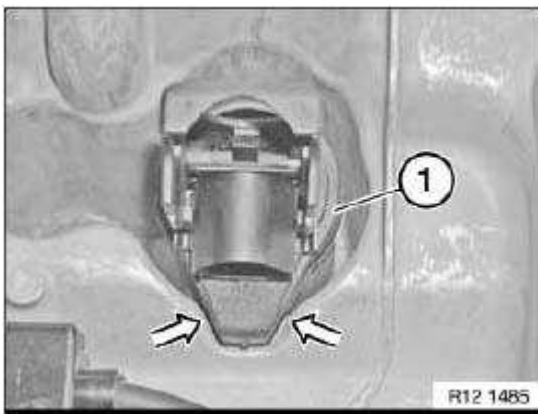


Fig. 4: Rubber Seal Of Ignition Coil

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Push plug (1) with plug retainer (2) open onto ignition coil.

Carefully close plug retainer (2) in direction of arrow.

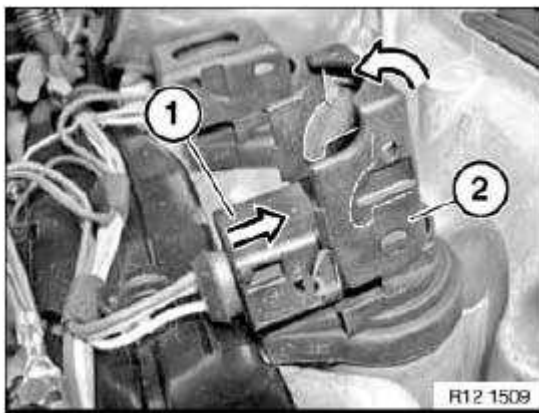


Fig. 5: Closing Plug Retainer

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

The plug retainer must snap into place without great effort.

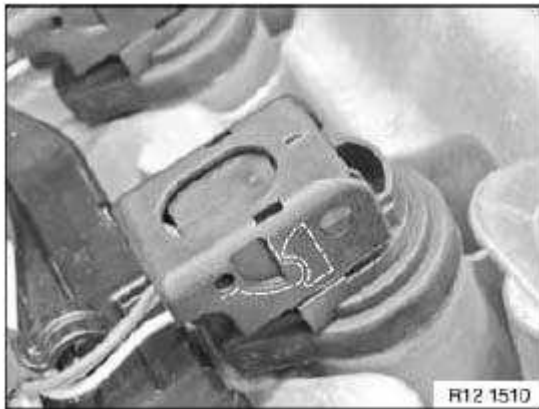


Fig. 6: Plug Retainer

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Now clear the fault memory.

12 13 009 CHECKING ROD-TYPE IGNITION COILS (M54, M56, N40, N42, N43, N45, N46, N52, N62, N62TU, N73)

Special Tools Required

- 12 1 301
- 12 7 050 (ADAPTER LEAD)

Necessary preliminary tasks:

- Read out fault memory in DME (Digital Engine Electronics)
- N52: Remove sound absorption hood

Unlock plug fastener (1) of ignition coil.

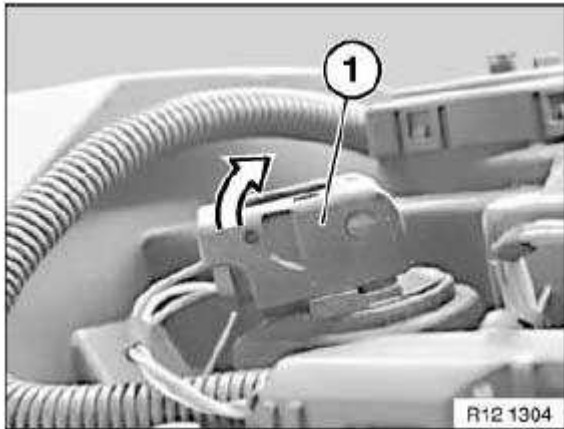


Fig. 7: Identifying Plug Fastener Of Ignition Coil
Courtesy of BMW OF NORTH AMERICA, INC.

Detach plug (1) in direction of arrow.

Pull out ignition coil (2) towards top.

NOTE: Procedure applies to all rod-type ignition coils.

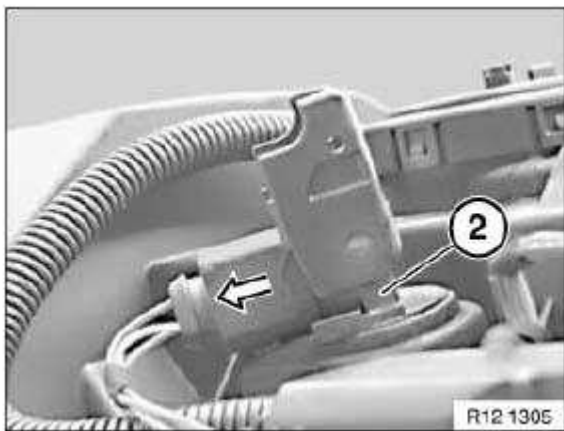


Fig. 8: Pulling Out Ignition Coil & Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Install special tool **12 7 050** .

Installation:

Special tool **12 7 050** is attached between spark plug and rodtype ignition coil.

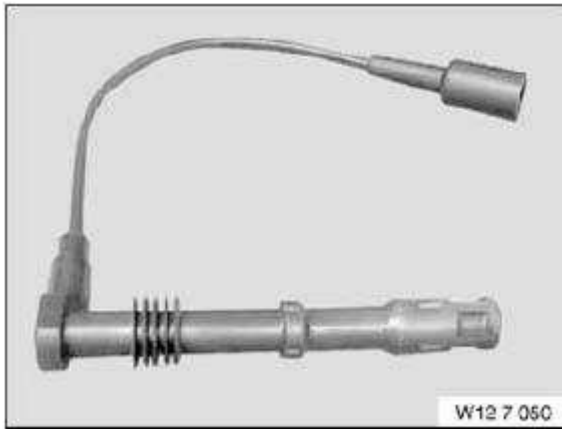


Fig. 9: Identifying Special Tool (12 7 050)
Courtesy of BMW OF NORTH AMERICA, INC.

Secondary measurement:

Connect KV clip-on probe (1) of DIS Tester to special tool **12 7 050** .

Procedure on DIS Tester:

- Select < Measurement >.
- Select < Preset measurement >.
- Select < Secondary ignition signal >.
- Connect < TD cable to diagnostic head >.
- Select < static ignition distribution >.
- Select < Number of cylinders >.

For subsequent procedure, follow DIS instructions.

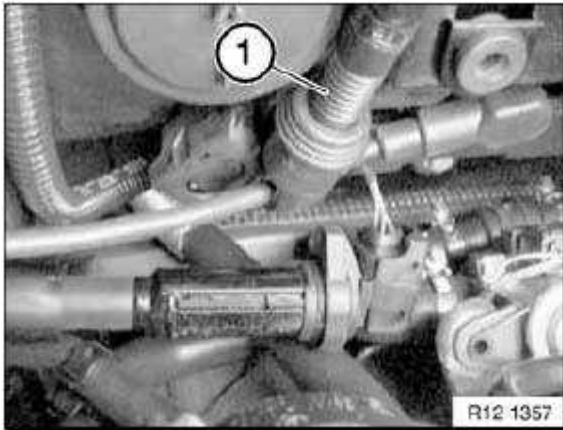


Fig. 10: Identifying KV Clip-On Probe Of DIS Tester
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Illustration shows: KV clip-on probe (1) US version.

Primary measurement:

Connect 26-pin pin box with special tool **12 1 301** to connector (1) DME module 5.

Procedure on DIS Tester:

- Select < Measurement >.
- Select < Preset measurement >.
- Select < Ignition signal term.1 >.

For subsequent procedure, follow DIS instructions.

NOTE: Pin assignment acc. to connection scheme.

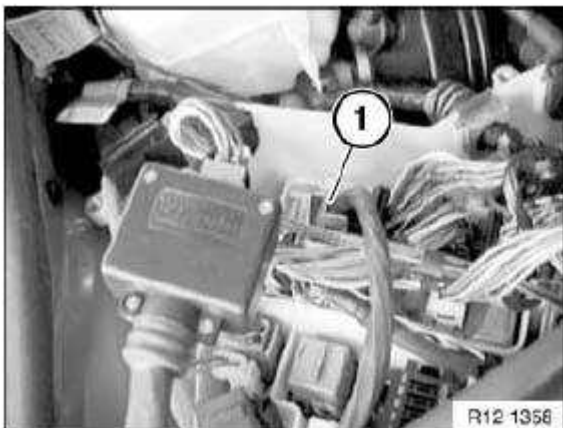


Fig. 11: Identifying DME Module 5 Connector

Courtesy of BMW OF NORTH AMERICA, INC.

Illustration N42.

IMPORTANT: Ignition signal is a multiple spark ignition.

Illustration of multiple spark ignition

1. Start of ignition peak.
2. Level of ignition voltage.
3. Level of sparking voltage.
4. Spark duration.
5. Sparking voltage curve.
6. Start of decay process.
7. Decay process.

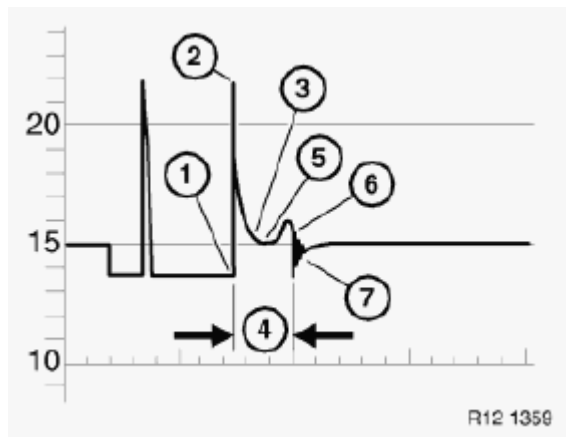


Fig. 12: Illustration Of Multiple Spark Ignition
Courtesy of BMW OF NORTH AMERICA, INC.

M54/M56/N40/N42/N45/N46/N62/N73:

The following ignition oscillogram applies to engines with **multiple spark ignition** from a production date of April 2001:

Depending on engine temperature (approx. -20° to 100°) and engine speed (< 2000 rpm.), some ignition voltage peaks (approx. 1-5 ignition peaks) can occur before the typical ignition voltage characteristic.

The additional ignition peaks play **no** role in diagnosis.

The last ignition peak (1) on the oscillogram is decisive.

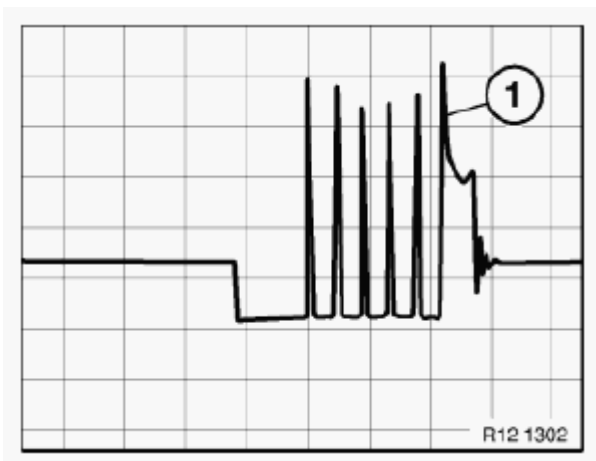


Fig. 13: Ignition Voltage Characteristic Graph
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The display of the ignition voltage peak is approx. 20-25% lower than the real value.

It is not the height of the ignition voltage peaks but rather the uniformity of all the cylinders that is important.

Differences of 3000 to 4000 volts are permitted.

14 ELECTRONIC SWITCHING OR CONTROL UNIT

12 14 523 REPLACING INLET CAMSHAFT PULSE GENERATOR (N52, N52K, N51, N53)

IMPORTANT: Read and comply with 61 35 ... NOTES ON ESD PROTECTION (ELECTROSTATIC DISCHARGE) .

Necessary preliminary tasks:

- Read out fault memory of DME control unit
- Switch off ignition
- If necessary, remove radiator cover

Unlock plug (1) and remove.

Release bolt.

Installation:

Replace screw.

Tightening torque: 12 14 3AZ, see 12 14 ELECTRONIC SHIFT UNITS OR CONTROL UNITS .

Remove pulse generator (2).

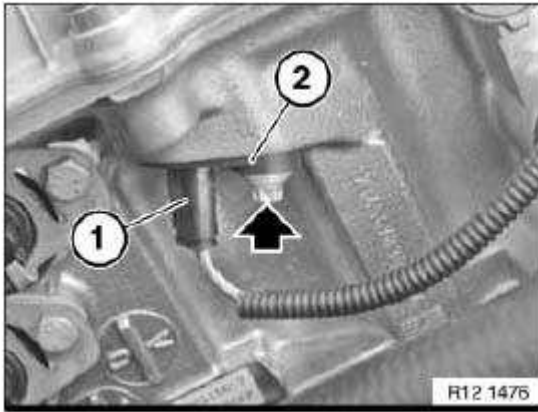


Fig. 14: Plug And Pulse Generator

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Check stored fault messages.
Now clear the fault memory.

12 14 524 REPLACING EXHAUST CAMSHAFT PULSE GENERATOR (N52, N52K, N51, N53)

IMPORTANT: Read and comply with 61 35 ... NOTES ON ESD PROTECTION (ELECTRO STATIC DISCHARGE) .

Necessary preliminary tasks:

- Read out fault memory of DME control unit
- Switch off ignition
- If necessary, remove radiator cover

Unlock plug (1) and remove.

Release bolt.

Installation:

Replace screw.

Tightening torque: 12 14 4AZ, see **12 14 ELECTRONIC SHIFT UNITS OR CONTROL UNITS** .

Remove pulse generator (2).

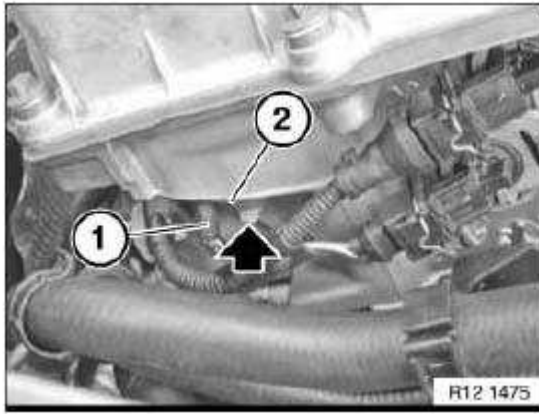


Fig. 15: Plug And Pulse Generator

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Check stored fault messages.
Now clear the fault memory.

12 14 600 REMOVING/REPLACING KNOCK SENSORS (N52, N52K, N51)

IMPORTANT: Aluminium-magnesium materials.

No steel screws/bolts may be used due to the threat of electrochemical corrosion.

A magnesium crankcase requires aluminium screws/bolts exclusively.

Aluminium screws/bolts must be replaced each time they are released.

The end faces of aluminium screws/bolts are painted blue for the purposes of reliable identification.

Jointing torque and angle of rotation must be observed without fail (risk of damage).

Necessary preliminary tasks:

- Read out fault memory of DME control unit
- Switch off ignition
- Disconnect battery negative lead **61 20 900 DISCONNECTING AND CONNECTING BATTERY NEGATIVE LEAD**
- Remove intake air manifold

Unlock plug (1) and remove.

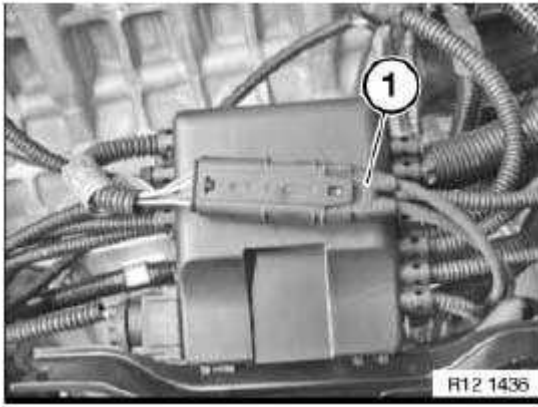


Fig. 16: Plug

Courtesy of BMW OF NORTH AMERICA, INC.

Release screws on both knock sensors (1) and remove knock sensors (1).

Installation:

Replace aluminium screws.

Tightening torque: 12 14 1AZ, see **12 14 ELECTRONIC SHIFT UNITS OR CONTROL UNITS** .

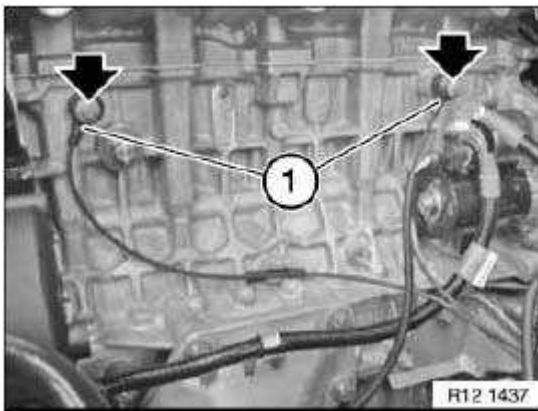


Fig. 17: Knock Sensors

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Clean support face of knock sensors on engine block.

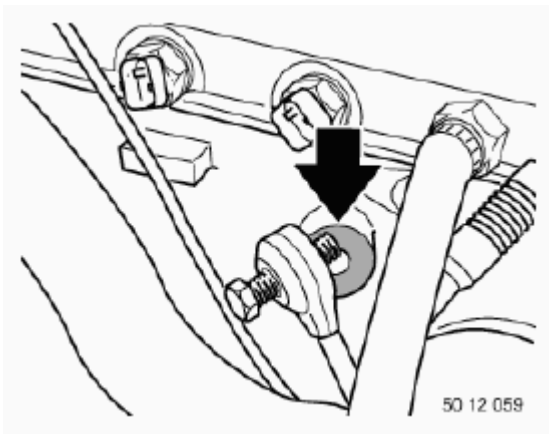


Fig. 18: Support Face Of Knock Sensors
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: **Check stored fault messages.**
 Now clear the fault memory.

12 14 700 CODING CONTROL MODULE (DME / DDE)

Switch off ignition.

Connect MoDiC or DIS/GT1 Tester.

Switch on ignition.

Select "Coding" program.

For subsequent procedure, follow instructions in MoDiC or DIS/GT1 Tester.

Carry out adjustment of following control units:

- EWS (electronic immobilizer)
- DME (Digital Motor Electronics) or
- DDE (Digital Diesel Electronics)

12 14 705 PROGRAMMING CONTROL UNIT (DME / DDE)

Switch off ignition.

Connect MoDiC or DIS/GT1 Tester.

Switch on ignition.

Select "Programming".

For subsequent procedure, follow instructions in MoDiC or DIS/GT1 Tester.

Carry out adjustment of following control units:

- EWS (electronic immobilizer)
- DME (Digital Motor Electronics) or
- DDE (Digital Diesel Electronics)

31 ALTERNATOR WITH DRIVE AND MOUNTING

12 31... REPLACING ALTERNATOR BELT PULLEY

Special tools required:

See **12 ENGINE ELECTRICAL SYSTEM**

- 12 7 110

Remove and install alternator drive belt.

Depending on alternator type, grip shaft with:

- hexagon socket
- multi-tooth socket or
- Torx socket wrench

Release nut with special tool 12 7 110.

Installation:

Tightening torque: 12 31 2AZ / 12 31 3AZ, see **12 31 ALTERNATOR WITH DRIVE AND MOUNTING PARTS**.

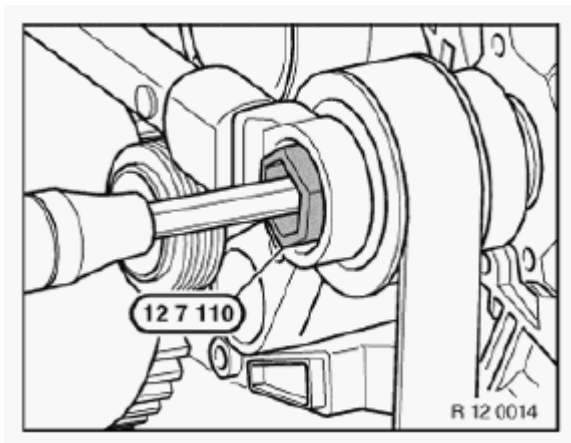


Fig. 19: Special Tool 12 7 110

Courtesy of BMW OF NORTH AMERICA, INC.

12 31... REPLACING ALTERNATOR BELT PULLEY

Special tools required:

See **12 ENGINE ELECTRICAL SYSTEM**

- 12 7 121
- 12 7 122

Illustrations show N42:

If fitted, remove cover cap from belt pulley.

Depending on alternator type, slacken screw with:

- Torx socket wrench
- Slacken multi-tooth socket wrench (special tool 12 7 122).

Grip freewheel with special tool 12 7 121.

Installation:

Tightening torque: 12 31 8AZ, see **12 31 ALTERNATOR WITH DRIVE AND MOUNTING PARTS** .

Remove alternator drive belt.

Release screw and if necessary remove freewheel.



Fig. 20: Special Tool 12 7 121 And 12 7 122

Courtesy of BMW OF NORTH AMERICA, INC.

12 31 ... REPLACING ALTERNATOR BELT PULLEY (WITH OVERRUNNING CLUTCH)

Special tools required:

See 12 ENGINE ELECTRICAL SYSTEM

- 12 7 120

Remove and install alternator drive belt. Grip alternator shaft with: - internal serration. Release nut with special tools 12 7 120.

Installation: Tightening torque, see 12 31 3AZ in 31 ALTERNATOR WITH DRIVE AND MOUNT .

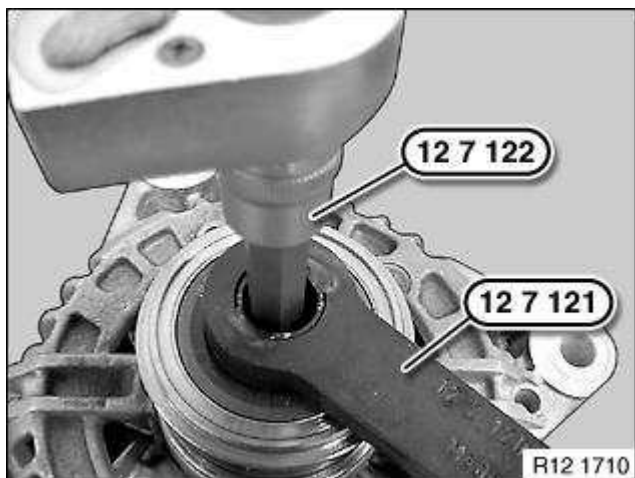


Fig. 21: Release Nut With Special Tools 12 7 120
Courtesy of BMW OF NORTH AMERICA, INC.

12 31 009 CHECKING ALTERNATOR (BSD)

Necessary preliminary tasks:

- Correct connections on charged battery
- Correct connections on alternator and starter motor
- Good ground connection between engine and body
- Tensioned ribbed V-belt
- Read out DME/DDE fault memory.

NOTE: **The alternator with BSD interface can communicate with the engine control unit (DME/DDE).**
 The alternator is not connected to the charge telltale light.
 The alternator can identify various faults.

BSD alternator can be recognized by the plug connection on the alternator.

Connect diagnosis tester.

- Function selection
- Complete vehicle
- Drive
- Voltage and current regulation
- Voltage and current generation
- Alternator
- Follow instruction in diagnostic program

Oscillogram for a fault-free alternator:

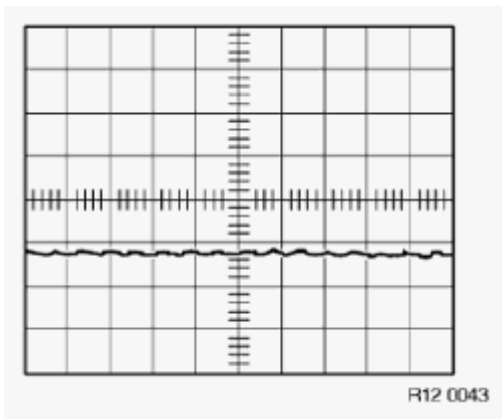


Fig. 22: Oscillogram Graph - Fault-Free Alternator
Courtesy of BMW OF NORTH AMERICA, INC.

Oscillogram for a faulty alternator:

One phase interrupted.

Repair/exchange alternator.

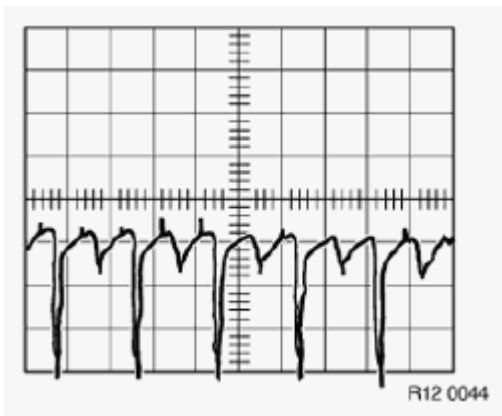


Fig. 23: Oscillogram Graph - One Phase Interrupted

Courtesy of BMW OF NORTH AMERICA, INC.

Interturn fault.

Repair/exchange alternator.

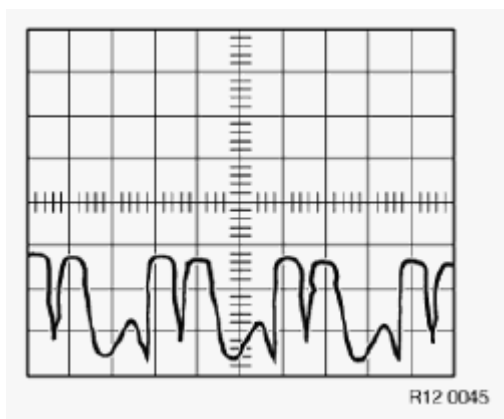


Fig. 24: Oscilloscope Graph - Interturn Fault
Courtesy of BMW OF NORTH AMERICA, INC.

Open circuit in negative diode.

Repair/exchange alternator.

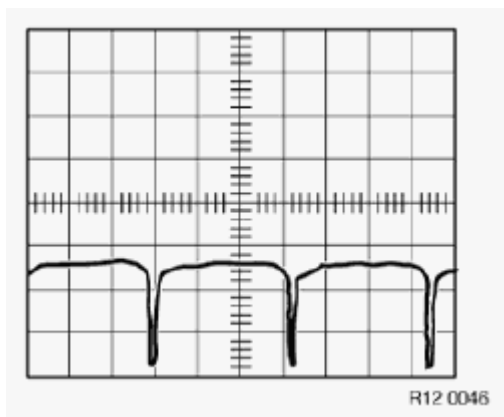


Fig. 25: Oscilloscope Graph - Open Circuit In Negative Diode
Courtesy of BMW OF NORTH AMERICA, INC.

Short circuit in positive diode.

Repair/exchange alternator.

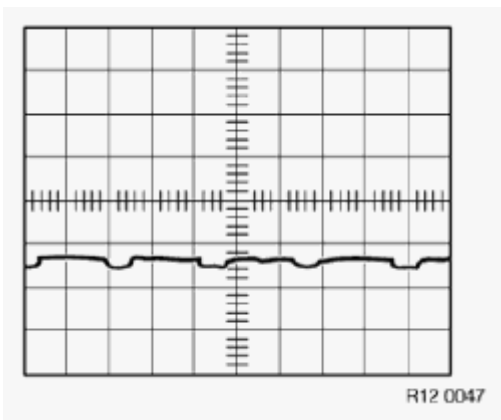


Fig. 26: Oscillogram Graph - Short Circuit In Positive Diode
 Courtesy of BMW OF NORTH AMERICA, INC.

Open circuit in positive diode.

Repair/exchange alternator.

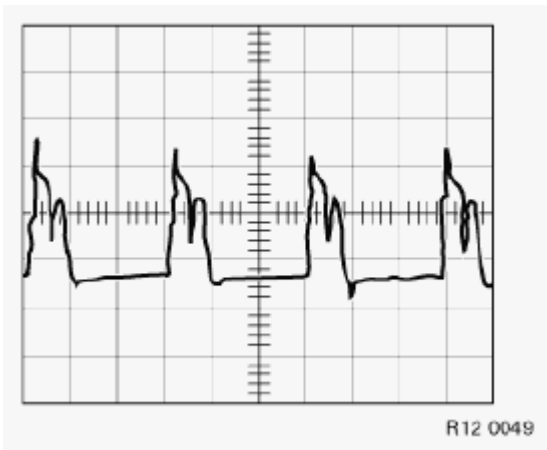


Fig. 27: Oscillogram Graph - Open Circuit In Positive Diode
 Courtesy of BMW OF NORTH AMERICA, INC.

Open circuit in exciter diode.

Repair/exchange alternator.

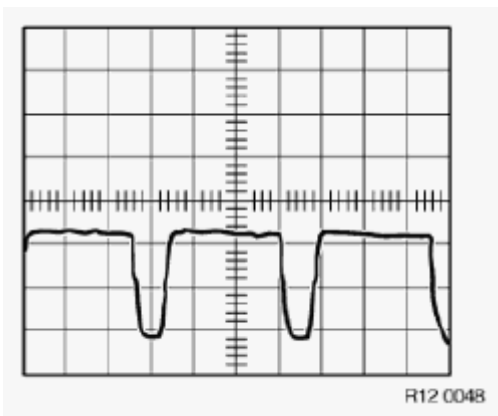


Fig. 28: Oscillogram Graph - Open Circuit In Exciter Diode
 Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check function of DME/DDE.

12 31 020 REMOVING AND INSTALLING OR REPLACING ALTERNATOR (N52, N52K, N51, N53)

IMPORTANT: Aluminium-magnesium materials.

No steel screws/bolts may be used due to the threat of electrochemical corrosion.

A magnesium crankcase requires aluminium screws/bolts exclusively.

Aluminium screws/bolts must be replaced each time they are released.

The end faces of aluminium screws/bolts are painted blue for the purposes of reliable identification.

Jointing torque and angle of rotation must be observed without fail (risk of damage).

Necessary preliminary tasks:

- Switch off ignition
- Disconnect battery negative lead **61 20 900 DISCONNECTING AND CONNECTING BATTERY NEGATIVE LEAD**
- Remove intake filter housing
- Remove alternator drive belt

Unlock plug (1) and remove.

Slacken nut (2).

Installation:

Tightening torque 12 31 1AZ.

Release screws and remove alternator (3).

Installation:

Replace aluminium screws.

Tightening torque 12 31 2AZ.

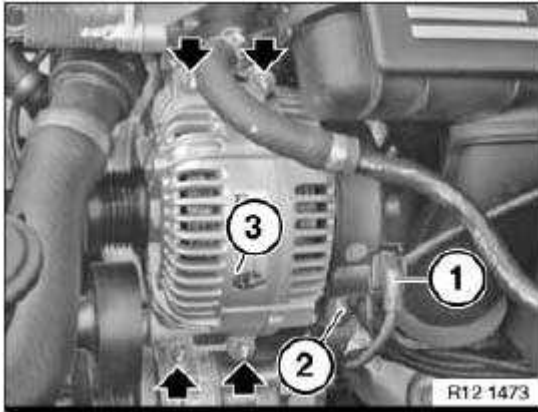


Fig. 29: Plug And Alternator

Courtesy of BMW OF NORTH AMERICA, INC.

32 REGULATOR

12 32 501 REPLACING VOLTAGE REGULATOR

Necessary preliminary tasks:

- Switch off ignition
- Disconnect battery negative lead **61 20 900 DISCONNECTING AND CONNECTING BATTERY NEGATIVE LEAD**
- Notes on removing and installing electronic control units
- Remove alternator

Bosch:

Release protective caps (1).

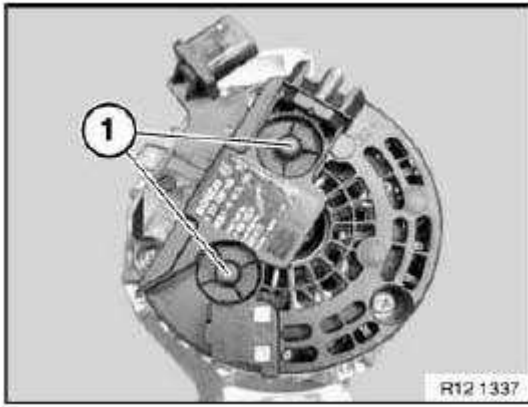


Fig. 30: Protective Caps

Courtesy of BMW OF NORTH AMERICA, INC.

Bosch:

Release screw (1) and nuts (2), remove cover.

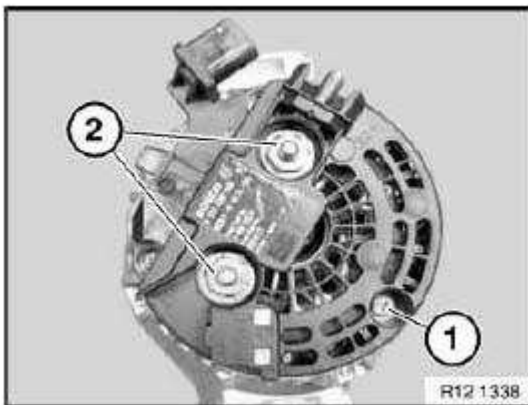


Fig. 31: Cover Screw And Nuts

Courtesy of BMW OF NORTH AMERICA, INC.

Bosch:

Release screws and remove regulator switch (1) in direction of arrow.

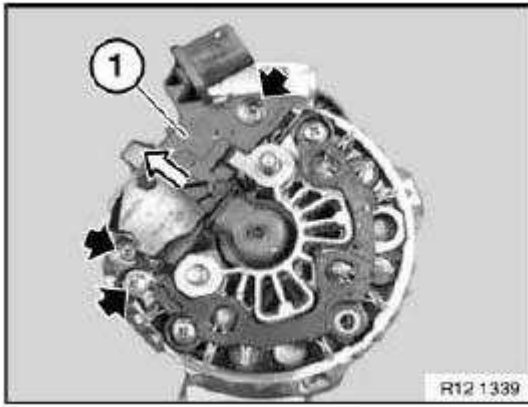


Fig. 32: Removing Regulator Switch

Courtesy of BMW OF NORTH AMERICA, INC.

Bosch:

Installation:

Clean contact surfaces and check pretension of contact spring, replace regulator switch if necessary.

Measurement A = min. 5 mm.

Check collector ring for wear and recondition if necessary.

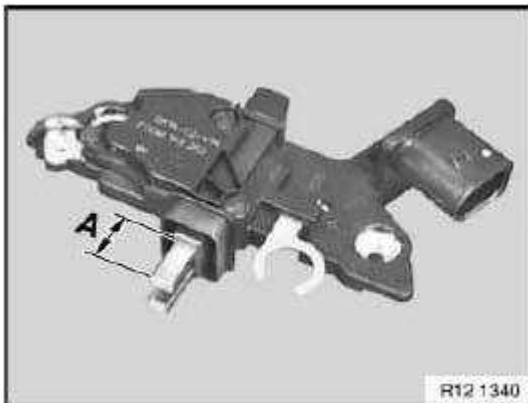


Fig. 33: Pretension Of Contact Spring

Courtesy of BMW OF NORTH AMERICA, INC.

Valeo:

Unscrew nut (1).

Slacken nut (2).

Release screws (3).

Release cover (4).

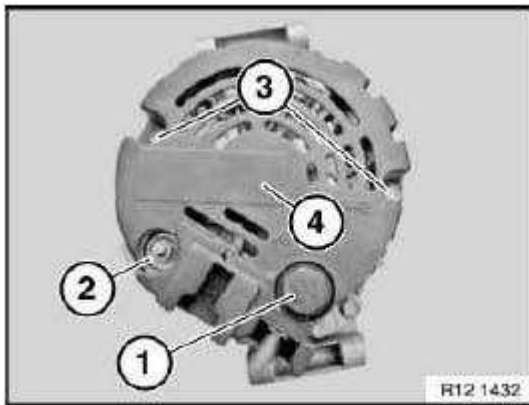


Fig. 34: Cover Nuts And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Valeo:

Release screws.

Remove regulator switch (1) towards top.

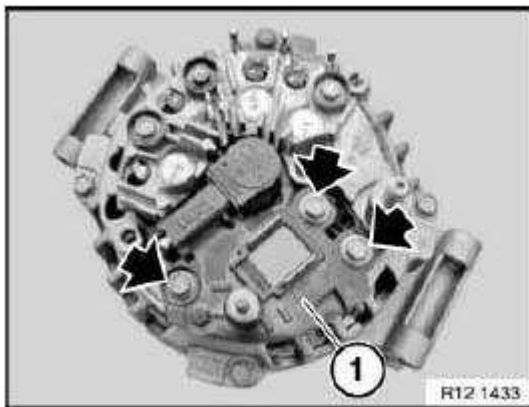


Fig. 35: Regulator Switch
Courtesy of BMW OF NORTH AMERICA, INC.

Valeo:

Installation:

Clean contact surfaces and check pretension of contact spring, replace regulator switch if necessary.

Measurement A = min. 5 mm.

Check collector ring for wear and recondition if necessary.

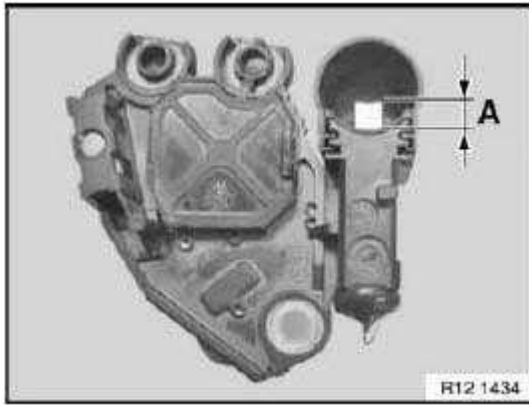


Fig. 36: Pretension Of Contact Spring
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Fit new regulator (1) with attached mounting sleeve (2) or locked carbon brush.

Pull off mounting sleeve (2) and replace with cover (3).

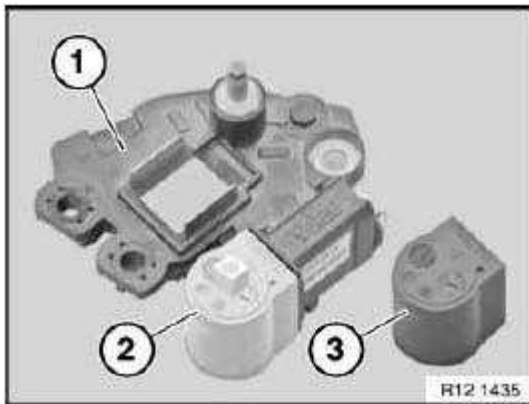


Fig. 37: Regulator With Mounting Sleeve
 Courtesy of BMW OF NORTH AMERICA, INC.

41 STARTER WITH MOUNTING

12 41 020 REMOVING AND INSTALLING/REPLACING STARTER (N52, N52K, N51, N53, N54)

IMPORTANT: Aluminium-magnesium materials.

No steel screws/bolts may be used due to the threat of electrochemical corrosion.

A magnesium crankcase requires aluminium screws/bolts exclusively.

Aluminium screws/bolts must be replaced each time they are released.

The end faces of aluminium screws/bolts are painted blue for the purposes of

reliable identification.

Jointing torque and angle of rotation must be observed without fail (risk of damage).

Necessary preliminary tasks:

- Switch off ignition
- Disconnect battery negative lead **61 20 900 DISCONNECTING AND CONNECTING BATTERY NEGATIVE LEAD**
- Remove intake air manifold

Unlock plug (1) and remove.

Unfasten nut.

Tightening torque: 12 41 3AZ, see **12 41 STARTER MOTOR WITH MOUNTING**

Remove battery positive lead (2).

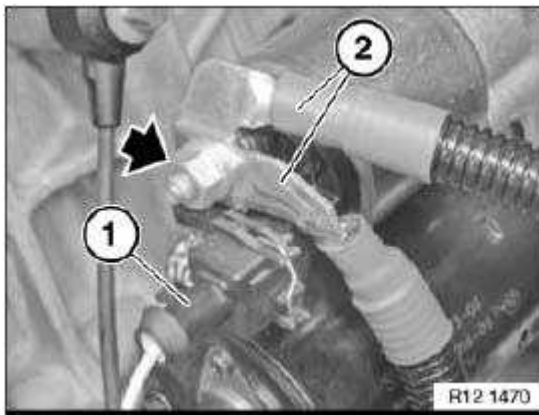


Fig. 38: Plug And Battery Positive Lead
Courtesy of BMW OF NORTH AMERICA, INC.

Release bolt (1).

Installation:

Replace aluminium screws.

Tightening torque: 12 41 1AZ, see **12 41 STARTER MOTOR WITH MOUNTING** .

Release screws (2).

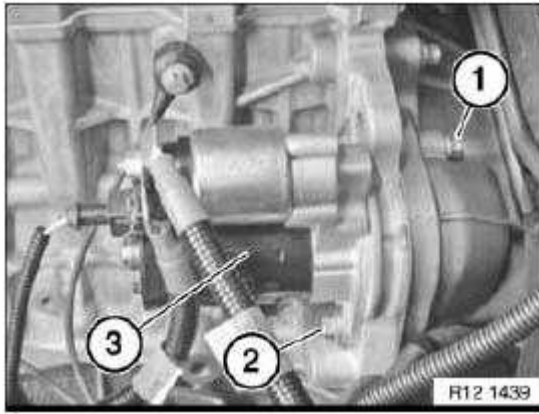


Fig. 39: Starter Motor

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace aluminium screws.

Tightening torque: 12 41 2AZ, see **12 41 STARTER MOTOR WITH MOUNTING**

Remove starter motor (3).

Installation:

Check starter pinion and ring gear for damage, replace starter motor if necessary.

12 41 041 REPLACING SOLENOID SWITCH

Turn off ignition.

Remove starter motor.

Release nut (1).

Remove cable lug (2).

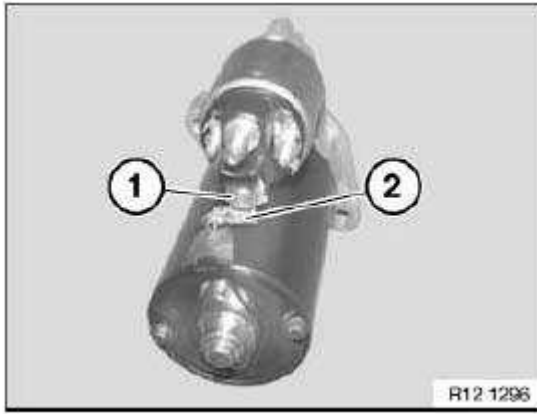


Fig. 40: Cable Lug

Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Do not turn cable lug (2) while tightening down - risk of short circuit to starter motor housing.

Tightening torque: 12 41 4AZ, see 12 41 STARTER MOTOR WITH MOUNTING

Release screws (1).

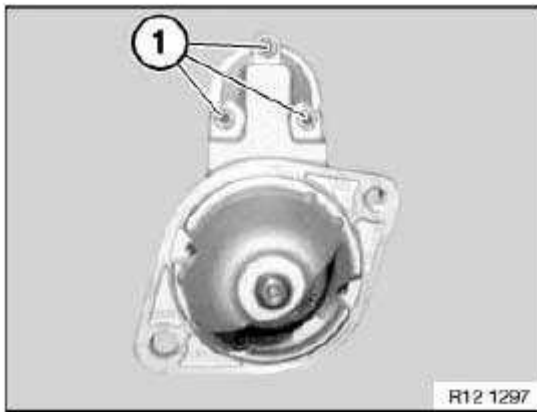


Fig. 41: Starter Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Remove solenoid switch (1) and spring (2).

Unhook pin (3).

Installation:

Check pin (3) for wear and apply grease.

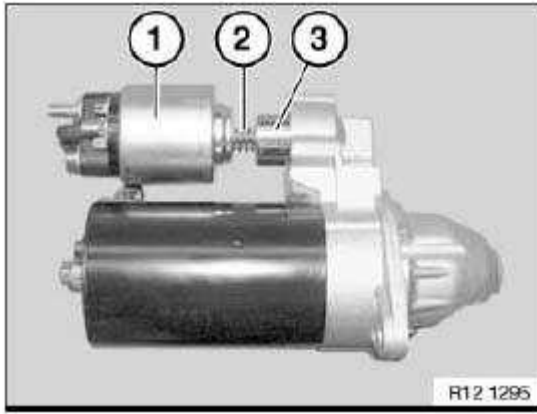


Fig. 42: Solenoid Switch, Pin And Spring
Courtesy of BMW OF NORTH AMERICA, INC.

61 OIL PRESSURE-OIL TEMPERATURE GAUGE

12 61 280 REMOVING AND INSTALLING/REPLACING OIL PRESSURE SENSOR (N52, N52K, N51, N54, N53)

Necessary preliminary tasks:

- Switch off ignition
- **N52, N52K, N51, N53 only:**
 - Remove ignition coil cover
- **N54 only:**
 - Remove intake filter housing

WARNING: Scalding hazard!
Only perform this task on an engine that has cooled down.

Installation location:

Oil filter housing, front left.

Engine oil may emerge when oil pressure sensor is replaced; have a cleaning cloth ready.

Unlock plug (1) and remove.

Release oil pressure sensor (2).

Tightening torque: 12 61 1AZ, see **12 61 ENGINE OIL PRESSURE, ENGINE OIL TEMPERATURE, OIL CONDITION DISPLAY** .

Installation:

Check engine oil level, top up engine oil if necessary.

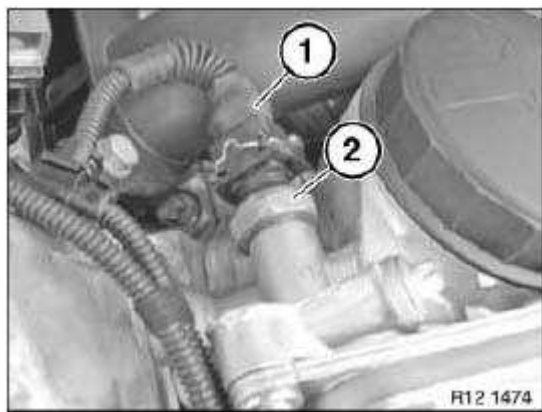


Fig. 43: Plug And Oil Pressure Sensor
Courtesy of BMW OF NORTH AMERICA, INC.

12 61 285 REPLACING ENGINE OIL LEVEL SENSOR (N52, N52K, N51, N46, N54, N53)

IMPORTANT: Read and comply with 61 35 ... NOTES ON ESD PROTECTION (ELECTRO STATIC DISCHARGE) .

Necessary preliminary tasks:

- Switch off ignition
- E60 / E63 / E64 / E83 / E85 / E86 / E70 only: Remove reinforcement plate, see **31 10 010 REMOVING AND INSTALLING/REPLACING REINFORCEMENT PLATE** .
- E81 / E87 / E90 / E91 / E92 / E93 only: Remove underbody protection
- Drain off engine oil

Unlock plug (1) and remove.

Unscrew nuts.

Tightening torque: 12 61 2AZ, see **12 61 ENGINE OIL PRESSURE, ENGINE OIL TEMPERATURE, OIL CONDITION DISPLAY** .

Remove oil level sensor (2).

Installation:

Clean sealing face on oil sump.

Replace seal on oil level sensor.

An excessively low torque value will result in oil leaks.

An excessively high torque value will result in damage to the oil level sensor.

Top up engine oil.

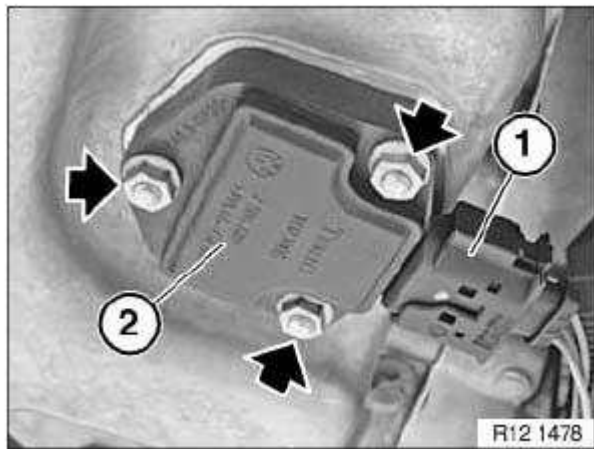


Fig. 44: Oil Level Sensor And Plug

Courtesy of BMW OF NORTH AMERICA, INC.

ENGINE PERFORMANCE

Diagnostic Trouble Codes - MSV80 Engine Operating System

BMW MSV80

MSV80 engine operating system applies to N54 engine.

DIAGNOSTIC TROUBLE CODES TABLE

DTC	Description
<u>DTC P0010</u>	'A' Camshaft Position - Actuator Circuit/Open (Bank 1) (SIG)
<u>DTC P0012</u>	'A' Camshaft Position - Timing Over-Retarded (Bank 1) (PLAUS)
<u>DTC P0013</u>	'B' Camshaft Position - Actuator Circuit/Open (Bank 1) (SIG)
<u>DTC P0015</u>	'B' Camshaft Position - Timing Over-Retarded (Bank 1) (PLAUS)
<u>DTC P0016</u>	Crankshaft Position - Camshaft Position Correlation (Bank 1 Sensor A) (MAX)
<u>DTC P0017</u>	Crankshaft Position - Camshaft Position Correlation (Bank 1 Sensor B) (MAX)
<u>DTC P0030</u>	HO2S Heater Control Circuit (Bank 1 Sensor 1) (SIG)
<u>DTC P0031</u>	HO2S Heater Control Circuit Low (Bank 1 Sensor 1) (MIN)
<u>DTC P0032</u>	HO2S Heater Control Circuit High (Bank 1 Sensor 1) (MAX)
<u>DTC P0036</u>	HO2S Heater Control Circuit (Bank 1 Sensor 2) (SIG)
<u>DTC P0037</u>	HO2S Heater Control Circuit Low (Bank 1 Sensor 2) (MIN)
<u>DTC P0038</u>	HO2S Heater Control Circuit High (Bank 1 Sensor 2) (MAX)
<u>DTC P0040</u>	O2 Sensor Signals Swapped Bank 1 Sensor 1 / Bank 2 Sensor 1 (PLAUS)
<u>DTC P0041</u>	O2 Sensor Signals Swapped Bank 1 Sensor 2 / Bank 2 Sensor 2 (PLAUS)
<u>DTC P0050</u>	HO2S Heater Control Circuit (Bank 2 Sensor 1) (SIG)
<u>DTC P0051</u>	HO2S Heater Control Circuit Low (Bank 2 Sensor 1) (MIN)
<u>DTC P0052</u>	HO2S Heater Control Circuit High (Bank 2 Sensor 1) (MAX)
<u>DTC P0056</u>	HO2S Heater Control Circuit (Bank 2 Sensor 2) (SIG)
<u>DTC P0057</u>	HO2S Heater Control Circuit Low (Bank 2 Sensor 2) (MIN)
<u>DTC P0058</u>	HO2S Heater Control Circuit High (Bank 2 Sensor 2) (MAX)
<u>DTC P0070</u>	Ambient Air Temperature Sensor Circuit (SIG)
<u>DTC P0071</u>	Ambient Air Temperature Sensor Range/Performance (PLAUS)
<u>DTC P0072</u>	Ambient Air Temperature Sensor Circuit Low (MIN)
<u>DTC P0073</u>	Ambient Air Temperature Sensor Circuit High (MAX)
<u>DTC P00B2</u>	Radiator Coolant Temperature Sensor Circuit Range/Performance (PLAUS)
<u>DTC P00B3</u>	Radiator Coolant Temperature Sensor Circuit Low (MIN)
<u>DTC P00B4</u>	Radiator Coolant Temperature Sensor Circuit High (MAX)
<u>DTC P0100</u>	Mass or Volume Air Flow 'A' Circuit (MAX)
<u>DTC P0111</u>	Intake Air Temperature Sensor 1 Circuit Range/Performance (Bank 1) (PLAUS)
<u>DTC P0112</u>	Intake Air Temperature Sensor 1 Circuit Low (Bank 1) (MIN)
<u>DTC P0113</u>	Intake Air Temperature Sensor 1 Circuit High (Bank 1) (MAX)
<u>DTC P0117</u>	Engine Coolant Temperature Sensor 1 Circuit Low (MIN)

<u>DTC P0118</u>	Engine Coolant Temperature Sensor 1 Circuit High (MAX)
<u>DTC P0121</u>	Throttle/Pedal Position Sensor/Switch 'A' Circuit Range/Performance (PLAUS)
<u>DTC P0122</u>	Throttle/Pedal Position Sensor/Switch 'A' Circuit Low (MIN)
<u>DTC P0123</u>	Throttle/Pedal Position Sensor/Switch 'A' Circuit High (MAX)
<u>DTC P0128</u>	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature) (PLAUS)
<u>DTC P0131</u>	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 1) (MIN)
<u>DTC P0132</u>	O2 Sensor Circuit High Voltage (Bank 1 Sensor 1) (MAX)
<u>DTC P0133</u>	O2 Sensor Circuit Slow Response (Bank 1 Sensor 1) (MAX)
<u>DTC P0135</u>	O2 Sensor Heater Circuit (Bank 1 Sensor 1) (MAX)
<u>DTC P0135</u>	O2 Sensor Heater Circuit (Bank 1 Sensor 1) (MIN)
<u>DTC P0137</u>	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 2) (MIN)
<u>DTC P0138</u>	O2 Sensor Circuit High Voltage (Bank 1 Sensor 2) (MAX)
<u>DTC P0139</u>	O2 Sensor Circuit Slow Response (Bank 1 Sensor 2) (PLAUS)
<u>DTC P0140</u>	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 2) (SIG)
<u>DTC P0141</u>	O2 Sensor Heater Circuit (Bank 1 Sensor 2) (MAX)
<u>DTC P0151</u>	O2 Sensor Circuit Low Voltage (Bank 2 Sensor 1) (MIN)
<u>DTC P0152</u>	O2 Sensor Circuit High Voltage (Bank 2 Sensor 1) (MAX)
<u>DTC P0153</u>	O2 Sensor Circuit Slow Response (Bank 2 Sensor 1) (MAX)
<u>DTC P0155</u>	O2 Sensor Heater Circuit (Bank 2 Sensor 1) (MAX)
<u>DTC P0155</u>	O2 Sensor Heater Circuit (Bank 2 Sensor 1) (MIN)
<u>DTC P0157</u>	O2 Sensor Circuit Low Voltage (Bank 2 Sensor 2) (MIN)
<u>DTC P0158</u>	O2 Sensor Circuit High Voltage (Bank 2 Sensor 2) (MAX)
<u>DTC P0159</u>	O2 Sensor Circuit Slow Response (Bank 2 Sensor 2) (PLAUS)
<u>DTC P0160</u>	O2 Sensor Circuit No Activity Detected (Bank 2 Sensor 2) (SIG)
<u>DTC P0161</u>	O2 Sensor Heater Circuit (Bank 2 Sensor 2) (MAX)
<u>DTC P0171</u>	System Too Lean (Bank 1) (MAX)
<u>DTC P0172</u>	System Too Rich (Bank 1) (MIN)
<u>DTC P0174</u>	System Too Lean (Bank 2) (MAX)
<u>DTC P0175</u>	System Too Rich (Bank 2) (MIN)
<u>DTC P0201</u>	Injector Circuit/Open - Cylinder 1 (SIG)
<u>DTC P0202</u>	Injector Circuit/Open - Cylinder 2 (SIG)
<u>DTC P0203</u>	Injector Circuit/Open - Cylinder 3 (SIG)
<u>DTC P0204</u>	Injector Circuit/Open - Cylinder 4 (SIG)
<u>DTC P0205</u>	Injector Circuit/Open - Cylinder 5 (SIG)
<u>DTC P0206</u>	Injector Circuit/Open - Cylinder 6 (SIG)
<u>DTC P0221</u>	Throttle/Pedal Position Sensor/Switch 'B' Circuit Range/Performance (PLAUS)
<u>DTC P0222</u>	Throttle/Pedal Position Sensor/Switch 'B' Circuit Low (MIN)
<u>DTC P0223</u>	Throttle/Pedal Position Sensor/Switch 'B' Circuit High (MAX)
<u>DTC P0261</u>	Cylinder 1 Injector Circuit Low (MIN)
<u>DTC P0262</u>	Cylinder 1 Injector Circuit High (MAX)

<u>DTC P0264</u>	Cylinder 2 Injector Circuit Low (MIN)
<u>DTC P0265</u>	Cylinder 2 Injector Circuit High (MAX)
<u>DTC P0267</u>	Cylinder 3 Injector Circuit Low (MIN)
<u>DTC P0268</u>	Cylinder 3 Injector Circuit High (MAX)
<u>DTC P0270</u>	Cylinder 4 Injector Circuit Low (MIN)
<u>DTC P0271</u>	Cylinder 4 Injector Circuit High (MAX)
<u>DTC P0273</u>	Cylinder 5 Injector Circuit Low (MIN)
<u>DTC P0274</u>	Cylinder 5 Injector Circuit High (MAX)
<u>DTC P0276</u>	Cylinder 6 Injector Circuit Low (MIN)
<u>DTC P0277</u>	Cylinder 6 Injector Circuit High (MAX)
<u>DTC P0300</u>	Random/Multiple Cylinder Misfire Detected (MAX)
<u>DTC P0300</u>	Random/Multiple Cylinder Misfire Detected (MIN)
<u>DTC P0300</u>	Random/Multiple Cylinder Misfire Detected (PLAUS)
<u>DTC P0300</u>	Random/Multiple Cylinder Misfire Detected (SIG)
<u>DTC P0301</u>	Cylinder 1 Misfire Detected (MAX)
<u>DTC P0301</u>	Cylinder 1 Misfire Detected (MIN)
<u>DTC P0301</u>	Cylinder 1 Misfire Detected (SIG)
<u>DTC P0302</u>	Cylinder 2 Misfire Detected (MAX)
<u>DTC P0302</u>	Cylinder 2 Misfire Detected (MIN)
<u>DTC P0302</u>	Cylinder 2 Misfire Detected (SIG)
<u>DTC P0303</u>	Cylinder 3 Misfire Detected (MAX)
<u>DTC P0303</u>	Cylinder 3 Misfire Detected (MIN)
<u>DTC P0303</u>	Cylinder 3 Misfire Detected (SIG)
<u>DTC P0304</u>	Cylinder 4 Misfire Detected (MAX)
<u>DTC P0304</u>	Cylinder 4 Misfire Detected (MIN)
<u>DTC P0304</u>	Cylinder 4 Misfire Detected (SIG)
<u>DTC P0305</u>	Cylinder 5 Misfire Detected (MAX)
<u>DTC P0305</u>	Cylinder 5 Misfire Detected (MIN)
<u>DTC P0305</u>	Cylinder 5 Misfire Detected (SIG)
<u>DTC P0306</u>	Cylinder 6 Misfire Detected (MAX)
<u>DTC P0306</u>	Cylinder 6 Misfire Detected (MIN)
<u>DTC P0306</u>	Cylinder 6 Misfire Detected (SIG)
<u>DTC P0313</u>	Misfire Detected With Low Fuel (MIN)
<u>DTC P0326</u>	Knock Sensor 1 Circuit Range/Performance (Bank 1 or Single Sensor) (PLAUS)
<u>DTC P0327</u>	Knock Sensor 1 Circuit Low (Bank 1 or Single Sensor) (MIN)
<u>DTC P0328</u>	Knock Sensor 1 Circuit High (Bank 1 or Single Sensor) (MAX)
<u>DTC P0335</u>	Crankshaft Position Sensor 'A' Circuit (MAX)
<u>DTC P0335</u>	Crankshaft Position Sensor 'A' Circuit (MIN)
<u>DTC P0340</u>	Camshaft Position Sensor 'A' Circuit (Bank 1 or Single Sensor) (MAX)
<u>DTC P0341</u>	Camshaft Position Sensor 'A' Circuit Range/Performance (Bank 1 or Single Sensor) (MAX)

<u>DTC P0344</u>	Camshaft Position Sensor 'A' Circuit Intermittent (Bank 1 or Single Sensor) (MAX)
<u>DTC P0351</u>	Ignition Coil 'A' Primary/Secondary Circuit (MAX)
<u>DTC P0352</u>	Ignition Coil 'B' Primary/Secondary Circuit (MAX)
<u>DTC P0353</u>	Ignition Coil 'C' Primary/Secondary Circuit (MAX)
<u>DTC P0354</u>	Ignition Coil 'D' Primary/Secondary Circuit (MAX)
<u>DTC P0355</u>	Ignition Coil 'E' Primary/Secondary Circuit (MAX)
<u>DTC P0356</u>	Ignition Coil 'F' Primary/Secondary Circuit (MAX)
<u>DTC P0365</u>	Camshaft Position Sensor 'B' Circuit (Bank 1) (MAX)
<u>DTC P0366</u>	Camshaft Position Sensor 'B' Circuit Range/Performance (Bank 1) (MAX)
<u>DTC P0369</u>	Camshaft Position Sensor 'B' Circuit Intermittent (Bank 1) (MAX)
<u>DTC P0370</u>	Timing Reference High Resolution Signal 'A' (MAX)
<u>DTC P0370</u>	Timing Reference High Resolution Signal 'A' (MAX)
<u>DTC P0370</u>	Timing Reference High Resolution Signal 'A' (MIN)
<u>DTC P0373</u>	Timing Reference High Resolution Signal 'A' Intermittent/Erratic Pulses (MAX)
<u>DTC P0420</u>	Catalyst System Efficiency Below Threshold (Bank 1) (MAX)
<u>DTC P0420</u>	Catalyst System Efficiency Below Threshold (Bank 1) (MIN)
<u>DTC P0430</u>	Catalyst System Efficiency Below Threshold (Bank 2) (MAX)
<u>DTC P0430</u>	Catalyst System Efficiency Below Threshold (Bank 2) (MIN)
<u>DTC P0440</u>	Evaporative Emission System (PLAUS)
<u>DTC P0441</u>	Evaporative Emission System Incorrect Purge Flow (SIG)
<u>DTC P0442</u>	Evaporative Emission System Leak Detected (small leak) (MAX)
<u>DTC P0444</u>	Evaporative Emission System Purge Control Valve Circuit Open (SIG)
<u>DTC P0456</u>	Evaporative Emission System Leak Detected (very small leak) (MIN)
<u>DTC P0458</u>	Evaporative Emission System Purge Control Valve Circuit Low (MIN)
<u>DTC P0459</u>	Evaporative Emission System Purge Control Valve Circuit High (MAX)
<u>DTC P0461</u>	Fuel Level Sensor 'A' Circuit Range/Performance (PLAUS)
<u>DTC P0462</u>	Fuel Level Sensor 'A' Circuit Low (MIN)
<u>DTC P0463</u>	Fuel Level Sensor 'A' Circuit High (MAX)
<u>DTC P0475</u>	Exhaust Pressure Control Valve (SIG)
<u>DTC P0477</u>	Exhaust Pressure Control Valve Low (MIN)
<u>DTC P0478</u>	Exhaust Pressure Control Valve High (MAX)
<u>DTC P0480</u>	Fan 1 Control Circuit (SIG)
<u>DTC P0491</u>	Secondary Air Injection System Insufficient Flow (Bank 1) (MAX)
<u>DTC P0492</u>	Secondary Air Injection System Insufficient Flow (Bank 2) (MIN)
<u>DTC P0500</u>	Vehicle Speed Sensor 'A' (SIG)
<u>DTC P0503</u>	Vehicle Speed Sensor 'A' Intermittent/Erratic/High (PLAUS)
<u>DTC P0506</u>	Idle Air Control System RPM Lower Than Expected (MIN)
<u>DTC P0507</u>	Idle Air Control System RPM Higher Than Expected (MAX)
<u>DTC P0512</u>	Starter Request Circuit (MAX)
<u>DTC P0512</u>	Starter Request Circuit (MIN)

<u>DTC P0512</u>	Starter Request Circuit (SIG)
<u>DTC P0520</u>	Engine Oil Pressure Sensor/Switch Circuit (SIG)
<u>DTC P0521</u>	Engine Oil Pressure Sensor/Switch Range/ Performance (PLAUS)
<u>DTC P0522</u>	Engine Oil Pressure Sensor/Switch Low (MIN)
<u>DTC P0523</u>	Engine Oil Pressure Sensor/Switch High (MAX)
<u>DTC P0524</u>	Engine Oil Pressure Too Low (MIN)
<u>DTC P0571</u>	Brake Switch 'A' Circuit (PLAUS)
<u>DTC P0597</u>	Thermostat Heater Control Circuit/Open (SIG)
<u>DTC P0598</u>	Thermostat Heater Control Circuit Low (MIN)
<u>DTC P0599</u>	Thermostat Heater Control Circuit High (MAX)
<u>DTC P0604</u>	Internal Control Module Random Access Memory (RAM) Error (MAX)
<u>DTC P0604</u>	Internal Control Module Random Access Memory (RAM) Error (MIN)
<u>DTC P0604</u>	Internal Control Module Random Access Memory (RAM) Error (MIN)
<u>DTC P0605</u>	Internal Control Module Read Only Memory (ROM) Error (MAX)
<u>DTC P0606</u>	ECM/PCM Processor (SIG)
<u>DTC P060C</u>	Internal Control Module Main Processor Performance (PLAUS)
<u>DTC P0620</u>	Generator Control Circuit (MAX)
<u>DTC P0620</u>	Generator Control Circuit (SIG)
<u>DTC P062F</u>	Internal Control Module EEPROM Error (PLAUS)
<u>DTC P062F</u>	Internal Control Module EEPROM Error (SIG)
<u>DTC P062F</u>	Internal Control Module EEPROM Error (SIG)
<u>DTC P0645</u>	A/C Clutch Relay Control Circuit (SIG)
<u>DTC P0646</u>	A/C Clutch Relay Control Circuit Low (MIN)
<u>DTC P0647</u>	A/C Clutch Relay Control Circuit High (MAX)
<u>DTC P0668</u>	PCM/ECM/TCM Internal Temperature Sensor Circuit Low (MIN)
<u>DTC P0669</u>	PCM/ECM/TCM Internal Temperature Sensor Circuit High (MAX)
<u>DTC P0686</u>	ECM/PCM Power Relay Control Circuit Low (MIN)
<u>DTC P0687</u>	ECM/PCM Power Relay Control Circuit High (MAX)
<u>DTC P0691</u>	Fan 1 Control Circuit Low (MIN)
<u>DTC P0692</u>	Fan 1 Control Circuit High (MAX)
<u>DTC P0703</u>	Brake Switch 'B' Circuit (PLAUS)
<u>DTC P0831</u>	Clutch Pedal Switch 'A' Circuit Low (MIN)
<u>DTC P0832</u>	Clutch Pedal Switch 'A' Circuit High (MAX)
<u>DTC P0A14</u>	Engine Mount 'A' Control Circuit/Open (MAX)
<u>DTC P0A14</u>	Engine Mount 'A' Control Circuit/Open (MIN)
<u>DTC P0A14</u>	Engine Mount 'A' Control Circuit/Open (SIG)
<u>DTC P0A14</u>	Engine Mount 'A' Control Circuit/Open (SIG)
<u>DTC P0A15</u>	Engine Mount 'A' Control Circuit Low (MIN)
<u>DTC P0A16</u>	Engine Mount 'A' Control Circuit High (MAX)
<u>DTC P0A3B</u>	Generator Over Temperature (MAX)
<u>DTC P0A3B</u>	Generator Over Temperature (MAX)
<u>DTC P1004</u>	

	VVT-Guiding Sensor Solenoid Loss (Bank 1) (MAX)
<u>DTC P1006</u>	VVT-Guiding Sensor Parity Error (Bank 1) (SIG)
<u>DTC P1012</u>	VVT-Reference Sensor Solenoid Loss (Bank 1) (MAX)
<u>DTC P1014</u>	VVT-Reference Sensor Parity Error (Bank 1) (SIG)
<u>DTC P1017</u>	VVT-Sensors Plausibility (Bank 1) (PLAUS)
<u>DTC P1017</u>	VVT-Sensors Plausibility (Bank 1) (PLAUS)
<u>DTC P1019</u>	VVT-Supply Voltage Sensors High Input (Bank 1) (MAX)
<u>DTC P101A</u>	VVT-Self-Learning Function, Stops Not Learned (MAX)
<u>DTC P101A</u>	VVT-Self-Learning Function, Stops Not Learned (MIN)
<u>DTC P101A</u>	VVT-Self-Learning Function, Stops Not Learned (SIG)
<u>DTC P1020</u>	VVT-Supply Voltage Sensors Low Input (Bank 1) (MIN)
<u>DTC P1023</u>	VVT-Self-Learning Function Faulty Adjustment Range (Bank 1) (MAX)
<u>DTC P1024</u>	VVT-Self-Learning Function Faulty Lower Learning Range (Bank 1) (MIN)
<u>DTC P102B</u>	VVT-Guiding Sensor Diagnostic Error (Bank 1) (MIN)
<u>DTC P102C</u>	VVT-Reference Sensor Diagnostic Error (Bank 1) (MIN)
<u>DTC P1030</u>	VVT-Actuator Monitoring Position Control, Control Deviation (Bank 1) (PLAUS)
<u>DTC P1030</u>	VVT-Actuator Monitoring Position Control, Control Deviation (Bank 1) (SIG)
<u>DTC P103A</u>	VVT-System Current Too High (MAX)
<u>DTC P1041</u>	Internal VVT-Control Module EEPROM Error (Bank 1) (PLAUS)
<u>DTC P1047</u>	VVT-Control Circuit High Input (Bank 1) (MAX)
<u>DTC P1048</u>	VVT-Control Circuit Low Input (Bank 1) (MIN)
<u>DTC P1049</u>	VVT-Control Circuit Engine Cables Short Circuit (Bank 1) (SIG)
<u>DTC P1055</u>	VVT-Supply Voltage Control Motor High Input (Bank 1) (MAX)
<u>DTC P1056</u>	VVT-Supply Voltage Control Motor Low Input (Bank 1) (MIN)
<u>DTC P1057</u>	VVT-Supply Voltage Control Motor Electrical (Bank 1) (PLAUS)
<u>DTC P105A</u>	Internal Control Module VVT Error, Current Too High (MAX)
<u>DTC P105B</u>	Internal Control Module VVT Error, Voltage Too Low (MIN)
<u>DTC P1062</u>	VVT-Limp Home Request Full Stroke Position not Reached (Bank 1) (SIG)
<u>DTC P1064</u>	VVT-Value Comparison Starting Position/Parking Position Plausibility (Bank 1) (MAX)
<u>DTC P1075</u>	VVT-Overload Protection (Bank 1) (MAX)
<u>DTC P1076</u>	VVT-Overload Protection ECU-Temperature High Input (Bank 1) (SIG)
<u>DTC P1078</u>	VVT-Overload Protection Control Motor Current High Input (Bank 1) (MIN)
<u>DTC P107A</u>	VVT-Overload Protection Control Motor Current Too High (MAX)
<u>DTC P107B</u>	VVT-Overload Protection Control Motor Temperature Too High (MIN)
<u>DTC P107C</u>	VVT-Overload Protection Temperature Too High (MIN)
<u>DTC P107C</u>	VVT-Overload Protection Temperature Too High (SIG)
<u>DTC P1104</u>	Differential Pressure Sensor Intake Manifold Pressure Too Low (Bank 1) (MIN)
<u>DTC P1105</u>	Differential Pressure Sensor Intake Manifold Pressure Too High (Bank 1) (MAX)
<u>DTC P110D</u>	Throttle Position Sensor A and B Range/Performance (PLAUS)

<u>DTC P111E</u>	Intake Air Temperature Sensor 1 Maximum Temperature Implausible (Bank 1) (MAX)
<u>DTC P111F</u>	Intake Air Temperature Sensor 1 Minimum Temperature Implausible (Bank 1) (MIN)
<u>DTC P1124</u>	Differential Pressure Sensor Intake Manifold Offset (Bank 1) (PLAUS)
<u>DTC P112C</u>	O2 Sensor Negative Current or Positive Current Control Circuit/Open (Bank 1 Sensor 1) (MIN)
<u>DTC P112C</u>	O2 Sensor Negative Current or Positive Current Control Circuit/Open (Bank 1 Sensor 1) (SIG)
<u>DTC P112D</u>	O2 Sensor Negative Current or Positive Current Control Circuit/Open (Bank 2 Sensor 1) (MIN)
<u>DTC P112D</u>	O2 Sensor Negative Current or Positive Current Control Circuit/Open (Bank 2 Sensor 1) (SIG)
<u>DTC P1130</u>	O2 Sensor Circuit Dynamic Test (Bank 1 Sensor 2) (PLAUS)
<u>DTC P1131</u>	O2 Sensor Circuit Dynamic Test (Bank 2 Sensor 2) (PLAUS)
<u>DTC P114A</u>	Post Catalyst Fuel Trim Via Oxygen Sensor System Too Rich (Bank 1) (MAX)
<u>DTC P114B</u>	Post Catalyst Fuel Trim Via Oxygen Sensor System Too Lean (Bank 1) (MIN)
<u>DTC P114C</u>	Post Catalyst Fuel Trim Via Oxygen Sensor System Too Rich (Bank 2) (MAX)
<u>DTC P114D</u>	Post Catalyst Fuel Trim Via Oxygen Sensor System Too Lean (Bank 2) (MIN)
<u>DTC P114F</u>	Air Mass Flow Sensor Defective (MIN)
<u>DTC P115A</u>	Mass or Volume Air Flow 'A' Maximum Exceeded (MAX)
<u>DTC P116C</u>	Air Mass Flow Sensor Signal Range (MAX)
<u>DTC P116D</u>	Air Mass Flow Sensor Signal Gradient Error (MIN)
<u>DTC P116E</u>	Air Mass Flow Sensor Signal Electrical (SIG)
<u>DTC P1197</u>	Differential Pressure Sensor Intake Manifold High Input (Bank 1) (MAX)
<u>DTC P1198</u>	Differential Pressure Sensor Intake Manifold Low Input (Bank 1) (MIN)
<u>DTC P1214</u>	Fuel Pump Speed Too High (MAX)
<u>DTC P1215</u>	Fuel Pump Speed Too Low (MIN)
<u>DTC P1216</u>	Fuel Pump Emergency Operation (SIG)
<u>DTC P1217</u>	Fuel Pump Overtemperature Condition (PLAUS)
<u>DTC P1230</u>	Fuel Pump Relay Primary Circuit (SIG)
<u>DTC P1234</u>	Fuel Pump Relay Primary Circuit Low (MIN)
<u>DTC P1236</u>	Fuel Pump Relay Primary Circuit High (MAX)
<u>DTC P1244</u>	Fuel Pump Emergency Cut-Off (SIG)
<u>DTC P1300</u>	Camshaft Position Sensor 'A' Segment Timing Error (Bank 1) (MAX)
<u>DTC P1301</u>	Ignition Monitoring Cylinder 1 Spark Duration Too Short (MIN)
<u>DTC P1302</u>	Ignition Monitoring Cylinder 2 Spark Duration Too Short (MIN)
<u>DTC P1303</u>	Ignition Monitoring Cylinder 3 Spark Duration Too Short (MIN)
<u>DTC P1304</u>	Ignition Monitoring Cylinder 4 Spark Duration Too Short (MIN)
<u>DTC P1305</u>	Ignition Monitoring Cylinder 5 Spark Duration Too Short (MIN)
<u>DTC P1306</u>	Ignition Monitoring Cylinder 6 Spark Duration Too Short (MIN)
<u>DTC P130A</u>	Camshaft Position Sensor 'B' Segment Timing Error (Bank 1) (MAX)

<u>DTC P1327</u>	Knock Sensor 2 Circuit Low Input (Bank 1) (MIN)
<u>DTC P1328</u>	Knock Sensor 2 Circuit High Input (Bank 1) (MAX)
<u>DTC P135B</u>	Knock Sensor 2 Circuit Range/Performance (Bank 1) (PLAUS)
<u>DTC P1383</u>	Ignition Monitoring Malfunction (SIG)
<u>DTC P1396</u>	Crankshaft Position Sensor Segment Timing Plausibility (MIN)
<u>DTC P1407</u>	Fuel Level Signal 1 (PLAUS)
<u>DTC P1408</u>	Fuel Level Signal 2 (PLAUS)
<u>DTC P140A</u>	Secondary Air Injection System Insufficient Total Flow (Bank 1 and Bank 2) (SIG)
<u>DTC P140E</u>	Cylinder Injection Cut-Off, Fuel Level Too Low (PLAUS)
<u>DTC P1413</u>	Secondary Air Injection Pump Relay Control Circuit Signal Low (MIN)
<u>DTC P1414</u>	Secondary Air Injection Pump Relay Control Circuit Signal High (MAX)
<u>DTC P1415</u>	Mass or Volume Air Flow Too Low (MIN)
<u>DTC P1417</u>	Throttle Control Incorrect Air Supply (SIG)
<u>DTC P1424</u>	Mass or Volume Air Flow Too High (MAX)
<u>DTC P1434</u>	Diagnostic Module Tank Leakage (DM-TL) (SIG)
<u>DTC P143B</u>	Direct Ozone Reduction Catalyst Temperature Sensor Wrong Code (PLAUS)
<u>DTC P143C</u>	Direct Ozone Reduction Catalyst Temperature / Radiator Coolant Temperature Correlation (SIG)
<u>DTC P143E</u>	Direct Ozone Reduction Catalyst Temperature Sensor Gradient Too Low (PLAUS)
<u>DTC P1447</u>	Diagnostic Module Tank Leakage (DM-TL) Pump Current Too High during Switching Solenoid Test (PLAUS)
<u>DTC P1448</u>	Diagnostic Module Tank Leakage (DM-TL) Pump Current Too Low (MIN)
<u>DTC P1449</u>	Diagnostic Module Tank Leakage (DM-TL) Pump Current Too High (MAX)
<u>DTC P1453</u>	Secondary Air Injection Pump Relay Control Circuit Electrical (SIG)
<u>DTC P14C0</u>	Fan Mechanical or Hardware Defect (PLAUS)
<u>DTC P14C1</u>	Radiator Shutter Mechanical or Hardware Defect (PLAUS)
<u>DTC P14C2</u>	DISA (Differentiated Intake Manifold) Actuator 1 Mechanical or Hardware Defect (PLAUS)
<u>DTC P14C3</u>	DISA (Differentiated Intake Manifold) Actuator 2 Mechanical or Hardware Defect (PLAUS)
<u>DTC P14C4</u>	Radiator Shutter (Upper) Mechanical (MIN)
<u>DTC P14C5</u>	Radiator Shutter (Upper) Hardware Defect (MAX)
<u>DTC P14C6</u>	Radiator Shutter (Lower) Electrical (MAX)
<u>DTC P150A</u>	Battery Sensor BSD (Bit Serial Data Interface) Extended Communication Circuit (MAX)
<u>DTC P150B</u>	Battery Sensor BSD (Bit Serial Data Interface) Communication Circuit (SIG)
<u>DTC P150B</u>	Battery Sensor BSD (Bit Serial Data Interface) Communication Circuit (SIG)
<u>DTC P150C</u>	Battery Sensor Firmware Implausible (PLAUS)
<u>DTC P150D</u>	Battery Sensor Temperature Error (MAX)
<u>DTC P150E</u>	Battery Sensor Voltage Error (SIG)

<u>DTC P150F</u>	Battery Sensor Current Error (PLAUS)
<u>DTC P1511</u>	DISA (Differentiated Intake Manifold) Control Circuit Electrical (MAX)
<u>DTC P1511</u>	DISA (Differentiated Intake Manifold) Control Circuit Electrical (MIN)
<u>DTC P1511</u>	DISA (Differentiated Intake Manifold) Control Circuit Electrical (SIG)
<u>DTC P1511</u>	DISA (Differentiated Intake Manifold) Control Circuit Electrical (SIG)
<u>DTC P1512</u>	DISA (Differentiated Intake Manifold) Control Circuit Signal Low (MIN)
<u>DTC P1512</u>	DISA (Differentiated Intake Manifold) Control Circuit Signal Low (MIN)
<u>DTC P1513</u>	DISA (Differentiated Intake Manifold) Control Circuit Signal High (MAX)
<u>DTC P1513</u>	DISA (Differentiated Intake Manifold) Control Circuit Signal High (MAX)
<u>DTC P1515</u>	Engine Off Timer Plausibility (PLAUS)
<u>DTC P151A</u>	Battery Sensor Terminal 15/30 Wakeup Circuit (MAX)
<u>DTC P151B</u>	Battery Sensor Wakeup Circuit (PLAUS)
<u>DTC P151C</u>	Battery Sensor System Error (SIG)
<u>DTC P1521</u>	Engine Oil Quality Sensor Communication Error (SIG)
<u>DTC P1540</u>	Driving Dynamics Control Switch High Input (MAX)
<u>DTC P1541</u>	Driving Dynamics Control Switch Low Input (MIN)
<u>DTC P1551</u>	Engine Off Timer Timeout (SIG)
<u>DTC P1553</u>	Engine Position System 'B' Performance (Bank 1) (MAX)
<u>DTC P1554</u>	Engine Position System 'A' Performance (Bank 1) (MAX)
<u>DTC P155A</u>	Multifunction Steering Wheel (MFL) Interface, Toggle-Bit Fault (MAX)
<u>DTC P155A</u>	Multifunction Steering Wheel (MFL) Interface, Toggle-Bit Fault (MIN)
<u>DTC P155A</u>	Multifunction Steering Wheel (MFL) Interface, Toggle-Bit Fault (PLAUS)
<u>DTC P1561</u>	Cold Start Idle Air Control System RPM Lower Than Expected (Bank 1) (MIN)
<u>DTC P1562</u>	Cold Start Idle Air Control System RPM Higher Than Expected (Bank 1) (MAX)
<u>DTC P1563</u>	Multifunction Steering Wheel (MFL) Rocker Switch Defective (PLAUS)
<u>DTC P1576</u>	Multifunction Steering Wheel (MFL) Interface, Bit Error (PLAUS)
<u>DTC P1582</u>	Oil Pump Circuit High (MAX)
<u>DTC P1583</u>	Oil Pump Circuit Low (MIN)
<u>DTC P1584</u>	Oil Pump Circuit Open (SIG)
<u>DTC P1586</u>	Engine Oil Quality Sensor Temperature Measurement (MAX)
<u>DTC P1587</u>	Engine Oil Quality Sensor Level Measurement (MIN)
<u>DTC P1588</u>	Engine Oil Quality Sensor Permeability Measurement (PLAUS)
<u>DTC P15A1</u>	Engine Oil Pressure Control, Mechanical, Solenoid Valve Sticking In Fully Energized Position (Minimum Oil Pressure) (MAX)
<u>DTC P15A2</u>	Engine Oil Pressure Control, Mechanical, Solenoid Valve Sticking In De-Energized Position (Maximum Oil Pressure) (MIN)
<u>DTC P15A3</u>	Engine Oil Pressure Too High (MAX)
<u>DTC P15A6</u>	Engine Oil Pressure Too High Before Start (MAX)
<u>DTC P15A7</u>	Engine Oil Pressure Too Low Before Start (MIN)
<u>DTC P15B0</u>	Terminal 15 Sense Circuit Input High (MAX)
<u>DTC P15B1</u>	Terminal 15 Sense Circuit Input Low (MIN)

<u>DTC P15B2</u>	Terminal 15 Sense Circuit CAS Error (SIG)
<u>DTC P15B3</u>	Terminal 15 Sense Circuit Range/Performance (PLAUS)
<u>DTC P160A</u>	Powermanagement Exhaustive Discharge (MIN)
<u>DTC P160B</u>	Powermanagement Defective (PLAUS)
<u>DTC P160C</u>	Powermanagement Overvoltage (MAX)
<u>DTC P160D</u>	Powermanagement Undervoltage (MIN)
<u>DTC P160E</u>	Powermanagement Operation Without Battery (SIG)
<u>DTC P160F</u>	Powermanagement No-Load Current Error (PLAUS)
<u>DTC P1618</u>	Control Module Self-Test, AD-Converter Monitoring (PLAUS)
<u>DTC P1625</u>	Pedal Position Sensor Potentiometer Supply Channel 2 Electrical (PLAUS)
<u>DTC P1632</u>	Throttle Valve Adaptation Conditions Not Met (Bank 1) (MAX)
<u>DTC P1633</u>	Throttle Valve Adaptation Limp-Home Position Unknown (Bank 1) (MIN)
<u>DTC P1634</u>	Throttle Valve Adaptation Spring Test Failed (Bank 1) (MAX)
<u>DTC P1635</u>	Throttle Valve Adaptation Lower Mechanical Stop Not Adapted (Bank 1) (MAX)
<u>DTC P1636</u>	Throttle Valve Control Circuit (Bank 1) (SIG)
<u>DTC P1637</u>	Throttle Valve Position Control, Control Deviation (Bank 1) (MAX)
<u>DTC P1638</u>	Throttle Valve Position Control Throttle Stuck Temporarily (Bank 1) (MAX)
<u>DTC P1639</u>	Throttle Valve Position Control Throttle Stuck Permanently (Bank 1) (MAX)
<u>DTC P1644</u>	Throttle Valve Adaptation Stop Relearning Lower Mechanical Stop (Bank 1) (PLAUS)
<u>DTC P164C</u>	Pedal Position Sensor Potentiometer Supply Channel 1 Electrical (PLAUS)
<u>DTC P165A</u>	EWS (Electronic Immobilizer) Interface to ECM, Hardware Error (MAX)
<u>DTC P165B</u>	EWS (Electronic Immobilizer) Interface to ECM, Checksum Error (PLAUS)
<u>DTC P165C</u>	EWS (Electronic Immobilizer) Data, No Available Storage Possibility (MAX)
<u>DTC P165D</u>	EWS (Electronic Immobilizer) Data, Faulty Release Code Storage (MIN)
<u>DTC P165E</u>	EWS (Electronic Immobilizer) Data, Checksum Error (PLAUS)
<u>DTC P165F</u>	Internal Control Module Measurement Error Oxygen Sensor Heating (Bank 1, Sensor 1) (SIG)
<u>DTC P1660</u>	EWS (Electronic Immobilizer) Telegram Error (MIN)
<u>DTC P1661</u>	Timeout EWS (Electronic Immobilizer) - Telegram (SIG)
<u>DTC P1667</u>	EWS (Electronic Immobilizer) Start Value Not Yet Programmed (MIN)
<u>DTC P1667</u>	EWS (Electronic Immobilizer) Start Value Not Yet Programmed (PLAUS)
<u>DTC P1668</u>	EWS (Electronic Immobilizer) Start Value Destroyed (SIG)
<u>DTC P166A</u>	Control Module Self-Test, LDM (Longitudinal Dynamics Management) Monitoring (SIG)
<u>DTC P166B</u>	LDM (Longitudinal Dynamics Management) Torque Request In Spite of Brake Signal (MAX)
<u>DTC P166C</u>	LDM (Longitudinal Dynamics Management) Torque Request Implausible (PLAUS)
<u>DTC P166F</u>	Internal Control Module Measurement Error Oxygen Sensor Heating (Bank 2, Sensor 1) (SIG)

<u>DTC P1675</u>	Throttle Valve Actuator Start Test Re-Adaptation Required (MAX)
<u>DTC P1694</u>	Throttle Valve Actuator Start Test Spring Test and Limp-Home Position Failed (SIG)
<u>DTC P169A</u>	Throttle Valve Actuator Start Test Limp-Home Position Failed (MIN)
<u>DTC P16A0</u>	Internal Control Module Memory Check Sum Error in Boot Software (MAX)
<u>DTC P16A1</u>	Internal Control Module Memory Check Sum Error in Application Software (MIN)
<u>DTC P16A2</u>	Internal Control Module Memory Check Sum Error in Data (SIG)
<u>DTC P16A3</u>	Internal Control Module Non-Volatile Memory (NVMY) Error (MAX)
<u>DTC P16A4</u>	Timeout Control Module Knock Sensor SPI-Bus (SIG)
<u>DTC P16A5</u>	Timeout Control Module Multiple Output Stage SPI-Bus (SIG)
<u>DTC P16A6</u>	Control Module Self-Test, Cruise Control Monitoring (MAX)
<u>DTC P16A7</u>	Control Module Self-Test, Hot Film Air Mass Meter Monitoring (MAX)
<u>DTC P16A8</u>	Control Module Self-Test, Throttle Position Monitoring (MIN)
<u>DTC P16A9</u>	Control Module Self-Test, Speed Monitoring Reset (PLAUS)
<u>DTC P16B0</u>	Control Module Self-Test, Pedal Position Sensor Monitoring (PLAUS)
<u>DTC P16B1</u>	Control Module Self-Test, Idle Air Control System Integrated Component Plausibility (MAX)
<u>DTC P16B2</u>	Control Module Self-Test, Idle Air Control System PD-Component Plausibility (MIN)
<u>DTC P16B3</u>	Control Module Self-Test, MSR (Engine-Drag-Torque Control) Monitoring (MAX)
<u>DTC P16B4</u>	Control Module Self-Test, DCC (Dynamic Cruise Control) Monitoring (MIN)
<u>DTC P16B5</u>	Control Module Self-Test, AMT (Automatic Manual Transmission) Monitoring (SIG)
<u>DTC P16B6</u>	Control Module Self-Test, ETC Monitoring (PLAUS)
<u>DTC P16B7</u>	Control Module Self-Test, Clutch Torque Monitoring Maximum Value Plausibility (MAX)
<u>DTC P16B8</u>	Control Module Self-Test, Clutch Torque Monitoring Minimum Value Plausibility (MIN)
<u>DTC P16B9</u>	Control Module Self-Test, Torque Loss Monitoring (SIG)
<u>DTC P16C0</u>	Control Module Self-Test, Driving Dynamics Control Switch Monitoring (PLAUS)
<u>DTC P16C1</u>	Control Module Self-Test, Torque Monitoring Current Indicated Value Plausibility (PLAUS)
<u>DTC P16C1</u>	Control Module Self-Test, Torque Monitoring Current Indicated Value Plausibility (PLAUS)
<u>DTC P16C2</u>	Control Module Self-Test, Speed Limitation Monitoring (PLAUS)
<u>DTC P16C5</u>	Main Relay Switching Delay (MIN)
<u>DTC P16C6</u>	CAN Timeout BSD (Bit Serial Data Interface) (MAX)
<u>DTC P16C6</u>	CAN Timeout BSD (Bit Serial Data Interface) (MAX)
<u>DTC P16C6</u>	CAN Timeout BSD (Bit Serial Data Interface) (MAX)
<u>DTC P16C6</u>	CAN Timeout BSD (Bit Serial Data Interface) (MIN)

<u>DTC P16C6</u>	CAN Timeout BSD (Bit Serial Data Interface) (MIN)
<u>DTC P16C6</u>	CAN Timeout BSD (Bit Serial Data Interface) (PLAUS)
<u>DTC P16C6</u>	CAN Timeout BSD (Bit Serial Data Interface) (PLAUS)
<u>DTC P16C6</u>	CAN Timeout BSD (Bit Serial Data Interface) (SIG)
<u>DTC P16C6</u>	CAN Timeout BSD (Bit Serial Data Interface) (SIG)
<u>DTC P16C6</u>	CAN Timeout BSD (Bit Serial Data Interface) (SIG)
<u>DTC P16C6</u>	CAN Timeout BSD (Bit Serial Data Interface) (SIG)
<u>DTC P16C8</u>	Serial Communication Link EKP (Electrical Fuel Pump) (SIG)
<u>DTC P2067</u>	Fuel Level Sensor 'B' Circuit Low (MIN)
<u>DTC P2068</u>	Fuel Level Sensor 'B' Circuit High (MAX)
<u>DTC P2088</u>	'A' Camshaft Position Actuator Control Circuit Low (Bank 1) (MIN)
<u>DTC P2089</u>	'A' Camshaft Position Actuator Control Circuit High (Bank 1) (MAX)
<u>DTC P2090</u>	'B' Camshaft Position Actuator Control Circuit Low (Bank 1) (MIN)
<u>DTC P2091</u>	'B' Camshaft Position Actuator Control Circuit High (Bank 1) (MAX)
<u>DTC P2096</u>	Post Catalyst Fuel Trim System Too Lean (Bank 1) (MIN)
<u>DTC P2097</u>	Post Catalyst Fuel Trim System Too Rich (Bank 1) (MAX)
<u>DTC P2098</u>	Post Catalyst Fuel Trim System Too Lean (Bank 2) (MIN)
<u>DTC P2099</u>	Post Catalyst Fuel Trim System Too Rich (Bank 2) (MAX)
<u>DTC P2120</u>	Throttle/Pedal Position Sensor/Switch 'D' Circuit (PLAUS)
<u>DTC P2122</u>	Throttle/Pedal Position Sensor/Switch 'D' Circuit Low (MIN)
<u>DTC P2123</u>	Throttle/Pedal Position Sensor/Switch 'D' Circuit High (MAX)
<u>DTC P2127</u>	Throttle/Pedal Position Sensor/Switch 'E' Circuit Low (MIN)
<u>DTC P2128</u>	Throttle/Pedal Position Sensor/Switch 'E' Circuit High (MAX)
<u>DTC P2138</u>	Throttle/Pedal Position Sensor/Switch 'D'/'E' Voltage Correlation (PLAUS)
<u>DTC P213F</u>	Fuel Pump System Fault - Forced Engine Shutdown (SIG)
<u>DTC P2183</u>	Engine Coolant Temperature Sensor 2 Circuit Range/Performance (PLAUS)
<u>DTC P2184</u>	Engine Coolant Temperature Sensor 2 Circuit Low (MIN)
<u>DTC P2185</u>	Engine Coolant Temperature Sensor 2 Circuit High (MAX)
<u>DTC P2195</u>	O2 Sensor Signal Biased/Stuck Lean (Bank 1 Sensor 1) (MAX)
<u>DTC P2196</u>	O2 Sensor Signal Biased/Stuck Rich (Bank 1 Sensor 1) (MAX)
<u>DTC P2197</u>	O2 Sensor Signal Biased/Stuck Lean (Bank 2 Sensor 1) (MAX)
<u>DTC P2198</u>	O2 Sensor Signal Biased/Stuck Rich (Bank 2 Sensor 1) (MAX)
<u>DTC P2228</u>	Barometric Pressure Circuit Low (MIN)
<u>DTC P2229</u>	Barometric Pressure Circuit High (MAX)
<u>DTC P2243</u>	O2 Sensor Reference Voltage Circuit/Open (Bank 1 Sensor 1) (MAX)
<u>DTC P2247</u>	O2 Sensor Reference Voltage Circuit/Open (Bank 2 Sensor 1) (MAX)
<u>DTC P2270</u>	O2 Sensor Signal Biased/Stuck Lean (Bank 1 Sensor 2) (MIN)
<u>DTC P2271</u>	O2 Sensor Signal Biased/Stuck Rich (Bank 1 Sensor 2) (MAX)
<u>DTC P2272</u>	O2 Sensor Signal Biased/Stuck Lean (Bank 2 Sensor 2) (MIN)
<u>DTC P2273</u>	O2 Sensor Signal Biased/Stuck Rich (Bank 2 Sensor 2) (MAX)
<u>DTC P2297</u>	O2 Sensor Out of Range During Deceleration (Bank 1 Sensor 1) (MAX)
<u>DTC P2298</u>	

	O2 Sensor Out of Range During Deceleration (Bank 2 Sensor 1) (MAX)
<u>DTC P2299</u>	Brake Pedal Position/Accelerator Pedal Position Incompatible (PLAUS)
<u>DTC P2400</u>	Evaporative Emission System Leak Detection Pump Control Circuit/Open (SIG)
<u>DTC P2401</u>	Evaporative Emission System Leak Detection Pump Control Circuit Low (MIN)
<u>DTC P2402</u>	Evaporative Emission System Leak Detection Pump Control Circuit High (MAX)
<u>DTC P240A</u>	Evaporative Emission System Leak Detection Pump Heater Control Circuit/Open (SIG)
<u>DTC P240B</u>	Evaporative Emission System Leak Detection Pump Heater Control Circuit Low (MIN)
<u>DTC P240C</u>	Evaporative Emission System Leak Detection Pump Heater Control Circuit High (MAX)
<u>DTC P2414</u>	O2 Sensor Exhaust Sample Error (Bank 1 Sensor 1) (MAX)
<u>DTC P2415</u>	O2 Sensor Exhaust Sample Error (Bank 2 Sensor 1) (MAX)
<u>DTC P2418</u>	Evaporative Emission System Switching Valve Control Circuit/Open (SIG)
<u>DTC P2419</u>	Evaporative Emission System Switching Valve Control Circuit Low (MIN)
<u>DTC P2420</u>	Evaporative Emission System Switching Valve Control Circuit High (MAX)
<u>DTC P250A</u>	Engine Oil Level Sensor Circuit (SIG)
<u>DTC P250B</u>	Engine Oil Level Sensor Circuit Range/Performance (PLAUS)
<u>DTC P250F</u>	Engine Oil Level Too Low (MIN)
<u>DTC P252A</u>	Engine Oil Quality Sensor Circuit (MIN)
<u>DTC P252A</u>	Engine Oil Quality Sensor Circuit (PLAUS)
<u>DTC P252A</u>	Engine Oil Quality Sensor Circuit (SIG)
<u>DTC P252A</u>	Engine Oil Quality Sensor Circuit (SIG)
<u>DTC P2568</u>	Direct Ozone Reduction Catalyst Temperature Sensor Circuit Range/Performance (PLAUS)
<u>DTC P2569</u>	Direct Ozone Reduction Catalyst Temperature Sensor Circuit Low (MIN)
<u>DTC P2570</u>	Direct Ozone Reduction Catalyst Temperature Sensor Circuit High (MAX)
<u>DTC P2626</u>	O2 Sensor Pumping Current Trim Circuit/Open (Bank 1 Sensor 1) (PLAUS)
<u>DTC P2629</u>	O2 Sensor Pumping Current Trim Circuit/Open (Bank 2 Sensor 1) (PLAUS)
<u>DTC P300A</u>	Controlled Air Guiding Circuit High (MAX)
<u>DTC P300B</u>	Controlled Air Guiding Circuit Low (MIN)
<u>DTC P300C</u>	Controlled Air Guiding Circuit (SIG)
<u>DTC P3022</u>	O2 Sensor Disturbed SPI Communication To WRAF-IC (Bank 1 Sensor 1) (MIN)
<u>DTC P3023</u>	O2 Sensor Disturbed SPI Communication to WRAF-IC (Bank 2 Sensor 1) (MIN)
<u>DTC P3024</u>	O2 Sensor Initialization Error WRAF-IC (Bank 1 Sensor 1) (MAX)
<u>DTC P3025</u>	O2 Sensor Initialization Error WRAF-IC (Bank 2 Sensor 1) (MAX)
<u>DTC P316A</u>	Engine Coolant Temperature Signal Stuck High (PLAUS)
<u>DTC P3196</u>	Cold Start Radiator Coolant Temperature Sensor Signal High (MAX)
<u>DTC P3197</u>	Radiator Coolant Temperature Gradient Too High (PLAUS)

<u>DTC P3198</u>	Engine Coolant Temperature 1 Gradient Too High (PLAUS)
<u>DTC P3199</u>	Engine Coolant Temperature Signal Stuck (PLAUS)
<u>DTC P3202</u>	Powertrain CAN, CAN Chip Cut-Off (SIG)
<u>DTC P3205</u>	Local CAN, CAN Chip Cut Off (SIG)
<u>DTC P321E</u>	Ambient Pressure Sensor Maximum Pressure Implausible (MAX)
<u>DTC P321F</u>	Ambient Pressure Sensor Minimum Pressure Implausible (MIN)
<u>DTC P3223</u>	Generator Mechanical (PLAUS)
<u>DTC P3226</u>	E-Box Control Circuit Fan High Input (MAX)
<u>DTC P3227</u>	E-Box Control Circuit Fan Low Input (MIN)
<u>DTC P3228</u>	E-Box Control Circuit Fan Open Circuit (SIG)
<u>DTC P3235</u>	Control Module Monitoring Version Coding Plausibility (PLAUS)
<u>DTC P324A</u>	Generator Type Implausible (MAX)
<u>DTC P324A</u>	Generator Type Implausible (MIN)
<u>DTC P324C</u>	Generator Over Temperature Calculated (MAX)
<u>DTC P324C</u>	Generator Over Temperature Calculated (MAX)
<u>DTC P324E</u>	Generator Regulator Type Implausible (MAX)
<u>DTC P3255</u>	Generator Voltage in Starting Phase above Threshold (MAX)
<u>DTC P325A</u>	Generator Electrical Error Calculated (MAX)
<u>DTC U0101</u>	Lost Communication With TCM (SIG)
<u>DTC U0126</u>	Lost Communication With Steering Angle Sensor Module (SIG)
<u>DTC U0137</u>	Lost Communication With Trailer Brake Control Module (SIG)
<u>DTC U0155</u>	Lost Communication With Instrument Panel Cluster (IPC) Control Module (SIG)
<u>DTC U0167</u>	Lost Communication With Vehicle Immobilizer Control Module (SIG)
<u>DTC U1100</u>	Lost Communication With ASC/DSC (SIG)
<u>DTC U1100</u>	Lost Communication With ASC/DSC (SIG)
<u>DTC U1100</u>	Lost Communication With ASC/DSC (SIG)
<u>DTC U1101</u>	Lost Communication With Ambient Temperature/Relative Time (SIG)
<u>DTC U1102</u>	Message Monitoring Actuation Cruise Control/ACC Alive Check (MIN)
<u>DTC U1103</u>	Lost Communication With Actuation Cruise Control/ACC (SIG)
<u>DTC U1104</u>	Message Monitoring Actuation Cruise Control/ACC Check Sum Error (PLAUS)
<u>DTC U1105</u>	Message Monitoring Torque Request ACC Alive Check (MIN)
<u>DTC U1106</u>	Lost Communication With Torque Request ACC (SIG)
<u>DTC U1107</u>	Message Monitoring Torque Request ACC Check Sum Error (PLAUS)
<u>DTC U1108</u>	Message Monitoring Torque Request Steering Alive Check (MIN)
<u>DTC U1108</u>	Message Monitoring Torque Request Steering Alive Check (MIN)
<u>DTC U1109</u>	Lost Communication With Torque Request Steering (SIG)
<u>DTC U1109</u>	Lost Communication With Torque Request Steering (SIG)
<u>DTC U110A</u>	Message Monitoring Torque Request Steering Check Sum Error (PLAUS)
<u>DTC U110A</u>	Message Monitoring Torque Request Steering Check Sum Error (PLAUS)
<u>DTC U110B</u>	Message Monitoring Torque Request DSC Alive Check (MIN)
<u>DTC U110C</u>	Lost Communication With Torque Request DSC (SIG)
<u>DTC U110D</u>	

	Message Monitoring Torque Request DSC Check Sum Error (PLAUS)
<u>DTC U110E</u>	Message Monitoring Torque Request ETC Alive Check (MIN)
<u>DTC U110E</u>	Message Monitoring Torque Request ETC Alive Check (MIN)
<u>DTC U110F</u>	Lost Communication With Torque Request ETC (SIG)
<u>DTC U110F</u>	Lost Communication With Torque Request ETC (SIG)
<u>DTC U1110</u>	Message Monitoring Torque Request ETC Check Sum Error (MIN)
<u>DTC U1110</u>	Message Monitoring Torque Request ETC Check Sum Error (MIN)
<u>DTC U1110</u>	Message Monitoring Torque Request ETC Check Sum Error (PLAUS)
<u>DTC U1110</u>	Message Monitoring Torque Request ETC Check Sum Error (PLAUS)
<u>DTC U1110</u>	Message Monitoring Torque Request ETC Check Sum Error (PLAUS)
<u>DTC U1110</u>	Message Monitoring Torque Request ETC Check Sum Error (PLAUS)
<u>DTC U1110</u>	Message Monitoring Torque Request ETC Check Sum Error (SIG)
<u>DTC U1110</u>	Message Monitoring Torque Request ETC Check Sum Error (SIG)
<u>DTC U1110</u>	Message Monitoring Torque Request ETC Check Sum Error (SIG)
<u>DTC U1114</u>	Message Monitoring Vehicle Mode Status Alive Check (MIN)
<u>DTC U1115</u>	Lost Communication With Vehicle Mode Status (SIG)
<u>DTC U1116</u>	Message Monitoring Vehicle Mode Status Check Sum Error (PLAUS)
<u>DTC U1118</u>	Lost Communication With Speed (SIG)
<u>DTC U111A</u>	Lost Communication With Transmission Data (SIG)
<u>DTC U111B</u>	Lost Communication With Transmission Data2 (SIG)
<u>DTC U111C</u>	Lost Communication With Mileage/Range (SIG)
<u>DTC U111D</u>	Message Monitoring Terminal Status Alive Check (MIN)
<u>DTC U111E</u>	Lost Communication With Terminal Status (SIG)
<u>DTC U111F</u>	Message Monitoring Terminal Status Check Sum Error (PLAUS)
<u>DTC U1120</u>	Lost Communication With Steering Wheel Angle (SIG)
<u>DTC U1121</u>	Lost Communication With Power Management Battery Voltage (SIG)
<u>DTC U1122</u>	Lost Communication With Power Management Charge Voltage (SIG)
<u>DTC U1123</u>	Message Monitoring ARS-Module Status Alive Check (MIN)
<u>DTC U1124</u>	Lost Communication With ARS-Module Status (SIG)
<u>DTC U1126</u>	Lost Communication With DSC Status (SIG)
<u>DTC U1128</u>	Lost Communication With EKP (Electrical Fuel Pump) Status (SIG)
<u>DTC U1129</u>	Lost Communication With Reverse Status (SIG)
<u>DTC U112A</u>	Message Monitoring Instrument Pack Status Alive Check (MIN)
<u>DTC U112B</u>	Lost Communication With Instrument Pack Status (SIG)
<u>DTC U112B</u>	Lost Communication With Instrument Pack Status (SIG)
<u>DTC U112B</u>	Lost Communication With Instrument Pack Status (SIG)
<u>DTC U112C</u>	Lost Communication With Heat Flow/Load Moment A/C (SIG)
<u>DTC U112D</u>	Lost Communication With Control Crash Cut-Off EKP (Electrical Fuel Pump) (SIG)
<u>DTC U1130</u>	Lost Communication With Radiator Shutter (Upper) (PLAUS)
<u>DTC U1132</u>	Lost Communication With Generator via BSD (Bit Serial Data Interface) (MAX)

<u>DTC U1132</u>	Lost Communication With Generator via BSD (Bit Serial Data Interface) (SIG)
<u>DTC U1134</u>	Lost Communication With Lamp Status (SIG)
<u>DTC U1135</u>	Lost Communication With Status Water Valve (SIG)
<u>DTC U113A</u>	Lost Communication With Central Locking System Status (SIG)
<u>DTC U113C</u>	Lost Communication With Time/Date (SIG)
<u>DTC U113D</u>	Lost Communication With Wheel Torque Management Request/Driveline (SIG)
<u>DTC U113E</u>	Lost Communication With Display Transmission Data (SIG)
<u>DTC U1154</u>	Lost Communication With Message 2 TCM (SIG)
<u>DTC U1155</u>	Message Monitoring 2 TCM Check Sum Error (PLAUS)
<u>DTC U1156</u>	Message Monitoring 2 TCM Alive Check (MIN)
<u>DTC U1160</u>	Lost Communication With Message 2 TCM (SIG)
<u>DTC U1161</u>	Message Monitoring 3 TCM Alive Check (MIN)
<u>DTC U1162</u>	Message Monitoring 3 TCM Check Sum Error (PLAUS)
<u>DTC U1166</u>	Message Monitoring EWS (Electronic Immobilizer) - Frame Error (MIN)
<u>DTC U1167</u>	Message Monitoring Direct Ozone Reduction Catalyst Temperature Sensor Frame Error (SIG)
<u>DTC U1168</u>	Message Monitoring Direct Ozone Reduction Catalyst Temperature Sensor Check Sum Error (PLAUS)

DTC P0010: 'A' CAMSHAFT POSITION - ACTUATOR CIRCUIT/OPEN (BANK 1) (SIG)

BMW Fault Code (hex)

0x2A80

BMW Fault Code (dez)

10880

BMW Fault Code Description VS-Text

Intake VANOS, activation

Component

Camshaft Position Actuator

Subcomponent

Intake

Monitoring criteria

Monitoring of VANOS control. Engine speed > 500 RPM.

Fault debouncing

none

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

0.5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Open circuit

Repair procedures (plant/service)

Check wiring. Repair if defective. If wiring is OK, proceed to check component.

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0012: 'A' CAMSHAFT POSITION - TIMING OVER-RETARDED (BANK 1) (PLAUS)

BMW Fault Code (hex)

0x2A82

BMW Fault Code (dez)

10882

BMW Fault Code Description VS-Text

VANOS intake

Component

Camshaft Position Timing

Subcomponent

Intake

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P0013: 'B' CAMSHAFT POSITION - ACTUATOR CIRCUIT/OPEN (BANK 1) (SIG)

BMW Fault Code (hex)

0x2A85

BMW Fault Code (dez)

10885

BMW Fault Code Description VS-Text

Exhaust VANOS, activation

Component

Camshaft Position Actuator

Subcomponent

Exhaust

Monitoring criteria

Monitoring of VANOS control. Engine speed > 500 RPM

Fault debouncing

none

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

0.5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Open circuit

Repair procedures (plant/service)

Check wiring. Repair if defective. If wiring is OK, proceed to check component.

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0015: 'B' CAMSHAFT POSITION - TIMING OVER-RETARDED (BANK 1) (PLAUS)

BMW Fault Code (hex)

0x2A87

BMW Fault Code (dez)

10887

BMW Fault Code Description VS-Text

Exhaust VANOS, mechanism

Component

Camshaft Position Timing

Subcomponent

Exhaust

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P0016: CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 1 SENSOR A) (MAX)

BMW Fault Code (hex)

0x2AA4

BMW Fault Code (dez)

10916

BMW Fault Code Description VS-Text

Camshaft sensor, inlet, tooth fault

Component

Crankshaft/Camshaft Position Sensor

Subcomponent

Intake

Monitoring criteria

NWE synchronous, adaptation enabled

Fault debouncing

On each camshaft tooth flank when the position is out of tolerance. Immediate entry without debounce.

Terminal conditions

Terminal 15 on

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Position of NWA outside tolerance range relative to crankshaft, with massive sudden change relative to last reference adaptation.

Repair procedures (plant/service)

1. Check position (valve timing setting) of camshaft and reluctor
2. Check torque on crankshaft center bolt

MIL illumination/CC message/emergency program

MIL 2nd DC, CAM operates in emergency default mode

Remarks

Installation fault or mechanical malfunction in camshaft drive

DTC P0017: CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 1 SENSOR B) (MAX)

BMW Fault Code (hex)

0x2AA5

BMW Fault Code (dez)

10917

BMW Fault Code Description VS-Text

Camshaft sensor, exhaust, tooth fault

Component

Crankshaft/Camshaft Position Sensor

Subcomponent

Exhaust

Monitoring criteria

NWA synchronized, adaptation enabled

Fault debouncing

On each camshaft tooth flank when the position is out of tolerance. Immediate entry without debounce.

Terminal conditions

Terminal 15 on

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Position of NWA outside tolerance range relative to crankshaft, with massive sudden change relative to last reference adaptation.

Repair procedures (plant/service)

1. Check position (valve timing setting) of camshaft and reluctor
2. Check torque on crankshaft center bolt

MIL illumination/CC message/emergency program

MIL 2nd DC, CAM operates in emergency default mode

Remarks

Installation fault or mechanical malfunction in camshaft drive

DTC P0030: HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1) (SIG)**BMW Fault Code (hex)**

0x2C9C

BMW Fault Code (dez)

11420

BMW Fault Code Description VS-Text

Oxygen sensor heating before catalytic converter, activation

Component

Oxygen Sensor, Front

Subcomponent

Heater Electrical

Monitoring criteria

Driver circuit diagnosis for O2 sensor heater. UBatt > 10 V. Sensors installed. No fault memories.

Fault debouncing

Active immediately after terminal 15 change; electr. faults entered within a few seconds.

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

none

Time conditions

0.2 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Heater wire open

Repair procedures (plant/service)

1. Visual inspection of wires, DME plug and O2 sensor for damage
2. Check wires
3. Check plug-in connections DME <=> Wiring harness <=> Upstream O2 sensor forward of catalyst for Bank 1
4. Replace O2 sensor
5. Replace DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0031: HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1) (MIN)

BMW Fault Code (hex)

0x2C9C

BMW Fault Code (dez)

11420

BMW Fault Code Description VS-Text

Oxygen sensor heating before catalytic converter, activation

Component

Oxygen Sensor, Front

Subcomponent

Heater Electrical

Monitoring criteria

Driver circuit diagnosis for O2 sensor heater. UBatt > 10 V. Sensors installed. No fault memories.

Fault debouncing

Active immediately after terminal 15 change; electr. faults entered within a few seconds

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

none

Time conditions

0.2 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Heater has short to ground

Repair procedures (plant/service)

1. Visual inspection of wires, DME plug and O2 sensor for damage
2. Check wires
3. Check plug-in connections DME <=> Wiring harness <=> Upstream O2 sensor forward of catalyst for Bank 1
4. Replace O2 sensor
5. Replace DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0032: HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1) (MAX)

BMW Fault Code (hex)

0x2C9C

BMW Fault Code (dez)

11420

BMW Fault Code Description VS-Text

Oxygen sensor heating before catalytic converter, activation

Component

Oxygen Sensor, Front

Subcomponent

Heater Electrical

Monitoring criteria

Driver circuit diagnosis for O2 sensor heater. UBatt > 10 V. Sensors installed. No fault memories.

Fault debouncing

Active immediately after terminal 15 change; electr. faults entered within a few seconds

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

none

Time conditions

0.2 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Heater short circuit to positive

Repair procedures (plant/service)

1. Visual inspection of wires, DME plug and O2 sensor for damage
2. Check wires
3. Check plug-in connections DME <=> Wiring harness <=> Upstream O2 sensor forward of catalyst for Bank 1
4. Replace O2 sensor
5. Replace DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0036: HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 2) (SIG)

BMW Fault Code (hex)

0x2C9E

BMW Fault Code (dez)

11422

BMW Fault Code Description VS-Text

Oxygen sensor heating behind catalytic converter, activation

Component

Oxygen Sensor, Rear

Subcomponent

Heater Electrical

Monitoring criteria

Driver circuit diagnosis for O2 sensor heater. UBatt > 10 V. Sensors installed. No fault memories.

Fault debouncing

Active immediately after terminal 15 change; electr. faults entered within a few seconds

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

none

Time conditions

0.2 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Heater wire open

Repair procedures (plant/service)

1. Visual inspection of wires, DME plug and O2 sensor for damage
2. Check wires
3. Check plug-in connections DME <=> Wiring harness <=> Downstream O2 sensor behind catalyst for Bank 1
4. Replace O2 sensor
5. Replace DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0037: HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2) (MIN)

BMW Fault Code (hex)

0x2C9E

BMW Fault Code (dez)

11422

BMW Fault Code Description VS-Text

Oxygen sensor heating behind catalytic converter, activation

Component

Oxygen Sensor, Rear

Subcomponent

Heater Electrical

Monitoring criteria

Driver circuit diagnosis for O2 sensor heater. UBatt > 10 V. Sensors installed. No fault memories.

Fault debouncing

Active immediately after terminal 15 change; electr. faults entered within a few seconds

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

none

Time conditions

0.2 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Heater has short to ground

Repair procedures (plant/service)

1. Visual inspection of wires, DME plug and O2 sensor for damage
2. Check wires
3. Check plug-in connections DME <=> Wiring harness <=> Downstream O2 sensor behind catalyst for Bank 1
4. Replace O2 sensor
5. Replace DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0038: HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2) (MAX)

BMW Fault Code (hex)

0x2C9E

BMW Fault Code (dez)

11422

BMW Fault Code Description VS-Text

Oxygen sensor heating behind catalytic converter, activation

Component

Oxygen Sensor, Rear

Subcomponent

Heater Electrical

Monitoring criteria

Driver circuit diagnosis for O2 sensor heater. UBatt > 10 V. Sensors installed. No fault memories.

Fault debouncing

Active immediately after terminal 15 change; electr. faults entered within a few seconds

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

none

Time conditions

0.2 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Heater short circuit to positive

Repair procedures (plant/service)

1. Visual inspection of wires, DME plug and O2 sensor for damage
2. Check wires
3. Check plug-in connections DME <=> Wiring harness <=> Downstream O2 sensor behind catalyst for Bank 1
4. Replace O2 sensor
5. Replace DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0040: O2 SENSOR SIGNALS SWAPPED BANK 1 SENSOR 1/BANK 2 SENSOR 1 (PLAUS)

BMW Fault Code (hex)

0x2C24

BMW Fault Code (dez)

11300

BMW Fault Code Description VS-Text

Oxygen sensors before catalytic converter mixed up

Component

Oxygen Sensor, Front

Subcomponent

Sensors Swapped

Monitoring criteria

Monitoring of interchanged O2 sensors. Implausible O2 sensor signal at idle and during highway operation. Engine speed exceeds 288 RPM. No overrun cutoff. No fault memories.

Fault debouncing

Lambda control for both banks at control limit

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

Engine at operating temperature

Time conditions

approximately 50 sec.

System test

O2 sensors reversed

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Oxygen sensor before catalytic converter for Banks 1 and 2 connections reversed.

Repair procedures (plant/service)

Replace pre-cat O2 sensors.

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P0041: O2 SENSOR SIGNALS SWAPPED BANK 1 SENSOR 2 / BANK 2 SENSOR 2 (PLAUS)

BMW Fault Code (hex)

0x2C6A

BMW Fault Code (dez)

11370

BMW Fault Code Description VS-Text

Oxygen sensors behind catalytic converter, mixed up

Component

Oxygen Sensor, Rear

Subcomponent

Sensors Swapped

Monitoring criteria

O2 sensor system check O2 sensor voltage too low = Signal sticks at lean on one bank and O2 sensor voltage too high = Signal sticks on rich on the other bank The trim controller diagnosis must have been executed, see trim controller diagnosis. Detection of faults during the trim control diagnosis triggers the active test. Engine running at idle is adequate for the active test;

Fault debouncing

Downstream (post-cat) O2 sensor voltage < 0.2 V with rich lambda specification in active test for one bank, and downstream (post-cat) O2 sensor voltage > 0.7 V with lean lambda specification in active test on the other bank

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

Engine at operating temperature

Time conditions

roughly 300s following completion of trim control diagnosis

System test

O2 sensors reversed

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Downstream (post-cat) O2 sensors connected to wrong banks

Repair procedures (plant/service)

Replace downstream (post-cat) O2 sensors

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P0050: HO2S HEATER CONTROL CIRCUIT (BANK 2 SENSOR 1) (SIG)

BMW Fault Code (hex)

0x2C9D

BMW Fault Code (dez)

11421

BMW Fault Code Description VS-Text

Oxygen sensor heating before catalytic converter 2, activation

Component

Oxygen Sensor, Front

Subcomponent

Heater Electrical

Monitoring criteria

Driver circuit diagnosis for O2 sensor heater. UBatt > 10 V. Sensors installed. No fault memories.

Fault debouncing

Active immediately after terminal 15 change; electr. faults entered within a few seconds

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

none

Time conditions

0.2 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Heater wire open

Repair procedures (plant/service)

1. Visual inspection of wires, DME plug and O2 sensor for damage
2. Check wires
3. Check plug-in connections DME <=> Wiring harness <=> Upstream O2 sensor forward of catalyst for Bank 2
4. Replace O2 sensor
5. Replace DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0051: HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 1) (MIN)

BMW Fault Code (hex)

0x2C9D

BMW Fault Code (dez)

11421

BMW Fault Code Description VS-Text

Oxygen sensor heating before catalytic converter 2, activation

Component

Oxygen Sensor, Front

Subcomponent

Heater Electrical

Monitoring criteria

Driver circuit diagnosis for O2 sensor heater. UBatt > 10V. Sensors installed. No fault memories

Fault debouncing

Active immediately after terminal 15 change; electr. faults entered within a few seconds.

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

none

Time conditions

0.2 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Heater has short to ground

Repair procedures (plant/service)

1. Visual inspection of wires, DME plug and O2 sensor for damage
2. Check wires
3. Check plug-in connections DME <=> Wiring harness <=> Upstream O2 sensor forward of catalyst for Bank 2
4. Replace O2 sensor
5. Replace DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0052: HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 1) (MAX)

BMW Fault Code (hex)

0x2C9D

BMW Fault Code (dez)

11421

BMW Fault Code Description VS-Text

Oxygen sensor heating before catalytic converter 2, activation.

Component

Oxygen Sensor, Front

Subcomponent

Heater Electrical

Monitoring criteria

Driver circuit diagnosis for O2 sensor heater. UBatt > 10 V. Sensors installed. No fault memories

Fault debouncing

Active immediately after terminal 15 change; electr. faults entered within a few seconds

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

none

Time conditions

0.2 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Heater short circuit to positive

Repair procedures (plant/service)

1. Visual inspection of wires, DME plug and O2 sensor for damage
2. Check wires
3. Check plug-in connections DME <=> Wiring harness <=> Upstream O2 sensor forward of catalyst for Bank 2
4. Replace O2 sensor
5. Replace DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0056: HO2S HEATER CONTROL CIRCUIT (BANK 2 SENSOR 2) (SIG)

BMW Fault Code (hex)

0x2C9F

BMW Fault Code (dez)

11423

BMW Fault Code Description VS-Text

Oxygen sensor heating behind catalytic converter 2, activation

Component

Oxygen Sensor, Rear

Subcomponent

Heater Electrical

Monitoring criteria

Driver circuit diagnosis for O2 sensor heater. UBatt > 10 V Sensors installed. No fault memories.

Fault debouncing

Active immediately after terminal 15 change; electr. faults entered within a few seconds

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

none

Time conditions

0.2 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Heater wire open

Repair procedures (plant/service)

1. Visual inspection of wiring, DME plug and O2 sensor for damage
2. Inspect wiring
3. Check plug-in connections DME <=> Wiring harness <=> downstream (post-cat) O2 sensor for Bank 2 precatalyst
4. Replace O2 sensor
5. Replace DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0057: HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 2) (MIN)

BMW Fault Code (hex)

0x2C9F

BMW Fault Code (dez)

11423

BMW Fault Code Description VS-Text

Oxygen sensor heating behind catalytic converter 2, activation

Component

Oxygen Sensor, Rear

Subcomponent

Heater Electrical

Monitoring criteria

Driver circuit diagnosis for O2 sensor heater. UBatt > 10 V Sensors installed. No fault memories

Fault debouncing

Active immediately after terminal 15 change; electr. faults entered within a few seconds.

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

none

Time conditions

0.2 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Heater has short to ground

Repair procedures (plant/service)

1. Visual inspection of wiring, DME plug and O2 sensor for damage
2. Inspect wiring
3. Check plug-in connections DME <=> Wiring harness <=> downstream (post-cat) O2 sensor for Bank 2 precatalyst
4. Replace O2 sensor
5. Replace DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0058: HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 2) (MAX)

BMW Fault Code (hex)

0x2C9F

BMW Fault Code (dez)

11423

BMW Fault Code Description VS-Text

Oxygen sensor heating behind catalytic converter 2, activation

Component

Oxygen Sensor, Rear

Subcomponent

Heater Electrical

Monitoring criteria

Driver circuit diagnosis for O2 sensor heater. UBatt > 10 V Sensors installed. No fault memories.

Fault debouncing

Active immediately after terminal 15 change; electr. faults entered within a few seconds

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

none

Time conditions

0.2 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Heater short circuit to positive

Repair procedures (plant/service)

1. Visual inspection of wiring, DME plug and O2 sensor for damage
2. Inspect wiring
3. Check plug-in connections DME <=> Wiring harness <=> downstream (post-cat) O2 sensor for Bank 2 precatlyst
4. Replace O2 sensor
5. Replace DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0070: AMBIENT AIR TEMPERATURE SENSOR CIRCUIT (SIG)

BMW Fault Code (hex)

0x2F9A

BMW Fault Code (dez)

12186

BMW Fault Code Description VS-Text

Ambient temperature sensor, communication

Component

Ambient Air Temperature Sensor

Subcomponent

Electrical

Monitoring criteria

Ambient temperature sensor signal communications monitor

Fault debouncing

22 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Invalid data reading received from instrument cluster: Fault in wiring to sensor, sensor disconnected or defective

Repair procedures (plant/service)

1. Visual inspection of sensor
2. Electrical check on sensor wire and power wires
3. Sensor replacement

MIL illumination/CC message/emergency program

MIL ON in US versions only

Remarks

none

DTC P0071: AMBIENT AIR TEMPERATURE SENSOR RANGE/PERFORMANCE (PLAUS)

BMW Fault Code (hex)

0x2F99

BMW Fault Code (dez)

12185

BMW Fault Code Description VS-Text

Ambient temperature sensor, plausibility

Component

Ambient Air Temperature Sensor

Subcomponent

Plausibility

Monitoring criteria

PLAUS

Fault debouncing

Plausibility monitoring of ambient temperature sensor with end of start phase recognized

Terminal conditions

no invariable debounce time, constant sensor data reading during engine warm-up produces entry

Voltage conditions

Terminal 15 ON

Temperature conditions

none

Time conditions

Outside temperature > 35°C or outside temperature < -7°C, Coolant temperature > -10°C

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

N

Repair procedures (plant/service)

Constant, invariable sensor signal: Sticking sensor, sensor manipulation

MIL illumination/CC message/emergency program

1. Visual inspection of sensor
2. Electrical check on sensor wire and power supply wire
3. Check sensor data response to motion
4. Replace sensor

Remarks

MIL ON in US versions only

DTC P0072: AMBIENT AIR TEMPERATURE SENSOR CIRCUIT LOW (MIN)

BMW Fault Code (hex)

0x2F9A

BMW Fault Code (dez)

12186

BMW Fault Code Description VS-Text

Ambient temperature sensor, communication

Component

Ambient Air Temperature Sensor

Subcomponent

Electrical

Monitoring criteria

Ambient temperature sensor signal communications monitor

Fault debouncing

22 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Instrument cluster receives fault report and symptom: Fault in wiring to sensor, sensor disconnected or defective.

Repair procedures (plant/service)

1. Visual inspection of sensor
2. Electrical check on sensor wire and power wires.
3. Sensor replacement

MIL illumination/CC message/emergency program

MIL ON in US versions only

Remarks

none

DTC P0073: AMBIENT AIR TEMPERATURE SENSOR CIRCUIT HIGH (MAX)

BMW Fault Code (hex)

0x2F9A

BMW Fault Code (dez)

12186

BMW Fault Code Description VS-Text

Ambient temperature sensor, communication

Component

Ambient Air Temperature Sensor

Subcomponent

Electrical

Monitoring criteria

Ambient temperature sensor signal communications monitor.

Fault debouncing

22 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Instrument cluster receives fault report and symptom: Fault in wiring to sensor, sensor disconnected or defective.

Repair procedures (plant/service)

1. Visual inspection of sensor
2. Electrical check on sensor wire and power wires
3. Sensor replacement

MIL illumination/CC message/emergency program

MIL ON in US versions only

Remarks

none

DTC P00B2: RADIATOR COOLANT TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE (PLAUS)

BMW Fault Code (hex)

0x2EEC

BMW Fault Code (dez)

12012

BMW Fault Code Description VS-Text

Temperature sensor cooler outlet, plausibility

Component

Radiator Coolant Temperature Sensor

Subcomponent

Plausibility

Monitoring criteria

Engine must be running

Fault debouncing

no invariable debounce time, constant sensor data reading during engine warm-up produces entry

Terminal conditions

Terminal 15 ON

Voltage conditions

11 V < electrical system voltage < 26 V

Temperature conditions

-10°C < Coolant temperature at engine start < 65°C, -10°C < Induction air temperature at engine start < 69°C

Time conditions

600 ms

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Temperature sensor seizing, sensor manipulation

Repair procedures (plant/service)

1. Visual inspection of sensor
2. Perform electrical check on sensor and power-supply wires
3. Test to determine whether the temperature really changes when the thermostat opens
4. Replace sensor

MIL illumination/CC message/emergency program

MIL ON in US versions only

Remarks

temperature condition defined by data entry

DTC P00B3: RADIATOR COOLANT TEMPERATURE SENSOR CIRCUIT LOW (MIN)

BMW Fault Code (hex)

0x2EEA

BMW Fault Code (dez)

12010

BMW Fault Code Description VS-Text

Temperature sensor cooler outlet, signal

Component

Radiator Coolant Temperature Sensor

Subcomponent

Electrical

Monitoring criteria

Radiator discharge temperature signal monitor

Fault debouncing

5 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 9.15 V

Temperature conditions

none

Time conditions

5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short to ground in sensor wire

Repair procedures (plant/service)

1. Perform electrical check on sensor wire and power-supply wires.
2. Visual inspection of plug-in contacts (on component and DME ends).
3. Replace sensor.

MIL illumination/CC message/emergency program

MIL ON in US versions only

Remarks

Voltage range diagnosis

DTC P00B4: RADIATOR COOLANT TEMPERATURE SENSOR CIRCUIT HIGH (MAX)

BMW Fault Code (hex)

0x2EEA

BMW Fault Code (dez)

12010

BMW Fault Code Description VS-Text

Temperature sensor cooler outlet, signal

Component

Radiator Coolant Temperature Sensor

Subcomponent

Electrical

Monitoring criteria

Radiator discharge temperature signal monitor

Fault debouncing

No compliance with temperature condition and time after end of start > 120 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 9.15 V

Temperature conditions

Intake air temperature $\geq -5.25^{\circ}\text{C}$ or if less than -5.25°C , then time after end of start phase > 120 sec.

Time conditions

No compliance with temperature condition and time after end of start >120 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Sensor wire shorted to positive or open circuit in wire

Repair procedures (plant/service)

1. Perform electrical check on sensor wire and power-supply wires
2. Visual inspection of plug-in contacts (on component and DME ends)
3. Replace sensor

MIL illumination/CC message/emergency program

MIL ON in US versions only

Remarks

Voltage range diagnosis

DTC P0100: MASS OR VOLUME AIR FLOW 'A' CIRCUIT (MAX)

BMW Fault Code (hex)

0x2D16

BMW Fault Code (dez)

11542

BMW Fault Code Description VS-Text

Air-mass sensor, signal

Component

Mass Air Flow Sensor

Subcomponent

Electrical

Monitoring criteria

Engine start completed

Fault debouncing

0.2 sec.

Terminal conditions

Terminal 15

Voltage conditions

OBD1 conditions met (voltage between 10 V and 16 V)

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Sensor wire fallen off

Repair procedures (plant/service)

1. Visual inspection of plug-in terminals (at components and DME)
2. Perform electrical check on sensor wire, power supply and ground
3. Replace sensor

MIL illumination/CC message/emergency program

none

Remarks

Line break

DTC P0111: INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT RANGE/PERFORMANCE (BANK 1) (PLAUS)

BMW Fault Code (hex)

0x2F09

BMW Fault Code (dez)

12041

BMW Fault Code Description VS-Text

Intake air temperature sensor, plausibility

Component

Intake Air Temperature Sensor

Subcomponent

Plausibility

Monitoring criteria

Engine must be running, compliance with specified diagnosis conditions is mandatory (see Time conditions).

Fault debouncing

30 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

When the engine is started the ambient temperature must exceed -7.5°C and be lower than 35.3°C , engine temperature above 84.75°C

Time conditions

(Drive at 40 km/h for 120 sec., then allow to stand at idle for up to 60 sec.) x2 (run though routine twice) + debounce time 30 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Constant, invariable sensor signal: Sticking sensor, sensor manipulation

Repair procedures (plant/service)

1. Check sensor data
2. Carry out electrical check on sensor wire and power supply wires
3. Visual inspection of sensor
4. Replace sensor

MIL illumination/CC message/emergency program

MIL ON in US versions only

Remarks

none

DTC P0112: INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW (BANK 1) (MIN)

BMW Fault Code (hex)

0x2F08

BMW Fault Code (dez)

12040

BMW Fault Code Description VS-Text

Intake-air temperature sensor, signal

Component

Intake Air Temperature Sensor

Subcomponent

1 Electrical

Monitoring criteria

Engine must be running

Fault debouncing

5 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

Ambient temperature at engine start must be above -7°C, and should not drop below -7°C during subsequent driving

Time conditions

5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short to ground in sensor wire

Repair procedures (plant/service)

1. Perform electrical check on sensor wire and power-supply wires
2. Visual inspection of plug-in contacts (on component and DME ends)
3. Replace sensor

MIL illumination/CC message/emergency program

MIL ON in US versions only

Remarks

Voltage range diagnosis

DTC P0113: INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH (BANK 1) (MAX)**BMW Fault Code (hex)**

0x2F08

BMW Fault Code (dez)

12040

BMW Fault Code Description VS-Text

Intake-air temperature sensor, signal

Component

Intake Air Temperature Sensor

Subcomponent

1 Electrical

Monitoring criteria

Time after end of start phase > 120 sec. > 24 sec. (provisional data content definition), engine must be running

Fault debouncing

5 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

Ambient temperature at engine start must be above -7°C , and should not drop below -7°C during subsequent driving

Time conditions

5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Sensor wire shorted to positive or open circuit in wire

Repair procedures (plant/service)

1. Perform electrical check on sensor wire and power-supply wires
2. Visual inspection of plug-in contacts (on component and DME ends)
3. Replace sensor

MIL illumination/CC message/emergency program

MIL ON in US versions only

Remarks

Voltage range diagnosis Important: If the ground wire is open LV_ERR_MAF is before LV_ERR_TIA in the control module's fault memory.

DTC P0117: ENGINE COOLANT TEMPERATURE SENSOR 1 CIRCUIT LOW (MIN)

BMW Fault Code (hex)

0x2EE0

BMW Fault Code (dez)

12000

BMW Fault Code Description VS-Text

Coolant temperature sensor, signal

Component

Engine Coolant Temperature Sensor

Subcomponent

1 Electrical

Monitoring criteria

Coolant temperature signal monitor

Fault debouncing

1.5 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 9.15 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short to ground in sensor wire

Repair procedures (plant/service)

1. Perform electrical check on sensor wire and power-supply wires
2. Visual inspection of plug-in contacts (on component and DME ends)
3. Replace sensor

MIL illumination/CC message/emergency program

MIL ON, electrical water pump and E fan at full power with engine running

Remarks

Voltage range diagnosis

DTC P0118: ENGINE COOLANT TEMPERATURE SENSOR 1 CIRCUIT HIGH (MAX)

BMW Fault Code (hex)

0x2EE0

BMW Fault Code (dez)

12000

BMW Fault Code Description VS-Text

Coolant temperature sensor, signal

Component

Engine Coolant Temperature Sensor

Subcomponent

1 Electrical

Monitoring criteria

Coolant temperature signal monitor

Fault debouncing

1.5 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 9.15 V

Temperature conditions

Intake air temperature $\geq -5.25^{\circ}\text{C}$

Time conditions

If compliance with temperature condition is not present, then time after start phase completion > 120 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Sensor wire shorted to positive or open circuit in wire

Repair procedures (plant/service)

1. Perform electrical check on sensor wire and power-supply wires
2. Visual inspection of plug-in contacts (on component and DME ends)
3. Replace sensor

MIL illumination/CC message/emergency program

MIL ON, electrical water pump and E fan at full power with engine running

Remarks

Voltage range diagnosis

DTC P0121: THROTTLE/PEDAL POSITION SENSOR/SWITCH 'A' CIRCUIT RANGE/PERFORMANCE (PLAUS)

BMW Fault Code (hex)

0x2CF6

BMW Fault Code (dez)

11510

BMW Fault Code Description VS-Text

Throttle-valve potentiometer 1, plausibility to air mass

Component

Throttle Position Sensor

Subcomponent

A

Monitoring criteria

Plausibility check on throttle valve aperture angle as measured against modeled data

Fault debouncing

0.25 sec.

Terminal conditions

Terminal 15 on, engine on

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

Aperture angle in percent

Calculated value Y/N

Y

Possible Fault Causes

Contact resistance in input wires or plug-in contacts at throttle valve, electrical problem with throttle valve

Repair procedures (plant/service)

1. Check: The sum of throttle valve voltages must equal 5 V
2. Perform electrical check on wiring from DME to throttle valve
3. Visual inspection of plug-in contacts (at component, wiring harness and DME)
4. Replace component

MIL illumination/CC message/emergency program

CC status report: WAL_1, reduced engine output!, MIL ON possible EMB + RPM limit at 1300 RPM

Remarks

none

DTC P0122: THROTTLE/PEDAL POSITION SENSOR/SWITCH 'A' CIRCUIT LOW (MIN)

BMW Fault Code (hex)

0x2CF9

BMW Fault Code (dez)

11513

BMW Fault Code Description VS-Text

Throttle-valve potentiometer

Component

Throttle Position Sensor

Subcomponent

A

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P0123: THROTTLE/PEDAL POSITION SENSOR/SWITCH 'A' CIRCUIT HIGH (MAX)

BMW Fault Code (hex)

0x2CF9

BMW Fault Code (dez)

11513

BMW Fault Code Description VS-Text

Throttle-valve potentiometer

Component

Throttle Position Sensor

Subcomponent

A

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P0128: COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE) (PLAUS)

BMW Fault Code (hex)

0x2EF4

BMW Fault Code (dez)

12020

BMW Fault Code Description VS-Text

Map thermostat, mechanism

Component

Thermostat

Subcomponent

Functional Check

Monitoring criteria

Outside temperature > -10°C Start temperature (coolant temperature) < 65°C and > -10°C Speed > 30 and <130 km/h

Fault debouncing

Once release point is reached 25 sec.

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

-10°C < Coolant temperature at engine start < 65°C, -10°C < Induction air temperature at engine start < 69°C

Time conditions

approximately 10 minutes

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

The thermostat seizes in open position (sticking in open position corresponds to a gap of roughly 1 mm!); Engine fails to warm to normal operating temperature.

Repair procedures (plant/service)

1. Check heating of engine
2. Check thermostat and replace as indicated

MIL illumination/CC message/emergency program

MIL on in 2nd driving cycle

Remarks

US only

DTC P0131: O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1) (MIN)

BMW Fault Code (hex)

0x2C3F

BMW Fault Code (dez)

11327

BMW Fault Code Description VS-Text

DME, internal fault: oxygen sensor, evaluation module

Component

Oxygen Sensor, Front

Subcomponent

Electrical

Monitoring criteria

Monitoring of O2 sensor chip No fault memories

Fault debouncing

Short to ground in self-diagnosis processor chip

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

none

Time conditions

approximately 5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short to ground

Repair procedures (plant/service)

1. Visual inspection of wires, DME plug and O2 sensor for damage
2. Check wires
3. Check plug-in connections DME <=> Wiring harness <=> Upstream (pre-cat) O2 sensor for Bank 2
4. Check wiring harness for shorts to positive or ground and shorts/shunt to other bank (melted?) => Replace wiring harness
5. Replace O2 sensor
6. Replace DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0132: O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1) (MAX)

BMW Fault Code (hex)

0x2C3F

BMW Fault Code (dez)

11327

BMW Fault Code Description VS-Text

DME, internal fault: oxygen sensor, evaluation module

Component

Oxygen Sensor, Front

Subcomponent

Electrical

Monitoring criteria

Monitoring of O2 sensor chip No fault memories

Fault debouncing

Self-diagnosis processor chip has short to positive

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

none

Time conditions

approximately 5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short to positive

Repair procedures (plant/service)

1. Visual inspection of wires, DME plug and O2 sensor for damage
2. Check wires
3. Check plug-in connections DME <=> Wiring harness <=> Upstream (pre-cat) O2 sensor for Bank 2
4. Check wiring harness for shorts to positive or ground and shorts/shunt to other bank (melted?) => Replace wiring harness
5. Replace O2 sensor
6. Replace DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0133: O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1) (MAX)

BMW Fault Code (hex)

0x2C39

BMW Fault Code (dez)

11321

BMW Fault Code Description VS-Text

Oxygen sensor before catalytic converter, dynamics

Component

Oxygen Sensor, Front

Subcomponent

Slow Response

Monitoring criteria

O2 sensor dynamic test. No fault memories. Drive at 50 - 80 km/h and at moderate engine speed.

Fault debouncing

Reduced dynamic response from sensor

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

Engine at operating temperature

Time conditions

approximately 400 sec.

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Aging in O2 sensor. Poisoned O2 sensor. In isolated instances an open wire can produce these symptoms.

Repair procedures (plant/service)

Replace the suspect O2 sensor. If this fails to resolve the issue, inspect the wiring.

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0135: O2 SENSOR HEATER CIRCUIT (BANK 1 SENSOR 1) (MAX)

BMW Fault Code (hex)

0x2CA6

BMW Fault Code (dez)

11430

BMW Fault Code Description VS-Text

Oxygen sensor heating before catalytic converter, function

Component

Oxygen Sensor, Front

Subcomponent

Heater

Monitoring criteria

Check O2 sensor heater; sensor too cold

Fault debouncing

O2 sensor temperature < 680°C for more than 5 sec.

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

none

Time conditions

Roughly 40 sec. after engine start; after approximately 15 sec. in standard operation

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Age effects on sensor heater. Higher contact resistance. Open circuit at Pin VN.

Repair procedures (plant/service)

1. Visual inspection of wires, DME plug and O2 sensor for damage
2. Check wires (including resistance)
3. Check plug-in connections DME <=> Wiring harness <=> Upstream (pre-cat) O2 sensor on Bank 1 (water or corrosion in the plug? => Repeatedly disconnect the plug and then FIRMLY press it back in)
4. Replace O2 sensor

5. Replace DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0135: O2 SENSOR HEATER CIRCUIT (BANK 1 SENSOR 1) (MIN)

BMW Fault Code (hex)

0x2CA6

BMW Fault Code (dez)

11430

BMW Fault Code Description VS-Text

Oxygen sensor heating before catalytic converter, function

Component

Oxygen Sensor, Front

Subcomponent

Heater

Monitoring criteria

Data content defined

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P0137: O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) (MIN)

BMW Fault Code (hex)

0x2C75

BMW Fault Code (dez)

11381

BMW Fault Code Description VS-Text

Oxygen sensor behind catalytic converter, signal

Component

Oxygen Sensor, Rear

Subcomponent

Electrical

Monitoring criteria

O2 sensor signal check. No fault memories. Mass airflow exceeds 10 kg/h.

Fault debouncing

Bank 1 downstream (post-cat) O2 sensor voltage less than 0.02 V; internal resistance in circuit for downstream oxygen sensor less than 10 ohms

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

Engine at operating temperature

Time conditions

approximately 2 minutes

System test

none

Signal information

Voltage < 0.2 V

Calculated value Y/N

N

Possible Fault Causes

Short to ground

Repair procedures (plant/service)

1. Check wiring
2. Check plugs
3. Resistance measurement
4. Measure voltage
5. Replace Bank 1 downstream (post-cat) O2 sensor

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0138: O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) (MAX)

BMW Fault Code (hex)

0x2C73

BMW Fault Code (dez)

11379

BMW Fault Code Description VS-Text

Oxygen sensor behind catalytic converter, signal

Component

Oxygen Sensor, Rear

Subcomponent

Electrical

Monitoring criteria

O2 sensor signal test. No fault memories

Fault debouncing

Voltage on Bank 1 O2 sensor behind catalytic converter greater than 4.6 V

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

none

Time conditions

approximately 15 sec.

System test

none

Signal information

Voltage > 4.6 V

Calculated value Y/N

N

Possible Fault Causes

Short to positive

Repair procedures (plant/service)

1. Check wiring
2. Measure downstream (post-cat) O2 sensor voltage
3. Check plug
4. Replace Bank 1 downstream (post-cat) O2 sensor

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0139: O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2) (PLAUS)

BMW Fault Code (hex)

0x2C7B

BMW Fault Code (dez)

11387

BMW Fault Code Description VS-Text

Oxygen sensor behind catalytic converter, signal

Component

Oxygen Sensor, Rear

Subcomponent

Slow Response

Monitoring criteria

O2 sensor behind catalytic converter voltage too high with overrun injection deactivation active; signal sticks at rich

Fault debouncing

Voltage > 0.2 V

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

Engine at operating temperature

Time conditions

Approximately 10s overrun injection deactivation

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Open wire; short to positive, O2 sensor sticking (with aid of a power source) at $U > 0.2 \text{ V}$; sensor too cold in overrun fuel supply deactivation

Repair procedures (plant/service)

1. Check wiring
2. Check plugs
3. Measure wire resistance against positive and ground
4. Replace Bank 1 downstream (post-cat) O2 sensor

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P0140: O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2) (SIG)**BMW Fault Code (hex)**

0x2C77

BMW Fault Code (dez)

11383

BMW Fault Code Description VS-Text

Oxygen sensor behind catalytic converter, signal

Component

Oxygen Sensor, Rear

Subcomponent

Electrical

Monitoring criteria

O2 sensor signal test. No fault memories

Fault debouncing

O2 sensor voltage between 0.4 V and 0.5 V; internal resistance in downstream oxygen sensor's circuit exceeds 60 k Ohms

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

Engine at operating temperature

Time conditions

approximately 2 minutes

System test

none

Signal information

Voltage 0.4 ... 0.5 V

Calculated value Y/N

N

Possible Fault Causes

Open circuit

Repair procedures (plant/service)

1. Visual inspection of wiring and plugs
2. Measure resistance
3. Replace affected wire

4. Replace wiring harness
5. Replace O2 sensor

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0141: O2 SENSOR HEATER CIRCUIT (BANK 1 SENSOR 2) (MAX)

BMW Fault Code (hex)

0x2CA8

BMW Fault Code (dez)

11432

BMW Fault Code Description VS-Text

Oxygen sensor heating behind catalytic converter, function

Component

Oxygen Sensor, Rear

Subcomponent

Heater

Monitoring criteria

Check internal resistance of O2 sensor to check sensor heater => If the heater is too weak, the O2 sensor's internal resistance rises too high (= sensor too cold). No fault memories.

Fault debouncing

Internal resistance $R > 12000$ Ohm (US) or 15000 Ohm (ECE)

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

Exhaust-gas temperature less than 700°C

Time conditions

approximately 400 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

O2 sensor is too cool; contact resistance at terminals in heater wire too high; heater too weak owing to aging

Repair procedures (plant/service)

Was the temperature drop caused by external factors (driving into snow pile, ice on O2 sensor)? Thaw sensor, clear all fault memory, continue driving!

1. Check O2 sensor heater: Contact resistance on plugs and in wiring is excessive (DME-wiring harness-sensor)
2. Check wiring
3. Check O2 sensor plug (water or corrosion in the plug? Repeatedly disconnect the plug and then re-insert it FIRMLY)
4. Replace plug and/or wire as indicated
5. Replace the affected downstream (post-cat) O2 sensor

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0151: O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 1) (MIN)

BMW Fault Code (hex)

0x2C40

BMW Fault Code (dez)

11328

BMW Fault Code Description VS-Text

DME, internal fault: oxygen sensor 2, evaluation module

Component

Oxygen Sensor, Front

Subcomponent

Electrical

Monitoring criteria

Monitoring of O2 sensor chip. No fault memories.

Fault debouncing

Short to ground in self-diagnosis processor chip

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

none

Time conditions

approximately 5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short to ground

Repair procedures (plant/service)

1. Visual inspection of wires, DME plug and O2 sensor for damage
2. Check wires
3. Check plug-in connections DME <=> Wiring harness <=> Upstream (pre-cat) O2 sensor for Bank 2
4. Check wiring harness for shorts to positive or ground and shorts/shunt to other bank (melted?) => Replace wiring harness
5. Replace O2 sensor
6. Replace DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0152: O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 1) (MAX)

BMW Fault Code (hex)

0x2C40

BMW Fault Code (dez)

11328

BMW Fault Code Description VS-Text

DME, internal fault: oxygen sensor 2, evaluation module

Component

Oxygen Sensor, Front

Subcomponent

Electrical

Monitoring criteria

Monitoring of O2 sensor chip. No fault memories.

Fault debouncing

Self-diagnosis processor chip has short to positive

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

none

Time conditions

approximately 5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short to positive

Repair procedures (plant/service)

1. Visual inspection of wires, DME plug and O2 sensor for damage
2. Check wires
3. Check plug-in connections DME <=> Wiring harness <=> Upstream (pre-cat) O2 sensor for Bank 2
4. Check wiring harness for shorts to positive or ground and shorts/shunt to other bank (melted?) => Replace wiring harness
5. Replace O2 sensor
6. Replace DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0153: O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 1) (MAX)

BMW Fault Code (hex)

0x2C3A

BMW Fault Code (dez)

11322

BMW Fault Code Description VS-Text

Oxygen sensor before catalytic converter 2, dynamics

Component

Oxygen Sensor, Front

Subcomponent

Slow Response

Monitoring criteria

O2 sensor dynamic test. No fault memories. Drive at 50 - 80 km/h and at moderate engine speed.

Fault debouncing

Reduced dynamic response from sensor

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

Engine at operating temperature

Time conditions

approximately 400 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Aging in O2 sensor. Poisoned O2 sensor. In isolated instances an open wire can produce these symptoms.

Repair procedures (plant/service)

Replace the suspect O2 sensor. If this fails to resolve the issue, inspect the wiring.

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0155: O2 SENSOR HEATER CIRCUIT (BANK 2 SENSOR 1) (MAX)

BMW Fault Code (hex)

0x2CA7

BMW Fault Code (dez)

11431

BMW Fault Code Description VS-Text

Oxygen sensor heating before catalytic converter 2, function

Component

Oxygen Sensor, Front

Subcomponent

Heater

Monitoring criteria

Check O2 sensor heater; sensor too cold

Fault debouncing

O2 sensor temperature < 680°C for more than 5 sec.

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

none

Time conditions

Roughly 40 sec. after engine start; after approximately 15 sec. in standard operation

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Age effects on sensor heater. Higher contact resistance. Open circuit at Pin VN.

Repair procedures (plant/service)

1. Visual inspection of wires, DME plug and O2 sensor for damage
2. Check wires (including resistance)
3. Check plug-in connections DME <=> Wiring harness <=> Upstream (pre-cat) O2 sensor for Bank 2 (water or corrosion in the plug? => Repeatedly disconnect the plug and then FIRMLY press it back in)
4. Replace O2 sensor
5. Replace DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0155: O2 SENSOR HEATER CIRCUIT (BANK 2 SENSOR 1) (MIN)

BMW Fault Code (hex)

0x2CA7

BMW Fault Code (dez)

11431

BMW Fault Code Description VS-Text

Oxygen sensor heating before catalytic converter 2, function

Component

Oxygen Sensor, Front

Subcomponent

Heater

Monitoring criteria

Data content defined

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P0157: O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 2) (MIN)

BMW Fault Code (hex)

0x2C76

BMW Fault Code (dez)

11382

BMW Fault Code Description VS-Text

Oxygen sensor behind catalytic converter 2, signal

Component

Oxygen Sensor, Rear

Subcomponent

Electrical

Monitoring criteria

O2 sensor signal check. No fault memories; Mass airflow exceeds 10 kg/h

Fault debouncing

Bank 2 downstream (post-cat) O2 sensor voltage less than 0.02 V; internal resistance in circuit for downstream oxygen sensor less than 10 ohms

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

Engine at operating temperature

Time conditions

approximately 2 minutes

System test

none

Signal information

Voltage < 0.2 V

Calculated value Y/N

N

Possible Fault Causes

Short to ground

Repair procedures (plant/service)

1. Check wiring
2. Check plugs
3. Resistance measurement
4. Measure voltage
5. Replace Bank 2 downstream (post-cat) O2 sensor

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0158: O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 2) (MAX)**BMW Fault Code (hex)**

0x2C74

BMW Fault Code (dez)

11380

BMW Fault Code Description VS-Text

Oxygen sensor behind catalytic converter 2, signal

Component

Oxygen Sensor, Rear

Subcomponent

Electrical

Monitoring criteria

O2 sensor signal test. No fault memories

Fault debouncing

Voltage on Bank 2 O2 sensor behind catalytic converter greater than 4.6 V

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

none

Time conditions

approximately 15 sec.

System test

none

Signal information

Voltage > 4.6 V

Calculated value Y/N

N

Possible Fault Causes

Short to positive

Repair procedures (plant/service)

1. Check wiring
2. Measure downstream (post-cat) O2 sensor voltage
3. Check plug
4. Replace Bank 2 downstream (post-cat) O2 sensor.

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0159: O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 2) (PLAUS)

BMW Fault Code (hex)

0x2C7C

BMW Fault Code (dez)

11388

BMW Fault Code Description VS-Text

Oxygen sensor behind catalytic converter 2, signal

Component

Oxygen Sensor, Rear

Subcomponent

Slow Response

Monitoring criteria

O2 sensor behind catalytic converter voltage too high with overrun injection deactivation active; signal sticks at rich

Fault debouncing

Voltage > 0.2 V

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

Engine at operating temperature

Time conditions

Approximately 10s overrun injection deactivation

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Open wire; short to positive, O2 sensor sticking (with aid of a power source) at $U > 0.2 \text{ V}$; sensor too cold in overrun fuel supply deactivation.

Repair procedures (plant/service)

1. Check wiring
2. Check plugs
3. Measure wire resistance against positive and ground
4. Replace Bank 2 downstream (post-cat) O2 sensor

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0160: O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 2 SENSOR 2) (SIG)

BMW Fault Code (hex)

0x2C78

BMW Fault Code (dez)

11384

BMW Fault Code Description VS-Text

Oxygen sensor behind catalytic converter 2, signal

Component

Oxygen Sensor, Rear

Subcomponent

Electrical

Monitoring criteria

O2 sensor signal test. No fault memories

Fault debouncing

O2 sensor voltage between 0.4 V and 0.5 V; internal resistance in downstream oxygen sensor's circuit exceeds 60 k Ohms

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

Engine at operating temperature

Time conditions

approximately 2 minutes

System test

none

Signal information

Voltage 0.4 ... 0.5 V

Calculated value Y/N

N

Possible Fault Causes

Open circuit

Repair procedures (plant/service)

1. Visual inspection of wiring and plugs
2. Measure resistance
3. Replace affected wire
4. Replace wiring harness
5. Replace O2 sensor

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0161: O2 SENSOR HEATER CIRCUIT (BANK 2 SENSOR 2) (MAX)

BMW Fault Code (hex)

0x2CA9

BMW Fault Code (dez)

11433

BMW Fault Code Description VS-Text

Oxygen sensor heating behind catalytic converter 2, function

Component

Oxygen Sensor, Rear

Subcomponent

Heater

Monitoring criteria

Check internal resistance of O2 sensor to check sensor heater => If the heater is too weak, the O2 sensor's internal resistance rises too high (= sensor too cold). No fault memories

Fault debouncing

Internal resistance $R > 12000$ Ohm (US) or 15000 Ohm (ECE)

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

Exhaust-gas temperature less than 700°C

Time conditions

approximately 400 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

O2 sensor is too cool; contact resistance at terminals in heater wire too high; heater too weak owing to aging.

Repair procedures (plant/service)

Was the temperature drop caused by external factors (driving into snow pile, ice on O2 sensor)? Thaw sensor, clear all fault memory, continue driving!

1. Check O2 sensor heater: Contact resistance on plugs and in wiring is excessive (DME-wiring harness-sensor)

2. Check wiring
3. Check O2 sensor plug (water or corrosion in the plug? Repeatedly disconnect the plug and then re-insert it FIRMLY)
4. Replace plug and/or wire as indicated
5. Replace the affected downstream (post-cat) O2 sensor

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0171: SYSTEM TOO LEAN (BANK 1) (MAX)

BMW Fault Code (hex)

0x29E0

BMW Fault Code (dez)

10720

BMW Fault Code Description VS-Text

Mixture control

Component

Fuel System

Subcomponent

All Load Ranges

Monitoring criteria

Closed-loop lambda mixture control = Active

Fault debouncing

65 sec. lambda controller + adaptation deviation in max. 1200 sec.

Terminal conditions

Engine must be running

Voltage conditions

none

Temperature conditions

Tam > - 10°C

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

--Mixture too lean A. Air path

1. Leaks in induction tract (also in lines to brake booster)
2. Resonators obstructed
3. Leaks or malfunctions in positive crankcase ventilation
4. Leaks in crankcase (oil filler cap)
5. HFM malfunction
6. EVAP valve leaking

Repair procedures (plant/service)

- Visual inspection of affected components - Find and repair leaks - Mutual exchange of HFM or injector valves
- Inspect HFM plug-in contacts and electrical wires - Check fuel pressure

MIL illumination/CC message/emergency program

MIL on in 2nd driving cycle

Remarks

none

DTC P0172: SYSTEM TOO RICH (BANK 1) (MIN)

BMW Fault Code (hex)

0x29E0

BMW Fault Code (dez)

10720

BMW Fault Code Description VS-Text

Mixture control

Component

Fuel System

Subcomponent

All Load Ranges

Monitoring criteria

Closed-loop lambda mixture control = Active

Fault debouncing

75 sec. lambda controller + adaptation deviation in max. 1200 sec.

Terminal conditions

Engine must be running

Voltage conditions

none

Temperature conditions

Tam > -10°C

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

--Mixture too rich A. Air path

1. Resonators obstructed/sealed
2. Malfunction in positive crankcase ventilation
3. HFM malfunction
4. Tank EVAP valve is leaking (tank ventilation gases) - Collateral fault from incorrect DISA positioning - Collateral fault

Repair procedures (plant/service)

- Visual inspection of affected components - Reverse Mutual installation positions of HFM or injector valves - Check HFM plug contacts and electrical wiring - Check fuel pressure - Catalyst on one bank melted (Visual inspection through O2 sensor fittings)

MIL illumination/CC message/emergency program

MIL on in 2nd driving cycle

Remarks

none

DTC P0174: SYSTEM TOO LEAN (BANK 2) (MAX)

BMW Fault Code (hex)

0x29E1

BMW Fault Code (dez)

10721

BMW Fault Code Description VS-Text

Mixture control 2

Component

Fuel System

Subcomponent

All Load Ranges

Monitoring criteria

Closed-loop lambda mixture control = Active

Fault debouncing

65 sec. lambda controller + adaptation deviation in max. 1200 sec.

Terminal conditions

Engine must be running

Voltage conditions

none

Temperature conditions

Tam > -10°C

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

--Mixture too lean A. Air path

1. Leaks in induction tract (also in lines to brake booster)
2. Resonators obstructed
3. Leaks or malfunctions in positive crankcase ventilation
4. Leaks in crankcase (oil filler cap)
5. HFM malfunction
6. EVAP valve leaking

Repair procedures (plant/service)

- Visual inspection of affected components - Find and repair leaks - Mutual exchange of HFM or injector valves
- Inspect HFM plug-in contacts and electrical wires - Check fuel pressure

MIL illumination/CC message/emergency program

MIL on in 2nd driving cycle

Remarks

none

DTC P0175: SYSTEM TOO RICH (BANK 2) (MIN)

BMW Fault Code (hex)

0x29E1

BMW Fault Code (dez)

10721

BMW Fault Code Description VS-Text

Mixture control 2

Component

Fuel System

Subcomponent

All Load Ranges

Monitoring criteria

Closed-loop lambda mixture control = Active

Fault debouncing

75 sec. lambda controller + adaptation deviation in max. 1200 sec.

Terminal conditions

Engine must be running

Voltage conditions

none

Temperature conditions

T_{am} > -10°C

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

--Mixture too rich A. Air path

1. Resonators obstructed/sealed
2. Malfunction in positive crankcase ventilation
3. HFM malfunction
4. Tank EVAP valve is leaking (tank ventilation gases) - Collateral fault from incorrect DISA positioning - Collateral fault

Repair procedures (plant/service)

- Visual inspection of affected components - Reverse Mutual installation positions of HFM or injector valves - Check HFM plug contacts and electrical wiring - Check fuel pressure - Catalyst on one bank melted (Visual inspection through O2 sensor fittings)

MIL illumination/CC message/emergency program

MIL on in 2nd driving cycle

Remarks

none

DTC P0201: INJECTOR CIRCUIT/OPEN - CYLINDER 1 (SIG)

BMW Fault Code (hex)

0x2E30

BMW Fault Code (dez)

11824

BMW Fault Code Description VS-Text

Fuel injector, cylinder 1, activation

Component

Injector

Subcomponent

Open Circuit

Monitoring criteria

Injector control monitor

Fault debouncing

0.2 sec.

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

1.5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Open circuit

Repair procedures (plant/service)

Check wiring. Repair if defective. If wiring is OK, proceed to check component.

MIL illumination/CC message/emergency program

MIL

Remarks

none

DTC P0202: INJECTOR CIRCUIT/OPEN - CYLINDER 2 (SIG)**BMW Fault Code (hex)**

0x2E31

BMW Fault Code (dez)

11825

BMW Fault Code Description VS-Text

Fuel injector, cylinder 2, activation

Component

Injector

Subcomponent

Open Circuit

Monitoring criteria

Injector control monitor

Fault debouncing

0.2 sec.

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

1.5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Open circuit

Repair procedures (plant/service)

Check wiring. Repair if defective. If wiring is OK, proceed to check component.

MIL illumination/CC message/emergency program

MIL

Remarks

none

DTC P0203: INJECTOR CIRCUIT/OPEN - CYLINDER 3 (SIG)

BMW Fault Code (hex)

0x2E32

BMW Fault Code (dez)

11826

BMW Fault Code Description VS-Text

Fuel injector, cylinder 3, activation

Component

Injector

Subcomponent

Open Circuit

Monitoring criteria

Injector control monitor

Fault debouncing

0.2 sec.

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

1.5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Open circuit

Repair procedures (plant/service)

Check wiring. Repair if defective. If wiring is OK, proceed to check component.

MIL illumination/CC message/emergency program

MIL

Remarks

none

DTC P0204: INJECTOR CIRCUIT/OPEN - CYLINDER 4 (SIG)**BMW Fault Code (hex)**

0x2E33

BMW Fault Code (dez)

11827

BMW Fault Code Description VS-Text

Fuel injector, cylinder 4, activation

Component

Injector

Subcomponent

Open Circuit

Monitoring criteria

Injector control monitor

Fault debouncing

0.2 sec.

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

1.5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Open circuit

Repair procedures (plant/service)

Check wiring. Repair if defective. If wiring is OK, proceed to check component

MIL illumination/CC message/emergency program

MIL

Remarks

none

DTC P0205: INJECTOR CIRCUIT/OPEN - CYLINDER 5 (SIG)

BMW Fault Code (hex)

0x2E34

BMW Fault Code (dez)

11828

BMW Fault Code Description VS-Text

Fuel injector, cylinder 5, activation

Component

Injector

Subcomponent

Open Circuit

Monitoring criteria

Injector control monitor

Fault debouncing

0.2 sec.

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

1.5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Open circuit

Repair procedures (plant/service)

Check wiring. Repair if defective. If wiring is OK, proceed to check component.

MIL illumination/CC message/emergency program

MIL

Remarks

none

DTC P0206: INJECTOR CIRCUIT/OPEN - CYLINDER 6 (SIG)**BMW Fault Code (hex)**

0x2E35

BMW Fault Code (dez)

11829

BMW Fault Code Description VS-Text

Fuel injector, cylinder 6, activation

Component

Injector

Subcomponent

Open Circuit

Monitoring criteria

Injector control monitor

Fault debouncing

0.2 sec.

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

1.5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Open circuit

Repair procedures (plant/service)

Check wiring. Repair if defective. If wiring is OK, proceed to check component.

MIL illumination/CC message/emergency program

MIL

Remarks

none

DTC P0221: THROTTLE/PEDAL POSITION SENSOR/SWITCH 'B' CIRCUIT RANGE/PERFORMANCE (PLAUS)

BMW Fault Code (hex)

0x2CF7

BMW Fault Code (dez)

11511

BMW Fault Code Description VS-Text

Throttle-valve potentiometer 2, plausibility to air mass

Component

Throttle Position Sensor

Subcomponent

B

Monitoring criteria

Plausibility check on throttle valve aperture angle as measured against modeled data

Fault debouncing

0.25 sec.

Terminal conditions

Terminal 15 on, engine on

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

Aperture angle in percent

Calculated value Y/N

Y

Possible Fault Causes

Contact resistance in input wires or plug-in contacts at throttle valve, electrical problem with throttle valve

Repair procedures (plant/service)

1. Check: The sum of throttle valve voltages must equal 5 V
2. Perform electrical check on wiring from DME to throttle valve
3. Visual inspection of plug-in contacts (at component, wiring harness and DME)
4. Replace component

MIL illumination/CC message/emergency program

CC status report: WAL_1, reduced engine output!, MIL ON possible EMB + RPM limit at 1300 RPM

Remarks

none

DTC P0222: THROTTLE/PEDAL POSITION SENSOR/SWITCH 'B' CIRCUIT LOW (MIN)

BMW Fault Code (hex)

0x2CFA

BMW Fault Code (dez)

11514

BMW Fault Code Description VS-Text

Throttle-valve potentiometer 2

Component

Throttle Position Sensor

Subcomponent

B

Monitoring criteria

Throttle valve test

Fault debouncing

0.02 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

none

Temperature conditions

none

Time conditions

50 ms

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

1. Main relay response lag.
2. Short to ground in Channel 2 sensor wire or wire open.

Repair procedures (plant/service)

1. Check fault memory for faults related to ""power supply to pedal travel sensor"" and/or ""main relay;""
replace main relay as indicated
 1. Perform electrical check on sensor wire and power supply
 2. Visual inspection of plug contacts (on component and DME ends)

MIL illumination/CC message/emergency program

none

Remarks

Voltage range diagnosis

NOTE: This is the first fault entered in the control module's fault memory when the main relay is defective or a problem exists with the voltage supply to pedal-position sensor 1, as the debounce time is very short.

DTC P0223: THROTTLE/PEDAL POSITION SENSOR/SWITCH 'B' CIRCUIT HIGH (MAX)

BMW Fault Code (hex)

0x2CFA

BMW Fault Code (dez)

11514

BMW Fault Code Description VS-Text

Throttle-valve potentiometer 2

Component

Throttle Position Sensor

Subcomponent

B

Monitoring criteria

Throttle valve test

Fault debouncing

0.02 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

none

Temperature conditions

none

Time conditions

50 ms

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Channel 2 sensor wire shorted to positive

Repair procedures (plant/service)

1. Electrical check on sensor wire and electrical power supply
2. Visual inspection of plug-in contacts (at component and DME ends)

MIL illumination/CC message/emergency program

MIL control through lv_err_tps_obd

Remarks

Voltage range diagnosis

DTC P0261: CYLINDER 1 INJECTOR CIRCUIT LOW (MIN)

BMW Fault Code (hex)

0x2E30

BMW Fault Code (dez)

11824

BMW Fault Code Description VS-Text

Fuel injector, cylinder 1, activation

Component

Injector

Subcomponent

Short to Ground

Monitoring criteria

Injector control monitor

Fault debouncing

0.2 sec.

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

1.5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short circuit to ground in wire or component.

Repair procedures (plant/service)

Check wiring. Repair if defective. If wiring is OK, proceed to check component.

MIL illumination/CC message/emergency program

MIL

Remarks

none

DTC P0262: CYLINDER 1 INJECTOR CIRCUIT HIGH (MAX)

BMW Fault Code (hex)

0x2E30

BMW Fault Code (dez)

11824

BMW Fault Code Description VS-Text

Fuel injector, cylinder 1, activation

Component

Injector

Subcomponent

Short to Battery

Monitoring criteria

Injector control monitor

Fault debouncing

0.2 sec.

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

1.5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Wire is shorted to positive, or a short to positive is present in the component

Repair procedures (plant/service)

Check wiring. Repair if defective. If wiring is OK, proceed to check component.

MIL illumination/CC message/emergency program

MIL

Remarks

Problem resolved only after terminal switch

DTC P0264: CYLINDER 2 INJECTOR CIRCUIT LOW (MIN)

BMW Fault Code (hex)

0x2E31

BMW Fault Code (dez)

11825

BMW Fault Code Description VS-Text

Fuel injector, cylinder 2, activation

Component

Injector

Subcomponent

Short to Ground

Monitoring criteria

Injector control monitor

Fault debouncing

0.2 sec.

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

1.5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short circuit to ground in wire or component.

Repair procedures (plant/service)

Check wiring. Repair if defective. If wiring is OK, proceed to check component.

MIL illumination/CC message/emergency program

MIL

Remarks

none

DTC P0265: CYLINDER 2 INJECTOR CIRCUIT HIGH (MAX)

BMW Fault Code (hex)

0x2E31

BMW Fault Code (dez)

11825

BMW Fault Code Description VS-Text

Fuel injector, cylinder 2, activation

Component

Injector

Subcomponent

Short to Battery

Monitoring criteria

Injector control monitor

Fault debouncing

0.2 sec.

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

1.5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Wire is shorted to positive, or a short to positive is present in the component.

Repair procedures (plant/service)

Check wiring. Repair if defective. If wiring is OK, proceed to check component.

MIL illumination/CC message/emergency program

MIL

Remarks

Problem resolved only after terminal switch

DTC P0267: CYLINDER 3 INJECTOR CIRCUIT LOW (MIN)

BMW Fault Code (hex)

0x2E32

BMW Fault Code (dez)

11826

BMW Fault Code Description VS-Text

Fuel injector, cylinder 3, activation

Component

Injector

Subcomponent

Short to Ground

Monitoring criteria

Injector control monitor

Fault debouncing

0.2 sec.

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

1.5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short circuit to ground in wire or component.

Repair procedures (plant/service)

Check wiring. Repair if defective. If wiring is OK, proceed to check component.

MIL illumination/CC message/emergency program

MIL

Remarks

none

DTC P0268: CYLINDER 3 INJECTOR CIRCUIT HIGH (MAX)**BMW Fault Code (hex)**

0x2E32

BMW Fault Code (dez)

11826

BMW Fault Code Description VS-Text

Fuel injector, cylinder 3, activation

Component

Injector

Subcomponent

Short to Battery

Monitoring criteria

Injector control monitor

Fault debouncing

0.2 sec.

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

1.5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Wire is shorted to positive, or a short to positive is present in the component

Repair procedures (plant/service)

Check wiring. Repair if defective. If wiring is OK, proceed to check component

MIL illumination/CC message/emergency program

MIL

Remarks

Problem resolved only after terminal switch

DTC P0270: CYLINDER 4 INJECTOR CIRCUIT LOW (MIN)

BMW Fault Code (hex)

0x2E33

BMW Fault Code (dez)

11827

BMW Fault Code Description VS-Text

Fuel injector, cylinder 4, activation

Component

Injector

Subcomponent

Short to Ground

Monitoring criteria

Injector control monitor

Fault debouncing

0.2 sec.

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

1.5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short circuit to ground in wire or component.

Repair procedures (plant/service)

Check wiring. Repair if defective. If wiring is OK, proceed to check component.

MIL illumination/CC message/emergency program

MIL

Remarks

none

DTC P0271: CYLINDER 4 INJECTOR CIRCUIT HIGH (MAX)

BMW Fault Code (hex)

0x2E33

BMW Fault Code (dez)

11827

BMW Fault Code Description VS-Text

Fuel injector, cylinder 4, activation

Component

Injector

Subcomponent

Short to Batt

Monitoring criteria

Injector control monitor

Fault debouncing

0.2 sec.

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

1.5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Wire is shorted to positive, or a short to positive is present in the component

Repair procedures (plant/service)

Check wiring. Repair if defective. If wiring is OK, proceed to check component

MIL illumination/CC message/emergency program

MIL

Remarks

Problem resolved only after terminal switch

DTC P0273: CYLINDER 5 INJECTOR CIRCUIT LOW (MIN)

BMW Fault Code (hex)

0x2E34

BMW Fault Code (dez)

11828

BMW Fault Code Description VS-Text

Fuel injector, cylinder 5, activation

Component

Injector

Subcomponent

Short to Ground

Monitoring criteria

Injector control monitor

Fault debouncing

0.2 sec.

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

1.5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short circuit to ground in wire or component.

Repair procedures (plant/service)

Check wiring. Repair if defective. If wiring is OK, proceed to check component.

MIL illumination/CC message/emergency program

MIL

Remarks

none

DTC P0274: CYLINDER 5 INJECTOR CIRCUIT HIGH (MAX)

BMW Fault Code (hex)

0x2E34

BMW Fault Code (dez)

11828

BMW Fault Code Description VS-Text

Fuel injector, cylinder 5, activation

Component

Injector

Subcomponent

Short to Batt

Monitoring criteria

Injector control monitor

Fault debouncing

0.2 sec.

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

1.5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Wire is shorted to positive, or a short to positive is present in the component.

Repair procedures (plant/service)

Check wiring. Repair if defective. If wiring is OK, proceed to check component.

MIL illumination/CC message/emergency program

MIL

Remarks

Problem resolved only after terminal switch

DTC P0276: CYLINDER 6 INJECTOR CIRCUIT LOW (MIN)

BMW Fault Code (hex)

0x2E35

BMW Fault Code (dez)

11829

BMW Fault Code Description VS-Text

Fuel injector, cylinder 6, activation

Component

Injector

Subcomponent

Short to Ground

Monitoring criteria

Injector control monitor

Fault debouncing

0.2 sec.

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

1.5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short circuit to ground in wire or component.

Repair procedures (plant/service)

Check wiring. Repair if defective. If wiring is OK, proceed to check component.

MIL illumination/CC message/emergency program

MIL

Remarks

none

DTC P0277: CYLINDER 6 INJECTOR CIRCUIT HIGH (MAX)

BMW Fault Code (hex)

0x2E35

BMW Fault Code (dez)

11829

BMW Fault Code Description VS-Text

Fuel injector, cylinder 6, activation

Component

Injector

Subcomponent

Short to Batt

Monitoring criteria

Injector control monitor

Fault debouncing

0.2 sec.

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

1.5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Wire is shorted to positive, or a short to positive is present in the component

Repair procedures (plant/service)

Check wiring. Repair if defective. If wiring is OK, proceed to check component

MIL illumination/CC message/emergency program

MIL

Remarks

Problem resolved only after terminal switch

DTC P0300: RANDOM/MULTIPLE CYLINDER MISFIRE DETECTED (MAX)

BMW Fault Code (hex)

0x29CC

BMW Fault Code (dez)

10700

BMW Fault Code Description VS-Text

Combustion misfires, several cylinders

Component

Misfire

Subcomponent

Multiple

Monitoring criteria

Combustion consistency measurement. Starting at engine speed $n > 450$ and $n < 7000$. Ambient pressure > 740 hPa. Combustion miss on at least two cylinders.

Fault debouncing

Combustion miss within 200 crankshaft rotations, weighted according to engine speed and load factor.

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

Coolant temperature $> - 6.8^{\circ}\text{C}$

Time conditions

6 crankshaft rotations after start

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Ignition miss or fuel trim fault affecting at least two individual cylinders

Repair procedures (plant/service)

Ignition coils, spark plugs, ignition cables, injectors, DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

Supplementary information always provided when combustion miss is detected on more than two cylinders.

DTC P0300: RANDOM/MULTIPLE CYLINDER MISFIRE DETECTED (MIN)

BMW Fault Code (hex)

0x29CC

BMW Fault Code (dez)

10700

BMW Fault Code Description VS-Text

Combustion misfires, several cylinders

Component

Misfire

Subcomponent

Multiple

Monitoring criteria

Combustion consistency measurement. Starting at engine speed $n > 450$ and $n < 7000$. Ambient pressure > 740 hPa. Combustion miss on at least two cylinders

Fault debouncing

Combustion miss within first 1000 crankshaft rotations after start

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

Coolant temperature $> - 6.8$ °C

Time conditions

6 crankshaft rotations after start

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Ignition miss or fuel trim fault affecting at least two individual cylinders

Repair procedures (plant/service)

Ignition coils, spark plugs, ignition cables, injectors, DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

Supplementary information always provided when combustion miss is detected on more than two cylinders.

DTC P0300: RANDOM/MULTIPLE CYLINDER MISFIRE DETECTED (PLAUS)

BMW Fault Code (hex)

0x29CC

BMW Fault Code (dez)

10700

BMW Fault Code Description VS-Text

Combustion misfires, several cylinders

Component

Misfire

Subcomponent

Multiple

Monitoring criteria

Combustion consistency measurement. Starting at engine speed $n > 450$ and $n < 7000$. Ambient pressure > 740 hPa. Combustion miss on at least two cylinders.

Fault debouncing

at least 2 bits from Symbol are set to 2

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

Coolant temperature $> - 6.8^{\circ}\text{C}$

Time conditions

6 crankshaft rotations after start

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Ignition miss or fuel trim fault affecting at least two individual cylinders.

Repair procedures (plant/service)

Ignition coils, spark plugs, ignition cables, injectors, DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

Supplementary information always provided when combustion miss is detected on more than two cylinders.

DTC P0300: RANDOM/MULTIPLE CYLINDER MISFIRE DETECTED (SIG)

BMW Fault Code (hex)

0x29CC

BMW Fault Code (dez)

10700

BMW Fault Code Description VS-Text

Combustion misfires, several cylinders

Component

Misfire

Subcomponent

Multiple

Monitoring criteria

Combustion consistency measurement. Starting at engine speed $n > 450$ and $n < 7000$. Ambient pressure > 740 hPa Combustion miss on at least two cylinders

Fault debouncing

Combustion miss detected within four diagnosis windows consisting of 1000 crankshaft rotations.

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

Coolant temperature > - 6.8°C

Time conditions

6 crankshaft rotations after start

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Ignition miss or fuel trim fault affecting at least two individual cylinders

Repair procedures (plant/service)

Ignition coils, spark plugs, ignition cables, injectors, DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

Supplementary information always provided when combustion miss is detected on more than two cylinders.

DTC P0301: CYLINDER 1 MISFIRE DETECTED (MAX)**BMW Fault Code (hex)**

0x29CD

BMW Fault Code (dez)

10701

BMW Fault Code Description VS-Text

Combustion misfires, cylinder 1

Component

Misfire

Subcomponent

Cyl 1

Monitoring criteria

Combustion consistency measurement. Starting at engine speed $n > 450$ and $n < 7000$. Ambient pressure > 740 hPa

Fault debouncing

Combustion miss within 200 crankshaft rotations, weighted according to engine speed and load factor

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

Coolant temperature $> - 6.8^{\circ}\text{C}$

Time conditions

6 crankshaft rotations after start

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Combustion miss or problem with fuel trim

Repair procedures (plant/service)

Ignition coils, spark plugs, ignition cables, injectors, DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0301: CYLINDER 1 MISFIRE DETECTED (MIN)

BMW Fault Code (hex)

0x29CD

BMW Fault Code (dez)

10701

BMW Fault Code Description VS-Text

Combustion misfires, cylinder 1

Component

Misfire

Subcomponent

Cyl 1

Monitoring criteria

Combustion consistency measurement. Starting at engine speed $n > 450$ and $n < 7000$. Ambient pressure > 740 hPa.

Fault debouncing

Combustion miss within first 1000 crankshaft rotations after start.

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

Coolant temperature > - 6.8°C

Time conditions

6 crankshaft rotations after start

System test

None

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Combustion miss or problem with fuel trim

Repair procedures (plant/service)

Ignition coils, spark plugs, ignition cables, injectors, DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0301: CYLINDER 1 MISFIRE DETECTED (SIG)**BMW Fault Code (hex)**

0x29CD

BMW Fault Code (dez)

10701

BMW Fault Code Description VS-Text

Combustion misfires, cylinder 1

Component

Misfire

Subcomponent

Cyl 1

Monitoring criteria

Combustion consistency measurement. Starting at engine speed $n > 450$ and $n < 7000$. Ambient pressure > 740 hPa

Fault debouncing

Combustion miss detected within four diagnosis windows consisting of 1000 crankshaft rotations.

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

Coolant temperature $> - 6.8^{\circ}\text{C}$

Time conditions

6 crankshaft rotations after start

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Combustion miss or problem with fuel trim

Repair procedures (plant/service)

Ignition coils, spark plugs, ignition cables, injectors, DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0302: CYLINDER 2 MISFIRE DETECTED (MAX)

BMW Fault Code (hex)

0x29CE

BMW Fault Code (dez)

10702

BMW Fault Code Description VS-Text

Combustion misfires, cylinder 2

Component

Misfire

Subcomponent

Cyl 2

Monitoring criteria

Combustion consistency measurement. Starting at engine speed $n > 450$ and $n < 7000$. Ambient pressure > 740 hPa

Fault debouncing

Combustion miss within 200 crankshaft rotations, weighted according to engine speed and load factor.

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

Coolant temperature > - 6.8°C

Time conditions

6 crankshaft rotations after start

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Combustion miss or problem with fuel trim

Repair procedures (plant/service)

Ignition coils, spark plugs, ignition cables, injectors, DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0302: CYLINDER 2 MISFIRE DETECTED (MIN)

BMW Fault Code (hex)

0x29CE

BMW Fault Code (dez)

10702

BMW Fault Code Description VS-Text

Combustion misfires, cylinder 2

Component

Misfire

Subcomponent

Cyl 2

Monitoring criteria

Combustion consistency measurement. Starting at engine speed $n > 450$ and $n < 7000$. Ambient pressure > 740 hPa

Fault debouncing

Combustion miss within first 1000 crankshaft rotations after start

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

Coolant temperature $> -6.8^{\circ}\text{C}$

Time conditions

6 crankshaft rotations after start

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Combustion miss or problem with fuel trim

Repair procedures (plant/service)

Ignition coils, spark plugs, ignition cables, injectors, DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0302: CYLINDER 2 MISFIRE DETECTED (SIG)

BMW Fault Code (hex)

0x29CE

BMW Fault Code (dez)

10702

BMW Fault Code Description VS-Text

Combustion misfires, cylinder 2

Component

Misfire

Subcomponent

Cyl 2

Monitoring criteria

Combustion consistency measurement. Starting at engine speed $n > 450$ and $n < 7000$. Ambient pressure > 740 hPa

Fault debouncing

Combustion miss detected within four diagnosis windows consisting of 1000 crankshaft rotations

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

Coolant temperature > - 6.8°C

Time conditions

6 crankshaft rotations after start

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Combustion miss or problem with fuel trim

Repair procedures (plant/service)

Ignition coils, spark plugs, ignition cables, injectors, DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0303: CYLINDER 3 MISFIRE DETECTED (MAX)

BMW Fault Code (hex)

0x29CF

BMW Fault Code (dez)

10703

BMW Fault Code Description VS-Text

Combustion misfires, cylinder 3

Component

Misfire

Subcomponent

Cyl 3

Monitoring criteria

Combustion consistency measurement. Starting at engine speed $n > 450$ and $n < 7000$. Ambient pressure > 740 hPa

Fault debouncing

Combustion miss within 200 crankshaft rotations, weighted according to engine speed and load factor

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

Coolant temperature $> - 6.8^{\circ}\text{C}$

Time conditions

6 crankshaft rotations after start

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Combustion miss or problem with fuel trim

Repair procedures (plant/service)

Ignition coils, spark plugs, ignition cables, injectors, DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0303: CYLINDER 3 MISFIRE DETECTED (MIN)

BMW Fault Code (hex)

0x29CF

BMW Fault Code (dez)

10703

BMW Fault Code Description VS-Text

Combustion misfires, cylinder 3

Component

Misfire

Subcomponent

Cyl 3

Monitoring criteria

Combustion consistency measurement. Starting at engine speed $n > 450$ and $n < 7000$. Ambient pressure > 740 hPa.

Fault debouncing

Combustion miss within first 1000 crankshaft rotations after start.

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

Coolant temperature $> - 6.8^{\circ}\text{C}$

Time conditions

6 crankshaft rotations after start

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Combustion miss or problem with fuel trim

Repair procedures (plant/service)

Ignition coils, spark plugs, ignition cables, injectors, DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0303: CYLINDER 3 MISFIRE DETECTED (SIG)**BMW Fault Code (hex)**

0x29CF

BMW Fault Code (dez)

10703

BMW Fault Code Description VS-Text

Combustion misfires, cylinder 3

Component

Misfire

Subcomponent

Cyl 3

Monitoring criteria

Combustion consistency measurement. Starting at engine speed $n > 450$ and $n < 7000$. Ambient pressure > 740 hPa

Fault debouncing

Combustion miss detected within four diagnosis windows consisting of 1000 crankshaft rotations

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

Coolant temperature $> -6.8^{\circ}\text{C}$

Time conditions

6 crankshaft rotations after start

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Combustion miss or problem with fuel trim

Repair procedures (plant/service)

Ignition coils, spark plugs, ignition cables, injectors, DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0304: CYLINDER 4 MISFIRE DETECTED (MAX)

BMW Fault Code (hex)

0x29D0

BMW Fault Code (dez)

10704

BMW Fault Code Description VS-Text

Combustion misfires, cylinder 4

Component

Misfire

Subcomponent

Cyl 4

Monitoring criteria

Combustion consistency measurement. Starting at engine speed $n > 450$ and $n < 7000$. Ambient pressure > 740 hPa

Fault debouncing

Combustion miss within 200 crankshaft rotations, weighted according to engine speed and load factor

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

Coolant temperature $> - 6.8^{\circ}\text{C}$

Time conditions

6 crankshaft rotations after start

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Combustion miss or problem with fuel trim

Repair procedures (plant/service)

Ignition coils, spark plugs, ignition cables, injectors, DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0304: CYLINDER 4 MISFIRE DETECTED (MIN)

BMW Fault Code (hex)

0x29D0

BMW Fault Code (dez)

10704

BMW Fault Code Description VS-Text

Combustion misfires, cylinder 4

Component

Misfire

Subcomponent

Cyl 4

Monitoring criteria

Combustion consistency measurement. Starting at engine speed $n > 450$ and $n < 7000$. Ambient pressure > 740 hPa

Fault debouncing

Combustion miss within first 1000 crankshaft rotations after start

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

Coolant temperature > - 6.8°C

Time conditions

6 crankshaft rotations after start

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Combustion miss or problem with fuel trim

Repair procedures (plant/service)

Ignition coils, spark plugs, ignition cables, injectors, DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0304: CYLINDER 4 MISFIRE DETECTED (SIG)

BMW Fault Code (hex)

0x29D0

BMW Fault Code (dez)

10704

BMW Fault Code Description VS-Text

Combustion misfires, cylinder 4

Component

Misfire

Subcomponent

Cyl 4

Monitoring criteria

Combustion consistency measurement. Starting at engine speed $n > 450$ and $n < 7000$. Ambient pressure > 740 hPa

Fault debouncing

Combustion miss detected within four diagnosis windows consisting of 1000 crankshaft rotations

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

Coolant temperature $> - 6.8^{\circ}\text{C}$

Time conditions

6 crankshaft rotations after start

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Combustion miss or problem with fuel trim

Repair procedures (plant/service)

Ignition coils, spark plugs, ignition cables, injectors, DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0305: CYLINDER 5 MISFIRE DETECTED (MAX)

BMW Fault Code (hex)

0x29D1

BMW Fault Code (dez)

10705

BMW Fault Code Description VS-Text

Combustion misfires, cylinder 5

Component

Misfire

Subcomponent

Cyl 5

Monitoring criteria

Combustion consistency measurement. Starting at engine speed $n > 450$ and $n < 7000$. Ambient pressure > 740 hPa

Fault debouncing

Combustion miss within 200 crankshaft rotations, weighted according to engine speed and load factor

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

Coolant temperature > - 6.8°C

Time conditions

6 crankshaft rotations after start

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Combustion miss or problem with fuel trim

Repair procedures (plant/service)

Ignition coils, spark plugs, ignition cables, injectors, DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0305: CYLINDER 5 MISFIRE DETECTED (MIN)

BMW Fault Code (hex)

0x29D1

BMW Fault Code (dez)

10705

BMW Fault Code Description VS-Text

Combustion misfires, cylinder 5

Component

Misfire

Subcomponent

Cyl 5

Monitoring criteria

Combustion consistency measurement. Starting at engine speed $n > 450$ and $n < 7000$. Ambient pressure > 740 hPa

Fault debouncing

Combustion miss within first 1000 crankshaft rotations after start

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

Coolant temperature $> - 6.8^{\circ}\text{C}$

Time conditions

6 crankshaft rotations after start

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Combustion miss or problem with fuel trim

Repair procedures (plant/service)

Ignition coils, spark plugs, ignition cables, injectors, DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0305: CYLINDER 5 MISFIRE DETECTED (SIG)**BMW Fault Code (hex)**

0x29D1

BMW Fault Code (dez)

10705

BMW Fault Code Description VS-Text

Combustion misfires, cylinder 5

Component

Misfire

Subcomponent

Cyl 5

Monitoring criteria

Combustion consistency measurement. Starting at engine speed $n > 450$ and $n < 7000$. Ambient pressure > 740 hPa

Fault debouncing

Combustion miss detected within four diagnosis windows consisting of 1000 crankshaft rotations

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

Coolant temperature > -6.8°C

Time conditions

6 crankshaft rotations after start

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Combustion miss or problem with fuel trim

Repair procedures (plant/service)

Ignition coils, spark plugs, ignition cables, injectors, DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0306: CYLINDER 6 MISFIRE DETECTED (MAX)

BMW Fault Code (hex)

0x29D2

BMW Fault Code (dez)

10706

BMW Fault Code Description VS-Text

Combustion misfires, cylinder 6

Component

Misfire

Subcomponent

Cyl 6

Monitoring criteria

Combustion consistency measurement. Starting at engine speed $n > 450$ and $n < 7000$. Ambient pressure > 740 hPa

Fault debouncing

Combustion miss within 200 crankshaft rotations, weighted according to engine speed and load factor

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

Coolant temperature $> -6.8^{\circ}\text{C}$

Time conditions

6 crankshaft rotations after start

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Combustion miss or problem with fuel trim

Repair procedures (plant/service)

Ignition coils, spark plugs, ignition cables, injectors, DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0306: CYLINDER 6 MISFIRE DETECTED (MIN)

BMW Fault Code (hex)

0x29D2

BMW Fault Code (dez)

10706

BMW Fault Code Description VS-Text

Combustion misfires, cylinder 6

Component

Misfire

Subcomponent

Cyl 6

Monitoring criteria

Combustion consistency measurement. Starting at engine speed $n > 450$ and $n < 7000$. Ambient pressure > 740 hPa

Fault debouncing

Combustion miss within first 1000 crankshaft rotations after start

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

Coolant temperature > - 6.8°C

Time conditions

6 crankshaft rotations after start

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Combustion miss or problem with fuel trim

Repair procedures (plant/service)

Ignition coils, spark plugs, ignition cables, injectors, DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0306: CYLINDER 6 MISFIRE DETECTED (SIG)

BMW Fault Code (hex)

0x29D2

BMW Fault Code (dez)

10706

BMW Fault Code Description VS-Text

Combustion misfires, cylinder 6

Component

Misfire

Subcomponent

Cyl 6

Monitoring criteria

Combustion consistency measurement. Starting at engine speed $n > 450$ and $n < 7000$. Ambient pressure > 740 hPa

Fault debouncing

Combustion miss detected within four diagnosis windows consisting of 1000 crankshaft rotations

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

Coolant temperature $> - 6.8^{\circ}\text{C}$

Time conditions

6 crankshaft rotations after start

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Combustion miss or problem with fuel trim

Repair procedures (plant/service)

Ignition coils, spark plugs, ignition cables, injectors, DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P0313: MISFIRE DETECTED WITH LOW FUEL (MIN)**BMW Fault Code (hex)**

0x29D9

BMW Fault Code (dez)

10713

BMW Fault Code Description VS-Text

Misfire at low tank fill level

Component

Misfire

Subcomponent

Low Fuel

Monitoring criteria

Combustion consistency measurement. Starting at engine speed $n > 450$ and $n < 7000$. Ambient pressure > 740 hPa

Fault debouncing

Combustion miss detected within four diagnosis windows consisting of 1000 crankshaft rotations

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

Coolant temperature $> - 6.8^{\circ}\text{C}$

Time conditions

6 crankshaft rotations after start

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Not enough fuel in tank

Repair procedures (plant/service)

Refuel, ignition coils, spark plugs, ignition cables, injectors, DME

MIL illumination/CC message/emergency program

according to the corresponding combustion miss fault

Remarks

Supplementary information always provided when combustion miss of any kind is detected during operation in the fuel reserve range.

DTC P0326: KNOCK SENSOR 1 CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR) (PLAUS)

BMW Fault Code (hex)

0x2E68

BMW Fault Code (dez)

11880

BMW Fault Code Description VS-Text

Knock-sensor signal 1

Component

Knock Sensor

Subcomponent

Sensor 1

Monitoring criteria

Knock sensor signal monitor. Vehicle road operation at > 2800 RPM (current data status, tends toward > 2560 RPM) and air mass > 180 mg/unit. It is not possible to clear fault by switching ignition terminals. Compliance with the activation conditions and absence of malfunction extending over several seconds are required before fault code can be cleared.

Fault debouncing

The debounce time is derived from assessment of statistical diagnosis

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

min 1 sec., max 3 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Knock sensor signal too low. Threaded sensor connection is loose or wire connecting knock sensor 2 to engine-management ECU is open.

Repair procedures (plant/service)

1. Check knock sensor connection to verify that it is tight.
2. Check wire connecting knock sensor 1 and engine-management control module
3. Check for connection between knock sensor 1 and ground or positive
4. Replace knock sensor

MIL illumination/CC message/emergency program

No warning message. (No closed-loop knock control available. Power loss, as engine reverts to operation in safe range.)

Remarks

none

DTC P0327: KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR) (MIN)**BMW Fault Code (hex)**

0x2E68

BMW Fault Code (dez)

11880

BMW Fault Code Description VS-Text

Knock-sensor signal 1

Component

Knock Sensor

Subcomponent

Sensor 1

Monitoring criteria

Knock sensor signal monitor. Vehicle road operation at > 2800 1 RPM (current data status, tends toward > 2560 RPM) and air mass > 180 mg/unit. It is not possible to clear fault by switching ignition terminals. Compliance with the activation conditions and absence of malfunction extending over several seconds are required before fault code can be cleared.

Fault debouncing

Yes, by event counter. Knock signal sensor must lie below threshold (differential knock signal < 180 mV < 200 mV) for 1...3 sec., then fault code is registered

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

min 1 sec., max 3 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Knock sensor signal too low. Threaded sensor connection is loose or wire connecting knock sensor 1 to engine-management ECU is open.

Repair procedures (plant/service)

1. Check knock sensor connection to verify that it is tight.
2. Check wire connecting knock sensor 1 and engine-management control module
3. Check for connection between knock sensor 1 and ground or positive
4. Replace knock sensor

MIL illumination/CC message/emergency program

No warning message. (No closed-loop knock control available. Power loss, as engine reverts to operation in safe range.)

Remarks

none

DTC P0328: KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR) (MAX)

BMW Fault Code (hex)

0x2E68

BMW Fault Code (dez)

11880

BMW Fault Code Description VS-Text

Knock-sensor signal 1

Component

Knock Sensor

Subcomponent

Sensor 1

Monitoring criteria

Knock sensor signal monitor. Vehicle road operation at > 2800 RPM (current data status, tends toward > 2560

RPM) and air mass > 180 mg/unit. It is not possible to clear fault by switching ignition terminals. Compliance with the activation conditions and absence of malfunction extending over several seconds are required before fault code can be cleared.

Fault debouncing

Yes, by event counter. If knock sensor signal remains below threshold (differential knock signal > 4.8 V) for 1...3 sec. fault code is stored.

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

min 1 sec., max 3 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Knock sensor signal too high. Threaded sensor connection is loose or wire connecting knock sensor 1 to the engine-management ECU is shorted to positive.

Repair procedures (plant/service)

1. Check knock sensor connection to verify that it is tight.
2. Check wire connecting knock sensor 1 and engine-management control module
3. Check for connection between knock sensor 1 and ground or positive
4. Replace knock sensor

MIL illumination/CC message/emergency program

No warning message. (No closed-loop knock control available. Power loss, as engine reverts to operation in safe range.)

Remarks

none

DTC P0335: CRANKSHAFT POSITION SENSOR 'A' CIRCUIT (MAX)

BMW Fault Code (hex)

0x2A94

BMW Fault Code (dez)

10900

BMW Fault Code Description VS-Text

Crankshaft sensor, signal

Component

Crankshaft Position Sensor

Subcomponent

Electrical

Monitoring criteria

Engine turns over, KW signals are not detected.

Fault debouncing

Application number of camshaft flanks detected and no crankshaft tooth has been recognized

Terminal conditions

Terminal 15 on

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Crankshaft sensor signal missing, prior to engine start

Repair procedures (plant/service)

1. Check signal wire for short to positive, ground, opens and interference signals
2. Replace crankshaft sensor

MIL illumination/CC message/emergency program

MIL 2nd DC CRK in emergency default mode

Remarks

none

DTC P0335: CRANKSHAFT POSITION SENSOR 'A' CIRCUIT (MIN)

BMW Fault Code (hex)

0x2A94

BMW Fault Code (dez)

10900

BMW Fault Code Description VS-Text

Crankshaft sensor, signal

Component

Crankshaft Position Sensor

Subcomponent

Electrical

Monitoring criteria

Engine turns over, crankshaft signals detected.

Fault debouncing

Application number of camshaft flanks detected and no crankshaft tooth has been recognized

Terminal conditions

Terminal 15 on

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

KWG signal missing after engine start

Repair procedures (plant/service)

1. Check signal wire for short to positive, ground, opens and interference signals
2. Replace crankshaft sensor

MIL illumination/CC message/emergency program

MIL 2nd DC CRK emergency default mode

Remarks

none

DTC P0340: CAMSHAFT POSITION SENSOR 'A' CIRCUIT (BANK 1 OR SINGLE SENSOR) (MAX)

BMW Fault Code (hex)

0x2AA0

BMW Fault Code (dez)

10912

BMW Fault Code Description VS-Text

Camshaft sensor, inlet, signal

Component

Camshaft Position Sensor

Subcomponent

Intake Electrical

Monitoring criteria

NWE synchronous

Fault debouncing

On every engine cycle when no camshaft flank has been detected.

Terminal conditions

Terminal 15 on

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Intake camshaft sensor signal missing or implausible

Repair procedures (plant/service)

1. Check signal wire for short to positive, ground, opens and interference pulses.
2. Replace camshaft exhaust side sensor.

MIL illumination/CC message/emergency program

MIL 2nd DC, CAM operates in emergency default mode

Remarks

Sensor failure after synchronization or during start if NW is not the NW used for synchronization.

DTC P0341: CAMSHAFT POSITION SENSOR 'A' CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR) (MAX)**BMW Fault Code (hex)**

0x2A9A

BMW Fault Code (dez)

10906

BMW Fault Code Description VS-Text

Camshaft sensor, inlet, signal

Component

Camshaft Position Sensor

Subcomponent

Intake Electrical

Monitoring criteria

Engine turning over

Fault debouncing

On every camshaft flank when the flank was outside tolerance. At engine start only.

Terminal conditions

Terminal 15 on

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

No valid camshaft flank recognized for synchronization. VANOS not locked down at start.

Repair procedures (plant/service)

1. Check signal wire for short to positive, ground, open wire.
2. Replace camshaft sensor.
3. Check positions (valve timing setting) of camshaft reluctors
4. Check timing chain and chain tensioner assembly.
5. Check VANOS solenoids for dirt and contamination

MIL illumination/CC message/emergency program

MIL 2nd DC, CAM emergency default mode, Synchronization via exhaust camshaft.

Remarks

No synchronization with NWE possible

DTC P0344: CAMSHAFT POSITION SENSOR 'A' CIRCUIT INTERMITTENT (BANK 1 OR SINGLE SENSOR) (MAX)

BMW Fault Code (hex)

0x2A9E

BMW Fault Code (dez)

10910

BMW Fault Code Description VS-Text

Camshaft sensor, inlet, synchronization

Component

Camshaft Position Sensor

Subcomponent

Intake Electrical

Monitoring criteria

NWE synchronous

Fault debouncing

On every camshaft flank if the flank ratio was not in tolerance.

Terminal conditions

Terminal 15 on

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Intake camshaft autonomous synchronization, incorrect tooth flank ratio.

Repair procedures (plant/service)

1. Replace camshaft reluctor, installation fault
2. Signal interference
3. Replace intake camshaft sensor, transmitting inverted signal

MIL illumination/CC message/emergency program

MIL 2nd DC, CAM operates in emergency default mode

Remarks

Flank pattern does not match stored pattern.

DTC P0351: IGNITION COIL 'A' PRIMARY/SECONDARY CIRCUIT (MAX)

BMW Fault Code (hex)

0x2E24

BMW Fault Code (dez)

11812

BMW Fault Code Description VS-Text

Ignition coil, cylinder 1

Component

Ignition Coil

Subcomponent

A Primary/Secondary Circuit

Monitoring criteria

No dual ignition, secondary spark absent

Fault debouncing

Segment synchronization

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 11 V

Temperature conditions

none

Time conditions

t > 1 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Voltage supply and ground connection for ignition system, ignition coil

Repair procedures (plant/service)

Check voltage supply, KBB/ZSP plug contact, measure KBB insulation resistance, replace ignition coil.

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P0352: IGNITION COIL 'B' PRIMARY/SECONDARY CIRCUIT (MAX)

BMW Fault Code (hex)

0x2E25

BMW Fault Code (dez)

11813

BMW Fault Code Description VS-Text

Ignition coil, cylinder 2

Component

Ignition Coil

Subcomponent

B Primary/Secondary Circuit

Monitoring criteria

No dual ignition, secondary spark absent

Fault debouncing

Segment synchronization

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 11 V

Temperature conditions

none

Time conditions

t > 1 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Voltage supply and ground connection for ignition system, ignition coil

Repair procedures (plant/service)

Check voltage supply, KBB/ZSP plug contact, measure KBB insulation resistance, replace ignition coil.

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P0353: IGNITION COIL 'C' PRIMARY/SECONDARY CIRCUIT (MAX)

BMW Fault Code (hex)

0x2E26

BMW Fault Code (dez)

11814

BMW Fault Code Description VS-Text

Ignition coil, cylinder 3

Component

Ignition Coil

Subcomponent

C Primary/Secondary Circuit

Monitoring criteria

No dual ignition, secondary spark absent

Fault debouncing

Segment synchronization

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 11 V

Temperature conditions

none

Time conditions

t > 1 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Voltage supply and ground connection for ignition system, ignition coil

Repair procedures (plant/service)

Check voltage supply, KBB/ZSP plug contact, measure KBB insulation resistance, replace ignition coil.

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P0354: IGNITION COIL 'D' PRIMARY/SECONDARY CIRCUIT (MAX)

BMW Fault Code (hex)

0x2E27

BMW Fault Code (dez)

11815

BMW Fault Code Description VS-Text

Ignition coil, cylinder 4

Component

Ignition Coil

Subcomponent

D Primary/Secondary Circuit

Monitoring criteria

No dual ignition, secondary spark absent

Fault debouncing

Segment synchronization

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 11 V

Temperature conditions

none

Time conditions

t > 1 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Voltage supply and ground connection for ignition system, ignition coil

Repair procedures (plant/service)

Check voltage supply, KBB/ZSP plug contact, measure KBB insulation resistance, replace ignition coil.

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P0355: IGNITION COIL 'E' PRIMARY/SECONDARY CIRCUIT (MAX)

BMW Fault Code (hex)

0x2E28

BMW Fault Code (dez)

11816

BMW Fault Code Description VS-Text

Ignition coil, cylinder 5

Component

Ignition Coil

Subcomponent

E Primary/Secondary Circuit

Monitoring criteria

No dual ignition, secondary spark absent

Fault debouncing

Segment synchronization

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 11 V

Temperature conditions

none

Time conditions

t > 1 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Voltage supply and ground connection for ignition system, ignition coil.

Repair procedures (plant/service)

Check voltage supply, KBB/ZSP plug contact, measure KBB insulation resistance, replace ignition coil.

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P0356: IGNITION COIL 'F' PRIMARY/SECONDARY CIRCUIT (MAX)**BMW Fault Code (hex)**

0x2E29

BMW Fault Code (dez)

11817

BMW Fault Code Description VS-Text

Ignition coil, cylinder 6

Component

Ignition Coil

Subcomponent

F Primary/Secondary Circuit

Monitoring criteria

No dual ignition, secondary spark absent

Fault debouncing

Segment synchronization

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 11 V

Temperature conditions

none

Time conditions

t > 1 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Voltage supply and ground connection for ignition system, ignition coil

Repair procedures (plant/service)

Check voltage supply, KBB/ZSP plug contact, measure KBB insulation resistance, replace ignition coil.

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P0365: CAMSHAFT POSITION SENSOR 'B' CIRCUIT (BANK 1) (MAX)

BMW Fault Code (hex)

0x2AA1

BMW Fault Code (dez)

10913

BMW Fault Code Description VS-Text

Camshaft sensor, exhaust, signal

Component

Camshaft Position Sensor

Subcomponent

Exhaust Electrical

Monitoring criteria

NWA synchronous

Fault debouncing

On every engine cycle when no camshaft flank has been detected.

Terminal conditions

Terminal 15 on

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Exhaust camshaft signal implausible or missing

Repair procedures (plant/service)

1. Check signal wire for short to positive, ground, opens and interference pulses
2. Replace camshaft exhaust side sensor,

MIL illumination/CC message/emergency program

MIL 2nd DC, CAM operates in emergency default mode

Remarks

Sensor failure after synchronization or during start if NW is not the NW used for synchronization.

**DTC P0366: CAMSHAFT POSITION SENSOR 'B' CIRCUIT RANGE/PERFORMANCE (BANK 1)
(MAX)****BMW Fault Code (hex)**

0x2A9B

BMW Fault Code (dez)

10907

BMW Fault Code Description VS-Text

Camshaft sensor, exhaust, signal

Component

Camshaft Position Sensor

Subcomponent

Exhaust Electrical

Monitoring criteria

Engine turns over, synchronization with NWE fails

Fault debouncing

On every camshaft flank when the flank was outside tolerance. At engine start only.

Terminal conditions

Terminal 15 on

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

No valid camshaft flank recognized for synchronization. VANOS not locked down at start.

Repair procedures (plant/service)

1. Check signal wire for short to positive, ground, open wire.
2. Replace camshaft sensor.
3. Check positions (valve timing setting) of camshaft reluctors
4. Check timing chain and chain tensioner assembly.
5. Check VANOS solenoids for dirt and contamination

MIL illumination/CC message/emergency program

Nothing, as double fault is present

Remarks

No synchronization possible with any camshaft

DTC P0369: CAMSHAFT POSITION SENSOR 'B' CIRCUIT INTERMITTENT (BANK 1) (MAX)

BMW Fault Code (hex)

0x2A9F

BMW Fault Code (dez)

10911

BMW Fault Code Description VS-Text

Camshaft sensor, exhaust, synchronization

Component

Camshaft Position Sensor

Subcomponent

Exhaust Electrical

Monitoring criteria

NWA synchronous

Fault debouncing

On every camshaft flank if the flank ratio was not in tolerance.

Terminal conditions

Terminal 15 on

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Exhaust camshaft autonomous synchronization, incorrect tooth flank ratio

Repair procedures (plant/service)

1. Replace camshaft retractor, installation fault
2. Signal interference
3. Replace NWA sensor, transmitting inverted signal

MIL illumination/CC message/emergency program

MIL 2nd DC, CAM operates in emergency default mode

Remarks

Flank pattern does not match stored pattern.

DTC P0370: TIMING REFERENCE HIGH RESOLUTION SIGNAL 'A' (MAX)

BMW Fault Code (hex)

0x2A96

BMW Fault Code (dez)

10902

BMW Fault Code Description VS-Text

Crankshaft sensor, tooth fault

Component

Crankshaft Position Sensor

Subcomponent

Signal

Monitoring criteria

Engine turns over, camshaft synchronized

Fault debouncing

On each synchronization gap, without loss of synchronization.

Terminal conditions

Terminal 15 on

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Number of teeth counted during one engine rotation incorrect by less than 3 teeth.

Repair procedures (plant/service)

1. Check signal wire for short to positive, ground, opens and interference signals
2. Replace crankshaft sensor

MIL illumination/CC message/emergency program

MIL 2nd DC CRK emergency default mode

Remarks

Incorrect tooth number at gap without loss of synchronization

DTC P0370: TIMING REFERENCE HIGH RESOLUTION SIGNAL 'A' (MAX)

BMW Fault Code (hex)

0x2A97

BMW Fault Code (dez)

10903

BMW Fault Code Description VS-Text

Crankshaft sensor, gap fault

Component

Crankshaft Position Sensor

Subcomponent

Signal

Monitoring criteria

Engine turns over, camshaft synchronized

Fault debouncing

On each tooth if the tooth time was outside the expected window. Assessment at each synchro gap.

Terminal conditions

Terminal 15 on

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

At least one invalid tooth time during the last engine rotation.

Repair procedures (plant/service)

1. Check signal wire for short to positive, ground, opens and interference signals
2. Replace crankshaft sensor

MIL illumination/CC message/emergency program

MIL 2nd DC CRK emergency default mode

Remarks

Tooth time outside expected window

DTC P0370: TIMING REFERENCE HIGH RESOLUTION SIGNAL 'A' (MIN)

BMW Fault Code (hex)

0x29DB

BMW Fault Code (dez)

10715

BMW Fault Code Description VS-Text

Smooth running, segment timing

Component

Crankshaft Position Sensor

Subcomponent

Signal

Monitoring criteria

Misfire diagnosis is deactivated in response to detected tooth jump and/or fault in tooth recognition at crankshaft reluctor rotor.

Fault debouncing

Jump by one or two teeth

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

Always active

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Crankshaft sensor, defective reluctor

Repair procedures (plant/service)

Check and replace as indicated: Crankshaft sensor, reluctor.

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P0373: TIMING REFERENCE HIGH RESOLUTION SIGNAL 'A' INTERMITTENT/ERRATIC PULSES (MAX)

BMW Fault Code (hex)

0x2A95

BMW Fault Code (dez)

10901

BMW Fault Code Description VS-Text

Crankshaft sensor, synchronization

Component

Crankshaft Position Sensor

Subcomponent

Signal

Monitoring criteria

Engine turns over, camshaft synchronized

Fault debouncing

At each synchronization gap if synchronization has been lost.

Terminal conditions

Terminal 15 on

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Number of teeth counted during one engine rotation incorrect by more than 2 teeth.

Repair procedures (plant/service)

1. Check signal wire for short to positive, ground, opens and interference signals
2. Replace crankshaft sensor

MIL illumination/CC message/emergency program

MIL 2nd DC CRK emergency default mode

Remarks

Incorrect tooth number at gap with loss of synchronization

DTC P0420: CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1) (MAX)

BMW Fault Code (hex)

0x29F4

BMW Fault Code (dez)

10740

BMW Fault Code Description VS-Text

Catalytic-converter conversion

Component

Catalyst

Subcomponent

Efficiency

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P0420: CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1) (MIN)

BMW Fault Code (hex)

0x29F4

BMW Fault Code (dez)

10740

BMW Fault Code Description VS-Text

Catalytic-converter conversion

Component

Catalyst

Subcomponent

Efficiency

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P0430: CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 2) (MAX)

BMW Fault Code (hex)

0x29F5

BMW Fault Code (dez)

10741

BMW Fault Code Description VS-Text

Catalytic-converter conversion 2

Component

Catalyst

Subcomponent

Efficiency

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P0430: CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 2) (MIN)

BMW Fault Code (hex)

0x29F5

BMW Fault Code (dez)

10741

BMW Fault Code Description VS-Text

Catalytic-converter conversion 2

Component

Catalyst

Subcomponent

Efficiency

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P0440: EVAPORATIVE EMISSION SYSTEM (PLAUS)

BMW Fault Code (hex)

0x2A1A

BMW Fault Code (dez)

10778

BMW Fault Code Description VS-Text

Tank-venting system, function

Component

EVAP System

Subcomponent

Flow Check

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

TEV Check

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

Symptom is not used

DTC P0441: EVAPORATIVE EMISSION SYSTEM INCORRECT PURGE FLOW (SIG)

BMW Fault Code (hex)

0x2A1A

BMW Fault Code (dez)

10778

BMW Fault Code Description VS-Text

Tank-venting system, function

Component

EVAP System

Subcomponent

Flow Check

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

TEV Check

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

Symptom is not used

DTC P0442: EVAPORATIVE EMISSION SYSTEM LEAK DETECTED (SMALL LEAK) (MAX)

BMW Fault Code (hex)

0x2A15

BMW Fault Code (dez)

10773

BMW Fault Code Description VS-Text

DMTL, minor leak

Component

EVAP System

Subcomponent

Leak Detection

Monitoring criteria

Fuel tank system minute leakage monitor, after completion of DMTL diagnosis

Fault debouncing

After distance traveled > 200 m in driving cycle following diagnosis

Terminal conditions

Terminal 15 ON

Voltage conditions

10.95 < vehicle electrical system voltage < 14.5

Temperature conditions

1.5°C > Ambient temperature > 38°C

Time conditions

none

System test

DMTL Check

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Leak > 1 mm in the tank system

Repair procedures (plant/service)

Search for leak in tank system (remember DMTL/TEV)

MIL illumination/CC message/emergency program

MIL ON

Remarks

Installed in US only (initialization version)

DTC P0444: EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT OPEN (SIG)

BMW Fault Code (hex)

0x2A19

BMW Fault Code (dez)

10777

BMW Fault Code Description VS-Text

Tank-venting valve, activation

Component

EVAP System

Subcomponent

Valve

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P0456: EVAPORATIVE EMISSION SYSTEM LEAK DETECTED (VERY SMALL LEAK) (MIN)

BMW Fault Code (hex)

0x2A16

BMW Fault Code (dez)

10774

BMW Fault Code Description VS-Text

DMTL, superfine leak

Component

EVAP System

Subcomponent

Leak Detection

Monitoring criteria

Tank system minute leakage monitor

Fault debouncing

Ignition on, in driving cycle following diagnosis

Terminal conditions

Terminal 15 ON

Voltage conditions

10.95 < vehicle electrical system voltage < 14.5

Temperature conditions

1.5°C > Ambient temperature > 38°C

Time conditions

none

System test

DMTL Check

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Leak > 0.5 mm in the tank system

Repair procedures (plant/service)

Search for leak in tank system/Check fuel filler cap

MIL illumination/CC message/emergency program

MIL ON

Remarks

Installed in US only (initialization version)

DTC P0458: EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT LOW (MIN)

BMW Fault Code (hex)

0x2A19

BMW Fault Code (dez)

10777

BMW Fault Code Description VS-Text

Tank-venting valve, activation

Component

EVAP System

Subcomponent

Valve

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P0459: EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH (MAX)

BMW Fault Code (hex)

0x2A19

BMW Fault Code (dez)

10777

BMW Fault Code Description VS-Text

Tank-venting valve, activation

Component

EVAP System

Subcomponent

Valve

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P0461: FUEL LEVEL SENSOR 'A' CIRCUIT RANGE/PERFORMANCE (PLAUS)

BMW Fault Code (hex)

0x2A1C

BMW Fault Code (dez)

10780

BMW Fault Code Description VS-Text

Tank fill level, plausibility

Component

Fuel Level Sensor

Subcomponent

Plausibility

Monitoring criteria

Excess mechanical resistance in the level sensor causes the level signal to change too slowly relative to engine fuel consumption, leading to generation of a fault memory entry

Fault debouncing

20 liters of fuel consumption required

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

none

Time conditions

Immediately after engine starts

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Mechanical seizure of level sensor in tank

Repair procedures (plant/service)

1. Check level sensor data directly at flange
2. Check variation in sensor data by rocking/knocking on the tank
3. Carefully open the tank flange, check for binding in the float lever
4. Replace the fuel level sensor only if binding is found in the float lever (distorted sensor lever, bearing resists motion)

MIL illumination/CC message/emergency program

NO

Remarks

none

DTC P0462: FUEL LEVEL SENSOR 'A' CIRCUIT LOW (MIN)

BMW Fault Code (hex)

0x2DE2

BMW Fault Code (dez)

11746

BMW Fault Code Description VS-Text

Tank fill level, right, signal

Component

Fuel Level Sensor

Subcomponent

Electrical

Monitoring criteria

Right level sensor shorted, sensor resistance too low

Fault debouncing

90 sec.

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Sensor value too low

Repair procedures (plant/service)

Check sensor resistance, determine location of open wire/short circuit (wiring harness, plug, cluster, junction box, tank)

MIL illumination/CC message/emergency program

NO

Remarks

none

DTC P0463: FUEL LEVEL SENSOR 'A' CIRCUIT HIGH (MAX)

BMW Fault Code (hex)

0x2DE2

BMW Fault Code (dez)

11746

BMW Fault Code Description VS-Text

Tank fill level, right, signal

Component

Fuel Level Sensor

Subcomponent

Electrical

Monitoring criteria

Open wire to right-side level sensor, sensor resistance too high

Fault debouncing

90 sec.

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Sensor value too high

Repair procedures (plant/service)

Check sensor resistance, determine location of open wire/short circuit (wiring harness, plug, cluster, junction box, tank)

MIL illumination/CC message/emergency program

NO

Remarks

none

DTC P0475: EXHAUST PRESSURE CONTROL VALVE (SIG)

BMW Fault Code (hex)

0x2F6C

BMW Fault Code (dez)

12140

BMW Fault Code Description VS-Text

Exhaust-gas flap, activation

Component

No Info

Subcomponent

No Info

Monitoring criteria

Exhaust valve control-activation monitor. Component must be installed. Tester must be used to trigger component for 10 sec.

Fault debouncing

5 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Open circuit

Repair procedures (plant/service)

1. Check wiring. Repair if defective. If wiring is OK proceed to check component (which and how?)

MIL illumination/CC message/emergency program

No display

Remarks

none

DTC P0477: EXHAUST PRESSURE CONTROL VALVE LOW (MIN)

BMW Fault Code (hex)

0x2F6C

BMW Fault Code (dez)

12140

BMW Fault Code Description VS-Text

Exhaust-gas flap, activation

Component

No Info

Subcomponent

No Info

Monitoring criteria

Exhaust valve control-activation monitor. Component must be installed. Tester must be used to trigger component for 10 sec.

Fault debouncing

2 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short circuit to ground in wire or component.

Repair procedures (plant/service)

1. Check wiring. Repair if defective. If wiring is OK proceed to check component (which and how?)

MIL illumination/CC message/emergency program

No display

Remarks

none

DTC P0478: EXHAUST PRESSURE CONTROL VALVE HIGH (MAX)

BMW Fault Code (hex)

0x2F6C

BMW Fault Code (dez)

12140

BMW Fault Code Description VS-Text

Exhaust-gas flap, activation

Component

No Info

Subcomponent

No Info

Monitoring criteria

Exhaust valve control-activation monitor. Component must be installed. Tester must be used to trigger component for 10 sec.

Fault debouncing

2 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Wire is shorted to positive, or a short to positive is present in the component

Repair procedures (plant/service)

1. Check wiring. Repair if defective. If wiring is OK proceed to check component (which and how?)

MIL illumination/CC message/emergency program

No display

Remarks

none

DTC P0480: FAN 1 CONTROL CIRCUIT (SIG)**BMW Fault Code (hex)**

0x2EFE

BMW Fault Code (dez)

12030

BMW Fault Code Description VS-Text

Electric fan, activation

Component

No Info

Subcomponent

No Info

Monitoring criteria

PWM > 10%

Fault debouncing

5 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

Ambient temperature > -20°C

Time conditions

5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Open circuit

Repair procedures (plant/service)

1. Check voltage supply to fan. (If there is no power to the fan, or the voltage supply is intermittent, this fault code will be entered in the fault memory.)
2. Check wiring. Repair if defective. If wiring is OK, proceed to check component

MIL illumination/CC message/emergency program

no external display;

Remarks

An inoperative E fan can also cause the engine to overheat.

DTC P0491: SECONDARY AIR INJECTION SYSTEM INSUFFICIENT FLOW (BANK 1) (MAX)

BMW Fault Code (hex)

0x2A00

BMW Fault Code (dez)

10752

BMW Fault Code Description VS-Text

Secondary-air system

Component

Secondary Air System

Subcomponent

Flow Check

Monitoring criteria

Activation conditions: - Engine start - Secondary air-injection must be active - Ambient temperature $>3^{\circ}\text{C}$ - 3.8°C $<$ Coolant temperature $< 50.3^{\circ}\text{C}$

Fault debouncing

40 sec.

Terminal conditions

Terminal 15, engine start

Voltage conditions

Vehicle electrical system voltage (battery voltage between 7 & 15 V)

Temperature conditions

Ambient temperature $> 3^{\circ}\text{C}$, coolant start temperature between 3.8°C & 50.3°C

Time conditions

none

System test

EOL test of secondary air-injection system. (Do not run more than 5 EOL tests in succession; the SA pump can overheat).

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Potential cause - Connection between secondary air-injection valve and exhaust bank 1 (in engine block) is obstructed.

Repair procedures (plant/service)

1. Remove secondary air-injection valve and clean the passage to Bank 1 (in engine block)
2. Install valve again and run through EOL test. If the malfunction is registered again, repeat steps 1 and 2.

MIL illumination/CC message/emergency program

MIL

Remarks

none

DTC P0492: SECONDARY AIR INJECTION SYSTEM INSUFFICIENT FLOW (BANK 2) (MIN)

BMW Fault Code (hex)

0x2A00

BMW Fault Code (dez)

10752

BMW Fault Code Description VS-Text

Secondary-air system

Component

Secondary Air System

Subcomponent

Flow Check

Monitoring criteria

Activation conditions: - Engine start - Secondary air-injection must be active - Ambient temperature $>3^{\circ}\text{C}$ - $3.8^{\circ}\text{C} < \text{Coolant temperature} < 50.3^{\circ}\text{C}$

Fault debouncing

40 sec.

Terminal conditions

Terminal 15, engine start

Voltage conditions

Vehicle electrical system voltage (battery voltage between 7 & 15 V)

Temperature conditions

Ambient temperature $> 3^{\circ}\text{C}$, coolant start temperature between 3.8°C & 50.3°C

Time conditions

none

System test

EOL test of secondary air-injection system (Do not run more than 5 EOL tests in succession; the SA pump can overheat)

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Potential cause - Connection between secondary air-injection valve and exhaust bank 2 (in engine block) is obstructed.

Repair procedures (plant/service)

1. Remove secondary air-injection valve and clean the passage to Bank 2 (in engine block)
2. Install valve again and run through EOL test. If the malfunction is registered again, repeat steps 1 and 2.

MIL illumination/CC message/emergency program

MIL

Remarks

none

DTC P0500: VEHICLE SPEED SENSOR 'A' (SIG)

BMW Fault Code (hex)

0x2F4E

BMW Fault Code (dez)

12110

BMW Fault Code Description VS-Text

Vehicle speed, signal

Component

Vehicle Speed Sensor

Subcomponent

Electrical

Monitoring criteria

Speed signal monitor

Fault debouncing

5 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

100 ms

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Dual fault: No speed information available from hardware signal or from CAN

Repair procedures (plant/service)

Check CAN link between DSC and DME

MIL illumination/CC message/emergency program

US: MIL ON ECE: No MIL

Remarks

This defect location applies only to the CAN fault. Active only when an active hardware signal fault (12111) is present.

DTC P0503: VEHICLE SPEED SENSOR 'A' INTERMITTENT/ERRATIC/HIGH (PLAUS)**BMW Fault Code (hex)**

0x2F4F

BMW Fault Code (dez)

12111

BMW Fault Code Description VS-Text

Vehicle speed, plausibility

Component

Vehicle Speed Sensor

Subcomponent

Electrical

Monitoring criteria

Speed signal monitor Mass airflow > 272 mg/stroke and N > 2400 rpm (manual trans) N > 2820 rpm (automatic) and speed = 0 km/h for 5.0 sec.

Fault debouncing

5 sec.

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

5.0 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

no speed signal available! (defective rear right wheelspeed sensor)

Repair procedures (plant/service)

Read diagnostic control module's fault memory from DSC (defective rear right wheelspeed sensor)

MIL illumination/CC message/emergency program

None Default value from CAN

Remarks

none

DTC P0506: IDLE AIR CONTROL SYSTEM RPM LOWER THAN EXPECTED (MIN)

BMW Fault Code (hex)

0x2ADF

BMW Fault Code (dez)

10975

BMW Fault Code Description VS-Text

Idle air control, engine speed

Component

Idle Speed Control

Subcomponent

RPM

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P0507: IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED (MAX)

BMW Fault Code (hex)

0x2ADF

BMW Fault Code (dez)

10975

BMW Fault Code Description VS-Text

Idle air control, engine speed

Component

Idle Speed Control

Subcomponent

RPM

Monitoring criteria

Monitor for idle control Idle = ON Speed = 0 km/h. After roughly 120 sec., depends on start temperature

Fault debouncing

none

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

none

Time conditions

20 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Impossible to adjust idle speed to ± 100 relative to specified RPM

Repair procedures (plant/service)

Note any other fault code entries and repair the associated problems! Check all load-responsive servo actuators such as Valvetronic and the throttle valve for stored control module fault memory entries and malfunctions! (check injection and induction system as indicated)

MIL illumination/CC message/emergency program

MIL on in 2nd driving cycle

Remarks

US only

DTC P0512: STARTER REQUEST CIRCUIT (MAX)

BMW Fault Code (hex)

0x2F58

BMW Fault Code (dez)

12120

BMW Fault Code Description VS-Text

Automatic starting, activation

Component

No Info

Subcomponent

No Info

Monitoring criteria

Automatic starter activation-control monitor. Convenience start relay initialized. Start relay installed.

Fault debouncing

1 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

0.25s at N=0.5 sec. at N > 750 rpm

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Wire is shorted to positive, or a short to positive is present in the component

Repair procedures (plant/service)

1. Check wiring. Repair if defective. If wiring is OK, proceed to check component (start relay).

MIL illumination/CC message/emergency program

no external display

Remarks

none

DTC P0512: STARTER REQUEST CIRCUIT (MIN)

BMW Fault Code (hex)

0x2F58

BMW Fault Code (dez)

12120

BMW Fault Code Description VS-Text

Automatic starting, activation

Component

No Info

Subcomponent

No Info

Monitoring criteria

Automatic starter activation-control monitor. Convenience start relay initialized. Start relay installed.

Fault debouncing

1 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

0.25s at N=0.5 sec. at N>750 RPM

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short circuit to ground in wire or component.

Repair procedures (plant/service)

Check wiring. Repair if defective. If wiring is OK, proceed to check component (starter relay).

MIL illumination/CC message/emergency program

no external display;

Remarks

none

DTC P0512: STARTER REQUEST CIRCUIT (SIG)

BMW Fault Code (hex)

0x2F58

BMW Fault Code (dez)

12120

BMW Fault Code Description VS-Text

Automatic starting, activation

Component

No Info

Subcomponent

No Info

Monitoring criteria

Automatic starter activation-control monitor. Convenience start relay initialized. Start relay installed

Fault debouncing

1 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

0.25 s at N=0.5 sec. at N>750 rpm

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Open circuit

Repair procedures (plant/service)

Check wiring. Repair if defective. If wiring is OK, proceed to check component (starter relay).

MIL illumination/CC message/emergency program

no external display;

Remarks

none

DTC P0520: ENGINE OIL PRESSURE SENSOR/SWITCH CIRCUIT (SIG)**BMW Fault Code (hex)**

0x2F7B

BMW Fault Code (dez)

12155

BMW Fault Code Description VS-Text

Oil-pressure switch, plausibility

Component

No Info

Subcomponent

No Info

Monitoring criteria

Oil pressure switch monitor

Fault debouncing

Engine shutdown: continues roughly 8 sec. after engine is switched off.

Terminal conditions

Engine speed = 0 Control module in post-operational shutdown phase

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

60°C < engine temperature < 150°C

Time conditions

3 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Open wire Switch seizes

Repair procedures (plant/service)

1. Check wire from oil pressure switch. If not OK --> Repair wire If OK -->
2. Replace switch
3. Switch should change position when engine is started and then shut down (ground connection)

MIL illumination/CC message/emergency program

Possible display in the MMI will vary according to whether the switch seizes while open or closed.

Remarks

Oil pressure cannot be monitored if switch is defective.

DTC P0521: ENGINE OIL PRESSURE SENSOR/SWITCH RANGE/ PERFORMANCE (PLAUS)

BMW Fault Code (hex)

0x30C6

BMW Fault Code (dez)

12486

BMW Fault Code Description VS-Text

Engine-oil-pressure sensor, plausibility

Component

No Info

Subcomponent

No Info

Monitoring criteria

Commercial vehicle > 0

Fault debouncing

0.2

Terminal conditions

Terminal 15

Voltage conditions

none

Temperature conditions

>-10°C

Time conditions

none

System test

Jump in specified pressure, specified pressure ramp

Signal information

Analogous to oil pressure signal

Calculated value Y/N

N

Possible Fault Causes

Oil pressure signal seized

Repair procedures (plant/service)

Replace oil pressure sensor

MIL illumination/CC message/emergency program

No

Remarks

Implementation on at Prg. Version 500

DTC P0522: ENGINE OIL PRESSURE SENSOR/SWITCH LOW (MIN)

BMW Fault Code (hex)

0x30C3

BMW Fault Code (dez)

12483

BMW Fault Code Description VS-Text

Engine-oil-pressure sensor, signal

Component

No Info

Subcomponent

No Info

Monitoring criteria

Signal monitoring, oil pressure data

Fault debouncing

2 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 9.15 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Sensor wire shorted to ground or open circuit in wire.

Repair procedures (plant/service)

1. Perform electrical check on sensor wire and power-supply wires.
2. Visual inspection of plug-in contacts (on component and DME ends).
3. Replace sensor.

MIL illumination/CC message/emergency program

No message currently available!

Remarks

none

DTC P0523: ENGINE OIL PRESSURE SENSOR/SWITCH HIGH (MAX)**BMW Fault Code (hex)**

0x30C3

BMW Fault Code (dez)

12483

BMW Fault Code Description VS-Text

Engine-oil-pressure sensor, signal

Component

No Info

Subcomponent

No Info

Monitoring criteria

Signal monitoring, oil pressure data

Fault debouncing

2 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 9.15 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Sensor wire shorted to positive

Repair procedures (plant/service)

1. Perform electrical check on sensor wire and power-supply wires
2. Visual inspection of plug-in contacts (on component and DME ends)

3. Replace sensor

MIL illumination/CC message/emergency program

No message currently available!

Remarks

none

DTC P0524: ENGINE OIL PRESSURE TOO LOW (MIN)

BMW Fault Code (hex)

0x30C5

BMW Fault Code (dez)

12485

BMW Fault Code Description VS-Text

Engine-oil pump, mechanical: engine-oil pressure

Component

No Info

Subcomponent

No Info

Monitoring criteria

Commercial vehicle >0 + Stored operating coordinate reached (depends on NKW+Tmot)

Fault debouncing

0.2

Terminal conditions

Terminal 15

Voltage conditions

none

Temperature conditions

>-10°C

Time conditions

none

System test

Jump in specified pressure, specified pressure ramp.

Signal information

Analogous to oil pressure signal

Calculated value Y/N

N

Possible Fault Causes

Pump control plunger is seizing

Repair procedures (plant/service)

Replace oil pump

MIL illumination/CC message/emergency program

Yes, if it allows oil pressure to drop to unacceptable level.

Remarks

Activation only in Prg. Version 500

DTC P0571: BRAKE SWITCH 'A' CIRCUIT (PLAUS)**BMW Fault Code (hex)**

0x2F63

BMW Fault Code (dez)

12131

BMW Fault Code Description VS-Text

Brake-light switch, plausibility

Component

Brake Switch

Subcomponent

Electrical

Monitoring criteria

Brake light switch monitor. Depress brake pedal repeatedly

Fault debouncing

If the BTS is still OK the fault will be registered immediately when the brake pedal is depressed. If the plug is disconnected the fault will be registered after approximately 40 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

500 ms

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

The brakelight switch is sticking or has an intermittent contact. Defective signal wire.

Repair procedures (plant/service)

1. Check to determine whether foreign matter or objects (dirt) are causing the switch to hang.
2. Electrical check on wire a. --> If not OK, repair wire. b. --> If OK, replace switch.
3. Check by depressing the brake pedal repeatedly. No fault should be stored.

MIL illumination/CC message/emergency program

If the switch is defective the cruise control or ACC will be deactivated. Display: - Defective speed control or distance control failure

Remarks

The switch is also evaluated by the other control modules. Messages are 'Gear selection possible without brake application' and 'Starting possible without brake application'

DTC P0597: THERMOSTAT HEATER CONTROL CIRCUIT/OPEN (SIG)

BMW Fault Code (hex)

0x2EF5

BMW Fault Code (dez)

12021

BMW Fault Code Description VS-Text

Map thermostat, activation

Component

Thermostat

Subcomponent

Electrical

Monitoring criteria

Control-activation with $5\% < \text{PWM} < 95\%$

Fault debouncing

10 sec.

Terminal conditions

Terminal 15 ON Engine start

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

3 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Open circuit

Repair procedures (plant/service)

1. Check wiring. Repair if defective. If wiring is OK, proceed to check component (electrical check).

MIL illumination/CC message/emergency program

no external display

Remarks

none

DTC P0598: THERMOSTAT HEATER CONTROL CIRCUIT LOW (MIN)

BMW Fault Code (hex)

0x2EF5

BMW Fault Code (dez)

12021

BMW Fault Code Description VS-Text

Map thermostat, activation

Component

Thermostat

Subcomponent

Electrical

Monitoring criteria

Control-activation with $5\% < \text{PWM} < 95\%$

Fault debouncing

10 sec.

Terminal conditions

Terminal 15 ON Engine start

Voltage conditions

Voltage in onboard electrical system $> 10 \text{ V}$

Temperature conditions

none

Time conditions

3 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short circuit to ground in wire or component.

Repair procedures (plant/service)

1. Check wiring. Repair if defective. If wiring is OK, proceed to check component (electrical check).

MIL illumination/CC message/emergency program

no external display;

Remarks

none

DTC P0599: THERMOSTAT HEATER CONTROL CIRCUIT HIGH (MAX)

BMW Fault Code (hex)

0x2EF5

BMW Fault Code (dez)

12021

BMW Fault Code Description VS-Text

Map thermostat, activation

Component

Thermostat

Subcomponent

Electrical

Monitoring criteria

Control-activation with $5\% < \text{PWM} < 95\%$

Fault debouncing

10 sec.

Terminal conditions

Terminal 15 ON Engine start

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

3 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Wire is shorted to positive, or a short to positive is present in the component

Repair procedures (plant/service)

1. Check wiring. Repair if defective. If wiring is OK, proceed to check component (electrical check).

MIL illumination/CC message/emergency program

no external display

Remarks

none

DTC P0604: INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR (MAX)

BMW Fault Code (hex)

0x2AB2

BMW Fault Code (dez)

10930

BMW Fault Code Description VS-Text

DME, internal fault: RAM

Component

ECM/TCM

Subcomponent

RAM

Monitoring criteria

RAM checksum test This test is executed once, while the control module is booting.

Fault debouncing

No debounce. Fault can be reset by clearing fault memory.

Terminal conditions

Immediately after wakeup in dormant control module

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Internal RAM in DME checksum fault.

Repair procedures (plant/service)

Determine whether fault is stored again after carrying out the following procedure. If yes: Replace DME.

1. Clear fault memory
2. Ignition off, allow vehicle to assume complete dormant status
3. Ignition on
4. Read out stored fault codes from fault memory

MIL illumination/CC message/emergency program

none

Remarks

Internal control module fault

DTC P0604: INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR (MIN)

BMW Fault Code (hex)

0x2AB2

BMW Fault Code (dez)

10930

BMW Fault Code Description VS-Text

DME, internal fault: RAM

Component

ECM/TCM

Subcomponent

RAM

Monitoring criteria

RAM checksum test

Fault debouncing

The checksum will be recalculated in response to data manipulation, leading to a deviation that causes fault code registration.

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Internal TPU-RAM checksum fault

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P0604: INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR (MIN)

BMW Fault Code (hex)

0x2D67

BMW Fault Code (dez)

11623

BMW Fault Code Description VS-Text

DME, internal fault: monitoring, processors

Component

ECM/TCM

Subcomponent

RAM

Monitoring criteria

Internal control-module fault, RAM processor fault

Fault debouncing

immediately

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

none

Time conditions

immediately

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Possible sources of this fault are: faults in the data request and response process between the main computer and the process-monitor computer in the control module (on both sides, main computer and monitor computer) - the level 2 ROM check detects an fault - the level 2 RAM check detects an fault - the level 2 program flow monitor detects an fault.

Repair procedures (plant/service)

Ensure that correct software and data have been flash-programmed; repeat flash-programming as indicated. If frequency > 3 Replace DME

MIL illumination/CC message/emergency program

MIL OFF. EML ON. CC: Power loss, engine malfunction.

Remarks

none

DTC P0605: INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR (MAX)**BMW Fault Code (hex)**

0x2D67

BMW Fault Code (dez)

11623

BMW Fault Code Description VS-Text

DME, internal fault: monitoring, processors

Component

ECM/TCM

Subcomponent

ROM

Monitoring criteria

Internal control-module fault, read memory processor fault

Fault debouncing

immediately

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

none

Time conditions

immediately

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Possible sources of this fault are: faults in the data request and response process between the main computer and the process-monitor computer in the control module (on both sides, main computer and monitor computer) - the level 2 ROM check detects an fault - the level 2 RAM check detects an fault - the level 2 program flow monitor detects an fault

Repair procedures (plant/service)

Ensure that correct software and data have been flash-programmed; repeat flash-programming as indicated. If frequency > 3. Replace DME.

MIL illumination/CC message/emergency program

MIL OFF. EML ON CC: Power loss, engine malfunction.

Remarks

none

DTC P0606: ECM/PCM PROCESSOR (SIG)

BMW Fault Code (hex)

0x2D67

BMW Fault Code (dez)

11623

BMW Fault Code Description VS-Text

DME, internal fault: monitoring, processors

Component

No Info

Subcomponent

No Info

Monitoring criteria

Internal control-module fault, general processor fault

Fault debouncing

immediately

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

none

Time conditions

immediately

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Possible sources of this fault are: faults in the data request and response process between the main computer and the process-monitor computer in the control module (on both sides, main computer and monitor computer) - the level 2 ROM check detects an fault - the level 2 RAM check detects an fault - the level 2 program flow monitor detects an fault.

Repair procedures (plant/service)

Ensure that correct software and data have been flash-programmed; repeat flash-programming as indicated. If frequency > 3 . Replace DME.

MIL illumination/CC message/emergency program

MIL OFF. EML ON. CC: Power loss, engine malfunction.

Remarks

none

DTC P060C: INTERNAL CONTROL MODULE MAIN PROCESSOR PERFORMANCE (PLAUS)

BMW Fault Code (hex)

0x2D67

BMW Fault Code (dez)

11623

BMW Fault Code Description VS-Text

DME, internal fault: monitoring, processors

Component

No Info

Subcomponent

No Info

Monitoring criteria

Internal control-module fault, processor fault in monitor computer

Fault debouncing

immediately

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

none

Time conditions

immediately

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Possible sources of this fault are: faults in the data request and response process between the main computer and the process-monitor computer in the control module (on both sides, main computer and monitor computer) - the level 2 ROM check detects an fault - the level 2 RAM check detects an fault - the level 2 program flow monitor detects an fault

Repair procedures (plant/service)

Ensure that correct software and data have been flash-programmed; repeat flash-programming as indicated. If frequency > 3, Replace DME

MIL illumination/CC message/emergency program

MIL OFF, EML ON, CC: Power loss, engine malfunction.

Remarks

none

DTC P0620: GENERATOR CONTROL CIRCUIT (MAX)**BMW Fault Code (hex)**

0x2ECD

BMW Fault Code (dez)

11981

BMW Fault Code Description VS-Text

Generator, electric

Component

No Info

Subcomponent

No Info

Monitoring criteria

Commercial vehicle > 350 RPM, no BSD communications fault

Fault debouncing

25 sec.

Terminal conditions

Terminal 15 ON, no BSD fault

Voltage conditions

System voltage

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Phase or diode failure. Regulator control circuit failure ==> Undervoltage or overvoltage

Repair procedures (plant/service)

With confirmation from restart ==> Replace alternator

MIL illumination/CC message/emergency program

Charge indicator lamp

Remarks

Can occur during vehicle servicing when external power source is connected, Etc.

DTC P0620: GENERATOR CONTROL CIRCUIT (SIG)

BMW Fault Code (hex)

0x2E97

BMW Fault Code (dez)

11927

BMW Fault Code Description VS-Text

Generator

Component

No Info

Subcomponent

No Info

Monitoring criteria

El. fault

Fault debouncing

Commercial vehicle >350 RPM, No communications fault

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

25 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Phase or diode failure. Regulator control circuit failure ==> Undervoltage or overvoltage

Repair procedures (plant/service)

With confirmation from restart ==> Replace alternator

MIL illumination/CC message/emergency program

Charge indicator lamp

Remarks

Can occur during vehicle servicing when external power source is connected, etc.

DTC P062F: INTERNAL CONTROL MODULE EEPROM ERROR (PLAUS)**BMW Fault Code (hex)**

0x2FA3

BMW Fault Code (dez)

12195

BMW Fault Code Description VS-Text

No coding

Component

No Info

Subcomponent

No Info

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

Terminal 15 ON

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

No code entry executed (after programming)

Repair procedures (plant/service)

Perform code entry

MIL illumination/CC message/emergency program

none

Remarks

Occurs after every programming session (data or program)

DTC P062F: INTERNAL CONTROL MODULE EEPROM ERROR (SIG)

BMW Fault Code (hex)

0x2FA3

BMW Fault Code (dez)

12195

BMW Fault Code Description VS-Text

No coding

Component

ECM/TCM

Subcomponent

EEPROM

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

Terminal 15 ON

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Incorrect code data in EEPROM

Repair procedures (plant/service)

Recode DME and clear fault memory, replace DME if fault occurs more than once.

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P062F: INTERNAL CONTROL MODULE EEPROM ERROR (SIG)

BMW Fault Code (hex)

0x2FA4

BMW Fault Code (dez)

12196

BMW Fault Code Description VS-Text

Incorrect data record

Component

No Info

Subcomponent

No Info

Monitoring criteria

Always active

Fault debouncing

none

Terminal conditions

Terminal 15 ON

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Timeout on VEHICLE VERSION message from CAS

Repair procedures (plant/service)

Check CAS and/or CAN link to CAS

MIL illumination/CC message/emergency program

Reduced output

Remarks

Occurs when vehicle version message from CAS is missing

DTC P0645: A/C CLUTCH RELAY CONTROL CIRCUIT (SIG)

BMW Fault Code (hex)

0x2F12

BMW Fault Code (dez)

12050

BMW Fault Code Description VS-Text

Air-conditioning compressor, activation

Component

No Info

Subcomponent

No Info

Monitoring criteria

Air conditioner relay control-activation monitor; air conditioning initialized. Briefly triggered by relay. Air conditioning installed and switched on.

Fault debouncing

1 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Open circuit

Repair procedures (plant/service)

Check wiring. Repair if defective. If wiring is OK, proceed to check component, A/C compressor relay.

MIL illumination/CC message/emergency program

no external display;

Remarks

none

DTC P0646: A/C CLUTCH RELAY CONTROL CIRCUIT LOW (MIN)**BMW Fault Code (hex)**

0x2F12

BMW Fault Code (dez)

12050

BMW Fault Code Description VS-Text

Air-conditioning compressor, activation

Component

No Info

Subcomponent

No Info

Monitoring criteria

Air conditioner relay control-activation monitor; air conditioning initialized. Briefly triggered by relay. Air conditioning installed and switched on.

Fault debouncing

1 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short circuit to ground in wire or component.

Repair procedures (plant/service)

1. Check wiring. Repair if defective. If wiring is OK, proceed to check component, A/C compressor relay.

MIL illumination/CC message/emergency program

no external display

Remarks

none

DTC P0647: A/C CLUTCH RELAY CONTROL CIRCUIT HIGH (MAX)

BMW Fault Code (hex)

0x2F12

BMW Fault Code (dez)

12050

BMW Fault Code Description VS-Text

Air-conditioning compressor, activation

Component

No Info

Subcomponent

No Info

Monitoring criteria

Air conditioner relay control-activation monitor; air conditioning initialized. Briefly triggered by relay. Air conditioning installed and switched on.

Fault debouncing

1 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Wire is shorted to positive, or a short to positive is present in the component

Repair procedures (plant/service)

Check wiring. Repair if defective. If wiring is OK proceed to check component, a/c compressor relay

MIL illumination/CC message/emergency program

no external display;

Remarks

none

DTC P0668: PCM/ECM/TCM INTERNAL TEMPERATURE SENSOR CIRCUIT LOW (MIN)

BMW Fault Code (hex)

0x2F85

BMW Fault Code (dez)

12165

BMW Fault Code Description VS-Text

DME, internal fault: interior-temperature sensor, signal

Component

ECM/TCM

Subcomponent

Internal Temperature Sensor

Monitoring criteria

Control module internal temperature sensor monitor

Fault debouncing

5 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

none

Temperature conditions

none

Time conditions

Time after end of start phase > 10 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short to ground in sensor wire

Repair procedures (plant/service)

Replace DME, as sensor is internal component.

MIL illumination/CC message/emergency program

none

Remarks

Voltage range diagnosis

DTC P0669: PCM/ECM/TCM INTERNAL TEMPERATURE SENSOR CIRCUIT HIGH (MAX)

BMW Fault Code (hex)

0x2F85

BMW Fault Code (dez)

12165

BMW Fault Code Description VS-Text

DME, internal fault: interior-temperature sensor, signal

Component

ECM/TCM

Subcomponent

Internal Temperature Sensor

Monitoring criteria

Control module internal temperature sensor monitor

Fault debouncing

5 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

none

Temperature conditions

none

Time conditions

Time after end of start phase > 10 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Sensor wire shorted to positive or open circuit in wire

Repair procedures (plant/service)

Replace DME, as sensor is internal component

MIL illumination/CC message/emergency program

none

Remarks

Voltage range diagnosis

DTC P0686: ECM/PCM POWER RELAY CONTROL CIRCUIT LOW (MIN)

BMW Fault Code (hex)

0x2ACB

BMW Fault Code (dez)

10955

BMW Fault Code Description VS-Text

DME master relay, activation

Component

ECM/PCM Power Relay

Subcomponent

Electrical

Monitoring criteria

Main relay monitoring. Main relay must have opened.

Fault debouncing

none

Terminal conditions

First Terminal 15 OFF (wait until main relay opens) then Terminal 15 ON (and leave ON)

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

System responds to fault by storing fault code within approximately 1 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Main relay fails to make owing to mechanical problems. (or contacts close only with lag) Or the connecting wire to the DME has a short circuit to UBatt or is open.

Repair procedures (plant/service)

Check wiring. Repair if defective. If wiring is OK, proceed to check component.

MIL illumination/CC message/emergency program

none

Remarks

When you encounter this fault, note that in all likelihood other diagnostic fault codes will also be entered in the fault memory (throttle plate potentiometer 1 and 2, voltage supply to pedal-position sensor, etc.), as the main relay's response lag or refusal to make will prevent the power supply from reaching these components.

DTC P0687: ECM/PCM POWER RELAY CONTROL CIRCUIT HIGH (MAX)**BMW Fault Code (hex)**

0x2ACB

BMW Fault Code (dez)

10955

BMW Fault Code Description VS-Text

DME master relay, activation

Component

ECM/PCM Power Relay

Subcomponent

Electrical

Monitoring criteria

Main relay monitoring Main relay is deactivated by DME (8 sec. after Terminal 15 off)

Fault debouncing

none

Terminal conditions

First Terminal 15 ON then OFF (then leave OFF)

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

System responds to fault by storing fault code within approximately 8.9 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Main relay fails to disengage owing to mechanical factors. (melted together) Or the wire to the DME is shorted to ground.

Repair procedures (plant/service)

Check wiring. Repair if defective. If wiring is OK, proceed to check component

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P0691: FAN 1 CONTROL CIRCUIT LOW (MIN)

BMW Fault Code (hex)

0x2EFE

BMW Fault Code (dez)

12030

BMW Fault Code Description VS-Text

Electric fan, activation

Component

No Info

Subcomponent

No Info

Monitoring criteria

PWM > 10%

Fault debouncing

5 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

Ambient temperature > -20°C

Time conditions

11 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short circuit to ground in wire or component.

Repair procedures (plant/service)

1. Check wiring. Repair if defective. If wiring is OK, proceed to check component (electrical check)

MIL illumination/CC message/emergency program

no external display;

Remarks

An inoperative E fan can also cause the engine to overheat.

DTC P0692: FAN 1 CONTROL CIRCUIT HIGH (MAX)

BMW Fault Code (hex)

0x2EFE

BMW Fault Code (dez)

12030

BMW Fault Code Description VS-Text

Electric fan, activation

Component

No Info

Subcomponent

No Info

Monitoring criteria

PWM > 10%

Fault debouncing

5 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

Ambient temperature > -20°C

Time conditions

5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Wire is shorted to positive, or a short to positive is present in the component

Repair procedures (plant/service)

1. Check wiring. Repair if defective. If wiring is OK proceed to check component (electrical check)

MIL illumination/CC message/emergency program

no external display

Remarks

An inoperative E fan can also cause the engine to overheat.

DTC P0703: BRAKE SWITCH 'B' CIRCUIT (PLAUS)

BMW Fault Code (hex)

0x2F64

BMW Fault Code (dez)

12132

BMW Fault Code Description VS-Text

Brake-light test switch, plausibility

Component

No Info

Subcomponent

No Info

Monitoring criteria

Brake light switch monitor. Depress brake pedal repeatedly

Fault debouncing

If the BLS is still OK, the fault will be stored immediately as soon as the brake pedal is depressed. If the plug is disconnected the BLS fault will be registered after approximately 40 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

500 ms

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

The brakelight test switch is sticking or has an intermittent contact. Defective signal wire.

Repair procedures (plant/service)

1. Check to determine whether foreign matter or objects (dirt) are causing the switch to hang.
2. Electrical check on wire a. --> If not OK, repair wire. b. --> If OK, replace switch.
3. Check by depressing the brake pedal repeatedly. No fault should be stored.

MIL illumination/CC message/emergency program

If the switch is defective the cruise control or ACC will be deactivated. Display: - Defective speed control or distance control failure

Remarks

The switch is also evaluated by the other control modules. Messages are 'Gear selection possible without brake application' and 'Starting possible without brake application'

DTC P0831: CLUTCH PEDAL SWITCH 'A' CIRCUIT LOW (MIN)**BMW Fault Code (hex)**

0x2F67

BMW Fault Code (dez)

12135

BMW Fault Code Description VS-Text

Clutch switch, signal

Component

No Info

Subcomponent

No Info

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P0832: CLUTCH PEDAL SWITCH 'A' CIRCUIT HIGH (MAX)

BMW Fault Code (hex)

0x2F67

BMW Fault Code (dez)

12135

BMW Fault Code Description VS-Text

Clutch switch, signal

Component

No Info

Subcomponent

No Info

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P0A14: ENGINE MOUNT 'A' CONTROL CIRCUIT/OPEN (MAX)

BMW Fault Code (hex)

0x2FC6

BMW Fault Code (dez)

12230

BMW Fault Code Description VS-Text

Energy-saving mode active

Component

No Info

Subcomponent

No Info

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P0A14: ENGINE MOUNT 'A' CONTROL CIRCUIT/OPEN (MIN)

BMW Fault Code (hex)

0x2FC6

BMW Fault Code (dez)

12230

BMW Fault Code Description VS-Text

Energy-saving mode active

Component

No Info

Subcomponent

No Info

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P0A14: ENGINE MOUNT 'A' CONTROL CIRCUIT/OPEN (SIG)

BMW Fault Code (hex)

0x2FAB

BMW Fault Code (dez)

12203

BMW Fault Code Description VS-Text

Active engine mount, electric

Component

No Info

Subcomponent

No Info

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P0A14: ENGINE MOUNT 'A' CONTROL CIRCUIT/OPEN (SIG)

BMW Fault Code (hex)

0x2FC6

BMW Fault Code (dez)

12230

BMW Fault Code Description VS-Text

Energy-saving mode active

Component

No Info

Subcomponent

No Info

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P0A15: ENGINE MOUNT 'A' CONTROL CIRCUIT LOW (MIN)

BMW Fault Code (hex)

0x2FAB

BMW Fault Code (dez)

12203

BMW Fault Code Description VS-Text

Active engine mount, electric

Component

No Info

Subcomponent

No Info

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P0A16: ENGINE MOUNT 'A' CONTROL CIRCUIT HIGH (MAX)

BMW Fault Code (hex)

0x2FAB

BMW Fault Code (dez)

12203

BMW Fault Code Description VS-Text

Active engine mount, electric

Component

No Info

Subcomponent

No Info

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P0A3B: GENERATOR OVER TEMPERATURE (MAX)

BMW Fault Code (hex)

0x2E97

BMW Fault Code (dez)

11927

BMW Fault Code Description VS-Text

Generator

Component

No Info

Subcomponent

No Info

Monitoring criteria

Overtemperature fault

Fault debouncing

Commercial vehicle >350 RPM, No communications fault

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

25 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Air cooling obstructed by leaves, Etc. Overall thermal overload stemming from extremely negative operating profile possible.

Repair procedures (plant/service)

Inspect alternator for unobstructed air current.

MIL illumination/CC message/emergency program

No Info

Remarks

Important! Fault debounce leads to reduced availability of comfort and convenience accessories

DTC P0A3B: GENERATOR OVER TEMPERATURE (MAX)**BMW Fault Code (hex)**

0x2ECF

BMW Fault Code (dez)

11983

BMW Fault Code Description VS-Text

Generator, overtemperature

Component

No Info

Subcomponent

No Info

Monitoring criteria

Commercial vehicle > 350 RPM, no BSD communications fault

Fault debouncing

25 sec.

Terminal conditions

Terminal 15 ON, no BSD fault

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Alternator airflow obstructed. Thermal overload from unfavorable driving profile possible.

Repair procedures (plant/service)

Inspect alternator for unobstructed air current.

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P1004: VVT-GUIDING SENSOR SOLENOID LOSS (BANK 1) (MAX)

BMW Fault Code (hex)

0x2A35

BMW Fault Code (dez)

10805

BMW Fault Code Description VS-Text

Valvetronic, eccentric shaft sensor: guide

Component

Valvetronic (VVT)

Subcomponent

Guiding Sensor

Monitoring criteria

No faults related to the sensor voltage supply should be present (fault code #10800) and there should be no faults or SPI parity faults related to the VVT sensor (fault code #10801) or (fault code #10802)

Fault debouncing

20 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Electrical system voltage terminal 87 > 10.0 V

Temperature conditions

none

Time conditions

20 ms

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Missing reductor on VVT sensor

Repair procedures (plant/service)

1. Inspect to determine whether VVT sensor reductor is installed correctly.
2. Replace VVT sensor if Item 1 is OK

MIL illumination/CC message/emergency program

ECE: No warning message. Engine reverts to VVT emergency backup mode (throttled operation) US: OPEN

Remarks

none

DTC P1006: VVT-GUIDING SENSOR PARITY ERROR (BANK 1) (SIG)**BMW Fault Code (hex)**

0x2A31

BMW Fault Code (dez)

10801

BMW Fault Code Description VS-Text

Valvetronic, eccentric shaft sensor: guide

Component

Valvetronic (VVT)

Subcomponent

Guiding Sensor

Monitoring criteria

VVT lead sensor monitor. No faults related to the sensor's voltage supply should be present (fault code 10800).

Fault debouncing

100 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Electrical system voltage terminal 87 > 10.0 V

Temperature conditions

none

Time conditions

100 ms

System test

none

Signal information

analog, 0-5 V

Calculated value Y/N

N

Possible Fault Causes

Open circuit, or short to positive or ground, or signal wire between VVT lead sensor and DME. Open cable shield on VVT sensor wire (no ground connection).

Repair procedures (plant/service)

If fault codes (#10801) and (#10802) are simultaneously stored in the fault memory, proceed to check the following:

1. Dual fault is stored when VVT sensor is not connected to the DME. Is VVT sensor connected to the wiring harness? If not: Plug in and check wiring harness between DME and VVT sensor. Determine whether the VVT sensor wire shield is grounded at the DME (PIN 7-10) and sensor (PIN 4).

Replace VVT sensor. If only fault code (#10801) is entered:

1. Check signal wire (VVT sensor PIN 1, PIN 3) between VVT sensor and DME for breakage or short circuits and corroded plugs.
2. Determine whether a

MIL illumination/CC message/emergency program

ECE: No warning message. Engine reverts to VVT emergency backup mode (throttled operation) US: OPEN

Remarks

none

DTC P1012: VVT-REFERENCE SENSOR SOLENOID LOSS (BANK 1) (MAX)

BMW Fault Code (hex)

0x2A36

BMW Fault Code (dez)

10806

BMW Fault Code Description VS-Text

Valvetronic, eccentric shaft sensor: reference

Component

Valvetronic (VVT)

Subcomponent

Reference Sensor

Monitoring criteria

No faults related to the sensor voltage supply should be present (fault code #10800) and there should be no faults or SPI parity faults related to the VVT sensor (fault code #10801) or (fault code #10802).

Fault debouncing

20 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Electrical system voltage terminal 87 > 10.0 V

Temperature conditions

none

Time conditions

20 ms

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Missing reductor on VVT sensor

Repair procedures (plant/service)

1. Inspect to determine whether VVT sensor reductor is installed correctly.
2. Replace VVT sensor if Item 1 is OK

MIL illumination/CC message/emergency program

ECE: No warning message. Engine reverts to VVT emergency backup mode (throttled operation) US: OPEN.

Remarks

none

DTC P1014: VVT-REFERENCE SENSOR PARITY ERROR (BANK 1) (SIG)

BMW Fault Code (hex)

0x2A32

BMW Fault Code (dez)

10802

BMW Fault Code Description VS-Text

Valvetronic, eccentric shaft sensor: reference

Component

Valvetronic (VVT)

Subcomponent

Reference Sensor

Monitoring criteria

VVT reference sensor monitor. No faults related to the sensor's voltage supply should be present (fault code 10800).

Fault debouncing

100 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Electrical system voltage terminal 87 > 10.0 V

Temperature conditions

none

Time conditions

100 ms

System test

none

Signal information

analog, 0-5 V

Calculated value Y/N

N

Possible Fault Causes

Open circuit, or short to positive or ground, or signal wire between VVT reference sensor and DME. Open cable shield on VVT sensor wire (no ground connection)

Repair procedures (plant/service)

If faults (#10801) and (#10802) are simultaneously stored in the fault memory, proceed to check the following:

1. Dual fault is stored when VVT sensor is not connected to the DME. Is VVT sensor connected to the wiring harness? If not: Plug in and check wiring harness between DME and VVT sensor.

Replace VVT sensor. If only fault code (#10802) is entered:

1. Check signal wire (VVT sensor PIN 7, PIN 9) between VVT sensor and DME for breakage or short circuits and corroded plugs.
2. Determine whether a cycle signal is visible every 1 ms at sensor Pin
3. (Ignition on!). If yes, proceed to Item
4. If no, this signal wire is

MIL illumination/CC message/emergency program

ECE: No warning message. Engine reverts to VVT emergency backup mode (throttled operation) US: OPEN

Remarks

none

DTC P1017: VVT-SENSORS PLAUSIBILITY (BANK 1) (PLAUS)**BMW Fault Code (hex)**

0x2A37

BMW Fault Code (dez)

10807

BMW Fault Code Description VS-Text

Valvetronic, eccentric shaft sensor: plausibility

Component

Valvetronic (VVT)

Subcomponent

Sensors

Monitoring criteria

VVT sensor plausibility monitor

1. No faults regarding the sensor voltage supply should be present (fault code #10800)
2. No sensor faults should be present (fault codes #10801 to #10806)

Fault debouncing

50 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Electrical system voltage terminal 87 > 10.0 V

Temperature conditions

none

Time conditions

50 ms

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

The VVT sensor signal is not plausible.

Repair procedures (plant/service)

1. Check reluctor on VVT sensor to ensure correct installation and firm seating.
2. Replace VVT sensor if Item 1 is OK

MIL illumination/CC message/emergency program

ECE: No warning message. Engine reverts to VVT emergency backup mode (throttled operation) US: OPEN

Remarks

none

DTC P1017: VVT-SENSORS PLAUSIBILITY (BANK 1) (PLAUS)**BMW Fault Code (hex)**

0x2A47

BMW Fault Code (dez)

10823

BMW Fault Code Description VS-Text

Valvetronic, eccentric shaft sensor: plausibility

Component

Valvetronic (VVT)

Subcomponent

Sensors

Monitoring criteria

Sensor signal monitor (cumulative sensor faults). Always active

Fault debouncing

20 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

none

Temperature conditions

none

Time conditions

100 ms

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Open sensor wire; reluctor missing; VVT sensor defective

Repair procedures (plant/service)

1. Examination of sensor plugs, sensor wiring.
2. If Item 1 is OK, inspect the reluctor.
3. If the reluctor is OK, replace VVT sensor.

MIL illumination/CC message/emergency program

ECE: No warning message. Engine reverts to VVT emergency backup mode (throttled operation) US: OPEN

Remarks

none

DTC P1019: VVT-SUPPLY VOLTAGE SENSORS HIGH INPUT (BANK 1) (MAX)**BMW Fault Code (hex)**

0x2A30

BMW Fault Code (dez)

10800

BMW Fault Code Description VS-Text

Valvetronic, eccentric shaft sensor: power supply

Component

Valvetronic (VVT)

Subcomponent

Power Supply Sensors

Monitoring criteria

Monitoring of voltage supply to eccentric shaft. Nominal value for voltage supply sensor = 5.0 V

Fault debouncing

Sensor power-supply voltage > 5.25 V

Terminal conditions

Terminal 15 ON

Voltage conditions

Electrical system voltage terminal 87 > 10.0 V

Temperature conditions

none

Time conditions

10 ms

System test

none

Signal information

analog, 5 V

Calculated value Y/N

N

Possible Fault Causes

Short to positive on VVT sensor power-supply wire

Repair procedures (plant/service)

1. Check sensor power supply voltage with multimeter. Supply voltage must lie between 4.75 V and 5.25 V.
2. If result is outside specified range: Check power-supply wire to VVT sensor and check plug.
3. If contact is stretched or corroded: Replace plug on VVT sensor
4. If wiring harness is defective: Replace wiring harness between DME and VVT sensor.

MIL illumination/CC message/emergency program

ECE: No warning message. Engine reverts to VVT emergency backup mode (throttled operation) US: OPEN

Remarks

none

DTC P101A: VVT-SELF-LEARNING FUNCTION, STOPS NOT LEARNED (MAX)

BMW Fault Code (hex)

0x2A46

BMW Fault Code (dez)

10822

BMW Fault Code Description VS-Text

Valvetronic, adaptation

Component

Valvetronic (VVT)

Subcomponent

Self-Learning Function

Monitoring criteria

Monitoring of VVT system for mechanical wear.

Fault debouncing

100 ms

Terminal conditions

none

Voltage conditions

none

Temperature conditions

$T_{mot} > 60^{\circ}\text{C}$

Time conditions

100 ms

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Mechanical wear

Repair procedures (plant/service)

Remove the valve cover and inspect for indications of mechanical wear (such as rocker arm wear, etc.)

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P101A: VVT-SELF-LEARNING FUNCTION, STOPS NOT LEARNED (MIN)

BMW Fault Code (hex)

0x2A46

BMW Fault Code (dez)

10822

BMW Fault Code Description VS-Text

Valvetronic, adaptation

Component

Valvetronic (VVT)

Subcomponent

Self-Learning Function

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P101A: VVT-SELF-LEARNING FUNCTION, STOPS NOT LEARNED (SIG)

BMW Fault Code (hex)

0x2A39

BMW Fault Code (dez)

10809

BMW Fault Code Description VS-Text

Valvetronic, adjustment range

Component

Valvetronic (VVT)

Subcomponent

Self-Learning Function

Monitoring criteria

Adjustment range monitor. When travel limit initialization routine is executed. (travel limit initialization routine is automatically executed in a 5 hour (engine operating hours) cycle or with 'initialize travel limits' tester request.

Fault debouncing

following renewed successful execution of the travel limit initialization routine

Terminal conditions

Terminal 15 ON

Voltage conditions

Electrical system voltage. Terminal 87 > 10.0 V

Temperature conditions

none

Time conditions

immediately

System test

Initialize for VVT travel limit

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

No travel stops initialized/present

Repair procedures (plant/service)

1. Use tester request to repeat the VVT travel limit initialization routine
2. If Item No. 1 is not OK, it will be necessary to check the VVT mechanical components/VVT servo motor

MIL illumination/CC message/emergency program

ECE: No warning message. Engine reverts to VVT emergency backup mode (throttled operation) US: OPEN

Remarks

none

DTC P1020: VVT-SUPPLY VOLTAGE SENSORS LOW INPUT (BANK 1) (MIN)

BMW Fault Code (hex)

0x2A30

BMW Fault Code (dez)

10800

BMW Fault Code Description VS-Text

Valvetronic, eccentric shaft sensor: power supply

Component

Valvetronic (VVT)

Subcomponent

Power Supply Sensors

Monitoring criteria

Monitoring of voltage supply to eccentric shaft. Nominal value for voltage supply sensor = 5.0 V

Fault debouncing

Sensor power-supply voltage < 4.75 V

Terminal conditions

Terminal 15 ON

Voltage conditions

Electrical system voltage terminal 87 > 10.0 V

Temperature conditions

none

Time conditions

10 ms

System test

none

Signal information

analog, 5 V

Calculated value Y/N

N

Possible Fault Causes

Short to ground on VVT sensor power wire

Repair procedures (plant/service)

1. Check sensor power supply voltage with multimeter. Supply voltage must lie between 4.75 V and 5.25 V.
2. If result is outside specified range: Check power-supply wire to VVT sensor and check plug.
3. If contact is stretched or corroded: Replace plug on VVT sensor
4. If wiring harness is defective: Replace wiring harness between DME and VVT sensor.

MIL illumination/CC message/emergency program

ECE: No warning message. Engine reverts to VVT emergency backup mode (throttled operation) US: OPEN

Remarks

none

**DTC P1023: VVT-SELF-LEARNING FUNCTION FAULTY ADJUSTMENT RANGE (BANK 1)
(MAX)**

BMW Fault Code (hex)

0x2A39

BMW Fault Code (dez)

10809

BMW Fault Code Description VS-Text

Valvetronic, adjustment range

Component

Valvetronic (VVT)

Subcomponent

Self-Learning Function

Monitoring criteria

Adjustment range monitor. When travel limit initialization routine is executed. (travel limit initialization routine is automatically executed in a 5 hour (engine operating hours) cycle or with 'initialize travel limits' tester request.

Fault debouncing

following renewed successful execution of the travel limit initialization routine

Terminal conditions

Terminal 15 ON

Voltage conditions

Electrical system voltage. Terminal 87 >10.0 V

Temperature conditions

none

Time conditions

immediately

System test

Initialize for VVT travel limit

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

The initialized range is outside the approved tolerance range.

Repair procedures (plant/service)

1. Use tester request to repeat the VVT travel limit initialization routine.
2. If Item No.1 is not OK, it will be necessary to check the VVT mechanical components/VVT servo motor.

MIL illumination/CC message/emergency program

ECE: No warning message. Engine reverts to VVT emergency backup mode (throttled operation) US: OPEN

Remarks

none

DTC P1024: VVT-SELF-LEARNING FUNCTION FAULTY LOWER LEARNING RANGE (BANK 1) (MIN)

BMW Fault Code (hex)

0x2A39

BMW Fault Code (dez)

10809

BMW Fault Code Description VS-Text

Valvetronic, adjustment range

Component

Valvetronic (VVT)

Subcomponent

Self-Learning Function

Monitoring criteria

Adjustment range monitor. When travel limit initialization routine is executed. (travel limit initialization routine is automatically executed in a 5 hour (engine operating hours) cycle or with 'initialize travel limits' tester request.

Fault debouncing

following renewed successful execution of the travel limit initialization routine

Terminal conditions

Terminal 15 ON

Voltage conditions

Electrical system voltage Terminal 87 >10.0 V

Temperature conditions

none

Time conditions

immediately

System test

Initialize for VVT travel limit

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

No initialization for lower travel limit

Repair procedures (plant/service)

1. Use tester request to repeat the VVT travel limit initialization routine
2. If Item No.1 is not OK, it will be necessary to check the VVT mechanical components/VVT servo motor

MIL illumination/CC message/emergency program

ECE: No warning message. Engine reverts to VVT emergency backup mode (throttled operation) US: OPEN

Remarks

none

DTC P102B: VVT-GUIDING SENSOR DIAGNOSTIC ERROR (BANK 1) (MIN)**BMW Fault Code (hex)**

0x2A33

BMW Fault Code (dez)

10803

BMW Fault Code Description VS-Text

Valvetronic, eccentric shaft sensor: guide

Component

Valvetronic (VVT)

Subcomponent

Guiding Sensor

Monitoring criteria

Internal VVT lead sensor monitor No faults related to the sensor voltage supply should be present (fault code #10800) and there should be no faults or SPI parity faults related to the VVT sensor (fault code #10801) or (fault code #10802)

Fault debouncing

20 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Electrical system voltage terminal 87 >10.0 V

Temperature conditions

none

Time conditions

20 ms

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Internal fault in VVT sensor

Repair procedures (plant/service)

Sensor replacement

MIL illumination/CC message/emergency program

ECE: No warning message. Engine reverts to VVT emergency backup mode (throttled operation) US: OPEN

Remarks

none

DTC P102C: VVT-REFERENCE SENSOR DIAGNOSTIC ERROR (BANK 1) (MIN)

BMW Fault Code (hex)

0x2A34

BMW Fault Code (dez)

10804

BMW Fault Code Description VS-Text

Valvetronic, eccentric shaft sensor: reference

Component

Valvetronic (VVT)

Subcomponent

Reference Sensor

Monitoring criteria

Internal VVT reference sensor monitor. No faults related to the sensor voltage supply should be present (fault code #10800) and there should be no faults or SPI parity faults related to the VVT sensor (fault code #10801) or (fault code #10802)

Fault debouncing

20 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Electrical system voltage terminal 87 >10.0 V

Temperature conditions

none

Time conditions

20 ms

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Internal fault in VVT sensor

Repair procedures (plant/service)

Sensor replacement

MIL illumination/CC message/emergency program

ECE: No warning message. Engine reverts to VVT emergency backup mode (throttled operation) US: OPEN

Remarks

none

DTC P1030: VVT-ACTUATOR MONITORING POSITION CONTROL, CONTROL DEVIATION (BANK 1) (PLAUS)

BMW Fault Code (hex)

0x2A38

BMW Fault Code (dez)

10808

BMW Fault Code Description VS-Text

Valvetronic, monitoring, sluggish movement

Component

Valvetronic (VVT)

Subcomponent

Position Control

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P1030: VVT-ACTUATOR MONITORING POSITION CONTROL, CONTROL DEVIATION (BANK 1) (SIG)

BMW Fault Code (hex)

0x2A38

BMW Fault Code (dez)

10808

BMW Fault Code Description VS-Text

Valvetronic, monitoring, sluggish movement

Component

Valvetronic (VVT)

Subcomponent

Position Control

Monitoring criteria

VVT system monitoring for binding and resistance to motion. Always active when no other VVT fault is present.

Fault debouncing

55 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Electrical system voltage terminal 87 >10.0 V

Temperature conditions

none

Time conditions

55 ms

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Specified sensor value is not reached (not quickly enough).

Repair procedures (plant/service)

1. Use tester to request initialization of travel limits and note whether travel limit initialization routine executes without problems.
2. If Item 1 is not OK, replace VVT motor and repeat Item 1
3. If replacing VVT motor fails to resolve the problem: Open the valve cover and check the VVT for mechanical binding and seizure.

MIL illumination/CC message/emergency program

ECE: No warning message. Engine reverts to VVT emergency backup mode (throttled operation) US: OPEN

Remarks

none

DTC P103A: VVT-SYSTEM CURRENT TOO HIGH (MAX)

BMW Fault Code (hex)

0x2A45

BMW Fault Code (dez)

10821

BMW Fault Code Description VS-Text

Valvetronic, actuator motor: plausibility

Component

Valvetronic (VVT)

Subcomponent

System Current

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P1041: INTERNAL VVT-CONTROL MODULE EEPROM ERROR (BANK 1) (PLAUS)

BMW Fault Code (hex)

0x2A3A

BMW Fault Code (dez)

10810

BMW Fault Code Description VS-Text

Valvetronic, internal fault

Component

Valvetronic (VVT)

Subcomponent

ECM

Monitoring criteria

E2PROM fault

Fault debouncing

Fault set immediate without debounce

Terminal conditions

Terminal 15 ON

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Malfunction in control module electronic circuitry

Repair procedures (plant/service)

Ignition off, wait for control module to return to dormant ""sleep"" state, run travel limit initialization routine again or trigger travel limit initialization routine manually

MIL illumination/CC message/emergency program

Limp-home operation 1

Remarks

none

DTC P1047: VVT-CONTROL CIRCUIT HIGH INPUT (BANK 1) (MAX)

BMW Fault Code (hex)

0x2A3D

BMW Fault Code (dez)

10813

BMW Fault Code Description VS-Text

Valvetronic, actuator motor: activation

Component

Valvetronic (VVT)

Subcomponent

Control Motor

Monitoring criteria

Short circuit to voltage supply

Fault debouncing

Fault set immediate without debounce

Terminal conditions

Terminal 15 ON

Voltage conditions

Battery voltage > 6.99 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Malfunction in control module electronic circuitry

Repair procedures (plant/service)

1. Ignition off, let control module return to dormant state as indicated, restart
2. If Item 1 is not OK, it will be necessary to check the electronics in the control module

MIL illumination/CC message/emergency program

Emergency default mode 2

Remarks

none

DTC P1048: VVT-CONTROL CIRCUIT LOW INPUT (BANK 1) (MIN)

BMW Fault Code (hex)

0x2A3D

BMW Fault Code (dez)

10813

BMW Fault Code Description VS-Text

Valvetronic, actuator motor: activation

Component

Valvetronic (VVT)

Subcomponent

Control Motor

Monitoring criteria

Short to ground

Fault debouncing

Fault set immediate without debounce

Terminal conditions

Terminal 15 ON

Voltage conditions

Battery voltage > 6.99 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Malfunction in control module electronic circuitry

Repair procedures (plant/service)

1. Ignition off, let control module return to dormant state as indicated, restart
2. If Item 1 is not OK, it will be necessary to check the electronics in the control module

MIL illumination/CC message/emergency program

Emergency default mode 2

Remarks

none

DTC P1049: VVT-CONTROL CIRCUIT ENGINE CABLES SHORT CIRCUIT (BANK 1) (SIG)

BMW Fault Code (hex)

0x2A3D

BMW Fault Code (dez)

10813

BMW Fault Code Description VS-Text

Valvetronic, actuator motor: activation

Component

Valvetronic (VVT)

Subcomponent

Control Motor

Monitoring criteria

Short circuit between motor wires

Fault debouncing

Fault set immediate without debounce

Terminal conditions

Terminal 15 ON

Voltage conditions

Battery voltage > 6.99 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

1. Disconnected VVL motor wires
2. Malfunction in control module electronics

Repair procedures (plant/service)

1. Check wiring to VVT motor
2. Ignition off, allow control module to assume dormant state as indicated, restart
3. If Items 1 and 2 are not OK, it will be necessary to inspect the control module's electronic circuitry

MIL illumination/CC message/emergency program

Emergency default mode 2

Remarks

none

DTC P1055: VVT-SUPPLY VOLTAGE CONTROL MOTOR HIGH INPUT (BANK 1) (MAX)

BMW Fault Code (hex)

0x2A3F

BMW Fault Code (dez)

10815

BMW Fault Code Description VS-Text

Valvetronic, actuator motor: power supply

Component

Valvetronic (VVT)

Subcomponent

Power Supply Control Motor

Monitoring criteria

VVT servo motor power supply monitor

Fault debouncing

Power-supply voltage > 17 V

Terminal conditions

Terminal 15 ON

Voltage conditions

Electrical system voltage terminal 87 >10.0 V

Temperature conditions

none

Time conditions

Fault code is stored following detection of fault (10 ms)

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short circuit to positive in VVT power supply

Repair procedures (plant/service)

1. Check VVT power supply voltage with multimeter. Supply voltage must lie between 5.75 V and 17 V.
2. If result is outside specified range: Inspect the power-supply wire to the VVT pins and check the plug.
3. If contact is stretched or corroded: Replace plug
4. If wiring harness is defective: Replace wiring harness.

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P1056: VVT-SUPPLY VOLTAGE CONTROL MOTOR LOW INPUT (BANK 1) (MIN)**BMW Fault Code (hex)**

0x2A3F

BMW Fault Code (dez)

10815

BMW Fault Code Description VS-Text

Valvetronic, actuator motor: power supply

Component

Valvetronic (VVT)

Subcomponent

Power Supply Control Motor

Monitoring criteria

VVT servo motor power supply monitor

Fault debouncing

Power supply voltage < 5.75 V

Terminal conditions

Terminal 15 ON

Voltage conditions

Electrical system voltage terminal 87 > 10.0 V

Temperature conditions

none

Time conditions

Fault code is stored following detection of fault (10 ms)

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short circuit to ground in VVT power supply.

Repair procedures (plant/service)

1. Check VVT power supply voltage with multimeter. Supply voltage must lie between 5.75 V and 17 V.
2. If result is outside specified range: Inspect the power-supply wire to the VVT pins and check the plug.

3. If contact is stretched or corroded: Replace plug
4. If wiring harness is defective: Replace wiring harness.

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P1057: VVT-SUPPLY VOLTAGE CONTROL MOTOR ELECTRICAL (BANK 1) (PLAUS)

BMW Fault Code (hex)

0x2A3C

BMW Fault Code (dez)

10812

BMW Fault Code Description VS-Text

Valvetronic relay, activation

Component

Valvetronic (VVT)

Subcomponent

Power Supply Control Motor

Monitoring criteria

The voltage at the capacitors is monitored. If this is below an offset of the battery voltage an fault symptom is registered

Fault debouncing

0.05

Terminal conditions

Main relay ON

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Malfunction in control module electronic circuitry

Repair procedures (plant/service)

1. Ignition off, let control module return to dormant state as indicated, restart
2. If Item 1 is not OK, it will be necessary to check the electronics in the control module

MIL illumination/CC message/emergency program

Emergency default mode 2

Remarks

none

DTC P105A: INTERNAL CONTROL MODULE VVT ERROR, CURRENT TOO HIGH (MAX)

BMW Fault Code (hex)

0x2A77

BMW Fault Code (dez)

10871

BMW Fault Code Description VS-Text

Control module, internal fault: Valvetronic output stage

Component

ECM

Subcomponent

Valvetronic (VVT) Current

Monitoring criteria

Excess current recognized on high side or low side transistors (ATIC61 diagnosis)

Fault debouncing

0.2

Terminal conditions

Terminal 15 ON

Voltage conditions

Battery voltage > 9.953125 V and battery voltage < 25.898438 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Shorty circuit in the H-bridge (for additional information refer to possible fault code entries in short circuit diagnosis, 'DR_SC_VVL').

Repair procedures (plant/service)

1. Ignition off, let control module return to dormant state as indicated, restart
2. If Item 1 is not OK, it will be necessary to check the electronics in the control module

MIL illumination/CC message/emergency program

Fault entry in info memory only

Remarks

none

DTC P105B: INTERNAL CONTROL MODULE VVT ERROR, VOLTAGE TOO LOW (MIN)

BMW Fault Code (hex)

0x2A77

BMW Fault Code (dez)

10871

BMW Fault Code Description VS-Text

Control module, internal fault: Valvetronic output stage

Component

ECM

Subcomponent

Valvetronic (VVT) Voltage

Monitoring criteria

Undervoltage in power supply to driver circuit has been detected (ATIC61 diagnosis)

Fault debouncing

0.2

Terminal conditions

Terminal 15 ON

Voltage conditions

Battery voltage > 9.953125 V and battery voltage < 25.898438 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

H bridge voltage supply owing to (for instance)

1. battery voltage too low
2. VVJL relay fails to make, or
3. other problems in the control module electronic circuitry

Repair procedures (plant/service)

1. Ignition off, let control module return to dormant state as indicated, restart
2. If Item 1 is not OK, it will be necessary to check the electronics in the control module.

MIL illumination/CC message/emergency program

Fault entry in info memory only

Remarks

none

DTC P1062: VVT-LIMP HOME REQUEST FULL STROKE POSITION NOT REACHED (BANK 1) (SIG)

BMW Fault Code (hex)

0x2A44

BMW Fault Code (dez)

10820

BMW Fault Code Description VS-Text

Valvetronic, power limitation

Component

Valvetronic (VVT)

Subcomponent

Limp Home Request

Monitoring criteria

1. VVT must be in emergency operation mode (meaning that no VVT sensor signal is present) and unit travels to upper travel limit at 30% pulse-duty factor for VVT motor.
2. The mass induction airflow is employed as an index to determine whether the maximum VVT stroke has been reached.

Fault debouncing

after Terminal 15 switch and/or always active if DME is awake.

Terminal conditions

Terminal 15 ON

Voltage conditions

none

Temperature conditions

none

Time conditions

20 ms

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

1. A dual VVT sensor fault must be entered in the fault memory.
2. Check for mechanical binding in mechanical components in VVT system (VVT servo motor, VVT gears, VVT eccentric shaft...)

Repair procedures (plant/service)

1. Check and repair the sensor defect using the correct repair instructions.
2. Check HFM mass airflow signal
3. Check VVT mechanical system (VVT servo motor, VVT gearset, VVT eccentric shaft...)

MIL illumination/CC message/emergency program

ECE: No warning message. Engine reverts to VVT emergency backup mode (throttled operation) US: OPEN

Remarks

none

DTC P1064: VVT-VALUE COMPARISON STARTING POSITION/PARKING POSITION PLAUSIBILITY (BANK 1) (MAX)

BMW Fault Code (hex)

0x2A42

BMW Fault Code (dez)

10818

BMW Fault Code Description VS-Text

Valvetronic, position at new start: plausibility

Component

Valvetronic (VVT)

Subcomponent

Value Comparison

Monitoring criteria

When the DME is activated (wake-up) it assesses the current VVT sensor angle based on the last VVT sensor angle prior to shutdown. If there is a substantial difference in the two angles, the operative assumption will that substantial repairs have been carried out on the cylinder head. The VVT travel limit positions must be re-initialized. No VVT sensor faults should be present (#10800, #10801,#10802).

Fault debouncing

Following successful travel limit initialization routine (can be initiated by tester), active only once at moment when system starts (DME wake-up).

Terminal conditions

Terminal 15 ON

Voltage conditions

none

Temperature conditions

none

Time conditions

immediately

System test

Initialize for VVT travel limit

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Mechanical repairs may have been carried out on the cylinder head.

Repair procedures (plant/service)

Conduct travel limit initialization routine using tester for activation. Delete stored fault codes from DME fault memory and initiate dormant vehicle state. Repeat procedure in case of doubt.

MIL illumination/CC message/emergency program

ECE: No warning message. Engine reverts to VVT emergency backup mode (throttled operation) US: OPEN

Remarks

none

DTC P1075: VVT-OVERLOAD PROTECTION (BANK 1) (MAX)

BMW Fault Code (hex)

0x2A41

BMW Fault Code (dez)

10817

BMW Fault Code Description VS-Text

Valvetronic, electrical overload protection

Component

Valvetronic (VVT)

Subcomponent

Overload Protection

Monitoring criteria

Electrical overload protection. The engine management monitors the VVT motor's current draw. If the monitored current draw exceeds a defined threshold for several seconds the VVT system is deactivated (VVT emergency operation mode), and the engine reverts to throttled operation. Always active provided that fault codes #10813,#10816, #10819 are not present.

Fault debouncing

Warning threshold: 112°C DME internal driver circuit temperature. Deactivation threshold: 126°C internal DME driver circuit temperature

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

1. Loose reluctor on VVT sensor
2. Defective VVT servo motor (interturn short circuit causes low resistance in motor winding)
3. Short circuit in wiring harness (wire between VVT servo motor and DME)

Repair procedures (plant/service)

1. Check for correct reluctor attachment at VVT sensor.
2. Defective VVT servo motor (for instance, interturn short circuit) Check servo motor and replace as indicated (Clear fault memory/switch ignition terminals)
3. Check VVT motor wiring harness between VVT motor and DME for shorts between both VVT motor wires and vehicle ground.

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P1076: VVT-OVERLOAD PROTECTION ECU-TEMPERATURE HIGH INPUT (BANK 1) (SIG)

BMW Fault Code (hex)

0x2A40

BMW Fault Code (dez)

10816

BMW Fault Code Description VS-Text

Valvetronic, thermal overload protection

Component

Valvetronic (VVT)

Subcomponent

Overload Protection

Monitoring criteria

Monitoring of maximum transistor temperature

Fault debouncing

0.03

Terminal conditions

Terminal 15 ON

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Maximum transistor temperature too high

Repair procedures (plant/service)

1. Repeat the diagnostic routine once the vehicle cools
2. If Item 1 is not OK, it will be necessary to proceed to an examination of the control module's electronic circuitry

MIL illumination/CC message/emergency program

Emergency default mode 2

Remarks

none

DTC P1078: VVT-OVERLOAD PROTECTION CONTROL MOTOR CURRENT HIGH INPUT (BANK 1) (MIN)**BMW Fault Code (hex)**

0x2A3E

BMW Fault Code (dez)

10814

BMW Fault Code Description VS-Text

Valvetronic, actuator motor: overload

Component

Valvetronic (VVT)

Subcomponent

Overload Protection

Monitoring criteria

Monitoring of servo motor overload; The VVT servo motor temperature is calculated in the DME using a model. The first stage occurs when it heats beyond a warning threshold (fault #10819, fault class 2). This is 190°C (VVT motor temperature) and causes the VVT to revert to operation in its emergency mode. If the VVT motor were to overheat even further, the VVT system would be completely deactivated upon reaching the deactivation threshold (200°C VVT motor temperature).

Fault debouncing

Warning threshold: 190°C VVT Servo motor temperature. Deactivation threshold: 200°C VVT servo motor temperature

Terminal conditions

Terminal 15 ON

Voltage conditions

none

Temperature conditions

none

Time conditions

Fault code is entered immediately as soon as VVT motor reaches the critical level.

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

A model is employed to calculate the VVT servo motor's temperature in the DME. The first stage occurs when it heats beyond a warning threshold (fault code #10819, fault class 2). This is 190°C (VVT motor temperature)

and causes the VVT to revert to operation in its emergency mode. If the VVT motor were to overheat even further, the VVT system would be completely deactivated upon reaching the deactivation threshold (200°C VVT motor temperature). Overheated VVT motor (based on model calculations, no monitored figures).
Defective VVT motor.

Repair procedures (plant/service)

1. Check VVT servo motor
2. Allow servo motor to cool, Clear fault memory and verify that DME software is the most recent version.
3. DO NOT replace DME!

MIL illumination/CC message/emergency program

ECE: No warning message. Engine reverts to VVT emergency backup mode (throttled operation) US: OPEN

Remarks

none

DTC P107A: VVT-OVERLOAD PROTECTION CONTROL MOTOR CURRENT TOO HIGH (MAX)

BMW Fault Code (hex)

0x2A43

BMW Fault Code (dez)

10819

BMW Fault Code Description VS-Text

Valvetronic, thermal overload protection: warning threshold

Component

Valvetronic (VVT)

Subcomponent

Overload Protection

Monitoring criteria

The engine-management system monitors the VVT motor's current draw. If the monitored current draw exceeds a defined threshold for several seconds the VVT system is deactivated (VVT emergency operation mode), and the engine reverts to throttled operation.

Fault debouncing

always active when DME is awake current threshold roughly 24A,

Terminal conditions

Terminal 15 ON

Voltage conditions

none

Temperature conditions

none

Time conditions

immediately

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

1. Loose reductor on VVT sensor
2. Defective VVT servo motor (soft interturn short circuit makes resistance too low in motor winding)
3. Short circuit in wiring harness (wire between VVT servo motor and DME)
4. Abuse of accelerator pedal module. Brief, rapid repeated pressure on the accelerator pedal extending over a period of time increases current flow within the VVT system.

Repair procedures (plant/service)

1. Check for correct reductor attachment at VVT sensor.
2. Defective VVT servo motor (for instance, interturn short circuit) Check servo motor and replace as indicated
3. Check wiring harness from VVT motor to DME for shorts between the two VVT wires and vehicle ground.
4. If abuse is suspected: Clear fault memory from DME

MIL illumination/CC message/emergency program

ECE: No warning message. Engine reverts to VVT emergency backup mode (throttled operation) US: OPEN

Remarks

none

DTC P107B: VVT-OVERLOAD PROTECTION CONTROL MOTOR TEMPERATURE TOO HIGH (MIN)

BMW Fault Code (hex)

0x2A43

BMW Fault Code (dez)

10819

BMW Fault Code Description VS-Text

Valvetronic, thermal overload protection: warning threshold

Component

Valvetronic (VVT)

Subcomponent

Overload Protection

Monitoring criteria

A temperature model is employed to monitor the VVT servo motor. When the calculated VVT motor temperature rises beyond the warning threshold this fault code is entered.

Fault debouncing

Always active when DME is awake VVT motor temperature: Warning threshold 190°C

Terminal conditions

Terminal 15 ON

Voltage conditions

none

Temperature conditions

none

Time conditions

immediately

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

A temperature model is employed to monitor the VVT servo motor. When the calculated VVT motor temperature rises beyond the warning threshold (190°C) this fault code is entered.

Repair procedures (plant/service)

1. Check VVT servo motor
2. Allow engine to cool, let vehicle return to dormant state, Clear fault memory and verify that DME has most recent software version.

MIL illumination/CC message/emergency program

ECE: No warning message. Engine reverts to VVT emergency backup mode (throttled operation) US: OPEN

Remarks

none

DTC P107C: VVT-OVERLOAD PROTECTION TEMPERATURE TOO HIGH (MIN)

BMW Fault Code (hex)

0x2A44

BMW Fault Code (dez)

10820

BMW Fault Code Description VS-Text

Valvetronic, power limitation

Component

No Info

Subcomponent

No Info

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P107C: VVT-OVERLOAD PROTECTION TEMPERATURE TOO HIGH (SIG)

BMW Fault Code (hex)

0x2A43

BMW Fault Code (dez)

10819

BMW Fault Code Description VS-Text

Valvetronic, thermal overload protection: warning threshold

Component

Valvetronic (VVT)

Subcomponent

Overload Protection

Monitoring criteria

The temperature of the VVT driver circuit in the DME is monitored, and the system responds to overheating by reverting to VVT emergency mode operation - the vehicle continues to operate, but in throttled mode. Incorrect use of the pedal-position sensor, consisting of rapid, repeated pressure extending over several minutes heats up the VVT driver circuit in the DME, leading to its deactivation when it reaches a critical level.

Fault debouncing

after Terminal 15 switch and/or always active if DME is awake. VVT driver circuit in the DME: Warning threshold 112°C

Terminal conditions

Terminal 15 ON

Voltage conditions

none

Temperature conditions

none

Time conditions

immediately

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

1. Loose reductor on VVT sensor. (vibrations in position determination lead to overheating of the VVT driver circuit within the DME)
2. EBOX fan fails owing to loose plug-in connection, open wire, defective EBOX fan.
3. Incorrect installation of DME in the EBOX (EBOX fan must be positioned to ventilate DME).
4. Air openings from vehicle interior to EBOX obstructed.
5. Short in wiring harness between VVT servo motor and DME.
6. Defective DME

Repair procedures (plant/service)

If no tampering/abuse can be detected the following tests should be carried out:

1. Check for correct reductor attachment at VVT sensor.
2. Use tester to manually activate the E-box fan for acoustic check.
3. DME installed according to specification and check to verify installation of spacer plate (to guide airflow in E-Box).

4. Check wiring harness between VVT motor and DME for soft shorts between the two VVT motor wires and vehicle ground
5. Defective VVT servo motor (for instance, interturn short circuit) - Replace servo motor and determine whether malfunction is still present (Clear fault)

MIL illumination/CC message/emergency program

ECE: No warning message. Engine reverts to VVT emergency backup mode (throttled operation) US: OPEN

Remarks

none

DTC P1104: DIFFERENTIAL PRESSURE SENSOR INTAKE MANIFOLD PRESSURE TOO LOW (BANK 1) (MIN)

BMW Fault Code (hex)

0x2D29

BMW Fault Code (dez)

11561

BMW Fault Code Description VS-Text

Differential-pressure sensor, intake manifold: plausibility

Component

Differential Pressure Sensor

Subcomponent

Pressure

Monitoring criteria

Differential pressure sensor monitor 6% <. Relative charge factor <120% -20° <. Induction air temperature sensor < 85°C 560 rpm <. Engine speed < 7200 rpm. Time after start > 30 sec. regardless of EVAP active/inactive.

Fault debouncing

0.2 sec.

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

Coolant temperature $> -10^{\circ}\text{C}$

Time conditions

4.4 sec.

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

MIN Fault (monitored intake manifold pressure (absolute) too low) - Incorrect throttle plate angle - Vacuum sensor fault

Repair procedures (plant/service)

1. Visual inspection of vacuum sensor plug contacts.
2. Check wiring between vacuum sensor and DME.
3. Check induction system/crankcase for leaks (crankcase vacuum control can allow excess air from the crankcase to flow into the intake manifold, for instance, if vacuum line from brake booster to vacuum pump is leaking).

MIL illumination/CC message/emergency program

US: MIL ON

Remarks

US only

DTC P1105: DIFFERENTIAL PRESSURE SENSOR INTAKE MANIFOLD PRESSURE TOO HIGH

(BANK 1) (MAX)

BMW Fault Code (hex)

0x2D29

BMW Fault Code (dez)

11561

BMW Fault Code Description VS-Text

Differential-pressure sensor, intake manifold: plausibility

Component

Differential Pressure Sensor

Subcomponent

Pressure

Monitoring criteria

Differential pressure sensor monitor 6% <. Relative charge factor <120% - 20° <. Induction air temperature sensor < 85°C 560 RPM. Engine speed < 7200 RPM. Time after start > 30 sec. regardless of EVAP active/inactive

Fault debouncing

0.2 sec.

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

Coolant temperature $> -10^{\circ}\text{C}$

Time conditions

4.4 sec.

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

MAX fault (intake manifold pressure (absolute) too high) - Induction system/crankcase vacuum leak - Incorrect throttle plate angle - Vacuum sensor malfunction

Repair procedures (plant/service)

1. Visual inspection of vacuum sensor plug contacts
2. Check wiring between vacuum sensor and DME
3. Check induction system/crankcase for leaks (crankcase vacuum control can allow excess air from the crankcase to flow into the intake manifold, for instance, if vacuum line from brake booster to vacuum pump is leaking)

MIL illumination/CC message/emergency program

US: MIL ON

Remarks

US only

DTC P110D: THROTTLE POSITION SENSOR A AND B RANGE/PERFORMANCE (PLAUS)

BMW Fault Code (hex)

0x2D07

BMW Fault Code (dez)

11527

BMW Fault Code Description VS-Text

Throttle

Component

Throttle Position Sensor

Subcomponent

A and B

Monitoring criteria

Engine must be running

Fault debouncing

none

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

none

Time conditions

250 ms

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Contact resistance in input wires or plug-in contacts at throttle valve, electrical problem with throttle valve

Repair procedures (plant/service)

1. Check: The sum of throttle valve voltages must equal 5 V
2. Perform electrical check on wiring from DME to throttle valve

3. Visual inspection of plug-in contacts (at component, wiring harness and DME)
4. Replace component

MIL illumination/CC message/emergency program

MIL activation control. With previous fault, switches to MIN/MAX selection for throttle valve aperture definition

Remarks

Throttle valve voltages deviate by more than 0.6 V. Important: This malfunction can lead to an HFM fault; when throttle valve and HFM faults appear simultaneously there is no immediate need to proceed to an examination of the HFM.

DTC P111E: INTAKE AIR TEMPERATURE SENSOR 1 MAXIMUM TEMPERATURE IMPLAUSIBLE (BANK 1) (MAX)

BMW Fault Code (hex)

0x2F09

BMW Fault Code (dez)

12041

BMW Fault Code Description VS-Text

Intake air temperature sensor, plausibility

Component

Intake Air Temperature Sensor

Subcomponent

1 Temperature

Monitoring criteria

Engine must be running, compliance with specified diagnosis conditions is mandatory (see Time conditions)

Fault debouncing

30 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

When the engine is started the ambient temperature must exceed -7.5°C and be less than 35.3°C

Time conditions

Drive over 40 km/h for 120 sec. + debounce time of 30 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Data readings from sensor too high: Sticking sensor, sensor manipulation

Repair procedures (plant/service)

1. Check sensor data
2. Carry out electrical check on sensor wire and power supply wires
3. Visual inspection of sensor
4. Replace sensor

MIL illumination/CC message/emergency program

MIL ON in US versions only

Remarks

none

DTC P111F: INTAKE AIR TEMPERATURE SENSOR 1 MINIMUM TEMPERATURE IMPLAUSIBLE (BANK 1) (MIN)

BMW Fault Code (hex)

0x2F09

BMW Fault Code (dez)

12041

BMW Fault Code Description VS-Text

Intake air temperature sensor, plausibility

Component

Intake Air Temperature Sensor

Subcomponent

1 Temperature

Monitoring criteria

Engine must be running, compliance with specified diagnosis conditions is mandatory (see Time conditions)

Fault debouncing

30 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

When the engine is started the ambient temperature must exceed -7.5°C and be less than 35.3°C.

Time conditions

Drive over 40 km/h for 120 sec. + debounce time of 30 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Data readings from sensor are too low: Sticking sensor, sensor manipulation.

Repair procedures (plant/service)

1. Check sensor data
2. Check outside temperature data
3. Perform electrical check on sensor and supply wires
4. Visual inspection of sensor
5. Replace sensor

MIL illumination/CC message/emergency program

MIL ON in US versions only

Remarks

ATTENTION: This fault can also be triggered by an implausibly high figure for outside temperature. Therefore: Always check outside temperature to ensure that it is plausible.

**DTC P1124: DIFFERENTIAL PRESSURE SENSOR INTAKE MANIFOLD OFFSET (BANK 1)
(PLAUS)**

BMW Fault Code (hex)

0x2D2A

BMW Fault Code (dez)

11562

BMW Fault Code Description VS-Text

Differential-pressure sensor, intake manifold: adaptation

Component

Differential Pressure Sensor

Subcomponent

Offset

Monitoring criteria

Throttle valve open

Fault debouncing

1 sec.

Terminal conditions

in control module shutdown period

Voltage conditions

none

Temperature conditions

none

Time conditions

3 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Implausible signal from differential pressure sensor

Repair procedures (plant/service)

1. Determine whether throttle valve operation is trouble-free
2. Replace sensor

MIL illumination/CC message/emergency program

US: MIL ON ECE: No MIL

Remarks

none

**DTC P112C: O2 SENSOR NEGATIVE CURRENT OR POSITIVE CURRENT CONTROL
CIRCUIT/OPEN (BANK 1 SENSOR 1) (MIN)**

BMW Fault Code (hex)

0x2C3D

BMW Fault Code (dez)

11325

BMW Fault Code Description VS-Text

Oxygen sensor before catalytic converter, line fault

Component

Oxygen Sensor, Front

Subcomponent

Negative/Positive Current

Monitoring criteria

Not supported

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P112C: O2 SENSOR NEGATIVE CURRENT OR POSITIVE CURRENT CONTROL CIRCUIT/OPEN (BANK 1 SENSOR 1) (SIG)

BMW Fault Code (hex)

0x2C3D

BMW Fault Code (dez)

11325

BMW Fault Code Description VS-Text

Oxygen sensor before catalytic converter, line fault

Component

Oxygen Sensor, Front

Subcomponent

Negative/Positive Current

Monitoring criteria

O2 sensor wiring monitor O2 sensor signal freezes. No fault memories. Drive at 50 - 80 km/h at moderate engine speed.

Fault debouncing

Voltage seizes at 2 V (Lambda = 1) OR voltage < 2.1 V with overrun injection deactivation active

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

Engine at operating temperature

Time conditions

approximately 9s with overrun injection deactivation active

System test

O2 sensors reversed

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Sensor inactive. Wire VG or IP is open. Catalyst is plugged (rich exhaust at O2 sensor in overrun cut-off); oil or gasoline in the exhaust gases during operation in overrun cut-off phase.

Repair procedures (plant/service)

1. Visual inspection of wires, DME plug and O2 sensor for damage
2. Inspect wires
3. Check plug-in connections DME <=> Wiring harness <=> Upstream (pre-cat) O2 sensor for Bank 1 (water or corrosion in plug?) => Repeatedly remove the plug and then reconnect it FIRMLY)
4. Check catalytic converter (is FSD lean fault entered for the other bank?)
5. Piston rings, injectors, positive crankcase ventilation OK? FSD fault? Then continue there!
6. Replace O2 sensor
7. Replace DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P112D: O2 SENSOR NEGATIVE CURRENT OR POSITIVE CURRENT CONTROL CIRCUIT/OPEN (BANK 2 SENSOR 1) (MIN)

BMW Fault Code (hex)

0x2C3E

BMW Fault Code (dez)

11326

BMW Fault Code Description VS-Text

Oxygen sensor before catalytic converter 2, line fault

Component

Oxygen Sensor, Front

Subcomponent

Negative/Positive Current

Monitoring criteria

Not supported

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

**DTC P112D: O2 SENSOR NEGATIVE CURRENT OR POSITIVE CURRENT CONTROL
CIRCUIT/OPEN (BANK 2 SENSOR 1) (SIG)**

BMW Fault Code (hex)

0x2C3E

BMW Fault Code (dez)

11326

BMW Fault Code Description VS-Text

Oxygen sensor before catalytic converter 2, line fault

Component

Oxygen Sensor, Front

Subcomponent

Negative/Positive Current

Monitoring criteria

O2 sensor wiring monitor O2 sensor signal freezes. No fault memories. Drive at 50 - 80 km/h at moderate engine speed.

Fault debouncing

Voltage seizes at 2 V ($\Lambda = 1$) or voltage < 2.1 V with overrun injection deactivation active

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

Engine at operating temperature

Time conditions

approximately 9s with overrun injection deactivation active

System test

O2 sensors reversed

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Sensor inactive Wire VG or IP is open Catalyst is plugged (rich exhaust at O2 sensor in overrun cut-off); oil or gasoline in the exhaust gases during operation in overrun cut-off phase

Repair procedures (plant/service)

1. Visual inspection of wires, DME plug and O2 sensor for damage
2. Inspect wires
3. Check plug-in connections DME <=> Wiring harness <=> Upstream (pre-cat) O2 sensor for Bank 1 (water or corrosion in plug?) => Repeatedly remove the plug and then reconnect it FIRMLY)
4. Check catalytic converter (is FSD lean fault entered for the other bank?)
5. Piston rings, injectors, positive crankcase ventilation OK? FSD fault? Then continue there!
6. Replace O2 sensor
7. Replace DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P1130: O2 SENSOR CIRCUIT DYNAMIC TEST (BANK 1 SENSOR 2) (PLAUS)**BMW Fault Code (hex)**

0x2C6D

BMW Fault Code (dez)

11373

BMW Fault Code Description VS-Text

Oxygen sensor behind catalytic converter, aging.

Component

Oxygen Sensor, Rear

Subcomponent

Dynamic Test

Monitoring criteria

O2 sensor aging test. No secondary air injection, $0 < \text{Speed} < 150 \text{ km/h}$

Fault debouncing

Switching time counter > 1.5 (sensor transition from rich to lean too slow)

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

Coolant temperature $> 50^{\circ}\text{C}$

Time conditions

Approximately 5 sec. after start of overrun cut-off

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Excessive lag in O2 signal change from rich to lean when overrun injection deactivation assumes operation; excessive sensor lag owing to cooling; sensor too slow owing to aging.

Repair procedures (plant/service)

Was the temperature drop caused by external factors (driving into snow pile, ice on O2 sensor)? Thaw sensor, clear all fault memory, continue driving.

1. Check O2 sensor heater: Contact resistance on plugs and in wiring is excessive (DME-wiring harness-sensor)
2. Check wiring
3. Check O2 sensor plug (water or corrosion in the plug? Repeatedly disconnect the plug and then re-insert it FIRMLY)
4. Replace plug and/or wire as indicated
5. Replace the affected downstream (post-cat) O2 sensor

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P1131: O2 SENSOR CIRCUIT DYNAMIC TEST (BANK 2 SENSOR 2) (PLAUS)

BMW Fault Code (hex)

0x2C6E

BMW Fault Code (dez)

11374

BMW Fault Code Description VS-Text

Oxygen sensor behind catalytic converter 2, aging

Component

Oxygen Sensor, Rear

Subcomponent

Dynamic Test

Monitoring criteria

O2 sensor aging test. No secondary air injection, 0 < Speed < 150 km/h

Fault debouncing

Switching time counter > 1.5 (sensor transition from rich to lean too slow)

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

Coolant temperature > 50°C

Time conditions

Approximately 5 sec. after start of overrun cut-off

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Excessive lag in O2 signal change from rich to lean when overrun injection deactivation assumes operation; excessive sensor lag owing to cooling; sensor too slow owing to aging.

Repair procedures (plant/service)

Was the temperature drop caused by external factors (driving into snow pile, ice on O2 sensor)? Thaw sensor, clear all fault memory, continue driving!

1. Check O2 sensor heater: Contact resistance on plugs and in wiring is excessive (DME-wiring harness-sensor)
2. Check wiring
3. Check O2 sensor plug (water or corrosion in the plug? Repeatedly disconnect the plug and then re-insert it FIRMLY)
4. Replace plug and/or wire as indicated
5. Replace the affected downstream (post-cat) O2 sensor

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P114A: POST CATALYST FUEL TRIM VIA OXYGEN SENSOR SYSTEM TOO RICH (BANK 1) (MAX)

BMW Fault Code (hex)

0x2C7E

BMW Fault Code (dez)

11390

BMW Fault Code Description VS-Text

Oxygen sensor behind catalytic converter, trim control

Component

Fuel System

Subcomponent

Post Catalyst via Oxygen Sensor

Monitoring criteria

O2 sensor trim control. No fault memories. Drive at 50 - 80 km/h and at moderate engine speed.

Fault debouncing

Excessive trim controller deviation; behind catalytic converter sensor voltage outside range around trim controller specification point with trim controller active (approximately < 0.2 V or approximately > 0.9 V)

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

Engine at operating temperature

Time conditions

approximately 4 minutes

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Defective wiring. Exhaust system leak. Pre-cat or downstream (post-cat) O2 sensor defective.

Repair procedures (plant/service)

This fault automatically triggers an active test (secondary fault stored in the control module's fault memory!).

1. Read out results of active test (are other fault codes still stored in the fault memory)? => Then continue at this point!
2. Initiate system test for reversed O2 sensors. Follow instructions for system test.
3. If the system test fails to produce a result then
4. Visual inspection of wiring and plugs
5. Electrical check of wiring
6. Replace wiring or plugs as indicated
7. Check exhaust system forward of downstream (post-cat) O2 sensor for leaks
8. Replace downstream (post-cat) O2 sensor

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P114B: POST CATALYST FUEL TRIM VIA OXYGEN SENSOR SYSTEM TOO LEAN (BANK 1) (MIN)

BMW Fault Code (hex)

0x2C7E

BMW Fault Code (dez)

11390

BMW Fault Code Description VS-Text

Oxygen sensor behind catalytic converter, trim control

Component

Fuel System

Subcomponent

Post Catalyst via Oxygen Sensor

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P114C: POST CATALYST FUEL TRIM VIA OXYGEN SENSOR SYSTEM TOO RICH (BANK 2) (MAX)

BMW Fault Code (hex)

0x2C7F

BMW Fault Code (dez)

11391

BMW Fault Code Description VS-Text

Oxygen sensor behind catalytic converter 2, trim control

Component

Fuel System

Subcomponent

Post Catalyst via Oxygen Sensor

Monitoring criteria

O2 sensor trim control. No fault memories. Drive at 50 - 80 km/h and at moderate engine speed.

Fault debouncing

Excessive trim controller deviation; behind catalytic converter sensor voltage outside range around trim controller specification point with trim controller active (approximately < 0.2 V or approximately > 0.9 V)

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

Engine at operating temperature

Time conditions

approximately 4 minutes

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Defective wiring. Exhaust system leak. Pre-cat or downstream (post-cat) O2 sensor defective.

Repair procedures (plant/service)

This fault automatically triggers an active test (secondary fault stored in the control module's fault memory!).

1. Read out results of active test (are other fault codes still stored in the fault memory)? => Then continue at this point!
2. Initiate system test for reversed O2 sensors. Follow instructions for system test.
3. If the system test fails to produce a result then
4. Visual inspection of wiring and plugs
5. Electrical check of wiring

6. Replace wiring or plugs as indicated
7. Check exhaust system forward of downstream (post-cat) O2 sensor for leaks
8. Replace downstream (post-cat) O2 sensor

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P114D: POST CATALYST FUEL TRIM VIA OXYGEN SENSOR SYSTEM TOO LEAN (BANK 2) (MIN)

BMW Fault Code (hex)

0x2C7F

BMW Fault Code (dez)

11391

BMW Fault Code Description VS-Text

Oxygen sensor behind catalytic converter 2, trim control

Component

Fuel System

Subcomponent

Post Catalyst via Oxygen Sensor

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P114F: AIR MASS FLOW SENSOR DEFECTIVE (MIN)

BMW Fault Code (hex)

0x2D16

BMW Fault Code (dez)

11542

BMW Fault Code Description VS-Text

Air-mass sensor, signal

Component

No Info

Subcomponent

No Info

Monitoring criteria

Engine start completed

Fault debouncing

0.2 sec.

Terminal conditions

Terminal 15

Voltage conditions

OBD1 conditions met (voltage between 10 V and 16 V)

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Sensor's self-diagnosis reports fault or range violation with period duration exceeding upper limit.

Repair procedures (plant/service)

1. Visual inspection of plug-in contacts (at both component and DME ends)
2. Measure sensor wire, power supply and ground (possible intermittent contact!)
3. Replace sensor

MIL illumination/CC message/emergency program

none

Remarks

If the ""air mass period duration"" displayed in the environmental data is > 4500 us this is a fault generated by the sensor's own self-diagnosis utility (sensor reports active problem). The response should be to replace the sensor. If the ""air mass period duration"" is < 4500 us, this is an upward range violation (period duration too high) that can be caused by defects in both the sensor and the wiring harness.

DTC P115A: MASS OR VOLUME AIR FLOW 'A' MAXIMUM EXCEEDED (MAX)

BMW Fault Code (hex)

0x2D15

BMW Fault Code (dez)

11541

BMW Fault Code Description VS-Text

Air-mass sensor, measurement range

Component

Mass Air Flow

Subcomponent

General

Monitoring criteria

Engine start completed

Fault debouncing

0.2 sec.

Terminal conditions

none

Voltage conditions

OBD1 conditions met (voltage between 10 V and 16 V)

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Range violation in frequency supplied by HFM, stimulation with frequency generator.

Repair procedures (plant/service)

1. Check frequency of HFM
2. Check sensor and replace as indicated

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P116C: AIR MASS FLOW SENSOR SIGNAL RANGE (MAX)

BMW Fault Code (hex)

0x2D0F

BMW Fault Code (dez)

11535

BMW Fault Code Description VS-Text

Air-mass sensor, signal

Component

Mass Air Flow Sensor

Subcomponent

Signal

Monitoring criteria

Engine start completed

Fault debouncing

0.2 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

OBD1 conditions met (voltage between 10 V and 16 V)

Temperature conditions

none

Time conditions

none

System test

none

Signal information

Sum fault

Calculated value Y/N

N

Possible Fault Causes

Frequency outside valid range, stimulation with frequency generator

Repair procedures (plant/service)

1. Visual inspection of plug-in terminals (at components and DME)
2. Perform electrical check on sensor wire, power supply and ground
3. Replace sensor

MIL illumination/CC message/emergency program

MIL ON

Remarks

ATTENTION: If the ground wire is open an HFM fault will appear together with an intake air temperature fault in the fault memory

DTC P116D: AIR MASS FLOW SENSOR SIGNAL GRADIENT ERROR (MIN)

BMW Fault Code (hex)

0x2D0F

BMW Fault Code (dez)

11535

BMW Fault Code Description VS-Text

Air-mass sensor, signal

Component

Mass Air Flow Sensor

Subcomponent

Signal

Monitoring criteria

Data content defined for this fault

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

Data content defined for this fault

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P116E: AIR MASS FLOW SENSOR SIGNAL ELECTRICAL (SIG)

BMW Fault Code (hex)

0x2D0F

BMW Fault Code (dez)

11535

BMW Fault Code Description VS-Text

Air-mass sensor, signal

Component

Mass Air Flow Sensor

Subcomponent

Signal

Monitoring criteria

Engine start completed

Fault debouncing

0.2 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

OBD1 conditions met (voltage between 10 V and 16 V)

Temperature conditions

none

Time conditions

none

System test

none

Signal information

Sum fault

Calculated value Y/N

N

Possible Fault Causes

Range violation, defective sensor or signal wire has fallen off

Repair procedures (plant/service)

1. Visual inspection of plug-in contacts (at both component and DME ends)
2. Measure sensor wire, power supply and ground (possible intermittent contact!)
3. Replace sensor

MIL illumination/CC message/emergency program

MIL ON

Remarks

Refer to fault 'Mass airflow sensor, Signal', Symptom 1

DTC P1197: DIFFERENTIAL PRESSURE SENSOR INTAKE MANIFOLD HIGH INPUT (BANK 1) (MAX)

BMW Fault Code (hex)

0x2D28

BMW Fault Code (dez)

11560

BMW Fault Code Description VS-Text

Differential-pressure sensor, intake manifold: signal

Component

Differential Pressure Sensor

Subcomponent

Electrical

Monitoring criteria

Monitor for differential pressure sensor. Engine start ended.

Fault debouncing

0.5 sec.

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Pin 5 - 33 shorted to positive or open circuit

Repair procedures (plant/service)

1. Visual inspection of plug-in terminals (at components and DME)
2. Perform electrical check on sensor wire, power supply and ground

3. Replace sensor

MIL illumination/CC message/emergency program

US: MIL ON ECE: No MIL

Remarks

none

DTC P1198: DIFFERENTIAL PRESSURE SENSOR INTAKE MANIFOLD LOW INPUT (BANK 1) (MIN)

BMW Fault Code (hex)

0x2D28

BMW Fault Code (dez)

11560

BMW Fault Code Description VS-Text

Differential-pressure sensor, intake manifold: signal

Component

Differential Pressure Sensor

Subcomponent

Electrical

Monitoring criteria

Monitor for differential pressure sensor. Engine start ended

Fault debouncing

0.5 sec.

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Pin 5 - 33 shorted to ground

Repair procedures (plant/service)

1. Visual inspection of plug-in terminals (at components and DME)
2. Perform electrical check on sensor wire, power supply and ground
3. Replace sensor

MIL illumination/CC message/emergency program

US: MIL ON ECE: No MIL

Remarks

none

DTC P1214: FUEL PUMP SPEED TOO HIGH (MAX)**BMW Fault Code (hex)**

0x2AAE

BMW Fault Code (dez)

10926

BMW Fault Code Description VS-Text

Fuel pump

Component

No Info

Subcomponent

No Info

Monitoring criteria

Self-diagnosis from EKP module fault memory entry via CAN

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P1215: FUEL PUMP SPEED TOO LOW (MIN)

BMW Fault Code (hex)

0x2AAE

BMW Fault Code (dez)

10926

BMW Fault Code Description VS-Text

Fuel pump

Component

No Info

Subcomponent

No Info

Monitoring criteria

Self-diagnosis from EKP module fault memory entry via CAN

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P1216: FUEL PUMP EMERGENCY OPERATION (SIG)

BMW Fault Code (hex)

0x2AAE

BMW Fault Code (dez)

10926

BMW Fault Code Description VS-Text

Fuel pump

Component

Fuel Regulators/Valves/Sensors

Subcomponent

Fuel Pump

Monitoring criteria

Self-diagnosis from EKP module fault memory entry via CAN.

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P1217: FUEL PUMP OVERTEMPERATURE CONDITION (PLAUS)

BMW Fault Code (hex)

0x2AAE

BMW Fault Code (dez)

10926

BMW Fault Code Description VS-Text

Fuel pump

Component

No Info

Subcomponent

No Info

Monitoring criteria

Self-diagnosis from EKP module fault memory entry via CAN

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P1230: FUEL PUMP RELAY PRIMARY CIRCUIT (SIG)

BMW Fault Code (hex)

0x2F94

BMW Fault Code (dez)

12180

BMW Fault Code Description VS-Text

Fuel-pump relay, activation

Component

No Info

Subcomponent

No Info

Monitoring criteria

SIG

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

Data content defined

DTC P1234: FUEL PUMP RELAY PRIMARY CIRCUIT LOW (MIN)

BMW Fault Code (hex)

0x2F94

BMW Fault Code (dez)

12180

BMW Fault Code Description VS-Text

Fuel-pump relay, activation

Component

No Info

Subcomponent

No Info

Monitoring criteria

min

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

Data content defined

DTC P1236: FUEL PUMP RELAY PRIMARY CIRCUIT HIGH (MAX)

BMW Fault Code (hex)

0x2F94

BMW Fault Code (dez)

12180

BMW Fault Code Description VS-Text

Fuel-pump relay, activation

Component

No Info

Subcomponent

No Info

Monitoring criteria

MAX

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

Data content defined

DTC P1244: FUEL PUMP EMERGENCY CUT-OFF (SIG)

BMW Fault Code (hex)

0x2AAD

BMW Fault Code (dez)

10925

BMW Fault Code Description VS-Text

Fuel pump, emergency shutoff

Component

Fuel Regulators/Valves/Sensors

Subcomponent

Fuel Pump

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P1300: CAMSHAFT POSITION SENSOR 'A' SEGMENT TIMING ERROR (BANK 1) (MAX)

BMW Fault Code (hex)

0x2AA2

BMW Fault Code (dez)

10914

BMW Fault Code Description VS-Text

Camshaft sensor, inlet, gap loss

Component

Camshaft Position Sensor

Subcomponent

Intake Signal

Monitoring criteria

NWE synchronous

Fault debouncing

On every camshaft flank if the flank ratio is not in tolerance.

Terminal conditions

Terminal 15 on

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Interference on the sensor signal

Repair procedures (plant/service)

1. Check signal wire for short to positive, ground, opens and interference pulses
2. Replace camshaft exhaust side sensor

MIL illumination/CC message/emergency program

MIL 2nd DC, CAM operates in emergency default mode

Remarks

Signal interference

DTC P1301: IGNITION MONITORING CYLINDER 1 SPARK DURATION TOO SHORT (MIN)**BMW Fault Code (hex)**

0x2E18

BMW Fault Code (dez)

11800

BMW Fault Code Description VS-Text

Firing, cylinder 1

Component

No Info

Subcomponent

No Info

Monitoring criteria

Engine on, start phase completed, crankshaft absolves 48 revolutions after start (corresponding to approximately 5 sec. at idle), dual ignition off, secondary sparks off

Fault debouncing

Segment synchronization

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 11 V

Temperature conditions

Outside temperature > -9.8°C

Time conditions

t > 5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Voltage supply and ground connection for ignition system spark plugs ignition coil.

Repair procedures (plant/service)

Check wiring harness, ground connection and plug-in contacts. Visual inspection of spark plug, ignition coil (replace if damaged). After excluding all of these faults from consideration replace the control module.

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P1302: IGNITION MONITORING CYLINDER 2 SPARK DURATION TOO SHORT (MIN)

BMW Fault Code (hex)

0x2E19

BMW Fault Code (dez)

11801

BMW Fault Code Description VS-Text

Firing, cylinder 2

Component

No Info

Subcomponent

No Info

Monitoring criteria

Engine on, start phase completed, crankshaft absolves 48 revolutions after start (corresponding to approximately 5 sec. at idle), dual ignition off, secondary sparks off

Fault debouncing

Segment synchronization

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 11 V

Temperature conditions

Outside temperature > -9.8°C

Time conditions

t > 5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Voltage supply and ground connection for ignition system spark plugs ignition coil

Repair procedures (plant/service)

Check wiring harness, ground connection and plug-in contacts. Visual inspection of spark plug, ignition coil (replace if damaged). After excluding all of these faults from consideration replace the control module.

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P1303: IGNITION MONITORING CYLINDER 3 SPARK DURATION TOO SHORT (MIN)**BMW Fault Code (hex)**

0x2E1A

BMW Fault Code (dez)

11802

BMW Fault Code Description VS-Text

Firing, cylinder 3

Component

No Info

Subcomponent

No Info

Monitoring criteria

Engine on, start phase completed, crankshaft absolves 48 revolutions after start (corresponding to approximately 5 sec. at idle), dual ignition off, secondary sparks off

Fault debouncing

Segment synchronization

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 11 V

Temperature conditions

Outside temperature > -9.8°C

Time conditions

t > 5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Voltage supply and ground connection for ignition system spark plugs ignition coil.

Repair procedures (plant/service)

Check wiring harness, ground connection and plug-in contacts. Visual inspection of spark plug, ignition coil (replace if damaged). After excluding all of these faults from consideration replace the control module.

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P1304: IGNITION MONITORING CYLINDER 4 SPARK DURATION TOO SHORT (MIN)

BMW Fault Code (hex)

0x2E1B

BMW Fault Code (dez)

11803

BMW Fault Code Description VS-Text

Firing, cylinder 4

Component

No Info

Subcomponent

No Info

Monitoring criteria

Engine on, start phase completed, crankshaft absolves 48 revolutions after start (corresponding to approximately 5 sec. at idle), dual ignition off, secondary sparks off

Fault debouncing

Segment synchronization

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 11 V

Temperature conditions

Outside temperature > -9.8°C

Time conditions

t > 5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Voltage supply and ground connection for ignition system spark plugs ignition coil

Repair procedures (plant/service)

Check wiring harness, ground connection and plug-in contacts. Visual inspection of spark plug, ignition coil (replace if damaged). After excluding all of these faults from consideration replace the control module.

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P1305: IGNITION MONITORING CYLINDER 5 SPARK DURATION TOO SHORT (MIN)

BMW Fault Code (hex)

0x2E1C

BMW Fault Code (dez)

11804

BMW Fault Code Description VS-Text

Firing, cylinder 5

Component

No Info

Subcomponent

No Info

Monitoring criteria

Engine on, start phase completed, crankshaft absolves 48 revolutions after start (corresponding to approximately 5 sec. at idle), dual ignition off, secondary sparks off

Fault debouncing

Segment synchronization

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 11 V

Temperature conditions

Outside temperature > -9.8°C

Time conditions

t > 5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Voltage supply and ground connection for ignition system spark plugs ignition coil.

Repair procedures (plant/service)

Check wiring harness, ground connection and plug-in contacts. Visual inspection of spark plug, ignition coil (replace if damaged). After excluding all of these faults from consideration replace the control module.

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P1306: IGNITION MONITORING CYLINDER 6 SPARK DURATION TOO SHORT (MIN)**BMW Fault Code (hex)**

0x2E1D

BMW Fault Code (dez)

11805

BMW Fault Code Description VS-Text

Firing, cylinder 6

Component

No Info

Subcomponent

No Info

Monitoring criteria

Engine on, start phase completed, crankshaft absolves 48 revolutions after start (corresponding to approximately 5 sec. at idle), dual ignition off, secondary sparks off

Fault debouncing

Segment synchronization

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 11 V

Temperature conditions

Outside temperature > -9.8°C

Time conditions

t > 5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Voltage supply and ground connection for ignition system spark plugs ignition coil.

Repair procedures (plant/service)

Check wiring harness, ground connection and plug-in contacts. Visual inspection of spark plug, ignition coil (replace if damaged). After excluding all of these faults from consideration replace the control module.

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P130A: CAMSHAFT POSITION SENSOR 'B' SEGMENT TIMING ERROR (BANK 1) (MAX)

BMW Fault Code (hex)

0x2AA3

BMW Fault Code (dez)

10915

BMW Fault Code Description VS-Text

Camshaft sensor, exhaust, space loss

Component

Camshaft Position Sensor

Subcomponent

Exhaust Signal

Monitoring criteria

NWA synchronous

Fault debouncing

On every camshaft flank if the flank ratio is not in tolerance.

Terminal conditions

Terminal 15 on

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Interference on the sensor signal

Repair procedures (plant/service)

1. Check signal wire for short to positive, ground, opens and interference pulses
2. Replace camshaft exhaust side sensor

MIL illumination/CC message/emergency program

MIL 2nd DC, CAM operates in emergency default mode

Remarks

Signal interference

DTC P1327: KNOCK SENSOR 2 CIRCUIT LOW INPUT (BANK 1) (MIN)

BMW Fault Code (hex)

0x2E69

BMW Fault Code (dez)

11881

BMW Fault Code Description VS-Text

Knock-sensor signal 2

Component

Knock Sensor

Subcomponent

Sensor 2

Monitoring criteria

Knock sensor signal monitor. Vehicle road operation at > 2800 1 RPM (current data status, tends toward > 2560 RPM) and air mass > 180 mg/unit. It is not possible to clear fault by switching ignition terminals. Compliance with the activation conditions and absence of malfunction extending over several seconds are required before fault code can be cleared.

Fault debouncing

Yes, by event counter. Knock signal sensor must lie below threshold (differential knock signal $< 180 \text{ mV} < 200 \text{ mV}$) for 1...3 sec., then fault code is registered

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system $> 10 \text{ V}$

Temperature conditions

none

Time conditions

min 1 sec., max 3 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Knock sensor signal too high. Threaded sensor connection is loose or wire connecting knock sensor 2 to the engine-management ECU is shorted to positive

Repair procedures (plant/service)

1. Check knock sensor connection to verify that it is tight.
2. Check wire connecting knock sensor 1 and engine-management control module
3. Check for connection between knock sensor 1 and ground or positive
4. Replace knock sensor

MIL illumination/CC message/emergency program

No warning message. (No closed-loop knock control available. Power loss, as engine reverts to operation in

safe range.)

Remarks

none

DTC P1328: KNOCK SENSOR 2 CIRCUIT HIGH INPUT (BANK 1) (MAX)

BMW Fault Code (hex)

0x2E69

BMW Fault Code (dez)

11881

BMW Fault Code Description VS-Text

Knock-sensor signal 2

Component

Knock Sensor

Subcomponent

Sensor 2

Monitoring criteria

Knock sensor signal monitor. Vehicle road operation at >2800 1 RPM (current data status, tends toward > 2560 RPM) and air mass > 180 mg/unit. It is not possible to clear fault by switching ignition terminals. Compliance with the activation conditions and absence of malfunction extending over several seconds are required before fault code can be cleared.

Fault debouncing

Yes, by event counter. If knock sensor signal remains below threshold (differential knock signal > 4.8 V) for 1...3 sec. fault code is stored.

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

min 1 sec., max 3 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Knock sensor signal too low. Threaded sensor connection is loose or wire connecting knock sensor 1 to engine-management ECU is open.

Repair procedures (plant/service)

1. Check knock sensor connection to verify that it is tight.
2. Check wire connecting knock sensor 1 and engine-management control module
3. Check for connection between knock sensor 1 and ground or positive
4. Replace knock sensor

MIL illumination/CC message/emergency program

No warning message. (No closed-loop knock control available. Power loss, as engine reverts to operation in safe range.)

Remarks

none

DTC P135B: KNOCK SENSOR 2 CIRCUIT RANGE/PERFORMANCE (BANK 1) (PLAUS)**BMW Fault Code (hex)**

0x2E69

BMW Fault Code (dez)

11881

BMW Fault Code Description VS-Text

Knock-sensor signal 2

Component

Knock Sensor

Subcomponent

Sensor 2

Monitoring criteria

Knock sensor signal monitor. Vehicle road operation at > 2800 1 RPM (current data status, tends toward > 2560 RPM) and air mass > 180 mg/unit. It is not possible to clear fault by switching ignition terminals. Compliance with the activation conditions and absence of malfunction extending over several seconds are required before fault code can be cleared.

Fault debouncing

The debounce time is derived from assessment of statistical diagnosis

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

min 1 sec., max 3 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Knock sensor signal too low. Threaded sensor connection is loose or wire connecting knock sensor 2 to engine-management ECU is open.

Repair procedures (plant/service)

1. Check knock sensor connection to verify that it is tight.
2. Check wire connecting knock sensor 1 and engine-management control module
3. Check for connection between knock sensor 1 and ground or positive
4. Replace knock sensor

MIL illumination/CC message/emergency program

No warning message. (No closed-loop knock control available. Power loss, as engine reverts to operation in safe range.)

Remarks

none

DTC P1383: IGNITION MONITORING MALFUNCTION (SIG)**BMW Fault Code (hex)**

0x2E77

BMW Fault Code (dez)

11895

BMW Fault Code Description VS-Text

Firing, voltage supply

Component

No Info

Subcomponent

No Info

Monitoring criteria

Start process completed, ignition failure on all cylinders

Fault debouncing

Fault is detected when all combustion durations = 0 ms,

Terminal conditions

Terminal 15, engine on

Voltage conditions

6 - 24 V

Temperature conditions

-40°C - 150°C

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Defect in central voltage supply (voltage supply, ignition wiring loom)

Repair procedures (plant/service)

Check voltage supply and ignition wiring loom including interfaces

MIL illumination/CC message/emergency program

NO

Remarks

Ignition failure encompassing all cylinders, fault detected when all combustion durations = 0 ms,

DTC P1396: CRANKSHAFT POSITION SENSOR SEGMENT TIMING PLAUSIBILITY (MIN)

BMW Fault Code (hex)

0x29DA

BMW Fault Code (dez)

10714

BMW Fault Code Description VS-Text

Crankshaft sensor, segment adaptation

Component

Crankshaft Position Sensor

Subcomponent

Signal

Monitoring criteria

In the adaptation phases with active overrun injection deactivation

Fault debouncing

Violation of maximum approved adaptation range

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

Always active

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Crankshaft sensor, defective reluctor

Repair procedures (plant/service)

Check and replace as indicated: Crankshaft sensor, reluctor

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P1407: FUEL LEVEL SIGNAL 1 (PLAUS)

BMW Fault Code (hex)

0x2DE2

BMW Fault Code (dez)

11746

BMW Fault Code Description VS-Text

Tank fill level, right, signal

Component

Fuel Level Sensor

Subcomponent

Signal

Monitoring criteria

Short circuit or open circuit in left-side level sensor, sensor resistance too low/high

Fault debouncing

90 sec.

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Sensor value too low/high

Repair procedures (plant/service)

Check sensor resistance, determine location of open wire/short circuit (wiring harness, plug, cluster, junction box, tank)

MIL illumination/CC message/emergency program

NO

Remarks

none

DTC P1408: FUEL LEVEL SIGNAL 2 (PLAUS)

BMW Fault Code (hex)

0x2DE1

BMW Fault Code (dez)

11745

BMW Fault Code Description VS-Text

Tank fill level, left, signal

Component

Fuel Level Sensor

Subcomponent

Signal

Monitoring criteria

Short circuit or open circuit in left-side level sensor, sensor resistance too low/high

Fault debouncing

90 sec.

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Sensor value too low/high

Repair procedures (plant/service)

Check sensor resistance, determine location of open wire/short circuit (wiring harness, plug, cluster, junction box, tank)

MIL illumination/CC message/emergency program

NO

Remarks

none

DTC P140A: SECONDARY AIR INJECTION SYSTEM INSUFFICIENT TOTAL FLOW (BANK 1 AND BANK 2) (SIG)

BMW Fault Code (hex)

0x2A00

BMW Fault Code (dez)

10752

BMW Fault Code Description VS-Text

Secondary-air system

Component

Secondary Air System

Subcomponent

Flow Check, 1+2

Monitoring criteria

Activation conditions: - Engine start - Secondary air-injection must be active - Ambient temperature $>3^{\circ}\text{C}$ - $3.8^{\circ}\text{C} < \text{Coolant temperature} < 50.3^{\circ}\text{C}$

Fault debouncing

40 sec.

Terminal conditions

Terminal 15, engine start

Voltage conditions

Vehicle electrical system voltage (battery voltage between 7 & 15 V)

Temperature conditions

Ambient temperature $> 3^{\circ}\text{C}$, coolant start temperature between 3.8°C & 50.3°C

Time conditions

none

System test

EOL test of secondary air-injection system (Do not run more than 5 EOL tests in succession; the SA pump can overheat)

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Potential causes - Hose between SA pump and SA valve disconnected/damaged - Defective secondary air-injection pump - Defective secondary air-injection valve - Obstructed passage between secondary air injection

valve and the exhaust banks (in engine block)

Repair procedures (plant/service)

1. Visual inspection from connecting hose between secondary air injection pump (SAP) and secondary air-injection valve (SAV). Replace the hose if it is damaged.
2. Determine whether hose is connected. - if not - connect hose. A click must be audible when the hose is connected.
3. Conduct EOL test and listen to determine whether SAP is running or not: - if yes - determine whether the pump is producing pressure (hold with hand), it should be possible to feel pressure - of not - check wiring to pump (plug, relay, wiring), conduct EOL test with pump supplied by separate 12 V power source.

MIL illumination/CC message/emergency program

MIL

Remarks

none

DTC P140E: CYLINDER INJECTION CUT-OFF, FUEL LEVEL TOO LOW (PLAUS)

BMW Fault Code (hex)

0x29DC

BMW Fault Code (dez)

10716

BMW Fault Code Description VS-Text

Cylinder injection cutout

Component

Injection Deactivation

Subcomponent

Low Fuel

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P1413: SECONDARY AIR INJECTION PUMP RELAY CONTROL CIRCUIT SIGNAL LOW (MIN)

BMW Fault Code (hex)

0x2A03

BMW Fault Code (dez)

10755

BMW Fault Code Description VS-Text

Secondary-air pump relay, activation

Component

Secondary Air System

Subcomponent

Pump

Monitoring criteria

Control activation monitor, in post-start phase when pump is triggered

Fault debouncing

0.5 sec. with pump active 5 sec. when inactive

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

0.5 sec. with pump active 5 sec. when inactive

System test

Secondary air-injection system check

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short to ground in relay activation circuit

Repair procedures (plant/service)

1. Electrical check on wire
2. Visual inspection of plug-in connectors (at both component and DME ends)
3. Use tester to trigger components
4. Relay replacement

MIL illumination/CC message/emergency program

MIL ON

Remarks

Relay triggers secondary air-injection pump, initialization

DTC P1414: SECONDARY AIR INJECTION PUMP RELAY CONTROL CIRCUIT SIGNAL HIGH (MAX)

BMW Fault Code (hex)

0x2A03

BMW Fault Code (dez)

10755

BMW Fault Code Description VS-Text

Secondary-air pump relay, activation

Component

Secondary Air System

Subcomponent

Pump

Monitoring criteria

Control activation monitor, in post-start phase when pump is triggered

Fault debouncing

0.5 sec. with pump active 5 sec. when inactive

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

0.5 sec. with pump active 5 sec. when inactive

System test

Secondary air-injection system check

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short to positive in relay activation circuit

Repair procedures (plant/service)

1. Electrical check on wire
2. Visual inspection of plug-in connectors (at both component and DME ends)
3. Use tester to trigger components
4. Relay replacement

MIL illumination/CC message/emergency program

MIL ON

Remarks

Relay triggers secondary air-injection pump, initialization

DTC P1415: MASS OR VOLUME AIR FLOW TOO LOW (MIN)

BMW Fault Code (hex)

0x2D06

BMW Fault Code (dez)

11526

BMW Fault Code Description VS-Text

Air-mass system

Component

Mass Air Flow

Subcomponent

General

Monitoring criteria

Mass airflow data monitor 6% < relative charge <120% -20° < induction air temperature < 85°C 560 1 RPM < engine speed < 7200 RPM Time after start > 30 sec. Regardless of whether EVAP is active/inactive

Fault debouncing

0.2 sec.

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system >= 10 V

Temperature conditions

Coolant temperature > -10°C

Time conditions

6.2 sec.

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

MIN fault (HFM monitored data too low) - HFM signal wire shunt - Vacuum leak induction system/crankcase - for instance, oil filler cap open - for instance, induction system leak - for instance, brake servo leak - HFM sensor fault - Collateral malfunction: DISA positioning - Collateral malfunction: incorrect stroke registration.

Repair procedures (plant/service)

1. Visual inspection of HFM plug contacts
2. Check wiring between HFM and DME
3. Check induction system/crankcase for leaks (the positive crankcase ventilation system can allow vacuum leaks with air from the crankcase entering the manifold, for instance, if vacuum line from brake booster to vacuum pump is leaking)
4. Check for DISA diagnostic fault code entries and DISA control operation (DISA fault does not prevent HFM plausibility check)
5. Carry out VVT travel limit initialization routine

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P1417: THROTTLE CONTROL INCORRECT AIR SUPPLY (SIG)**BMW Fault Code (hex)**

0x2D09

BMW Fault Code (dez)

11529

BMW Fault Code Description VS-Text

THROTTLE

Component

Throttle Control

Subcomponent

Air Supply

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P1424: MASS OR VOLUME AIR FLOW TOO HIGH (MAX)

BMW Fault Code (hex)

0x2D06

BMW Fault Code (dez)

11526

BMW Fault Code Description VS-Text

Air-mass system

Component

Mass Air Flow

Subcomponent

General

Monitoring criteria

Mass airflow data monitor 6% < relative charge <120% -20° < induction air temperature < 85°C 560 1 RPM < engine speed < 7200 RPM Time after start > 30 sec. Regardless of whether EVAP is active/inactive

Fault debouncing

0.2 sec.

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

Coolant temperature $> -10^{\circ}\text{C}$

Time conditions

6.2 sec.

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

MAX fault (HFM monitored data too high) - HFM signal wire shunt - HFM sensor fault - Collateral fault from incorrect DISA positioning - Collateral fault from incorrect stroke measurement

Repair procedures (plant/service)

1. Visual inspection of HFM plug contacts
2. Check wiring between HFM and DME
3. Check induction system/crankcase for leaks (the positive crankcase ventilation system can allow vacuum leaks with air from the crankcase entering the manifold, for instance, if vacuum line from brake booster to vacuum pump is leaking)
4. Check for DISA diagnostic fault code entries and DISA control operation (DISA fault does not prevent HFM plausibility check)
5. Carry out VVT travel limit initialization routine

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P1434: DIAGNOSTIC MODULE TANK LEAKAGE (DM-TL) (SIG)**BMW Fault Code (hex)**

0x2A17

BMW Fault Code (dez)

10775

BMW Fault Code Description VS-Text

DMTL, system fault

Component

EVAP System

Subcomponent

Pump Current

Monitoring criteria

DMTL component monitor

Fault debouncing

Following completion of DMTL check

Terminal conditions

Terminal 15 ON

Voltage conditions

10.95 < vehicle electrical system voltage < 14.5

Temperature conditions

1.5°C > Ambient temperature > 38°C

Time conditions

Following completion of DMTL check

System test

DMTL Check

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Valve in DMTL defective

Repair procedures (plant/service)

Replace DMTL

MIL illumination/CC message/emergency program

MIL ON

Remarks

Installed in US only (initialization version)

DTC P143B: DIRECT OZONE REDUCTION CATALYST TEMPERATURE SENSOR WRONG CODE (PLAUS)

BMW Fault Code (hex)

0x2AD9

BMW Fault Code (dez)

10969

BMW Fault Code Description VS-Text

EAC sensor, coding

Component

Direct Ozone Reduction

Subcomponent

Catalyst Temperature Sensor

Monitoring criteria

EAC sensor must be installed, and the correct data set (SULEV) must be programmed in the DME

Fault debouncing

24 sec.

Terminal conditions

Terminal 15

Voltage conditions

Voltage in onboard electrical system > 9 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

LIN bus signal

Calculated value Y/N

N

Possible Fault Causes

EAC sensor has been tampered with

Repair procedures (plant/service)

Replace EAC sensor

MIL illumination/CC message/emergency program

MIL in second driving cycle

Remarks

none

DTC P143C: DIRECT OZONE REDUCTION CATALYST TEMPERATURE/RADIATOR COOLANT TEMPERATURE CORRELATION (SIG)

BMW Fault Code (hex)

0x2AD8

BMW Fault Code (dez)

10968

BMW Fault Code Description VS-Text

EAC sensor, monitoring

Component

Direct Ozone Reduction

Subcomponent

Catalyst Temperature Sensor

Monitoring criteria

Coolant temperature > 86°C, Coolant temperature at radiator discharge >40°C --> meaning thermostat is certainly open and the EAC sensor in valid temperature range

Fault debouncing

At least twice (more often as required). Drive at least 30 sec. as during acceleration from rest in urban traffic.

Terminal conditions

none

Voltage conditions

UBatt >10 V

Temperature conditions

> -7°C

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Sensor subjected to tampering has been installed, or sensor's installation location not as specified, or sensor is defective.

Repair procedures (plant/service)

Check temperature gradient (Service Test); install new sensor as indicated

MIL illumination/CC message/emergency program

MIL in 2nd DC

Remarks

none

DTC P143E: DIRECT OZONE REDUCTION CATALYST TEMPERATURE SENSOR GRADIENT TOO LOW (PLAUS)

BMW Fault Code (hex)

0x2AD8

BMW Fault Code (dez)

10968

BMW Fault Code Description VS-Text

EAC sensor, monitoring

Component

Direct Ozone Reduction

Subcomponent

Catalyst Temperature Sensor

Monitoring criteria

Coolant temperature $> 86^{\circ}\text{C}$, Coolant temperature at radiator discharge $> 40^{\circ}\text{C}$ --> meaning thermostat is certainly open and the EAC sensor in valid temperature range

Fault debouncing

At least twice (more often as required). Drive at least 30 sec. as during acceleration from rest in urban traffic.

Terminal conditions

none

Voltage conditions

UBatt $> 10\text{ V}$

Temperature conditions

$> -7^{\circ}\text{C}$

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Sensor subjected to tampering has been installed, or sensor's installation location not as specified, or sensor is defective

Repair procedures (plant/service)

Check temperature gradient (Service Test); install new sensor as indicated

MIL illumination/CC message/emergency program

MIL in 2nd DC

Remarks

none

DTC P1447: DIAGNOSTIC MODULE TANK LEAKAGE (DM-TL) PUMP CURRENT TOO HIGH DURING SWITCHING SOLENOID TEST (PLAUS)

BMW Fault Code (hex)

0x2A17

BMW Fault Code (dez)

10775

BMW Fault Code Description VS-Text

DMTL, system fault

Component

EVAP System

Subcomponent

Pump Current

Monitoring criteria

DMTL component monitor

Fault debouncing

After DMTL check is triggered 2 times

Terminal conditions

Terminal 15 ON

Voltage conditions

10.95 < vehicle electrical system voltage < 14.5

Temperature conditions

1.5°C > Ambient temperature > 38°C

Time conditions

After DMTL check is triggered 2 times

System test

DMTL Check

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Moisture in the DMTL/DMTL heater defective

Repair procedures (plant/service)

Replace DMTL

MIL illumination/CC message/emergency program

MIL ON

Remarks

Installed in US only (initialization version)

DTC P1448: DIAGNOSTIC MODULE TANK LEAKAGE (DM-TL) PUMP CURRENT TOO LOW (MIN)

BMW Fault Code (hex)

0x2A17

BMW Fault Code (dez)

10775

BMW Fault Code Description VS-Text

DMTL, system fault

Component

EVAP System

Subcomponent

Pump Current

Monitoring criteria

DMTL component monitor

Fault debouncing

Roughly 1 minute after DMTL check is triggered

Terminal conditions

Terminal 15 ON

Voltage conditions

10.95 < vehicle electrical system voltage < 14.5

Temperature conditions

1.5°C > Ambient temperature > 38°C

Time conditions

Roughly 1 minute after DMTL check is triggered

System test

DMTL Check

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Pump motor current too low, pump defective

Repair procedures (plant/service)

Replace DMTL

MIL illumination/CC message/emergency program

MIL ON

Remarks

Installed in US only (initialization version)

DTC P1449: DIAGNOSTIC MODULE TANK LEAKAGE (DM-TL) PUMP CURRENT TOO HIGH (MAX)

BMW Fault Code (hex)

0x2A17

BMW Fault Code (dez)

10775

BMW Fault Code Description VS-Text

DMTL, system fault

Component

EVAP System

Subcomponent

Pump Current

Monitoring criteria

DMTL component monitor

Fault debouncing

Roughly 1 minute after DMTL check is triggered

Terminal conditions

Terminal 15 ON

Voltage conditions

10.95 < vehicle electrical system voltage < 14.5

Temperature conditions

1.5°C > Ambient temperature > 38°C

Time conditions

Roughly 1 minute after DMTL check is triggered

System test

DMTL Check

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Pump motor current too high, pump resistance, locks up

Repair procedures (plant/service)

Replace DMTL

MIL illumination/CC message/emergency program

MIL ON

Remarks

Installed in US only (initialization version)

DTC P1453: SECONDARY AIR INJECTION PUMP RELAY CONTROL CIRCUIT ELECTRICAL (SIG)

BMW Fault Code (hex)

0x2A03

BMW Fault Code (dez)

10755

BMW Fault Code Description VS-Text

Secondary-air pump relay, activation

Component

Secondary Air System

Subcomponent

Pump

Monitoring criteria

Control activation monitor, in post-start phase when pump is triggered

Fault debouncing

0.5 sec. with pump active 5 sec. when inactive

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

0.5 sec. with pump active 5 sec. when inactive

System test

Secondary air-injection system check

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Interruption of relay activation current

Repair procedures (plant/service)

1. Electrical check on wire
2. Visual inspection of plug-in connectors (at both component and DME ends)
3. Use tester to trigger components
4. Relay replacement

MIL illumination/CC message/emergency program

MIL ON

Remarks

Relay triggers secondary air-injection pump, initialization

DTC P14C0: FAN MECHANICAL OR HARDWARE DEFECT (PLAUS)

BMW Fault Code (hex)

0x2EFF

BMW Fault Code (dez)

12031

BMW Fault Code Description VS-Text

Electric fan, self-diagnosis

Component

No Info

Subcomponent

No Info

Monitoring criteria

PWM > 10%

Fault debouncing

200 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

Ambient temperature > -20°C

Time conditions

Appears twice for 6 sec. each time; At ecfpwm (=pulse-duty factor?) > 10%. Roughly 115 sec. may elapse before fault code is registered in fault memory!

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Fault in fan's electronic control circuit. Binding in fan blade assembly. Fan blade assembly seized.

Repair procedures (plant/service)

1. Disconnect plug from fan assembly. (otherwise there is an injury hazard)
2. The fan moves freely Check and remove any foreign objects. --> Fan is mechanically seized: Replace fan
--> Fan blades turn freely: Reconnect plug and use tester to activate fan at least 15%. --> Fan should start.
--> Fan fails to start running: Replace fan assembly

MIL illumination/CC message/emergency program

no external display;

Remarks

An inoperative E fan can also cause the engine to overheat.

DTC P14C1: RADIATOR SHUTTER MECHANICAL OR HARDWARE DEFECT (PLAUS)

BMW Fault Code (hex)

0x2F0F

BMW Fault Code (dez)

12047

BMW Fault Code Description VS-Text

Radiator blind, self-diagnosis

Component

No Info

Subcomponent

No Info

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

**DTC P14C2: DISA (DIFFERENTIATED INTAKE MANIFOLD) ACTUATOR 1 MECHANICAL OR
HARDWARE DEFECT (PLAUS)**

BMW Fault Code (hex)

0x2AAB

BMW Fault Code (dez)

10923

BMW Fault Code Description VS-Text

Variable intake system, self-diagnosis

Component

No Info

Subcomponent

No Info

Monitoring criteria

Monitoring of DISA controller (large valve) Engine speed > 500 RPM

Fault debouncing

Valve must lock up mechanically 10 times in succession. (5x open and 5x closed)

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

Ambient temperature > -20°C

Time conditions

none

System test

none

Signal information

PWM between 15% and 70%

Calculated value Y/N

N

Possible Fault Causes

Fault in electronic valve control. Physical seizure of valve; Valve binding.

Repair procedures (plant/service)

Replace large DISA valve

MIL illumination/CC message/emergency program

none

Remarks

Reduced power in various rpm ranges; downward shift in torque curve

DTC P14C3: DISA (DIFFERENTIATED INTAKE MANIFOLD) ACTUATOR 2 MECHANICAL OR HARDWARE DEFECT (PLAUS)

BMW Fault Code (hex)

0x2AAC

BMW Fault Code (dez)

10924

BMW Fault Code Description VS-Text

Variable intake system 2, self-diagnosis

Component

No Info

Subcomponent

No Info

Monitoring criteria

Monitoring of DISA controller (no valve) Engine speed > 500 rpm

Fault debouncing

Valve must lock up mechanically 10 times in succession. (5x open and 5x closed)

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

Ambient temperature > -20°C

Time conditions

none

System test

none

Signal information

PWM between 15% and 70%

Calculated value Y/N

N

Possible Fault Causes

Fault in electronic valve control. Physical seizure of valve; Valve binding;

Repair procedures (plant/service)

Replace small DISA valve

MIL illumination/CC message/emergency program

none

Remarks

Reduced power in various rpm ranges; downward shift in torque curve

DTC P14C4: RADIATOR SHUTTER (UPPER) MECHANICAL (MIN)**BMW Fault Code (hex)**

0x2F11

BMW Fault Code (dez)

12049

BMW Fault Code Description VS-Text

Radiator blind, top

Component

No Info

Subcomponent

No Info

Monitoring criteria

1. AKKS must be initialized. Operation of lower flap: 3 x open and 3 x closed or conduct the system test.

Fault debouncing

none

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

In the SGBD

Signal information

PWM of 5-90%

Calculated value Y/N

N

Possible Fault Causes

Mech. defect in valve. Possibly from ice cover in winter, or valve mechanism is defective (also: internal fault)
PVE: Hold valve on clamp

Repair procedures (plant/service)

1. Check AKKS for sticking and seizure. (may be iced up in winter)
2. Use the tester to trigger the valve repeatedly. If OK Clear fault memory, conduct system test --> No fault code entry. If not OK: Replace AKKS and conduct test for GLF --> No fault code entry

MIL illumination/CC message/emergency program

no external display;

Remarks

There is no danger with the AKKS provided the malfunction did not arise while it was closed.

DTC P14C5: RADIATOR SHUTTER (UPPER) HARDWARE DEFECT (MAX)

BMW Fault Code (hex)

0x2F11

BMW Fault Code (dez)

12049

BMW Fault Code Description VS-Text

Radiator blind, top

Component

No Info

Subcomponent

No Info

Monitoring criteria

1. AKKS must be initialized. Operation of lower flap: 3 x open and 3 x closed or conduct the system test.

Fault debouncing

none

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

In the SGBD

Signal information

PWM of 5-90%

Calculated value Y/N

N

Possible Fault Causes

Electrical defect in valve actuator. PVE: Not possible without destroying the controller.

Repair procedures (plant/service)

1. Replace AKKS

MIL illumination/CC message/emergency program

no external display;

Remarks

There is no danger with the AKKS provided the malfunction did not arise while it was closed.

DTC P14C6: RADIATOR SHUTTER (LOWER) ELECTRICAL (MAX)

BMW Fault Code (hex)

0x2F10

BMW Fault Code (dez)

12048

BMW Fault Code Description VS-Text

Radiator blind, bottom

Component

No Info

Subcomponent

No Info

Monitoring criteria

1. PKKS must be initialized. Operation of lower flap: 3 x open and 3 x closed or conduct the system test

Fault debouncing

up to 20 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

In the SGBD

Signal information

PWM of 5-90%

Calculated value Y/N

N

Possible Fault Causes

1. Fault in wire from AKKS to PKKS (all 3 fault classes)
2. Fault in wire from PKKS to ground (open wire or short to UBatt)
3. Retention solenoid defective (internal short or burned through)

Repair procedures (plant/service)

1. Check wire from AKKS PIN 4 to PKKS (connection +)
2. Check ground connection to the PKKS
3. Check retention solenoid (internal short or burned through)

MIL illumination/CC message/emergency program

no external display;

Remarks

There is no danger with the PKKS provided the malfunction did not arise while it was closed.

DTC P150A: BATTERY SENSOR BSD (BIT SERIAL DATA INTERFACE) EXTENDED COMMUNICATION CIRCUIT (MAX)

BMW Fault Code (hex)

0x2E8B

BMW Fault Code (dez)

11915

BMW Fault Code Description VS-Text

Intelligent battery sensor, signal

Component

No Info

Subcomponent

No Info

Monitoring criteria

IBS: Interference with extended communications on BSD bus

Fault debouncing

10 sec.

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

1. Brief bus fault
2. Other defective BSD component interferes with BSD bus.
3. Intermittent short to positive or ground
4. Intermittent contact in BSD wire
5. Defective battery sensor.

Repair procedures (plant/service)

1. Check BSD wire for sporadic shorts to battery voltage and ground
2. Check for intermittent contacts
3. Systematically disconnect other BSD components one after the other and replace as indicated

4. If fault persists after clearing fault memory, replace battery sensor
5. If fault memory entry is logged repeatedly, replace battery sensor

MIL illumination/CC message/emergency program

No warning lamp or CC status report

Remarks

none

DTC P150B: BATTERY SENSOR BSD (BIT SERIAL DATA INTERFACE) COMMUNICATION CIRCUIT (SIG)

BMW Fault Code (hex)

0x2E8B

BMW Fault Code (dez)

11915

BMW Fault Code Description VS-Text

Intelligent battery sensor, signal

Component

No Info

Subcomponent

No Info

Monitoring criteria

IBS: Interference in data communications on BSD bus

Fault debouncing

10 sec.

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

1. BSD wire open
2. Other defective BSD component interferes with traffic on BSD bus.
3. Intermittent short to positive or ground
4. Defective battery sensor.

Repair procedures (plant/service)

1. Check BSD wire for shorts to battery voltage and ground
2. Check for open wires
3. Disconnect other BSD components one after the other and replace as indicated
4. If fault persists after clearing fault memory, replace battery sensor
5. If fault memory entry is logged repeatedly, replace battery sensor

MIL illumination/CC message/emergency program

No warning lamp or CC status report

Remarks

none

DTC P150B: BATTERY SENSOR BSD (BIT SERIAL DATA INTERFACE) COMMUNICATION

CIRCUIT (SIG)

BMW Fault Code (hex)

0x2E8E

BMW Fault Code (dez)

11918

BMW Fault Code Description VS-Text

Intelligent battery sensor, communication

Component

No Info

Subcomponent

No Info

Monitoring criteria

IBS communications monitor

Fault debouncing

10 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Terminal 87 > 10.0 V

Temperature conditions

none

Time conditions

approximately 10 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

1. Battery sensor not installed on battery, as optional equipment
2. Open circuit in wire (BSD_BUS) between battery sensor and DME.
3. Defective battery sensor.

Repair procedures (plant/service)

1. Determine whether battery sensor is installed. If not, use SGBD to delete all adaptation data and then switch ignition off/on.
2. Check continuity in wire connecting DME to battery sensor (BSD_BUS)
3. Ensure correct fit of battery sensor on battery ground terminal and check seating of all plugs
4. Replace battery sensor.

MIL illumination/CC message/emergency program

No warning message. The alternator responds to loss of the BSD_BUS signal by charging at a constant 14.4 V battery.

Remarks

none

DTC P150C: BATTERY SENSOR FIRMWARE IMPLAUSIBLE (PLAUS)

BMW Fault Code (hex)

0x2E8B

BMW Fault Code (dez)

11915

BMW Fault Code Description VS-Text

Intelligent battery sensor, signal

Component

No Info

Subcomponent

No Info

Monitoring criteria

IBS: Implausible SW version

Fault debouncing

10 sec.

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Installed sensor incompatible or too old

Repair procedures (plant/service)

Install sensor with current part number

MIL illumination/CC message/emergency program

No warning lamp or CC status report

Remarks

none

DTC P150D: BATTERY SENSOR TEMPERATURE ERROR (MAX)

BMW Fault Code (hex)

0x2E8C

BMW Fault Code (dez)

11916

BMW Fault Code Description VS-Text

Intelligent battery sensor, signal transmission

Component

No Info

Subcomponent

No Info

Monitoring criteria

Implausible battery temperature measurement

Fault debouncing

10 sec.

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Self-diagnosis has detected potential problem in its temperature measurement

Repair procedures (plant/service)

1. If fault persists after deletion of stored fault codes from log, replace battery sensor.
2. If fault code is entered repeatedly, replace battery sensor.

MIL illumination/CC message/emergency program

No warning lamp or CC status report

Remarks

none

DTC P150E: BATTERY SENSOR VOLTAGE ERROR (SIG)**BMW Fault Code (hex)**

0x2E8C

BMW Fault Code (dez)

11916

BMW Fault Code Description VS-Text

Intelligent battery sensor, signal transmission

Component

No Info

Subcomponent

No Info

Monitoring criteria

Implausible battery voltage measurement

Fault debouncing

10 sec.

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Self-diagnosis has detected possible problem with its voltage measurement

Repair procedures (plant/service)

1. If fault persists after deletion of stored fault codes from log, replace battery sensor
2. If fault code is entered repeatedly, replace battery sensor

MIL illumination/CC message/emergency program

No warning lamp or CC status report

Remarks

none

DTC P150F: BATTERY SENSOR CURRENT ERROR (PLAUS)

BMW Fault Code (hex)

0x2E8C

BMW Fault Code (dez)

11916

BMW Fault Code Description VS-Text

Intelligent battery sensor, signal transmission

Component

No Info

Subcomponent

No Info

Monitoring criteria

Implausible battery current measurement

Fault debouncing

10 sec.

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Self-diagnosis has detected possible problem with its battery current measurement

Repair procedures (plant/service)

1. Check electrical system/alternator for overvoltage
2. If fault remains after deleting stored fault codes from log, replace battery sensor
3. If fault is logged repeatedly, replace battery sensor

MIL illumination/CC message/emergency program

No warning lamp or CC status report

Remarks

none

DTC P1511: DISA (DIFFERENTIATED INTAKE MANIFOLD) CONTROL CIRCUIT ELECTRICAL (MAX)

BMW Fault Code (hex)

0x2AAA

BMW Fault Code (dez)

10922

BMW Fault Code Description VS-Text

Variable intake system, plausibility

Component

No Info

Subcomponent

No Info

Monitoring criteria

6% < Relative charge < 120% 560 RPM < Engine speed < 7200 RPM. Time after start > 30s. Regardless of whether EVAP is active/inactive = High load demand. Additional induction air restriction Induction air temperature = +60°C maximum. Induction air temperature = +0°C minimum.

Fault debouncing

none

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

Coolant temperature $> -10^{\circ}\text{C}$ $0 < \text{Induction air temperature} < 60^{\circ}\text{C}$

Time conditions

1.1 sec.

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

No pressure pulses in intake manifold prior to low switching speed (approximately 3200 1 rpm) or pulsation present after low switching speed. Valves fail to close completely or leak.

Repair procedures (plant/service)

Remove DISA valves (both, as individual assessment of DISA 1/2 is not possible) and inspect - valves present? - Are seals and gaskets present? - Are seals and gaskets OK? - Does valve open/close completely?

MIL illumination/CC message/emergency program

none

Remarks

Data content defined

DTC P1511: DISA (DIFFERENTIATED INTAKE MANIFOLD) CONTROL CIRCUIT ELECTRICAL (MIN)

BMW Fault Code (hex)

0x2AAA

BMW Fault Code (dez)

10922

BMW Fault Code Description VS-Text

Variable intake system, plausibility

Component

No Info

Subcomponent

No Info

Monitoring criteria

6% < Relative charge <120% 560 rpm < Engine speed < 7200 rpm. Time after start > 30s Regardless of

whether EVAP is active/inactive = High load demand. Additional induction air restriction. Induction air temperature = +60°C maximum. Induction air temperature = +0°C minimum.

Fault debouncing

none

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

Coolant temperature $> -10^{\circ}\text{C}$ $0 < \text{Induction air temperature} < 60^{\circ}\text{C}$

Time conditions

1.1 sec.

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

No pressure pulses in intake manifold prior to high switching speed (approximately 4400 1 rpm) or pulsation present after high switching speed. Valves fail to close completely or leak.

Repair procedures (plant/service)

Remove DISA valves (both, as individual assessment of DISA 1/2 is not possible) and inspect - valves present?
- Are seals and gaskets present? - Are seals and gaskets OK? - Does valve open/close completely?

MIL illumination/CC message/emergency program

none

Remarks

Data content defined

DTC P1511: DISA (DIFFERENTIATED INTAKE MANIFOLD) CONTROL CIRCUIT ELECTRICAL (SIG)

BMW Fault Code (hex)

0x2AA8

BMW Fault Code (dez)

10920

BMW Fault Code Description VS-Text

Variable intake system, servomotor: activation

Component

DISA (Differentiated Intake Manifold)

Subcomponent

Electrical

Monitoring criteria

Monitoring of DISA controller. Engine speed > 500 rpm.

Fault debouncing

none

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

0.5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Open circuit

Repair procedures (plant/service)

1. Check voltage supply to valve. (If positive power to the valve is missing or intermittent this fault code will be stored.)
2. Check wiring. Repair if defective. If wiring is OK, proceed to check component.

MIL illumination/CC message/emergency program

none

Remarks

Not in B30UL_US reduced power in various engine speed ranges; low torque curve.

DTC P1511: DISA (DIFFERENTIATED INTAKE MANIFOLD) CONTROL CIRCUIT ELECTRICAL (SIG)

BMW Fault Code (hex)

0x2AA9

BMW Fault Code (dez)

10921

BMW Fault Code Description VS-Text

Variable intake system, servomotor 2: activation

Component

DISA (Differentiated Intake Manifold)

Subcomponent

Electrical

Monitoring criteria

Monitoring of DISA controller 2 actuator. Engine speed > 500 rpm.

Fault debouncing

none

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

0.5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Open circuit

Repair procedures (plant/service)

1. Check voltage supply to valve. (If positive power to the valve is missing or intermittent this fault code will be stored.)
2. Check wiring. Repair if defective. If wiring is OK, proceed to check component

MIL illumination/CC message/emergency program

none

Remarks

Not in B25UL and B30UL_US reduced power in various engine speed ranges; low torque curve

DTC P1512: DISA (DIFFERENTIATED INTAKE MANIFOLD) CONTROL CIRCUIT SIGNAL LOW (MIN)

BMW Fault Code (hex)

0x2AA8

BMW Fault Code (dez)

10920

BMW Fault Code Description VS-Text

Variable intake system, servomotor: activation

Component

DISA (Differentiated Intake Manifold)

Subcomponent

Signal

Monitoring criteria

Monitoring of DISA controller. Engine speed > 500 rpm.

Fault debouncing

none

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

5.5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short circuit to ground in wire or component.

Repair procedures (plant/service)

Check wiring. Repair if defective. If wiring is OK, proceed to check component.

MIL illumination/CC message/emergency program

none

Remarks

Not in B30UL_US reduced power in various engine speed ranges; low torque curve

DTC P1512: DISA (DIFFERENTIATED INTAKE MANIFOLD) CONTROL CIRCUIT SIGNAL LOW (MIN)

BMW Fault Code (hex)

0x2AA9

BMW Fault Code (dez)

10921

BMW Fault Code Description VS-Text

Variable intake system, servomotor 2: activation

Component

DISA (Differentiated Intake Manifold)

Subcomponent

Signal

Monitoring criteria

Monitoring of DISA controller 2 actuator Engine speed > 500 rpm

Fault debouncing

none

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

5.5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short circuit to ground in wire or component.

Repair procedures (plant/service)

Check wiring. Repair if defective. If wiring is OK, proceed to check component.

MIL illumination/CC message/emergency program

none

Remarks

Not in B25UL and B30UL_US reduced power in various engine speed ranges; low torque curve

DTC P1513: DISA (DIFFERENTIATED INTAKE MANIFOLD) CONTROL CIRCUIT SIGNAL HIGH (MAX)

BMW Fault Code (hex)

0x2AA8

BMW Fault Code (dez)

10920

BMW Fault Code Description VS-Text

Variable intake system, servomotor: activation

Component

DISA (Differentiated Intake Manifold)

Subcomponent

Signal

Monitoring criteria

Monitoring of DISA controller Engine speed > 500 rpm

Fault debouncing

none

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

0.5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Wire is shorted to positive, or a short to positive is present in the component

Repair procedures (plant/service)

Check wiring. Repair if defective. If wiring is OK, proceed to check component

MIL illumination/CC message/emergency program

none

Remarks

Not in B30UL_US reduced power in various engine speed ranges; low torque curve

DTC P1513: DISA (DIFFERENTIATED INTAKE MANIFOLD) CONTROL CIRCUIT SIGNAL HIGH (MAX)

BMW Fault Code (hex)

0x2AA9

BMW Fault Code (dez)

10921

BMW Fault Code Description VS-Text

Variable intake system, servomotor 2: activation

Component

DISA (Differentiated Intake Manifold)

Subcomponent

Signal

Monitoring criteria

Monitoring of DISA controller 2 actuator. Engine speed > 500 RPM

Fault debouncing

none

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

0.5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Wire is shorted to positive, or a short to positive is present in the component

Repair procedures (plant/service)

Check wiring. Repair if defective. If wiring is OK, proceed to check component

MIL illumination/CC message/emergency program

none

Remarks

Not in B25UL and B30UL_US reduced power in various engine speed ranges; low torque curve

DTC P1515: ENGINE OFF TIMER PLAUSIBILITY (PLAUS)

BMW Fault Code (hex)

0x2F80

BMW Fault Code (dez)

12160

BMW Fault Code Description VS-Text

System time, plausibility

Component

Engine Off Timer, External

Subcomponent

Electrical

Monitoring criteria

Terminal 15 on Engine running

Fault debouncing

2 Min

Terminal conditions

Terminal 15 on

Voltage conditions

Battery voltage > 10 V

Temperature conditions

Engine shutdown temperature > 85°C

Time conditions

Engine off time < 12 min or > 10 h

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Defective engine temperature sensor. Timer in instrument cluster is defective

Repair procedures (plant/service)

Check engine temperature sensor. Check instrument cluster.

MIL illumination/CC message/emergency program

Mil in 2nd driving cycle

Remarks

US only

DTC P151A: BATTERY SENSOR TERMINAL 15/30 WAKEUP CIRCUIT (MAX)**BMW Fault Code (hex)**

0x2E8D

BMW Fault Code (dez)

11917

BMW Fault Code Description VS-Text

Intelligent battery sensor, function

Component

No Info

Subcomponent

No Info

Monitoring criteria

During Terminal 15/wakeup request from IBS and critical charge status. Short to ground in Terminal 15 wakeup wire.

Fault debouncing

10 sec.

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

1. Terminal 15/wake-up wire shorted to ground
2. Defective driver circuit in battery sensor

Repair procedures (plant/service)

1. With battery sensor disconnected, check Terminal 15/wake-up wire for shorts to ground
2. Check for non-approved connection of supplementary electr. equipment to Terminal 15/wake-up wire
3. If fault code is stored, replace battery sensor

MIL illumination/CC message/emergency program

No warning lamp or CC status report

Remarks

none

DTC P151B: BATTERY SENSOR WAKEUP CIRCUIT (PLAUS)

BMW Fault Code (hex)

0x2E8D

BMW Fault Code (dez)

11917

BMW Fault Code Description VS-Text

Intelligent battery sensor, function

Component

No Info

Subcomponent

No Info

Monitoring criteria

Terminal 15-Wakeup wire signal level implausible

Fault debouncing

10 sec.

Terminal conditions

With each change in terminal-15 status, i.e., off or on

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

1. Terminal 15/wake-up wire open
2. Intermittent open in Terminal 15/wake-up wire
3. Terminal 15/wake-up wire shorted to ground or battery voltage
4. Defective driver circuit in battery sensor

Repair procedures (plant/service)

1. Check Terminal 15/wakeup wire for opens and intermittent contacts
2. With battery sensor removed and Terminal 15 off, check Terminal 15/wakeup wire for short to battery voltage -> Repair wire and/or check Terminal 15, control module wakeup
3. With battery sensor removed and Terminal 15 on, check Terminal 15/wakeup wire for short to ground

4. With battery sensor connected and Terminal 15 off, check Terminal 15/wakeup wire for shorts to battery voltage - > Replace battery sensor
5. With battery sensor connected and Terminal 15 on, check Terminal 15/wakeup wire for shorts to ground - > Replace battery sensor

MIL illumination/CC message/emergency program

No warning lamp or CC status report

Remarks

none

DTC P151C: BATTERY SENSOR SYSTEM ERROR (SIG)

BMW Fault Code (hex)

0x2E8D

BMW Fault Code (dez)

11917

BMW Fault Code Description VS-Text

Intelligent battery sensor, function

Component

No Info

Subcomponent

No Info

Monitoring criteria

IBS system fault

Fault debouncing

10 sec.

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Self-diagnosis utility has detected internal IBS fault

Repair procedures (plant/service)

Replace battery sensor

MIL illumination/CC message/emergency program

No warning lamp or CC status report

Remarks

none

DTC P1521: ENGINE OIL QUALITY SENSOR COMMUNICATION ERROR (SIG)

BMW Fault Code (hex)

0x2E9F

BMW Fault Code (dez)

11935

BMW Fault Code Description VS-Text

Oil condition sensor

Component

Engine Oil Quality Sensor

Subcomponent

Communication

Monitoring criteria

The sensor fails to respond

Fault debouncing

30 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 9 V

Temperature conditions

none

Time conditions

10 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Defective oil sensor (no communications)

Repair procedures (plant/service)

Wiring harness check/sensor replacement

MIL illumination/CC message/emergency program

CC message 182 - suppressed starting with E90 with BN2000

Remarks

Engine must be between 900 rpm and 5000 rpm

DTC P1540: DRIVING DYNAMICS CONTROL SWITCH HIGH INPUT (MAX)

BMW Fault Code (hex)

0x2AC6

BMW Fault Code (dez)

10950

BMW Fault Code Description VS-Text

Button, Dynamic Driving Control (SPORT button), signal

Component

No Info

Subcomponent

No Info

Monitoring criteria

SPORT switch monitoring only with CAN-11 network

Fault debouncing

none

Terminal conditions

Terminal 15 ON

Voltage conditions

none

Temperature conditions

none

Time conditions

500 ms

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Sensor wire shorted to positive or open circuit in wire

Repair procedures (plant/service)

1. Electrical check on switch wire and power wires
2. Visual inspection of plug-in connections (on component and DME ends)
3. Switch replacement

MIL illumination/CC message/emergency program

none

Remarks

Voltage range diagnosis

DTC P1541: DRIVING DYNAMICS CONTROL SWITCH LOW INPUT (MIN)**BMW Fault Code (hex)**

0x2AC6

BMW Fault Code (dez)

10950

BMW Fault Code Description VS-Text

Button, Dynamic Driving Control (SPORT button), signal

Component

No Info

Subcomponent

No Info

Monitoring criteria

SPORT switch monitoring only with CAN-11 network

Fault debouncing

none

Terminal conditions

Terminal 15 ON

Voltage conditions

none

Temperature conditions

none

Time conditions

500 ms

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short to ground in switch wire

Repair procedures (plant/service)

1. Electrical check on switch wire and power wires
2. Visual inspection of plug-in connections (on component and DME ends)
3. Switch replacement

MIL illumination/CC message/emergency program

none

Remarks

Voltage range diagnosis

DTC P1551: ENGINE OFF TIMER TIMEOUT (SIG)

BMW Fault Code (hex)

0x2F80

BMW Fault Code (dez)

12160

BMW Fault Code Description VS-Text

System time, plausibility

Component

Engine Off Timer, External

Subcomponent

Electrical

Monitoring criteria

Terminal 15 on Engine running

Fault debouncing

2 Min

Terminal conditions

Terminal 15 on

Voltage conditions

Battery voltage > 10 V

Temperature conditions

Engine shutdown temperature > 85°C

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Yes

Possible Fault Causes

CAN signal incorrect or not present

Repair procedures (plant/service)

Check CAN signal

MIL illumination/CC message/emergency program

Mil in 2nd driving cycle

Remarks

US only

DTC P1553: ENGINE POSITION SYSTEM 'B' PERFORMANCE (BANK 1) (MAX)

BMW Fault Code (hex)

0x2A99

BMW Fault Code (dez)

10905

BMW Fault Code Description VS-Text

Crankshaft - exhaust camshaft, correlation

Component

Crankshaft/Camshaft Position Sensor

Subcomponent

Exhaust

Monitoring criteria

NWA synchronized, adaptation enabled

Fault debouncing

On each camshaft tooth flank when the position is out of tolerance.

Terminal conditions

Terminal 15 on

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Position of NWA relative to crankshaft outside tolerance range.

Repair procedures (plant/service)

1. Check position (valve timing setting) of camshaft and reluctor
2. Check timing chain and tensioner mechanism.
3. Check VANOS solenoid for dirt and contamination
4. Check torque on crankshaft center bolt

MIL illumination/CC message/emergency program

MIL 2nd DC, CAM operates in emergency default mode

Remarks

Installation fault or mechanical malfunction in camshaft drive

DTC P1554: ENGINE POSITION SYSTEM 'A' PERFORMANCE (BANK 1) (MAX)

BMW Fault Code (hex)

0x2A98

BMW Fault Code (dez)

10904

BMW Fault Code Description VS-Text

Crankshaft - inlet camshaft, correlation

Component

Crankshaft/Camshaft Position Sensor

Subcomponent

Intake

Monitoring criteria

NWE synchronous, adaptation enabled

Fault debouncing

On each camshaft tooth flank when the position is out of tolerance.

Terminal conditions

Terminal 15 on

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Position of NWE relative to crankshaft outside tolerance range.

Repair procedures (plant/service)

1. Check position (valve timing setting) of camshaft and reluctor.
2. Check timing chain and tensioner mechanism.
3. Check VANOS solenoid for dirt and contamination.
4. Check torque on crankshaft center bolt.

MIL illumination/CC message/emergency program

MIL 2nd DC, CAM operates in emergency default mode

Remarks

Installation fault or mechanical malfunction in camshaft drive.

DTC P155A: MULTIFUNCTION STEERING WHEEL (MFL) INTERFACE, TOGGLE-BIT FAULT (MAX)**BMW Fault Code (hex)**

0x2DBE

BMW Fault Code (dez)

11710

BMW Fault Code Description VS-Text

Active cruise control, blocked for driving cycle

Component

No Info

Subcomponent

No Info

Monitoring criteria

Terminal 15 ON, ACC recognized

Fault debouncing

none

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

100 ms

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Throttle valve fault, accelerator pedal fault, torque demand from ACC despite pressure on brake pedal.

Repair procedures (plant/service)

Check fault memory for stored faults related to internal fault sources within DME (see at left). Otherwise check ACC control module.

MIL illumination/CC message/emergency program

ACC operation locked out for entire driving cycle

Remarks

ACC interface deactivated for entire driving cycle

DTC P155A: MULTIFUNCTION STEERING WHEEL (MFL) INTERFACE, TOGGLE-BIT FAULT (MIN)

BMW Fault Code (hex)

0x2DBE

BMW Fault Code (dez)

11710

BMW Fault Code Description VS-Text

Active cruise control, blocked for driving cycle

Component

No Info

Subcomponent

No Info

Monitoring criteria

Terminal 15 ON, ACC recognized

Fault debouncing

none

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

100 ms

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Crankshaft fault, clutch switch fault, brakelight switch fault, CAN timeout on DSC, ACC, instrument cluster or EGS.

Repair procedures (plant/service)

Check fault memory for stored faults related to internal fault sources within DME (see at left).

MIL illumination/CC message/emergency program

ACC operation cancelled while fault is active

Remarks

Temporary deactivation of ACC interface

DTC P155A: MULTIFUNCTION STEERING WHEEL (MFL) INTERFACE, TOGGLE-BIT FAULT (PLAUS)

BMW Fault Code (hex)

0x2DB7

BMW Fault Code (dez)

11703

BMW Fault Code Description VS-Text

Cruise control, time limit of data transmission reached

Component

No Info

Subcomponent

No Info

Monitoring criteria

1. CAN 11 vehicle (E46, E85, E83)
2. Multifunction steering wheel installed
3. Any MF-wheel button pressed

Fault debouncing

none

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

1700 ms

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Defective MFL module, open PIN 2--04 wire

Repair procedures (plant/service)

1. Visual inspection of plug contacts (component and DME ends)
2. Electrical check of wiring
3. Replace MFL module

MIL illumination/CC message/emergency program

Vehicle speed controller deactivated, no warning lamp

Remarks

No signal received from MFL module

DTC P1561: COLD START IDLE AIR CONTROL SYSTEM RPM LOWER THAN EXPECTED (BANK 1) (MIN)

BMW Fault Code (hex)

0x2AE0

BMW Fault Code (dez)

10976

BMW Fault Code Description VS-Text

Idle speed control during cold start, plausibility

Component

Idle Speed Control

Subcomponent

Cold Start RPM

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P1562: COLD START IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED (BANK 1) (MAX)

BMW Fault Code (hex)

0x2AE0

BMW Fault Code (dez)

10976

BMW Fault Code Description VS-Text

Idle speed control during cold start, plausibility

Component

Idle Speed Control

Subcomponent

Cold Start RPM

Monitoring criteria

Idle = ON VS = 0 km/h High idle for catalyst heating = On

Fault debouncing

20 sec.

Terminal conditions

Engine must be running

Voltage conditions

none

Temperature conditions

>-10°C

Time conditions

Roughly 120 seconds, varies according to start temperature

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Not possible to maintain idle speed at specified level including offset for catalyst heating

Repair procedures (plant/service)

Note any other fault code entries and repair the associated problems! Check all load-responsive servo actuators such as Valvetronic and the throttle valve for stored control module fault memory entries and malfunctions! (check injection and induction system as indicated).

MIL illumination/CC message/emergency program

MIL on in 2nd driving cycle

Remarks

US only

DTC P1563: MULTIFUNCTION STEERING WHEEL (MFL) ROCKER SWITCH DEFECTIVE (PLAUS)

BMW Fault Code (hex)

0x2DB6

BMW Fault Code (dez)

11702

BMW Fault Code Description VS-Text

Cruise control, switch, multifunction steering wheel

Component

No Info

Subcomponent

No Info

Monitoring criteria

Simultaneous recognition of pressure on '+' and '-' buttons

1. CAN 11 vehicle (E46, E85, E83)
2. Multifunction steering wheel present
3. MF wheel S/B button or VE pressed

Fault debouncing

none

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

800 ms

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Internal short circuit between '+' and '-' buttons in MFL module, or mechanical defect allowing simultaneous operation.

Repair procedures (plant/service)

1. Visual inspection of MFL module (buttons: '+' and '-')
2. Replace MFL module

MIL illumination/CC message/emergency program

Vehicle speed controller deactivated, no warning lamp

Remarks

Simultaneous pressure on '+' and '-' buttons detected

DTC P1576: MULTIFUNCTION STEERING WHEEL (MFL) INTERFACE, BIT ERROR (PLAUS)**BMW Fault Code (hex)**

0x2DB5

BMW Fault Code (dez)

11701

BMW Fault Code Description VS-Text

Cruise control, signal

Component

No Info

Subcomponent

No Info

Monitoring criteria

Redundancy fault in transmitting cruise control user input

1. CAN 11 vehicle (E46, E85, E83)
2. Multifunction steering wheel present
3. MF-wheel button WA, S/B or OFF is pressed

Fault debouncing

none

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

800 ms

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Defective MFL module

Repair procedures (plant/service)

Replace MFL module

MIL illumination/CC message/emergency program

Vehicle speed controller deactivated, no warning lamp

Remarks

not translated

DTC P1582: OIL PUMP CIRCUIT HIGH (MAX)

BMW Fault Code (hex)

0x30C2

BMW Fault Code (dez)

12482

BMW Fault Code Description VS-Text

Oil-pressure control valve, activation

Component

No Info

Subcomponent

No Info

Monitoring criteria

Monitored at: 10% PWM < Control activation PWM to oil pump < 94% PWM (idle)

Fault debouncing

1 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

0.5 sec.

System test

none

Signal information

PWM of 0-100%

Calculated value Y/N

N

Possible Fault Causes

Wire is shorted to positive, or a short to positive is present in the component

Repair procedures (plant/service)

1. Check wiring. Repair if defective. If wiring is OK, proceed to check component

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P1583: OIL PUMP CIRCUIT LOW (MIN)

BMW Fault Code (hex)

0x30C2

BMW Fault Code (dez)

12482

BMW Fault Code Description VS-Text

Oil-pressure control valve, activation

Component

No Info

Subcomponent

No Info

Monitoring criteria

Monitored at: 10% PWM < Control activation PWM to oil pump < 94% PWM (idle)

Fault debouncing

1 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

0.5 sec.

System test

none

Signal information

PWM of 0-100%

Calculated value Y/N

N

Possible Fault Causes

Short circuit to ground in wire or component.

Repair procedures (plant/service)

1. Check wiring Repair if defective If wiring is OK proceed to check component

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P1584: OIL PUMP CIRCUIT OPEN (SIG)

BMW Fault Code (hex)

0x30C2

BMW Fault Code (dez)

12482

BMW Fault Code Description VS-Text

Oil-pressure control valve, activation

Component

No Info

Subcomponent

No Info

Monitoring criteria

Monitored at: 10% PWM < Control activation PWM to oil pump < 94% PWM (idle)

Fault debouncing

1 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

0.5 sec.

System test

none

Signal information

PWM of 0-100%

Calculated value Y/N

N

Possible Fault Causes

Open circuit

Repair procedures (plant/service)

1. Check wiring. Repair if defective. If wiring is OK proceed to check component

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P1586: ENGINE OIL QUALITY SENSOR TEMPERATURE MEASUREMENT (MAX)**BMW Fault Code (hex)**

0x2E9F

BMW Fault Code (dez)

11935

BMW Fault Code Description VS-Text

Oil condition sensor

Component

Engine Oil Quality Sensor

Subcomponent

Temperature

Monitoring criteria

Incorrect level measurement

Fault debouncing

30 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 9 V

Temperature conditions

none

Time conditions

10 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Defective oil sensor (temperature sensor)

Repair procedures (plant/service)

Sensor replacement

MIL illumination/CC message/emergency program

CC message 182 - suppressed starting with E90 with BN2000

Remarks

Engine must be between 900 RPM and 5000 RPM

DTC P1587: ENGINE OIL QUALITY SENSOR LEVEL MEASUREMENT (MIN)

BMW Fault Code (hex)

0x2E9F

BMW Fault Code (dez)

11935

BMW Fault Code Description VS-Text

Oil condition sensor

Component

Engine Oil Quality Sensor

Subcomponent

Level

Monitoring criteria

Incorrect temperature measurement

Fault debouncing

30 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 9 V

Temperature conditions

none

Time conditions

10 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Defective oil sensor (level sensor)

Repair procedures (plant/service)

Sensor replacement

MIL illumination/CC message/emergency program

CC message 182 - suppressed starting with E90 with BN2000

Remarks

Engine must be between 900 RPM and 5000 RPM

DTC P1588: ENGINE OIL QUALITY SENSOR PERMEABILITY MEASUREMENT (PLAUS)

BMW Fault Code (hex)

0x2E9F

BMW Fault Code (dez)

11935

BMW Fault Code Description VS-Text

Oil condition sensor

Component

Engine Oil Quality Sensor

Subcomponent

Permeability

Monitoring criteria

Permittivity measurement defective

Fault debouncing

30 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 9 V

Temperature conditions

none

Time conditions

10 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Defective oil sensor (permittivity sensor)

Repair procedures (plant/service)

Sensor replacement

MIL illumination/CC message/emergency program

CC message 182 - suppressed starting with E90 with BN2000

Remarks

Engine must be between 900 rpm and 5000 rpm

DTC P15A1: ENGINE OIL PRESSURE CONTROL, MECHANICAL, SOLENOID VALVE STICKING IN FULLY ENERGIZED POSITION (MINIMUM OIL PRESSURE) (MAX)

BMW Fault Code (hex)

0x30C4

BMW Fault Code (dez)

12484

BMW Fault Code Description VS-Text

Engine-oil-pressure control, mechanical

Component

No Info

Subcomponent

No Info

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P15A2: ENGINE OIL PRESSURE CONTROL, MECHANICAL, SOLENOID VALVE STICKING IN DE-ENERGIZED POSITION (MAXIMUM OIL PRESSURE) (MIN)

BMW Fault Code (hex)

0x30C4

BMW Fault Code (dez)

12484

BMW Fault Code Description VS-Text

Engine-oil-pressure control, mechanical

Component

No Info

Subcomponent

No Info

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P15A3: ENGINE OIL PRESSURE TOO HIGH (MAX)

BMW Fault Code (hex)

0x30C5

BMW Fault Code (dez)

12485

BMW Fault Code Description VS-Text

Engine-oil pump, mechanical: engine-oil pressure

Component

No Info

Subcomponent

No Info

Monitoring criteria

Commercial vehicle >0 + Stored operating coordinate reached (depends on NKW+Tmot)

Fault debouncing

0.2

Terminal conditions

Terminal 15

Voltage conditions

none

Temperature conditions

>-10°C

Time conditions

none

System test

Jump in specified pressure, specified pressure ramp

Signal information

Analogous to oil pressure signal

Calculated value Y/N

N

Possible Fault Causes

Pump control plunger is seizing

Repair procedures (plant/service)

Replace oil pump

MIL illumination/CC message/emergency program

NO

Remarks

Activation only in Prg. Version 500

DTC P15A6: ENGINE OIL PRESSURE TOO HIGH BEFORE START (MAX)

BMW Fault Code (hex)

0x30C6

BMW Fault Code (dez)

12486

BMW Fault Code Description VS-Text

Engine-oil-pressure sensor, plausibility

Component

No Info

Subcomponent

No Info

Monitoring criteria

NKW=0, Terminal 15, the barometric pressure sensor must not be malfunctioning

Fault debouncing

0.2

Terminal conditions

Terminal 15

Voltage conditions

none

Temperature conditions

none

Time conditions

Minimum deactivation time over Tmot

System test

Jump in specified pressure, specified pressure ramp

Signal information

Analogous to oil pressure signal

Calculated value Y/N

N

Possible Fault Causes

Pressure indicated by oil pressure sensor is too high

Repair procedures (plant/service)

Replace oil pressure sensor

MIL illumination/CC message/emergency program

NO

Remarks

Implementation on at Prg. Version 500

DTC P15A7: ENGINE OIL PRESSURE TOO LOW BEFORE START (MIN)**BMW Fault Code (hex)**

0x30C6

BMW Fault Code (dez)

12486

BMW Fault Code Description VS-Text

Engine-oil-pressure sensor, plausibility

Component

No Info

Subcomponent

No Info

Monitoring criteria

NKW=0, Terminal 15, the barometric pressure sensor must not be malfunctioning

Fault debouncing

0.2

Terminal conditions

Terminal 15

Voltage conditions

none

Temperature conditions

none

Time conditions

Minimum deactivation time over Tmot

System test

Jump in specified pressure, specified pressure ramp

Signal information

Analogous to oil pressure signal

Calculated value Y/N

N

Possible Fault Causes

Pressure indicated by oil pressure sensor is too low

Repair procedures (plant/service)

Replace oil pressure sensor

MIL illumination/CC message/emergency program

NO

Remarks

Implementation on at Prg. Version 500

DTC P15B0: TERMINAL 15 SENSE CIRCUIT INPUT HIGH (MAX)

BMW Fault Code (hex)

0x2DC3

BMW Fault Code (dez)

11715

BMW Fault Code Description VS-Text

Monitoring, terminal 15

Component

No Info

Subcomponent

No Info

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P15B1: TERMINAL 15 SENSE CIRCUIT INPUT LOW (MIN)

BMW Fault Code (hex)

0x2DC3

BMW Fault Code (dez)

11715

BMW Fault Code Description VS-Text

Monitoring, terminal 15

Component

No Info

Subcomponent

No Info

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P15B2: TERMINAL 15 SENSE CIRCUIT CAS ERROR (SIG)

BMW Fault Code (hex)

0x2DC3

BMW Fault Code (dez)

11715

BMW Fault Code Description VS-Text

Monitoring, terminal 15

Component

No Info

Subcomponent

No Info

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P15B3: TERMINAL 15 SENSE CIRCUIT RANGE/PERFORMANCE (PLAUS)

BMW Fault Code (hex)

0x2DC3

BMW Fault Code (dez)

11715

BMW Fault Code Description VS-Text

Monitoring, terminal 15

Component

No Info

Subcomponent

No Info

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P160A: POWERMANAGEMENT EXHAUSTIVE DISCHARGE (MIN)

BMW Fault Code (hex)

0x2DEC

BMW Fault Code (dez)

11756

BMW Fault Code Description VS-Text

Power management, battery

Component

Powermanagement

Subcomponent

Electrical

Monitoring criteria

Deep discharge: Battery sensor data recognized under all conditions.

Fault debouncing

Deep discharge: 60 seconds below 9.52 V (debounced in SW)

Terminal conditions

none

Voltage conditions

Onboard electrical system voltage < 9.52 V

Temperature conditions

none

Time conditions

60 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

High energy consumption in parked vehicle leads to battery damage.

Repair procedures (plant/service)

Conduct energy diagnosis: Check control modules for standby current faults. Check battery's suitability for use, recharge or replace as indicated.

MIL illumination/CC message/emergency program

No CC message

Remarks

none

DTC P160B: POWERMANAGEMENT DEFECTIVE (PLAUS)**BMW Fault Code (hex)**

0x2DEC

BMW Fault Code (dez)

11756

BMW Fault Code Description VS-Text

Power management, battery

Component

Powermanagement

Subcomponent

Electrical

Monitoring criteria

is not now used

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

No CC message

Remarks

none

DTC P160C: POWERMANAGEMENT OVERVOLTAGE (MAX)

BMW Fault Code (hex)

0x2DEB

BMW Fault Code (dez)

11755

BMW Fault Code Description VS-Text

Power management, vehicle electrical system

Component

Powermanagement

Subcomponent

Electrical

Monitoring criteria

Overvoltage with engine running:

Fault debouncing

Voltage in onboard electrical system > K_OSPGAPP (16 V) for 10 sec. (debounced in SW)

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 16 V

Temperature conditions

none

Time conditions

10 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Defective alternator

Repair procedures (plant/service)

Perform alternator diagnosis.

MIL illumination/CC message/emergency program

No CC message

Remarks

none

DTC P160D: POWERMANAGEMENT UNDERVOLTAGE (MIN)**BMW Fault Code (hex)**

0x2DEB

BMW Fault Code (dez)

11755

BMW Fault Code Description VS-Text

Power management, vehicle electrical system

Component

Powermanagement

Subcomponent

Electrical

Monitoring criteria

Low voltage while engine is running

Fault debouncing

Vehicle electrical system voltage < K_USPGAPP (10.5 V) for 10 sec. (debounced in SW)

Terminal conditions

Terminal 15, engine on

Voltage conditions

Onboard electrical system voltage < 10.5 V

Temperature conditions

none

Time conditions

10 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Defective alternator

Repair procedures (plant/service)

Perform alternator diagnosis.

MIL illumination/CC message/emergency program

No CC message

Remarks

none

DTC P160E: POWERMANAGEMENT OPERATION WITHOUT BATTERY (SIG)

BMW Fault Code (hex)

0x2DEB

BMW Fault Code (dez)

11755

BMW Fault Code Description VS-Text

Power management, vehicle electrical system

Component

Powermanagement

Subcomponent

Electrical

Monitoring criteria

Operation without battery with engine running Voltage fluctuations caused by poor battery contacts

Fault debouncing

Vehicle electrical system voltage < K_USPGAPP (10.5V) for 10 sec. (debounced in SW)

Terminal conditions

Terminal 15, engine on

Voltage conditions

Substantial voltage fluctuations (10.5 V -14 V)

Temperature conditions

none

Time conditions

approximately 200 ms

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Battery not correctly connected.

Repair procedures (plant/service)

Check battery terminals

MIL illumination/CC message/emergency program

CC message 'Check battery connections'

Remarks

none

DTC P160F: POWERMANAGEMENT NO-LOAD CURRENT ERROR (PLAUS)

BMW Fault Code (hex)

0x2DED

BMW Fault Code (dez)

11757

BMW Fault Code Description VS-Text

Power management, closed-circuit current violation

Component

Powermanagement

Subcomponent

Electrical

Monitoring criteria

Standby current violation: Standby current draw exceeds approved level. Standby current is calculated only when ISD-BSD communications are not present - vehicle in sleep mode.

Fault debouncing

Vehicle in sleep mode

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

High energy draw when parked

Repair procedures (plant/service)

Conduct energy diagnosis:

MIL illumination/CC message/emergency program

CC message 'High battery discharge when parked'

Remarks

none

DTC P1618: CONTROL MODULE SELF-TEST, AD-CONVERTER MONITORING (PLAUS)

BMW Fault Code (hex)

0x2D5C

BMW Fault Code (dez)

11612

BMW Fault Code Description VS-Text

DME, internal fault: monitoring, hardware

Component

ECM Self-Test

Subcomponent

AD-Converter

Monitoring criteria

AD converter monitor. Comparison of two AD converter results

Fault debouncing

480 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

none

Time conditions

480 ms

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Internal control-module fault

Repair procedures (plant/service)

Replace DME

MIL illumination/CC message/emergency program

MIL OFF EML ON CC: Reduced power, engine malfunction RPM limited to 1300 rpm.

Remarks

AD converter monitor

DTC P1625: PEDAL POSITION SENSOR POTENTIOMETER SUPPLY CHANNEL 2 ELECTRICAL (PLAUS)

BMW Fault Code (hex)

0x2D1E

BMW Fault Code (dez)

11550

BMW Fault Code Description VS-Text

Accelerator-pedal module, pedal-position sensor 2, voltage supply

Component

Pedal Position Sensor

Subcomponent

E Electrical

Monitoring criteria

Pedal-position sensor monitor

Fault debouncing

0.02 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

none

Time conditions

220 ms

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short circuit to ground in voltage supply for Channel 2, defective voltage regulator, main relay activation lag

Repair procedures (plant/service)

1. Check fault memory for problem with throttle valve and/or main relay, replace main relay as indicated
2. Check power-supply wire for short to ground (also measure in PWG)
3. Replace DME

MIL illumination/CC message/emergency program

CC status report: Reduced engine power! EML ON restricted PW gradient and PW limit via RPM

Remarks

When relay is defective the fault appears together with throttle valve fault, the symptom being 'short circuit to ground', and fault in voltage supply to pedal-position sensor Channel 2.

DTC P1632: THROTTLE VALVE ADAPTATION CONDITIONS NOT MET (BANK 1) (MAX)**BMW Fault Code (hex)**

0x2CFB

BMW Fault Code (dez)

11515

BMW Fault Code Description VS-Text

Throttle-valve adaptation value

Component

Throttle Actuator

Subcomponent

Adaptation

Monitoring criteria

at time of adaptation request

Fault debouncing

none

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

Intake air temperature $> -10^{\circ}\text{C}$ or Coolant temperature $> -10^{\circ}\text{C}$ or Coolant temperature $< 142^{\circ}\text{C}$

Time conditions

80 ms after Terminal 15 ON

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Violation of adaptation conditions prior to completion of adaptation routine: Terminal 15 off or Electr. system voltage < 10 V or RPM > 32 RPM or Speed > 2 km/h or Throttle valve fault or PWM throttle valve control fault

Repair procedures (plant/service)

1. Check adaptation conditions, following confirmation proceed to terminal switch

MIL illumination/CC message/emergency program

CC status report: Reduction in engine performance!, MIL ON Throttle valve emergency default mode + speed governed to 1300 RPM

Remarks

Adaptation condition monitor

DTC P1633: THROTTLE VALVE ADAPTATION LIMP-HOME POSITION UNKNOWN (BANK 1) (MIN)

BMW Fault Code (hex)

0x2CFB

BMW Fault Code (dez)

11515

BMW Fault Code Description VS-Text

Throttle-valve adaptation value

Component

Throttle Actuator

Subcomponent

Adaptation

Monitoring criteria

Terminal change and request for adaptation

Fault debouncing

none

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

Intake air temperature > -10°C or Coolant temperature > -10°C or Coolant temperature < 142°C

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Not possible to initialize for emergency air position: Contact resistance in plug-in connection, throttle valve has electrical problem or mechanical seizure.

Repair procedures (plant/service)

1. Check: Sum of throttle valve voltages must equal 5 V
2. Perform electrical check on wires to throttle valve sensors, Visual inspection of plug-in terminals (on components, wiring harness and DME)
3. Component defect improbable, replace throttle valve only in emergency

MIL illumination/CC message/emergency program

CC status report: Reduced engine performance!, MIL ON EMB + RPM limit 1300 RPM

Remarks

Emergency air position adaptation monitor

DTC P1634: THROTTLE VALVE ADAPTATION SPRING TEST FAILED (BANK 1) (MAX)

BMW Fault Code (hex)

0x2CFC

BMW Fault Code (dez)

11516

BMW Fault Code Description VS-Text

Throttle valve, start check

Component

Throttle Actuator

Subcomponent

Adaptation

Monitoring criteria

Switch terminals

Fault debouncing

1 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

Intake air temperature $> -10^{\circ}\text{C}$ or Coolant temperature $> -10^{\circ}\text{C}$ or Coolant temperature $< 142^{\circ}\text{C}$

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

System fails spring test: Problem with voltage supply, Throttle valve is physically seizing or throttle valve motor is defective.

Repair procedures (plant/service)

1. Check engine-management fuses (5-fuse holder in E-Box)
2. Perform electrical check on wiring to throttle valve sensors and throttle valve motor
3. Visual inspection of plug-in terminals (at components, wiring harness and DME)
4. Replace component

MIL illumination/CC message/emergency program

CC status report: Reduced engine performance!, MIL ON EMB + RPM limit 1300 RPM

Remarks

Spring test, actually test to determine whether throttle valve is seizing

DTC P1635: THROTTLE VALVE ADAPTATION LOWER MECHANICAL STOP NOT ADAPTED (BANK 1) (MAX)

BMW Fault Code (hex)

0x2CFE

BMW Fault Code (dez)

11518

BMW Fault Code Description VS-Text

Throttle valve, continuous adaptation

Component

Throttle Actuator

Subcomponent

Adaptation

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P1636: THROTTLE VALVE CONTROL CIRCUIT (BANK 1) (SIG)

BMW Fault Code (hex)

0x2CEF

BMW Fault Code (dez)

11503

BMW Fault Code Description VS-Text

Throttle-valve actuator, activation

Component

Throttle Actuator

Subcomponent

Power Stage

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P1637: THROTTLE VALVE POSITION CONTROL, CONTROL DEVIATION (BANK 1) (MAX)

BMW Fault Code (hex)

0x2CEE

BMW Fault Code (dez)

11502

BMW Fault Code Description VS-Text

Throttle-valve actuator, sluggish movement

Component

Throttle Actuator

Subcomponent

Position Control

Monitoring criteria

Throttle valve test. Engine must be running. Throttle valve adaptation must not be in progress. Throttle valve actuator must be under current. No emergency default mode operation.

Fault debouncing

less than 1 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Problem with voltage supply, Mechanical binding in throttle valve assembly

Repair procedures (plant/service)

1. Check engine-management fuses (5-position fuse box in E-module)
2. Visual examination of contacts on throttle valve plug
3. Check throttle valve for binding and replace component as indicated

MIL illumination/CC message/emergency program

CC status report: WAL_1, reduced engine power!, MIL None activation control via lv_err_tps_obd, operation in emergency default mode if trigger point reached otherwise EMB + engine speed governed to 1300 RPM

Remarks

Control deviation TPS_SP to TPS_AV for longer than 1s in excess of 10°TPS

DTC P1638: THROTTLE VALVE POSITION CONTROL THROTTLE STUCK TEMPORARILY (BANK 1) (MAX)

BMW Fault Code (hex)

0x2CEC

BMW Fault Code (dez)

11500

BMW Fault Code Description VS-Text

Throttle-valve actuator, jamming briefly

Component

Throttle Actuator

Subcomponent

Throttle Stuck

Monitoring criteria

Throttle valve test. Engine must be running. Throttle valve adaptation must not be in progress. Throttle valve actuator must be under current. No emergency default mode operation

Fault debouncing

0.5 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Problem with voltage supply, throttle valve physically seized

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

Pulse-duty factor for control activation of throttle valve motor at least 0.5 sec, but less than 1 sec. over 99%

DTC P1639: THROTTLE VALVE POSITION CONTROL THROTTLE STUCK PERMANENTLY (BANK 1) (MAX)

BMW Fault Code (hex)

0x2CED

BMW Fault Code (dez)

11501

BMW Fault Code Description VS-Text

Throttle-valve actuator, jamming continuously

Component

Throttle Actuator

Subcomponent

Throttle Stuck

Monitoring criteria

Throttle valve test. Engine must be running. Throttle valve adaptation must not be in progress. Throttle valve actuator must be under current. No emergency default mode operation

Fault debouncing

1 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Problem with voltage supply, throttle valve physically seized

Repair procedures (plant/service)

1. Check engine-management fuses (5-fuse holder in E module)

2. Visual inspection of throttle valve plug contacts and electrical check on throttle valve motor wires
3. Check throttle valve for binding and replace component as indicated

MIL illumination/CC message/emergency program

CC status report: WAL_1, reduced engine power!, MIL None activation control via lv_err_tps_obd, operation in emergency default mode if trigger point reached otherwise EMB + engine speed governed to 1300 RPM

Remarks

Pulse-duty factor for control of throttle valve motor exceeds 1s over 99%

DTC P1644: THROTTLE VALVE ADAPTATION STOP RELEARNING LOWER MECHANICAL STOP (BANK 1) (PLAUS)

BMW Fault Code (hex)

0x2CFB

BMW Fault Code (dez)

11515

BMW Fault Code Description VS-Text

Throttle-valve adaptation value

Component

Throttle Actuator

Subcomponent

Adaptation

Monitoring criteria

Terminal change and request for adaptation

Fault debouncing

none

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

Intake air temperature $> -10^{\circ}\text{C}$ or Coolant temperature $> -10^{\circ}\text{C}$ or Coolant temperature $< 142^{\circ}\text{C}$

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

System unable to initialize for lower mechanical travel stop position: Contact resistance in plug-in connection. Throttle valve is contaminated, has electrical problem or mechanical seizure

Repair procedures (plant/service)

1. Check: Sum of throttle valve voltages must equal 5 V
2. Perform electrical check on wires to throttle valve sensors, visual inspection of plug-in terminals (at components, wiring harness and DME)
3. Check to determine whether objects that could physically prevent the throttle valve from closing are present in the intake manifold or throttle valve
4. Replace component

MIL illumination/CC message/emergency program

CC status report: Reduced engine performance!, MIL ON EMB + RPM limit 1300 RPM

Remarks

Lower mechanical travel stop monitor

DTC P164C: PEDAL POSITION SENSOR POTENTIOMETER SUPPLY CHANNEL 1 ELECTRICAL (PLAUS)

BMW Fault Code (hex)

0x2D1D

BMW Fault Code (dez)

11549

BMW Fault Code Description VS-Text

Accelerator-pedal module, pedal-position sensor 1, voltage supply

Component

Pedal Position Sensor

Subcomponent

D Electrical

Monitoring criteria

Pedal-position sensor monitor

Fault debouncing

0.02 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

none

Time conditions

220 ms

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short circuit to ground in voltage supply for Channel 1, defective voltage regulator, main relay activation lag

Repair procedures (plant/service)

1. Check fault memory for problem with throttle valve and/or main relay, replace main relay as indicated
2. Check power-supply wire for short to ground (also measure in PWG)
3. Replace DME

MIL illumination/CC message/emergency program

CC status report: Reduced engine power! EML ON restricted PW gradient and PW limit via RPM

Remarks

ATTENTION: This fault can produce throttle valve fault and HFM fault with the symptom 'short to ground' as collateral fault. When relay is defective this fault appears together with throttle valve fault, the symptom being 'short circuit to ground', and fault in voltage supply to pedal-position sensor Channel 2.

DTC P165A: EWS (ELECTRONIC IMMOBILIZER) INTERFACE TO ECM, HARDWARE ERROR (MAX)

BMW Fault Code (hex)

0x2F4A

BMW Fault Code (dez)

12106

BMW Fault Code Description VS-Text

Interface EWS-DME

Component

No Info

Subcomponent

No Info

Monitoring criteria

EWS code request

Fault debouncing

2

Terminal conditions

Terminal 15 on without running engine

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

CAS bus telegram

Calculated value Y/N

N

Possible Fault Causes

Signal interference on D_EWS wire.

Repair procedures (plant/service)

Problem diagnosis on wire, then DME/DDE problem diagnosis.

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P165B: EWS (ELECTRONIC IMMOBILIZER) INTERFACE TO ECM, CHECKSUM ERROR (PLAUS)

BMW Fault Code (hex)

0x2F4A

BMW Fault Code (dez)

12106

BMW Fault Code Description VS-Text

Interface EWS-DME

Component

No Info

Subcomponent

No Info

Monitoring criteria

EWS code request

Fault debouncing

2

Terminal conditions

Terminal 15 on without running engine

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

CAS bus telegram

Calculated value Y/N

N

Possible Fault Causes

Telegram structure not as expected

Repair procedures (plant/service)

Continue problem diagnosis with CAS

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P165C: EWS (ELECTRONIC IMMOBILIZER) DATA, NO AVAILABLE STORAGE POSSIBILITY (MAX)

BMW Fault Code (hex)

0x2F4B

BMW Fault Code (dez)

12107

BMW Fault Code Description VS-Text

DME, internal fault: immobilizer data

Component

No Info

Subcomponent

No Info

Monitoring criteria

Calibration procedure

Fault debouncing

1

Terminal conditions

Terminal 15

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Storage for EWS calibration not available

Repair procedures (plant/service)

Replace DME

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P165D: EWS (ELECTRONIC IMMOBILIZER) DATA, FAULTY RELEASE CODE STORAGE (MIN)

BMW Fault Code (hex)

0x2F4B

BMW Fault Code (dez)

12107

BMW Fault Code Description VS-Text

DME, internal fault: immobilizer data

Component

No Info

Subcomponent

No Info

Monitoring criteria

Calibration procedure

Fault debouncing

1

Terminal conditions

Terminal 15

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Enable code storage defective

Repair procedures (plant/service)

Replace DME

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P165E: EWS (ELECTRONIC IMMOBILIZER) DATA, CHECKSUM ERROR (PLAUS)

BMW Fault Code (hex)

0x2F4B

BMW Fault Code (dez)

12107

BMW Fault Code Description VS-Text

DME, internal fault: immobilizer data

Component

No Info

Subcomponent

No Info

Monitoring criteria

Terminal 15

Fault debouncing

1

Terminal conditions

Terminal 15

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Fault in checksum for EWS data content

Repair procedures (plant/service)

Replace DME, if fault occurs repeatedly

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P165F: INTERNAL CONTROL MODULE MEASUREMENT ERROR OXYGEN SENSOR HEATING (BANK 1, SENSOR 1) (SIG)

BMW Fault Code (hex)

0x2CA6

BMW Fault Code (dez)

11430

BMW Fault Code Description VS-Text

Oxygen sensor heating before catalytic converter, function

Component

Oxygen Sensor, Front

Subcomponent

ECM Self-Test

Monitoring criteria

Internal control-module fault, attempt to determine O2 sensor temperature failed. No fault memories.

Fault debouncing

Processor chip monitor, no valid temperature for more than 5 sec.

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

none

Time conditions

Roughly 40 sec. after engine start; after approximately 15 sec. in standard operation.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Invalid sensor temperature. Defective processing chip in control module.

Repair procedures (plant/service)

Replace DME

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P1660: EWS (ELECTRONIC IMMOBILIZER) TELEGRAM ERROR (MIN)

BMW Fault Code (hex)

0x2F4A

BMW Fault Code (dez)

12106

BMW Fault Code Description VS-Text

Interface EWS-DME

Component

No Info

Subcomponent

No Info

Monitoring criteria

EWS code request

Fault debouncing

2

Terminal conditions

Terminal 15 on without running engine

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

CAS bus telegram

Calculated value Y/N

N

Possible Fault Causes

Telegram structure not as expected

Repair procedures (plant/service)

Continue problem diagnosis with CAS

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P1661: TIMEOUT EWS (ELECTRONIC IMMOBILIZER) - TELEGRAM (SIG)

BMW Fault Code (hex)

0x2F4A

BMW Fault Code (dez)

12106

BMW Fault Code Description VS-Text

Interface EWS-DME

Component

No Info

Subcomponent

No Info

Monitoring criteria

EWS code request

Fault debouncing

2

Terminal conditions

Terminal 15 on without running engine

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

CAS bus telegram

Calculated value Y/N

N

Possible Fault Causes

Wiring harness defect in wire D_EWS; CAS defect; DME/DDE defect

Repair procedures (plant/service)

Check D_EWS wire

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P1667: EWS (ELECTRONIC IMMOBILIZER) START VALUE NOT YET PROGRAMMED (MIN)

BMW Fault Code (hex)

0x2F49

BMW Fault Code (dez)

12105

BMW Fault Code Description VS-Text

EWS preventing manipulation

Component

No Info

Subcomponent

No Info

Monitoring criteria

none

Fault debouncing

1

Terminal conditions

Terminal 15

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

No start value yet programmed.

Repair procedures (plant/service)

Program start value

MIL illumination/CC message/emergency program

none

Remarks

Start data can only be programmed at the factory

DTC P1667: EWS (ELECTRONIC IMMOBILIZER) START VALUE NOT YET PROGRAMMED (PLAUS)

BMW Fault Code (hex)

0x2F49

BMW Fault Code (dez)

12105

BMW Fault Code Description VS-Text

EWS preventing manipulation

Component

No Info

Subcomponent

No Info

Monitoring criteria

none

Fault debouncing

1

Terminal conditions

Terminal 15

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Content of telegram transmitted by CAS is not as expected

Repair procedures (plant/service)

Replace CAS/EWS and DME/DDE

MIL illumination/CC message/emergency program

none

Remarks

New control modules can only be calibrated at the factory; the control modules were mutually switched.

DTC P1668: EWS (ELECTRONIC IMMOBILIZER) START VALUE DESTROYED (SIG)

BMW Fault Code (hex)

0x2F4B

BMW Fault Code (dez)

12107

BMW Fault Code Description VS-Text

DME, internal fault: immobilizer data

Component

No Info

Subcomponent

No Info

Monitoring criteria

Terminal 15

Fault debouncing

1

Terminal conditions

Terminal 15

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Secret Key storage defective

Repair procedures (plant/service)

Replace DME, if fault occurs repeatedly

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P166A: CONTROL MODULE SELF-TEST, LDM (LONGITUDINAL DYNAMICS MANAGEMENT) MONITORING (SIG)

BMW Fault Code (hex)

0x2D50

BMW Fault Code (dez)

11600

BMW Fault Code Description VS-Text

DME, internal fault: monitoring, cruise control

Component

No Info

Subcomponent

No Info

Monitoring criteria

Control module monitoring. Throttle valve not without current, LDM initialized. Interface fails to detect

implausible torque demand.

Fault debouncing

480 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

none

Time conditions

480 ms

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Unrecognized implausible torque demand, internal control-module fault.

Repair procedures (plant/service)

Check CAN, LDM control module If frequency is ≥ 3 . Replace DME

MIL illumination/CC message/emergency program

MIL OFF EML OFF CC: Vehicle speed control. Vehicle speed controller is rejected.

Remarks

LDM torque demand monitor

DTC P166B: LDM (LONGITUDINAL DYNAMICS MANAGEMENT) TORQUE REQUEST IN SPITE OF BRAKE SIGNAL (MAX)

BMW Fault Code (hex)

0x2DC0

BMW Fault Code (dez)

11712

BMW Fault Code Description VS-Text

No message from LDM

Component

No Info

Subcomponent

No Info

Monitoring criteria

LDM recognized

Fault debouncing

none

Terminal conditions

Terminal 15 ON

Voltage conditions

none

Temperature conditions

none

Time conditions

500 ms

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

LDM fails to deactivate despite pressure on brake pedal

Repair procedures (plant/service)

Check LDM and brakelight switch/wiring

MIL illumination/CC message/emergency program

none

Remarks

Breakpoint: Program version '600'

**DTC P166C: LDM (LONGITUDINAL DYNAMICS MANAGEMENT) TORQUE REQUEST
IMPLAUSIBLE (PLAUS)**

BMW Fault Code (hex)

0x2DC0

BMW Fault Code (dez)

11712

BMW Fault Code Description VS-Text

No message from LDM

Component

No Info

Subcomponent

No Info

Monitoring criteria

LDM recognized

Fault debouncing

none

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

80 ms

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

LDM transmits implausible request

Repair procedures (plant/service)

Check LDM and replace as indicated

MIL illumination/CC message/emergency program

none

Remarks

Breakpoint: Program version '600'

DTC P166F: INTERNAL CONTROL MODULE MEASUREMENT ERROR OXYGEN SENSOR HEATING (BANK 2, SENSOR 1) (SIG)

BMW Fault Code (hex)

0x2CA7

BMW Fault Code (dez)

11431

BMW Fault Code Description VS-Text

Oxygen sensor heating before catalytic converter 2, function

Component

Oxygen Sensor, Front

Subcomponent

ECM Self-Test

Monitoring criteria

Internal control-module fault, attempt to determine O2 sensor temperature failed. No fault memories

Fault debouncing

Processor chip monitor, no valid temperature for more than 5 sec.

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

none

Time conditions

Roughly 40 sec. after engine start; after approximately 15 sec. in standard operation

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Invalid sensor temperature. Defective processing chip in control module

Repair procedures (plant/service)

Replace DME

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P1675: THROTTLE VALVE ACTUATOR START TEST RE-ADAPTATION REQUIRED (MAX)

BMW Fault Code (hex)

0x2CFD

BMW Fault Code (dez)

11517

BMW Fault Code Description VS-Text

No throttle-valve adaptation value

Component

Throttle Actuator

Subcomponent

Adaptation

Monitoring criteria

Switch terminals

Fault debouncing

1 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

Intake air temperature $> -10^{\circ}\text{C}$ or Coolant temperature $> -10^{\circ}\text{C}$ or Coolant temperature $< 142^{\circ}\text{C}$

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Not possible to initialize for emergency air position: Contact resistance in plug-in connection, throttle valve has electrical problem or mechanical seizure.

Repair procedures (plant/service)

1. Note collateral issues related to initial adaptation
2. Check: The sum of throttle valve voltages must equal 5 V
3. Perform electrical check on wiring to throttle valve sensors and throttle valve motor, visual inspection of plug-in contacts (at component, wiring harness and DME)
4. Replace component

MIL illumination/CC message/emergency program

CC status report: Reduced engine performance!, MIL ON EMB + RPM limit 1300 RPM

Remarks

Not possible to initialize for emergency air position, leading to demand for basic adaptation

DTC P1694: THROTTLE VALVE ACTUATOR START TEST SPRING TEST AND LIMP-HOME POSITION FAILED (SIG)

BMW Fault Code (hex)

0x2CFB

BMW Fault Code (dez)

11515

BMW Fault Code Description VS-Text

Throttle-valve adaptation value

Component

Throttle Actuator

Subcomponent

Spring Test

Monitoring criteria

Terminal change and request for adaptation

Fault debouncing

none

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

Intake air temperature $> -10^{\circ}\text{C}$ or Coolant temperature $> -10^{\circ}\text{C}$ or Coolant temperature $< 142^{\circ}\text{C}$

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Emergency air position outside tolerance range or spring test failed: Problem with voltage supply. Contact resistance in plug-in connection. Throttle valve is physically seizing or electrical problem.

Repair procedures (plant/service)

1. Check engine-management fuses (5-fuse holder in EBOX)
2. Check: The sum of throttle valve voltages must equal 5 V
3. Perform electrical check on wiring to throttle valve sensors and throttle valve motor
4. Visual inspection of plug-in contacts (at component, wiring harness and DME)
5. Replace component

MIL illumination/CC message/emergency program

CC status report: Reduced engine performance!, MIL ON EMB + RPM limit 1300 RPM

Remarks

Spring test and check on emergency air position

DTC P169A: THROTTLE VALVE ACTUATOR START TEST LIMP-HOME POSITION FAILED (MIN)

BMW Fault Code (hex)

0x2CFC

BMW Fault Code (dez)

11516

BMW Fault Code Description VS-Text

Throttle valve, start check

Component

Throttle Actuator

Subcomponent

Adaptation

Monitoring criteria

Switch terminals

Fault debouncing

1 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

Intake air temperature $> -10^{\circ}\text{C}$ or Coolant temperature $> -10^{\circ}\text{C}$ or Coolant temperature $< 142^{\circ}\text{C}$

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Emergency air position outside approved tolerance range: Contact resistance in plug connector, throttle valve with electrical problem or seizing mechanically.

Repair procedures (plant/service)

1. Check: Sum of throttle valve voltages must equal 5 V
2. Perform electrical check on wires to throttle valve sensors
3. Visual inspection of plug-in terminals (at components, wiring harness and DME)
4. Component defect is unlikely, replace throttle valve only in an emergency

MIL illumination/CC message/emergency program

CC status report: Reduced engine performance!, MIL ON EMB + RPM limit 1300 RPM

Remarks

Check emergency air position

DTC P16A0: INTERNAL CONTROL MODULE MEMORY CHECK SUM ERROR IN BOOT SOFTWARE (MAX)

BMW Fault Code (hex)

0x2AB3

BMW Fault Code (dez)

10931

BMW Fault Code Description VS-Text

DME, internal fault: checksum

Component

ECM/TCM

Subcomponent

Checksum

Monitoring criteria

Monitoring of boot software. After system start with ignition on

Fault debouncing

No debounce. Fault can be reset by clearing fault memory. However, a successful diagnostic cycle must be completed before the fault can be deleted. This can take several minutes.

Terminal conditions

Terminal 15 ON

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Fault in boot software (program code). Incorrect program version flash-programmed.

Repair procedures (plant/service)

Flash program correct program version.

MIL illumination/CC message/emergency program

none

Remarks

Engine operation no longer possible

DTC P16A1: INTERNAL CONTROL MODULE MEMORY CHECK SUM ERROR IN APPLICATION SOFTWARE (MIN)

BMW Fault Code (hex)

0x2AB3

BMW Fault Code (dez)

10931

BMW Fault Code Description VS-Text

DME, internal fault: checksum

Component

ECM/TCM

Subcomponent

Checksum

Monitoring criteria

Application software program monitor (development only)

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Fault in application software (program code). Incorrect program version flash-programmed.

Repair procedures (plant/service)

Flash program correct program version.

MIL illumination/CC message/emergency program

none

Remarks

Engine operation no longer possible

DTC P16A2: INTERNAL CONTROL MODULE MEMORY CHECK SUM ERROR IN DATA (SIG)

BMW Fault Code (hex)

0x2AB3

BMW Fault Code (dez)

10931

BMW Fault Code Description VS-Text

DME, internal fault: checksum

Component

ECM/TCM

Subcomponent

Checksum

Monitoring criteria

Application software data monitor (development only)

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Fault in application data (data file) The wrong data version has been flash-programmed

Repair procedures (plant/service)

Flash program correct software revision.

MIL illumination/CC message/emergency program

none

Remarks

Engine operation no longer possible

DTC P16A3: INTERNAL CONTROL MODULE NON-VOLATILE MEMORY (NVMY) ERROR (MAX)

BMW Fault Code (hex)

0x2AB4

BMW Fault Code (dez)

10932

BMW Fault Code Description VS-Text

DME, internal fault: RAM checksum

Component

ECM/TCM

Subcomponent

NVMY

Monitoring criteria

RAM checksum test. This test is executed once, while the control module is booting.

Fault debouncing

No debounce. Fault can be reset by clearing fault memory.

Terminal conditions

Immediately after wakeup in dormant control module.

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Defective data sector in DME's internal EEPROM. Poor or loose ground connections for the ignition coils.

Repair procedures (plant/service)

Start by checking ground connections on the ignition coils. If these are OK, proceed with the following steps. Check to determine whether the diagnostic fault code is stored again after proceeding through the following routine. If yes: Replace DME.

1. Clear fault memory
2. Ignition off, allow vehicle to assume complete dormant status
3. Ignition on
4. Read out stored fault codes from fault memory

MIL illumination/CC message/emergency program

none

Remarks

Possible loss of adaptation data. The following procedure can be used to reprogram the adaptation data:

1. Delete all adaptation data
2. Ignition off and then on
3. Brief drive. Adaptation data are reprogrammed automatically.

DTC P16A4: TIMEOUT CONTROL MODULE KNOCK SENSOR SPI-BUS (SIG)

BMW Fault Code (hex)

0x2AB5

BMW Fault Code (dez)

10933

BMW Fault Code Description VS-Text

DME, internal fault: knock-sensor module

Component

ECM

Subcomponent

Knock Sensor

Monitoring criteria

Monitoring of knock sensor chip Engine speed >320 rpm

Fault debouncing

Yes, by event counter. Fault must occur ten times before a fault memory entry is made.

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Interference at internal DME data bus (SPI_BUS) for processing chip for the knock sensors.

Repair procedures (plant/service)

Determine whether fault is stored again after carrying out the following procedure. If yes: Replace DME.

1. Clear fault memory
2. Ignition off, allow vehicle to assume complete dormant status
3. Ignition on
4. Read out stored fault codes from fault memory

MIL illumination/CC message/emergency program

none

Remarks

No warning message. No closed-loop knock control available. Performance loss as engine reverts to operation in safe range.

DTC P16A5: TIMEOUT CONTROL MODULE MULTIPLE OUTPUT STAGE SPI-BUS (SIG)

BMW Fault Code (hex)

0x2AB6

BMW Fault Code (dez)

10934

BMW Fault Code Description VS-Text

DME, internal fault: multiple output-stage module

Component

ECM

Subcomponent

Multiple Output Stage

Monitoring criteria

Driver circuit monitor

Fault debouncing

Yes, by event counter. Fault must occur ten times before a fault memory entry is made.

Terminal conditions

Terminal 15 ON

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Interference at internal DME data bus (SPI_BUS) for activation of driver circuits.

Repair procedures (plant/service)

Determine whether fault is stored again after carrying out the following procedure. If yes: Replace DME.

1. Clear fault memory
2. Ignition off, allow vehicle to assume complete dormant status
3. Ignition on
4. Read out stored fault codes from fault memory

MIL illumination/CC message/emergency program

No warning message. No control activation possible from some DME output terminals.

Remarks

none

DTC P16A6: CONTROL MODULE SELF-TEST, CRUISE CONTROL MONITORING (MAX)

BMW Fault Code (hex)

0x2D50

BMW Fault Code (dez)

11600

BMW Fault Code Description VS-Text

DME, internal fault: monitoring, cruise control

Component

No Info

Subcomponent

No Info

Monitoring criteria

Control module monitoring. Throttle valve not without current; Failure to comply with activation conditions for internal vehicle speed controller

Fault debouncing

480 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

none

Time conditions

480 ms

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Malfunction symptoms: No deactivation possible; Speed too low, brake activation, main switch operation

Repair procedures (plant/service)

Check speed signal, brake light switch, main cruise control switch. If frequency is ≥ 3 Replace DME

MIL illumination/CC message/emergency program

MIL OFF EML OFF CC: Vehicle speed control Vehicle speed controller is rejected

Remarks

Internal cruise control monitor

DTC P16A7: CONTROL MODULE SELF-TEST, HOT FILM AIR MASS METER MONITORING (MAX)

BMW Fault Code (hex)

0x2D51

BMW Fault Code (dez)

11601

BMW Fault Code Description VS-Text

Monitoring, air path

Component

ECM Self-Test

Subcomponent

HFM

Monitoring criteria

Control module monitoring. Throttle valve not without current; Air mass is implausible relative to injected fuel volume

Fault debouncing

4 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

none

Time conditions

4 sec.

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

HFM fault or fuel path fault not detected by diagnosis utility, internal control-module fault.

Repair procedures (plant/service)

Check air and fuel path. If frequency is > 3 Replace DME.

MIL illumination/CC message/emergency program

MIL OFF EML ON CC: Reduced power, engine malfunction RPM limited to 1300 RPM.

Remarks

Mass airflow monitor

DTC P16A8: CONTROL MODULE SELF-TEST, THROTTLE POSITION MONITORING (MIN)

BMW Fault Code (hex)

0x2D51

BMW Fault Code (dez)

11601

BMW Fault Code Description VS-Text

Monitoring, air path

Component

ECM Self-Test

Subcomponent

Throttle Valve

Monitoring criteria

Control module monitoring. Throttle valve is not without current; Throttle valve sensor fault not detected by standard diagnosis.

Fault debouncing

480 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

none

Time conditions

480 ms

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Throttle valve sensor fault not detected by diagnosis, internal control-module fault.

Repair procedures (plant/service)

Check throttle-valve potentiometer. At frequency > 3 . Replace DME.

MIL illumination/CC message/emergency program

MIL OFF. EML ON. CC: Reduced power, engine malfunction RPM limited to 1300 RPM.

Remarks

TPS sensor monitor

DTC P16A9: CONTROL MODULE SELF-TEST, SPEED MONITORING RESET (PLAUS)

BMW Fault Code (hex)

0x2D52

BMW Fault Code (dez)

11602

BMW Fault Code Description VS-Text

DME, internal fault: monitoring, engine speed

Component

ECM Self-Test

Subcomponent

RPM

Monitoring criteria

Control module monitor. Modeled RPM from segment time is compared with crankshaft RPM.

Fault debouncing

480 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

none

Time conditions

480 ms

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Internal control-module fault

Repair procedures (plant/service)

If frequency ≥ 3 . Replace DME.

MIL illumination/CC message/emergency program

MIL OFF. EML ON. CC: Reduced power, engine malfunction RPM limited to 1300 rpm.

Remarks

RPM monitor

DTC P16B0: CONTROL MODULE SELF-TEST, PEDAL POSITION SENSOR MONITORING (PLAUS)

BMW Fault Code (hex)

0x2D55

BMW Fault Code (dez)

11605

BMW Fault Code Description VS-Text

DME, internal fault: monitoring, accelerator-pedal module

Component

ECM Self-Test

Subcomponent

Pedal Position Sensor

Monitoring criteria

Control module monitor Comparison PWG sensor voltage above threshold

Fault debouncing

480 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

none

Time conditions

480 ms

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

PWG fault not detected by diagnosis, internal control-module fault

Repair procedures (plant/service)

If frequency ≥ 3 , Replace DME

MIL illumination/CC message/emergency program

MIL OFF, EML ON, CC: Reduced power, engine malfunction RPM limited to 1300 rpm.

Remarks

Accelerator pedal module monitor

DTC P16B1: CONTROL MODULE SELF-TEST, IDLE AIR CONTROL SYSTEM INTEGRATED COMPONENT PLAUSIBILITY (MAX)

BMW Fault Code (hex)

0x2D56

BMW Fault Code (dez)

11606

BMW Fault Code Description VS-Text

DME, internal fault: monitoring, idle air control

Component

ECM Self-Test

Subcomponent

Idle Speed Control

Monitoring criteria

Control module monitor. Throttle valve not without current. With I component LL controller implausible or specified LL RPM is too high.

Fault debouncing

480 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

none

Time conditions

480 ms

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Internal control-module fault

Repair procedures (plant/service)

If frequency ≥ 3 Replace DME

MIL illumination/CC message/emergency program

MIL OFF, EML ON, CC: Reduced power, engine malfunction RPM limited to 1300 RPM.

Remarks

Idle controller I element monitor

DTC P16B2: CONTROL MODULE SELF-TEST, IDLE AIR CONTROL SYSTEM PD-COMPONENT PLAUSIBILITY (MIN)

BMW Fault Code (hex)

0x2D56

BMW Fault Code (dez)

11606

BMW Fault Code Description VS-Text

DME, internal fault: monitoring, idle air control

Component

ECM Self-Test

Subcomponent

Idle Speed Control

Monitoring criteria

Control module monitor. Throttle valve not without current With PD component LL controller implausible or specified LL RPM is too high.

Fault debouncing

480 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

none

Time conditions

480 ms

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Internal control-module fault

Repair procedures (plant/service)

If frequency ≥ 3 Replace DME

MIL illumination/CC message/emergency program

MIL OFF, EML ON, CC: Reduced power, engine malfunction RPM limited to 1300 rpm.

Remarks

Idle controller PD element monitor

DTC P16B3: CONTROL MODULE SELF-TEST, MSR (ENGINE-DRAG-TORQUE CONTROL) MONITORING (MAX)

BMW Fault Code (hex)

0x2D57

BMW Fault Code (dez)

11607

BMW Fault Code Description VS-Text

DME, internal fault: monitoring, external torque request

Component

No Info

Subcomponent

No Info

Monitoring criteria

Control module monitor. Throttle valve not without current. Interface fails to detect implausible torque demand.

Fault debouncing

480 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

none

Time conditions

480 ms

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Unrecognized implausible torque demand, internal control-module fault.

Repair procedures (plant/service)

Check CAN, MSR control module If frequency is ≥ 3 , Replace DME.

MIL illumination/CC message/emergency program

MIL OFF, EML OFF, CC: ??? DSC cancelled.

Remarks

MSR demand monitor

DTC P16B4: CONTROL MODULE SELF-TEST, DCC (DYNAMIC CRUISE CONTROL) MONITORING (MIN)

BMW Fault Code (hex)

0x2D50

BMW Fault Code (dez)

11600

BMW Fault Code Description VS-Text

DME, internal fault: monitoring, cruise control

Component

No Info

Subcomponent

No Info

Monitoring criteria

Control module monitoring. Throttle valve not without current ACC/DCC initialized; Interface fails to detect implausible torque demand.

Fault debouncing

480 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

none

Time conditions

480 ms

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Unrecognized implausible torque demand, internal control-module fault

Repair procedures (plant/service)

Check CAN, ACC/DCC control module. If frequency is ≥ 3 Replace DME

MIL illumination/CC message/emergency program

MIL OFF, EML OFF, CC: Vehicle speed control. Vehicle speed controller is rejected.

Remarks

ACC/DCC torque demand monitor

DTC P16B5: CONTROL MODULE SELF-TEST, AMT (AUTOMATIC MANUAL TRANSMISSION) MONITORING (SIG)

BMW Fault Code (hex)

0x2D57

BMW Fault Code (dez)

11607

BMW Fault Code Description VS-Text

DME, internal fault: monitoring, external torque request

Component

No Info

Subcomponent

No Info

Monitoring criteria

Control module monitor Interface fails to detect implausible torque demand

Fault debouncing

480 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

none

Time conditions

480 ms

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Unrecognized implausible torque demand, internal control-module fault.

Repair procedures (plant/service)

Check CAN, SMG control module. If frequency is ≥ 3 Replace DME.

MIL illumination/CC message/emergency program

MIL OFF EML OFF CC: ??? SMG cancelled.

Remarks

SMG demand monitor

DTC P16B6: CONTROL MODULE SELF-TEST, ETC MONITORING (PLAUS)

BMW Fault Code (hex)

0x2D57

BMW Fault Code (dez)

11607

BMW Fault Code Description VS-Text

DME, internal fault: monitoring, external torque request

Component

No Info

Subcomponent

No Info

Monitoring criteria

Control module monitor. Interface fails to detect implausible torque demand

Fault debouncing

480 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

none

Time conditions

480 ms

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Unrecognized implausible torque demand, internal control-module fault

Repair procedures (plant/service)

Check CAN, EGS control module If frequency is ≥ 3 Replace DME.

MIL illumination/CC message/emergency program

MIL OFF EML OFF CC: ??? EGS cancelled.

Remarks

EGS demand monitor

DTC P16B7: CONTROL MODULE SELF-TEST, CLUTCH TORQUE MONITORING MAXIMUM VALUE PLAUSIBILITY (MAX)

BMW Fault Code (hex)

0x2D58

BMW Fault Code (dez)

11608

BMW Fault Code Description VS-Text

DME, internal fault: monitoring, nominal torque

Component

ECM Self-Test

Subcomponent

Clutch Torque

Monitoring criteria

Control module monitor. Throttle valve not without current. Calculated maximum clutch torque too high

Fault debouncing

480 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

none

Time conditions

480 ms

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Internal control-module fault

Repair procedures (plant/service)

If frequency ≥ 3 Replace DME

MIL illumination/CC message/emergency program

MIL OFF, EML ON, CC: Reduced power, engine malfunction RPM limited to 1300 rpm.

Remarks

Maximum clutch torque monitor

DTC P16B8: CONTROL MODULE SELF-TEST, CLUTCH TORQUE MONITORING MINIMUM VALUE PLAUSIBILITY (MIN)

BMW Fault Code (hex)

0x2D58

BMW Fault Code (dez)

11608

BMW Fault Code Description VS-Text

DME, internal fault: monitoring, nominal torque

Component

ECM Self-Test

Subcomponent

Clutch Torque

Monitoring criteria

Control module monitor. Throttle valve not without current. Calculated minimum clutch torque too high.

Fault debouncing

480 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

none

Time conditions

480 ms

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Internal control-module fault

Repair procedures (plant/service)

If frequency ≥ 3 Replace DME

MIL illumination/CC message/emergency program

MIL OFF, EML ON, CC: Reduced power, engine malfunction RPM limited to 1300 rpm.

Remarks

Minimum clutch torque monitor

DTC P16B9: CONTROL MODULE SELF-TEST, TORQUE LOSS MONITORING (SIG)

BMW Fault Code (hex)

0x2D58

BMW Fault Code (dez)

11608

BMW Fault Code Description VS-Text

DME, internal fault: monitoring, nominal torque

Component

ECM Self-Test

Subcomponent

Torque Loss

Monitoring criteria

Control module monitor. Throttle valve not without current. Calculation fault, calculated torque loss too high.

Fault debouncing

480 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

none

Time conditions

480 ms

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Internal control-module fault, implausible thermal conditions.

Repair procedures (plant/service)

Check temperature sensors (oil/coolant). If frequency is ≥ 3 Replace DME.

MIL illumination/CC message/emergency program

MIL OFF, EML ON, CC: Reduced power, engine malfunction RPM limited to 1300 rpm.

Remarks

Torque loss monitor

DTC P16C0: CONTROL MODULE SELF-TEST, DRIVING DYNAMICS CONTROL SWITCH MONITORING (PLAUS)**BMW Fault Code (hex)**

0x2D58

BMW Fault Code (dez)

11608

BMW Fault Code Description VS-Text

DME, internal fault: monitoring, nominal torque

Component

ECM Self-Test

Subcomponent

Driving Dynamics

Monitoring criteria

Always SPORT switch monitor. Sport switch voltages are not plausible and not detected by diagnosis utility.

Fault debouncing

480 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

none

Time conditions

480 ms

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Internal control-module fault

Repair procedures (plant/service)

If frequency ≥ 3 Replace DME

MIL illumination/CC message/emergency program

MIL OFF EML ON CC: Reduced power, engine malfunction RPM limited to 1300 rpm

Remarks

Sport button monitor

DTC P16C1: CONTROL MODULE SELF-TEST, TORQUE MONITORING CURRENT INDICATED VALUE PLAUSIBILITY (PLAUS)

BMW Fault Code (hex)

0x2D59

BMW Fault Code (dez)

11609

BMW Fault Code Description VS-Text

DME, internal fault: monitoring, actual torque

Component

ECM Self-Test

Subcomponent

Engine Torque

Monitoring criteria

Throttle valve not without current. Driver torque demand is being exceeded.

Fault debouncing

480 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

none

Time conditions

480 ms

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Internal control-module fault, major variation between specified and actual mass airflow

Repair procedures (plant/service)

Check mass airflow system (vacuum leaks, VVT, VANOS, throttle valve...). If frequency is ≥ 3 Replace DME

MIL illumination/CC message/emergency program

MIL OFF, EML ON, CC: Reduced power, engine malfunction RPM limited to 1300 rpm.

Remarks

Current induced engine torque monitor

DTC P16C1: CONTROL MODULE SELF-TEST, TORQUE MONITORING CURRENT INDICATED VALUE PLAUSIBILITY (PLAUS)

BMW Fault Code (hex)

0x2D5A

BMW Fault Code (dez)

11610

BMW Fault Code Description VS-Text

Monitoring engine torque limiting

Component

No Info

Subcomponent

No Info

Monitoring criteria

No interruption of current to throttle valve

Fault debouncing

Driver torque demand is exceeded => Torque limitation; fault entry after 7s

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

none

Time conditions

7 sec.

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Internal control-module fault, major variation between specified and actual mass airflow

Repair procedures (plant/service)

Check mass airflow system (HFM, vacuum leak, VVT, VANOS, throttle valve...)

MIL illumination/CC message/emergency program

MIL OFF, EML OFF, Brief torque restriction.

Remarks

Limit on current induced engine torque

DTC P16C2: CONTROL MODULE SELF-TEST, SPEED LIMITATION MONITORING (PLAUS)

BMW Fault Code (hex)

0x2D53

BMW Fault Code (dez)

11603

BMW Fault Code Description VS-Text

DME, internal fault: monitoring, engine speed limitation

Component

ECM Self-Test

Subcomponent

RPM Limitation

Monitoring criteria

Control module monitor. Currently defined RPM limit is exceeded and injection is still active.

Fault debouncing

480 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

none

Time conditions

480 ms

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Internal control-module fault

Repair procedures (plant/service)

Replace DME

MIL illumination/CC Message/Emergency Program

MIL OFF, EML ON, CC: Reduced power, engine malfunction Reset, RPM limited to 1300 RPM.

Remarks

RPM governor monitor

DTC P16C5: MAIN RELAY SWITCHING DELAY (MIN)

BMW Fault Code (hex)

0x2ACC

BMW Fault Code (dez)

10956

BMW Fault Code Description VS-Text

DME master relay, shift delay

Component

ECM/PCM Power Relay

Subcomponent

Switching Delay

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P16C6: CAN TIMEOUT BSD (BIT SERIAL DATA INTERFACE) (MAX)

BMW Fault Code (hex)

0x2E81

BMW Fault Code (dez)

11905

BMW Fault Code Description VS-Text

Electrical coolant pump, speed deviation

Component

No Info

Subcomponent

No Info

Monitoring criteria

Comparison of specified/actual RPM. No BSD fault.

Fault debouncing

10 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

Engine temperature above 20°C

Time conditions

8 sec.

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

- a. Wiring
- b. Binding

Repair procedures (plant/service)

1. Problem diagnosis with wiring check
2. Plug corrosion
3. EWP component fault

MIL illumination/CC message/emergency program

CC status report: none EWP fails to reach specified rotation rate

Remarks

none

DTC P16C6: CAN TIMEOUT BSD (BIT SERIAL DATA INTERFACE) (MAX)

BMW Fault Code (hex)

0x2E82

BMW Fault Code (dez)

11906

BMW Fault Code Description VS-Text

Electric coolant pump, cutoff

Component

No Info

Subcomponent

No Info

Monitoring criteria

Comparison of specified/actual RPM. No BSD fault

Fault debouncing

10 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

10 sec.

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

EWP component fault

Repair procedures (plant/service)

EWP component fault

MIL illumination/CC message/emergency program

CC status report: none EWP not operating. Heat management initiates emergency cooling action

Remarks

none

DTC P16C6: CAN TIMEOUT BSD (BIT SERIAL DATA INTERFACE) (MAX)

BMW Fault Code (hex)

0x2E83

BMW Fault Code (dez)

11907

BMW Fault Code Description VS-Text

Electric coolant pump, power-reduced operation

Component

No Info

Subcomponent

No Info

Monitoring criteria

Comparison of specified/actual RPM. No BSD fault

Fault debouncing

10 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

10 sec.

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Air in system

Repair procedures (plant/service)

Bleed cooling system/leak check

MIL illumination/CC message/emergency program

CC status report: None Limit on EWP rotation rate

Remarks

none

DTC P16C6: CAN TIMEOUT BSD (BIT SERIAL DATA INTERFACE) (MIN)

BMW Fault Code (hex)

0x2E82

BMW Fault Code (dez)

11906

BMW Fault Code Description VS-Text

Electric coolant pump, cutoff

Component

No Info

Subcomponent

No Info

Monitoring criteria

Comparison of specified/actual RPM. No BSD fault

Fault debouncing

10 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

10 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Jump start with truck battery

Repair procedures (plant/service)

Clear fault memory or, if fault is permanent, replace EWP components without jump starting.

MIL illumination/CC message/emergency program

CC status report. No EWP inoperative during power supply. Heat management initiates emergency cooling action.

Remarks

none

DTC P16C6: CAN TIMEOUT BSD (BIT SERIAL DATA INTERFACE) (MIN)**BMW Fault Code (hex)**

0x2E83

BMW Fault Code (dez)

11907

BMW Fault Code Description VS-Text

Electric coolant pump, power-reduced operation

Component

No Info

Subcomponent

No Info

Monitoring criteria

Comparison of specified/actual RPM. No BSD fault

Fault debouncing

10 sec.

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

10 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

- a. Wiring
- b. Battery charge status

Repair procedures (plant/service)

- 1. Charge battery
- 2. Problem diagnosis with wiring check
- 3. Plug corrosion
- 4. Component fault in EWP

MIL illumination/CC message/emergency program

CC status report: none. EWP fails to reach specified rotation rate.

Remarks

none

DTC P16C6: CAN TIMEOUT BSD (BIT SERIAL DATA INTERFACE) (PLAUS)

BMW Fault Code (hex)

0x2E83

BMW Fault Code (dez)

11907

BMW Fault Code Description VS-Text

Electric coolant pump, power-reduced operation

Component

No Info

Subcomponent

No Info

Monitoring criteria

Comparison of specified/actual RPM. No BSD fault

Fault debouncing

10 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

10 sec.

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

EWP component fault

Repair procedures (plant/service)

EWP component fault

MIL illumination/CC message/emergency program

CC status report: None Limit on EWP rotation rate

Remarks

none

DTC P16C6: CAN TIMEOUT BSD (BIT SERIAL DATA INTERFACE) (PLAUS)

BMW Fault Code (hex)

0x2E85

BMW Fault Code (dez)

11909

BMW Fault Code Description VS-Text

Electric coolant pump, communication

Component

No Info

Subcomponent

No Info

Monitoring criteria

Compare EWP status report with main relay activation. No BSD fault.

Fault debouncing

10 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

10 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Terminal 87 to EWP shorted to positive or ground, or open

Repair procedures (plant/service)

Problem diagnosis wiring check

MIL illumination/CC message/emergency program

CC status report: none. EWP runs based on BSD request.

Remarks

none

DTC P16C6: CAN TIMEOUT BSD (BIT SERIAL DATA INTERFACE) (SIG)

BMW Fault Code (hex)

0x2E7C

BMW Fault Code (dez)

11900

BMW Fault Code Description VS-Text

Bit-serial data interface, signal

Component

No Info

Subcomponent

No Info

Monitoring criteria

BSD bus monitor

Fault debouncing

Via event counter. Total failure between BSD bus and all components (water pump, oil sensor, alternator, battery sensor over approximately 3 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Terminal 87 >10.0 V

Temperature conditions

none

Time conditions

approximately 3 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short circuit on the BSD_BUS. Either to ground or positive, rendering communications impossible. Or no BSD_components connected to the DME.

Repair procedures (plant/service)

1. Disconnect all BSD_components (alternator, battery sensor, water pump) except for the oil sensor. Clear fault memory. Ignition off/on. If fault code is stored again: QLT is defective and must be replaced. Repeat test.
2. If fault code is entered again after QLT replacement: -> Check wiring harness (BSD_BUS) and all plug-in connections for corrosion and shorts to ground/UBatt.
3. If fault code no longer appears after QLT replacement: -> QLT was defective.
4. If no fault code is stored after all components (except QLT, as in 1.) are disconnected: -> The fault lies with one of the

MIL illumination/CC message/emergency program

No oil level display/no oil temperature display available. Service interval calculations for next visit are based on model. Water pump runs at 100% cooling capacity and draws continuous current of approximately 15A. Power management fails to operate correctly because it is not possible to read battery sensor.

Remarks

ATTENTION: Simply switching the ignition on/off is enough for problem diagnosis. Because the water pump may not be connected, and the engine could overheat, you should avoid starting the engine. Fault status can be reset by clearing fault memory.

DTC P16C6: CAN TIMEOUT BSD (BIT SERIAL DATA INTERFACE) (SIG)

BMW Fault Code (hex)

0x2E82

BMW Fault Code (dez)

11906

BMW Fault Code Description VS-Text

Electric coolant pump, cutoff

Component

No Info

Subcomponent

No Info

Monitoring criteria

Comparison of specified/actual rpm. No BSD fault.

Fault debouncing

10 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

10 sec.

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Contamination, Binding, Incorrect coolant mixture ratio.

Repair procedures (plant/service)

Respond to intermittent fault by triggering actuators for operational test and by checking concentration of coolant. Permanent fault indicates foreign objects or EWP component fault.

MIL illumination/CC message/emergency program

CC status report none EWP briefly/continuously without function. Heat management initiates emergency cooling strategy.

Remarks

none

DTC P16C6: CAN TIMEOUT BSD (BIT SERIAL DATA INTERFACE) (SIG)

BMW Fault Code (hex)

0x2E83

BMW Fault Code (dez)

11907

BMW Fault Code Description VS-Text

Electric coolant pump, power-reduced operation

Component

No Info

Subcomponent

No Info

Monitoring criteria

Comparison of specified/actual RPM. No BSD fault.

Fault debouncing

10 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

10 sec.

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

EWP component fault

Repair procedures (plant/service)

EWP component fault

MIL illumination/CC message/emergency program

CC status report: None. Limit on EWP rotation rate.

Remarks

none

DTC P16C6: CAN TIMEOUT BSD (BIT SERIAL DATA INTERFACE) (SIG)

BMW Fault Code (hex)

0x2E84

BMW Fault Code (dez)

11908

BMW Fault Code Description VS-Text

Electric coolant pump, communication

Component

No Info

Subcomponent

No Info

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P16C8: SERIAL COMMUNICATION LINK EKP (ELECTRICAL FUEL PUMP) (SIG)

BMW Fault Code (hex)

0x2DE0

BMW Fault Code (dez)

11744

BMW Fault Code Description VS-Text

No message from electric fuel pump

Component

No Info

Subcomponent

No Info

Monitoring criteria

EKP recognized

Fault debouncing

none

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

40 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Unable to receive CAN message.

Repair procedures (plant/service)

Check CAN link between EKP and DME

MIL illumination/CC message/emergency program

none

Remarks

Timeout on CAN message

DTC P2067: FUEL LEVEL SENSOR 'B' CIRCUIT LOW (MIN)

BMW Fault Code (hex)

0x2DE1

BMW Fault Code (dez)

11745

BMW Fault Code Description VS-Text

Tank fill level, left, signal

Component

Fuel Level Sensor

Subcomponent

Electrical

Monitoring criteria

Left-side level sensor shorted, sensor resistance too low.

Fault debouncing

90 sec.

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Sensor value too low

Repair procedures (plant/service)

Check sensor resistance, determine location of open wire/short circuit (wiring harness, plug, cluster, junction box, tank)

MIL illumination/CC message/emergency program

NO

Remarks

none

DTC P2068: FUEL LEVEL SENSOR 'B' CIRCUIT HIGH (MAX)

BMW Fault Code (hex)

0x2DE1

BMW Fault Code (dez)

11745

BMW Fault Code Description VS-Text

Tank fill level, left, signal

Component

Fuel Level Sensor

Subcomponent

Electrical

Monitoring criteria

Open circuit in wire to left-side level sensor, sensor resistance too high.

Fault debouncing

90 sec.

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Sensor value too high

Repair procedures (plant/service)

Check sensor resistance, determine location of open wire/short circuit (wiring harness, plug, cluster, junction box, tank)

MIL illumination/CC message/emergency program

NO

Remarks

none

DTC P2088: 'A' CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1) (MIN)

BMW Fault Code (hex)

0x2A80

BMW Fault Code (dez)

10880

BMW Fault Code Description VS-Text

Intake VANOS, activation

Component

Camshaft Position Actuator

Subcomponent

Intake

Monitoring criteria

Monitoring of VANOS control Engine. speed > 500 rpm

Fault debouncing

none

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

0.5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short circuit to ground in wire or component.

Repair procedures (plant/service)

Check wiring, repair if defective. If wiring is OK, proceed to check component.

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P2089: 'A' CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1) (MAX)

BMW Fault Code (hex)

0x2A80

BMW Fault Code (dez)

10880

BMW Fault Code Description VS-Text

Intake VANOS, activation

Component

Camshaft Position Actuator

Subcomponent

Intake

Monitoring criteria

Monitoring of VANOS control, Engine speed > 500 rpm,

Fault debouncing

none

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

0.5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Wire is shorted to positive, or a short to positive is present in the component.

Repair procedures (plant/service)

Check wiring. Repair if defective. If wiring is OK, proceed to check component

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P2090: 'B' CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1) (MIN)

BMW Fault Code (hex)

0x2A85

BMW Fault Code (dez)

10885

BMW Fault Code Description VS-Text

Exhaust VANOS, activation

Component

Camshaft Position Actuator

Subcomponent

Exhaust

Monitoring criteria

Monitoring of VANOS control. Engine speed > 500 rpm.

Fault debouncing

none

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

0.5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short circuit to ground in wire or component.

Repair procedures (plant/service)

Check wiring. Repair if defective. If wiring is OK, proceed to check component.

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P2091: 'B' CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1) (MAX)

BMW Fault Code (hex)

0x2A85

BMW Fault Code (dez)

10885

BMW Fault Code Description VS-Text

Exhaust VANOS, activation

Component

Camshaft Position Actuator

Subcomponent

Exhaust

Monitoring criteria

Monitoring of VANOS control Engine speed > 500 rpm

Fault debouncing

none

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

0.5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Wire is shorted to positive, or a short to positive is present in the component.

Repair procedures (plant/service)

Check wiring. Repair if defective. If wiring is OK proceed to check component.

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P2096: POST CATALYST FUEL TRIM SYSTEM TOO LEAN (BANK 1) (MIN)**BMW Fault Code (hex)**

0x2C31

BMW Fault Code (dez)

11313

BMW Fault Code Description VS-Text

Oxygen sensor before catalytic converter, trim control

Component

Fuel System

Subcomponent

Post Catalyst

Monitoring criteria

O2 sensor trim control. No fault memories. Drive at 50 - 80 km/h and at moderate engine speed..

Fault debouncing

Trim controller pegged

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

Engine at operating temperature

Time conditions

1 - 2 h steady-state operation; otherwise #11390 may occur

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Defective wiring. Exhaust system leak. Pre-cat or downstream (post-cat) O2 sensor defective.

Repair procedures (plant/service)

This malfunction automatically triggers an active test (collateral fault stored in the control module's fault memory!).

1. Read out results of active test (are other faults still stored in the control module's fault memory)? => Then continue at this point!)
2. Initiate system test for reversed O2 sensors. Follow instructions for system test.
3. If the system test fails to produce a result then
4. Visual inspection of wiring and plugs
5. Electrical check of wiring
6. Replace wiring or plugs as indicated
7. Check exhaust system forward of downstream (post-cat) O2 sensor for leaks
8. Replace upstream (pre-cat) O2 sensor

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P2097: POST CATALYST FUEL TRIM SYSTEM TOO RICH (BANK 1) (MAX)

BMW Fault Code (hex)

0x2C31

BMW Fault Code (dez)

11313

BMW Fault Code Description VS-Text

Oxygen sensor before catalytic converter, trim control

Component

Fuel System

Subcomponent

Post Catalyst

Monitoring criteria

O2 sensor trim control. No fault memories. Drive at 50 - 80 km/h and at moderate engine speed.

Fault debouncing

Trim controller pegged

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

Engine at operating temperature

Time conditions

1 - 2 h steady-state operation; otherwise #11390 may occur

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Drift in upsteam (pre-cat) O2 sensor - Fault in wiring to downstream (post-cat) O2 sensor - Leakage in exhaust system - Defective pre-cat or downstream (post-cat) O2 sensor

Repair procedures (plant/service)

This malfunction automatically triggers an active test (collateral fault stored in the control module's fault memory!).

1. Read out results of active test (are other faults still stored in the control module's fault memory)? => Then continue at this point!
2. Initiate system test for reversed O2 sensors. Follow instructions for system test.
3. If the system test fails to produce a result then
4. Visual inspection of wiring and plugs

5. Electrical check of wiring
6. Replace wiring or plugs as indicated
7. Check exhaust system forward of downstream (post-cat) O2 sensor for leaks
8. Replace upstream (pre-cat) O2 sensor

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P2098: POST CATALYST FUEL TRIM SYSTEM TOO LEAN (BANK 2) (MIN)

BMW Fault Code (hex)

0x2C32

BMW Fault Code (dez)

11314

BMW Fault Code Description VS-Text

Oxygen sensor before catalytic converter 2, trim control

Component

Fuel System

Subcomponent

Post Catalyst

Monitoring criteria

O2 sensor trim control No fault memories Drive at 50 - 80 km/h and at moderate engine speed.

Fault debouncing

Trim controller pegged

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

Engine at operating temperature

Time conditions

1 - 2 h steady-state operation; otherwise #11391 may occur

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Defective wiring. Exhaust system leak. Pre-cat or downstream (post-cat) O2 sensor defective.

Repair procedures (plant/service)

This malfunction automatically triggers an active test (collateral fault stored in the control module's fault memory!).

1. Read out results of active test (are other faults still stored in the control module's fault memory)? => Then continue at this point!
2. Initiate system test for reversed O2 sensors. Follow instructions for system test.
3. If the system test fails to produce a result then
4. Visual inspection of wiring and plugs
5. Electrical check of wiring
6. Replace wiring or plugs as indicated
7. Check exhaust system forward of downstream (post-cat) O2 sensor for leaks
8. Replace upstream (pre-cat) O2 sensor

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P2099: POST CATALYST FUEL TRIM SYSTEM TOO RICH (BANK 2) (MAX)**BMW Fault Code (hex)**

0x2C32

BMW Fault Code (dez)

11314

BMW Fault Code Description VS-Text

Oxygen sensor before catalytic converter 2, trim control

Component

Fuel System

Subcomponent

Post Catalyst

Monitoring criteria

O2 sensor trim control. No fault memories. Drive at 50 - 80 km/h and at moderate engine speed.

Fault debouncing

Trim controller pegged

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

Engine at operating temperature

Time conditions

1 - 2 h steady-state operation; otherwise #11391 may occur

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Defective wiring. Exhaust system leak. Pre-cat or downstream (post-cat) O2 sensor defective.

Repair procedures (plant/service)

This malfunction automatically triggers an active test (collateral fault stored in the control module's fault memory!).

1. Read out results of active test (are other faults still stored in the control module's fault memory)? => Then continue at this point!
2. Initiate system test for reversed O2 sensors. Follow instructions for system test.
3. If the system test fails to produce a result then
4. Visual inspection of wiring and plugs
5. Electrical check of wiring
6. Replace wiring or plugs as indicated
7. Check exhaust system forward of downstream (post-cat) O2 sensor for leaks
8. Replace upstream (pre-cat) O2 sensor

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P2120: THROTTLE/PEDAL POSITION SENSOR/SWITCH 'D' CIRCUIT (PLAUS)

BMW Fault Code (hex)

0x2D1F

BMW Fault Code (dez)

11551

BMW Fault Code Description VS-Text

Accelerator-pedal module, pedal-position sensor potentiometer, signal

Component

Pedal Position Sensor

Subcomponent

D Electrical

Monitoring criteria

Pedal-position sensor monitor

Fault debouncing

0.02 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

none

Time conditions

220 ms

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Dual fault in pedal-position sensor

Repair procedures (plant/service)

1. Read out the two root faults from the control module's fault memory
2. Process using prescribed test plan
3. Check main relay and overall vehicle electrical system voltage supply
4. Replace DME

MIL illumination/CC message/emergency program

CC status report: Reduced engine power! EML ON, MIL ON, PW = 0, fast idle when brake pedal is not depressed.

Remarks

Pedal reading 0, slightly high idle if brake pedal is not depressed

DTC P2122: THROTTLE/PEDAL POSITION SENSOR/SWITCH 'D' CIRCUIT LOW (MIN)

BMW Fault Code (hex)

0x2D1B

BMW Fault Code (dez)

11547

BMW Fault Code Description VS-Text

Accelerator pedal module, pedal-position sensor, signal 1

Component

Pedal Position Sensor

Subcomponent

D Electrical

Monitoring criteria

Pedal-position sensor monitor. No fault code currently registered.

Fault debouncing

0.02 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

none

Time conditions

240 ms

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Sensor wire shorted to ground or open circuit in wire

Repair procedures (plant/service)

1. Perform electrical check on sensor wire and power-supply wires
2. Visual inspection of plug-in contacts (on component and DME ends)
3. Replace PWG

MIL illumination/CC message/emergency program

CC status report: ??? EML ON, restricted PW gradient, and PW limit via rpm.

Remarks

Voltage range diagnosis

DTC P2123: THROTTLE/PEDAL POSITION SENSOR/SWITCH 'D' CIRCUIT HIGH (MAX)

BMW Fault Code (hex)

0x2D1B

BMW Fault Code (dez)

11547

BMW Fault Code Description VS-Text

Accelerator pedal module, pedal-position sensor, signal 1

Component

Pedal Position Sensor

Subcomponent

D Electrical

Monitoring criteria

Pedal-position sensor monitor. No fault code currently registered

Fault debouncing

0.02 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

none

Time conditions

240 ms

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Sensor wire shorted to positive

Repair procedures (plant/service)

1. Perform electrical check on sensor wire and power-supply wires
2. Visual inspection of plug-in contacts (on component and DME ends)
3. Replace PWG

MIL illumination/CC message/emergency program

CC status report: Reduced engine power! EML ON restricted PW gradient and PW limit via rpm

Remarks

Voltage range diagnosis

DTC P2127: THROTTLE/PEDAL POSITION SENSOR/SWITCH 'E' CIRCUIT LOW (MIN)**BMW Fault Code (hex)**

0x2D1C

BMW Fault Code (dez)

11548

BMW Fault Code Description VS-Text

Accelerator pedal module, pedal-position sensor, signal 2

Component

Pedal Position Sensor

Subcomponent

E Electrical

Monitoring criteria

Pedal-position sensor monitor. No fault code currently registered.

Fault debouncing

0.02 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

none

Time conditions

240 ms

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Sensor wire shorted to ground or open circuit in wire.

Repair procedures (plant/service)

1. Perform electrical check on sensor wire and power-supply wires
2. Visual inspection of plug-in contacts (on component and DME ends)

3. Replace PWG

MIL illumination/CC message/emergency program

CC status report: Reduced engine power! EML ON restricted PW gradient and PW limit via rpm.

Remarks

Voltage range diagnosis

DTC P2128: THROTTLE/PEDAL POSITION SENSOR/SWITCH 'E' CIRCUIT HIGH (MAX)

BMW Fault Code (hex)

0x2D1C

BMW Fault Code (dez)

11548

BMW Fault Code Description VS-Text

Accelerator pedal module, pedal-position sensor, signal 2

Component

Pedal Position Sensor

Subcomponent

E Electrical

Monitoring criteria

Pedal-position sensor monitor. No fault code currently registered

Fault debouncing

0.02 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

none

Time conditions

240 ms

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Sensor wire shorted to positive

Repair procedures (plant/service)

1. Perform electrical check on sensor wire and power-supply wires.
2. Visual inspection of plug-in contacts (on component and DME ends).
3. Replace PWG.

MIL illumination/CC message/emergency program

CC status report: Reduced engine power! EML ON, restricted PW gradient, and PW limit via RPM.

Remarks

Voltage range diagnosis

DTC P2138: THROTTLE/PEDAL POSITION SENSOR/SWITCH 'D'/'E' VOLTAGE CORRELATION (PLAUS)**BMW Fault Code (hex)**

0x2D20

BMW Fault Code (dez)

11552

BMW Fault Code Description VS-Text

Accelerator-pedal module, pedal-position sensor, plausibility between signal 1 and signal 2

Component

Pedal Position Sensor

Subcomponent

D/E Correlation

Monitoring criteria

Pedal-position sensor monitor

Fault debouncing

0.02 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system ≥ 10 V

Temperature conditions

none

Time conditions

340 ms

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Contact resistance in wiring or plug-in connections for PWG, electrical PWG problem (defective Hall-effect sensor).

Repair procedures (plant/service)

1. Check: Pedal-position sensor voltages [Pot voltage 2 = (Pot voltage1)/2]
2. Check wires from DME to PWG
3. Visual inspection of plug terminals (on components, wiring harness and DME)
4. Replace PWG

MIL illumination/CC message/emergency program

CC status report: Reduced engine power! EML ON restricted PW gradient and PW limit via rpm.

Remarks

Implausible spread between the two PWG voltages.

DTC P213F: FUEL PUMP SYSTEM FAULT - FORCED ENGINE SHUTDOWN (SIG)

BMW Fault Code (hex)

0x2AAD

BMW Fault Code (dez)

10925

BMW Fault Code Description VS-Text

Fuel pump, emergency shutoff

Component

Fuel Regulators/Valves/Sensors

Subcomponent

Fuel Pump

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P2183: ENGINE COOLANT TEMPERATURE SENSOR 2 CIRCUIT RANGE/PERFORMANCE (PLAUS)

BMW Fault Code (hex)

0x2EEC

BMW Fault Code (dez)

12012

BMW Fault Code Description VS-Text

Temperature sensor cooler outlet, plausibility

Component

Engine Coolant Temperature Sensor

Subcomponent

2 Plausibility

Monitoring criteria

Engine must be running

Fault debouncing

no invariable debounce time, constant sensor data reading during engine warm-up produces entry

Terminal conditions

Terminal 15 ON

Voltage conditions

11 V < electrical system voltage < 26 V

Temperature conditions

-10°C < Coolant temperature at engine start < 65°C, -10°C < Induction air temperature at engine start < 69°C

Time conditions

600 ms

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Temperature sensor seizing, sensor manipulation

Repair procedures (plant/service)

1. Visual inspection of sensor
2. Perform electrical check on sensor and power-supply wires 2) Test to determine whether the temperature really changes when the thermostat opens
3. Replace sensor

MIL illumination/CC message/emergency program

MIL ON in US versions only

Remarks

temperature condition defined by data entry

DTC P2184: ENGINE COOLANT TEMPERATURE SENSOR 2 CIRCUIT LOW (MIN)

BMW Fault Code (hex)

0x2EEA

BMW Fault Code (dez)

12010

BMW Fault Code Description VS-Text

Temperature sensor cooler outlet, signal

Component

Engine Coolant Temperature Sensor

Subcomponent

2 Electrical

Monitoring criteria

Radiator discharge temperature signal monitor

Fault debouncing

5 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 9.15 V

Temperature conditions

none

Time conditions

5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short to ground in sensor wire

Repair procedures (plant/service)

1. Perform electrical check on sensor wire and power-supply wires
2. Visual inspection of plug-in contacts (on component and DME ends)
3. Replace sensor

MIL illumination/CC message/emergency program

MIL ON in US versions only

Remarks

Voltage range diagnosis

DTC P2185: ENGINE COOLANT TEMPERATURE SENSOR 2 CIRCUIT HIGH (MAX)

BMW Fault Code (hex)

0x2EEA

BMW Fault Code (dez)

12010

BMW Fault Code Description VS-Text

Temperature sensor cooler outlet, signal

Component

Engine Coolant Temperature Sensor

Subcomponent

2 Electrical

Monitoring criteria

Radiator discharge temperature signal monitor

Fault debouncing

No compliance with temperature condition and time after end of start > 120 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 9.15 V

Temperature conditions

Intake air temperature $\geq -5.25^{\circ}\text{C}$ OR if less than -5.25°C , then time after end of start phase > 120 sec.

Time conditions

No compliance with temperature condition and time after end of start >120 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Sensor wire shorted to positive or open circuit in wire

Repair procedures (plant/service)

1. Perform electrical check on sensor wire and power-supply wires
2. Visual inspection of plug-in contacts (on component and DME ends)
3. Replace sensor

MIL illumination/CC message/emergency program

MIL ON in US versions only

Remarks

Voltage range diagnosis

DTC P2195: O2 SENSOR SIGNAL BIASED/STUCK LEAN (BANK 1 SENSOR 1) (MAX)

BMW Fault Code (hex)

0x2C27

BMW Fault Code (dez)

11303

BMW Fault Code Description VS-Text

Oxygen sensor before catalytic converter, system check

Component

Oxygen Sensor, Front

Subcomponent

Signal Check

Monitoring criteria

After trim control fault; sensor indicates more than 18% too lean

Fault debouncing

Terminal 15, engine on

Terminal conditions

none

Voltage conditions

none

Temperature conditions

Approximately 300s after trim control fault

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Sensor contamination, hole in sensor, short circuit to positive or ground

Repair procedures (plant/service)

Check sensor wiring for short circuit; otherwise replace the suspect sensor.

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P2196: O2 SENSOR SIGNAL BIASED/STUCK RICH (BANK 1 SENSOR 1) (MAX)

BMW Fault Code (hex)

0x2C2B

BMW Fault Code (dez)

11307

BMW Fault Code Description VS-Text

Oxygen sensor before catalytic converter, system check

Component

Oxygen Sensor, Front

Subcomponent

Signal Check

Monitoring criteria

After trim control fault; sensor indicates more than 18% too rich

Fault debouncing

Terminal 15, engine on

Terminal conditions

none

Voltage conditions

none

Temperature conditions

Approximately 300s after trim control fault

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Hole in sensor, short circuit to positive or ground

Repair procedures (plant/service)

Check sensor wiring for short circuit; otherwise replace the suspect sensor

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P2197: O2 SENSOR SIGNAL BIASED/STUCK LEAN (BANK 2 SENSOR 1) (MAX)

BMW Fault Code (hex)

0x2C28

BMW Fault Code (dez)

11304

BMW Fault Code Description VS-Text

Oxygen sensor before catalytic converter 2, system check

Component

Oxygen Sensor, Front

Subcomponent

Signal Check

Monitoring criteria

After trim control fault; sensor indicates more than 18% too lean.

Fault debouncing

Terminal 15, engine on

Terminal conditions

none

Voltage conditions

none

Temperature conditions

Approximately 300s after trim control fault

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Sensor contamination, hole in sensor, short circuit to positive or ground

Repair procedures (plant/service)

Check sensor wiring for short circuit; otherwise replace the suspect sensor

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P2198: O2 SENSOR SIGNAL BIASED/STUCK RICH (BANK 2 SENSOR 1) (MAX)

BMW Fault Code (hex)

0x2C2C

BMW Fault Code (dez)

11308

BMW Fault Code Description VS-Text

Oxygen sensor before catalytic converter 2, system check

Component

Oxygen Sensor, Front

Subcomponent

Signal Check

Monitoring criteria

Oxygen sensor before catalytic converter 2, system check End of start phase O2 sensor drifts toward rich

Fault debouncing

After trim control fault; sensor indicates more than 18% too rich

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

none

Time conditions

Approximately 300s after trim control fault

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Hole in sensor, short circuit to positive or ground

Repair procedures (plant/service)

Check sensor wiring for short circuit; otherwise replace the suspect sensor

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P2228: BAROMETRIC PRESSURE CIRCUIT LOW (MIN)**BMW Fault Code (hex)**

0x2F76

BMW Fault Code (dez)

12150

BMW Fault Code Description VS-Text

Ambient-pressure sensor, signal

Component

Ambient Pressure Sensor

Subcomponent

Electrical

Monitoring criteria

Ambient pressure sensor signal monitor

Fault debouncing

0.5 sec.

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

500 ms

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short-circuit with respect to ground

Repair procedures (plant/service)

Replace DME; this is an internal component

MIL illumination/CC message/emergency program

MIL on

Remarks

none

DTC P2229: BAROMETRIC PRESSURE CIRCUIT HIGH (MAX)

BMW Fault Code (hex)

0x2F76

BMW Fault Code (dez)

12150

BMW Fault Code Description VS-Text

Ambient-pressure sensor, signal

Component

Ambient Pressure Sensor

Subcomponent

Electrical

Monitoring criteria

Ambient pressure sensor signal monitor

Fault debouncing

0.5 sec.

Terminal conditions

Terminal 15, engine on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

500 ms

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short to positive or open circuit

Repair procedures (plant/service)

Replace DME; this is an internal component

MIL illumination/CC message/emergency program

MIL on

Remarks

none

DTC P2243: O2 SENSOR REFERENCE VOLTAGE CIRCUIT/OPEN (BANK 1 SENSOR 1) (MAX)

BMW Fault Code (hex)

0x2C3D

BMW Fault Code (dez)

11325

BMW Fault Code Description VS-Text

Oxygen sensor before catalytic converter, line fault

Component

Oxygen Sensor, Front

Subcomponent

Reference Voltage

Monitoring criteria

O2 sensor wiring monitor (heater) O2 sensor temperature is too low and the sensor signal is implausible No fault memories

Fault debouncing

Sensor temperature < 680°C and sensor voltage < 0.2 V with oscillator deactivated

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

Engine at operating temperature

Time conditions

approximately 15 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Sensor not active - Open UN wire

Repair procedures (plant/service)

1. Visual inspection of wires, DME plug and O2 sensor for damage
2. Inspect wires
3. Check plug-in connections DME <=> Wiring harness <=> Upstream (pre-cat) O2 sensor for Bank 1 (water or corrosion in plug?) => Repeatedly disconnect the plug and then FIRMLY press it back in)
4. Replace O2 sensor
5. Replace DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P2247: O2 SENSOR REFERENCE VOLTAGE CIRCUIT/OPEN (BANK 2 SENSOR 1) (MAX)

BMW Fault Code (hex)

0x2C3E

BMW Fault Code (dez)

11326

BMW Fault Code Description VS-Text

Oxygen sensor before catalytic converter 2, line fault

Component

Oxygen Sensor, Front

Subcomponent

Reference Voltage

Monitoring criteria

O2 sensor wiring monitor O2 sensor signal freezes. No fault memories - Drive at 50 - 80 km/h at moderate engine speed

Fault debouncing

Voltage seizes at 2 V (Lambda = 1) OR voltage < 2.1 V with overrun injection deactivation active

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

Engine at operating temperature

Time conditions

approximately 9s with overrun injection deactivation active

System test

O2 sensors reversed

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Sensor inactive Wire VG or IP is open Catalyst is plugged (rich exhaust at O2 sensor in overrun cut-off); oil or gasoline in the exhaust gases during operation in overrun cut-off phase

Repair procedures (plant/service)

1. Visual inspection of wires, DME plug and O2 sensor for damage
2. Inspect wires

3. Check plug-in connections DME <=> Wiring harness <=> Upstream (pre-cat) O2 sensor for Bank 1 (water or corrosion in plug?) => Repeatedly remove the plug and then reconnect it FIRMLY)
4. Check catalytic converter (is FSD lean fault entered for the other bank?)
5. Piston rings, injectors, positive crankcase ventilation OK? FSD fault? Then continue there!
6. Replace O2 sensor
7. Replace DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P2270: O2 SENSOR SIGNAL BIASED/STUCK LEAN (BANK 1 SENSOR 2) (MIN)

BMW Fault Code (hex)

0x2C6B

BMW Fault Code (dez)

11371

BMW Fault Code Description VS-Text

Oxygen sensor behind catalytic converter, system check

Component

Oxygen Sensor, Rear

Subcomponent

Signal Check

Monitoring criteria

O2 sensor system check O2 sensor voltage too high = Signal sticks at rich Trim controller diagnosis must have been executed, see Trim controller diagnosis. Detection of malfunctions during the trim control diagnosis triggers the active test. Engine running at idle is adequate for the active test;

Fault debouncing

O2 sensor behind catalytic converter voltage > 0.7 V with lean O2 data specification in active test

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

Engine at operating temperature

Time conditions

roughly 300 s following completion of trim control diagnosis

System test

O2 sensors reversed

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Downstream (post-cat) O2 sensor aged or downstream (post-cat) O2 sensor poisoned or downstream (post-cat) O2 sensor wire defective, pegging trim controller -> Trim controller diagnosis entry -> Activation of active test, entry of fault code #11371

Repair procedures (plant/service)

This malfunction is detected during the active test. The active test is triggered by the trim control diagnosis function (trim controller fault code stored in the control module's fault memory!)

1. Initiate system test for reversed O2 sensors. Follow instructions for system test.
2. If the system test fails to produce a result then
3. Visual inspection of wiring and plugs
4. Electrical check of wiring
5. Replace wires or plugs as indicated
6. Check exhaust system upstream from downstream (post-cat) O2 sensor for leaks
7. Replace downstream (post-cat) O2 sensor

8. Replace upstream (pre-cat) O2 sensor

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P2271: O2 SENSOR SIGNAL BIASED/STUCK RICH (BANK 1 SENSOR 2) (MAX)

BMW Fault Code (hex)

0x2C6B

BMW Fault Code (dez)

11371

BMW Fault Code Description VS-Text

Oxygen sensor behind catalytic converter, system check

Component

Oxygen Sensor, Rear

Subcomponent

Signal Check

Monitoring criteria

O2 sensor system check O2 sensor voltage too low = Signal sticks on lean Trim controller diagnosis must have been executed, see Trim controller diagnosis. Detection of faults during the trim control diagnosis triggers the active test. Engine running at idle is adequate for the active test.

Fault debouncing

O2 sensor behind catalytic converter voltage < 0.2 V with rich data specification for active test

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

Engine at operating temperature

Time conditions

roughly 300 s following completion of trim control diagnosis

System test

O2 sensors reversed

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Downstream (post-cat) O2 sensor aged or downstream (post-cat) O2 sensor poisoned or downstream (post-cat) O2 sensor wire defective or exhaust system forward of downstream (post-cat) O2 sensor is leaking, pegging trim controller -> Trim controller diagnosis entry -> Activation of active test, entry of fault code #11371

Repair procedures (plant/service)

This malfunction is detected during the active test. The active test is triggered by the trim control diagnosis function (trim controller fault code stored in the control module's fault memory!)

1. Initiate system test for reversed O2 sensors. Follow instructions for system test.
2. If the system test fails to produce a result then
3. Visual inspection of wiring and plugs
4. Electrical check of wiring
5. Replace wires or plugs as indicated
6. Check exhaust system upstream from downstream (post-cat) O2 sensor for leaks
7. Replace downstream (post-cat) O2 sensor
8. Replace upstream (pre-cat) O2 sensor

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P2272: O2 SENSOR SIGNAL BIASED/STUCK LEAN (BANK 2 SENSOR 2) (MIN)**BMW Fault Code (hex)**

0x2C6C

BMW Fault Code (dez)

11372

BMW Fault Code Description VS-Text

Oxygen sensor behind catalytic converter 2, system check

Component

Oxygen Sensor, Rear

Subcomponent

Signal Check

Monitoring criteria

O2 sensor system check O2 sensor voltage too high = Signal sticks at rich Trim controller diagnosis must have been executed, see Trim controller diagnosis. Detection of malfunctions during the trim control diagnosis triggers the active test. Engine running at idle is adequate for the active test;

Fault debouncing

O2 sensor behind catalytic converter voltage > 0.7 V with lean O2 data specification in active test

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

Engine at operating temperature

Time conditions

roughly 300s following completion of trim control diagnosis

System test

O2 sensors reversed

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Downstream (post-cat) O2 sensor aged or downstream (post-cat) O2 sensor poisoned or downstream (post-cat) O2 sensor wire defective, pegging trim controller at limit -> Trim controller diagnosis entry -> Activation of active test, entry of fault code #11372

Repair procedures (plant/service)

This malfunction is detected during the active test. The active test is triggered by the trim control diagnosis function (trim controller fault code stored in the control module's fault memory!)

1. Initiate system test for reversed O2 sensors. Follow instructions for system test.
2. If the system test fails to produce a result then
3. Visual inspection of wiring and plugs
4. Electrical check of wiring
5. Replace wires or plugs as indicated
6. Check exhaust system upstream from downstream (post-cat) O2 sensor for leaks
7. Replace downstream (post-cat) O2 sensor
8. Replace upstream (pre-cat) O2 sensor

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P2273: O2 SENSOR SIGNAL BIASED/STUCK RICH (BANK 2 SENSOR 2) (MAX)

BMW Fault Code (hex)

0x2C6C

BMW Fault Code (dez)

11372

BMW Fault Code Description VS-Text

Oxygen sensor behind catalytic converter 2, system check

Component

Oxygen Sensor, Rear

Subcomponent

Signal Check

Monitoring criteria

O2 sensor system check O2 sensor voltage too low = Signal sticks on lean - Trim controller diagnosis must have been executed, see Trim controller diagnosis. Detection of faults during the trim control diagnosis triggers the active test. Engine running at idle is adequate for the active test;

Fault debouncing

O2 sensor behind catalytic converter voltage < 0.2 V with rich data specification for active test

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

Engine at operating temperature

Time conditions

roughly 300s following completion of trim control diagnosis

System test

O2 sensors reversed

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Downstream (post-cat) O2 sensor aged or downstream (post-cat) O2 sensor poisoned or downstream (post-cat) O2 sensor wire defective or exhaust system forward of cat-back O2 sensor is leaking, pegging trim controller -> Trim controller diagnosis entry -> Activation of active test, entry of fault code #11372

Repair procedures (plant/service)

This malfunction is detected during the active test. The active test is triggered by the trim control diagnosis function (trim controller fault code stored in the control module's fault memory!)

1. Initiate system test for reversed O2 sensors. Follow instructions for system test.
2. If the system test fails to produce a result then
3. Visual inspection of wiring and plugs
4. Electrical check of wiring
5. Replace wires or plugs as indicated
6. Check exhaust system upstream from downstream (post-cat) O2 sensor for leaks
7. Replace downstream (post-cat) O2 sensor
8. Replace upstream (pre-cat) O2 sensor

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P2297: O2 SENSOR OUT OF RANGE DURING DECELERATION (BANK 1 SENSOR 1) (MAX)

BMW Fault Code (hex)

0x2C2D

BMW Fault Code (dez)

11309

BMW Fault Code Description VS-Text

Oxygen sensor before catalytic converter, overrun check

Component

Oxygen Sensor, Front

Subcomponent

Deceleration

Monitoring criteria

Implausible O2 sensor signal in overrun cutoff phase, no fault memories

Fault debouncing

Bank 1 O2 sensor before catalytic converter voltage less than 3.1 V or greater than 2.1 V with overrun injection deactivation active

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

Engine warm (exhaust-gas temperature > 380°C)

Time conditions

approximately 9 sec. with overrun cutoff active

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Catalytic converter obstructed (rich exhaust gas on O2 sensor during overrun cutoff); oil or gasoline in exhaust gas during overrun cutoff; defective wiring; Defective pre-cat O2 sensor;

Repair procedures (plant/service)

1. Visual inspection of wiring and plugs (water or corrosion in plug?)
 - a. Repeatedly remove the plug and then FIRMLY insert it again
2. Electrical check of wiring
3. Check catalytic converter (FSD lean fault may be entered for the other bank)
4. Piston rings, injector valves, positive crankcase ventilation OK? FSD fault? Then continue there!
5. Replace wires or plugs on O2 sensors as indicated
6. Replace O2 sensor

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P2298: O2 SENSOR OUT OF RANGE DURING DECELERATION (BANK 2 SENSOR 1) (MAX)

BMW Fault Code (hex)

0x2C2E

BMW Fault Code (dez)

11310

BMW Fault Code Description VS-Text

Oxygen sensor before catalytic converter 2, overrun check

Component

Oxygen Sensor, Front

Subcomponent

Deceleration

Monitoring criteria

Implausible O2 sensor signal in overrun cutoff phase, no fault memories

Fault debouncing

Bank 2 O2 sensor before catalytic converter voltage less than 3.1 V or greater than 2.1 V with overrun injection deactivation active

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

Engine warm (exhaust-gas temperature > 380°C)

Time conditions

approximately 9 sec. with overrun cutoff active

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Catalytic converter obstructed (rich exhaust gas on O2 sensor during overrun cutoff); oil or gasoline in exhaust gas during overrun cutoff; defective wiring; Defective pre-cat O2 sensor;

Repair procedures (plant/service)

1. Visual inspection of wiring and plugs (water or corrosion in plug?)
 - a. Repeatedly remove the plug and then FIRMLY insert it again
2. Electrical check of wiring
3. Check catalytic converter (FSD lean fault may be entered for the other bank)
4. Piston rings, injector valves, positive crankcase ventilation OK? FSD fault? Then continue there!
5. Replace wires or plugs on O2 sensors as indicated
6. Replace O2 sensor

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P2299: BRAKE PEDAL POSITION/ACCELERATOR PEDAL POSITION INCOMPATIBLE (PLAUS)

BMW Fault Code (hex)

0x2F8F

BMW Fault Code (dez)

12175

BMW Fault Code Description VS-Text

Accelerator pedal module and brake pedal, plausibility

Component

No Info

Subcomponent

No Info

Monitoring criteria

Accelerator pedal module and brake pedal plausibility monitor

Fault debouncing

1.5 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Continuous simultaneous pressure on accelerator and brake, seizing accelerator pedal

Repair procedures (plant/service)

1. Discuss driving habits with customer (driving with both feet)
2. Visual and operational check on PWG

MIL illumination/CC message/emergency program

none

Remarks

Can lead to substantial reductions in vehicle throttle response

DTC P2400: EVAPORATIVE EMISSION SYSTEM LEAK DETECTION PUMP CONTROL CIRCUIT/OPEN (SIG)

BMW Fault Code (hex)

0x2A13

BMW Fault Code (dez)

10771

BMW Fault Code Description VS-Text

DMTL leak diagnosis pump, activation

Component

EVAP System

Subcomponent

Pump

Monitoring criteria

Monitoring of control activation when pump is triggered

Fault debouncing

0.5 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

0.5 sec.

System test

DMTL Check

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Open circuit

Repair procedures (plant/service)

Check wiring - Repair if defective - If wiring is OK proceed to check component

MIL illumination/CC message/emergency program

MIL ON

Remarks

Installed in US only (initialization version)

DTC P2401: EVAPORATIVE EMISSION SYSTEM LEAK DETECTION PUMP CONTROL CIRCUIT LOW (MIN)

BMW Fault Code (hex)

0x2A13

BMW Fault Code (dez)

10771

BMW Fault Code Description VS-Text

DMTL leak diagnosis pump, activation

Component

EVAP System

Subcomponent

Pump

Monitoring criteria

Monitoring of control activation when pump is triggered

Fault debouncing

0.5 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

0.5 sec.

System test

DMTL Check

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short to ground

Repair procedures (plant/service)

Check wiring - Repair if defective - If wiring is OK proceed to check component

MIL illumination/CC message/emergency program

MIL ON

Remarks

Installed in US only (initialization version)

DTC P2402: EVAPORATIVE EMISSION SYSTEM LEAK DETECTION PUMP CONTROL CIRCUIT HIGH (MAX)**BMW Fault Code (hex)**

0x2A13

BMW Fault Code (dez)

10771

BMW Fault Code Description VS-Text

DMTL leak diagnosis pump, activation

Component

EVAP System

Subcomponent

Pump

Monitoring criteria

Monitoring of control activation when pump is triggered

Fault debouncing

0.5 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

0.5 sec.

System test

DMTL Check

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short to positive

Repair procedures (plant/service)

Check wiring - Repair if defective - If wiring is OK proceed to check component

MIL illumination/CC message/emergency program

MIL ON

Remarks

Installed in US only (initialization version)

DTC P240A: EVAPORATIVE EMISSION SYSTEM LEAK DETECTION PUMP HEATER CONTROL CIRCUIT/OPEN (SIG)

BMW Fault Code (hex)

0x2A18

BMW Fault Code (dez)

10776

BMW Fault Code Description VS-Text

DMTL, heater: activation

Component

EVAP System

Subcomponent

DMTL Heater

Monitoring criteria

Control monitoring when DMTL heater is being triggered.

Fault debouncing

5 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

5 sec.

System test

DMTL Check

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Open circuit

Repair procedures (plant/service)

Check wiring - Repair if defective - If wiring is OK proceed to check component

MIL illumination/CC message/emergency program

MIL ON

Remarks

Installed in US only (initialization version)

DTC P240B: EVAPORATIVE EMISSION SYSTEM LEAK DETECTION PUMP HEATER CONTROL CIRCUIT LOW (MIN)

BMW Fault Code (hex)

0x2A18

BMW Fault Code (dez)

10776

BMW Fault Code Description VS-Text

DMTL, heater: activation

Component

EVAP System

Subcomponent

DMTL Heater

Monitoring criteria

Control monitoring when DMTL heater is being triggered.

Fault debouncing

5 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

5 sec.

System test

DMTL Check

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short to ground

Repair procedures (plant/service)

Check wiring - Repair if defective - If wiring is OK proceed to check component

MIL illumination/CC message/emergency program

MIL ON

Remarks

Installed in US only (initialization version)

DTC P240C: EVAPORATIVE EMISSION SYSTEM LEAK DETECTION PUMP HEATER CONTROL CIRCUIT HIGH (MAX)

BMW Fault Code (hex)

0x2A18

BMW Fault Code (dez)

10776

BMW Fault Code Description VS-Text

DMTL, heater: activation

Component

EVAP System

Subcomponent

DMTL Heater

Monitoring criteria

Control monitoring when DMTL heater is being triggered.

Fault debouncing

5 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

5 sec.

System test

DMTL Check

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short to positive

Repair procedures (plant/service)

Check wiring - Repair if defective - If wiring is OK proceed to check component

MIL illumination/CC message/emergency program

MIL ON

Remarks

Installed in US only (initialization version)

DTC P2414: O2 SENSOR EXHAUST SAMPLE ERROR (BANK 1 SENSOR 1) (MAX)

BMW Fault Code (hex)

0x2C3B

BMW Fault Code (dez)

11323

BMW Fault Code Description VS-Text

Oxygen sensor before catalytic converter, not connected

Component

Oxygen Sensor, Front

Subcomponent

Exhaust Sample Error

Monitoring criteria

O2 sensor test O2 sensor indicates lean mixture although engine operates at part or full load

Fault debouncing

O2 sensor voltage >4.8 V at part-load (sensor registers air)

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

none

Time conditions

25 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

O2 sensor not screwed in

Repair procedures (plant/service)

Determine whether sensor is corrected threaded into place - Check exhaust system for leaks - Check the plug-in connection

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P2415: O2 SENSOR EXHAUST SAMPLE ERROR (BANK 2 SENSOR 1) (MAX)

BMW Fault Code (hex)

0x2C3C

BMW Fault Code (dez)

11324

BMW Fault Code Description VS-Text

Oxygen sensor before catalytic converter 2, not connected

Component

Oxygen Sensor, Front

Subcomponent

Exhaust Sample Error

Monitoring criteria

O2 sensor test O2 sensor indicates lean mixture although engine operates at part or full load

Fault debouncing

O2 sensor voltage >4.8 V at part-load (sensor registers air)

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

none

Time conditions

25 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

O2 sensor not screwed in

Repair procedures (plant/service)

Determine whether sensor is corrected threaded into place Check exhaust system for leaks Check the plug-in connection

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P2418: EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT/OPEN (SIG)**BMW Fault Code (hex)**

0x2A12

BMW Fault Code (dez)

10770

BMW Fault Code Description VS-Text

DMTL solenoid valve, activation

Component

EVAP System

Subcomponent

Switching Valve

Monitoring criteria

Monitoring of control activation when solenoid is triggered

Fault debouncing

0.5 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

0.5 sec.

System test

DMTL Check

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Open circuit

Repair procedures (plant/service)

Check wiring - Repair if defective - If wiring is OK proceed to check component

MIL illumination/CC message/emergency program

MIL ON

Remarks

Installed in US only (initialization version)

DTC P2419: EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT LOW (MIN)

BMW Fault Code (hex)

0x2A12

BMW Fault Code (dez)

10770

BMW Fault Code Description VS-Text

DMTL solenoid valve, activation

Component

EVAP System

Subcomponent

Switching Valve

Monitoring criteria

Monitoring of control activation when solenoid is triggered

Fault debouncing

0.5 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

0.5 sec.

System test

DMTL Check

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short to ground

Repair procedures (plant/service)

1 Check wiring Repair if defective If wiring is OK proceed to check component

MIL illumination/CC message/emergency program

MIL ON

Remarks

Installed in US only (initialization version)

DTC P2420: EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT HIGH (MAX)

BMW Fault Code (hex)

0x2A12

BMW Fault Code (dez)

10770

BMW Fault Code Description VS-Text

DMTL solenoid valve, activation

Component

EVAP System

Subcomponent

Switching Valve

Monitoring criteria

Monitoring of control activation when solenoid is triggered

Fault debouncing

0.5 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

0.5 sec.

System test

DMTL Check

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short to positive

Repair procedures (plant/service)

1 Check wiring Repair if defective If wiring is OK proceed to check component

MIL illumination/CC message/emergency program

MIL ON

Remarks

Installed in US only (initialization version)

DTC P250A: ENGINE OIL LEVEL SENSOR CIRCUIT (SIG)**BMW Fault Code (hex)**

0x2F9E

BMW Fault Code (dez)

12190

BMW Fault Code Description VS-Text

Thermal oil-level sensor

Component

Engine Oil Level Sensor

Subcomponent

Electrical

Monitoring criteria

No communications with sensor

Fault debouncing

10 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 9 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Defective oil sensor (no communications)

Repair procedures (plant/service)

Wiring harness check/sensor replacement

MIL illumination/CC message/emergency program

CC message 182 - suppressed starting with E90 with BN2000

Remarks

not used

DTC P250B: ENGINE OIL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE (PLAUS)

BMW Fault Code (hex)

0x2F9E

BMW Fault Code (dez)

12190

BMW Fault Code Description VS-Text

Thermal oil-level sensor

Component

Engine Oil Level Sensor

Subcomponent

Plausibility

Monitoring criteria

Implausible sensor signal

Fault debouncing

10 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 9 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Interference in oil sensor signal

Repair procedures (plant/service)

Wiring harness check/sensor replacement

MIL illumination/CC message/emergency program

CC message 182 - suppressed starting with E90 with BN2000

Remarks

not used

DTC P250F: ENGINE OIL LEVEL TOO LOW (MIN)

BMW Fault Code (hex)

0x2F9E

BMW Fault Code (dez)

12190

BMW Fault Code Description VS-Text

Thermal oil-level sensor

Component

Engine Oil Level

Subcomponent

Level

Monitoring criteria

Oil level below 5 liters

Fault debouncing

10 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 9 V

Temperature conditions

Oil temperature > 0

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Oil level too low (substantially below MIN)

Repair procedures (plant/service)

Add 1l engine oil

MIL illumination/CC message/emergency program

CC message 28

Remarks

not used

DTC P252A: ENGINE OIL QUALITY SENSOR CIRCUIT (MIN)

BMW Fault Code (hex)

0x2EC2

BMW Fault Code (dez)

11970

BMW Fault Code Description VS-Text

LIN bus, communication

Component

No Info

Subcomponent

No Info

Monitoring criteria

EAC sensor must be installed, and the correct data set (SULEV) must be programmed in the DME

Fault debouncing

2.4 sec.

Terminal conditions

Terminal 15

Voltage conditions

Voltage in onboard electrical system > 9 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

LIN bus signal

Calculated value Y/N

none

Possible Fault Causes

1. Incident electromagnetic radiation
2. Internal driver chip in DME defective

Repair procedures (plant/service)

1. Check routing of wiring and exclude electromagnetic interference problem as possible cause
2. Replace DME

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P252A: ENGINE OIL QUALITY SENSOR CIRCUIT (PLAUS)**BMW Fault Code (hex)**

0x2EC2

BMW Fault Code (dez)

11970

BMW Fault Code Description VS-Text

LIN bus, communication

Component

No Info

Subcomponent

No Info

Monitoring criteria

EAC sensor must be installed, and the correct data set (SULEV) must be programmed in the DME

Fault debouncing

2.4 sec.

Terminal conditions

Terminal 15

Voltage conditions

Voltage in onboard electrical system > 9 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

LIN bus signal

Calculated value Y/N

none

Possible Fault Causes

1. Incident electromagnetic radiation
2. Internal driver chip in DME defective

Repair procedures (plant/service)

1. Check routing of wiring and exclude electromagnetic interference problem as possible cause
2. Replace DME

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P252A: ENGINE OIL QUALITY SENSOR CIRCUIT (SIG)

BMW Fault Code (hex)

0x2EA1

BMW Fault Code (dez)

11937

BMW Fault Code Description VS-Text

Oil condition sensor, communication

Component

Engine Oil Quality Sensor

Subcomponent

Electrical

Monitoring criteria

Oil status sensor communications monitor

Fault debouncing

20 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 9 V

Temperature conditions

none

Time conditions

approximately 10 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

1. Oil sensor (BSD BUS) not connected
2. Open wire (BSD BUS) between oil sensor and DME
3. Defective oil sensor

Repair procedures (plant/service)

1. Check wire (BSD_BUS) connecting oil sensor (QLT) and DME.
2. Check plug-in connection at QLT.
3. Replace QLT

MIL illumination/CC message/emergency program

No warning message. No oil level display or oil temperature measurement is possible without the BSD_BUS signal.

Remarks

none

DTC P252A: ENGINE OIL QUALITY SENSOR CIRCUIT (SIG)**BMW Fault Code (hex)**

0x2EC2

BMW Fault Code (dez)

11970

BMW Fault Code Description VS-Text

LIN bus, communication

Component

No Info

Subcomponent

No Info

Monitoring criteria

EAC sensor must be installed, and the correct data set (SULEV) must be programmed in the DME

Fault debouncing

2.4 sec.

Terminal conditions

Terminal 15

Voltage conditions

Voltage in onboard electrical system > 9 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

LIN bus signal

Calculated value Y/N

none

Possible Fault Causes

1. Incident electromagnetic radiation
2. Internal driver chip in DME defective

Repair procedures (plant/service)

1. Check routing of wiring and exclude electromagnetic interference problem as possible cause
2. Replace DME

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P2568: DIRECT OZONE REDUCTION CATALYST TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE (PLAUS)

BMW Fault Code (hex)

0x2ADA

BMW Fault Code (dez)

10970

BMW Fault Code Description VS-Text

EAC sensor, electrical fault

Component

Direct Ozone Reduction

Subcomponent

Catalyst Temperature Sensor

Monitoring criteria

EAC sensor must be installed, and the correct data set (SULEV) must be programmed in the DME

Fault debouncing

2.5 sec.

Terminal conditions

Terminal 15

Voltage conditions

Voltage in onboard electrical system > 9 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

LIN bus signal

Calculated value Y/N

none

Possible Fault Causes

Fault in temperature measurement within sensor

Repair procedures (plant/service)

Replace EAC sensor

MIL illumination/CC message/emergency program

MIL in second driving cycle

Remarks

none

DTC P2569: DIRECT OZONE REDUCTION CATALYST TEMPERATURE SENSOR CIRCUIT LOW (MIN)

BMW Fault Code (hex)

0x2ADA

BMW Fault Code (dez)

10970

BMW Fault Code Description VS-Text

EAC sensor, electrical fault

Component

Direct Ozone Reduction

Subcomponent

Catalyst Temperature Sensor

Monitoring criteria

EAC sensor must be installed, and the correct data set (SULEV) must be programmed in the DME.

Fault debouncing

2.5 sec.

Terminal conditions

Terminal 15

Voltage conditions

Voltage in onboard electrical system > 9 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

LIN bus signal

Calculated value Y/N

none

Possible Fault Causes

Short to ground

Repair procedures (plant/service)

Replace EAC sensor

MIL illumination/CC message/emergency program

MIL in second driving cycle

Remarks

none

DTC P2570: DIRECT OZONE REDUCTION CATALYST TEMPERATURE SENSOR CIRCUIT HIGH (MAX)

BMW Fault Code (hex)

0x2ADA

BMW Fault Code (dez)

10970

BMW Fault Code Description VS-Text

EAC sensor, electrical fault

Component

Direct Ozone Reduction

Subcomponent

Catalyst Temperature Sensor

Monitoring criteria

EAC sensor must be installed, and the correct data set (SULEV) must be programmed in the DME.

Fault debouncing

2.5 sec.

Terminal conditions

Terminal 15

Voltage conditions

Voltage in onboard electrical system > 9 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

LIN bus signal

Calculated value Y/N

none

Possible Fault Causes

Short to positive

Repair procedures (plant/service)

Replace EAC sensor

MIL illumination/CC message/emergency program

MIL in second driving cycle

Remarks

none

**DTC P2626: O2 SENSOR PUMPING CURRENT TRIM CIRCUIT/OPEN (BANK 1 SENSOR 1)
(PLAUS)**

BMW Fault Code (hex)

0x2C3D

BMW Fault Code (dez)

11325

BMW Fault Code Description VS-Text

Oxygen sensor before catalytic converter, line fault

Component

Oxygen Sensor, Front

Subcomponent

Pumping Current

Monitoring criteria

O2 sensor wire monitoring. Voltage of O2 sensor signal is too high during overrun cut-off phase, overrun injection deactivation.

Fault debouncing

Voltage >5.8 V during overrun injection deactivation

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

Engine at operating temperature.

Time conditions

approximately 9s with overrun injection deactivation active

System test

O2 sensors reversed

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Sensor inactive. Wire IA is open. Catalyst is plugged (rich exhaust at O2 sensor in overrun cut-off); oil or gasoline in the exhaust gases during operation in overrun cut-off phase.

Repair procedures (plant/service)

1. Visual inspection of wires, DME plug and O2 sensor for damage
2. Inspect wires
3. Check plug-in connections DME <=> Wiring harness <=> Upstream (pre-cat) O2 sensor for Bank 1 (water or corrosion in plug?) => Repeatedly remove the plug and then reconnect it FIRMLY
4. Check catalytic converter (is FSD lean fault entered for the other bank?)
5. Piston rings, injectors, positive crankcase ventilation OK? FSD fault? Then continue there!
6. Replace O2 sensor
7. Replace DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

**DTC P2629: O2 SENSOR PUMPING CURRENT TRIM CIRCUIT/OPEN (BANK 2 SENSOR 1)
(PLAUS)**

BMW Fault Code (hex)

0x2C3E

BMW Fault Code (dez)

11326

BMW Fault Code Description VS-Text

Oxygen sensor before catalytic converter 2, line fault

Component

Oxygen Sensor, Front

Subcomponent

Pumping Current

Monitoring criteria

O2 sensor wire monitoring. Voltage of O2 sensor signal is too high during overrun cut-off phase, overrun injection deactivation

Fault debouncing

Voltage > 5.8 V during overrun injection deactivation

Terminal conditions

Terminal 15, engine on

Voltage conditions

none

Temperature conditions

Engine at operating temperature

Time conditions

approximately 9s with overrun injection deactivation active

System test

O2 sensors reversed

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Sensor inactive Wire IA is open Catalyst is plugged (rich exhaust at O2 sensor in overrun cut-off); oil or gasoline in the exhaust gases during operation in overrun cut-off phase

Repair procedures (plant/service)

1. Visual inspection of wires, DME plug and O2 sensor for damage.
2. Inspect wires
3. Check plug-in connections DME <=> Wiring harness <=> Upstream (pre-cat) O2 sensor for Bank 1 (water or corrosion in plug?) => Repeatedly remove the plug and then reconnect it FIRMLY)
4. Check catalytic converter (is FSD lean fault entered for the other bank?)
5. Piston rings, injectors, positive crankcase ventilation OK? FSD fault? Then continue there!
6. Replace O2 sensor
7. Replace DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P300A: CONTROLLED AIR GUIDING CIRCUIT HIGH (MAX)

BMW Fault Code (hex)

0x2F0D

BMW Fault Code (dez)

12045

BMW Fault Code Description VS-Text

Radiator blind, activation, (GLF)

Component

No Info

Subcomponent

No Info

Monitoring criteria

AKKS must be initialized.

Fault debouncing

up to 20 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

In the SGBD

Signal information

PWM of 5-90%

Calculated value Y/N

N

Possible Fault Causes

1. Wire from the DME to the AKKS is shorted to UBatt. PVE: Connect wire from DME to AKKS to UBatt.

Repair procedures (plant/service)

1. Check wire from the DME to the AKKS.

MIL illumination/CC message/emergency program

no external display

Remarks

There is no hazard provided that the voltage supply to the AKKS is OK. (Failsafe circuit in the AKKS is active: both flaps remain open.)

DTC P300B: CONTROLLED AIR GUIDING CIRCUIT LOW (MIN)

BMW Fault Code (hex)

0x2F0D

BMW Fault Code (dez)

12045

BMW Fault Code Description VS-Text

Radiator blind, activation, (GLF)

Component

No Info

Subcomponent

No Info

Monitoring criteria

AKKS must be initialized.

Fault debouncing

up to 20 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

No info.

Signal information

PWM of 5-90%

Calculated value Y/N

N

Possible Fault Causes

1. Wire from the DME to the AKKS is shorted to ground.
2. No voltage supply to the AKKS. PVE: Ground the wire from the DME to the AKKS.

Repair procedures (plant/service)

1. Determine whether a possible self-diagnosis fault at the AKKS or PKKS is stored as a fault in the fault memory. (If yes, start by repairing this.)
2. Check wire from the DME to the AKKS
3. Check voltage supply at the AKKS

MIL illumination/CC message/emergency program

no external display;

Remarks

There is no hazard provided that the voltage supply to the AKKS is OK. (Failsafe circuit in the AKKS is active: both flaps remain open.)

DTC P300C: CONTROLLED AIR GUIDING CIRCUIT (SIG)**BMW Fault Code (hex)**

0x2F0D

BMW Fault Code (dez)

12045

BMW Fault Code Description VS-Text

Radiator blind, activation, (GLF)

Component

No Info

Subcomponent

No Info

Monitoring criteria

AKKS must be initialized.

Fault debouncing

up to 20 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

No info.

Signal information

PWM of 5-90%

Calculated value Y/N

N

Possible Fault Causes

1. Wire from the DME to the AKKS is open. PVE: Open the wire from the DME to the AKKS.

Repair procedures (plant/service)

1. Check wire from the DME to the AKKS.

MIL illumination/CC message/emergency program

no external display

Remarks

There is no hazard provided that the voltage supply to the AKKS is OK. (Fail-safe circuit in the AKKS is active: both flaps remain open.)

DTC P3022: O2 SENSOR DISTURBED SPI COMMUNICATION TO WRAF-IC (BANK 1 SENSOR 1) (MIN)

BMW Fault Code (hex)

0x2C41

BMW Fault Code (dez)

11329

BMW Fault Code Description VS-Text

DME, internal fault: oxygen sensor

Component

Oxygen Sensor, Front

Subcomponent

ECM Self-Test

Monitoring criteria

Monitoring of O2 sensor chip. No fault memories.

Fault debouncing

Self-diagnosis processor chip: Communications fault with \$mUC.

Terminal conditions

Terminal 15 ON

Voltage conditions

none

Temperature conditions

none

Time conditions

approximately 5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Communication fault between processor chip and microcontroller.

Repair procedures (plant/service)

Replace DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

**DTC P3023: O2 SENSOR DISTURBED SPI COMMUNICATION TO WRAF-IC (BANK 2 SENSOR 1)
(MIN)**

BMW Fault Code (hex)

0x2C42

BMW Fault Code (dez)

11330

BMW Fault Code Description VS-Text

DME, internal fault: oxygen sensor 2

Component

Oxygen Sensor, Front

Subcomponent

ECM Self-Test

Monitoring criteria

Monitoring of O2 sensor chip. No fault memories.

Fault debouncing

Self-diagnosis processor chip: Communications fault with \$mUC.

Terminal conditions

Terminal 15 ON

Voltage conditions

none

Temperature conditions

none

Time conditions

approximately 5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Communication fault between processor chip and microcontroller.

Repair procedures (plant/service)

Replace DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P3024: O2 SENSOR INITIALIZATION ERROR WRAF-IC (BANK 1 SENSOR 1) (MAX)

BMW Fault Code (hex)

0x2C41

BMW Fault Code (dez)

11329

BMW Fault Code Description VS-Text

DME, internal fault: oxygen sensor

Component

Oxygen Sensor, Front

Subcomponent

ECM Self-Test

Monitoring criteria

Monitoring of O2 sensor chip. No fault memories.

Fault debouncing

Self-diagnosis processor chip: Communications fault with \$mUC

Terminal conditions

Terminal 15 ON

Voltage conditions

none

Temperature conditions

none

Time conditions

approximately 100 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Initialization fault

Repair procedures (plant/service)

Replace DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P3025: O2 SENSOR INITIALIZATION ERROR WRAF-IC (BANK 2 SENSOR 1) (MAX)

BMW Fault Code (hex)

0x2C42

BMW Fault Code (dez)

11330

BMW Fault Code Description VS-Text

DME, internal fault: oxygen sensor 2.

Component

Oxygen Sensor, Front

Subcomponent

ECM Self-Test

Monitoring criteria

Monitoring of O2 sensor chip. No fault memories.

Fault debouncing

Self-diagnosis processor chip: Communications fault with \$mUC

Terminal conditions

Terminal 15 ON

Voltage conditions

none

Temperature conditions

none

Time conditions

approximately 100 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Initialization fault

Repair procedures (plant/service)

Replace DME

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC P316A: ENGINE COOLANT TEMPERATURE SIGNAL STUCK HIGH (PLAUS)

BMW Fault Code (hex)

0x2EE6

BMW Fault Code (dez)

12006

BMW Fault Code Description VS-Text

Coolant-temperature sensor, measurement range

Component

Engine Coolant

Subcomponent

Temperature

Monitoring criteria

Engine must be running, T_ES > 360 min, UBatt > 11 V, TIA at start between - 10°C and 60°C, TAM_ST > - 10°C, cold start

Fault debouncing

immediately

Terminal conditions

Terminal 15 on and engine running

Voltage conditions

Voltage in onboard electrical system > 11 V

Temperature conditions

Induction air temperature at start between -10 and 60°C, ambient temperature > -10°C

Time conditions

Time parked > 360 min, time after start > 10 sec.

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Temperature sensor sticks at upper end of temperature range, sensor tampering.

Repair procedures (plant/service)

1. Visual inspection of sensor and wiring
2. Determine whether coolant temperature really remains constant while the engine warms up
3. Replace sensor

MIL illumination/CC message/emergency program

MIL ON, electrical water pump and E fan at full power with engine running

Remarks

none

DTC P3196: COLD START RADIATOR COOLANT TEMPERATURE SENSOR SIGNAL HIGH (MAX)

BMW Fault Code (hex)

0x2EEC

BMW Fault Code (dez)

12012

BMW Fault Code Description VS-Text

Temperature sensor cooler outlet, plausibility

Component

Radiator Coolant Temperature Sensor

Subcomponent

Cold Start

Monitoring criteria

Engine must be running

Fault debouncing

no debounce, fault code entered when engine is extremely cold (coolant temperature < -10°C) with excessively high sensor data reading immediately after engine start

Terminal conditions

Terminal 15 ON

Voltage conditions

11 V < electrical system voltage < 26 V

Temperature conditions

Coolant temperature < -10°C, induction air temperature < -10°C

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Readings transmitted by temperature sensor too high (coolant temperature_2 > coolant temperature just after start in cold environment): Sticking sensor, sensor manipulation.

Repair procedures (plant/service)

1. Visual inspection of sensor
2. Perform electrical check on sensor and power-supply wires
3. Test to determine whether the temperature really changes when the thermostat opens
4. Replace sensor

MIL illumination/CC message/emergency program

MIL ON in US versions only

Remarks

temperature condition defined by data entry

DTC P3197: RADIATOR COOLANT TEMPERATURE GRADIENT TOO HIGH (PLAUS)

BMW Fault Code (hex)

0x2EEB

BMW Fault Code (dez)

12011

BMW Fault Code Description VS-Text

Temperature sensor, radiator outlet, plausibility: gradient

Component

Radiator Coolant

Subcomponent

Temperature

Monitoring criteria

Radiator discharge temperature plausibility monitor

Fault debouncing

600 msec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 9.15 V

Temperature conditions

Coolant temperature > -10°C, induction air temperature > -10°C OBD test conditions??

Time conditions

10 Min ?? OBD DC?

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Creeping contact resistance or intermittent contact in sensor/power wires

Repair procedures (plant/service)

1. Perform electrical check on sensor wire and power-supply wires
2. Visual inspection of plug-in contacts (on component and DME ends)
3. Replace sensor

MIL illumination/CC message/emergency program

MIL ON in US versions only

Remarks

none

DTC P3198: ENGINE COOLANT TEMPERATURE 1 GRADIENT TOO HIGH (PLAUS)

BMW Fault Code (hex)

0x2EE3

BMW Fault Code (dez)

12003

BMW Fault Code Description VS-Text

Coolant temperature sensor, plausibility: gradient

Component

Engine Coolant

Subcomponent

Temperature

Monitoring criteria

UBatt > 9.15 V Terminal 15 on

Fault debouncing

600 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 9.15 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Creeping contact resistance or intermittent contact in sensor/power wires.

Repair procedures (plant/service)

1. Perform electrical check on sensor wire and power-supply wires
2. Visual inspection of plug-in contacts (on component and DME ends)
3. Replace sensor

MIL illumination/CC message/emergency program

MIL ON, electrical water pump and E fan at full power with engine running

Remarks

none

DTC P3199: ENGINE COOLANT TEMPERATURE SIGNAL STUCK (PLAUS)**BMW Fault Code (hex)**

0x2EE2

BMW Fault Code (dez)

12002

BMW Fault Code Description VS-Text

Coolant temperature sensor, plausibility: signal constant

Component

Engine Coolant

Subcomponent

Temperature

Monitoring criteria

Engine must be running

Fault debouncing

immediately

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 9.15 V

Temperature conditions

Coolant temperature at start < 65°C

Time conditions

Entry registered when sensor reading remains constant during engine warm-up phase (up to 10 min)

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Temperature sensor seizing, sensor manipulation

Repair procedures (plant/service)

1. Visual inspection of sensor
2. Test to determine whether coolant temperature really remains constant as engine warms
3. Sensor replacement

MIL illumination/CC message/emergency program

MIL ON, electrical water pump and E fan at full power with engine running.

Remarks

Temperature condition defined indirectly by data entry

DTC P3202: POWERTRAIN CAN, CAN CHIP CUT-OFF (SIG)

BMW Fault Code (hex)

0xCD87

BMW Fault Code (dez)

52615

BMW Fault Code Description VS-Text

PT-CAN communication fault

Component

Communication

Subcomponent

Powertrain

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P3205: LOCAL CAN, CAN CHIP CUTOFF (SIG)

BMW Fault Code (hex)

0xCD8B

BMW Fault Code (dez)

52619

BMW Fault Code Description VS-Text

PT CAN bus communication fault

Component

Communication

Subcomponent

Local

Monitoring criteria

Terminal 15 on and EKP control module connected to LoCan

Fault debouncing

Currently deactivated

Terminal conditions

none

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Short circuit in CAN bus

Repair procedures (plant/service)

1. Check CAN wires
2. Check plugs to all CAN stations

MIL illumination/CC message/emergency program

none

Remarks

CAN BUS OFF

DTC P321E: AMBIENT PRESSURE SENSOR MAXIMUM PRESSURE IMPLAUSIBLE (MAX)

BMW Fault Code (hex)

0x2F77

BMW Fault Code (dez)

12151

BMW Fault Code Description VS-Text

Ambient-pressure sensor, plausibility

Component

Ambient Pressure Sensor

Subcomponent

Pressure

Monitoring criteria

Ambient pressure sensor monitor

Fault debouncing

Because an excessively steep ambient pressure gradient must be detected, no precise statements regarding debounce time are possible.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

ambient pressure rises too rapidly

Repair procedures (plant/service)

1. Plausibility check on barometric pressure (data range and sensor travel during mountain ascent and descent)
2. Replace DME only if barometric pressure data are implausible (internal component)

MIL illumination/CC message/emergency program

MIL ON in US versions only

Remarks

none

DTC P321F: AMBIENT PRESSURE SENSOR MINIMUM PRESSURE IMPLAUSIBLE (MIN)

BMW Fault Code (hex)

0x2F77

BMW Fault Code (dez)

12151

BMW Fault Code Description VS-Text

Ambient-pressure sensor, plausibility

Component

Ambient Pressure Sensor

Subcomponent

Pressure

Monitoring criteria

Ambient pressure sensor monitor

Fault debouncing

Because an excessively steep ambient pressure gradient must be detected, no precise statements regarding debounce time are possible.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

excessively rapid decline in ambient pressure

Repair procedures (plant/service)

1. Plausibility check on barometric pressure (data range and sensor travel during mountain ascent and descent)
2. Replace DME only if barometric pressure data are implausible (internal component)

MIL illumination/CC message/emergency program

MIL ON in US versions only

Remarks

none

DTC P3223: GENERATOR MECHANICAL (PLAUS)

BMW Fault Code (hex)

0x2E97

BMW Fault Code (dez)

11927

BMW Fault Code Description VS-Text

Generator

Component

No Info

Subcomponent

No Info

Monitoring criteria

Mech. fault

Fault debouncing

Commercial vehicle >350 rpm, No communications fault

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

25 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Alternator fails to turn => bearing damage, belt torn

Repair procedures (plant/service)

Check bearings, replace belt

MIL illumination/CC message/emergency program

Charge indicator lamp

Remarks

Can occur during vehicle servicing when external power source is connected, etc.

DTC P3226: E-BOX CONTROL CIRCUIT FAN HIGH INPUT (MAX)

BMW Fault Code (hex)

0x2F71

BMW Fault Code (dez)

12145

BMW Fault Code Description VS-Text

Electronics-box fan, activation

Component

No Info

Subcomponent

No Info

Monitoring criteria

E-module fan activation-control monitor. Component must be installed. Tester must be used to trigger component for at least 15 sec.

Fault debouncing

2 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Wire is shorted to positive, or a short to positive is present in the component

Repair procedures (plant/service)

Check wiring. Repair if defective. If wiring is OK proceed to check component.

MIL illumination/CC message/emergency program

No display

Remarks

none

DTC P3227: E-BOX CONTROL CIRCUIT FAN LOW INPUT (MIN)

BMW Fault Code (hex)

0x2F71

BMW Fault Code (dez)

12145

BMW Fault Code Description VS-Text

Electronics-box fan, activation

Component

No Info

Subcomponent

No Info

Monitoring criteria

E-module fan activation-control monitor. Component must be installed. Tester must be used to trigger component for at least 15 sec.

Fault debouncing

2 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Short circuit to ground in wire or component.

Repair procedures (plant/service)

Check wiring. Repair if defective. If wiring is OK proceed to check component.

MIL illumination/CC message/emergency program

No display

Remarks

none

DTC P3228: E-BOX CONTROL CIRCUIT FAN OPEN CIRCUIT (SIG)

BMW Fault Code (hex)

0x2F71

BMW Fault Code (dez)

12145

BMW Fault Code Description VS-Text

Electronics-box fan, activation

Component

No Info

Subcomponent

No Info

Monitoring criteria

E-module fan activation-control monitor. Component must be installed. Tester must be used to trigger component for at least 15 sec.

Fault debouncing

5 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Open circuit

Repair procedures (plant/service)

Check wiring. Repair if defective. If wiring is OK proceed to check component.

MIL illumination/CC message/emergency program

No display

Remarks

none

DTC P3235: CONTROL MODULE MONITORING VERSION CODING PLAUSIBILITY (PLAUS)

BMW Fault Code (hex)

0x2FA4

BMW Fault Code (dez)

12196

BMW Fault Code Description VS-Text

Incorrect data record

Component

ECM Monitoring

Subcomponent

Coding

Monitoring criteria

Always active

Fault debouncing

none

Terminal conditions

Terminal 15 ON

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Incorrect data set in DME or incorrect code entered in DME

Repair procedures (plant/service)

Data programming, of fault remains active re-enter DME code, if then still active replace the DME.

MIL illumination/CC message/emergency program

Reduced output

Remarks

OL/UL code: Codes for CAS and/or code in data set and/or DME code do not match.

DTC P324A: GENERATOR TYPE IMPLAUSIBLE (MAX)

BMW Fault Code (hex)

0x2ED3

BMW Fault Code (dez)

11987

BMW Fault Code Description VS-Text

Generator, type incorrect

Component

No Info

Subcomponent

No Info

Monitoring criteria

Commercial vehicle > 350 rpm, No communications fault

Fault debouncing

25 sec.

Terminal conditions

Terminal 15 ON, no BSD fault

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Alternator not approved for use in this vehicle installed

Repair procedures (plant/service)

Install alternator with approved detail number

MIL illumination/CC message/emergency program

none

Remarks

If detail number is identical to approved number, information through VS to EA

DTC P324A: GENERATOR TYPE IMPLAUSIBLE (MIN)

BMW Fault Code (hex)

0x2E97

BMW Fault Code (dez)

11927

BMW Fault Code Description VS-Text

Generator

Component

No Info

Subcomponent

No Info

Monitoring criteria

Implausible alternator version

Fault debouncing

Commercial vehicle >350 rpm, No communications fault

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

25 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Alternator not approved for use in this vehicle installed

Repair procedures (plant/service)

Install alternator with approved detail number

MIL illumination/CC message/emergency program

none

Remarks

If detail number is identical to approved number, information through VS to EA

DTC P324C: GENERATOR OVER TEMPERATURE CALCULATED (MAX)**BMW Fault Code (hex)**

0x2ED0

BMW Fault Code (dez)

11984

BMW Fault Code Description VS-Text

Generator, plausibility: temperature

Component

No Info

Subcomponent

No Info

Monitoring criteria

Diagnosis not active, specific to application

Fault debouncing

Never, diagnosis not active

Terminal conditions

Terminal 15 ON, no BSD fault

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Alternator airflow obstructed. Thermal overload from unfavorable driving profile possible.

Repair procedures (plant/service)

Inspect alternator for unobstructed air current.

MIL illumination/CC message/emergency program

none

Remarks

none

DTC P324C: GENERATOR OVER TEMPERATURE CALCULATED (MAX)

BMW Fault Code (hex)

0x2ED1

BMW Fault Code (dez)

11985

BMW Fault Code Description VS-Text

Generator, mechanical

Component

No Info

Subcomponent

No Info

Monitoring criteria

Commercial vehicle >350 rpm, No communications fault.

Fault debouncing

25 sec.

Terminal conditions

Terminal 15 ON, no BSD fault

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Alternator fails to turn; bearing defect, belt slips or ruptures

Repair procedures (plant/service)

Check alternator shaft for resistance to motion, replace belt

MIL illumination/CC message/emergency program

Charge indicator lamp

Remarks

Can occur during vehicle servicing when external power source is connected, etc.

DTC P324E: GENERATOR REGULATOR TYPE IMPLAUSIBLE (MAX)**BMW Fault Code (hex)**

0x2ED2

BMW Fault Code (dez)

11986

BMW Fault Code Description VS-Text

Generator, regulator incorrect

Component

No Info

Subcomponent

No Info

Monitoring criteria

none

Fault debouncing

25 sec.

Terminal conditions

Terminal 15 ON, no BSD fault

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Installed regulator was not approved for this vehicle/this alternator.

Repair procedures (plant/service)

Install regulator with approved detail number

MIL illumination/CC message/emergency program

none

Remarks

If detail number is identical to approved number, information through VS to EA

DTC P3255: GENERATOR VOLTAGE IN STARTING PHASE ABOVE THRESHOLD (MAX)

BMW Fault Code (hex)

0x2E96

BMW Fault Code (dez)

11926

BMW Fault Code Description VS-Text

Generator, under-excitation

Component

No Info

Subcomponent

No Info

Monitoring criteria

Commercial vehicle > 350 rpm, alternator underexcitation requested

Fault debouncing

Never, diagnosis not active

Terminal conditions

Terminal 15 ON

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

Communications fault on BSD bus while PM is requesting alternator underexcitation.

1. Alternator (BSD-BUS) not connected
2. Open wire (BSD-BUS) between alternator and DME
3. Alternator defect

Repair procedures (plant/service)

1. Check wire (BSD_BUS) connecting alternator and DME.
2. Check plug-in connection at alternator.
3. Replace alternator.

MIL illumination/CC message/emergency program

MIL relevance not yet defined

Remarks

none

DTC P325A: GENERATOR ELECTRICAL ERROR CALCULATED (MAX)

BMW Fault Code (hex)

0x2ECE

BMW Fault Code (dez)

11982

BMW Fault Code Description VS-Text

Generator, plausibility: electric

Component

No Info

Subcomponent

No Info

Monitoring criteria

Specified alternator voltage > Application threshold 1 AND battery voltage < Application threshold 2; no electrical, mechanical or overheating faults, no active excitation current

Fault debouncing

Never, diagnosis not active

Terminal conditions

Terminal 15 ON

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

Y

Possible Fault Causes

B+ - Wire: Open or high contact resistance; Alternator defect. Battery defect.

Repair procedures (plant/service)

Repair B+ wire Check alternator, repair as indicated Check battery, repair as indicated

MIL illumination/CC message/emergency program

none

Remarks

none

DTC U0101: LOST COMMUNICATION WITH TCM (SIG)**BMW Fault Code (hex)**

0x2DC8

BMW Fault Code (dez)

11720

BMW Fault Code Description VS-Text

No message from EGS, EGS 1

Component

Communication

Subcomponent

TCM

Monitoring criteria

EGS detected

Fault debouncing

5 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Timeout on EGS message

Repair procedures (plant/service)

Check CAN link to EGS control module

MIL illumination/CC message/emergency program

none

Remarks

none

DTC U0126: LOST COMMUNICATION WITH STEERING ANGLE SENSOR MODULE (SIG)

BMW Fault Code (hex)

0x2DD2

BMW Fault Code (dez)

11730

BMW Fault Code Description VS-Text

No message from SAS control module, SAS

Component

No Info

Subcomponent

No Info

Monitoring criteria

1. CAN 11 vehicle (E46, E85, E83)
2. No short circuit on the PT CAN
3. LWS1 message initialized

Fault debouncing

5 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

400 ms

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

No reception of CAN message LWS1 possible.

Repair procedures (plant/service)

Check CAN link between LWS and DME

MIL illumination/CC message/emergency program

none

Remarks

LWS1-CAN message timeout

DTC U0137: LOST COMMUNICATION WITH TRAILER BRAKE CONTROL MODULE (SIG)

BMW Fault Code (hex)

0xCDAF

BMW Fault Code (dez)

52655

BMW Fault Code Description VS-Text

Message (status, trailer, 2E4)

Component

No Info

Subcomponent

No Info

Monitoring criteria

Trailer module recognized

Fault debouncing

200 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Unable to receive CAN message.

Repair procedures (plant/service)

Check CAN link between trailer module and DME

MIL illumination/CC message/emergency program

none

Remarks

Timeout on CAN message

DTC U0155: LOST COMMUNICATION WITH INSTRUMENT PANEL CLUSTER (IPC) CONTROL MODULE (SIG)

BMW Fault Code (hex)

0x2DE3

BMW Fault Code (dez)

11747

BMW Fault Code Description VS-Text

No message from instrument cluster, instrument cluster 7

Component

Communication

Subcomponent

Instrument Pack

Monitoring criteria

1. CAN 11 vehicle (E46, E85, E83)
2. No short circuit on the PT CAN
3. INSTR7 message initialized

Fault debouncing

500 sec.

Terminal conditions

Terminal 15 on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Unable to receive CAN message.

Repair procedures (plant/service)

Check instrument cluster/CAN link to instrument cluster control module

MIL illumination/CC message/emergency program

none

Remarks

Timeout message 'INSTR_7 '

DTC U0167: LOST COMMUNICATION WITH VEHICLE IMMOBILIZER CONTROL MODULE (SIG)

BMW Fault Code (hex)

0x2F4C

BMW Fault Code (dez)

12108

BMW Fault Code Description VS-Text

Message EWS-DME incorrect

Component

No Info

Subcomponent

No Info

Monitoring criteria

EWS code request

Fault debouncing

2

Terminal conditions

Terminal 15 on without running engine

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

CAN bus telegrams

Calculated value Y/N

N

Possible Fault Causes

Messages are not received

Repair procedures (plant/service)

Problem diagnosis through CAS and/or gateway.

MIL illumination/CC message/emergency program

none

Remarks

none

DTC U1100: LOST COMMUNICATION WITH ASC/DSC (SIG)

BMW Fault Code (hex)

0x2DCC

BMW Fault Code (dez)

11724

BMW Fault Code Description VS-Text

No message from ASC/DSC, ASC 1

Component

No Info

Subcomponent

No Info

Monitoring criteria

1. CAN 11 vehicle (E46, E85, E83)
2. No short circuit on the PT CAN
3. ASR_1 Message initialized

Fault debouncing

0.8 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

400 ms

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

No reception of CAN message ASC1 possible.

Repair procedures (plant/service)

Check CAN link between DSC and DME.

MIL illumination/CC message/emergency program

none

Remarks

Timeout on ASC1 CAN message

DTC U1100: LOST COMMUNICATION WITH ASC/DSC (SIG)

BMW Fault Code (hex)

0x2DCD

BMW Fault Code (dez)

11725

BMW Fault Code Description VS-Text

No message from ASC/DSC, ASC 3

Component

No Info

Subcomponent

No Info

Monitoring criteria

1. CAN 11 vehicle (E46, E85, E83)
2. No short circuit on the PT CAN
3. ASR_3 Message initialized

Fault debouncing

0.8 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

400 ms

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

No reception of CAN message ASC3 possible.

Repair procedures (plant/service)

Check CAN link between DSC and DME

MIL illumination/CC message/emergency program

none

Remarks

Timeout on ASC3 CAN message

DTC U1100: LOST COMMUNICATION WITH ASC/DSC (SIG)

BMW Fault Code (hex)

0x2DCE

BMW Fault Code (dez)

11726

BMW Fault Code Description VS-Text

No message from ASC/DSC, ASC 4

Component

No Info

Subcomponent

No Info

Monitoring criteria

1. CAN 11 vehicle (E46, E85, E83)
2. No short circuit on the PT CAN
3. ASR_4 Message initialized

Fault debouncing

0.8 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

400 ms

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

No reception of CAN message ASC4 possible.

Repair procedures (plant/service)

Check CAN link between DSC and DME

MIL illumination/CC message/emergency program

none

Remarks

Timeout on ASC4 CAN message

DTC U1101: LOST COMMUNICATION WITH AMBIENT TEMPERATURE/RELATIVE TIME (SIG)

BMW Fault Code (hex)

0xCD94

BMW Fault Code (dez)

52628

BMW Fault Code Description VS-Text

Message (outside temperature/relative time, 310)

Component

Communication

Subcomponent

Ambient Temperature/Relative Time

Monitoring criteria

Instrument cluster recognized

Fault debouncing

20 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Unable to receive CAN message.

Repair procedures (plant/service)

Check CAN links between instrument cluster and DME.

MIL illumination/CC message/emergency program

none

Remarks

Timeout on CAN message

DTC U1102: MESSAGE MONITORING ACTUATION CRUISE CONTROL/ACC ALIVE CHECK (MIN)

BMW Fault Code (hex)

0xCD95

BMW Fault Code (dez)

52629

BMW Fault Code Description VS-Text

Message (operation, vehicle-speed controller/ACC, 194)

Component

No Info

Subcomponent

No Info

Monitoring criteria

Cruise control lever recognized

Fault debouncing

1000 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Incorrect alive counter in CAN message

Repair procedures (plant/service)

Check SZL control module

MIL illumination/CC message/emergency program

none

Remarks

Incorrect alive counter transmission from SZL

DTC U1103: LOST COMMUNICATION WITH ACTUATION CRUISE CONTROL/ACC (SIG)

BMW Fault Code (hex)

0xCD95

BMW Fault Code (dez)

52629

BMW Fault Code Description VS-Text

Message (operation, vehicle-speed controller/ACC, 194)

Component

No Info

Subcomponent

No Info

Monitoring criteria

Cruise control lever recognized

Fault debouncing

1000 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Unable to receive CAN message.

Repair procedures (plant/service)

Check CAN link between SZL and DME

MIL illumination/CC message/emergency program

none

Remarks

Timeout on CAN message

DTC U1104: MESSAGE MONITORING ACTUATION CRUISE CONTROL/ACC CHECK SUM ERROR (PLAUS)

BMW Fault Code (hex)

0xCD95

BMW Fault Code (dez)

52629

BMW Fault Code Description VS-Text

Message (operation, vehicle-speed controller/ACC, 194)

Component

No Info

Subcomponent

No Info

Monitoring criteria

Cruise control lever recognized

Fault debouncing

1000 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Incorrect checksum in CAN message

Repair procedures (plant/service)

Check SZL control module

MIL illumination/CC message/emergency program

none

Remarks

Incorrect check sum transmitted by SZL

DTC U1105: MESSAGE MONITORING TORQUE REQUEST ACC ALIVE CHECK (MIN)

BMW Fault Code (hex)

0xCD96

BMW Fault Code (dez)

52630

BMW Fault Code Description VS-Text

Message (torque request ACC, B7)

Component

No Info

Subcomponent

No Info

Monitoring criteria

ACC recognized

Fault debouncing

80 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Incorrect alive counter in CAN message

Repair procedures (plant/service)

Check ACC control module

MIL illumination/CC message/emergency program

none

Remarks

Incorrect alive counter transmission from ACC.

DTC U1106: LOST COMMUNICATION WITH TORQUE REQUEST ACC (SIG)

BMW Fault Code (hex)

0xCD96

BMW Fault Code (dez)

52630

BMW Fault Code Description VS-Text

Message (torque request ACC, B7)

Component

No Info

Subcomponent

No Info

Monitoring criteria

ACC recognized

Fault debouncing

400 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Unable to receive CAN message.

Repair procedures (plant/service)

Check CAN link between ACC and DME

MIL illumination/CC message/emergency program

none

Remarks

Timeout on CAN message

DTC U1107: MESSAGE MONITORING TORQUE REQUEST ACC CHECK SUM ERROR (PLAUS)

BMW Fault Code (hex)

0xCD96

BMW Fault Code (dez)

52630

BMW Fault Code Description VS-Text

Message (torque request ACC, B7)

Component

No Info

Subcomponent

No Info

Monitoring criteria

ACC recognized

Fault debouncing

80 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Incorrect checksum in CAN message

Repair procedures (plant/service)

Check ACC control module

MIL illumination/CC message/emergency program

none

Remarks

Incorrect check sum transmitted by ACC

DTC U1108: MESSAGE MONITORING TORQUE REQUEST STEERING ALIVE CHECK (MIN)

BMW Fault Code (hex)

0xCD97

BMW Fault Code (dez)

52631

BMW Fault Code Description VS-Text

Message (torque request AFS, B9)

Component

No Info

Subcomponent

No Info

Monitoring criteria

AFS recognized

Fault debouncing

400 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Incorrect alive counter in CAN message.

Repair procedures (plant/service)

Check AFS control module.

MIL illumination/CC message/emergency program

none

Remarks

Incorrect alive counter transmission from AFS

DTC U1108: MESSAGE MONITORING TORQUE REQUEST STEERING ALIVE CHECK (MIN)

BMW Fault Code (hex)

0xCDB3

BMW Fault Code (dez)

52659

BMW Fault Code Description VS-Text

Message (torque request, steering, B1h)

Component

No Info

Subcomponent

No Info

Monitoring criteria

EHB3 recognized

Fault debouncing

400 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Incorrect alive counter in CAN message

Repair procedures (plant/service)

Check EHB3 control module

MIL illumination/CC message/emergency program

none

Remarks

Alive counter transmission fault in message from EHB3

DTC U1109: LOST COMMUNICATION WITH TORQUE REQUEST STEERING (SIG)

BMW Fault Code (hex)

0xCD97

BMW Fault Code (dez)

52631

BMW Fault Code Description VS-Text

Message (torque request AFS, B9)

Component

No Info

Subcomponent

No Info

Monitoring criteria

AFS recognized

Fault debouncing

800 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Unable to receive CAN message.

Repair procedures (plant/service)

Check CAN link between AFS and DME

MIL illumination/CC message/emergency program

none

Remarks

Timeout on CAN message

DTC U1109: LOST COMMUNICATION WITH TORQUE REQUEST STEERING (SIG)

BMW Fault Code (hex)

0xCDB3

BMW Fault Code (dez)

52659

BMW Fault Code Description VS-Text

Message (torque request, steering, B1h)

Component

No Info

Subcomponent

No Info

Monitoring criteria

EHB3 recognized

Fault debouncing

800 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Unable to receive CAN message.

Repair procedures (plant/service)

Check CAN link between EHB3 and DME

MIL illumination/CC message/emergency program

none

Remarks

Timeout on CAN message

DTC U110A: MESSAGE MONITORING TORQUE REQUEST STEERING CHECK SUM ERROR (PLAUS)

BMW Fault Code (hex)

0xCD97

BMW Fault Code (dez)

52631

BMW Fault Code Description VS-Text

Message (torque request AFS, B9)

Component

No Info

Subcomponent

No Info

Monitoring criteria

AFS recognized

Fault debouncing

400 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Incorrect checksum in CAN message

Repair procedures (plant/service)

Check AFS control module

MIL illumination/CC message/emergency program

none

Remarks

Incorrect check sum transmitted by AFS

DTC U110A: MESSAGE MONITORING TORQUE REQUEST STEERING CHECK SUM ERROR (PLAUS)

BMW Fault Code (hex)

0xCDB3

BMW Fault Code (dez)

52659

BMW Fault Code Description VS-Text

Message (torque request, steering, B1h)

Component

No Info

Subcomponent

No Info

Monitoring criteria

EHB3 recognized

Fault debouncing

400 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Incorrect checksum in CAN message

Repair procedures (plant/service)

Check EHB3 control module

MIL illumination/CC message/emergency program

none

Remarks

EHB3 has transmitted incorrect checksum

DTC U110B: MESSAGE MONITORING TORQUE REQUEST DSC ALIVE CHECK (MIN)

BMW Fault Code (hex)

0xCD98

BMW Fault Code (dez)

52632

BMW Fault Code Description VS-Text

Message (torque request DSC, B6)

Component

No Info

Subcomponent

No Info

Monitoring criteria

Always active

Fault debouncing

400 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Incorrect alive counter in CAN message

Repair procedures (plant/service)

Check DSC control module

MIL illumination/CC message/emergency program

none

Remarks

Incorrect DSC alive counter transmission

DTC U110C: LOST COMMUNICATION WITH TORQUE REQUEST DSC (SIG)

BMW Fault Code (hex)

0xCD98

BMW Fault Code (dez)

52632

BMW Fault Code Description VS-Text

Message (torque request DSC, B6)

Component

No Info

Subcomponent

No Info

Monitoring criteria

Always active

Fault debouncing

800 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Unable to receive CAN message.

Repair procedures (plant/service)

Check CAN link between DSC and DME

MIL illumination/CC message/emergency program

none

Remarks

Timeout on CAN message

DTC U110D: MESSAGE MONITORING TORQUE REQUEST DSC CHECK SUM ERROR (PLAUS)

BMW Fault Code (hex)

0xCD98

BMW Fault Code (dez)

52632

BMW Fault Code Description VS-Text

Message (torque request DSC, B6)

Component

No Info

Subcomponent

No Info

Monitoring criteria

Always active

Fault debouncing

400 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Incorrect checksum in CAN message

Repair procedures (plant/service)

Check DSC control module

MIL illumination/CC message/emergency program

none

Remarks

Incorrect check sum transmission from DSC

DTC U110E: MESSAGE MONITORING TORQUE REQUEST ETC ALIVE CHECK (MIN)

BMW Fault Code (hex)

0xCD99

BMW Fault Code (dez)

52633

BMW Fault Code Description VS-Text

Message (torque request EGS, B5)

Component

Communication

Subcomponent

Torque Request AT

Monitoring criteria

EGS detected

Fault debouncing

200 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Incorrect alive counter in CAN message

Repair procedures (plant/service)

Check EGS and replace as indicated (fault in EGS control module).

MIL illumination/CC message/emergency program

MIL ON

Remarks

Incorrect alive counter transmission from EGS

DTC U110E: MESSAGE MONITORING TORQUE REQUEST ETC ALIVE CHECK (MIN)

BMW Fault Code (hex)

0xCDB8

BMW Fault Code (dez)

52664

BMW Fault Code Description VS-Text

not translated

Component

Communication

Subcomponent

Torque Request AT

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC U110F: LOST COMMUNICATION WITH TORQUE REQUEST ETC (SIG)

BMW Fault Code (hex)

0xCD99

BMW Fault Code (dez)

52633

BMW Fault Code Description VS-Text

Message (torque request EGS, B5)

Component

Communication

Subcomponent

Torque Request AT

Monitoring criteria

EGS detected

Fault debouncing

400 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Unable to receive CAN message.

Repair procedures (plant/service)

Check EGS/CAN link to EGS control module

MIL illumination/CC message/emergency program

MIL ON

Remarks

Timeout on EGS message

DTC U110F: LOST COMMUNICATION WITH TORQUE REQUEST ETC (SIG)

BMW Fault Code (hex)

0xCDB8

BMW Fault Code (dez)

52664

BMW Fault Code Description VS-Text

not translated

Component

Communication

Subcomponent

Torque Request AT

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC U1110: MESSAGE MONITORING TORQUE REQUEST ETC CHECK SUM ERROR (MIN)

BMW Fault Code (hex)

0xCDB9

BMW Fault Code (dez)

52665

BMW Fault Code Description VS-Text

Message (status EMF, 201)

Component

No Info

Subcomponent

No Info

Monitoring criteria

Message 'STATUS_EMF ' recognized

Fault debouncing

2.2 sec.

Terminal conditions

Terminal 15 on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Incorrect alive counter in CAN message

Repair procedures (plant/service)

Check EHB3 and replace as indicated (fault in EHB3 control module)

MIL illumination/CC message/emergency program

none

Remarks

Alive counter fault in transmission from EHB control module

DTC U1110: MESSAGE MONITORING TORQUE REQUEST ETC CHECK SUM ERROR (MIN)

BMW Fault Code (hex)

0xCDBA

BMW Fault Code (dez)

52666

BMW Fault Code Description VS-Text

Message (positioning request EMF, 1A7)

Component

No Info

Subcomponent

No Info

Monitoring criteria

Message 'STAT_ZV_KLAPPEN' recognized

Fault debouncing

11 sec.

Terminal conditions

Terminal 15 on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Incorrect alive counter in CAN message

Repair procedures (plant/service)

Check EHB3 and replace as indicated (fault in EHB3 control module)

MIL illumination/CC message/emergency program

none

Remarks

Alive counter fault in transmission from EHB control module

DTC U1110: MESSAGE MONITORING TORQUE REQUEST ETC CHECK SUM ERROR (PLAUS)

BMW Fault Code (hex)

0xCD99

BMW Fault Code (dez)

52633

BMW Fault Code Description VS-Text

Message (torque request EGS, B5)

Component

Communication

Subcomponent

Torque Request AT

Monitoring criteria

EGS detected

Fault debouncing

200 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Incorrect checksum in CAN message

Repair procedures (plant/service)

Check EGS and replace as indicated (fault in EGS control module)

MIL illumination/CC message/emergency program

MIL ON

Remarks

Incorrect check sum transmission from EGS

DTC U1110: MESSAGE MONITORING TORQUE REQUEST ETC CHECK SUM ERROR (PLAUS)

BMW Fault Code (hex)

0xCDB8

BMW Fault Code (dez)

52664

BMW Fault Code Description VS-Text

not translated

Component

Communication

Subcomponent

Torque Request AT

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC U1110: MESSAGE MONITORING TORQUE REQUEST ETC CHECK SUM ERROR (PLAUS)

BMW Fault Code (hex)

0xCDB9

BMW Fault Code (dez)

52665

BMW Fault Code Description VS-Text

Message (status EMF, 201)

Component

No Info

Subcomponent

No Info

Monitoring criteria

Message 'STATUS_EMF ' recognized

Fault debouncing

2.2 sec.

Terminal conditions

Terminal 15 on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Incorrect checksum in CAN message

Repair procedures (plant/service)

Check EHB3 and replace as indicated (fault in EHB3 control module)

MIL illumination/CC message/emergency program

none

Remarks

Checksum from EHB control module not transmitted correctly

DTC U1110: MESSAGE MONITORING TORQUE REQUEST ETC CHECK SUM ERROR (PLAUS)

BMW Fault Code (hex)

0xCDBA

BMW Fault Code (dez)

52666

BMW Fault Code Description VS-Text

Message (positioning request EMF, 1A7)

Component

No Info

Subcomponent

No Info

Monitoring criteria

Message 'STAT_ZV_KLAPPEN ' recognized

Fault debouncing

11 sec.

Terminal conditions

Terminal 15 on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Incorrect checksum in CAN message

Repair procedures (plant/service)

Check EHB3 and replace as indicated (fault in EHB3 control module)

MIL illumination/CC message/emergency program

none

Remarks

Checksum from EHB control module not transmitted correctly

DTC U1110: MESSAGE MONITORING TORQUE REQUEST ETC CHECK SUM ERROR (SIG)

BMW Fault Code (hex)

0xCDB9

BMW Fault Code (dez)

52665

BMW Fault Code Description VS-Text

Message (status EMF, 201)

Component

No Info

Subcomponent

No Info

Monitoring criteria

Message 'STATUS_EMF ' recognized

Fault debouncing

2.2 sec.

Terminal conditions

Terminal 15 on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Unable to receive CAN message.

Repair procedures (plant/service)

Check EHB3 or CAN link to EHB3 control module

MIL illumination/CC message/emergency program

none

Remarks

Timeout message 'STATUS_EMF '

DTC U1110: MESSAGE MONITORING TORQUE REQUEST ETC CHECK SUM ERROR (SIG)

BMW Fault Code (hex)

0xCDBA

BMW Fault Code (dez)

52666

BMW Fault Code Description VS-Text

Message (positioning request EMF, 1A7)

Component

No Info

Subcomponent

No Info

Monitoring criteria

Message 'STAT_ZV_KLAPPEN ' recognized

Fault debouncing

11 sec.

Terminal conditions

Terminal 15 on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Unable to receive CAN message.

Repair procedures (plant/service)

Check EHB3 or CAN link to EHB3 control module

MIL illumination/CC message/emergency program

none

Remarks

Timeout message 'EMF control request'

DTC U1110: MESSAGE MONITORING TORQUE REQUEST ETC CHECK SUM ERROR (SIG)

BMW Fault Code (hex)

0xCDBE

BMW Fault Code (dez)

52670

BMW Fault Code Description VS-Text

not translated

Component

No Info

Subcomponent

No Info

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC U1114: MESSAGE MONITORING VEHICLE MODE STATUS ALIVE CHECK (MIN)

BMW Fault Code (hex)

0xCD9B

BMW Fault Code (dez)

52635

BMW Fault Code Description VS-Text

Message (vehicle mode, 315)

Component

No Info

Subcomponent

No Info

Monitoring criteria

Sport switch recognized

Fault debouncing

200 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Incorrect alive counter in CAN message

Repair procedures (plant/service)

Check SZM control module

MIL illumination/CC message/emergency program

none

Remarks

Alive counter from SZM transmitted incorrectly.

DTC U1115: LOST COMMUNICATION WITH VEHICLE MODE STATUS (SIG)

BMW Fault Code (hex)

0xCD9B

BMW Fault Code (dez)

52635

BMW Fault Code Description VS-Text

Message (vehicle mode, 315)

Component

No Info

Subcomponent

No Info

Monitoring criteria

Sport switch recognized

Fault debouncing

200 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Unable to receive CAN message.

Repair procedures (plant/service)

Check CAN link between SZM and DME

MIL illumination/CC message/emergency program

none

Remarks

Timeout on CAN message

DTC U1116: MESSAGE MONITORING VEHICLE MODE STATUS CHECK SUM ERROR (PLAUS)

BMW Fault Code (hex)

0xCD9B

BMW Fault Code (dez)

52635

BMW Fault Code Description VS-Text

Message (vehicle mode, 315)

Component

No Info

Subcomponent

No Info

Monitoring criteria

Sport switch recognized

Fault debouncing

200 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Incorrect checksum in CAN message

Repair procedures (plant/service)

Check SZM control module

MIL illumination/CC message/emergency program

none

Remarks

SZM has transmitted incorrect check sum

DTC U1118: LOST COMMUNICATION WITH SPEED (SIG)

BMW Fault Code (hex)

0xCD9C

BMW Fault Code (dez)

52636

BMW Fault Code Description VS-Text

Message (speed, 1A0)

Component

No Info

Subcomponent

No Info

Monitoring criteria

Always active

Fault debouncing

800 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Unable to receive CAN message.

Repair procedures (plant/service)

Check CAN link between DSC and DME

MIL illumination/CC message/emergency program

none

Remarks

Timeout on CAN message

DTC U111A: LOST COMMUNICATION WITH TRANSMISSION DATA (SIG)

BMW Fault Code (hex)

0xCD9D

BMW Fault Code (dez)

52637

BMW Fault Code Description VS-Text

Message (transmission data, BA)

Component

No Info

Subcomponent

No Info

Monitoring criteria

EGS/SMG recognized

Fault debouncing

400 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Timeout on transmission data message

Repair procedures (plant/service)

Check EGS/SMG control module and CAN links

MIL illumination/CC message/emergency program

MIL ON

Remarks

none

DTC U111B: LOST COMMUNICATION WITH TRANSMISSION DATA2 (SIG)

BMW Fault Code (hex)

0xCD9E

BMW Fault Code (dez)

52638

BMW Fault Code Description VS-Text

Message (transmission data 2, 1A2)

Component

No Info

Subcomponent

No Info

Monitoring criteria

EGS detected

Fault debouncing

800 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Unable to receive CAN message.

Repair procedures (plant/service)

Check EGS and/or CAN link to EGS control module

MIL illumination/CC message/emergency program

none

Remarks

Timeout on EGS message

DTC U111C: LOST COMMUNICATION WITH MILEAGE/RANGE (SIG)

BMW Fault Code (hex)

0xCD9F

BMW Fault Code (dez)

52639

BMW Fault Code Description VS-Text

Message (mileage/range, 330)

Component

No Info

Subcomponent

No Info

Monitoring criteria

Instrument cluster recognized

Fault debouncing

120 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Unable to receive CAN message.

Repair procedures (plant/service)

Check CAN links between instrument cluster and DME.

MIL illumination/CC message/emergency program

none

Remarks

Timeout on CAN message

DTC U111D: MESSAGE MONITORING TERMINAL STATUS ALIVE CHECK (MIN)

BMW Fault Code (hex)

0xCDA0

BMW Fault Code (dez)

52640

BMW Fault Code Description VS-Text

Message (terminal status, 130)

Component

No Info

Subcomponent

No Info

Monitoring criteria

Always active

Fault debouncing

100 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Incorrect alive counter in CAN message

Repair procedures (plant/service)

Check CAS and replace as indicated (fault in CAS control module)

MIL illumination/CC message/emergency program

none

Remarks

Incorrect alive counter transmission from CAS

DTC U111E: LOST COMMUNICATION WITH TERMINAL STATUS (SIG)**BMW Fault Code (hex)**

0xCDA0

BMW Fault Code (dez)

52640

BMW Fault Code Description VS-Text

Message (terminal status, 130)

Component

No Info

Subcomponent

No Info

Monitoring criteria

Always active

Fault debouncing

200 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Unable to receive CAN message.

Repair procedures (plant/service)

Check CAS and/or CAN link to CAS control module

MIL illumination/CC message/emergency program

none

Remarks

Timeout on CAS terminal status message

DTC U111F: MESSAGE MONITORING TERMINAL STATUS CHECK SUM ERROR (PLAUS)

BMW Fault Code (hex)

0xCDA0

BMW Fault Code (dez)

52640

BMW Fault Code Description VS-Text

Message (terminal status, 130)

Component

No Info

Subcomponent

No Info

Monitoring criteria

Always active

Fault debouncing

100 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Incorrect checksum in CAN message

Repair procedures (plant/service)

Check CAS and replace as indicated (fault in CAS control module)

MIL illumination/CC message/emergency program

none

Remarks

Incorrect checksum transmitted by CAS

DTC U1120: LOST COMMUNICATION WITH STEERING WHEEL ANGLE (SIG)

BMW Fault Code (hex)

0xCDA1

BMW Fault Code (dez)

52641

BMW Fault Code Description VS-Text

Message (steering wheel angle, C4)

Component

No Info

Subcomponent

No Info

Monitoring criteria

Steering wheel angle message recognized at least once

Fault debouncing

400 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Unable to receive CAN message.

Repair procedures (plant/service)

Check CAN link between DSC and DME

MIL illumination/CC message/emergency program

none

Remarks

Timeout on CAN message

DTC U1121: LOST COMMUNICATION WITH POWER MANAGEMENT BATTERY VOLTAGE (SIG)

BMW Fault Code (hex)

0xCDA2

BMW Fault Code (dez)

52642

BMW Fault Code Description VS-Text

Message (power management, battery voltage, 3B4)

Component

Communication

Subcomponent

Powermanagement

Monitoring criteria

Vehicle version is E65

Fault debouncing

200 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Unable to receive CAN message.

Repair procedures (plant/service)

Check CAN link between power module and DME

MIL illumination/CC message/emergency program

none

Remarks

Timeout on CAN message

DTC U1122: LOST COMMUNICATION WITH POWER MANAGEMENT CHARGE VOLTAGE (SIG)

BMW Fault Code (hex)

0xCDA3

BMW Fault Code (dez)

52643

BMW Fault Code Description VS-Text

Message (power management, charging voltage, 334)

Component

No Info

Subcomponent

No Info

Monitoring criteria

Vehicle version is E65

Fault debouncing

20 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Unable to receive CAN message.

Repair procedures (plant/service)

Check CAN link between power module and DME

MIL illumination/CC message/emergency program

none

Remarks

Timeout on CAN message

DTC U1123: MESSAGE MONITORING ARS-MODULE STATUS ALIVE CHECK (MIN)

BMW Fault Code (hex)

0xCDA4

BMW Fault Code (dez)

52644

BMW Fault Code Description VS-Text

Message (status ARS module, 1AC)

Component

No Info

Subcomponent

No Info

Monitoring criteria

ARS recognized

Fault debouncing

400 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Incorrect alive counter in CAN message

Repair procedures (plant/service)

Check ARS control module

MIL illumination/CC message/emergency program

none

Remarks

Incorrect alive counter transmission from ARS

DTC U1124: LOST COMMUNICATION WITH ARS-MODULE STATUS (SIG)

BMW Fault Code (hex)

0xCDA4

BMW Fault Code (dez)

52644

BMW Fault Code Description VS-Text

Message (status ARS module, 1AC)

Component

No Info

Subcomponent

No Info

Monitoring criteria

ARS recognized

Fault debouncing

800 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Unable to receive CAN message.

Repair procedures (plant/service)

Check CAN link between ARS and DME

MIL illumination/CC message/emergency program

none

Remarks

Timeout on CAN message

DTC U1126: LOST COMMUNICATION WITH DSC STATUS (SIG)

BMW Fault Code (hex)

0xCDA5

BMW Fault Code (dez)

52645

BMW Fault Code Description VS-Text

Message (status DSC, 19E)

Component

No Info

Subcomponent

No Info

Monitoring criteria

Always active

Fault debouncing

800 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Unable to receive CAN message.

Repair procedures (plant/service)

Check CAN link between DSC and DME

MIL illumination/CC message/emergency program

none

Remarks

Timeout on CAN message

DTC U1128: LOST COMMUNICATION WITH EKP (ELECTRICAL FUEL PUMP) STATUS (SIG)

BMW Fault Code (hex)

0xCDA6

BMW Fault Code (dez)

52646

BMW Fault Code Description VS-Text

Message (status el. fuel pump, 335)

Component

No Info

Subcomponent

No Info

Monitoring criteria

EKP recognized

Fault debouncing

40 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Unable to receive CAN message.

Repair procedures (plant/service)

Check CAN link between EKP and DME

MIL illumination/CC message/emergency program

none

Remarks

Timeout on CAN message

DTC U1129: LOST COMMUNICATION WITH REVERSE STATUS (SIG)

BMW Fault Code (hex)

0xCDA7

BMW Fault Code (dez)

52647

BMW Fault Code Description VS-Text

Message (status, reverse gear, 3B0)

Component

No Info

Subcomponent

No Info

Monitoring criteria

'Reverse gear status' recognized at least once

Fault debouncing

40 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

1. With manual transmission: Not possible to receive CAN message.
2. With automatic/SMG: Light module periodically transmits 'Reverse gear status' (owing to incorrect code entry, etc.)

Repair procedures (plant/service)

1. With manual transmission: Check CAN link between light module and DME.
2. With automatic/SMG: Check code entry in light module, delete version in DME and re-initialize (Terminal 15 switch)

MIL illumination/CC message/emergency program

none

Remarks

Timeout on CAN message or (temporary) incorrect light module code entry

DTC U112A: MESSAGE MONITORING INSTRUMENT PACK STATUS ALIVE CHECK (MIN)**BMW Fault Code (hex)**

0xCDA8

BMW Fault Code (dez)

52648

BMW Fault Code Description VS-Text

Message (status, instrument cluster, 1B4)

Component

Communication

Subcomponent

Instrument Pack

Monitoring criteria

Instrument cluster recognized

Fault debouncing

500 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Incorrect alive counter in CAN message.

Repair procedures (plant/service)

Check instrument cluster control module.

MIL illumination/CC message/emergency program

none

Remarks

Incorrect alive counter transmission from instrument cluster.

DTC U112B: LOST COMMUNICATION WITH INSTRUMENT PACK STATUS (SIG)**BMW Fault Code (hex)**

0x2DD0

BMW Fault Code (dez)

11728

BMW Fault Code Description VS-Text

No message from instrument cluster, instrument cluster 2

Component

Communication

Subcomponent

Instrument Pack

Monitoring criteria

1. CAN 11 vehicle (E46, E85, E83)
2. No short circuit on the PT CAN
3. INSTR2 message initialized

Fault debouncing

20 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

400 ms

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

No reception of CAN message INSTR2 possible.

Repair procedures (plant/service)

Check CAN links between instrument cluster and DME

MIL illumination/CC message/emergency program

none

Remarks

Timeout on INSTR2 CAN message

DTC U112B: LOST COMMUNICATION WITH INSTRUMENT PACK STATUS (SIG)

BMW Fault Code (hex)

0x2DD1

BMW Fault Code (dez)

11729

BMW Fault Code Description VS-Text

No message from instrument cluster, instrument cluster 3

Component

Communication

Subcomponent

Instrument Pack

Monitoring criteria

1. CAN 11 vehicle (E46, E85, E83)
2. No short circuit on the PT CAN
3. INSTR3 message initialized

Fault debouncing

20 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

400 ms

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

No reception of CAN message INSTR3 possible.

Repair procedures (plant/service)

Check CAN links between instrument cluster and DME

MIL illumination/CC message/emergency program

none

Remarks

Timeout INSTR3 CAN message

DTC U112B: LOST COMMUNICATION WITH INSTRUMENT PACK STATUS (SIG)

BMW Fault Code (hex)

0xCDA8

BMW Fault Code (dez)

52648

BMW Fault Code Description VS-Text

Message (status, instrument cluster, 1B4)

Component

Communication

Subcomponent

Instrument Pack

Monitoring criteria

Instrument cluster recognized

Fault debouncing

700 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Unable to receive CAN message.

Repair procedures (plant/service)

Check CAN links between instrument cluster and DME

MIL illumination/CC message/emergency program

none

Remarks

Timeout on CAN message

DTC U112C: LOST COMMUNICATION WITH HEAT FLOW/LOAD MOMENT A/C (SIG)

BMW Fault Code (hex)

0xCDA9

BMW Fault Code (dez)

52649

BMW Fault Code Description VS-Text

Message (A/C request, 1B5)

Component

No Info

Subcomponent

No Info

Monitoring criteria

Air conditioner recognized

Fault debouncing

40 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Unable to receive CAN message.

Repair procedures (plant/service)

Check CAN link between IHKA and DME

MIL illumination/CC message/emergency program

none

Remarks

Timeout on CAN message

DTC U112D: LOST COMMUNICATION WITH CONTROL CRASH CUT-OFF EKP (ELECTRICAL FUEL PUMP) (SIG)

BMW Fault Code (hex)

0xCDAA

BMW Fault Code (dez)

52650

BMW Fault Code Description VS-Text

Message (status, crash deactivation, el. fuel pump, 135)

Component

No Info

Subcomponent

No Info

Monitoring criteria

EKP recognized

Fault debouncing

200 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Unable to receive CAN message.

Repair procedures (plant/service)

Check CAN link between EKP and DME

MIL illumination/CC message/emergency program

none

Remarks

Timeout on CAN message

DTC U1130: LOST COMMUNICATION WITH RADIATOR SHUTTER (UPPER) (PLAUS)

BMW Fault Code (hex)

0x2F11

BMW Fault Code (dez)

12049

BMW Fault Code Description VS-Text

Radiator blind, top

Component

No Info

Subcomponent

No Info

Monitoring criteria

1. AKKS must be initialized. Operation of lower flap: 3 x open and 3 x closed. Or conduct the system test.

Fault debouncing

none

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

No info.

Signal information

PWM of 5-90 %

Calculated value Y/N

N

Possible Fault Causes

Defective in valve control's electronic circuitry. PVE: Insert a 1K resistor in front of Terminal 87 at DME PIN 1--09.

Repair procedures (plant/service)

1. Check voltage supply to AKKS (focus especially on GND [PIN 2] at the valve)
2. If OK, then replace AKKS

MIL illumination/CC message/emergency program

no external display;

Remarks

There is no danger with the AKKS provided the malfunction did not arise while it was closed.

DTC U1132: LOST COMMUNICATION WITH GENERATOR VIA BSD (BIT SERIAL DATA INTERFACE) (MAX)

BMW Fault Code (hex)

0x2ECC

BMW Fault Code (dez)

11980

BMW Fault Code Description VS-Text

Generator, communication

Component

No Info

Subcomponent

No Info

Monitoring criteria

Commercial vehicle >350 rpm, No communications fault.

Fault debouncing

25 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

1. Alternator (BSD-BUS) not connected
2. Open wire (BSD-BUS) between alternator and DME
3. Alternator defect

Repair procedures (plant/service)

1. Check wire (BSD_BUS) connecting alternator and DME.
2. Check plug-in connection at alternator.
3. Replace alternator.

MIL illumination/CC message/emergency program

No warning message. The alternator responds to loss of the BSD_BUS signal by charging at a constant 14.4 V battery.

Remarks

none

DTC U1132: LOST COMMUNICATION WITH GENERATOR VIA BSD (BIT SERIAL DATA INTERFACE) (SIG)

BMW Fault Code (hex)

0x2E98

BMW Fault Code (dez)

11928

BMW Fault Code Description VS-Text

Generator, communication

Component

No Info

Subcomponent

No Info

Monitoring criteria

Alternator communications monitor

Fault debouncing

Commercial vehicle >350 rpm, No communications fault.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

approximately 10 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

1. Alternator (BSD-BUS) not connected
2. Open wire (BSD-BUS) between alternator and DME
3. Alternator defect

Repair procedures (plant/service)

1. Check wire (BSD_BUS) connecting alternator and DME.
2. Check plug-in connection at alternator.
3. Replace alternator.

MIL illumination/CC message/emergency program

No warning message. The alternator responds to loss of the BSD_BUS signal by charging at a constant 14.4 V battery.

Remarks

none

DTC U1134: LOST COMMUNICATION WITH LAMP STATUS (SIG)

BMW Fault Code (hex)

0xCDAB

BMW Fault Code (dez)

52651

BMW Fault Code Description VS-Text

Message (lamp status, 21A)

Component

No Info

Subcomponent

No Info

Monitoring criteria

'Lamp status' message recognized at least once

Fault debouncing

200 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Unable to receive CAN message.

Repair procedures (plant/service)

Check CAN link between light module and DME.

MIL illumination/CC message/emergency program

none

Remarks

Timeout on CAN message

DTC U1135: LOST COMMUNICATION WITH STATUS WATER VALVE (SIG)

BMW Fault Code (hex)

0xCDAC

BMW Fault Code (dez)

52652

BMW Fault Code Description VS-Text

Message (status, water valve, 3B5)

Component

No Info

Subcomponent

No Info

Monitoring criteria

'Water valve' status message recognized at least once

Fault debouncing

200 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Unable to receive CAN message.

Repair procedures (plant/service)

Check CAN link between IHKA and DME

MIL illumination/CC message/emergency program

none

Remarks

Timeout on CAN message

DTC U113A: LOST COMMUNICATION WITH CENTRAL LOCKING SYSTEM STATUS (SIG)

BMW Fault Code (hex)

0xCDB1

BMW Fault Code (dez)

52657

BMW Fault Code Description VS-Text

Message (status, central locking, 2FC)

Component

No Info

Subcomponent

No Info

Monitoring criteria

Message 'STAT_ZV_KLAPPEN' recognized

Fault debouncing

4 sec.

Terminal conditions

Terminal 15 on

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Unable to receive CAN message.

Repair procedures (plant/service)

Check CAS/CAN link to CAS control module

MIL illumination/CC message/emergency program

none

Remarks

Timeout message 'STAT_ZV_KLAPPEN '

DTC U113C: LOST COMMUNICATION WITH TIME/DATE (SIG)

BMW Fault Code (hex)

0xCDAE

BMW Fault Code (dez)

52654

BMW Fault Code Description VS-Text

Message (time/date, 2F8)

Component

No Info

Subcomponent

No Info

Monitoring criteria

Instrument cluster recognized

Fault debouncing

240 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Unable to receive CAN message.

Repair procedures (plant/service)

Check CAN links between instrument cluster and DME.

MIL illumination/CC message/emergency program

none

Remarks

Timeout on CAN message

DTC U113D: LOST COMMUNICATION WITH WHEEL TORQUE MANAGEMENT REQUEST/DRIVELINE (SIG)**BMW Fault Code (hex)**

0xCDAD

BMW Fault Code (dez)

52653

BMW Fault Code Description VS-Text

Message (request, wheel torque, drivetrain, BF)

Component

No Info

Subcomponent

No Info

Monitoring criteria

LDM recognized

Fault debouncing

80 ms

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Unable to receive CAN message.

Repair procedures (plant/service)

Check LDM and CAN link to LDM control module.

MIL illumination/CC message/emergency program

none

Remarks

Timeout on CAN message

DTC U113E: LOST COMMUNICATION WITH DISPLAY TRANSMISSION DATA (SIG)

BMW Fault Code (hex)

0xCDB0

BMW Fault Code (dez)

52656

BMW Fault Code Description VS-Text

Message (display, transmission data)

Component

No Info

Subcomponent

No Info

Monitoring criteria

EGS detected

Fault debouncing

8 sec

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Unable to receive CAN message.

Repair procedures (plant/service)

Check EGS and/or CAN link to EGS control module.

MIL illumination/CC message/emergency program

none

Remarks

Timeout on EGS message

DTC U1154: LOST COMMUNICATION WITH MESSAGE 2 TCM (SIG)

BMW Fault Code (hex)

0x2DC9

BMW Fault Code (dez)

11721

BMW Fault Code Description VS-Text

No message from EGS, EGS 2

Component

Communication

Subcomponent

TCM

Monitoring criteria

EGS detected

Fault debouncing

5 sec.

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

5 sec.

System test

none

Signal information

none

Calculated value Y/N

N

Possible Fault Causes

Timeout on EGS message

Repair procedures (plant/service)

Check CAN link to EGS control module

MIL illumination/CC message/emergency program

none

Remarks

none

DTC U1155: MESSAGE MONITORING 2 TCM CHECK SUM ERROR (PLAUS)

BMW Fault Code (hex)

0x2DC9

BMW Fault Code (dez)

11721

BMW Fault Code Description VS-Text

No message from EGS, EGS 2

Component

Communication

Subcomponent

TCM

Monitoring criteria

Symptom is not used

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC U1156: MESSAGE MONITORING 2 TCM ALIVE CHECK (MIN)

BMW Fault Code (hex)

0x2DC9

BMW Fault Code (dez)

11721

BMW Fault Code Description VS-Text

No message from EGS, EGS 2

Component

Communication

Subcomponent

TCM

Monitoring criteria

Symptom is not used

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC U1160: LOST COMMUNICATION WITH MESSAGE 2 TCM (SIG)

BMW Fault Code (hex)

0xCDB4

BMW Fault Code (dez)

52660

BMW Fault Code Description VS-Text

Message (gearbox data, 3B1)

Component

No Info

Subcomponent

No Info

Monitoring criteria

Message 'Transmission data 3 ' recognized

Fault debouncing

Currently data content defined (pending)

Terminal conditions

Terminal 15 ON

Voltage conditions

Voltage in onboard electrical system > 10 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

Unable to receive CAN message.

Repair procedures (plant/service)

Check CAN link between DME and EGS/DKG

MIL illumination/CC message/emergency program

none

Remarks

Timeout on CAN message

DTC U1161: MESSAGE MONITORING 3 TCM ALIVE CHECK (MIN)

BMW Fault Code (hex)

0xCDB4

BMW Fault Code (dez)

52660

BMW Fault Code Description VS-Text

Message (gearbox data, 3B1)

Component

No Info

Subcomponent

No Info

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC U1162: MESSAGE MONITORING 3 TCM CHECK SUM ERROR (PLAUS)

BMW Fault Code (hex)

0xCDB4

BMW Fault Code (dez)

52660

BMW Fault Code Description VS-Text

Message (gearbox data, 3B1)

Component

No Info

Subcomponent

No Info

Monitoring criteria

none

Fault debouncing

none

Terminal conditions

none

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

none

Calculated value Y/N

none

Possible Fault Causes

none

Repair procedures (plant/service)

none

MIL illumination/CC message/emergency program

none

Remarks

none

DTC U1166: MESSAGE MONITORING EWS (ELECTRONIC IMMOBILIZER) - FRAME ERROR (MIN)

BMW Fault Code (hex)

0x2F4C

BMW Fault Code (dez)

12108

BMW Fault Code Description VS-Text

Message EWS-DME incorrect

Component

No Info

Subcomponent

No Info

Monitoring criteria

EWS code request

Fault debouncing

2

Terminal conditions

Terminal 15 on without running engine

Voltage conditions

none

Temperature conditions

none

Time conditions

none

System test

none

Signal information

CAN bus telegrams

Calculated value Y/N

N

Possible Fault Causes

Telegram structure not as expected

Repair procedures (plant/service)

Continue problem diagnosis with CAS

MIL illumination/CC message/emergency program

none

Remarks

none

DTC U1167: MESSAGE MONITORING DIRECT OZONE REDUCTION CATALYST TEMPERATURE SENSOR FRAME ERROR (SIG)

BMW Fault Code (hex)

0x2ADB

BMW Fault Code (dez)

10971

BMW Fault Code Description VS-Text

EAC sensor, communication

Component

Communication

Subcomponent

Direct Ozone Reduction Catalyst Temp. Sensor

Monitoring criteria

EAC sensor must be installed, and the correct data set (SULEV) must be programmed in the DME.

Fault debouncing

2.5 sec.

Terminal conditions

Terminal 15

Voltage conditions

Voltage in onboard electrical system > 9 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

LIN bus signal

Calculated value Y/N

N

Possible Fault Causes

Open wire from ground, Terminal 87 or LIN bus from the DME to the EAC sensor. Defective EAC sensor.

Repair procedures (plant/service)

1. Check ground wire from DME to EAC sensor
2. Check positive wire from DME to EAC sensor
3. Check bus wire from DME to EAC sensor
4. Replace sensor

MIL illumination/CC message/emergency program

MIL comes on after 2nd driving cycle

Remarks

none

DTC U1168: MESSAGE MONITORING DIRECT OZONE REDUCTION CATALYST TEMPERATURE SENSOR CHECK SUM ERROR (PLAUS)

BMW Fault Code (hex)

0x2ADB

BMW Fault Code (dez)

10971

BMW Fault Code Description VS-Text

EAC sensor, communication

Component

Communication

Subcomponent

Direct Ozone Reduction Catalyst Temp. Sensor

Monitoring criteria

EAC sensor must be installed, and the correct data set (SULEV) must be programmed in the DME.

Fault debouncing

2.5 sec.

Terminal conditions

Terminal 15

Voltage conditions

Voltage in onboard electrical system > 9 V

Temperature conditions

none

Time conditions

none

System test

none

Signal information

LIN bus signal

Calculated value Y/N

N

Possible Fault Causes

Open wire from ground, Terminal 87 or LIN bus from the DME to the EAC sensor. Defective EAC sensor.

Repair procedures (plant/service)

1. Check ground wire from DME to EAC sensor
2. Check positive wire from DME to EAC sensor
3. Check bus wire from DME to EAC sensor
4. Replace sensor

MIL illumination/CC message/emergency program

MIL comes on after 2nd driving cycle

Remarks

none

2007 ENGINE PERFORMANCE

Emission Applications - BMW X3

EMISSION APPLICATIONS

X3

Engine & Fuel System	⁽¹⁾ Emission Control Systems & Devices
2007	
3.0L (182") 6-Cyl. SFI	PCV, EVAP, TWC, FR, SPK, AP, HO2S, CEC, MIL, EVAP-CPCS, EVAP-VC, EVAP-LDP, ROV, SPK
(1) Major emission control systems and devices are listed in bold type. Components and other related devices are listed in light type.	

ABBREVIATIONS

CEC

Computerized Engine Controls

EVAP

Fuel Evaporative System

EVAP-CPCS

EVAP Canister Purge Control Solenoid

EVAP-LDP

EVAP Leak Detection Pump

EVAP-VC

EVAP Vapor Canister

FR

Fill Pipe Restrictor

HO2S

Heated Oxygen Sensor

MIL

Malfunction Indicator Light

PCV

Positive Crankcase Ventilation

SFI

Sequential Fuel Injection

SPK

Spark Controls

SPK-CC

SPK Computer Controlled

TWC

Three-Way Catalytic Converter

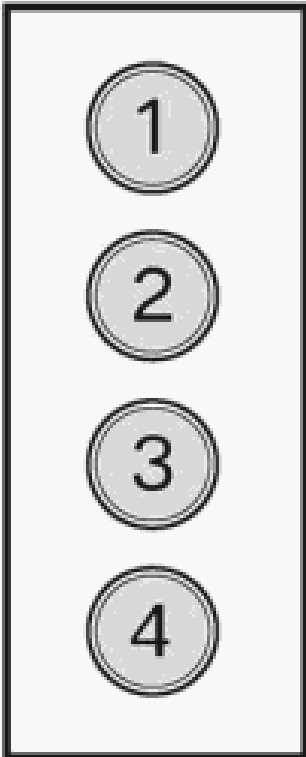
ENGINE PERFORMANCE

Firing Order & Cylinder Identification - BMW - All Models

FIRING ORDER & CYLINDER IDENTIFICATION

NOTE: This information is intended as a quick reference for firing order and cylinder identification only. The information provided covers many vehicles and may include some information that does not apply to the vehicle you have currently selected.

4 CYLINDER ENGINE

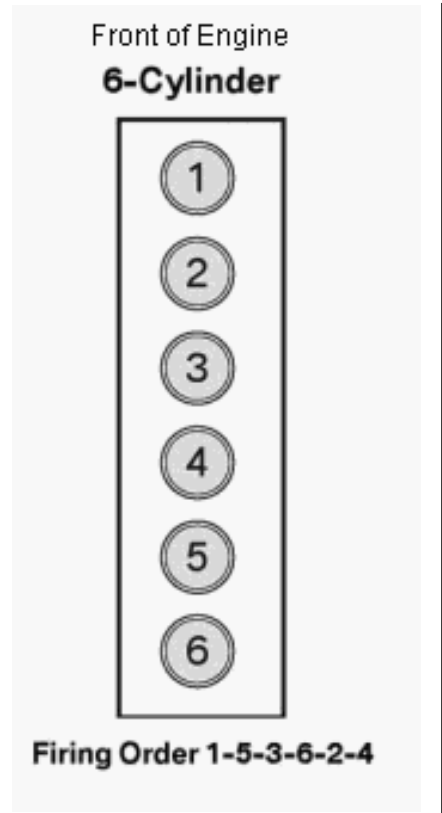
Engine Configuration	Firing Order	Cylinder Identification
In-Line 4	1-3-4-2	Front of Engine 4-Cylinder  Firing Order 1-3-4-2

6 CYLINDER ENGINE

Engine Configuration	Firing Order	Cylinder Identification

In-Line 6

1-5-3-6-2-4

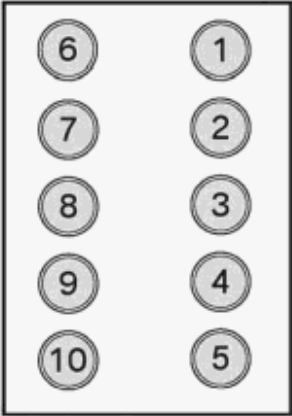


V8 ENGINE

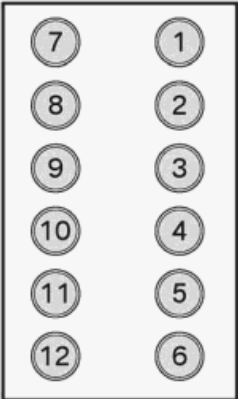
Engine Configuration	Firing Order	Cylinder Identification
V8	1-5-4-8-6-3-7-2	<p>Front of Engine 8-Cylinder</p> <p>Firing Order 1-5-4-8-6-3-7-2</p>

V10 ENGINE

Engine Configuration	Firing Order	Cylinder Identification
----------------------	--------------	-------------------------

V10	1-6-5-10-2-7-3-8-4-9	<p style="text-align: center;">Front of Engine 10-Cylinder</p>  <p style="text-align: center;">Firing Order 1-6-5-10-2-7-3-8-4-9</p>
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V12 ENGINE

Engine Configuration	Firing Order	Cylinder Identification
V12	1-7-5-11-3-9-6-12-2-8-4-10	<p style="text-align: center;">Front of Engine 12-Cylinder</p>  <p style="text-align: center;">Firing Order 1-7-5-11-3-9-6-12-2-8-4-10</p>

ENGINE PERFORMANCE

Fuel System - Repair Instructions - X3

31 FUEL PUMP WITH DRIVE AND LINE

13 31 ... NOTES ON FUEL PRESSURE CHECK (REFERENCE PRESSURE: ENVIRONMENT)

Feature of this version with ambient pressure:

The connection for the vacuum hose of the fuel pressure regulator is located between the throttle and the air cleaner or on the air cleaner.

Test precondition:

The correct fuel pressure regulator is fitted.

- Using the EPC, check whether the fuel pressure regulator suitable for the car is fitted:

Connect test adapter.

Description of operation:

The control function of the fuel pressure regulator must be guaranteed under all operating conditions. The fuel pump must always be able to generate a higher fuel pressure than the pressure regulated by the pressure regulator.

The injection rate is adjusted by means of the injection time; the injection time is controlled by the DME.

Description of operation: fuel return line

When the engine is at a standstill and the ignition key is in position 0, the fuel return line after the pressure regulator is at zero pressure.

Description of operation: pressure retaining function

The pressure regulator closes when the engine is at a standstill and the ignition key is in position 0. The fuel pressure in the delivery line is retained over an extended period. A non-return valve closes in the fuel pump. These measures help to retain the fuel pressure in the fuel system. Extended starting times are thus avoided.

Complaint: drive characteristic faults, lack of power

- Run engine at idle speed and measure fuel pressure.

If the measured value is less than the nominal value - 0.2 bar:

- Line cross-sections in fuel feed are constricted or fuel filter is clogged,

or

- Fuel pump voltage supply is not O.K.: e.g. as a result of high contact resistance (corrosion) in plug connection between wiring harness and fuel pump.

If the measured value is greater than the nominal value + 0.2 bar:

- Turn off engine stop and then observe measured value.
- If measured value drops to nominal value, then line cross-sections in fuel return are constricted or clogged.
- Check the fuel lines for kinks.

If no kinks are visible:

- Replace return lines

If measured value remains too high, then pressure regulator is in all probability faulty.

IMPORTANT: With less likelihood, the return line may be completely blocked. When the pressure regulator is removed, fuel could escape under pressure!

- Have a cleaning cloth ready and catch and dispose of escaping fuel.
- Replace the return line but not the pressure regulator.

Complaint: starting problems

- Run engine briefly at idle speed and switch off.
- Note down measured value while engine is stopped.
- Read off measured value again after approx. 20 to 30 minutes while engine is stopped.

Special tool 13 3 010 (hose clamp) is required for the following test.

If the measured value has dropped by more than 0.5 bar:

- Start engine and wait briefly for a stable pressure increase.
- Switch off the engine and immediately pinch off the delivery line just before the pressure gauge with the special tool 13 3 010.
- Note down measured value
- Read off measured value again after approx. 20 to 30 minutes while engine is stopped

If the measured value has now dropped by less than 0.5 bar, the following faults can be present:

- Fault in delivery lines
- Fault in in-tank delivery hose

- Faulty pressure-holding non-return valve in fuel pump

Check components. Replace faulty components.

If the measured value has dropped by more than 0.5 bar again:

- Replace pressure regulator

NOTE:

- **All the fuel hoses and hose clips which were detached within the framework of the checks must be replaced.**
- **Interrogate fault memory of DME control unit. Check stored fault messages. Rectify faults. Now clear the fault memory.**

13 31 029 CHECKING FUEL PUMP DELIVERY PRESSURE (N52)

Special tools required:

- 13 5 220
- 13 5 221
- 13 5 222

IMPORTANT: The fuel in the fuel lines is under pressure (approx. 5 bar)! Catch and dispose of escaping fuel.

Necessary preliminary tasks:

- Switch off ignition.
- Remove acoustic cover, see **11 00 REMOVING AND INSTALLING/REPLACING IGNITION COIL COVER (N52K)**.

Remove dust cap (1).

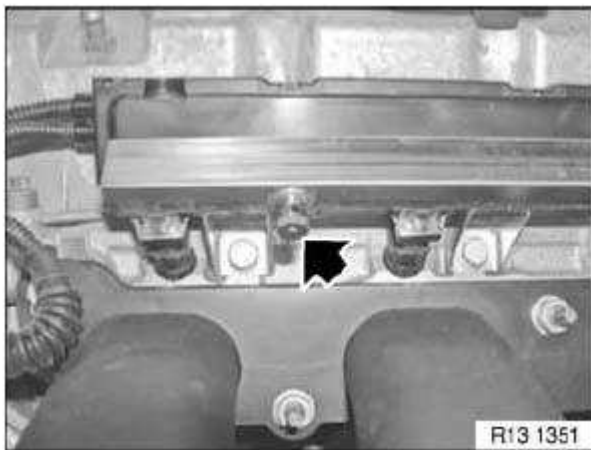


Fig. 1: Dust Cap

Courtesy of BMW OF NORTH AMERICA, INC.

Connect special tool kit 13 5 220 (comprising 13 5 221 and 13 5 222) to pressure sensor of DIS Tester.

Connect pressure sensor to DIS Tester.

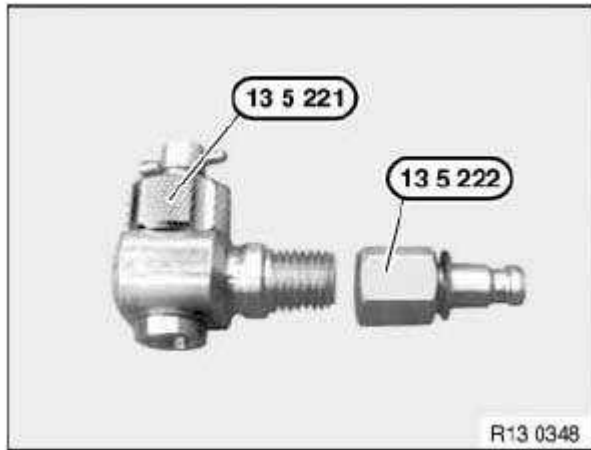


Fig. 2: Special Tool 13 5 221 And 13 5 222

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not under any circumstances screw in the check valve up to the mechanical stop.

This could damage the valve in the pressure regulator housing.

Mount special tool kit 13 5 220 to injection tube and tighten knurled nut hand-tight.

Screw out check valve (1) so that valve in pressure regulator housing is closed.

Start engine.

Screw in check valve (1) until a pressure reading is indicated on DIS Tester.

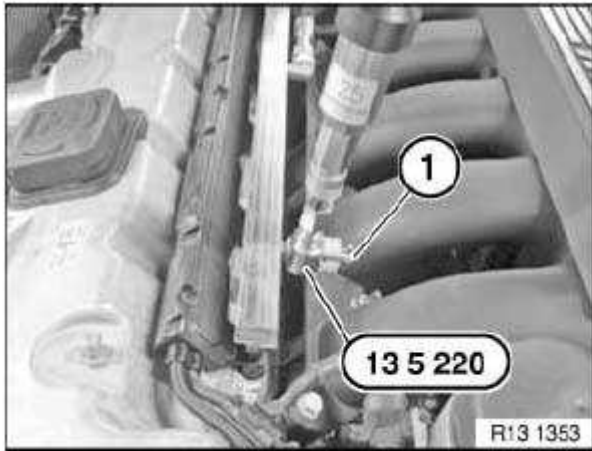


Fig. 3: Check Valve And Special Tool Kit 13 5 220
Courtesy of BMW OF NORTH AMERICA, INC.

Measuring fuel pressure.

- Select Measurement.
- Multimeter function appears
- Select Pressure test
- Read off value of fuel pressure.

Compare actual value of test pressure with specified value, see **13 53 INJECTORS AND LINES, FUEL PRESSURE REGULATOR N52 / N52K / N51** .

Switch off engine.

NOTE: Removing special tool kit 13 5 220 :

- Switch off engine
- Screw out check valve fully again.
- Remove special tool kit 13 5 220 from pressure regulator housing.
- Catch and dispose of escaping fuel.

**NOTE: Read out fault memory of DME control unit.
Check stored fault messages.
Now clear the fault memory.**

53 INJECTION NOZZLE AND LINES

13 53 240 REPLACING COMPLETE INJECTION PIPE (N52/ N52K)

Special tools required:

- 13 5 281

Necessary preliminary tasks:

- Read out fault memory of DME control unit
- Switch off ignition
- Remove clean air pipe
- Remove ignition coil cover, see **11 00 REMOVING AND INSTALLING/REPLACING IGNITION COIL COVER (N52K)**

Recycling

Fuel escapes when fuel line is detached. Catch and dispose of escaping fuel.

Observe country-specific waste-disposal regulations.

N52K only:

Unclip plug connection (1) from holder (2) and disconnect.

Unclip wiring harnesses from holder (2) and connector strip (3).

Disconnect holder (2) from injection pipe.

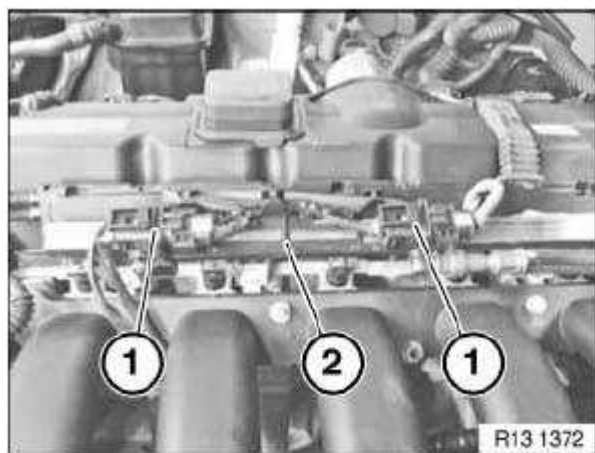


Fig. 4: Plug Connection And Holder
Courtesy of BMW OF NORTH AMERICA, INC.

Remove protective cap from compressed air valve.

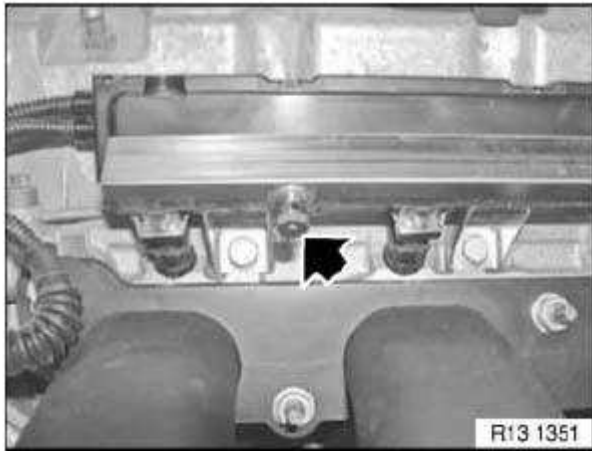


Fig. 5: Dust Cap

Courtesy of BMW OF NORTH AMERICA, INC.

Connect compressed air line (1) to compressed air valve.

Blow fuel back into tank with a short blast of compressed air (max. 3 bar).

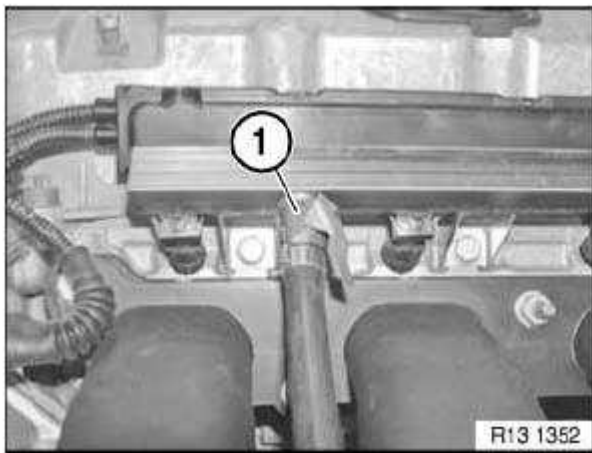


Fig. 6: Compressed Air Line

Courtesy of BMW OF NORTH AMERICA, INC.

Unlock and detach fuel line (1).

Detach connector strip (2) in direction of arrow.

Release screws.

Tightening torque: 1AZ, see **13 53 FUEL INJECTION NOZZLES AND PIPES** .

Remove injection pipe (3).

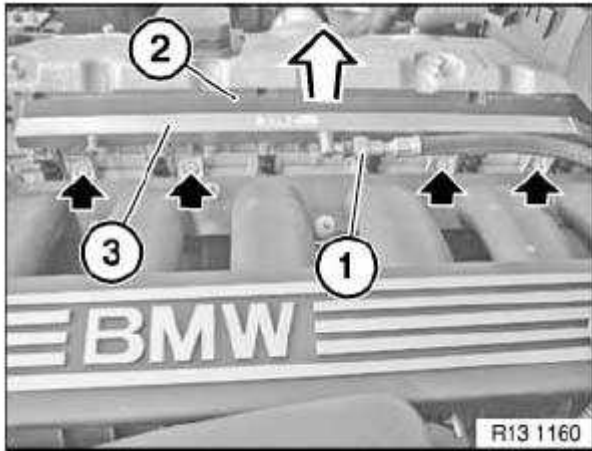


Fig. 7: Detaching Connector Strip
Courtesy of BMW OF NORTH AMERICA, INC.

Seal fuel hose with special tool 13 5 281 .



Fig. 8: Special Tool 13 5 281
Courtesy of BMW OF NORTH AMERICA, INC.

Lever out retainers (1).

Pull fuel injectors out of injection pipe.

Installation:

Replace sealing rings on fuel injectors and coat with anti - friction rubber coating.

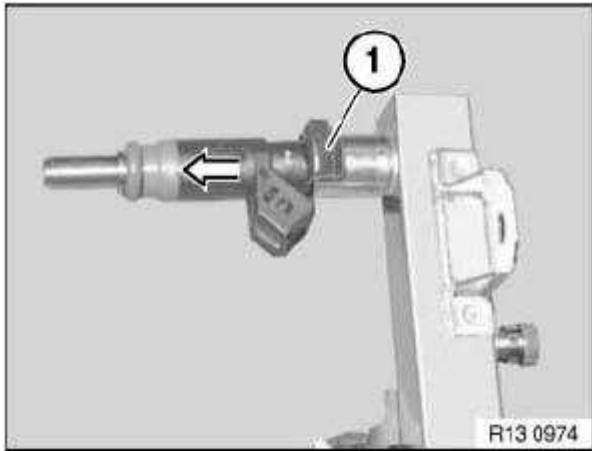


Fig. 9: Retainers

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Check stored fault messages.
Now clear the fault memory.

13 64 501 REMOVING AND INSTALLING/REPLACING A FUEL INJECTOR (N52, N52K, N51)

This work step is described in the section **13 53 240 Replacing complete injection pipe (N52/ N52K)**.

54 THROTTLE AND OPERATION

13 54 030 REMOVING AND INSTALLING/SEALING THROTTLE VALVE ASSEMBLY (N52 / N52K / N51 / N53)

Read and comply with **61 35 ... NOTES ON ESD PROTECTION (ELECTRO STATIC DISCHARGE)** .

Necessary preliminary tasks:

- Switch off ignition
- Remove air intake hose, see **13 54 250 Removing and installing/replacing intake hose (on air cleaner housing) (N52K)**.

Unlock plug (1) and remove.

Release screws.

Tightening torque: 1AZ, see **13 54 THROTTLE AND ACTUATOR** .

Remove throttle assembly (2).

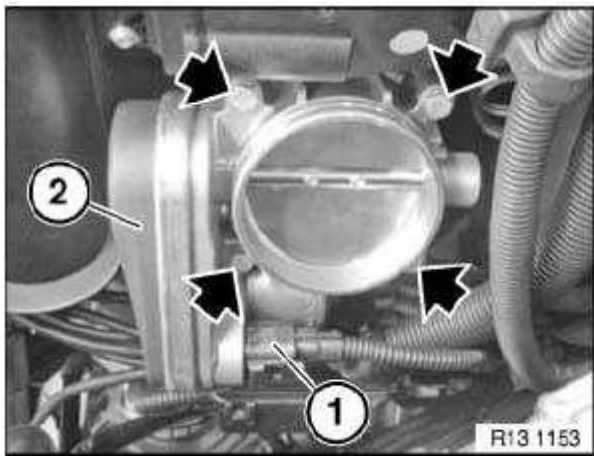


Fig. 10: Plug And Throttle Assembly
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace sealing ring (1) of throttle assembly (2).

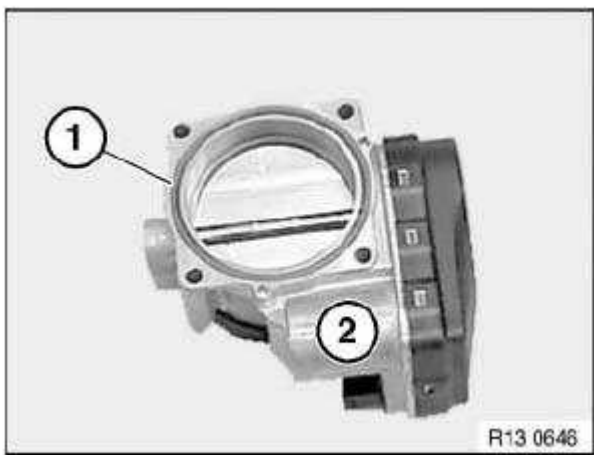


Fig. 11: Sealing Ring Of Throttle Assembly
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check stored fault messages.

Now clear the fault memory.

13 54 250 REMOVING AND INSTALLING/REPLACING INTAKE HOSE (ON AIR CLEANER HOUSING) (N52K)

Necessary preliminary tasks:

- Switch off ignition
- Remove intake filter housing, see **13 71 000 Removing and installing/replacing intake filter housing (N52K)**

Unfasten clip.

Feed out intake hose (1) and remove.

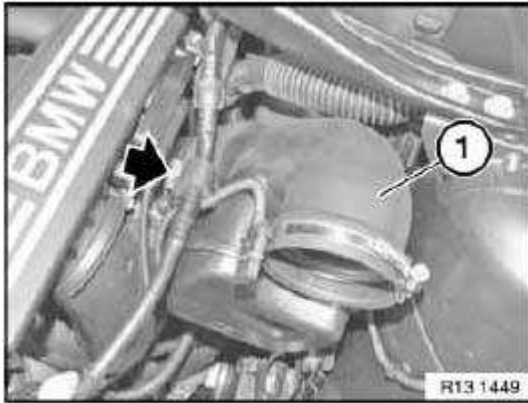


Fig. 12: Intake Hose

Courtesy of BMW OF NORTH AMERICA, INC.

13 54 251 REMOVING AND INSTALLING/REPLACING INTAKE HOSE (ON THROTTLE VALVE ASSEMBLY) (N52K)

Necessary preliminary tasks:

- Remove intake hose

Unfasten clip.

Detach intake hose (1) from throttle valve assembly and remove.

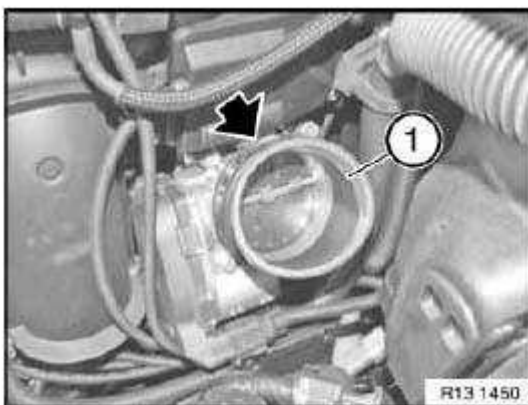


Fig. 13: Intake Hose

Courtesy of BMW OF NORTH AMERICA, INC.

62 SENSOR FOR CONTROL UNIT

13 62 010 REMOVING AND INSTALLING/REPLACING DIFFERENTIAL PRESSURE SENSOR (N52 / N52K / N51)

Necessary preliminary tasks:

- **E90 / E91 / E92 / E93 / E87:**

Remove lower section of microfilter housing, see **31 MICROFILTER** .

- **E85 / E86 E90 / E91 / E92 / E93:**

Remove left tension strut on suspension strut dome

- **E70:**

Remove intake filter housing, see **13 71 000 Removing and installing/replacing intake filter housing (N52K)**.

IMPORTANT: Read and comply with 61 35 ... NOTES ON ESD PROTECTION (ELECTRO STATIC DISCHARGE) .

Release screws.

Unlock plug (1) and remove.

Pull differential pressure sensor (2) out of intake air manifold.

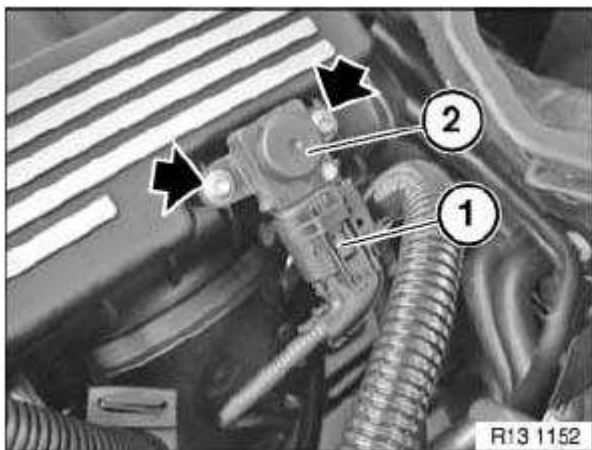


Fig. 14: Plug And Differential Pressure Sensor

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Read out fault memory of control unit of Digital Engine Electronics (DME).

Check stored fault messages.

Now clear the fault memory.

13 62 531 REPLACING COOLANT TEMPERATURE SENSOR (N52/ N52K/ N53)

WARNING: Danger of scalding!
Only perform these tasks on an engine that has cooled down.

Recycling

Catch and dispose of escaping coolant.

Observe country-specific waste-disposal regulations.

Necessary preliminary tasks:

- Read out fault memory of DME control unit
- Switch off ignition
- Remove intake duct

Coolant temperature sensor is mounted on cylinder head at front.

Unlock plug (1) and remove.

Release temperature sensor (2).

Installation:

Tightening torque: 2AZ, see **13 62 SENDERS FOR CONTROL UNIT** .

If necessary, top up coolant.

Check cooling system for leaks, see **17 00 009 CHECKING COOLING SYSTEM FOR LEAKS (M54, N46, N52)** .

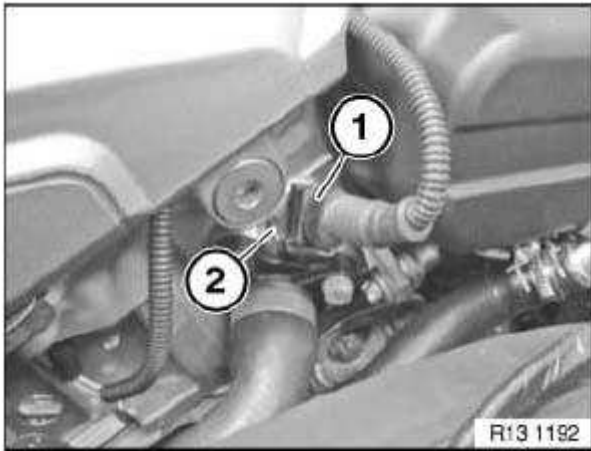


Fig. 15: Plug And Temperature Sensor

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Now clear the fault memory.

13 62 560 REMOVING AND INSTALLING/REPLACING AIR - MASS FLOW SENSOR (N52 / N52K / N53)

Necessary preliminary tasks:

- Read out fault memory of DME control unit
- Switch off ignition

Release bolts.

Unlock plug (1) and remove.

Pull air-mass flow sensor (2) out of upper section of intake filter housing.

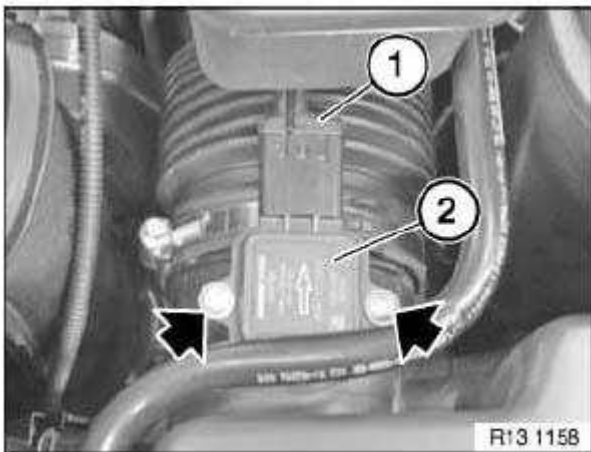


Fig. 16: Plug And Air-Mass Flow Sensor
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Check stored fault messages.
Now clear the fault memory.

13 62 560 REMOVING AND INSTALLING/REPLACING AIR - MASS FLOW SENSOR (N52)

Necessary preliminary tasks:

- Switch off ignition
- Read out fault memory of DME control unit.

Unlock plug (1) and remove.

Release screws.

Pull air-mass flow sensor (2) out of upper section of intake filter housing.

Installation:

Check sealing ring for damage.

Replace if necessary.

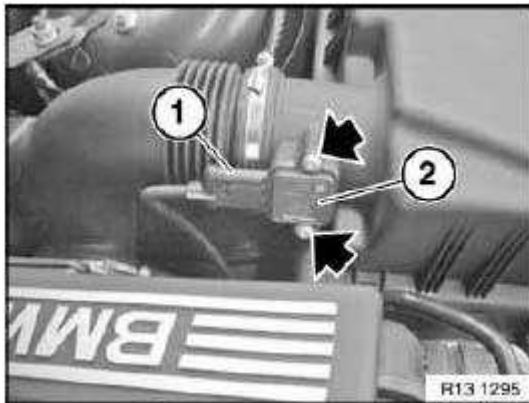


Fig. 17: Plug And Air-Mass Flow Sensor
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Check stored fault messages.
Now clear the fault memory.

64 START VALVES

13 64 501 REMOVING AND INSTALLING/REPLACING A FUEL INJECTOR (N52, N52K, N51)

This work step is described in the section **13 53 240 Replacing complete injection pipe (N52/ N52K)**.

13 64 541 REPLACING ALL FUEL INJECTORS

This work step is described in the section **13 53 240 Replacing complete injection pipe (N52/ N52K)**.

71 INTAKE SILENCER

13 71 000 REMOVING AND INSTALLING/REPLACING INTAKE FILTER HOUSING (N52K)

Necessary preliminary tasks:

- Switch off ignition
- Read out fault memory of DME control unit.

Unlock and remove gaiter (1).

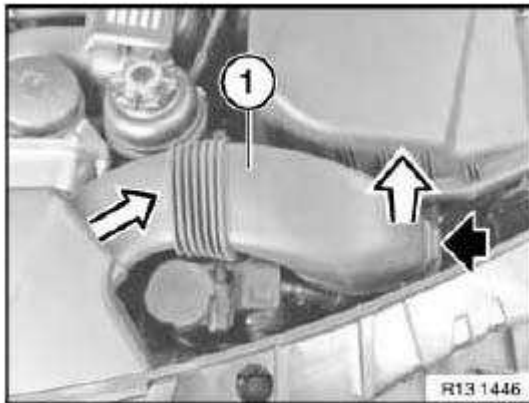


Fig. 18: Removing Gaiter

Courtesy of BMW OF NORTH AMERICA, INC.

Unlock plug (1) and remove.

Release clamp and detach air intake hose.

Detach intake filter housing (2) from bearings pins of rubber mounts in upward direction and remove.

Installation:

Make sure bearing pins are correctly seated in rubber mounts.

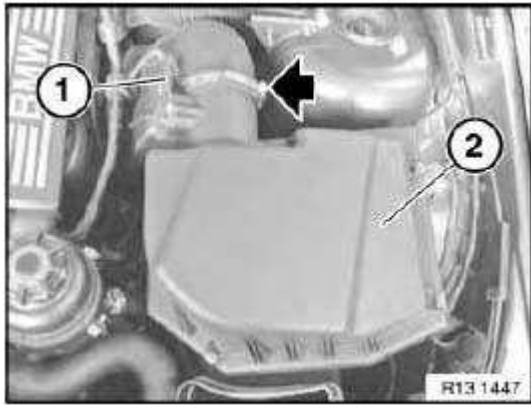


Fig. 19: Plug And Intake Filter Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Position holder (1) of intake filter housing on rubber mount (2).

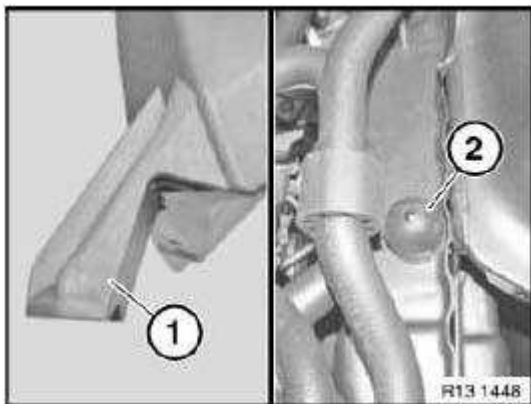


Fig. 20: Holder Of Intake Filter Housing On Rubber Mount
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Check stored fault messages.

Now clear the fault memory.

72 AIR CLEANER

13 72 001 REPLACING AIR CLEANER ELEMENT (N52K)

Necessary preliminary tasks:

- Read out fault memory of DME control unit
- Switch off ignition

Unlock plug (1) and remove.

Unfasten clip.

Open clips (2).

Remove top section (3) of intake filter housing.

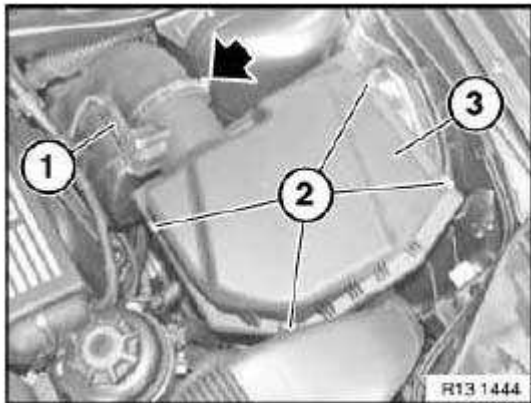


Fig. 21: Plug And Clips

Courtesy of BMW OF NORTH AMERICA, INC.

Remove air cleaner element (1).

Installation:

Clean upper and lower sections of intake filter housing from inside.

Install new air cleaner element.

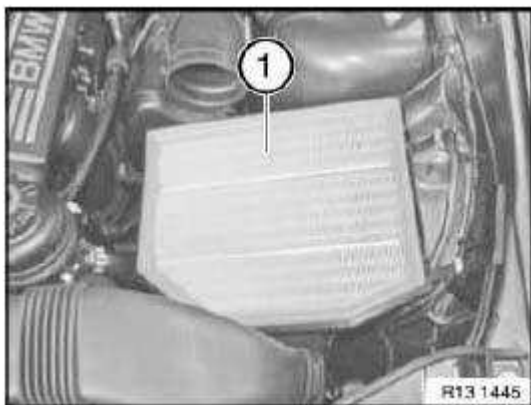


Fig. 22: Air Cleaner Element

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Check stored fault messages.
Now clear the fault memory.

90 CARBON CANISTER VENTILATION

13 90 500 REPLACING TANK VENT VALVE (N52 / N52K / N51 / N53)

Necessary preliminary tasks:

- Check stored fault messages
- Switch off ignition
- Remove throttle valve assembly, see **13 54 030 Removing and installing/sealing throttle valve assembly (N52 / N52K / N51 / N53).**

Installation location:

Tank vent valve is fitted at bottom on intake air manifold.

Unlock plug (1) and remove.

Unlock hose (2) and detach.

Unlock hose (3) on intake manifold and detach.

Detach tank vent valve (4) from bracket and remove.

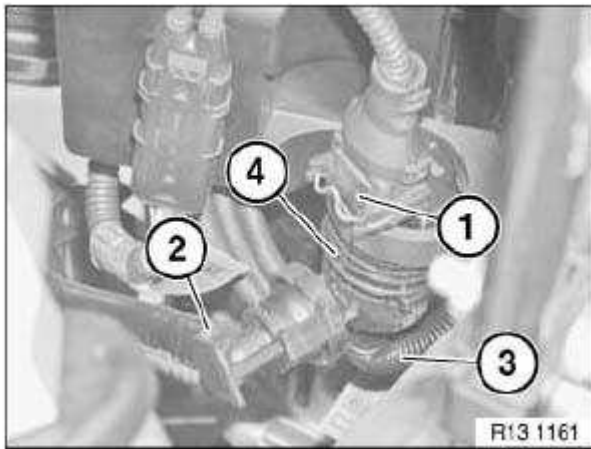


Fig. 23: Plug, Hose And Tank Vent Valve
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Read out fault memory of DME control unit.
Now clear the fault memory.

2004-08 ENGINE PERFORMANCE

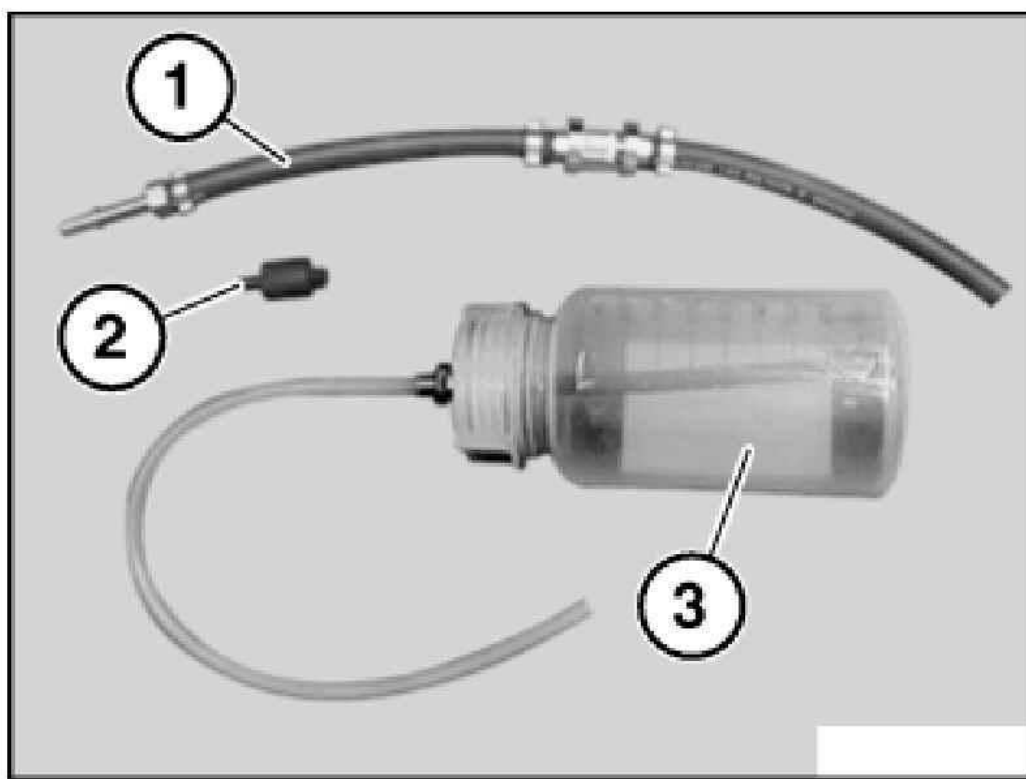
Fuel System - Special Tools - X3 & X5 (M54)

FUEL SYSTEM

13 0 131 COMPRESSED AIR HOSE WITH FILTER

Order number: 13 0 131

Compressed air hose with filter



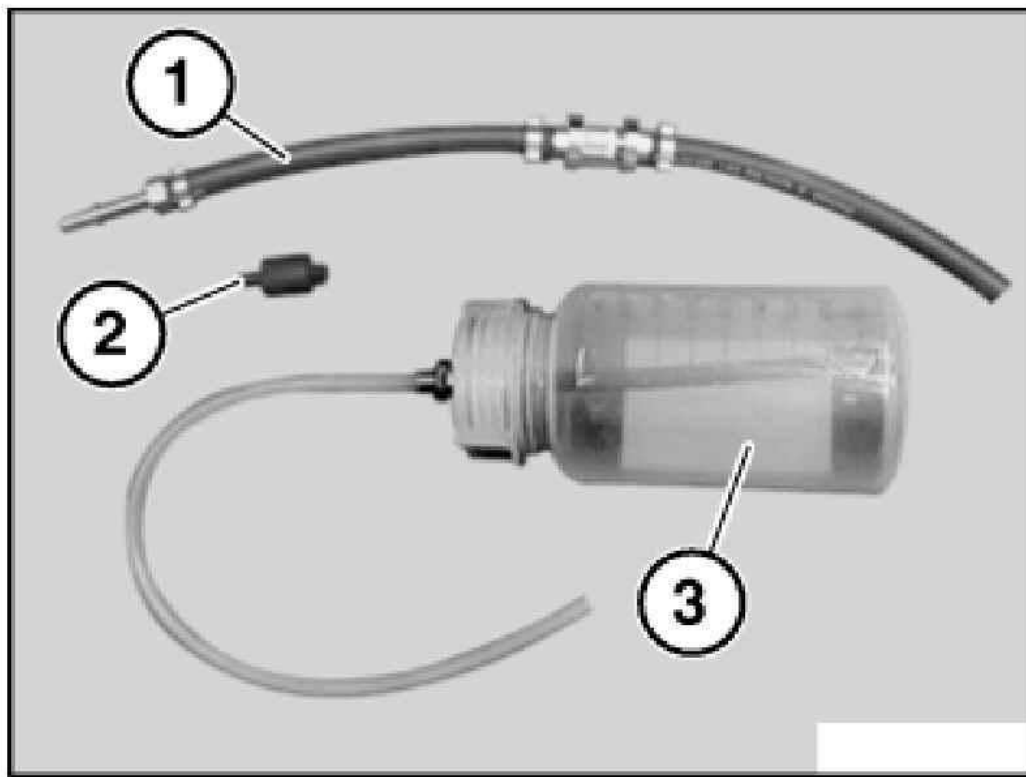
G03296782

Fig. 1: Identifying Compressed Air Hose With Filter
Courtesy of BMW OF NORTH AMERICA, INC.

13 0 132 ADAPTER

Order number: 13 0 132

Adapter



G03296783

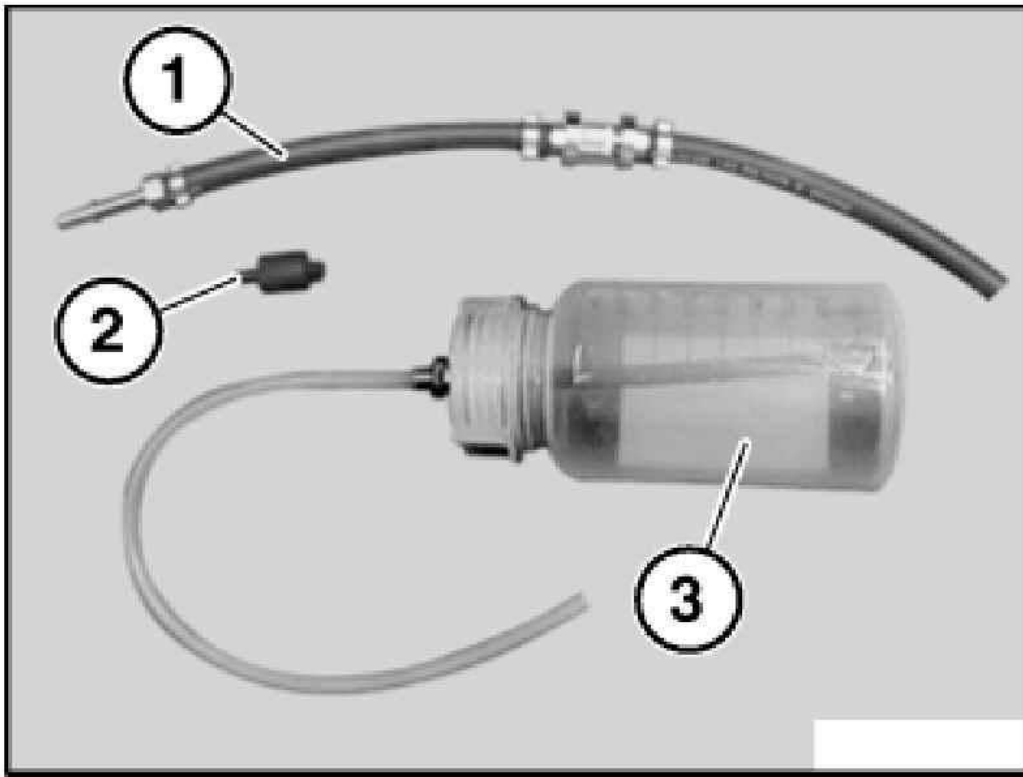
Fig. 2: Identifying Adapter

Courtesy of BMW OF NORTH AMERICA, INC.

13 0 133 CONTAINER

Order number: 13 0 133

Container



G03296784

Fig. 3: Identifying Container

Courtesy of BMW OF NORTH AMERICA, INC.

13 3 010 HOSE CLIP

Minimum set: Mechanical tools

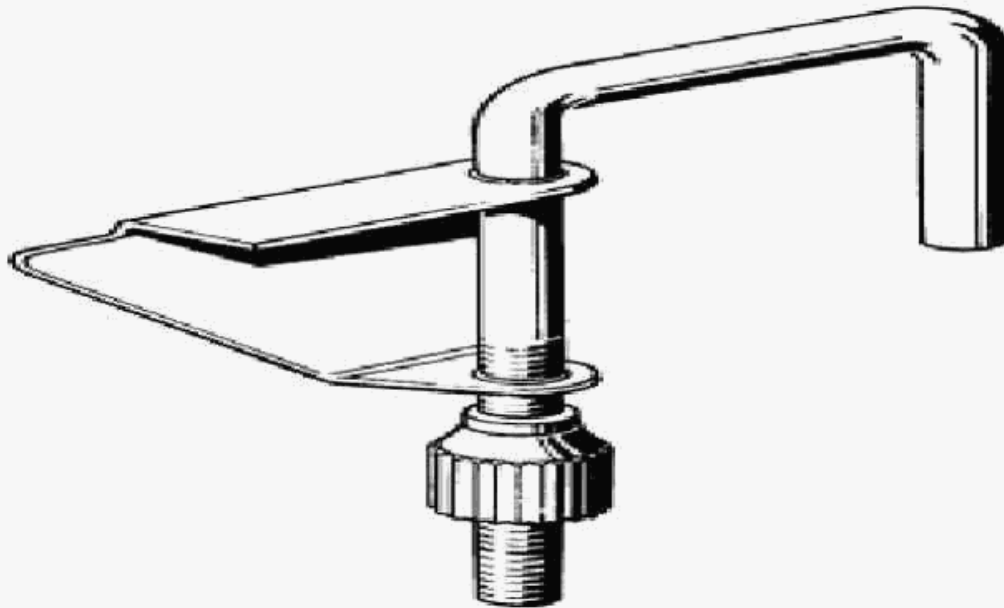
Note: For disconnecting a hose for repair work

Series: E12, E21, E23, E24, E28, E30, E30/C, E30tou, E31, E32, E32/3, E34, E34tou, E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E83, E85, E87, E90, E91, R50, R52, R53, RR1

Storage location: A22

Order number: 13 3 010

Hose clip



G03296785

Fig. 4: Identifying Hose Clip

Courtesy of BMW OF NORTH AMERICA, INC.

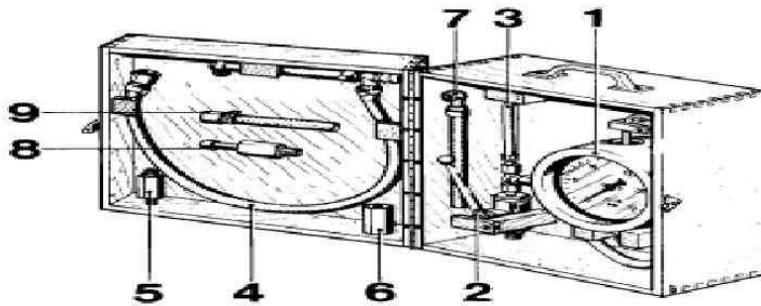
13 3 060 FIXTURE

Note: For checking fuel pressure on K-Jetronic and L-Jetronic as well as oil pressure

Engine: M10, M20, M20B25, M20B27, M21, M30, M30B34, M30Tur, M40, M41, M42, M43, M43TU, M44, M47, M47T2, M47TU, M50, M51, M52, M52TU, M54, M56, M57, M57D25, M57D30, M57TU, M60, M62, M62VAN, M67, M70, M73, M88, N40, N42, N45, N46, N62, N73, S14, S38, S50B30, S50B32, S50US, S52US, S54, S62, W10, W11, W17

Order number: 13 3 060

Fixture



- | | |
|--------------|---------------------------------|
| 1 = 13 3 061 | Pressure gauge 0...25 bar |
| 2 = 13 3 062 | 2-way cock |
| 3 = 13 3 063 | Connecting lines (2 x) |
| 4 = 13 3 064 | Connecting line |
| 5 = 13 3 065 | Connecting piece distributor |
| 6 = 13 3 066 | Connecting piece warm-up sensor |
| 7 = 13 3 067 | Connecting hose |
| 8 = 13 3 068 | Connecting piece distributor |
| 9 = 13 3 069 | Connecting piece |

G03296786

Fig. 5: Identifying Fixture

Courtesy of BMW OF NORTH AMERICA, INC.

Consisting of:

1 = 13 3 061 Pressure gauge 0...25 bar

2 = 13 3 062 2-way cock

Note: Engine: All, except S50, S54, N73

3 = 13 3 063 Connecting lines (2 x)

Note: For fuel and oil pressure testing

4 = 13 3 064 Connecting line

Note: Mit T-piece for L-Jetronic All except N73

5 = 13 3 065 Connecting piece distributor

Note: All except N73

6 = 13 3 066 Connecting piece warm-up sensor

Note: All except N73

7 = 13 3 067 Connecting hose

Note: For checking fuel pump delivery All except N73

In conjunction with: 13 3 020

8 = 13 3 068 Connecting piece distributor

Note: All except N73

In conjunction with: BMW SERVICE TESTER

9 = 13 3 069 Connecting piece

Note: For warm-up sensor with hose all except N73

In conjunction with: BMW SERVICE TESTER

13 5 220 ADAPTER

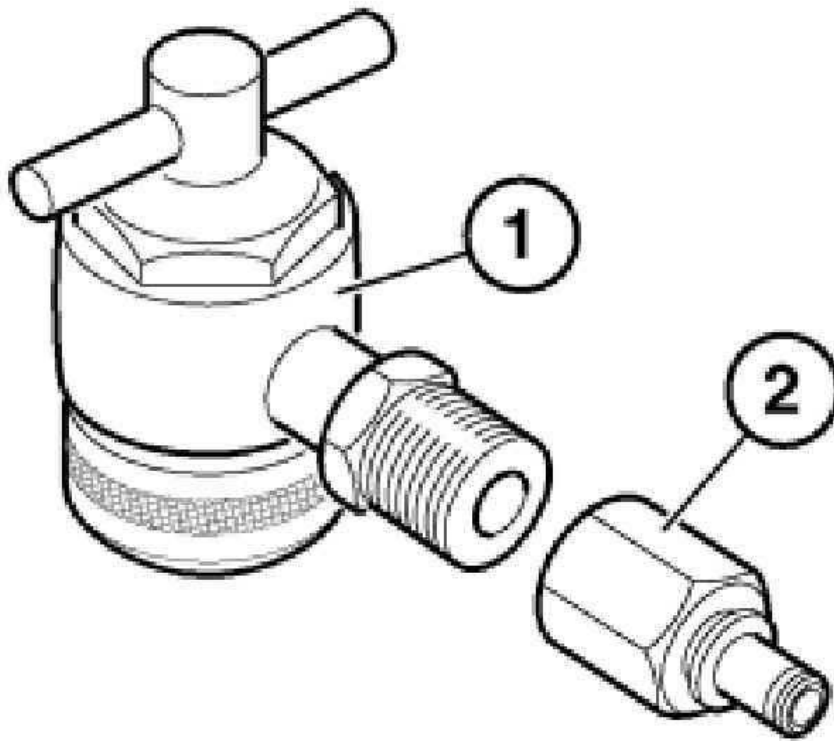
Minimum set: Mechanical tools

In conjunction with: 13 3 063 or 13 6 051

Note: For pressure gauge 13 3 061 or BMW DIS for measuring fuel pressure at injection rail

Engine: M10, M20, M20B25, M20B27, M21, M30, M30B34, M30Tur, M40, M41, M42, M43, M43TU, M44, M47, M47TU, M50, M51, M52, M52TU, M54, M56, M57, M57D25, M57D30, M57TU, M60, M62, M62VAN, M67, M70, M73, M88, N40, N42, N62, S14, S38, S50B30, S50B32, S50US, S52US, S54, S62, W10, W11, W17

Storage location: C16



1 = 13 5 221

Adapter

2 = 13 5 222

Coupling connector

G03296787

Fig. 6: Identifying Adapter

Courtesy of BMW OF NORTH AMERICA, INC.

SI number: 1 06 95 (963)

Order number: 13 5 220

Adapter

Consisting of:

1 = 13 5 221 Adapter

Note: Engine: M43, M44, M52, M62

2 = 13 5 222 Coupling connector

Note: For connecting DIS pressure sensor

13 5 280 PLUGS FOR FUEL LINES

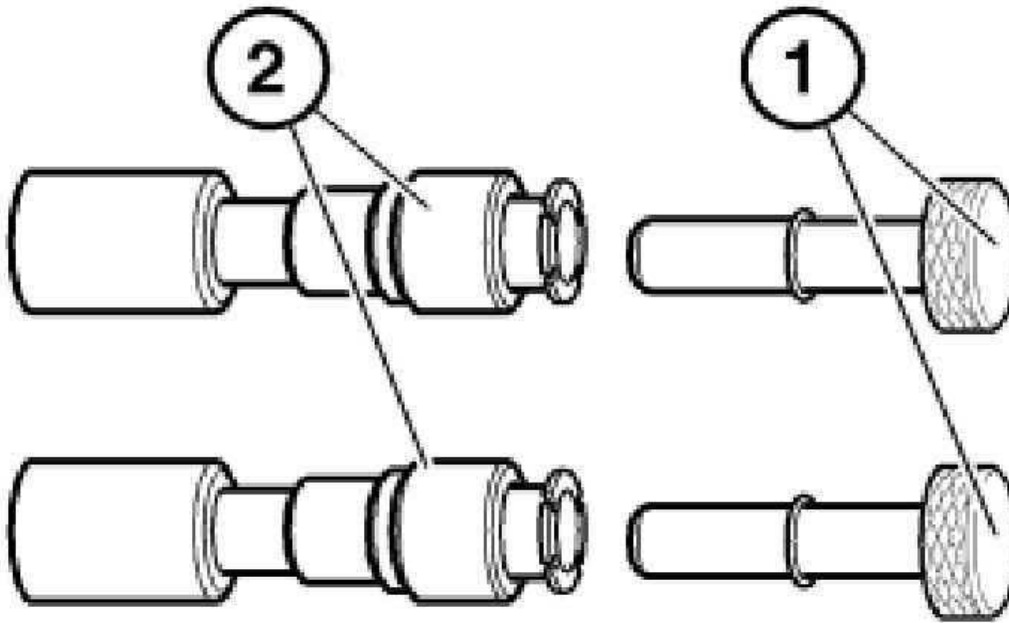
Note: For sealing off fuel lines when removing and installing engine - Applicable to M62 only fitted in E39 / M52 only fitted in E38 / S50B32 only fitted in E36 / N62 only fitted in E65 / M54 in E83.

Series: E36, E38, E39, E46, E60, E61, E63, E64, E65, E66, E67, E83, E85, R50, R52, R53, RR1

Engine: M52, M54, M62, N40, N42, N62, N73, S50B32, W10, W11

Storage location: B16

SI number: 1 18 96 (163)



1 = 13 5 281

Seal (2 x)

2 = 13 5 282

Seal (2 x)

G03296788

Fig. 7: Identifying Plugs For Fuel Lines
 Courtesy of BMW OF NORTH AMERICA, INC.

Order number: 13 5 280

Plugs for fuel lines

Consisting of:

1 = 13 5 281 Seal (2 x)

Note: For sealing quick couplings

2 = 13 5 282 Seal (2 x)

Note: For sealing fuel lines

13 6 050 SET OF ADAPTERS FOR BMW DIS

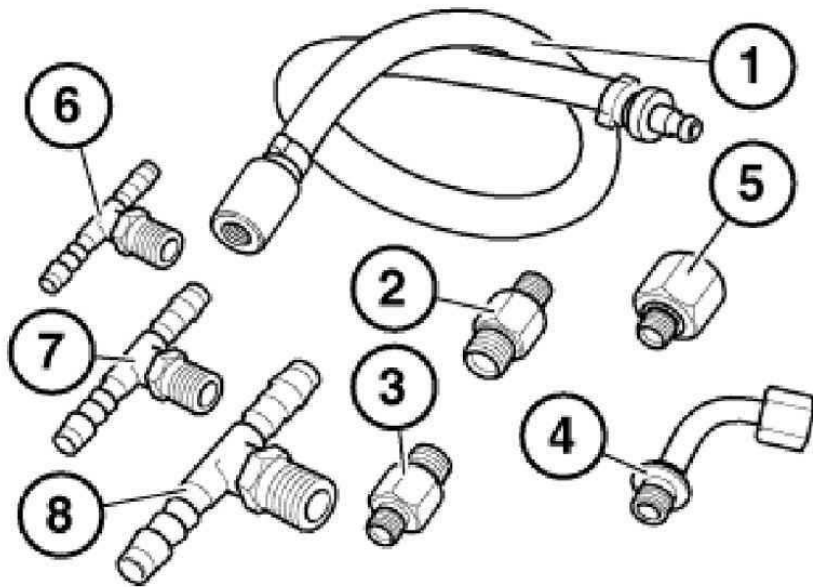
Minimum set: Mechanical tools

Note: For measuring oil and fuel pressures

Engine: M10, M20, M20B25, M20B27, M21, M30, M30B34, M30Tur, M40, M41, M42, M43, M43TU, M44, M47, M47T2, M47TU, M50, M51, M52, M52TU, M54, M56, M57, M57D25, M57D30, M57TU, M60, M62, M62VAN, M67, M70, M73, M88, N40, N42, N62, N73, S14, S38, S50B30, S50B32, S50US, S52US, S54, S62, W10, W11, W17

Storage location: A16, B16

SI number: 1 12 94 (859)



1	= 13 6 051	Connecting hose
2	= 13 6 052	Reducer
3	= 13 6 053	Reducer for adapter 16 1 300
4	= 13 6 054	Pipe elbow
5	= 13 6 055	Reducer for T-pieces 13 6 056 and 13 6 057
6	= 13 6 056	T-piece for 6 mm dia. line
7	= 13 6 057	T-piece for 8 mm dia. line

G03296789

Fig. 8: Identifying Set Of Adapters

Courtesy of BMW OF NORTH AMERICA, INC.

Order number: 13 6 050

Set of adapters for BMW DIS

Consisting of:

1 = 13 6 051 Connecting hose

Note: For connecting reducers 13 6 052, 13 6 053, 13 6 55 and adapters 11 4 050, 11 4 160, 11 4 170, 13 5 131 to BMW DIS

2 = 13 6 052 Reducer

Note: For pipe elbows 24 0 023, 24 0 024, 24 0 140

In conjunction with: 13 6 051

3 = 13 6 053 Reducer for adapter 16 1 300

In conjunction with: 13 6 051

4 = 13 6 054 Pipe elbow

In conjunction with: 13 6 051, 11 4 050

5 = 13 6 055 Reducer for T-pieces 13 6 056 and 13 6 057

In conjunction with: 13 6 051

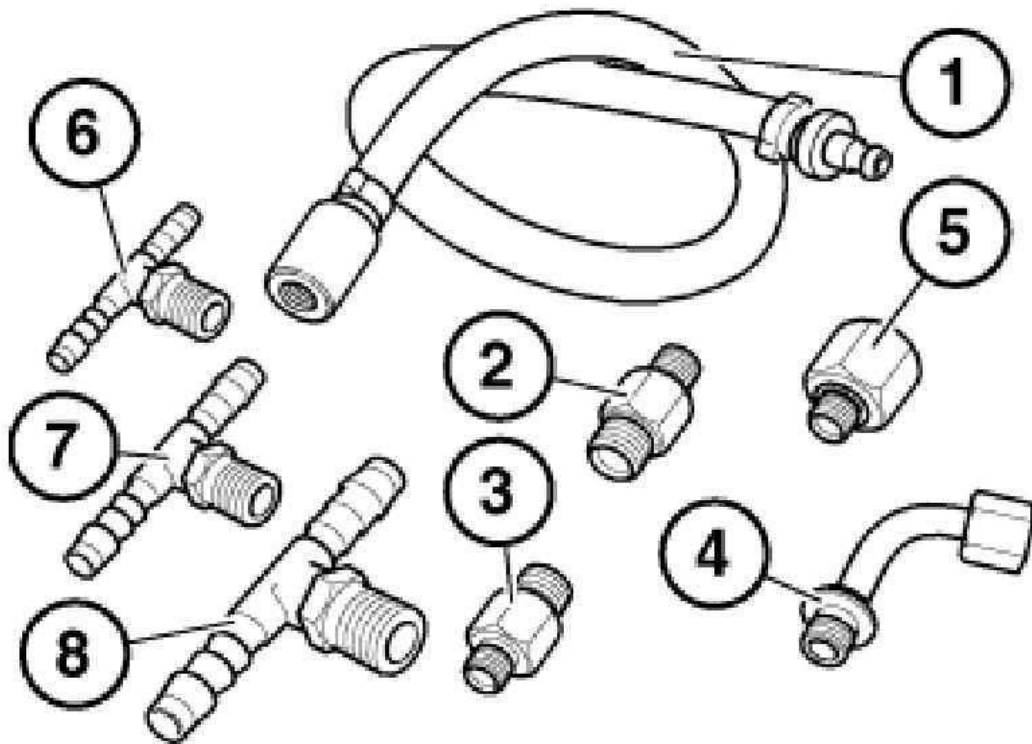
6 = 13 6 056 T-piece for 6 mm dia. line

7 = 13 6 057 T-piece for 8 mm dia. line

13 6 058 T-PIECE FOR 12 MM DIA. LINE

Order number: 13 6 058

T-piece for 12 mm dia. line



G03296790

Fig. 9: Identifying T-Piece

Courtesy of BMW OF NORTH AMERICA, INC.

13 6 200 ULTRASONIC CLEANING SYSTEM

Note: For fuel injectors complete with special detergent

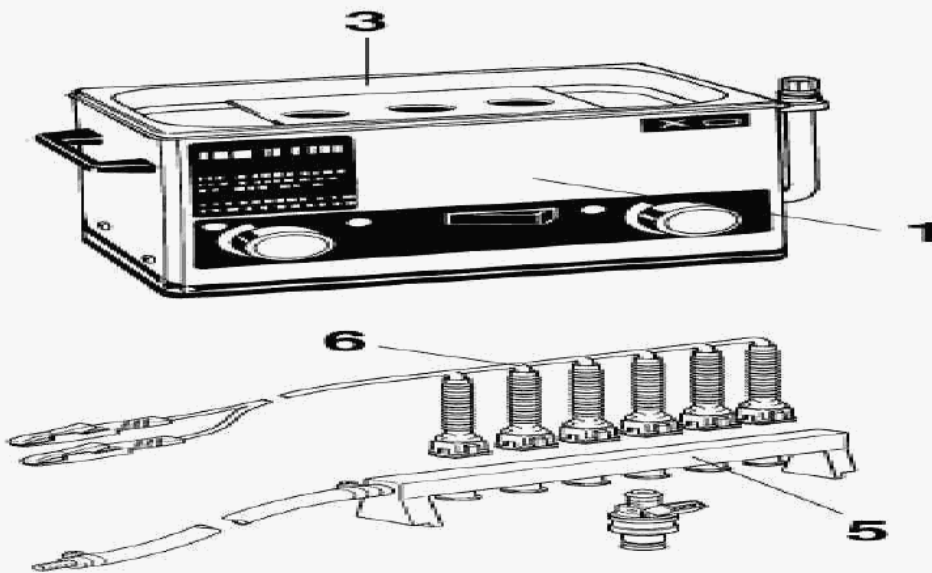
Engine: M10, M20, M21, M30, M40, M41, M42, M43, M44, M50, M51, M52, M54, M60, M62, M70, M73, M88, N42, N46, S14, S38, S50B30, S50B32, S50US, S52US

Storage location: Single

SI number: 2 01 87(623)

Order number: 13 6 200

Ultrasonic cleaning system



- | | |
|--------------|--------------------------|
| 1 = 13 6 201 | Ultrasonic cleaning unit |
| 3 = 13 6 203 | Basket |
| 5 = 13 6 205 | Mounting rail |
| 6 = 13 6 206 | Wiring harness |

G03296791

Fig. 10: Identifying Ultrasonic Cleaning System
 Courtesy of BMW OF NORTH AMERICA, INC.

Consisting of:

1 = 13 6 201 Ultrasonic cleaning unit

Note: Without special cleaner

3 = 13 6 203 Basket

Note: For diesel injection nozzles

5 = 13 6 205 Mounting rail

Note: For fuel injectors - engine: M10, M20, M30, M40, M42, M43, M44, M50, M52, M54, M60, M62, M70, M73, M88, N42, S14, S38, S50B30, S50B32, S50US, S52

6 = 13 6 206 Wiring harness

13 6 202 Special cleaner (R 60 L) 10 ltr.

13 6 207 Cleaning agent concentrate 1 ltr.

Note: Tunop 656

ENGINE PERFORMANCE

Fuel System - Technical Data - X3

53 INJECTION NOZZLE AND LINES

13 53 INJECTORS AND LINES, FUEL PRESSURE REGULATOR N52 / N52K / N51

TECHNICAL DATA - INJECTORS AND LINES, FUEL PRESSURE REGULATOR

Test pressure / nominal value	bar \pm 0.02	5.0
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ENGINE PERFORMANCE

Fuel System - Tightening Torques - X3

31 FUEL PUMP WITH DRIVE AND LINE

13 31 FUEL PUMP WITH DRIVE AND PIPES

FUEL PUMP WITH DRIVE AND PIPES - TIGHTENING TORQUES

	Type	thread	tightening specification	Measure
1AZ Fuel pump to engine	All			12 Nm
2AZ Fuel pipe coupling bolt	All / with K-Jetr.	M8		9 Nm
3AZ Fuel pipe coupling bolt	All / with K-Jetr.	M12		20 Nm
4AZ Fuel pipe to pressure regulator	All / with L-Jetr.			30 Nm
5AZ Return pipe connector to pressure regulator	All / with L-Jetr.			27 Nm

32 FUEL FILTER

13 32 FUEL FILTER

FUEL FILTER - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Fuel line to filter housing and injection pump				
Coupling nut	M21 / M51 / M41	M14 x 1.5		14 Nm
Adapter	M21 / M51 / M41	M12 x 1.5		9 Nm
Hollow bolt	M21 / M51 / M41	M14 x 1.5		14 Nm
2AZ Fuel filter to holder	M51 / M41	M8		22 Nm
3AZ Air duct to fuel cooler	M47			5.7 Nm
	M57			2 Nm
4AZ Fuel filter cover	M47			25 Nm
5AZ Fuel filter with holder to body	N42			8.8 Nm

51 INJ. PUMP, REGULAR, MIXER REGULATOR

13 51 INJECTION PUMP, CONTROL RECEPTACLE

INJECTION PUMP, CONTROL RECEPTACLE - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Plug for high pressure section of injection pump	M21 / M51 / M41			25 Nm
2AZ Distributor injection pump to holder	M21 / M51 / M41			25 Nm
3AZ Electric shutoff to injection pump	M21 / M51 / M41			20 ± 5 Nm
4AZ Electric cold start valve to injection pump	M21			20 Nm
5AZ Coupling bolt (OUT) to injection pump (fuel return)	M21 / M51 / M41			25 Nm
6AZ Pressure valve holder to injection pump	M21 / M51			45 Nm
7AZ Expansion element housing (temperature dependent idling speed boost) to injection pump	M21			18 Nm
8AZ Distributor injection pump to flange and console	M21 / M51 / M41			22 Nm
9AZ Electr. line on fuel cutout device	M51 / M41			2.5 Nm
10AZ Fuel feed line to injection pump (VP44)	M47			30 Nm
11 AZ Fuel return line to injection pump (VP44)	M47			25 Nm
12AZ Plug for static basic adjustment (injection pump VP44)	M47			13 Nm
13AZ Blocking screw for injection pump shaft without spacer plate (injection pump VP44)	M47			31 Nm
14AZ Blocking screw for injection pump shaft with spacer plate (injection pump VP44)	M47			13 Nm
15AZ Injection line (union nut) to injection pump (VP44)	M47			30 Nm

53 INJECTION NOZZLE AND LINES

13 53 FUEL INJECTION NOZZLES AND PIPES

FUEL INJECTION NOZZLES AND PIPES - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Fuel rail	N52, N52K	M6 x 12		9 ± 1 Nm
1AZ Fuel rail	N51	M6 x 16		9 ± 1 Nm

54 THROTTLE AND OPERATION

13 54 THROTTLE AND ACTUATOR

THROTTLE AND ACTUATOR - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Throttle-valve assembly to intake manifold	N52 / N52K / N51 / N53	M6 x 50		9 Nm

62 SENSOR FOR CONTROL UNIT

13 62 SENDERS FOR CONTROL UNIT

SENDERS FOR CONTROL UNIT - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Temperature time switch	M21 / M51			18 Nm
2AZ Coolant temperature sensor	M60/1 / M60/2 / M21 / M51			18 Nm
	All others			13 Nm
3AZ Temperature switch	All			28 Nm
4AZ Temperature sensor - air	All			13 Nm
5AZ Charge-air pressure sensor on holder	M51 / M41			4 Nm
Charge-air pressure sensor on intake manifold	M47			5 Nm
6AZ Twin temperature sensor (4-pin plug-in connection)	M41 / M43 / M44 / S50 / S52 / M52 / M57 / M67 / M62 / M73			13 Nm
7AZ Air-mass sensor on lower section of air filter housing	M51			3.5 Nm
Air-mass flow sensor to cylinder head cover	M47 / M47TU / M57 / M57TU			4.5 Nm
8AZ Pulse generator, camshaft to cylinder head cover	M57			4.5 Nm
	M47TU / M57TU			3.5 Nm
9AZ Intake neck on air-mass flow sensor	M47			9 Nm

64 START VALVES

13 64 FUEL INJECTORS

FUEL INJECTORS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Fuel injector to intake manifold	All	M6		10 Nm
2AZ Coupling nut on fuel injector	All / with K-Jetr.			25 Nm

2007 ENGINE PERFORMANCE

Self Diagnosis - Theory & Operation - 328i, 328xi, X3 (N52 Engine)

DIAGNOSTIC TROUBLE CODE INDEX

DIAGNOSTIC TROUBLE CODE INDEX - THEORY & OPERATION

DTC	Definition
<u>P0420/0430</u>	Catalyst Monitoring
<u>P0300, P0301, P0302, P0303, P0304, P0305, P0306</u>	Misfire Monitoring
<u>P0442/P0456, P1434, P1447, P1448, P1449</u>	Evaporative system leak measurement
<u>P0440, P0441</u>	EVAP (Functional check canister purge solenoid)
<u>P0461, P0462, P0463, P2067, P2068</u>	Fuel Level Sensor
<u>P0072, P0073</u>	CAN based Ambient Temperature - signal diagnosis
<u>P0071</u>	Ambient Temperature Signal Plausibility Check
<u>P0171, P0172, P0174, P0175</u>	Fuel System Monitoring Lambda Adaptation
<u>P2096/P2098, P2097/P2099</u>	Fuel System Monitoring Trim Control Plausibility Monitoring
<u>P0131/P0151, P0132/P0152</u>	Upstream Oxygen Sensor - Short Circuit Monitoring
<u>P112C/P112D, P2243/P2247, P2626/P2629</u>	Upstream Oxygen Sensor - Open Circuit Monitoring
<u>P3022/P3023, P3024/P3025</u>	Upstream Oxygen Sensor - Signal Controller Monitoring
<u>P2414/P2415</u>	Upstream Oxygen Sensor - Signal Activity Check
<u>P0040</u>	Upstream Oxygen Sensor - Swapped Sensors Check
<u>P2195, P2196, P2197, P2198</u>	Upstream Oxygen Sensor - Active Signal Check (Shift to lean / rich)
<u>P0133/P0153</u>	Upstream Oxygen Sensor - Signal Dynamic Monitoring (Slow Response)
<u>P2297/P2298</u>	Upstream Oxygen Sensor - Signal Monitoring During Fuel Cut-off
<u>P3026/P3027</u>	Upstream Oxygen Sensor - Heater Monitoring

<u>P0030, P0031, P0032, P0050, P0051, P0052</u>	Upstream Oxygen Sensor - Heater Circuit Monitoring
<u>P0137, P0138, P0140, P0157, P0158, P0160</u>	Downstream Oxygen Sensor - Circuit Monitoring
<u>P0139/P0159</u>	Downstream Oxygen Sensor - Signal Dynamic / Plausibility Check During Fuel Cutoff
<u>P1130/P1131</u>	Downstream Oxygen Sensor - Dynamic / Transition Time in Sensor Midpoint Range Monitoring
<u>P114A, P114B, P114C, P114D, P2279, P2271, P2271, P2273</u>	Downstream Oxygen Sensor - Active Signal Check (Stuck lean / rich)
<u>P0141, P0161, P0036, P0037, P0038, P0056, P0057, P0058</u>	Downstream Oxygen Sensor - Heater Circuit Monitoring
<u>P0017, P0018</u>	Electrical Coolant Temperature Diagnosis
<u>P3198</u>	Coolant Temperature Gradient Diagnosis
<u>P3199</u>	Coolant Temperature Stuck Diagnosis
<u>P316A</u>	Coolant Temperature Sensor stuck in a range Diagnosis with Engine off timer
<u>P1515, P1551</u>	Engine off timer Monitoring
<u>P0128, P0597, P0598, P0599</u>	Thermostat
<u>P0112, P0113</u>	Electrical Intake Air Temperature Diagnosis
<u>P0111, P111E, P111F</u>	Intake Air Plausibility Check
<u>P0012/P0015</u>	Variable Camshaft Timing (Vanos) (detection of mechanical IVVT error)
<u>P0340/P0365/P1300/P130A/P0344/P0369/P1554/P1553/P0016/P0017</u>	Camshaft position sensor (CMP)
<u>P0341</u>	Camshaft Crankshaft synchronization
<u>P0335/P0370/P0373</u>	Crankshaft position sensor (CRK)
<u>P1047, P1048, P1049, P1076, P1075, P103A, P1078, P107A, P107B, P107C, P105B, P105A, P1055, P1056, P1019, P1020, P1057, P1017, P1030, P1064, P101A, P1023, P1024, P1041</u>	Variable Valve Lift - Electrical Diagnosis
<u>P169A, P1694</u>	ETC spring check (start routine)
<u>P1632, P1633, P1634, P1635</u>	ETC adaptation diagnosis
<u>P1637, P1639</u>	Electronic Throttle Control

	(ETC) Motor Control Performance
<u>P0506, P0507</u>	ISC (Idle Speed Control) Actuator
<u>P1415, P1424</u>	Air Mass Flow Meter - Rationality check
<u>P1124, P1104, P1105</u>	Manifold Differential Pressure Sensor - Rationality check

CATALYST MONITORING

NOTE: OBD System Description of Siemens VDO ECU MSV80 for following models:

X3 3.0i, X3 3.0Si, 323i (only Canada), 328i, 328xi, 328Ci, 328Cxi, 328i sport wagon, 328xi sport wagon and 328Ci convertible

P0420/0430

DIAGNOSTIC OVERVIEW

The ECM tests the catalyst system during steady state driving by cycling the fueling LEAN and then RICH for a calibrated number of cycles while monitoring the oxygen storage capacity (OSC). Prior to the Catalyst test the canister purge valve is completely closed or completely opened with low canister purge value. This is to eliminate the influence of canister vapors on the downstream sensor during the test.

The first lean to rich cycle of the test is only used to establish an average voltage value of the downstream sensor voltage. During subsequent cycles the OSC is based on the integrated (accumulated) value of the difference between the average value of the previous lean to rich cycle and the measured instantaneous voltage during the current lean to rich cycle.

MONITORING FUNCTION

Catalyst monitoring is based on the monitoring of the oxygen storage capability by comparing the signals of the O2 sensor upstream and downstream the catalyst.

The engine control results in regular lambda oscillations of the exhaust gas. These oscillations are damped by the storage activity of the catalyst. The amplitude of the remaining lambda oscillations downstream the catalyst indicates the oxygen storage capability.

If all monitoring conditions are fulfilled, then a special defined A/F-modulation will be done. The relation of the deviations between the current downstream-sensor-signal to the average value of the downstream-sensor-signal is a sign for catalyst condition. The catalyst system is considered malfunctioning, if after a specified number of monitoring cycles the average of the ratios exceeds a threshold. The corresponding fault code is stored.

VARIABLES LIST

VARIABLES LIST

Siemens Parameter SAM/Specification	Description
CAT_DIAG	Result value of Cat diagnosis
SUM CAT DIAG	Counter Increment
CAT_DIAG_CLC	Current Cat Diagnosis
VLS_CAT_RATIO SUM	Final Sum of values

MISFIRE MONITORING

P0300, 0301, 0302, 0303, 0304, 0305, 0306

MONITORING FUNCTION

The method of engine misfire detection is based on evaluating the engine speed fluctuations.

The engine torque is a function of engine speed, engine load and the moment of inertia.

In order to detect misfiring at any cylinder, the torque of each cylinder is evaluated by metering the time between two ignition events, which is a measure for the mean value of the speed of this angular segment. This means, a change of the engine torque results in a change of the engine speed.

It is also an influence of the load torque. This means, the influences of different road surface, e. g. pavement, pot holes etc. If the mean engine speed is measured, influences caused by road surfaces have to be eliminated.

This method consists of following main parts:

Data acquisition:

The duration of the crankshaft segments is measured continuously for every combustion cycle.

Sensor wheel adaptation:

Within a defined engine speed range and during fuel cut-off, the adaptation of the sensor wheel tolerances, instead of the misfire detection, is carried out.

With progressing adaptation the sensitivity of the misfire detection is increasing. The adaptation values are stored and taken into consideration for the calculation of the engine roughness.

Calculation of the engine roughness:

The engine roughness is derived from the differences of the segment durations. Different statistical methods are used to distinguish between normal changes of the segment duration and the changes due to misfiring.

Determination of misfiring:

Misfire detection is performed by comparing the engine roughness threshold value with the engine roughness

value. If the threshold is exceeded, single misfire is detected.

STATISTICS, FAULT PROCESSING

Emission Limit: (e) (3.2.2)

If the sum of cylinder(s) misfire counters within 1000 revolutions is 4 times exceeding a predetermined value during a driving cycle, or during the first 1000 revolutions, the fault code for emission relevant misfiring is temporarily stored. If the following driving cycle is also above the emission limits, the MIL will be switched on and a cylinder selective or global fault will be stored.

Catalyst Damage: (e) (3.2.1)

If the weighted sum of cylinder(s) misfire counters within 200 revolutions exceeds a predetermined value the fault code for catalyst damage relevant misfiring is stored and the cylinder with the highest rate will be switched off and the MIL will be switched on immediately. If two cylinders are switched off and the misfire rate is still above the damage limits, MIL is flashed immediately. If one of the cylinder selective counters exceeds the predetermined threshold, the following measures take place:

1. The Lambda closed loop system is switched to open-loop condition.
2. The cylinder individual fault code is stored or if multiple cylinders, then the Global fault code is set.
3. Fuel supply of the misfiring cylinder(s) is not cut-off (per customer request)
4. No downstream fuel trim.

All misfire counters are reset after each interval.

CALIBRATION VARIABLES

CALIBRATION VARIABLES

Siemens VDO Parameter SAM/Specification	J1930 Description	Cal Value
C_MIS_B_MIN_NR	Threshold for CARB B detection	
C_MIS_A_IND_THD	Cylinder individual threshold used for cylinder shut-off during CARB A criterion window	
C_MIS_SUM_A_THD	Cylinder global threshold for misfire status CARB A detection	
THD_ER_AV	Engine speed fluctuation threshold for misfire detection	Table

FUNCTION VARIABLES

FUNCTION VARIABLES

Siemens VDO Parameter SAM/Specification	J1930 Description
MIS_NR_TDC_ER	Number of misfire (for all cylinder)
MIS_SUM_ER(SEG)	Number of misfire (cylinder selective)
MIS_B_(SEG)	CARB B relevant misfire sums (cylinder individual)

MIS_CTR_A_(SEG)	CARB A relevant misfire sums (cylinder individual)
MIS_SUM_A	CARB A misfire weighted sum (global)

EVAP-SYSTEM LEAK DIAGNOSIS (MODULE DM-TL)

EVAPORATIVE SYSTEM LEAK MEASUREMENT

P0442/0456, 1434, 1447, 1448, 1449

General description of leak measurement

The evaporative system monitoring permits the detection of leaks in the evaporative system with a diameter of 0.02 inches and up.

By means of a Diagnostic Module Tank Leakage (DM-TL), an electrical actuated pump located at the atmospheric connection of the evaporative canister, a pressure test of the evaporative system is performed in the following order:

- During the Reference Leak Measurement, the electrical actuated pump delivers through the reference restriction. The engine-management system measures the pump's electrical current consumption in this section.

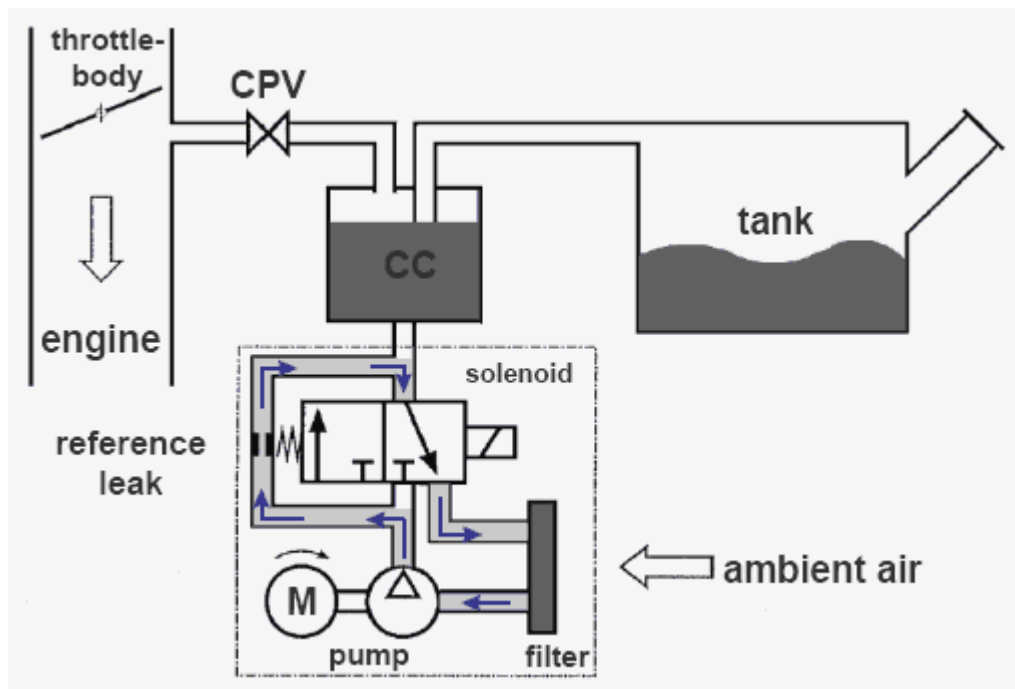


Fig. 1: Evaporative System Diagram (Actuated Pump Delivers Through Reference Restriction)
 Courtesy of BMW OF NORTH AMERICA, INC.

- During the Leak Measurement, the electrically actuated pump delivers through the charcoal canister into the fuel-tank system. The pressure in the evaporative system may be up to 2.5 kPa depending on the fuel level in the tank. The engine-management system measures the pump's electrical current consumption. A

comparison of the currents of the reference leak measurement and the leak measurement is an indication of the leakage in the tank.

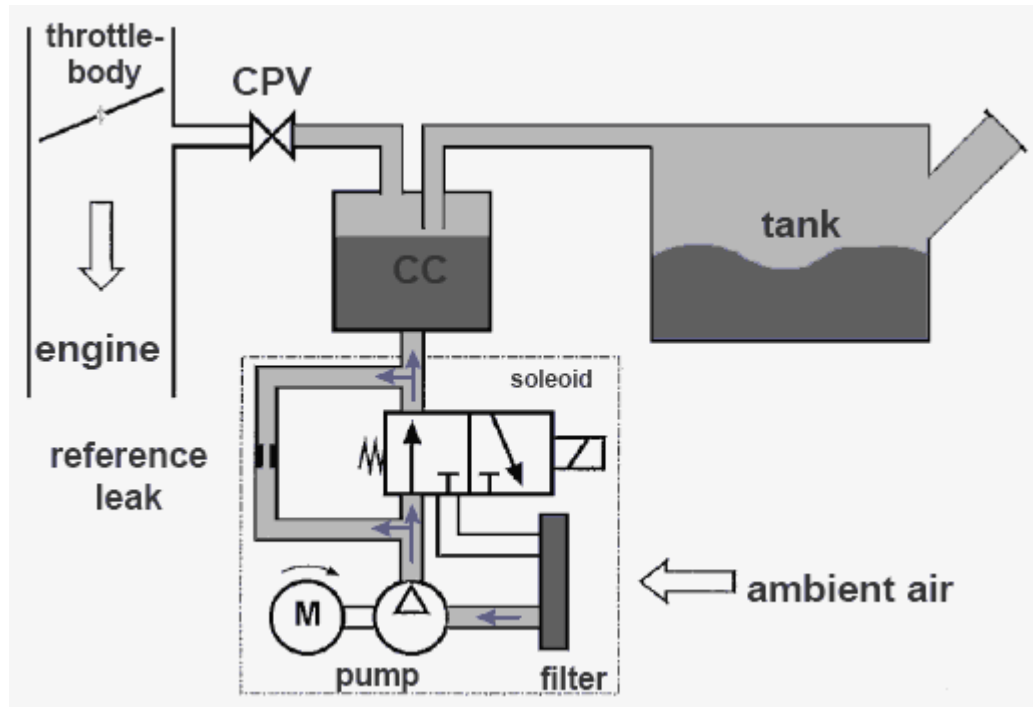


Fig. 2: Evaporative System Diagram (Actuated Pump Delivers Through Charcoal Canister Into Fuel-Tank System)

Courtesy of BMW OF NORTH AMERICA, INC.

0.02 inch diagnosis:

The first step of the diagnosis is the reference measurement, the result of the pump reference current is stored (picture in chapter a). After the solenoid switches, the venting system is pressurized (picture in chapter b). In the rough leak measurement the rough leak threshold is reached, if the leak is smaller than 0.04 inch and then the small leak measurement phase follows. When the DMTL current reaches the reference current within the small leak time, the system is tight (leak smaller than 0.02 inch), otherwise a small leak between 0.02 - 0.04 inches is detected.

0.04 inch diagnosis:

The first step of the diagnosis is also the reference measurement, the result of the pump reference is stored (picture in chapter a). After the solenoid switches, the venting system is pressurized (picture in chapter b). In the rough leak phase (time) the pump current must reach the rough leak threshold 1 (rough leak threshold 1 = idle current pump + K1 x (reference current - idle current)). Factor K1 is between 0.16 and 0.28 depending on the characteristic current value of the pump (reference current - idle current), this value is various in every pump.

If the rough leak threshold 1 is not reached in the rough leak time, the rough leak threshold 2 must be reached in an additional time (rough leak threshold 2 = idle current pump + K2 x (reference current - idle current)). Factor K2 is between 0.60 and 0.80 depending on the characteristic current value of the pump

(reference current - idle current).

If the rough leak threshold 2 is also not reached, a leak > 0.04 inches is detected.

In the diagram below is the typical current of a tight system, a 0.02 inch leak, and a leak > 0.04 inches.

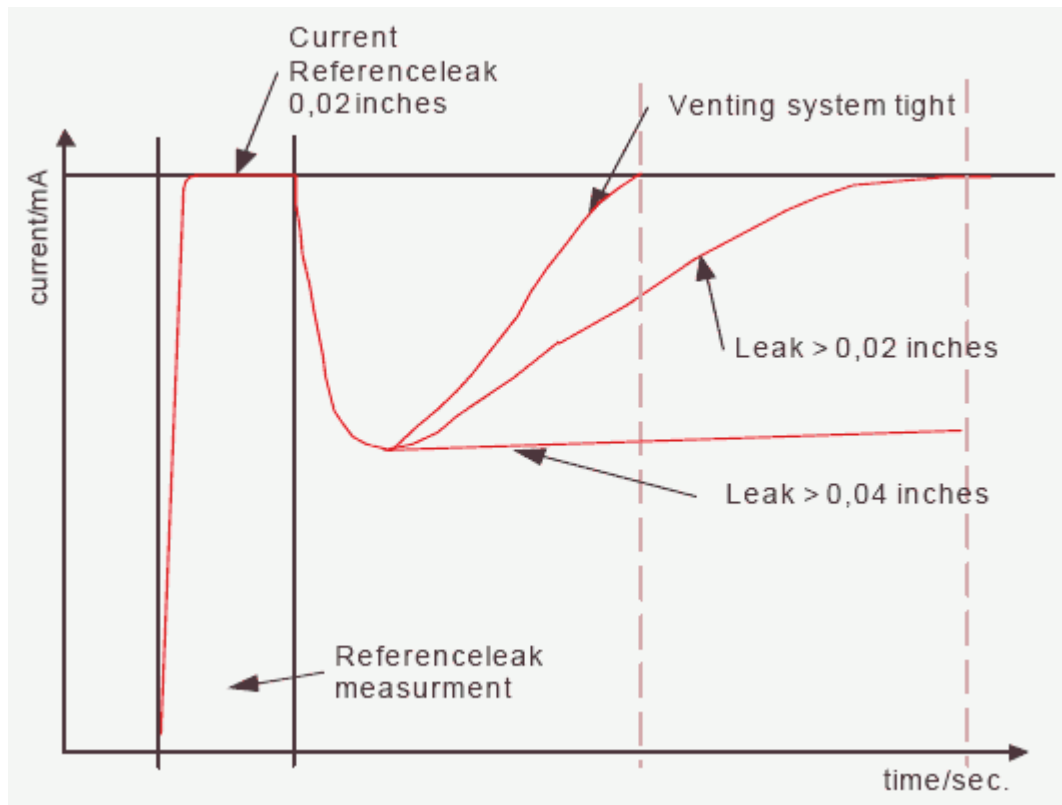


Fig. 3: Tight System Typical Current Diagram
Courtesy of BMW OF NORTH AMERICA, INC.

- c. After the test the remaining pressure in the evaporative system is bled off through the charcoal canister by switching off the pump and solenoid.

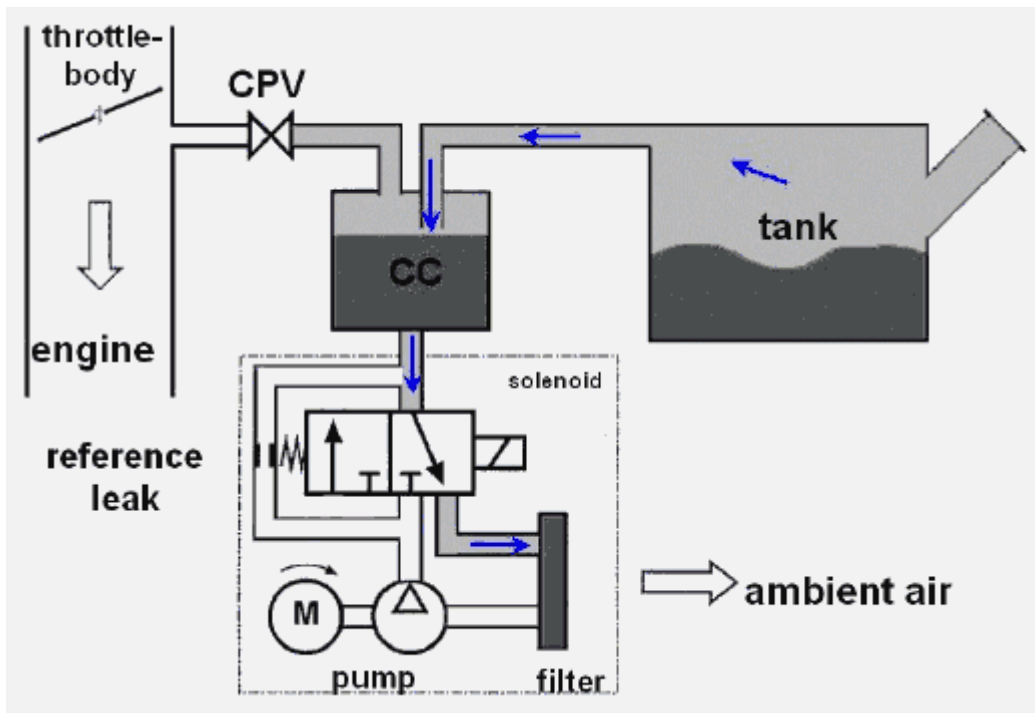


Fig. 4: Evaporative System Diagram
 Courtesy of BMW OF NORTH AMERICA, INC.

Diagnosis Frequency and MIL illumination

Diagnosis Frequency and MIL illumination-no refueling detected, leak > 0.04 inches

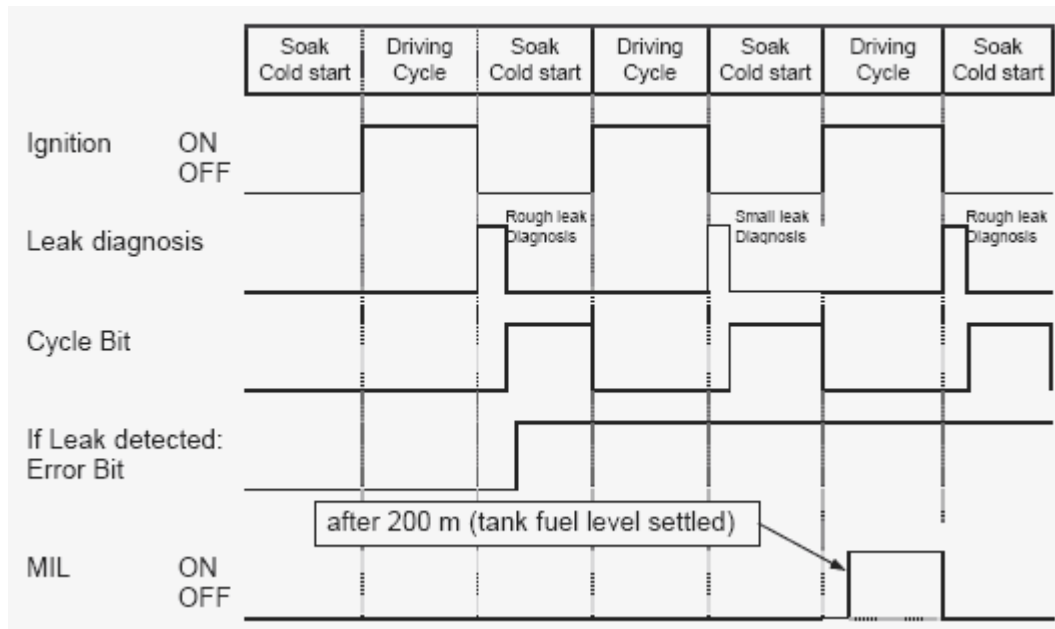


Fig. 5: Diagnosis Frequency And Mil Illumination Blinking Pattern (No Refueling Detected, Leak > 0.04 Inches)

Courtesy of BMW OF NORTH AMERICA, INC.

Diagnosis Frequency and MIL illumination-after refueling detected, leak > 0.02 inches

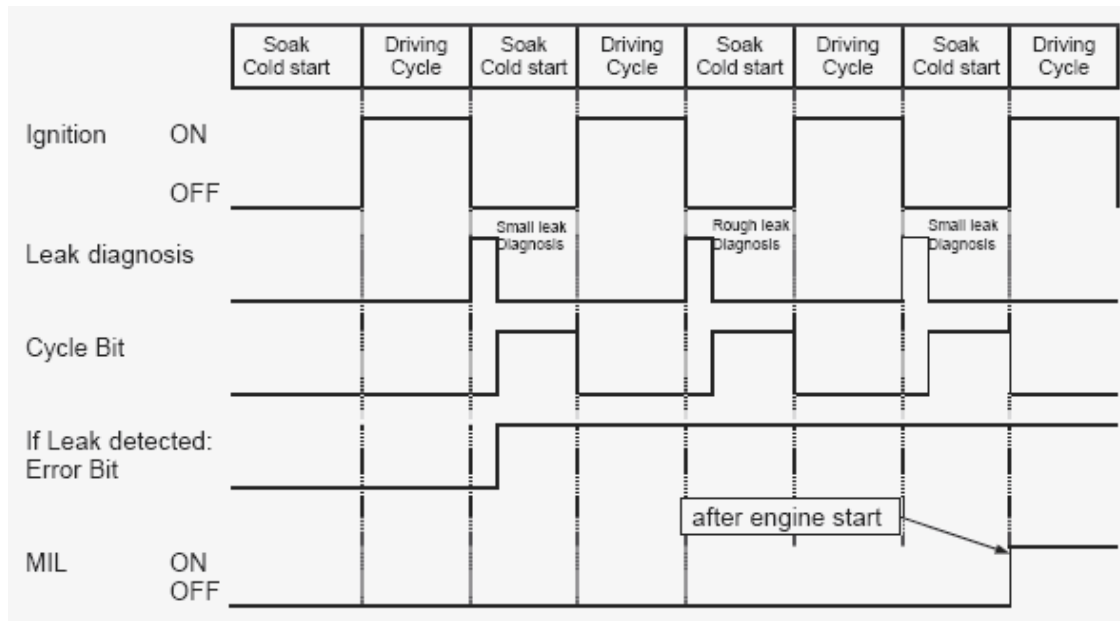


Fig. 6: Diagnosis Frequency And Mil Illumination Blinking Pattern (After Refueling Detected, Leak > 0.02 Inches)

Courtesy of BMW OF NORTH AMERICA, INC.

EVAP (FUNCTIONAL CHECK CANISTER PURGE SOLENOID)

P0440, 0441

Monitoring the canister purge solenoid

The diagnosis is used for the functional test of the CP solenoid (CPS).

The test consists of three steps. Step 2 can be triggered separately by an EOL (End Of Line) request by a serial communication tool.

Step 1: based on the activated charcoal filter (ACF) load degree

Step 2: based on ...

- the engine speed change at idle speed
- the deviation of lambda-controller
- manifold air pressure (MAP) change at idle speed

Step 3: based on the difference between the measured air mass flow before and during a CPS opening

Monitoring function

The first check of the CPS is based on the ACF- load degree. The "Canister Load diagnosis" is calculated

permanently until the complete check CPS is finished.

During the next check, the CPS is evaluated based on the engine speed change at idle speed. To this effect, the CPS is opened for a short time and the engine speed monitored for a certain period.

After this check has been enabled for the first time, it is requested during each idle speed phase. This is repeated as long as a result has been reached. This check is not bound to one IS phase, but can be distributed to several IS phases.

During this check the lambda deviation will also be checked.

In step 3 the CPS is considered on the basis of the measured mass air flow before and during a CPS opening phase.

If the CPS is detected to be not OK after all three checks have been passed (end of step 3), then the error is set.

FUEL LEVEL SENSOR

P0461, P0462, P0463, P2067, P2068

The diagnosis of the fuel level sensor signal consists of a circuit continuity check and a rationality check.

FUEL LEVEL SENSOR CIRCUIT CONTINUITY CHECK

The signal of the fuel level sensor is monitored concerning the valid range. This range depends on the used fuel level sensor.

If the left or right fuel level sensor signal is above the upper threshold, a short circuit plus is detected. If the left or right fuel level sensor signal is below the lower threshold, an appropriate fault code for the left or right sensor is set.

FUEL LEVEL SENSOR SIGNAL RATIONALITY CHECK (PLAUSIBILITY ERROR)

The engine management system of every BMW has the capability to calculate fuel consumption. For the fuel level sensor plausibility check, this calculated consumption is compared with the difference of the fuel level signal. When the calculated fuel consumption reaches an appropriate and predetermined amount (for example five gallons), the calculated fuel consumption is compared to the change in fuel level as indicated by the fuel level sensors. If the difference is greater than the applicable threshold value, a stuck fuel level sensor fault is detected and an appropriate fault code is set.

If a fault is present, the OBD II EVAP leak monitor will run using a substitute value of 85% total fuel tank volume.

The 85% substitute value will assure that in every case the required 0.020 inch leak is detected by the OBD II system.

FLS DIAGNOSIS FREQUENCY OF FLS CIRCUIT CONTINUITY CHECK

short circuit battery

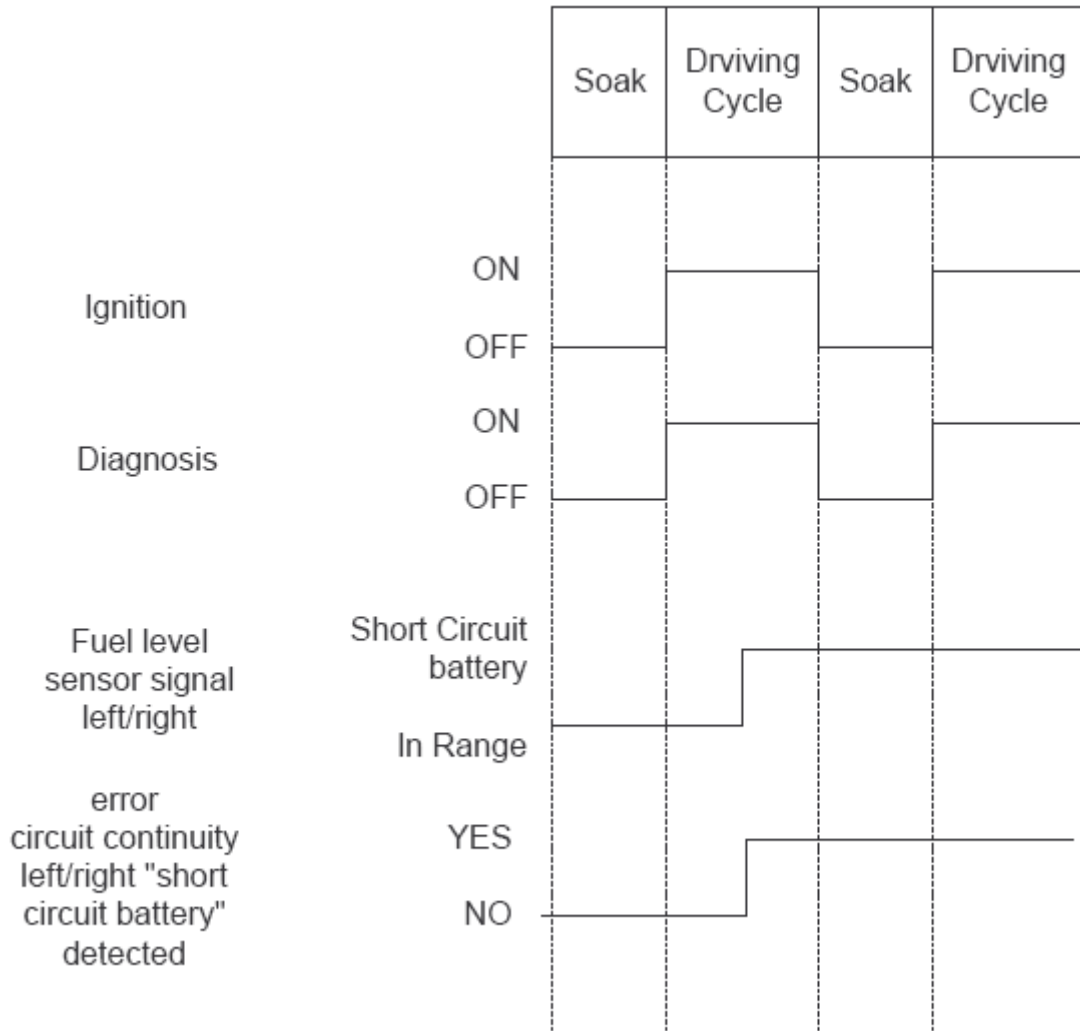


Fig. 7: FLS Diagnosis Frequency Pattern (Short Circuit Battery)
Courtesy of BMW OF NORTH AMERICA, INC.

short circuit ground

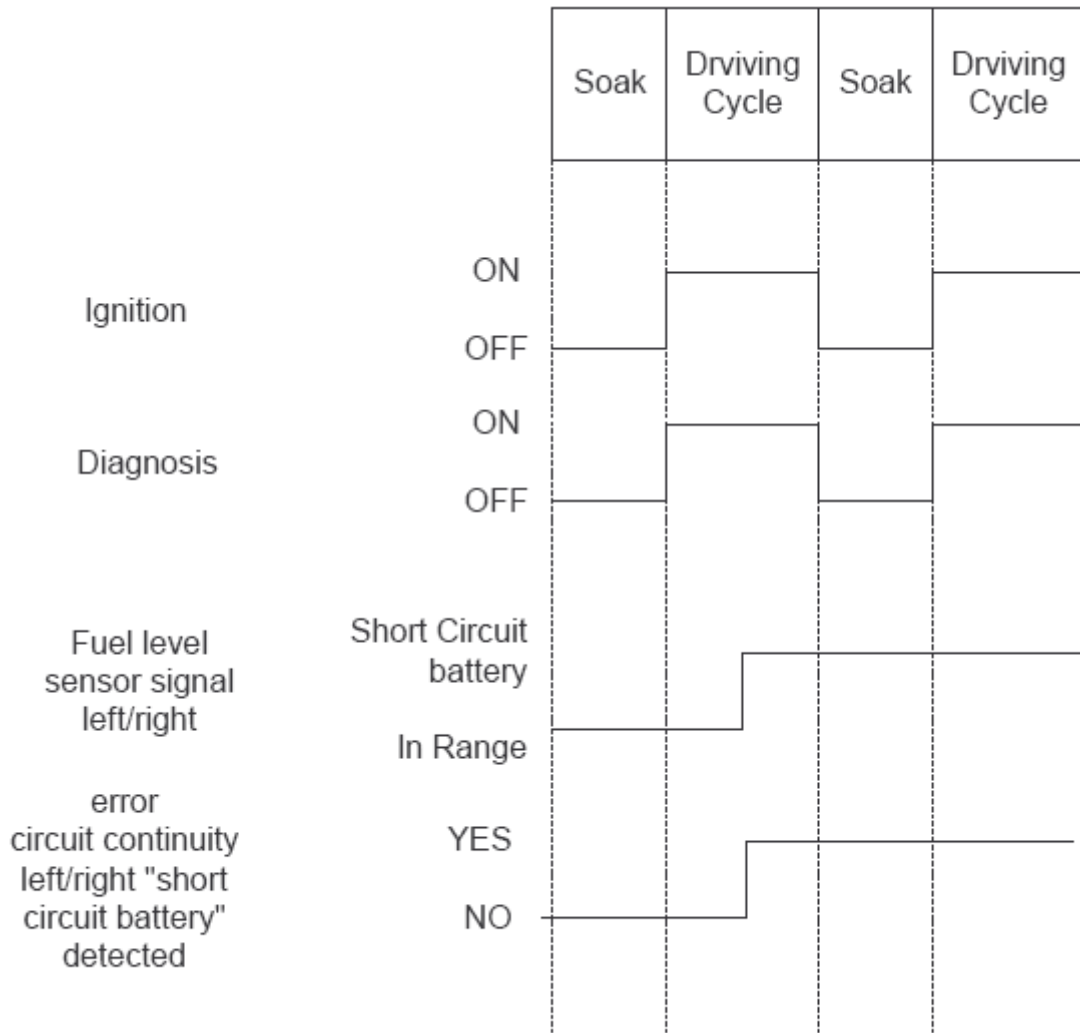


Fig. 8: FLS Diagnosis Frequency Pattern (Short Circuit Ground)
 Courtesy of BMW OF NORTH AMERICA, INC.

FLS DIAGNOSIS FREQUENCY OF FLS RATIONALITY CHECK (PLAUSIBILITY ERROR)

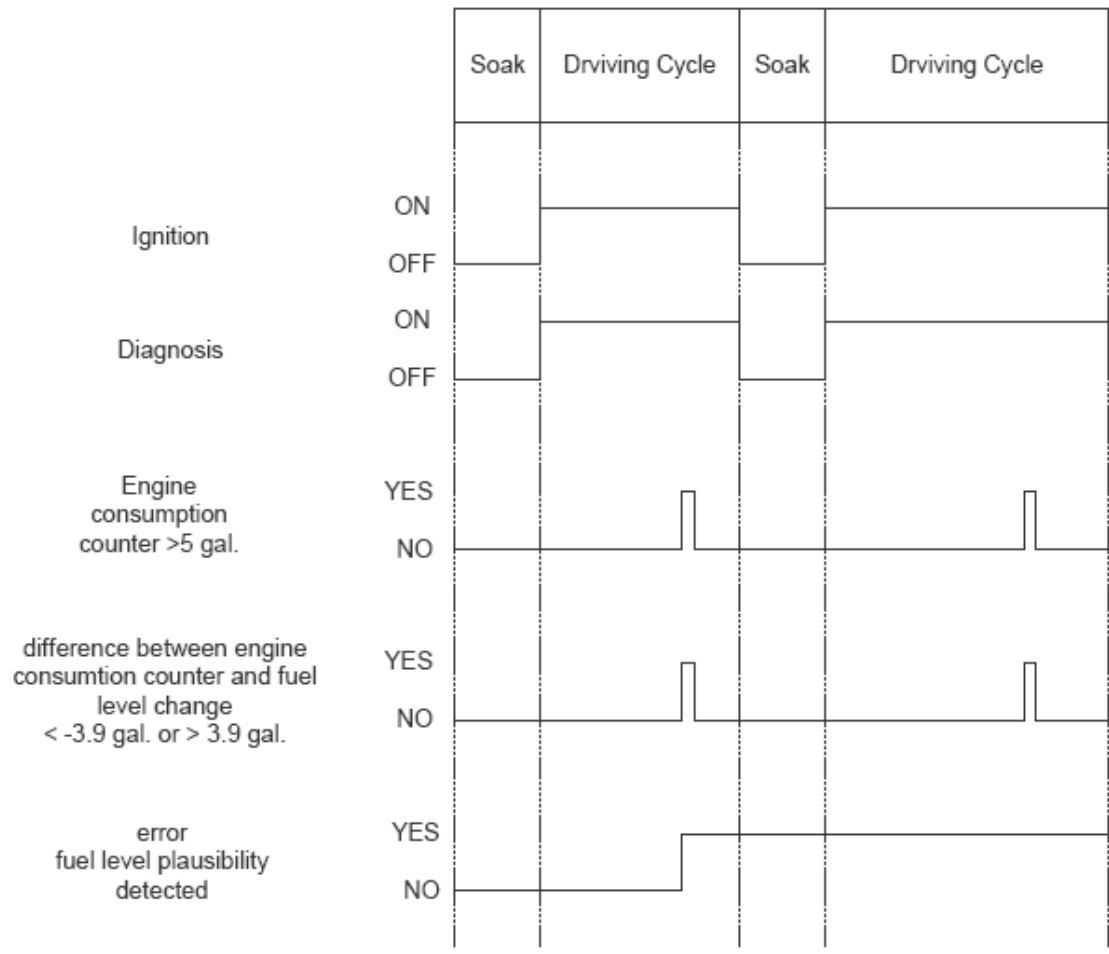


Fig. 9: FLS Diagnosis Frequency Pattern (FLS Rationality Check (Plausibility Error))
 Courtesy of BMW OF NORTH AMERICA, INC.

POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM

GENERAL DESCRIPTION OF THE PCV-SYSTEM

There are 3 tubes connected to the engine: The first of them conducts the blow-by gases from the cylinder head cover to the separator, where the oil is separated from the air and lead back by a second tube to the crankcase sump. A third tube directs the cleaned blow-by gases via the intake system to the combustion. The pressure regulator makes sure that the high vacuum level between crankcase and ambient air will be reduced if needed.

DIAGNOSIS OF A LEAKAGE IN THE PCV-SYSTEM

A disconnection or leakage in the PCV-System is indicated by a rough or stalling engine and results in a reaction within the fuel system (fuel trim deviation). In this case a fault code will be stored by the **fuel system monitoring**.

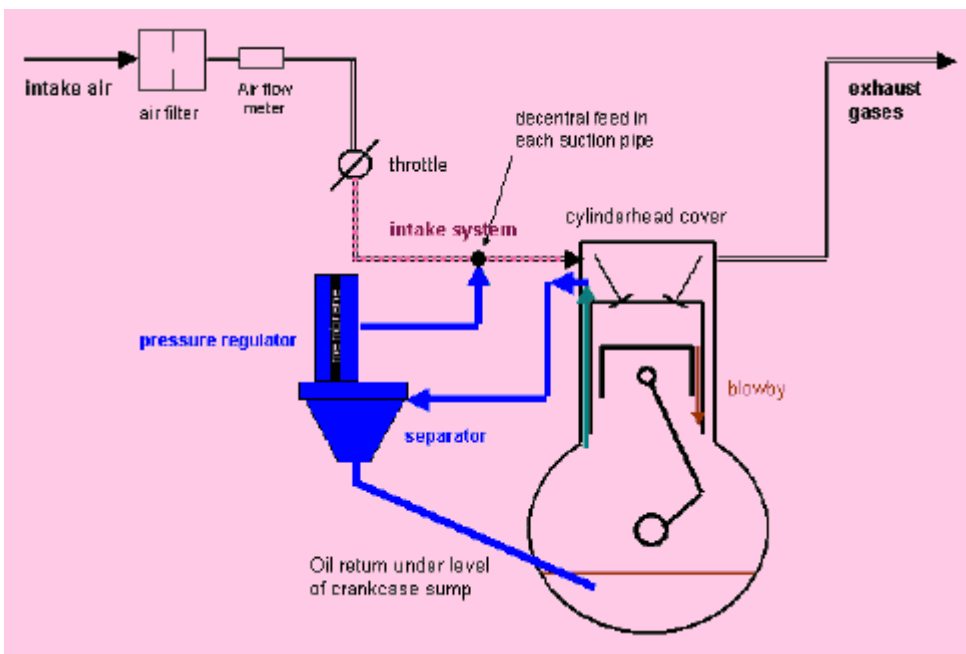


Fig. 10: PCV-System Diagram

Courtesy of BMW OF NORTH AMERICA, INC.

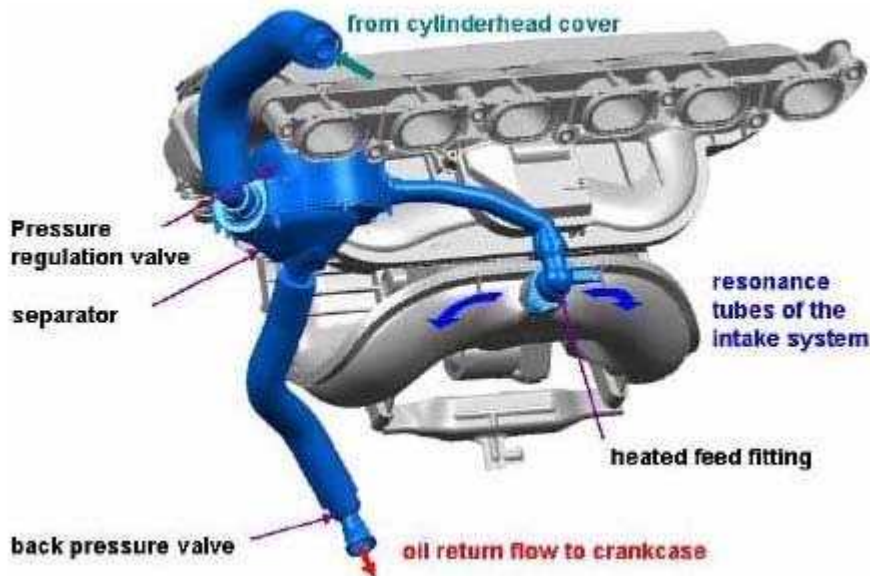


Fig. 11: Overview Of PCV-System

Courtesy of BMW OF NORTH AMERICA, INC.

AMBIENT TEMPERATURE MONITORING

CAN BASED AMBIENT TEMPERATURE - SIGNAL DIAGNOSIS

P0072, P0073

General Description

The purpose of this diagnosis is to detect electrical faults as defined in OBDII requirements. The input signal is a CAN message of instrumentation cluster. If an error is present on CAN signal, an error symptom is set and an error counter is de-bounced.

Error Symptoms

- short circuit to vbatt or open line
- short circuit to ground
- signal error

AMBIENT TEMPERATURE SIGNAL PLAUSIBILITY CHECK

P0071

General Description

This diagnosis is performed in order to detect a stuck or not plausible TAM signal which cannot be detected by electrical range diagnosis.

The first part, just after start looks at the change of ambient temperature and compares the start and stop temperature. If the check is positive the diagnosis is finished. In negative case diagnosis runs to next step during warm up phase.

The error detection is only performed if the monitoring conditions for time after start, engine state idle speed, time of engine stop, ECT and ambient temperature are fulfilled. The plausibility error is detected if the absolute value of the temperature-difference between the arithmetic mean of ECT (Engine Coolant Temperature) and TIA (Temperature Intake Air) and the ambient temperature TAM (in formula: $ABS [(ECT+TIA) \times 0,5 - TAM]$) exceeds the threshold for an anti-bounce time.

The error validation is only performed if ECT signal is valid and the vehicle was driven with a certain vehicle speed. If both conditions are true and an error was detected, then the error is set for this driving cycle and the diagnosis is switched off.

For RBM handling the Cold Start Denominator will be considered.

Error Symptoms

- Ambient temperature not plausible

Input parameters for monitoring

- ECT
- engine state
- engine stop time
- ambient temperature after engine stop (last driving cycle)

- ambient temperature at start
- actual ambient temperature
- vehicle speed
- engine run time after start

FUEL SYSTEM MONITORING

LAMBDA ADAPTATION

Diagnostic Overview / Monitoring Function

(P0171, 172, 174, 175)

The ECM monitors the fuel system control continuously during all engine states except PUC (decal fuel cut-off). After the enable conditions are met a counter is started. At this point the ECM evaluates the total percentage of short and long term fuel control. If no condition is present the end diagnostic counter will decrement from a calibrated value to zero and a passing decision is made.

If a lean condition is present and total fuel control is above the calibrated threshold two timers are started. If the lean threshold counter exceeds the calibrated threshold before the reset timer has decremented from a calibrated threshold to zero a lean error is set.

If a rich condition is present and total fuel control is below the calibrated threshold two timers are started. If the rich threshold counter exceeds the calibrated threshold before the reset timer has decremented from a calibrated threshold to zero a rich error is set.

The time counter is increased while "lambda controller + lambda adaptation" exceed minimum or maximum threshold.

The error is detected as soon as the time counter reaches its maximum value.

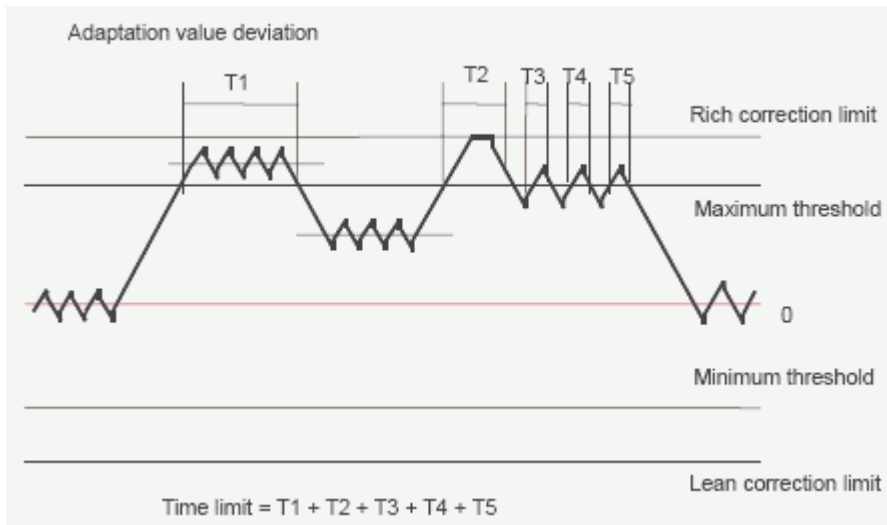


Fig. 12: Fuel System Monitoring Timing Chart
Courtesy of BMW OF NORTH AMERICA, INC.

Similar Conditions Function

When the engine management system recognizes a failure in the misfire or fuel systems, the engine management system is required to record the conditions present when the fault occurred. These conditions recorded include engine speed, engine load (MAF), and warm up status of the first event that resulted in the storage of a code. These conditions stored are referred to as **similar conditions**

Once the similar conditions are met without a failure in the misfire or fuel system, the flag is set to 1. Once this flag is set the driving cycle counter for that failure can be decremented.

The code and stored freeze frame conditions may be erased if similar conditions are not encountered during the next 80 driving cycles immediately following the initial detection of the malfunction.

The MIL may be extinguished after three sequential driving cycles in which similar conditions have been encountered without an exceeding the thresholds of the fuel system diagnostic.

TRIM CONTROL PLAUSIBILITY MONITORING

P2096/2098, P2097/2099

Monitoring function

The trim control plausibility monitoring detects a high deviation of the l-share of lambda trim control. If it exceeds given thresholds the following malfunction is detected:

Fuel trim above limit

If the above mentioned malfunction is detected, the corresponding fault code is stored.

FAULT CODE CHART

	B1S1	B2S1
Air fuel mixture too rich	P2097	P2099
Air fuel mixture too lean	P2096	P2098

Block diagram

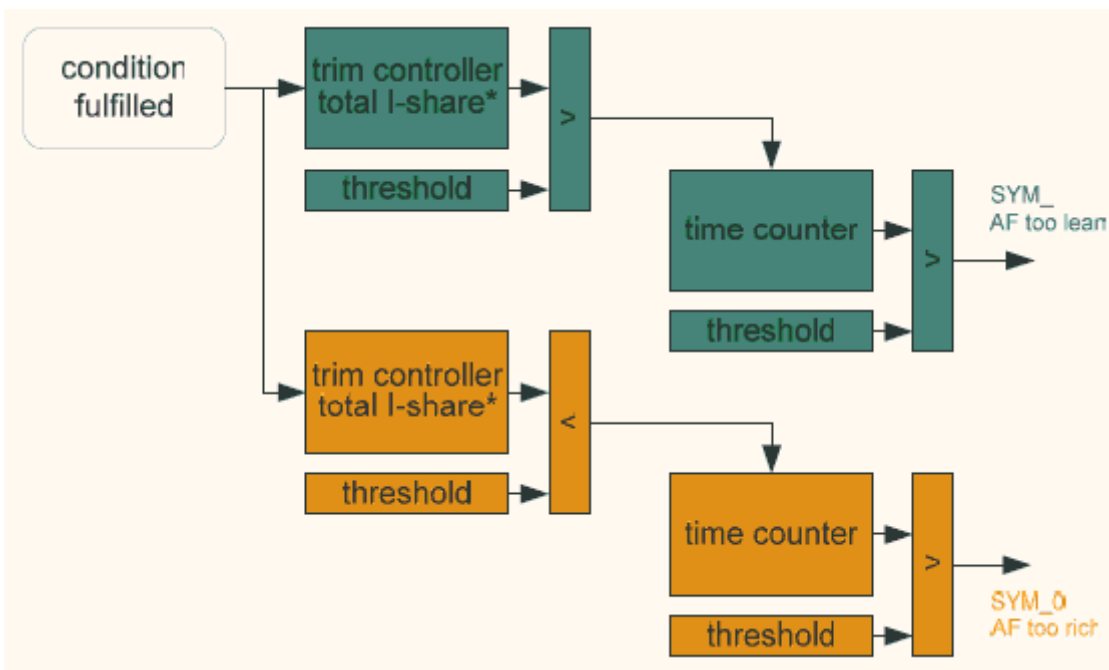


Fig. 13: Trim Control Plausibility Monitoring - Block Diagram
 Courtesy of BMW OF NORTH AMERICA, INC.

OXYGEN SENSOR MONITORING LINEAR UPSTREAM / BINARY DOWNSTREAM

UPSTREAM OXYGEN SENSOR MONITORING (LINEAR)

Upstream Oxygen Sensor - Short Circuit Monitoring

P0131/0151, P0132/0152

Monitoring function

The oxygen sensor circuit monitoring detects the following malfunctions by evaluating the error information received from oxygen sensor microcontroller:

- Short circuit of sensor signal to battery voltage
- Short circuit of sensor signal to ECM ground

If one of the above mentioned malfunctions is detected, the corresponding fault code is stored.

FAULT CODE CHART

	B1S1	B2S1
SC Ground	P0131	P0151
SC Vbatt	P0132	P0152

Upstream Oxygen Sensor - Open Circuit Monitoring

Monitoring function

The oxygen sensor circuit monitoring detects the following malfunctions by evaluating the error information received from oxygen sensor monitoring functions:

FAULT CODE CHART

	B1S1	B2S1
○ Reference voltage Failure - (UN)	P2243	P2247
○ Virtual Ground Failure - (VM)	P112C	P112D
○ Pumping Current Failure - (IP)	P112C	P112D
○ Trim Current Failure - (IA)	P2626	P2629

If one of the above mentioned malfunctions is detected, the corresponding fault code is stored.

Monitoring Description

This function determines, if an open circuit in any of the four electric lines (*Reference Voltage, Virtual Ground, Pumping Current and Trim Current*) is present in the WRAF Sensor.

This function shall be triggered only if one of the following diagnosis is active (to set the readiness bit), which are 'Upstream Oxygen Sensor - Signal Monitoring During Fuel Cut-off and 'Upstream Oxygen Sensor - Heater Monitoring'. The function shall go to the state = "active" only if one of the above diagnosis detected a fault.

(Reference Voltage)

If a heater error exist and sensor voltage is too low, while the internal resistance measurement is turned off, an open circuit in the line 'Reference voltage' occurred.

(Virtual Ground) or (Pumping Current)

An open circuit in line Virtual Ground or in the line Pumping current can be detected if the sensor signal stocks near lambda 1. The sensor non-activity can be detected by the Oxygen Sensor Signal Monitoring During Fuel Cut-off (signal voltage below e.g. 2.1 V *) in fuel cut off).

(Trim Current) If the sensor shows an augmented gain, i.e. the sensor signal is higher than the nominal characteristic line, the plausibility test during the fuel cutoff phase shall detect this symptom (signal voltage above e.g. 5.6 V *) during fuel cut off) and an Open Circuit is assigned to the line Trim Current.

)* For exact values please have a look at the summary table!

Upstream Oxygen Sensor - Signal Controller Monitoring

Diagnostic Overview

Sec (e) (7.2)

This function will detect an error during the initialization and/or operation of a WRAF sensor controller through SPI communication. Information communicated from the Basic Software (BSW) is used for initialization and communication between application software (ASW) and the controller. This is used to determine if the function is working properly.

Monitoring Function

Sec (e) (7.2.1)

After an ECU reset, the WRAF sensor controller is started and the diagnosis determines the time until the initialization, has been performed in the allowed time. If not successful, then a DTC will be stored. If this is successful, then the difference is checked between the present error counter and the stored value of this error counter at ECU reset, (switching from Key "OFF" to Key "ON") or at clearing error memory and after each function call, in case a difference between both counters was found. If there is a difference, another counter is incremented.

If this counter is higher than a threshold, a SPI communication error is stored.

FAULT CODE CHART

	B1S1	B2S1
Communication error	P3022	P3023
Initialization error	P3024	P3025

All of the above checks are performed internal to the ECU. (See)

Upstream Oxygen Sensor - Signal Activity Check

P2414/2415

Monitoring function

The oxygen sensor signal activity check monitors if the sensor is attached to the exhaust pipe and whether the exhaust is sampled correctly (no leakage). A malfunction is detected if the oxygen sensor voltage is above a threshold (shows too lean mixture in part load or full load)

If the above mentioned malfunction is detected, the corresponding fault code is stored.

B1S1 P2414

B2S1 P2415

Upstream Oxygen Sensor - Swapped Sensors Check

P0040

Monitoring Description

This function will detect if the Oxygen Sensor wire harness has been cross connected, i.e., Bank 1 with Bank 2. This is performed by the use of the output of the fuel correction (lambda controller) of each bank. If this control is on opposite limit at bank 1 and bank 2, the sensors are swapped and the corresponding fault code is stored.

Corresponding fault code:

P0040

Upstream Oxygen Sensor - Active Signal Check (Shift to lean / rich)

P2195, 2196, 2197, 2198

Monitoring Function

This monitor is an enhancement of the Downstream Oxygen Sensor - Active Signal Check (Stuck lean / rich) and the Trim Control Plausibility Monitoring. Its purpose is to help determine the root cause of a stocking downstream sensor signal or a implausible high i- share of the fuel trim controller.

The monitor will only be enabled if a fuel correction fault has been detected and a malfunction code has been stored (P2096 - P2097 - P2098 - P2099)

OR

if the rear sensor signal check has detected, that the rear sensor signal is very rich or very lean and the corresponding malfunction fault code has stored (P114A - PI 14B - PP114C-P114C)

If one of the listed fault codes exists, this diagnosis will be enabled to determine if the root cause of the malfunction is due to a stuck signal or characteristic line shift of the upstream O2 sensor or due to a stuck signal of the downstream O2 sensor or a system malfunction, i.e. vacuum leak, injector, etc...

If it has been determined that the upstream O2 signal was the root cause of the fuel correction fault, the appropriate DTC will be stored along with the fuel correction or with the downstream sensor stuck DTC.

Upstream Oxygen Sensor - Signal Dynamic Monitoring (Slow Response)

P0133/0153

Monitoring function

The oxygen sensor signal dynamic monitoring detects greater deviations of the dynamic behavior of the sensor signal compared to the nominal behavior, controlled by the lambda controller

The change of the dynamic behavior is caused by problems of the electrical connection (e.g. open circuit), extreme aging of the sensor or a low sensor temperature which slows down the sensor compared to the nominal behavior.

The monitoring is based on an amplitude criterion, i.e. the relation between the amplification of the oxygen sensor and the model is monitored and detects the following malfunction:

Sensor signal too slow

If the above mentioned malfunction is detected, the corresponding fault code is stored.

B1S1 P0133

B2S1 P0153

Upstream Oxygen Sensor - Signal Monitoring During Fuel Cut-off

P2297/2298

Monitoring function

The oxygen sensor signal monitoring during fuel cut-off detects if the oxygen sensor signal is not plausible during fuel cut-off. A malfunction is detected if the oxygen sensor voltage is outside the normal operating voltage range (3.1 V ... 5.68 V).)*

If the oxygen sensor signal voltage is between 2.1 ... 3.1 V during fuel cut-off, then the signal is not plausible.

If the above mentioned malfunction is detected, the corresponding fault code is stored.

B1S1 P2297

B2S1 P2298

If the oxygen sensor signal voltage is above a threshold during fuel cut-off (e.g. 5.6 V)*) or below a threshold (e.g. 2.1 V)*) then the open circuit diagnostic function is triggered (see chapter '**OXYGEN SENSOR MONITORING - OPEN CIRCUIT**'). The fault processing continues in this function.

)* For exact values please have a look at the summary table!

Upstream Oxygen Sensor - Heater Monitoring

P3026/3027

Diagnostic Overview

Sec (e) (7.2.3)

The purpose of this function is to detect oxygen sensor heater failures that would lead to an increase in emissions beyond the thresholds stated in the appropriate regulations.

The diagnosis shall be carried out by determining whether the measured oxygen sensor ceramic temperature falls below set limits over a number of measurement cycles. The evaluations of the diagnosis cycle are

determined after the completion of a limited number of monitoring cycles.

Deviations in the oxygen sensor ceramic temperature or the oxygen sensor not being operatively ready in a timely manner (because of a too low temperature) can lead to an increase in emissions above the applicable standards or prevent the sensor signal from being used as a diagnostic system monitoring device. Deviations may occur due to, for example, ageing of the heater element, defective wiring, increased heater circuit connector contact resistance, defective heater driver etc.

Monitoring Function

The diagnosis strategy is based on a statistical evaluation of the oxygen sensor ceramic temperature over a pre-defined number of monitoring cycles.

The oxygen sensor ceramic temperature shall be obtained indirectly via the measured internal resistance of the sensor.

If the sensor is not ready after a defined time (e.g. 30s after start))* the sensor is set to forced readiness mode and the Upstream Oxygen Sensor Heater Monitoring is started.

Two cases can appear:

- sensor temperature is invalid (no measurement of sensor temperature possible because of an ECU internal (electrical) failure)
=>P165F/P166F is stored
- sensor temperature is below a threshold
=> normal failure detection

A low sensor temperature can be caused by a weak heater or a open circuit in the temperature measurement line (line UN). After a low sensor temperature has been detected, the open circuit diagnosis is triggered to check, if an open circuit in line UN is present. If there is an open circuit, then open circuit fault code (P2243/P2247) is stored (see chapter 'OXYGEN SENSOR MONITORING - OPEN CIRCUIT' and picture below).

If there is no open circuit present, then the heater fault code is stored (P0135/P0155).

)* For exact values please have a look at the summary table!

SUMMARY

Sensor heater power temperature	too low	invalid
B1S1	P0135	P165F
B2S1	P0155	P166F

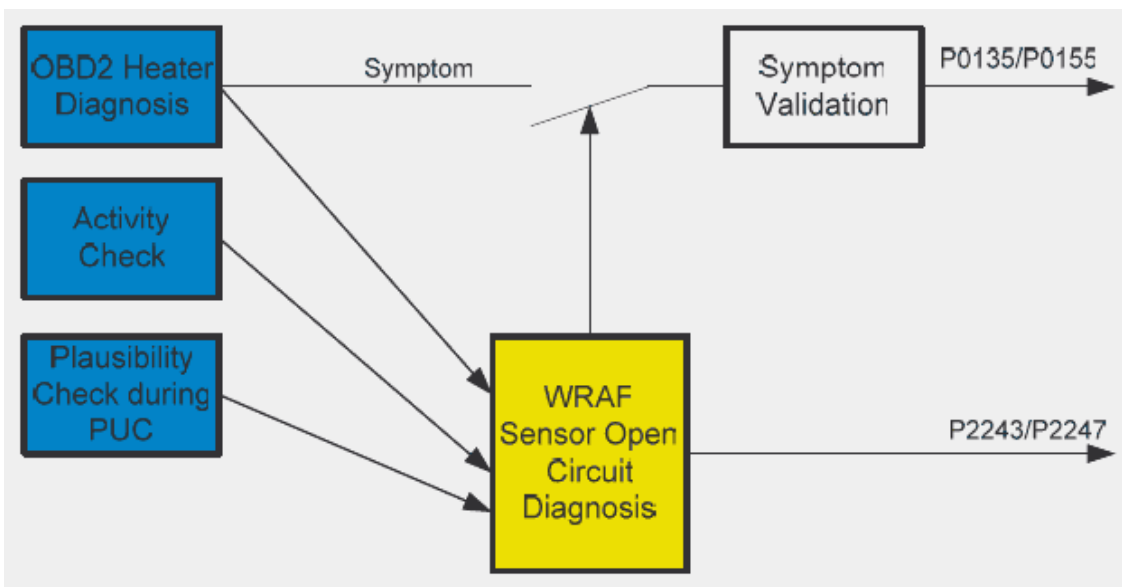


Fig. 14: Upstream Oxygen Sensor - Block Diagram
 Courtesy of BMW OF NORTH AMERICA, INC.

Upstream Oxygen Sensor - Heater Circuit Monitoring

P0030,0031,0032,0050,0051,0052

Monitoring function

The oxygen sensor heater circuit monitoring detects the following malfunctions by evaluating the error information received from the power stage:

- HO2S up SCVB
- HO2S up SCG
- HO2S up Open circuit

If one of the above mentioned malfunctions is detected, the corresponding fault code is stored.

FAULT CODE CHART

	B1S1	B2S1
SC Ground	P0031	P0051
SC Vbatt	P0032	P0052
Open circuit	P0030	P0050

DOWNSTREAM OXYGEN SENSOR MONITORING (BINARY)

Downstream Oxygen Sensor - Circuit Monitoring

P0137,0138,0140,0157,0158,0160

Monitoring function

The oxygen sensor electrical monitor detects the following malfunctions:

- HO2S Down signal SCVB
- HO2S Down signal SCG
- HO2S Down Signal Open Line

If one of the above mentioned malfunctions is detected, the corresponding fault code is stored.

FAULT CODE CHART

	B1S2	B2S2
SC Ground	P0137	P0157
SC Vbatt	P0138	P0158
Open circuit	P0140	P0160

Downstream Oxygen Sensor - Signal Dynamic / Plausibility Check During Fuel Cutoff

P0139/0159

Monitoring function

The following plausibility and activity monitoring is carried out: (e) (7.3.2)

Sensor signal plausibility and signal activity monitoring is performed during coasting conditions during fuel cut-off (slow response / sensor signal range too small).

A malfunction is detected, if the sensor signal is not below a threshold after a short time after entering fuel cut-off. This short time is needed to purge the exhaust pipe. Usually the signal falls from fuel trim correction setpoint (e.g. 680 mV) to a voltage near 0mV.

If one of the above mentioned malfunctions is detected, the corresponding fault code is stored.

FAULT CODE CHART

	B1S2	B2S2
Failure during fuel cut-off	P0139	P0159

Downstream Oxygen Sensor - Dynamic / Transition Time in Sensor Midpoint Range Monitoring

P1130/1131

Monitoring Function

This function monitors the transition Time in sensor midpoint range of the downstream sensor voltage. When a fuel cut-off phase starts, the following steps will be executed:

- sensor voltage must be above a threshold (signal must be rich enough, to measure the switctime)

Remark: Usually the signal starts at fuel trim control setpoint (e.g. 650 mV)

- sensor voltage value is stored (= "start-value")
- switctime measurement is started, when the signal is e.g. at 75 % of start value

Remark: The measurement start and stop- value are relative to the start value, to measure always the switctime around the fuel trim control setpoint.

- switctime measurement is finished, when the signal is e.g. at 40 % of start value
- measured switctime is corrected over mass air flow

The transition time ("switctime") is represented by a cycle counter. This switctime is measured over x)* fuel cut-off phases. The mean value after x fuel cut- off phases is compared with a failure threshold.

If this value is above a threshold, a malfunction is detected and the corresponding fault code is stored.

FAULT CODE CHART

	B1S2	B2S2
Switctime too high	P1130	P1131

)* For exact values of thresholds etc. please have a look at the summary table!

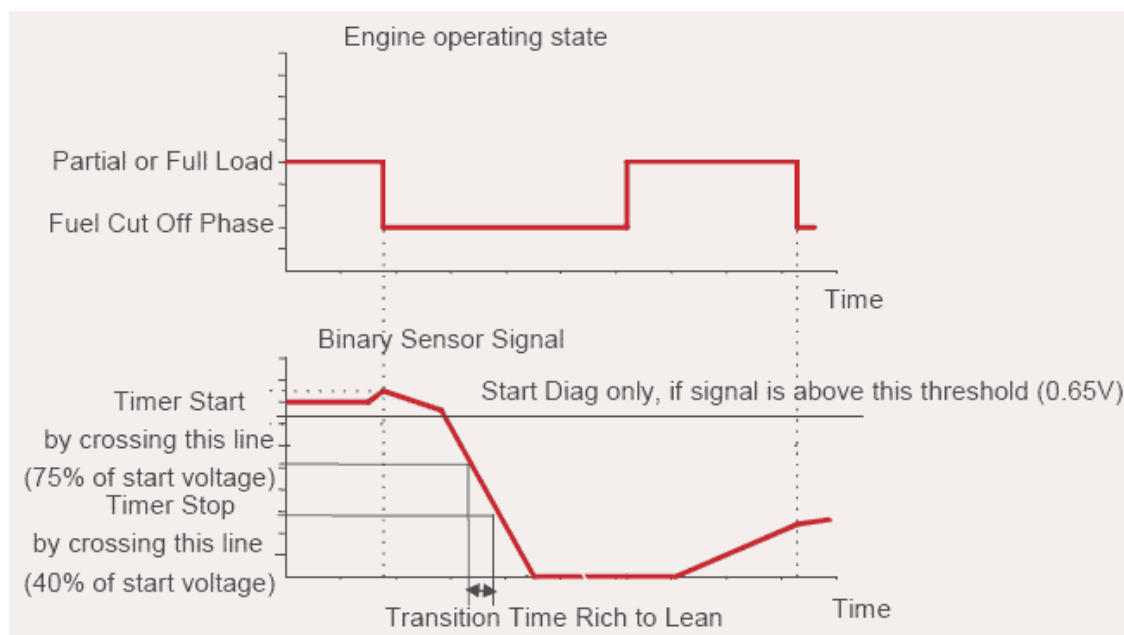


Fig. 15: Sensor Signal Graph

Courtesy of BMW OF NORTH AMERICA, INC.

Downstream Oxygen Sensor - Active Signal Check (Stuck lean / rich)

Monitoring Function

This monitor consists of two parts.

1. **Part one** monitors the downstream sensor voltage during active fuel trim controller p- share. If the fuel trim control is active, the downstream sensor voltage must be in a band around the trim control setpoint. If the voltage is outside this band)*, a mass air flow integral is incremented. If this integral is over a threshold, a malfunction is detected (see also picture below!). When the downstream sensor voltage will not switch to rich before the integral is over a threshold after a fuel cut-off phase, then this fault will be stored, too.

If the above mentioned malfunctions are detected, the corresponding fault code is stored.

FAULT CODE CHART

	B1S2	B2S2
Downstream sensor voltage too low	P114B	P114D
Downstream sensor voltage too high	P114A	P114C

)* For exact values of thresholds etc. please have a look at the summary table!

2. **Part two - Downstream Active Test:**

This monitor is an enhancement of the Downstream Oxygen Sensor - Active Signal Check (Stuck lean / rich) and the Trim Control Plausibility Monitoring. Its purpose is to help determine the root cause of a stocking downstream sensor signal or a implausible high i- share of the fuel trim controller.

The monitor will only be enabled if a fuel correction fault has been detected and a malfunction code has been stored (P2096 - P2097 - P2098 - P2099)

OR

if the rear sensor signal check has detected, that the rear sensor signal is very rich or very lean and the corresponding malfunction fault code has stored (P114A - PI 14B - PP114C-P114C)

If one of the listed fault codes exists, this diagnosis will be enabled to determine if the root cause of the malfunction is due to a stuck signal or characteristic line shift of the upstream O2 sensor or due to a stuck signal of the downstream O2 sensor or a system malfunction, i.e. vacuum leak, injector, etc...

If it has been determined that the upstream O2 signal was the root cause of the fuel correction fault, the appropriate DTC will be stored along with the fuel correction or with the downstream sensor stuck DTC (see chapter '[UPSTREAM OXYGEN SENSOR - ACTIVE SIGNAL CHECK \(SHIFT TO LEAN / RICH\)](#)').

If it has been determined that the downstream sensor signal was the root cause of the fuel correction fault, the appropriate DTC (see table below) will be stored along with the fuel correction or with the

downstream sensor stuck DTC.

This function will also detect, if the oxygen sensor wire harness has been cross connected, i.e., Bank 1 with Bank 2. When this failure is present, the downstream sensor voltages of bank 1 and 2 are on opposite limits.

If one of the above mentioned malfunctions is detected, the corresponding fault code is stored.

FAULT CODE CHART

	B1S2	B2S2
Downstream sensor stuck rich	P2271	P2273
Downstream sensor stuck lean	P2270	P2272
Downstream sensors interchanged	P0041	

Downstream Oxygen Sensor - Heater Circuit Monitoring

P0141,0161,P0036,0037,0038,0056,0057,0058

Monitoring Function: Circuit

For proper function of the oxygen sensor, the sensor element must be heated.

A non functioning heater delays the sensor readiness for closed loop control and thus influences emissions.

The monitoring strategy is based on the comparison of the O2 sensor heater resistance to an absolute threshold during coasting conditions where the exhaust temperature is sufficiently low as to cause the sensor ceramic temperature to fall outside normal operating levels, in cases where the heating power is insufficient.

The cooling energy of the exhaust gas is calculated and compared to a calibrated threshold.

The heater monitor is active if the calculated energy is equal or exceeds the threshold. Then the O2 sensor heater is compared to a calibrated threshold. If the heater resistance is equal or exceeds the threshold, an O2 sensor heater malfunction is detected and the corresponding fault code is stored.

Corresponding fault code:

B1S2 P0141

B2S2 P0161

Monitoring Function: Power stage

The purpose of this monitor is to detect errors within the O2 Sensor Heater Circuit. The signal for the O2 sensor heater is pulse-width modulated. The signal of the power stage is monitored internally by the driver. The driver can distinguish between three symptoms:

- HO2S Down SCVB

- HO2S Down SCG
- HO2S Down Open Line

If one of the above mentioned symptoms is present, a malfunction is detected and the corresponding fault code is stored.

FAULT CODE CHART

	B1S2	B2S2
SC Ground	P0037	P0057
SC Vbatt	P0038	P0058
Open circuit	P0036	P0056

CLOSED LOOP LAMBDA CONTROL - ENABLE CONDITIONS

Closed loop lambda control is enabled (with a delay) at the start of a driving cycle and can be temporary or permanently deactivated during the driving cycle. The turn-on delay at the start of a driving cycle is described by the following enable conditions:

- the upstream oxygen sensor operability is detected i.e. the upstream HO2'S operating temperature has been reached
- a calibrated delay time, after end of engine start, has elapsed
- the engine coolant temperature must have exceeded a calibrated threshold or the modeled engine coolant temperature (substitute for a faulty temperature sensor minimum) must have exceeded a calibrated threshold after a calibrated period of time
- no secondary air activity

Closed loop lambda operation is disabled during the driving cycle, if the following operating condition, which permits only mixture enrichment by the lambda controller, is fulfilled:

- when Catalyst overheating prevention is active.

Only for linear Lambda Sensor:

- the A/F ratio set-point value lies below oxygen sensor's measurable limit - in this case only A/F mixture enrichment can be executed by the lambda control (no closed loop operation) the moment the set-point value exceeds the measurable threshold.

Closed loop lambda operation is further deactivated during a driving cycle when any of the following conditions are fulfilled:

- during fuel cut-off or cylinder shut-off and immediately afterwards till the oxygen sensor again starts indicating correct values (the waiting time depends on integrated mass airflow or on a calibrated delay time).
- the mass air flow is below a calibrated threshold that leads to the minimum possible injection time.
- Secondary air system active

ENGINE COOLANT TEMPERATURE (ECT) MONITORING

ELECTRICAL COOLANT TEMPERATURE DIAGNOSIS

P0017,0018

General Description

The purpose of this diagnosis is to detect electrical faults of the sensor signal. The input signal is analog from a NTC and has to be in a calibrated range. Short cut to ground can be detected immediately, short cut to voltage battery or open load after a delay time. If an error symptom is detected, the error counter is de-bounced.

Error Symptoms

- Short circuit to voltage battery or open circuit
- Short circuit to ground

COOLANT TEMPERATURE GRADIENT DIAGNOSIS

P3198

General Description

The purpose of this diagnosis is to detect an implausible gradient on the coolant temperature signal. The diagnostic function checks whether the difference between one measured coolant temperature value and the succeeding value is too big.

Error Symptom

- ECT signal gradient error

Input parameters for monitoring

- measured ECT

COOLANT TEMPERATURE STUCK DIAGNOSIS

P3199

General Description

The purpose of this diagnosis is to detect a stuck coolant temperature signal. The diagnostic function checks if after a variation of the calculated coolant temperature also a variation of the measured coolant temperature is detected.

For RBM handling the Cold Start Denominator will be considered.

Error Symptom

- ECT signal stuck error

Input parameters for monitoring

- Measured ECT
- Calculated (modeled) ECT

COOLANT TEMPERATURE SENSOR STUCK IN A RANGE DIAGNOSIS WITH ENGINE OFF TIMER

P316A

General description

The engine off time is calculated by a relative time counter of an instrumentation CAN message. After evaluation of this message the engine off time is compared with the difference of ECT at engine stop and ECT. This is to check if the engine off time is within a certain temperature range.

Error Symptoms

- Coolant temperature signal stuck in range error

Input parameters for monitoring

- ECT (at start)
- IAT (at start)
- ambient temperature (at start)
- engine off timer

ENGINE OFF TIMER MONITORING

P1515,1551

General description

The engine off time is calculated by a relative time counter of an instrumentation CAN message. After evaluation of this message the engine off time is compared with the difference of ECT at engine stop and ECT. This is to check if the engine off time is within a certain temperature range.

Error Symptoms

- No signal from CAN (symptom 2)
- Engine off time not plausible to ECT (symptom 3)

Input parameters for monitoring

- ECT at engine stop
- ECT
- relative time counter via CAN

THERMOSTAT

P0128,0597,0598,0599

DESCRIPTION OF THE ENGINE COOLANT THERMOSTAT MONITORING

The coolant thermostat monitoring is done to detect a slow warm-up due to heat losses through thermostat and radiator. It is based on the comparison of the measured ECT sensor signal and the calculated ECT model (TCO_SUB).

The ECT model calculation is depending on the speed of the water pump, engine load and ambient temperature.

A malfunctioning coolant thermostat is detected, if the calculated ECT model has exceeded the threshold 1 (P0128) and the measured ECT sensor signal remains below threshold 2 (P0128).

Before a malfunctioning coolant thermostat is entered into failure memory, the conditions concerning low load, coasting duration and IAT during the monitoring are checked. If the monitoring conditions are met, the coolant thermostat is entered into failure memory. Otherwise the coolant thermostat monitoring is inhibited for this driving cycle.

THE INPUT PARAMETERS USED FOR MONITORING ARE

- Engine coolant temperature
- Intake air temperature
- Ambient air
- Engine load

EXAMPLE OF MONITORING METHOD

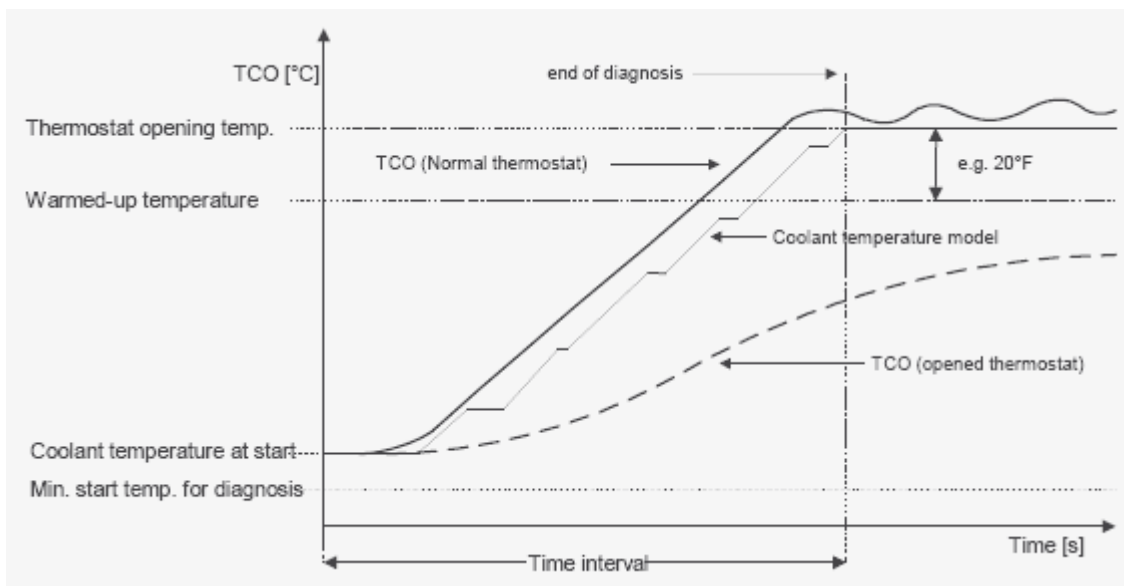


Fig. 16: Monitoring Method (Example)

Courtesy of BMW OF NORTH AMERICA, INC.

A comparison between the measured coolant temperature and the "warmed-up temperature" is done after a specific time interval. The interval itself is based on the coolant temperature model (Function of intake air mass).

As soon as the model temperature exceeds the thermostat opening temperature and all other monitoring conditions are fulfilled at the same time, a valid diagnosis occurs.

At that time, if the measured coolant temperature is higher than warmed-up temperature, the thermostat is concluded as normal thermostat.

On the contrary, if the measured coolant temperature is lower than warmed-up temperature, the thermostat is concluded as opened stuck thermostat.

INTAKE AIR TEMPERATURE (IAT) MONITORING

ELECTRICAL INTAKE AIR TEMPERATURE DIAGNOSIS

P0112,0113

General Description

The purpose of this diagnosis is to detect electrical faults as defined in OBDI requirements. The input signal is analog from a NTC and has to be in a calibrated range. Short cut to ground can be detected immediately, short cut to voltage battery or open load after a delay time. If an error symptom is detected, the error counter is de-bounced.

Error Symptoms

- Short circuit to voltage battery or open load
- Short circuit to ground

INTAKE AIR PLAUSIBILITY CHECK

P0111, 111E, 111F

General Description

This diagnosis checks IAT integrity for a plausible range and / or signal stuck. For the range detection, IAT has to be within coolant temperature and ambient temperature window. If IAT is outside of the range plus an offset, the error symptom is set and the error counter is de-bounced.

If the vehicle was driven with a certain vehicle speed for a calibrated time (cool down of hot IAT) and afterwards the vehicle was in idle for a calibrated time, and the IAT signal has not moved, then a stuck IAT signal is detected and the error is de-bounced.

For RBM handling the Cold Start Denominator will be considered.

Error Symptoms

- Signal too high
- Signal too low
- Signal not plausible

Input parameters for monitoring

- ECT
- Ambient temperature at start and continuously
- IAT
- Vehicle speed
- Engine speed

CAMSHAFT AND CRANKSHAFT SENSOR INCLUDING VALVE TIMING

CAMSHAFT SENSOR

Variable Camshaft Timing (Vanos) (detection of mechanical IVVT error)

P0012/0015

The BMW-Vanos is a combined hydraulic and mechanical camshaft control unit, managed by the ECU. The double Vanos allows the engine to control valve-timing continuously for both intake and exhaust camshafts. The electronically control of the Vanos positions is dependant on engine speed, load and temperature.

The diagnosis is monitoring the correct mechanical function of the variable camshaft timing. The diagnosis carries out a continuous rationality check of the Vanos function. If a malfunction is detected, an error bit will be set and sent to the Error management module. This module produces the final information for setting the corresponding DTC.

The diagnostic strategy for inlet and exhaust camshaft is identical.

Control deviation of the camshaft position controller: ("target + slow response")

Description

In this diagnosis module the difference between the actual and target position of the Vanos units ("control deviation") is checked. If the calculated difference between these two positions exceeds the established threshold, a counter is started. The counter is incremented twice per crank revolution (but not exceeding 10 msec-rates).

If the counter exceeds a limit (also adjustable), a Rationality Fault (DTC) is stored.

The control deviation diagnosis has got an interface to the Rate-Based Monitoring module.

A. In-use monitor performance Ratio:

The incrementing of the numerator, denominator, and the ratio calculation for the Variable Camshaft Timing monitor is executed by the Rate-Based Monitoring module. Like all monitors for which a standardized track and report in-use performance is required, the Variable Camshaft Timing monitor reports to the RBM-module via status flags.

B. Conditions for incrementing the Numerator:

The numerator is incremented if and only if the monitor is not inhibited due to stored faults and the diagnostic has been performed and a fault would have been detected.

C. Conditions for incrementing the Denominator:

The denominator is incremented if the monitor is not inhibited due to stored faults, the general driving conditions have been fulfilled and all additional physical conditions for incrementing have been fulfilled.

Camshaft position sensor (CMP)

P0340/0365/1300/130A/0344/0369/1554/1553/0016/0017

Description

The purpose of the diagnosis is to detect when the camshaft reference position is outside the designed range relative to the engine position from crankshaft and to detect a signal which is not valid.

The diagnostic strategy for inlet and exhaust camshaft is identical.

Monitoring Function

The detection of each camshaft position is done by an active hall sensor and a cam wheel, "3 asymmetric teeth". The camshaft sensor delivers 3 high and 3 low phases of different length per 720°CRK. The high or low pegel of the signal at the reference gap of the crankshaft signal determines the position of the engine within the combustion cycle. With that information, a engine position is calculated from the crankshaft position sensor within a range from [0 to 720[°CRK

The following malfunctions are detected:

MALFUNCTIONS REFERENCE CHART

- CMP sensor signal plausibility	P0340 / P0365
- CMP sensor signal segment period	P1300 / P130A
- CMP sensor signal loss of synchronization	P0344 / P0369
- CMP sensor signal reference to CRK position	P1554 / P1553
- CMP sensor signal jump of chain	P0016 / P0017

Diagnosis of signal plausibility

P0340/0365

The monitor checks once per combustion cycle the edge counter of the camshaft. If the edge counter has not changed during the last cycle, a cycle counter is incremented. When the counter reaches a threshold, the error CAM_plaus is delivered to the error management.

Diagnosis of period length

P1300/130A

The monitor checks at every edge of the CMP signal the length of the last signal period. If the difference to the designed length exceeds a max value, the corresponding debounce counter is incremented. When the counter reaches a threshold the error CAM_period is delivered to the error management.

Diagnosis of synchronization state

P0344/P0369

The monitor checks at every reference gap of the crankshaft sensor signal whether the camshaft is synchronized or not. If the camshaft is not synchronized, a revolution counter for the camshaft is incremented. When the counter reaches a threshold the error CAM_sync is delivered to the error management.

Diagnosis of mechanical reference position

P1554/1553

The monitor checks at least once per driving cycle the position of the camshaft in reference position compared to the crankshaft position. The deviation of all camshaft edges compared to the designed position is averaged. If the average value exceeds a max value, the corresponding debounce counter is incremented. When the counter

reaches a threshold the error CAM_ref_crk_cam is delivered to the error management.

Diagnosis of mechanical chain jump

P0016/0017

The diagnosis is performed after the reference position adaptation and uses the same calculated average value. The average value is stored in the non volatile RAM of the ECU as an adaptation value. Before storing the value, the new adapted value is compared with the stored value. If the deviation exceeds a max value, the error CAM_one_tooth_off is delivered to the error management and the new value is not stored in RAM. With this diagnosis a chain jump of the timing chain is detected.

The diagnosis of the mechanical chain jump has got an interface to the Rate-Based Monitoring module.

A. In-use monitor performance Ratio:

The incrementing of the numerator and denominator for the diagnosis of chain jump is executed by the Rate-Based Monitoring module. Like all monitors for which a standardized track and report in-use performance is required, the diagnosis monitor reports to the RBM-module via status flags.

B. Conditions for incrementing the Numerator:

The numerator is incremented if and only if the monitor is not inhibited due to stored faults and the diagnostic has been performed and a fault would have been detected.

C. Conditions for incrementing the Denominator:

The denominator is incremented with every driving cycle.

Flowchart for diagnosis of chain jump:

see Diagnosis of mechanical reference position

Camshaft Crankshaft synchronization

P0341

Description

The purpose of the diagnosis is to determine whether the inlet (first) camshaft is used for engine synchronization or the exhaust camshaft.

Monitoring Function

The diagnosis is performed at every edge of the selected camshaft signal and at the reference gap of the CKP sensor signal. With the period between current event and the last event, the function eliminates the edges of the camshaft which are not inside the designed window. The window is calculated from the designed position plus / minus a tolerance. The tolerance is expanded by the range of the variable valve timing, when the camshaft is not

in lock position.

The following malfunctions are detected:

MALFUNCTIONS REFERENCE CHART

- CMP sensor signal not valid for synchronization	P0341
---	-------

Diagnosis of camshaft crankshaft synchronization

The monitor eliminates with every event the edges from the list of all 6 cam edges, which are not inside the pattern. If only one edge is left, the edge number is identified and the camshaft is valid for synchronization. If no edge is left in the list, synchronization failed and is started again. If a calibrated number of synchronizations failed, the error is delivered to the error management. Afterwards, an only if synchronization fails with the intake camshaft, the same procedure is started with the exhaust camshaft.

CRANKSHAFT POSITION SENSOR (CRK)

P0335/0370/0373

Description

The purpose of this diagnostic is to check the integrity of the crankshaft sensor signal and/or electrical malfunctions. (Open line, SCG, SCVB)

Monitoring Function

The detection of crankshaft position is done by an active hall sensor and a crank wheel, "e.g. 60 minus 2 teeth". A reference gap, "e.g. of two teeth" allows the detection of the top dead center of cylinder 0. The crankshaft sensor delivers a certain number of high and low phases per 360°CRK. The transition from high to low is a falling edge; from low to high is a rising edge. Only the falling edges are counted. The difference between two falling edges is 6° CRK.

The following malfunctions are detected:

MALFUNCTIONS REFERENCE CHART

- missing CRK sensor signal	P0335
- no plausible CRK signal	P0335
- wrong tooth number	P0370
- wrong tooth period	P0370
- sync error	P0373

A teeth counter is incremented at every falling edge of the CRK sensor signal. If plus or minus one tooth is detected during the last 360° CRK at the reference gap, the tooth number debounce counter will be incremented. If the counter exceeds a limit, a CRK tooth error is delivered to the error management.

If more than one tooth plus or minus is detected the CRK loses synchronization and a CRK sync debounce counter will be incremented. If the counter exceeds a limit, a CRK sync error is delivered to the error

management.

The detection of a tooth period error is done by an acceptance window. The expected tooth period is multiplied and divided with an engine speed dependency factor. The result is a bottom and a top limit of tooth period, in which the transition from high to low of the electrical signal has to occur. If a tooth period is not valid, the tooth period error debounce counter will be incremented. If the counter exceeds a limit, a CRK tooth per error is delivered to the error management.

Detection of implausible crankshaft signal is based on the detection of CAM signals without receiving correct CRK signal. If 12 or more CAM edges are detected (eg. 2 working cycles), without valid synchronization of the crankshaft, then CRK plaus error is detected and delivered to the error management. If no CRK signal at all is received, the symptom is "missing signal", else the symptom is "implausible signal".

VARIABLE VALVE LIFT - ELECTRICAL DIAGNOSIS

P1047,1048,1049,1076,1075,103A, 1078,107A, 107B107C,105B,105A,1055,1056,1019, 1020,1057,1017,1030,1064,101A,1023,1024,1041

DESCRIPTIONS

The electronic control of the Variable Valve Lift positions is dependant on, Voltage Limits, Start & Stop position, Adaptations, current and temperature. The following errors will be detected in this system.

Electrical diagnosis is performed internally to the controller in order to detect the following errors: Short circuit to battery, to ground or short circuit to each other:

SCVB - P1047

SCG-P1048

S together - P1049

System current is monitored through the ECU and the variable valve train relay. This diagnosis checks for over-temperature and overload conditions and performs short term and long term high current monitoring (looks for current spikes over a threshold, and time vs. current table based):

Relay over temp - P1076

Relay overload - P1075

Relay overload - P103A

VVL Bus Conductor Temp - P1078

VVL Power Stage Warning - P107A

VV Train Bus Conductor Temp - P107B

VVL Power Stage Warning - P107C

Powerstage self diagnosis is performed to realize if power stage diagnosis has detected under voltage or overcurrent of high or low side. The diagnosis is a self check realized therefore in the specific hardware (powerstage).

undervoltage of driver - P105B

overcurrent detection on high side / low side of H-bridge - P105A

Power Supply Control Motor is monitored through the main relay and checks over and under voltage conditions. There is also a Power Supply sensor diagnosis which checks short circuit to battery and to ground. If this occurs, the following DTC's will be stored:

Power Supply over voltage - P1055

Power Supply Under Voltage - P1056

Power Supply Sensor SCVB - P1019

Power Supply Sensor SCG - P1020

VVL Relay Diagnosis is performed internally to the ECU and does a comparison of the main relay voltage to the variable valve lift capacitors. If the difference is greater than a threshold then an appropriate DTC will be stored.

Relay Diagnosis - P1057 (Battery Main Relay Voltage - Capacitor Voltage)

Sensor Diagnosis is performed internally to the ECU and checks the sensor supply voltage to tunable boundaries. A sensor signal versus an internal sensor self check will determine the integrity of the sensor. If an error is detected, the appropriate DTC will be stored.

Sensor Signal fault - P1017 (ECU check)

Control Position Diagnosis and the **Value Comparison Diagnosis** are used to monitor the start and stop positions and the current PWM signal movement of the variable valve train system. If the difference between the target and actual angle is determined to be greater than a threshold percentage an error is detected, if a difference in the start and stop positions are greater than a threshold an error is detected. If any of these errors is detected, the appropriate DTC will be stored:

Control Position fault - P1030 (PWM out of range)

Value Comparison fault - P1064 (Difference)

Self Learning / Adaptation Diagnosis is performed internally to the ECU. There are three adaptation diagnoses performed in this function, the top and bottom limit individually out of range and both limits out of range. Furthermore the ECU self check diagnosis is performed, which is basically a check sum error. If any of these

errors is detected, the appropriate DTC will be stored:

Top Limit Fault - P101A (top limit not reached)

Bottom Limit Fault - P1023 (bottom limit not reached)

Both Adaptations Fails - P1024 (both limits not reached)

ECU Check Sum Error - P1041

VARIABLE VALVE LIFT ELECTRICAL DIAGRAM

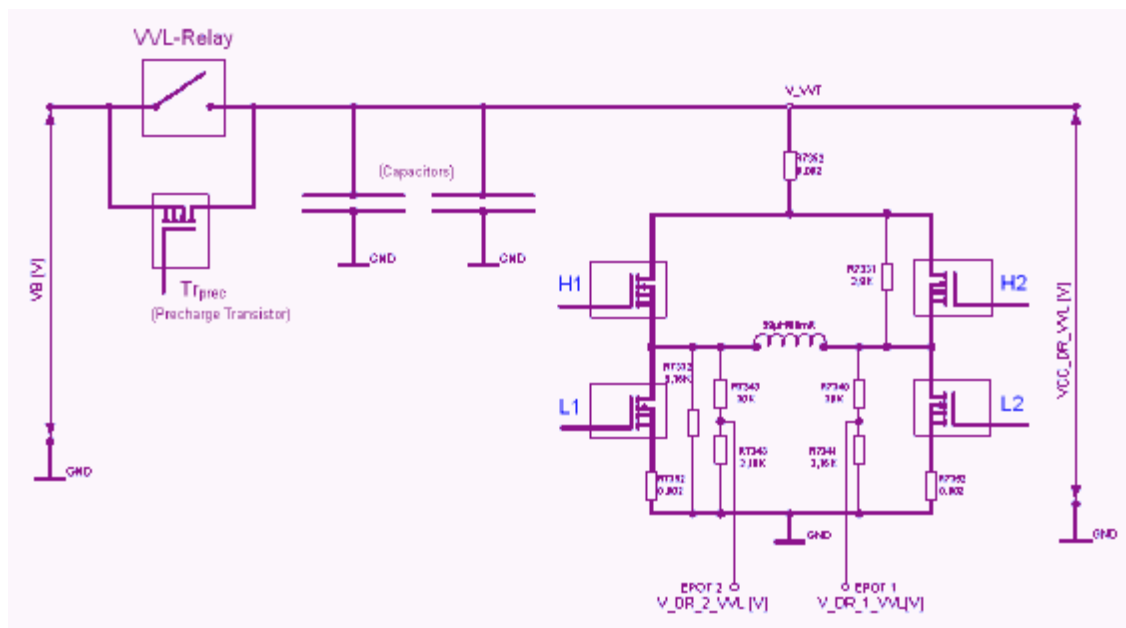


Fig. 17: Variable Valve Lift Electrical Diagram

Courtesy of BMW OF NORTH AMERICA, INC.

ELECTRONIC THROTTLE CONTROL MONITOR

ELECTRONIC THROTTLE CONTROL (ETC) MOTOR CONTROL CIRCUIT

Monitoring Descriptions

ETC Driver diagnosis (H-bridge): The ETC - H-Bridge IC continually checks the MTC if there is a short circuit to battery voltage or ground. In addition the IC is able to detect overtemperature. This is performed internally to the ECU.

ETC spring check (start routine)

(P169A, P1694)

This Diagnosis checks if the throttle spring is working correctly and if the throttle limp home position can be

reached.

The diagnosis is performed at the beginning of every driving cycle at ignition "Key ON" position.

ETC adaptation diagnosis

(P1632, P1633, P1634, P1635)

After the initial engine start and / or component change, the characteristic Potentiometer values for the limp home position and the lower mechanical stop are learned within an adaptation routine. The values are stored at the end of the driving cycle in the non-volatile memory.

If the conditions are not fulfilled, the malfunction errors (DTC's) are stored.

Electronic Throttle Control (ETC) Motor Control Performance

(P1637, P1639)

This diagnosis is able to detect a too slow or jammed actuator. The given pulse width modulation signal (MTCPWM) exceeds the position controller permissible maximum value for longer than designated (Max short or Max Long) time.

If either of the times is exceeded, the appropriate DTC will be stored.

Also if a maximum allowed difference between throttle actual value and setpoint value is exceeded, a DTC is stored.

ISC (IDLE SPEED CONTROL) ACTUATOR

90506,0507

IDLE SPEED CONTROL ELECTRICAL DIAGNOSIS

Sec (e) (16.2.2) (B) CCR Title 13, 1968.2

General Description

The purpose of this diagnosis is to detect electrical faults of the idle speed controller circuit. The controller is PWM modulated, inverse output signals are used for continuous activation of the opening and closing of a double-wound coil actuator.

The error detection is activated at Key "ON". The following errors are detected:

- Short to ground
- Short to battery
- Open circuit

If any of the above errors are detected during opening or closing of the controller, the appropriate DTC will be stored.

Idle Speed Control - Rationality Diagnosis

General Description:

This diagnosis detects the stability of the idle speed. If the commanded idle speed and the actual idle speed is not within a calibrated value, above or below commanded, the idle speed is considered to be out of range.

If the above failure conditions are detected, the appropriate DTC will be stored.

AIR MASS FLOW METER - RATIONALITY CHECK

P1415, 1424

DESCRIPTION

Depending on engine speed, valve-lift, inlet camshaft position, outlet camshaft position and manifold pressure an air mass flow into the cylinder is calculated. There is also a correction of the calculated air mass flow depending on intake air temperature, coolant temperature and ambient pressure. The ratio between the measured air mass flow and the calculated air mass flow must be between calibrated MIN/MAX-values. If the MIN/MAX thresholds are exceeded, a time counter is incremented. After this counter reaches the threshold within one diagnosis cycle, an air mass flow meter malfunction is detected.

MANIFOLD DIFFERENTIAL PRESSURE SENSOR - RATIONALITY CHECK

P1124,P1104,1105

DESCRIPTION

For a variable valve lift engine, the main function of the throttle body is to control the pressure in the intake manifold. Therefore the manifold differential pressure plausibility check is testing the plausibility of measured intake manifold pressure in comparison to the measured throttle position. So no throttle position acquisition error must be present.

The setpoint of the differential intake manifold pressure is up to 60-70% of maximum torque request constant 5 kPa beneath ambient pressure. At higher load the differential pressure setpoint becomes Zero.

In case the setpoint of the differential pressure in the intake manifold is > 3 Kpa beneath the ambient pressure, a differential pressure controller is active. The output of the controller is monitored. The output of the manifold pressure controller has to be between calibrated MIN/MAX-thresholds. If the MIN/MAX thresholds are exceeded a time counter is incremented. After this counter reaches the threshold within one diagnosis cycle, a manifold differential pressure sensor malfunction is detected.

COMPREHENSIVE COMPONENT MONITORING OBD II SIEMENS VDO FUNCTION DEFINITION

STRATEGY

Principle:

- **Sensors** that can affect emissions or are used to monitor other component / system are monitored for circuit continuity and short to battery voltage and / or to ground using high and low voltage signal limit.
- **Actuators** that can affect emissions or are used to monitor other component / system are monitored by power stage voltage check for valid signals.
- For some of sensors or actuators, plausibility checks are included to ensure proper operation of the components.

MONITORING STRATEGY FOR SENSORS

- Sensor signals out of a defined range are regarded as circuit malfunctions shorted to BATT, GND or Open circuit.

MONITORING STRATEGY FOR ACTUATORS

- Invalid actuator output signals at power stage are regarded as circuit malfunctions shorted to BATT, GND or Open circuit.

RATIONALITY CHECK

- Components are checked for the integrity of their values. This is accomplished by the use of a model or other sensor inputs. If a component does not function as expected or the integrity is in question (values are not within a threshold) it is considered out of range / plausible.

COMPREHENSIVE MONITORING FOR FOLLOWING SENSORS AND ACTUATORS

- Throttle Position Sensor - Electrical Check
- Mass Air Flow Sensor - Electrical Check
- Coolant Temperature Sensor (ECT) - Electrical Check
- Camshaft Position Sensor
- Vehicle Speed Signal
- Injector Valve Diagnosis
- Idle Speed Plausibility
- Differential Pressure Sensor - Electrical check
- Knock Sensor diagnosis
- TCU error diagnosis
- CAN Communication
- Pedal Position Sensor
- Ambient Pressure Sensor - Electrical check
- Ambient Pressure Sensor - Rationality Check

- EVAP - DMTL Valve, Electrical check
- EVAP - DMTL Heater, Electrical check
- EVAP - DMTL Pump, Electrical check
- EVAP - Purge Control Valve, Electrical check

LISTING OF ALL ECM INPUT AND OUTPUT SIGNALS

ECM INPUT AND OUTPUT SIGNAL LIST

BMW signal naming	BMW N52KP	Pin	SIEMENS signal naming	MSV80	OBD II relevant
Fahrzeug CAN-Schnittstelle 1 LOW	D_PT_CANL1	1_01	CAN-Low1	CAN1_L	No
Start(er)-Relais (Automatikstart)	A_S_START	1_02	start relay	RLY_START	No
Generatorschnittstelle	D_BSD	1_03	generator interface	BSD	No
Bremslichtschalter	E_S_BLS	1_04	brakelight switch	BLS	No
Abgasklappe	A_S_AKL	1_05	exhaust flap	EF	No
Masse Temperatur K hlwasseraustritt	M_TKA	1_06	ground coolant outlet temperature	TCO_EX_GND GND	Yes
Fahrerwunsch Geber 2	E_A_FWG2	1_07	pedal value sensor 2	PVS_2	No
Elektr. L fter getaktet	A_T_ELUE	1_08	cooling fan	CFA	No
Luftklappe	A T LKS	1_09	air flap	AF	No
Masse Pedalwertgeber 1	M_FWG1	1_10	ground pedal value sensor 1	GND	No
Spannungsversorgung 5V (PWG1)	A_U_FWG1	1_11	supply voltage PVS1	PVS1_VCC	No
Lin Bus	LIN_BUS_MS	1_12	Lin Bus	LIN	No
Sekund rluftpumpe Stufe 1	A_S_SLP	1_13	Secondary air pump	SAP	not used
Fahrzeug CAN-Schnittstelle 1 HIGH	D_PT_CANH1	1_14	CAN-High1	CAN1_H	No
Wegfahrsperr, EWS4	D_EWS	1_15	imobilizer EWS4	IMOB	No
Bremslichtschalter	E_S_BLTS	1_16	brakelight test switch	BTS	No
Fahrzeuggeschwindigkeit	E_F_DFAHR	1_17	wheel speed	WHEEL	Yes
Kupplungsschalter	E_S_KUP	1_18	clutch switch	CLU_SWI	No
Temperaturf hler K hlwasseraustritt	E_A_TKA	1_19	coolant outlet temperature	TCO_EX	not used
Fahrerwunsch Geber 1	E_A_FWG1	1_20	pedal value sensor 1	PVS_1	No
Drehzahl	A_F_TD	1_21	engine speed signal	ESS	Yes

Fzg. Pin KI 15/3	E_S_KL15_3	1_22	Ignition key KI. 15/3	V_IG_3	No
Masse Pedalwertgeber 2	M_FWG2	1_23	ground pedal value sensor 2	GND	No
Spannungsversorgung 5V (PWG2)	A_U_FWG2	1_24	supply voltage PVS2	PVS2_VCC	No
Sekund rluft	E_A_HFMS	1_25	mass air flow metersecondary air	MAFMS	not used
EBox-L fter	A_S_EBOXL	1_26	cooling fan Ebox	CFA_EBOX	No
Fzg. Pin KI.15	E_S_KL15	2_01	ignition key KI.15	V_IG	No
Lin Bus	LIN BUS MS	2_02	Lin Bus	LIN	No
Fahrdynamikkontrolle	E_A_FDC	2_03	Sound flap switch	SOF_SWI	No
Multifunktionslenkrad	D_FGRD	2_04	multifunctional steering wheel	MSW	No
Pumpstrom, Stetige-Lambdas. v Kat 2	A_I_LSVP2	2_05	pump current output 2	LSL_IA_2	Yes
Pumpzelle, Stetige-Lambdas. v Kat 1	E_A_LSVP1	2_06	pump current measurement 1	LSL_IP_1	Yes
Pumpzelle, Stetige-Lambdas. v Kat 2	E_A_LSVP2	2_07	pump current measurement 2	LSL_IP_2	Yes
Lambdasonde/Referenzzelle vor Kat 1	E_A_LSVR1	2_08	lambda sensor upstream 1	LS_UP_1	Yes
Lambdasonde/Referenzzelle vor Kat 2	E_A_LSVR2	2_09	lambda sensor upstream 2	LS_UP_2	Yes
Masse Lambdasonde vor Kat 1	M_LSV1	2_10	ground lambda sensor upstream 1	LS_UP_1_GND	Yes
Masse Lambdasonde vor Kat 2	M_LSV2	2_11	ground lambda sensor upstream 2	LS_UP_2_GND	Yes
Heizung Lambdasonde vor Kat 1	A_T_LHV1	2_12	lambda sensor heater upstream 1	LSH_UP_1	Yes
Heizung Lambdasonde vor Kat 2	A_T_LHV2	2_13	lambda sensor heater upstream 2	LSH_UP_2	Yes
Haupt-Relais (Ansteuerung)	A_S_HR	2_14	Main relay	RLY_MAIN	No
Ventil Tankleckdiagnose	A_S_DMTLV	2_15	Tank leakage detection valve	DMTLV	Yes
Pumpe Tankleckdiagnose	A_S_DMTLP	2_16	Tank leakage detection pump	DMTLP	Yes
DMTL Heizung	A_S_DMTLH	2_17	DMTL heater	DMTLH	Yes
Pumpstrom, Stetige-Lambdas. v Kat 1	A_I_LSVP1	2_18	pump current output 1	LSL_IA_1	Yes
Lambdasonde hinter Kat 2	E_A_LSH2	2_19	lambda sensor downstream 2	LS_DOWN_2	Yes
Lambdasonde hinter Kat 1	E_A_LSH1	2_20	lambda sensor downstream 1	LS_DOWN_1	Yes

Relais Klimakompressor	A_S_KOREL	2_21	relay air conditioning compressor	RLY_ACC	No
Reserve Analogeingang 1	E_A_RES1	2_22	Reserve analog 1	SPARE_AN_1	Not used
Masse Lambdasonde hinter Kat 1	M_LSH1	2_23	ground lambda sensor downstream 1	LS_DOWN_1_GND	Yes
Masse Lambdasonde hinter Kat 2	M_LSH2	2_24	ground lambda sensor downstream 2	LS_DOWN_2_GND	Yes
Heizung Lambdasonde hinter Kat 2	A_T_LHH2	2_25	lambda sensor heater downstream 2	LSH_DOWN_2	Yes
Heizung Lambdasonde hinter Kat 1	A_T_LHH1	2_26	lambda sensor heater downstream 1	LSH_DOWN_1	Yes
Dauerplus KI.30	E_U_30	3_01	direct battery KI.30	VB	No
Hauptrelais	E_U_HR	3_02	main relay KI.87	V_EL	No
Masse Zündung	M_ZUE	3_03	Ground ignition	GND_IG	No
Masse Elektronik Einspritzventile	M_EL/EV	3_04	ground electronic, injection	GND_EL	Yes
Masse VVT	M_VVT	3_05	ground VVT	GND_VVT	Yes
Masse VVT	M_VVT	3_06	ground VVT	GND_VVT	Yes
Spannungsversorgung VVT	E_U_VVTR1	4_01	Supply voltage from VVT relay	V_VVT	Yes
Spannungsversorgung VVT	E_U_VVTR1	4_02	Supply voltage from VVT relay	V_VVT	Yes
Motorausgang 2 VVT	A_T_VVT2M1	4_03	Motor output 2 VVT	VVT2M1	Yes
Motorausgang 1 VVT	A_T_VVT1M1	4_04	Motor output 1 VVT	VVT1M1	Yes
Motorausgang 2 VVT	A_T_VVT2M1	4_05	Motor output 2 VVT	VVT2M1	Yes
Motorausgang 1 VVT	A_T_VVT1M1	4_06	Motor output 1 VVT	VVT1M1	Yes
Masse (nicht angeschlossen)	n. c. (Masse)	5_01	GND (not connected)	n. c.	not used
Masse (nicht angeschlossen)	n. c. (Masse)	5_02	GND (not connected)	n. c.	not used
Masse (nicht angeschlossen)	n. c. (Masse)	5_03	GND (not connected)	n. c.	not used
MAF Frequenzsignal	E_P_HFM	5_04	SIMAF	SIMAF	not used
Masse Ildrucksensor	M_OLD	5_05	Ground oil	OILP_GND	not used

			pressure sensor		
Reserve Analogeingang 3	E_A_RES3	5_06	Reserve analog 3	SPARE_AN3	not used
Spannungsversorgung 5V (ldrucksensor)	A_U_OLD	5_07	Supply voltage OILP	OILP_VCC	No
NTC-Wasser (Motortemperatur)	E_A_TMOT	5_08	Coolant temperature	TCO	Yes
Masse Motortemperaturfühler	M_TMOT	5_09	ground coolant temperature sensor	TCO_GND	Yes
ldruck	E_S_OLD	5_10	Oil pressure	POIL	No
ldruckventil	A_T_OLP	5_11	Oilpressure valve	SAV_OILP	not used
Kraftstoffpumpe	A_S_EKP	5_12	Electrical fuel pump	EFP	No
Haupt-Relais (Ansteuerung)	A_S_HR	5_13	Main relay	RLY_MAIN	No
Spannungsversorgung 5V (DKG1,2)	A_U_DKG	5_14	supply voltage TPS	PVS1TPS_VCC	Yes
Ansteuerung 1 Drosselklappe	A_T_MDK1	5_15	throttle actuator out 1	MTC1	Yes
Ansteuerung 2 Drosselklappe	A_T_MDK2	5_16	throttle actuator out 2	MTC2	Yes
Masse reserve 2	M_RES1	5_17	Ground spare 2	SPARE2_GND	not used
Schaltsaugrohr 2	A_T_DISA2	5_18	variable intake manifold 2	VIM2	No
Klopfsensor 1B (Diff.- Signal)	E_A_KS1B	5_19	knock sensor 1B	KNKS_1_B	Yes
Klopfsensor 2B (Diff.- Signal)	E_A_KS2B	5_20	knock sensor 2B	KNKS_2_B	Yes
Applikation CAN- Schnittstelle 3 HIGH	D_APPLI_CANH	5_21	CAN-High3	CAN3_H	No
Lokaler CAN-High	D_LO_CANH	5_22	local CAN-High	LOCAN_H	No
Tankentluftungsventil	A_T_TEV	5_23	canister purge solenoid	CPS	Yes
Soundklappe	A_S_ESK	5_24	sound flap	SF	No
Spannungsversorgung 5V (Reserve)	A_U_RES1	5_25	Supply voltage spare	SPARE_VCC	not used
Reserve Analogeingang 2	E_A_RES2	5_26	Reserve analog 2	SPARE_AN_2	not used
Masse Hei filmluftmassenmesser	M_HFM	5_27	ground mass air flow meter	MAFM_GND	Yes
Ansauglufttemperatur	E_A_TANS	5_28	intake air temperature	TIA	Yes
Kurbelwellensensor	E_P_KWG	5_29	crankshaft position sensor	CRK	Yes
Masse Kurbelwellensensor	M_KWG	5_30	ground crankshaft position sensor	CRK_GND	Yes
Spannungsversorgung 5V			supply voltage		

(SDF)	A_U_SDF	5_31	MAP	MAP_VCC	Yes
Masse Saugrohrdrucksensor	M_SDF	5_32	ground manifold air pressure	MAP_GND	Yes
Saugrohrdrucksensor	E_A_SDF	5_33	manifold air pressure	MAP (IAP)	Yes
Reserve Analogeingang 1	E_A_RES1	5_34	Reserve analog 1	SPARE_AN_1	not used
Generatorschnittstelle	D_BSD	5_35	generator interface	BSD	No
Drosselklappengeber2	E_A_DKG2	5_36	throttle position sensor 2	TPS_2	Yes
Drosselklappengeber1	E_A_DKG1	5_37	throttle position sensor 1	TPS_1	Yes
Masse Drosselklappengeber	M_DKG	5_38	ground throttle position sensor	TPS_GND	Yes
ldrucksensor	E_A_OLD	5_39	Oil pressure sensor	OILP	not used
Schaltsaugrohr1	A_T_DISA1	5_40	variable intake manifold 1	VIM1	No
Klopfsensor 1A (Diff.-Signal)	E_A_KS1A	5_41	knock sensor 1A	KNKS_1_A	Yes
Klopfsensor 2A (Diff.-Signal)	E_A_KS2A	5_42	knock sensor 2A	KNKS_2_A	Yes
Applikation CAN Schnittstelle 3 LOW	D_APPLI_CANL	5_43	CAN-Low3	CAN3_L	No
Lokalerr CAN-Low	D_LO_CANL	5_44	local CAN-Low	LOCAN_L	No
Z ndspule 1	A P_ZSZ1	6_01	Ignition coil 1	IGC0	No
Z ndspule 5	A_P_ZSZ2	6_02	Ignition coil 5	IGC4	No
Z ndspule 3	A P_ZSZ3	6_03	Ignition coil 3	IGC2	No
Z ndspule 6	A_P_ZSZ4	6_04	Ignition coil 6	IGC5	No
Z ndspule 2	A_P_ZSZ5	6_05	Ignition coil 2	IGC1	No
Z ndspule 4	A_P_ZSZ6	6_06	Ignition coil 4	IGC3	No
Masse (nicht angeschlossen)	M_ZUE	6_07	GND (not connected)	IG_GND	not used
Masse (nicht angeschlossen)	M_ZUE	6_08	GND (not connected)	IG_GND	not used
Masse (nicht angeschlossen)	M_ZUE	6_09	GND (not connected)	IG_GND	not used
Masse (nicht angeschlossen)	M_ZUE	6_10	GND (not connected)	IG_GND	not used
Masse (nicht angeschlossen)	M_ZUE	6_11	GND (not connected)	IG_GND	not used
Masse (nicht angeschlossen)	M_ZUE	6_12	GND (not connected)	IG_GND	not used
Einspritzventil 1	A P_EVZ1	7_01	Injection valve 1	IV_0	Yes

Einspritzventil 5	A_P_EVZ2	7_02	Injection valve 5	IV_4	Yes
Einspritzventil 3	A_P_EVZ3	7_03	Injection valve 3	IV_2	Yes
NTC- Wasser (Motortemperatur)	E_A_TMOT	7_04	coolant temperature	TCO	Yes
VANOS Einlass	A_T_NWE	7_05	infinitely variable valve timing inlet	IVVT_IN	Yes
Datenclock VVT Sensor	A_P_CLKS1	7_06	Data clock VVT sensor	PCLK1S1	Yes
Dateneingang F h rungssensor VVT	E_T_DAT1S1	7_07	Data input main sensor VVT	TDAT1S1	Yes
Chip Select Referenzsensor VVT	A_P_CS2S1	7_08	Chip select refernce sensor VVT	PCS2S1	Yes
Dateneingang Referenzsensor VVT	E_T_DAT2S1	7_09	Data input reference sensor VVT	TDAT2S1	Yes
Schirm VVT	W_VVTS1	7_10	Shield VVT	VVT_SHIELD	Yes
Nockenwellengeber Einla	E_P_NWGE	7_11	camshaft position sensor inlet	CAM_IN	Yes
Nockenwellengeber Ausla	E_P_NWGA	7_12	camshaft position sensor exhaust	CAM_EX	Yes
ldruck	E_S_OLD	7_13	oil pressure	POIL	No
Einspritzventil 6	A_P_EVZ4	7_14	Injection valve 6	IV_5	Yes
Einspritzventil 2	A_P_EVZ5	7_15	Injection valve 2	IV_1	Yes
Einspritzventil 4	A P EVZ6	7_16	Injection valve 4	IV_3	Yes
Masse Motortemperaturfuhler	M_TMOT	7_17	ground coolant temperature sensor	TCO_GND	Yes
Vanos Auslass	A_T_NWA	7_18	infinitely variable valve timing exhaust	IVVT_EX	Yes
Elektr. Geregelttes Thermostat	A_S_KFK	7_19	el. controlled thermostat	ECT	Yes
Masse VVT-Sensor	M_VVTS1	7_20	Ground variable valve timing	VVTS1_GND	Yes
Spannungsversorgung 5V (VVT-Sensor)	A_U_VVTS1	7_21	supply voltage to VVT sensor	VVTS1_VCC	Yes
Chip Select Fuhungssensor VVT	A_P_CS1S1	7_22	Chip select main sensor VVT	PCS1S1	Yes
Schaltsignal VVT Relais	A_S_VVTR1	7_23	VVT relay	RLY_VVT	Yes
Masse Nockenwellengeber 1 Einla	M_NWGE	7_24	ground camshaft position sensor inlet 1	CAM_IN_GND	Yes
Masse Nockenwellengeber 1 Ausla	M_NWGA	7_25	ground camshaft position sensor	CAM_EX_GND	Yes

			exhaust 1		
Generatorschnittstelle	D_BSD	7_26	generator interface	BSD	No

LOCATION OF THE DATA LINK CONNECTOR

LOCATION OF THE DATA LINK CONNECTOR FOR FOLLOWING MODELS

X3 3.0i, X3 3.0Si



Fig. 18: Position DLC For X3 Models And Closed Design Cover
 Courtesy of BMW OF NORTH AMERICA, INC.



Fig. 19: Position DLC For X3 Models With Opened Design Cover And Closed Functional Cover
 Courtesy of BMW OF NORTH AMERICA, INC.



Fig. 20: Position DLC For X3 Models With Opened Design Cover And Opened Functional Cover
Courtesy of BMW OF NORTH AMERICA, INC.

The DLC is located at the lower left A-pillar and under a design cover. This cover has the letters OBD on it. Under the design cover there is an additional function cover (also labeled with the letters OBD) including an electrical function (resistance).

LOCATION OF THE DATA LINK CONNECTOR FOR FOLLOWING MODELS

323i (only Canada), 328i, 328xi, 328Ci, 328Cix, 328i sport wagon 328xi sport wagon, 328Ci conv.



Fig. 21: Position DLC For 3 Series Models And Closed Design Cover

Courtesy of BMW OF NORTH AMERICA, INC.



Fig. 22: Position DLC For 3 Series Models And Opened Design Cover / Closed Functional Cover
Courtesy of BMW OF NORTH AMERICA, INC.



Fig. 23: Position DLC For 3 Series Models And Opened Design Cover / Opened Functional Cover
Courtesy of BMW OF NORTH AMERICA, INC.

The DLC is located at the lower left A-pillar and under a design cover. This cover has the letters OBD on it. Under the design cover there is an additional function cover (also labeled with the letters OBD) including an

electrical function (resistance).

DRAWING AND LOCATION OF THE MALFUNCTION INDICATOR LIGHT

DRAWING AND LOCATION OF THE MALFUNCTION INDICATOR LIGHT FOR FOLLOWING MODELS

X3 3.0i, X3 3.0Si

X3 3.0i, X3 3.0Si



Fig. 24: Locating Malfunction Indicator Light
Courtesy of BMW OF NORTH AMERICA, INC.

DRAWING AND LOCATION OF THE MALFUNCTION INDICATOR LIGHT FOR FOLLOWING MODELS

323i (only Canada), 328i, 328xi, 328i sport wagon, 328xi sport wagon, 328Ci, 328Cix, 328Ci conv.

Complete Instrument panel (European Version)

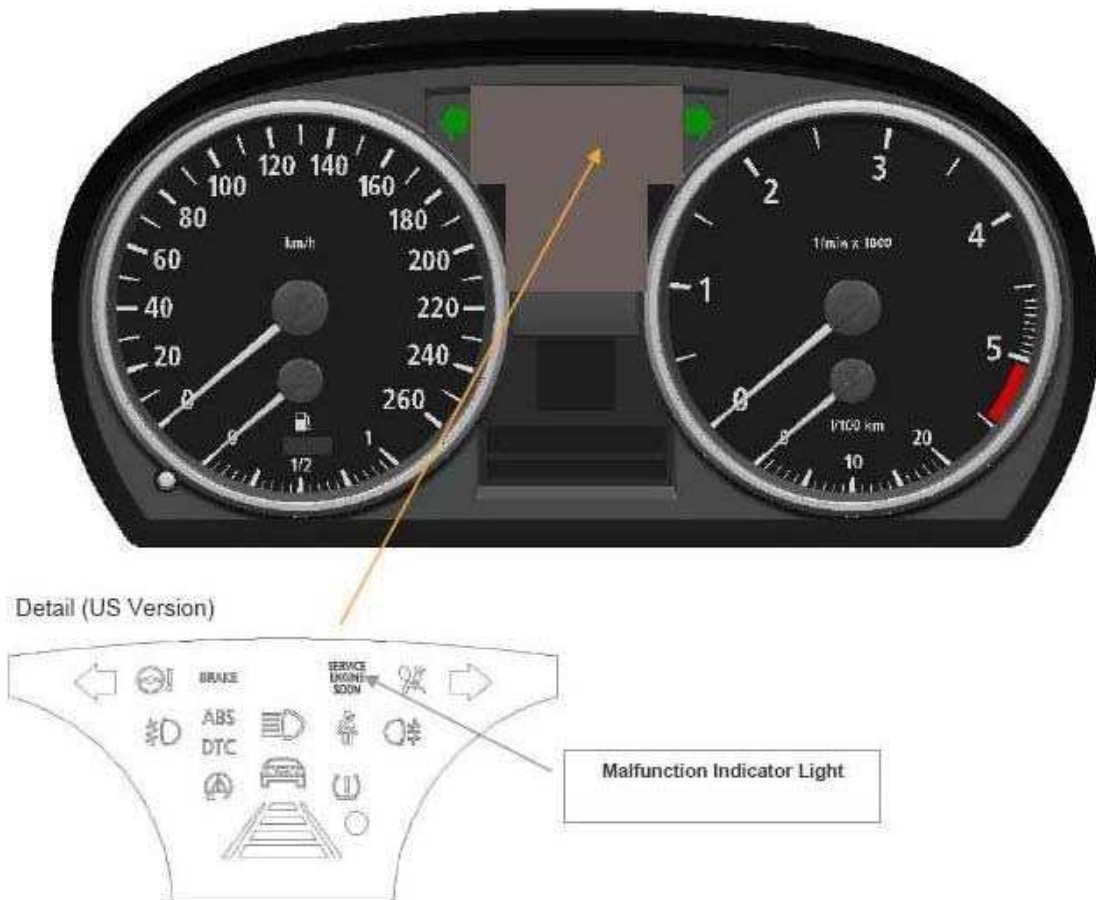


Fig. 25: Identifying Complete Instrument Panel (European Version)
 Courtesy of BMW OF NORTH AMERICA, INC.

CALCULATED LOAD AND FUEL TRIM DETERMINATION

The calculated engine load "LOAD_CLC [%]" is based on the measured mass air flow (metered by the hot-film air-mass sensor (HFM)).

Strategy:

A 2-dimensional map is used to interpolate the calculated engine load "LOAD_CLC [%]" depending on metered mass air flow and engine speed. A weighting factor is applied to compensate the altitude influence.

The calculation is performed as follows:

$$\text{LOAD_CLC [\%]} = \text{LOAD_CLC_RAW } f(\text{metered mass air flow, engine speed}) \times (1013\text{hPa} / \text{ambient pressure}) \times 100\%$$

with:

REFERENCE CHART

LOAD_CLC	calculated engine load in % with altitude correction
LOAD_CLC_RAW	calculated engine load in % without altitude correction

In case of a malfunction of the HFM, the metered mass air flow is substituted by a modeled mass air flow value.

START EMISSION REDUCTION STRATEGY MONITORING

P1561,1562

All parameters, that are relevant during the cat heating phase, are monitored by standard monitoring functions:

MONITORING FUNCTION REFERENCE CHART

Relevant Components during Cat Heating Phase						Impact of faulty Component			
Comp./ System	Parameter	needed for	Component Diagnosis	Diagnosis during Cat Heating	Emission Impact > 1,5xGW	Idle Speed	Ignition Angle	Engine Lambda	Tras
Secondary Air	Secondary Air Mass	Enleanment exhaust gas	Secondary Air diagnosis	Yes	Yes, dep. to variant and emission class			X	
Injection Value	Injection time	Enleanment lambda_engine < 1	Output stage diagnosis	Yes	none	X	X	X	
		Enleanment lambda_engine > 1	Misfire detection	Yes					
			Fuel supply diagnosis	no					
Mass Air Flow Sensor	Air Mass - Input for maps	Larger overlap, VANOS End position	Air mass flow sensor diagnosis	Yes	none	X	X	X	
			Air mass model diagnosis	Yes					
			Fuel supply diagnosis	no					
Throttle Position	Angle	Mass Air Flow	Power stage, accelerator pedal diagnosis	Yes	none	X	X	X	
Valvetronic	Valve Lift	Load-control	Valvetronic electrical / mechanical diagnosis	Yes	none	X	X	X	

			Air mass model diagnosis	Yes					
Phase Sensor (Camshaft)	Valve overlap	Larger overlap	RPM sensor diagnosis	Yes	none				
Camshaft Position Actuator	Valve overlap	Larger overlap	Output stage diagnosis Camshaft position actuator	Yes Yes	none				
RPM Sensor	Engine speed	Idle speed increase	RPM sensor diagnosis	Yes	none	X			
Idle Speed	Engine speed	EVAP, Camshaft Position	Idle speed diagnosis	Yes	none	X			
CAN-Communication with Transmission	CAN-bus	Shifting point	Timeout CAN-message	Yes	none	X			
Coolant Temperature Sensor	Temperature	Input for maps	Electrical plausibility Stuck signal	Yes no	Yes	X	X	X	
ECM	Signals	Calculation	Self Check RAM,ROM,W-dog	Yes	-				
Ignition	Ignition angle	Optimum: retarded ignition	Misfire detection	Yes	Yes, dep. to emission class		X		

Illustration 1 (Standard monitoring functions during Cat Heating - Overview)

To fulfill the legal requirements, the monitoring of the idle speed is now extended to the cold start phase. In case of an error, the specific P-Codes:

- P1561 Cold Start Idle Air Control System RPM lower than expected
- P1562 Cold Start Idle Air Control System RPM higher than expected

are set.

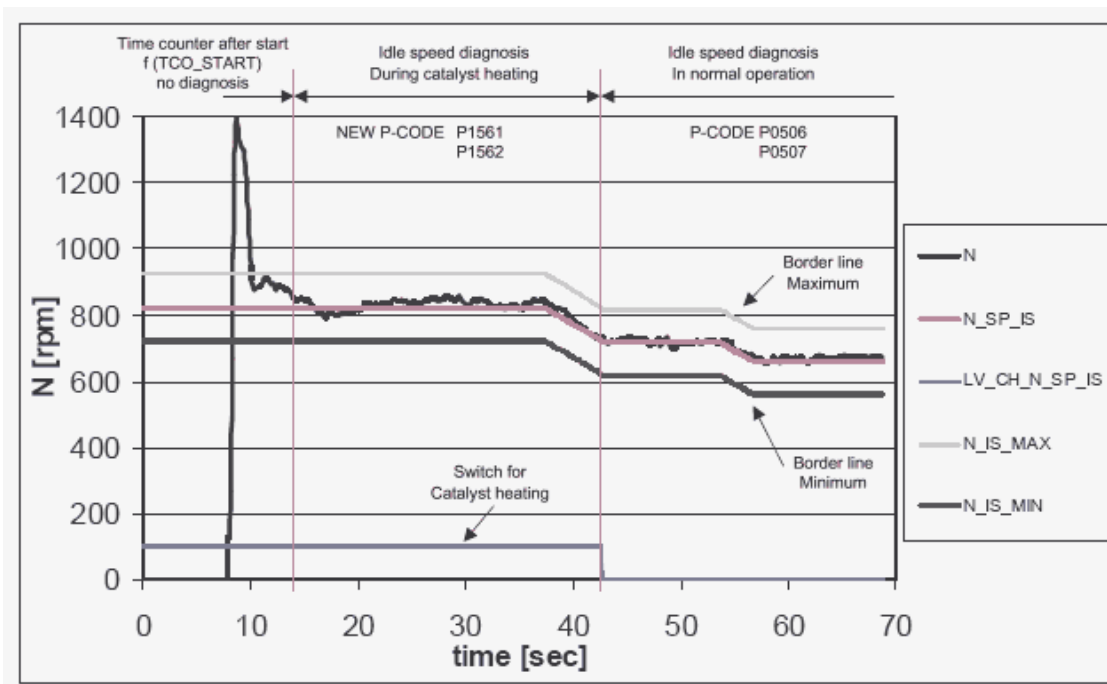


Fig. 26: Idle Speed Control Graph
 Courtesy of BMW OF NORTH AMERICA, INC.

Illustration 2 (Idle speed control)

During cat heating, it is essential to make sure, that enough thermal energy is applied to the catalyst to heat it up as quick as possible.

Therefore it is target to limit the ignition timing to the earliest possible value during the cat heating phase.

If there would be a demand for more torque and therefore for an advanced ignition timing beyond the limits, the engine would be allowed to stall instead of fulfilling the demand.

The torque limits are calibrated the way that the emissions stay below 1.5 times of the limits.

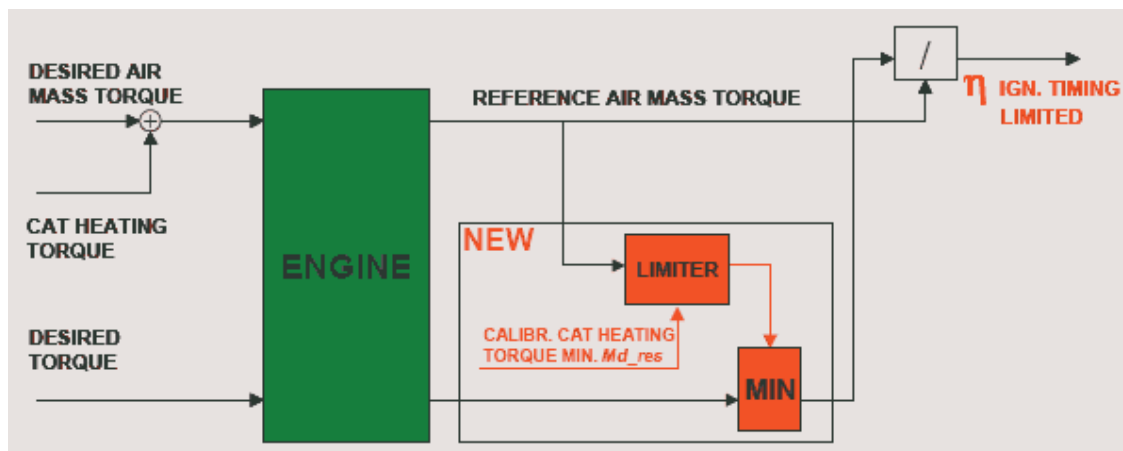


Fig. 27: Start Emission Reduction Strategy - Flow Chart
Courtesy of BMW OF NORTH AMERICA, INC.

Illustration 3 (Flowchart)

Known System:

During normal driving, the ignition timing desired torque corresponds to the air mass desired torque, which determines the ignition timing. During the cat heating phase, the cat heating torque is added to the air mass desired torque, resulting in a higher reference air mass torque.

The efficiency, desired torque divided by the reference torque, determines the ignition timing.

New System (BMW-development):

The earliest possible ignition timing is determined by the limitation of the torque reserve to a minimum value during the cat heating phase. For this, the required minimum cat heating torque is subtracted from the reference air mass torque. The thus reduced efficiency leads to a safe ignition retard and limits the ignition timing during the cat heating measures.

Limitation of ignition timing to the earliest possible ignition timing during the cat heating phase by limitation of torque reserve to the minimum required torque reserve.

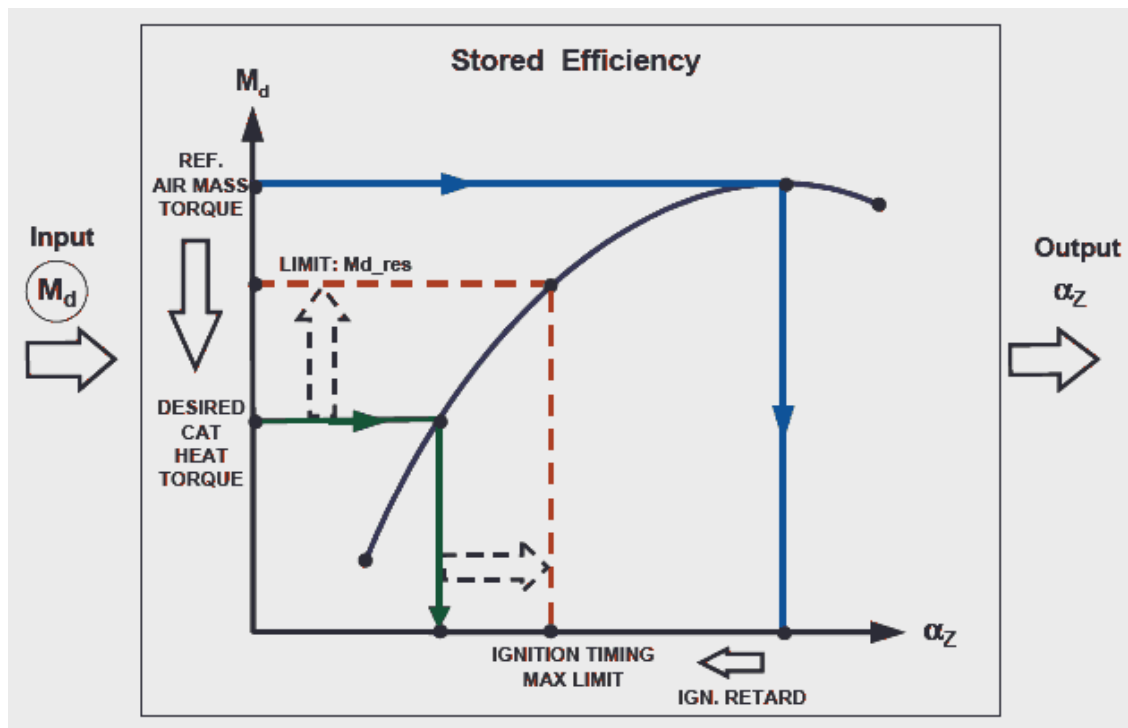


Fig. 28: Torque Characteristic Line And Ignition Timing Diagram
Courtesy of BMW OF NORTH AMERICA, INC.

Illustration 4 (Diagram torque characteristic line and ignition timing)

The maximum ignition timing after cold start with new BMW method:

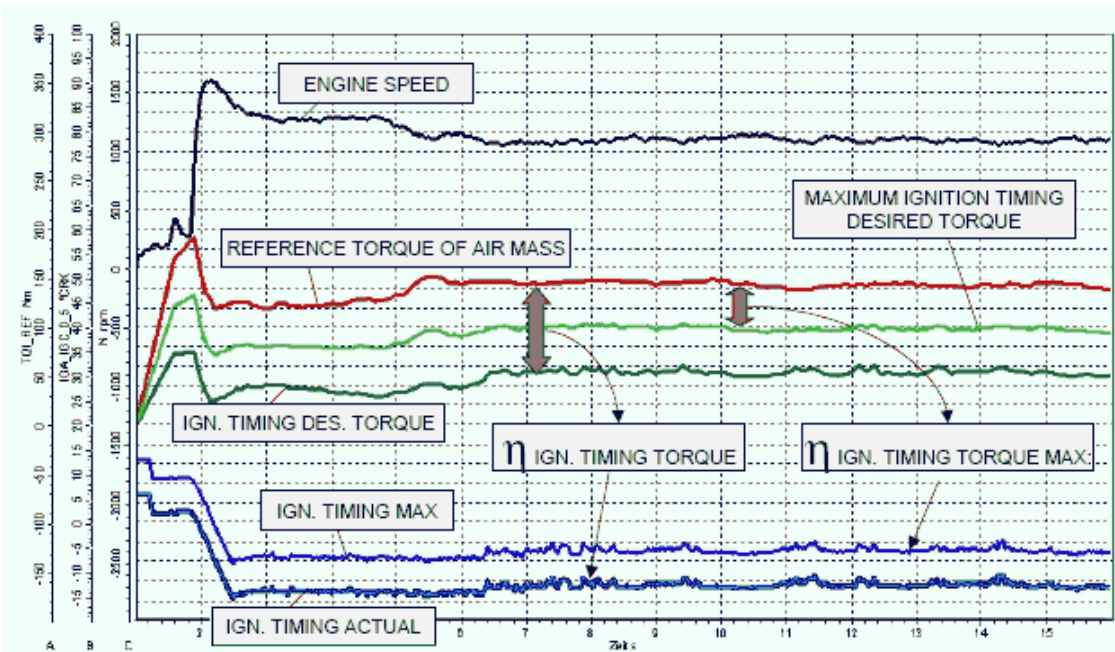


Fig. 29: Measuring Data (Maximum Ignition Timing After Cold Start With New BMW Method)
Courtesy of BMW OF NORTH AMERICA, INC.

Illustration 5 (Measuring Data)

HVAC

Air Conditioning & Heating Systems - Repair Instructions - X3

11 HEATER WITH OPERATION

64 11 ... INSTALLING SERVODRIVE



Fig. 1: Servodrive

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

If necessary, align shaft of flap(s) to be actuated to position of servodrive to be installed.

64 11 077 REMOVING AND INSTALLING/REPLACING BOWDEN CABLE FOR TEMPERABLE VENTILATION

Necessary preliminary tasks:

- Remove center fresh air grille, see **64 22 162 Removing and installing/replacing center fresh-air grill.**
- Remove right glovebox with housing, see **51 16 366 REMOVING AND INSTALLING RIGHT GLOVEBOX WITH HOUSING .**

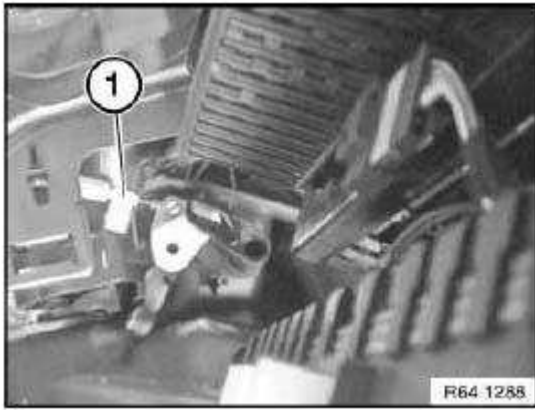


Fig. 2: Bowden Cable
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect Bowden cable (1).

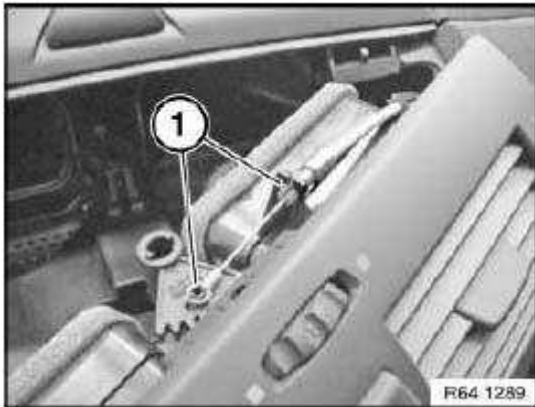


Fig. 3: Bowden Cable
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect Bowden cable from mountings (1) and feed out.

Installation:

Make sure Bowden cable can move freely.

If necessary, perform function test prior to assembly.

64 11 213 REMOVING AND INSTALLING/REPLACING HEATER - A/C UNIT FAN

Special tools required:

- 51 3 057

Necessary preliminary tasks:

E46 and E83:

Remove heater bulkhead, see **51 71 080 REMOVING AND INSTALLING/REPLACING HEATER BULKHEAD** .

E46 M43TU only:

Remove cylinder head.

E46 M47, M47TU only:

Remove complete wiper console.

Remove air cleaner element.

E46 M52TU, M54 only:

Remove engine cover.

E46 M57 only:

Remove intake air manifold.

E46 N42 only:

Remove cylinder head.

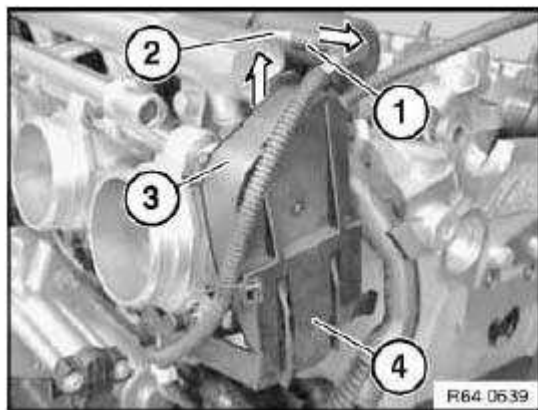


Fig. 4: Hose And Cover Strip

Courtesy of BMW OF NORTH AMERICA, INC.

Necessary preliminary tasks:

E46 S54 only:

Remove intake air manifold.

Detach hose (1) in direction of arrow from fitting (2).

Remove cover strip (3) in direction of arrow from guide (4).

Pull lock (1) in direction of arrow and feed out flap (2).

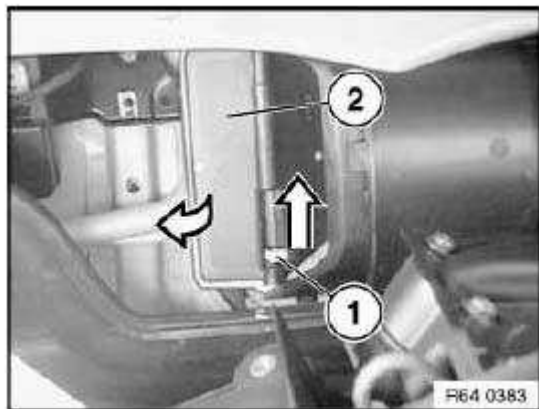


Fig. 5: Pulling Lock

Courtesy of BMW OF NORTH AMERICA, INC.

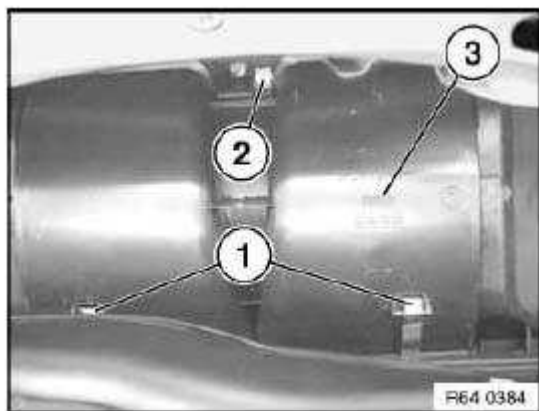


Fig. 6: Retainers And Fan Cover

Courtesy of BMW OF NORTH AMERICA, INC.

Unclip retainers (1).

Unscrew bolt (2).

Feed out fan cover (3).

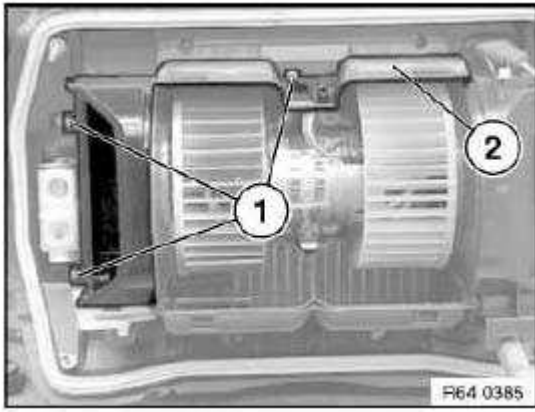


Fig. 7: Screws And Fan Cover

Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Pull out fan cover (2).

Installation:

Make sure fan cover (2) is correctly seated.

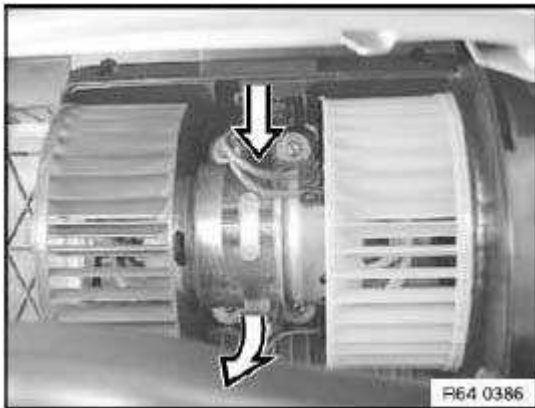


Fig. 8: Unfastening Plug Connection

Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten plug connection and disconnect.

Release retainer with special tool 51 3 057.

Installation:

Bridge (1) must snap into place in opening (2) of fan motor.

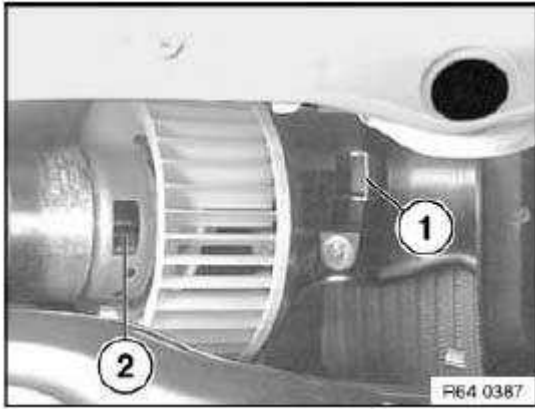


Fig. 9: Bridge

Courtesy of BMW OF NORTH AMERICA, INC.

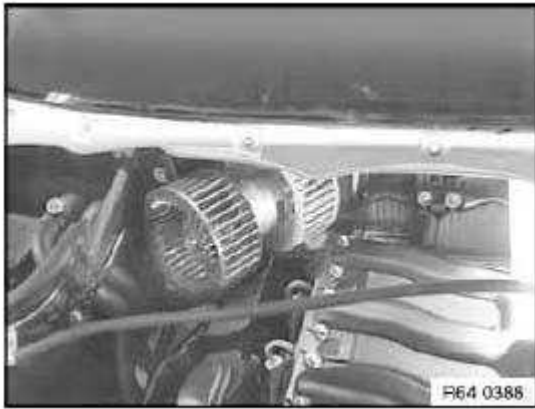


Fig. 10: Fan For Heater - A/C Unit

Courtesy of BMW OF NORTH AMERICA, INC.

Remove fan for heater - A/C unit towards front.

Installation:

Make sure fan for heater - A/C unit is correctly seated.

64 11 227 REPLACING OUTPUT STAGE/SWITCH FOR HEATER - A/C SYSTEM BLOWER

Necessary preliminary tasks:

- Remove servodrive of right fresh-air/recirculated-air flap, see **64 11 807 Removing and installing/replacing servodrive for right fresh-air flap.**

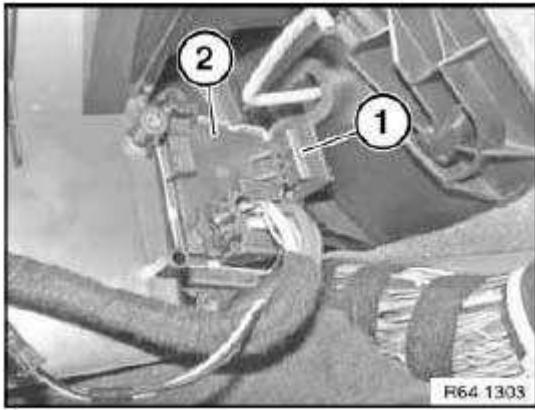


Fig. 11: Catch

Courtesy of BMW OF NORTH AMERICA, INC.

Release catch (1) and pull output stage (2) out of heater.

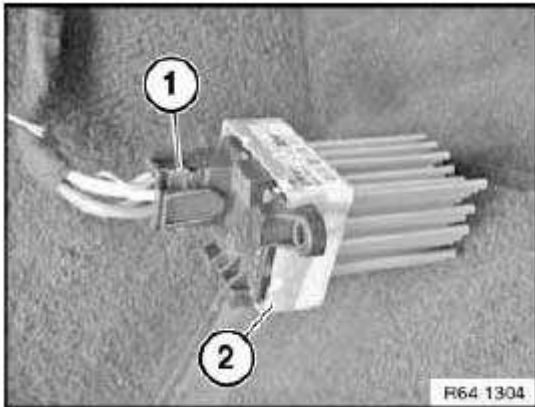


Fig. 12: Plug Connection

Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1) and remove output stage (2).

**64 11 377 REMOVING AND INSTALLING CONTROL PANEL FOR HEATER - A/C SYSTEM
(REPLACING, AUTOMATIC AIR CONDITIONING)**

Special tools required:

- **64 1 020 RELEASE HOOK**

**IMPORTANT: Read and comply with 61 35 ... NOTES ON ESD PROTECTION (ELECTRO
STATIC DISCHARGE) .**

Necessary preliminary tasks:

- Remove center fresh air grill, see **64 22 162 Removing and installing/replacing center fresh-air grill.**
- Remove ignition key from ignition switch
- Pull fuse 63 from distribution box in glovebox

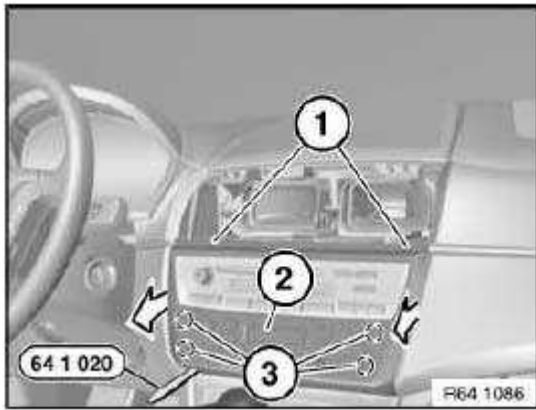


Fig. 13: Special Tool And Retaining Points
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Unclip control panel for heater - A/C system (2) with special tool 64 1 020 at retaining points (3) all round and pull back.

Unlock associated plug connections and disconnect.

Remove control panel for heater - A/C system (2).

Replacement:

Carry out programming/coding using appropriate BMW service tool.

64 11 807 REMOVING AND INSTALLING/REPLACING SERVODRIVE FOR RIGHT FRESH-AIR FLAP

Necessary preliminary tasks:

- Remove right glovebox with housing, see **51 16 366 REMOVING AND INSTALLING RIGHT GLOVEBOX WITH HOUSING .**

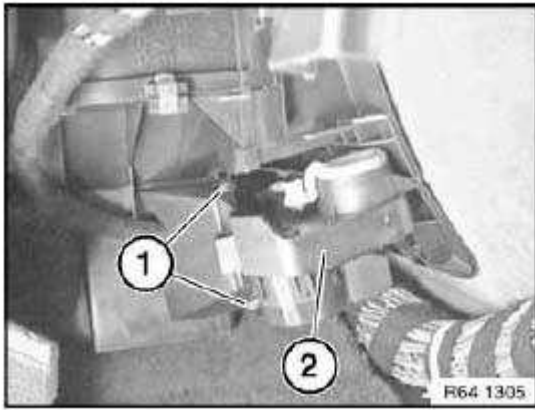


Fig. 14: Screws And Servomotor
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) and remove servomotor (2) complete with bracket.

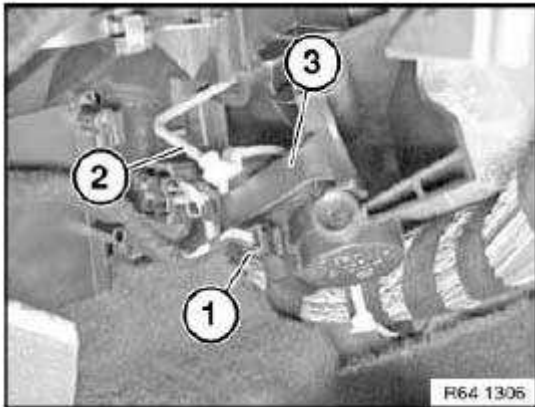


Fig. 15: Plug Connection And Actuating Lever
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1).

Disengage actuating lever (2) and remove bracket with servomotor (3).

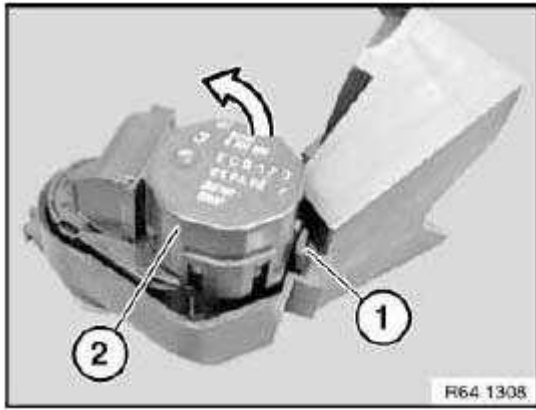


Fig. 16: Removing Servomotor From Holder
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

Release lock (1) and remove servomotor (2) from holder.

Installation:

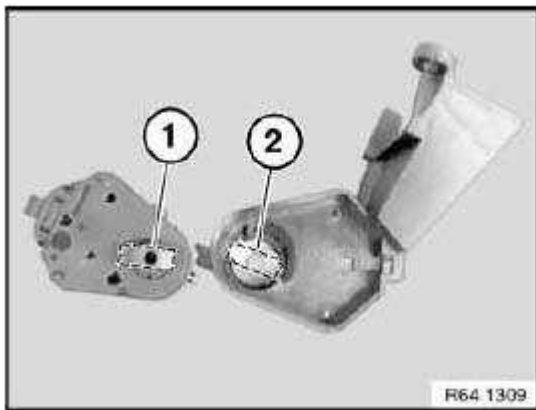


Fig. 17: Lug
Courtesy of BMW OF NORTH AMERICA, INC.

Lug (1) must be adapted to fit in counterpiece (2) on holder.

64 11 992 REMOVING AND INSTALLING/REPLACING SOLAR SENSOR

Special tools required:

- **64 1 020 RELEASE HOOK**

Necessary preliminary tasks:

- Remove instrument panel trim, see **51 45 030 REMOVING AND INSTALLING INSTRUMENT PANEL TRIM** .

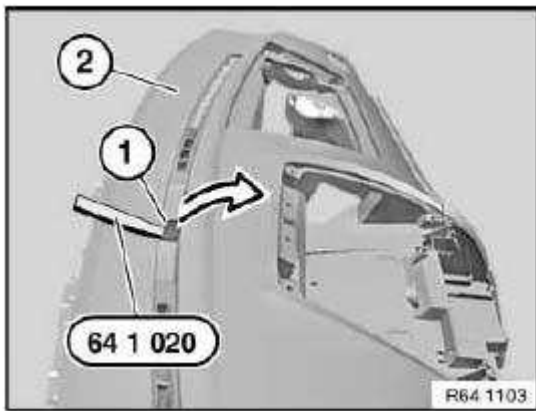


Fig. 18: Special Tool (64 1 020)

Courtesy of BMW OF NORTH AMERICA, INC.

Lever out solar sensor (1) with special tool 64 1 020 in direction of arrow.

Feed wiring harness of solar sensor (1) out of retainers of instrument panel trim (2).

Remove solar sensor (1) from instrument panel trim (2).

64 11 910 REMOVING AND INSTALLING/REPLACING TEMPERATURE SENSOR FOR HEATER CORE

Necessary preliminary tasks:

- Remove switch unit in centre console. See **61 31 057 REMOVING AND INSTALLING/REPLACING SWITCH UNIT IN CENTER CONSOLE** .

Remove temperature sensor (1) and disconnect plug connection (2).

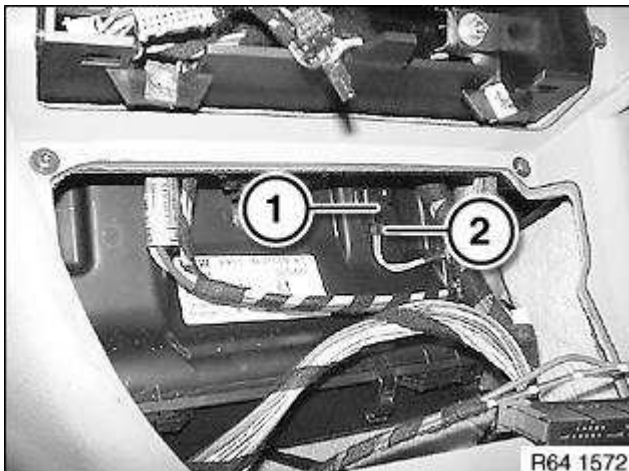


Fig. 19: Remove Temperature Sensor (1) And Disconnect Plug Connection (2)
Courtesy of BMW OF NORTH AMERICA, INC.

64 11 845 REPLACING ACTUATOR DRIVE OF DEFROSTER FLAPS

Necessary preliminary tasks:

- Remove **actuator drive for ventilation flaps.**

Unlock actuator drive (1) and feed out towards side. Disconnect plug connection.

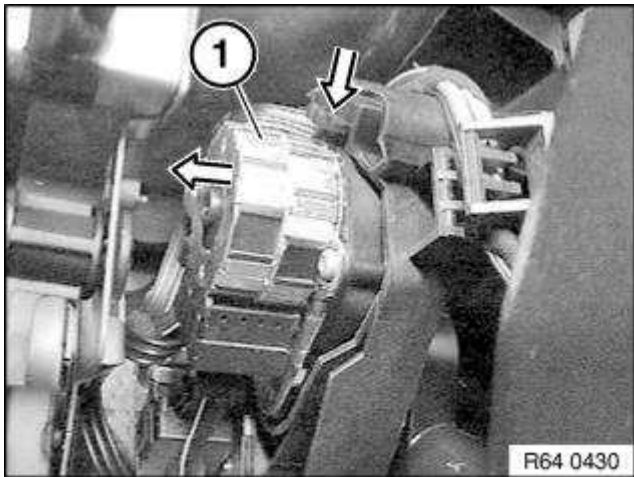


Fig. 20: Unlock Actuator Drive (1) And Feed Out Towards Side
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note: If necessary, align shaft for defroster flaps and drive (see illustration).

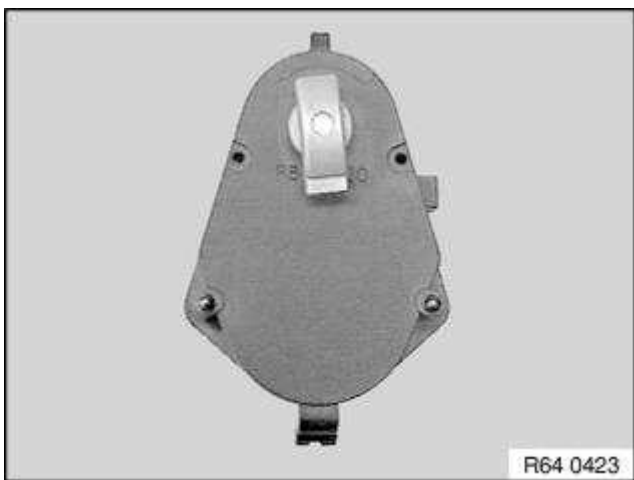


Fig. 21: Align Shaft For Defroster Flaps And Drive
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement: Servomotors must be re-addressed in the event of replacement! Addressing can only be carried out with the BMW diagnosis system. Service functions: Body, Heating and air conditioning function, Flap

motors, Re-address flap motors.

64 11 839 REPLACING ACTUATOR DRIVE OF FOOTWELL FLAP

Necessary preliminary tasks:

- Remove **RIGHT GLOVEBOX WITH HOUSING** .

Unhook adjusting lever (1).

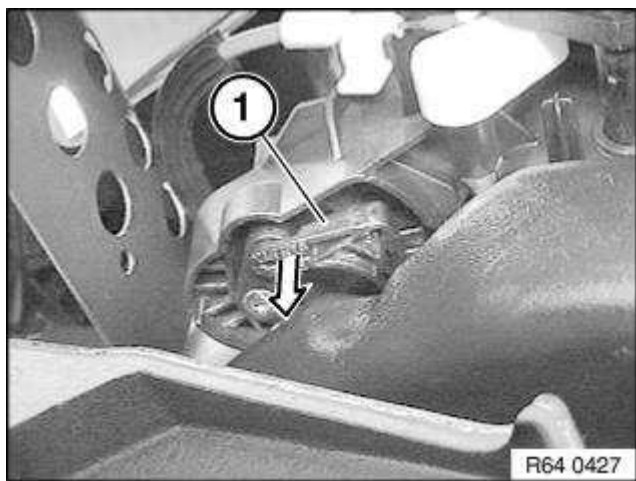


Fig. 22: Unhook Adjusting Lever (1)
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1). Unlock actuator drive (2) and feed out towards rear.

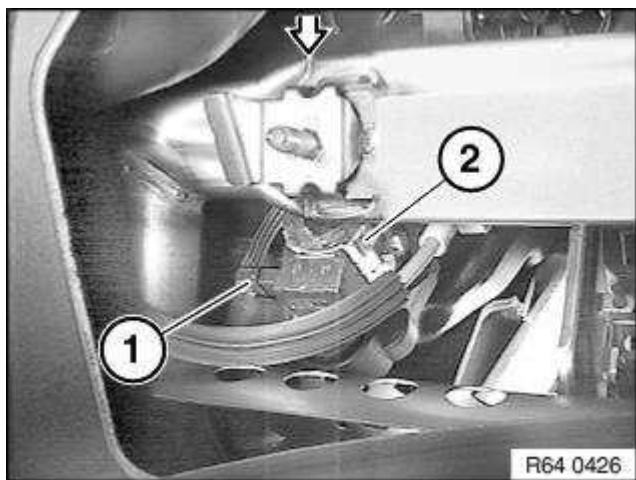


Fig. 23: Unlock Actuator Drive (2) And Feed Out Towards Rear
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note: If necessary, align shaft for footwell flap and drive (see illustration).

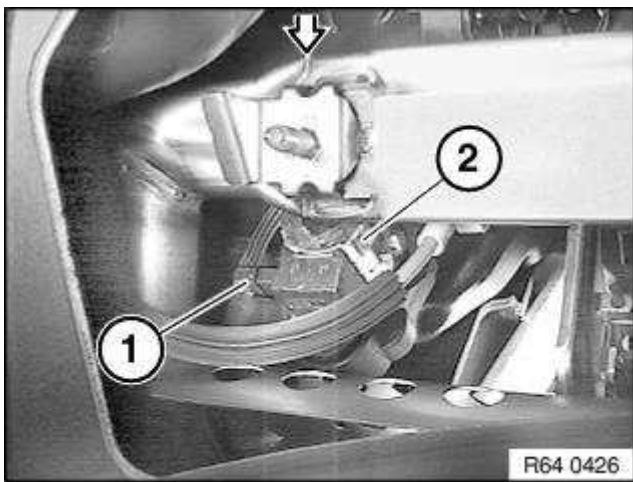


Fig. 24: Align Shaft For Footwell Flap And Drive
 Courtesy of BMW OF NORTH AMERICA, INC.

Replacement: Servomotors must be re-addressed in the event of replacement! Addressing can only be carried out with the BMW diagnosis system. Service functions: Body, Heating and air conditioning function, Flap motors, Re-address flap motors.

64 11 829 REPLACING ACTUATOR DRIVE OF VENTILATION FLAPS

Necessary preliminary tasks:

- Remove trim panel for pedal mechanism. See **51 45 185 REMOVING AND INSTALLING/REPLACING TRIM FOR PEDAL ASSEMBLY** .
- Remove lower section of steering column trim. See **32 31 020 REMOVING AND INSTALLING / REPLACING LOWER SECTION OF STEERING COLUMN TRIM** .

NOTE: Heater is removed for purposes of clarity.

Release screw (1). Unclip adjusting clasp (2) and feed out servomotor (3).

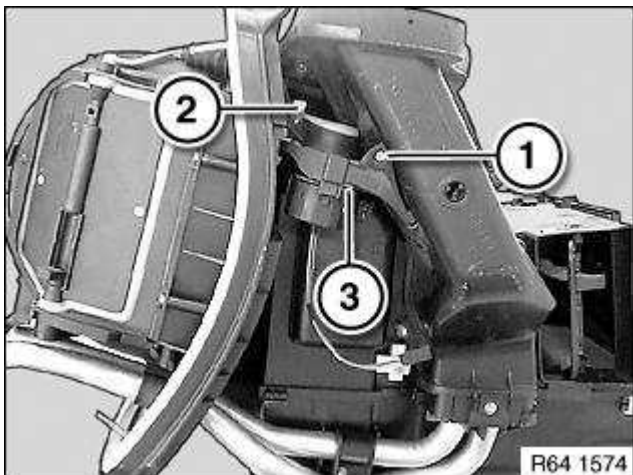


Fig. 25: Unclip Adjusting Clasp (2) And Feed Out Servomotor (3)
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement: Servomotors must be re-addressed in the event of replacement! Addressing can only be carried out with the BMW diagnosis system. Service functions: Body, Heating and air conditioning function, Flap motors, Re-address flap motors.

64 11 829 REPLACING ACTUATOR DRIVE OF VENTILATION FLAPS

Necessary preliminary tasks:

- Disconnect battery negative lead. See **61 20 900 DISCONNECTING AND CONNECTING BATTERY NEGATIVE LEAD** .
- Remove glovebox. See **51 16 366 REMOVING AND INSTALLING RIGHT GLOVEBOX WITH HOUSING** .
- Partially remove fuse box

Disconnect plug connection (1). Unlock actuator drive (2) and remove

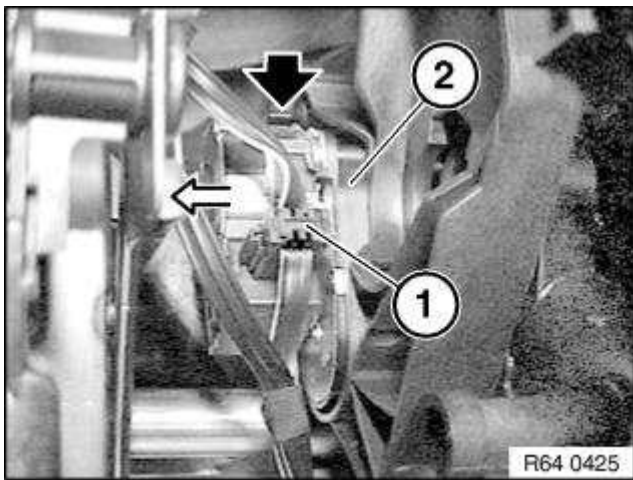


Fig. 26: Unlock Actuator Drive (2) And Remove
Courtesy of BMW OF NORTH AMERICA, INC.

Installation: If necessary, align shaft for defrosting flaps and drive (see illustration).

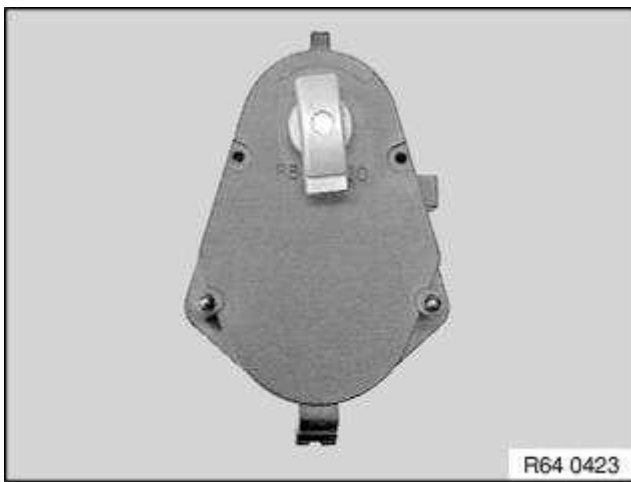


Fig. 27: Align Shaft For Defrosting Flaps And Drive
Courtesy of BMW OF NORTH AMERICA, INC.

64 11 942 REPLACING EVAPORATOR TEMPERATURE SENSOR

Necessary preliminary tasks:

- Remove trim panel for pedal assembly. See 45 INSTRUMENT CLUSTER TRIM PANEL .

NOTE: Left footwell heating duct removed for purposes of clarity.

Pull out evaporator temperature sensor (1) and disconnect plug connection (2).

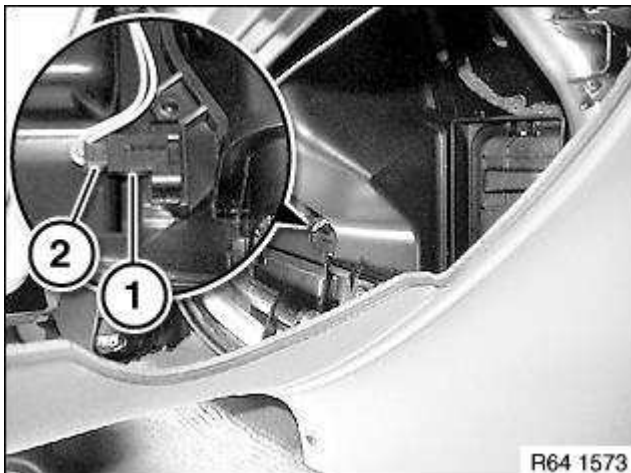


Fig. 28: Pull Out Evaporator Temperature Sensor (1) And Disconnect Plug Connection (2)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation: Ensure evaporator temperature sensor (1) is correctly seated.

64 11 208 REPLACING HEATER CORE

WARNING: Scalding hazard! Work on the cooling system may only be carried out when it has cooled down.

Necessary preliminary tasks:

- Remove **microfilter housing**.
- Remove instrument panel trim. See **51 45 030 REMOVING AND INSTALLING INSTRUMENT PANEL TRIM**.

Recycling: Coolant emerges when coolant hoses are detached. Have a suitable collecting container ready. Catch and dispose of escaping coolant. Observe country-specific waste-disposal regulations.

Detach hot water hoses (1) from heater and blow coolant out of heater core.

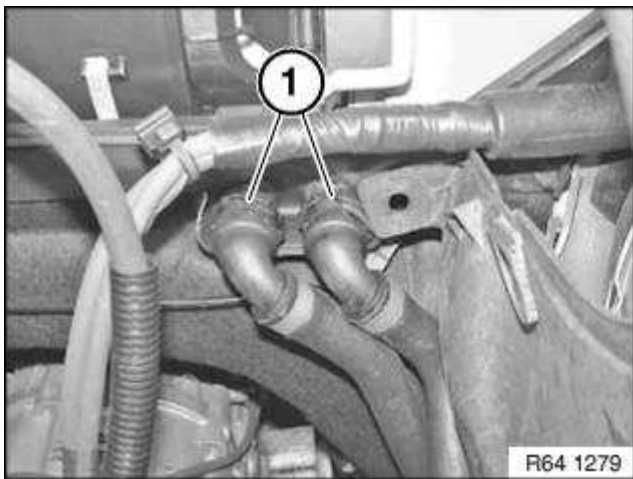


Fig. 29: Detach Hot Water Hoses (1) From Heater
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: For purposes of clarity, the following operations are shown on the removed heater core.

Pull out temperature sensor (1) and unclip wiring harness (2) from holder.

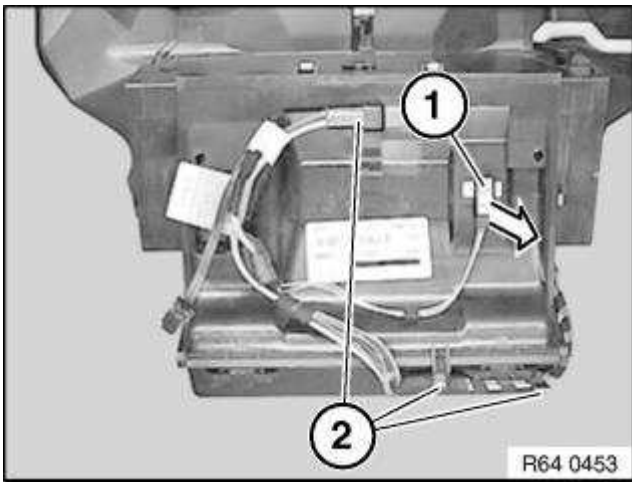


Fig. 30: Pull Out Temperature Sensor (1) And Unclip Wiring Harness (2) From Holder
Courtesy of BMW OF NORTH AMERICA, INC.

Installation: Ensure correct lead routing.

Release screw (1) and remove bracket (2) from double pipe. Unclip retainers (3) and lift off cover for heating element (4).

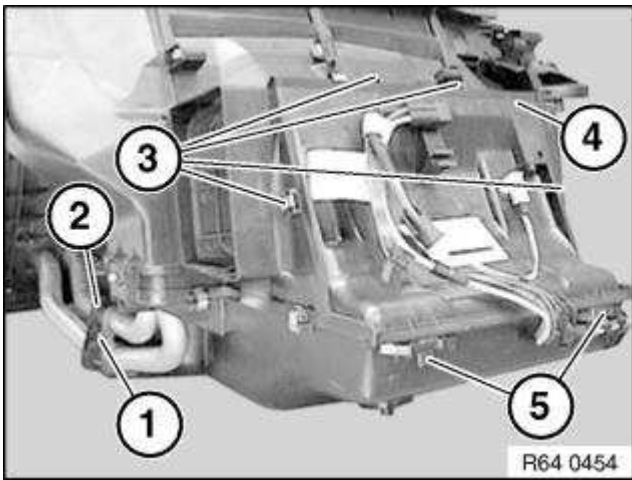


Fig. 31: Release Screw (1) And Remove Bracket (2) From Double Pipe
Courtesy of BMW OF NORTH AMERICA, INC.

Installation: First insert lugs (5).

Remove retainers (1) and remove double pipe (2) towards top. Raise heater core (3) at front and remove.

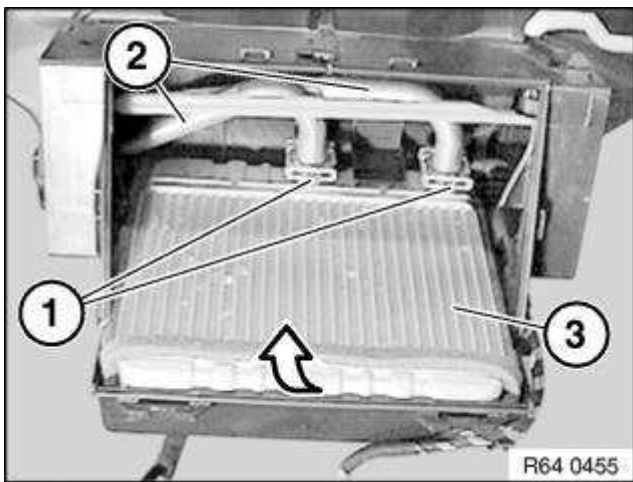


Fig. 32: Remove Retainers (1) And Remove Double Pipe (2) Towards Top
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation: Replace sealing rings, coat with anti-friction agent and make sure sealing rings and lines are correctly seated.

After installation: Venting cooling system and checking for water leaks. See **00 COOLANT, CHECKING COOLING SYSTEM** .

64 11 800 REPLACING SERVODRIVE ON GEAR FOR FLAP CONTROL (A/C CONTROL)

Necessary preliminary tasks:

- Remove **RIGHT GLOVEBOX WITH HOUSING** .

Move rotary knob (1) into position illustrated.



Fig. 33: Move Rotary Knob (1) Into Position Illustrated
 Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1). Unlock servo-drive (2) and remove towards bottom.

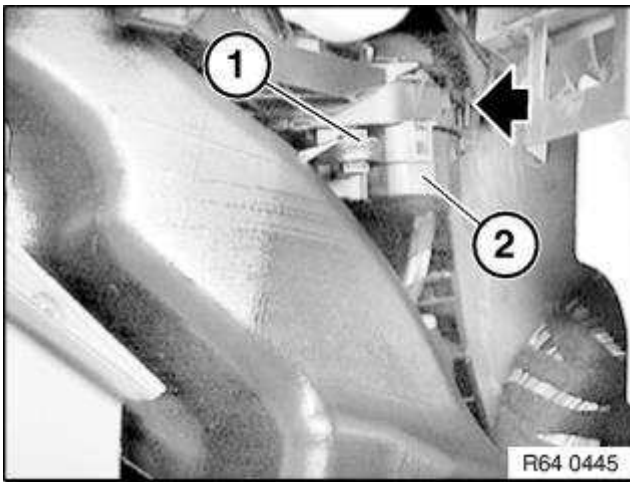


Fig. 34: Disconnect Plug Connection (1)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation: If necessary, align shaft for defrosting flaps and drive (see illustration).

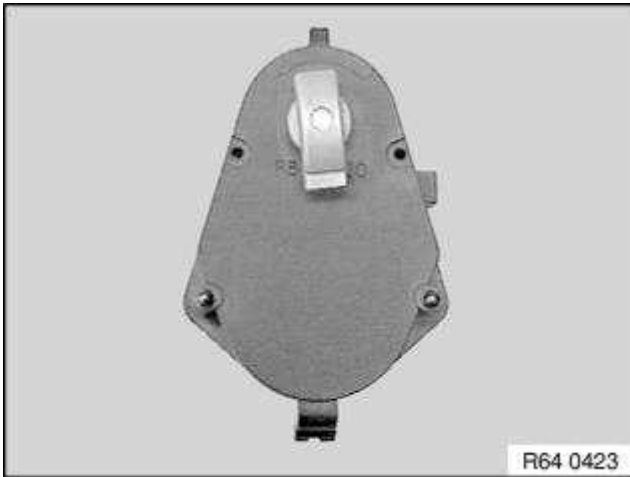


Fig. 35: Align Shaft For Defrosting Flaps And Drive
Courtesy of BMW OF NORTH AMERICA, INC.

22 NOZZLES AND OUTLETS

64 22 135 REMOVING AND INSTALLING/REPLACING LEFT FRESH-AIR GRILL

Special tools required:

- 00 9 341

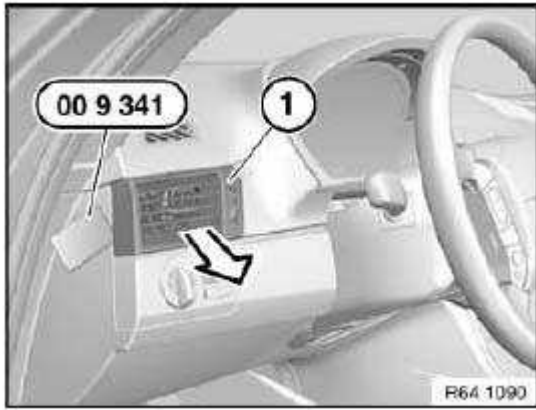


Fig. 36: Special Tool (00 9 341)
Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool 00 9 341 at side as illustrated.

Lever out left fresh-air grill (1) all round and remove in direction of arrow.

64 22 136 REMOVING AND INSTALLING/REPLACING RIGHT FRESH-AIR GRILL

Special tools required:

- 00 9 318

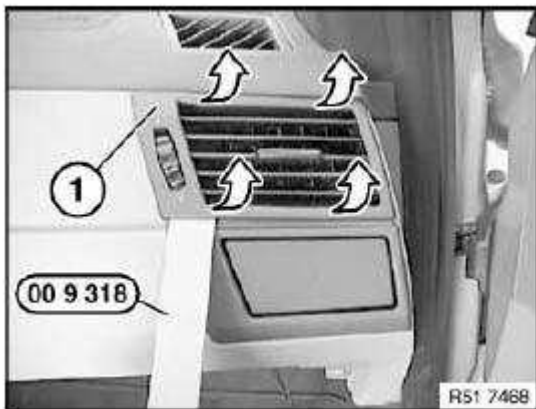


Fig. 37: Special Tool (00 9 318)
Courtesy of BMW OF NORTH AMERICA, INC.

Unclip right fresh-air grill (1) with special tool 00 9 318 and remove in direction of arrow.

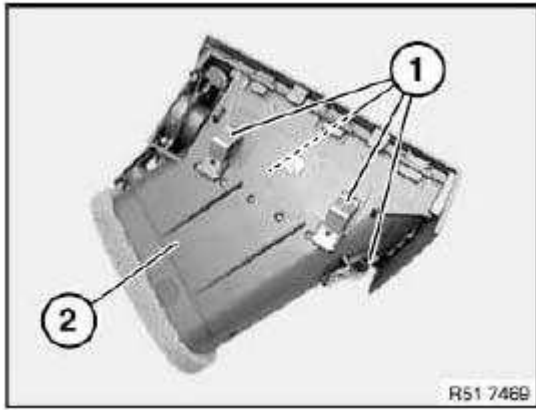


Fig. 38: Catches On Fresh-Air Grill
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Catches (1) on fresh-air grill (2) must not be damaged or missing.

64 22 162 REMOVING AND INSTALLING/REPLACING CENTER FRESH-AIR GRILL

Special tools required:

- **64 1 020 RELEASE HOOK**

Necessary preliminary tasks:

- Remove switch for hazard warning system/central locking, see **61 31 079 REMOVING AND INSTALLING/REPLACING SWITCH FOR HAZARD WARNING FLASHERS/CENTRAL LOCKING**.



Fig. 39: Special Tool (64 1 020)
Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool 64 1 020 at lower attachment points (1).

Lever out center fresh-air grill (2) and pull back.

Unclip Bowden cable (3) and remove center fresh-air grill (2).

31 MICROFILTER

64 31 010 REPLACING MICROFILTER FOR INTERIOR VENTILATION

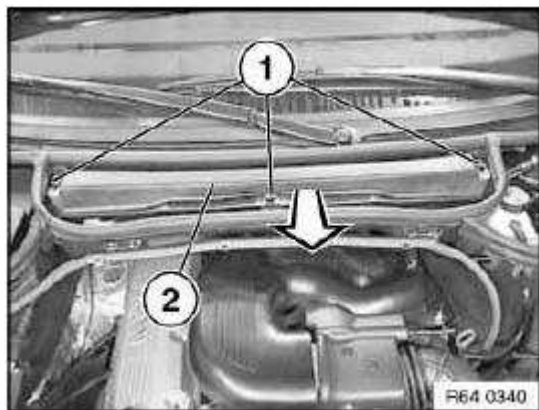


Fig. 40: Toggle And Cover

Courtesy of BMW OF NORTH AMERICA, INC.

Turn toggle (1) through approx. 90° and remove cover (2) towards front.

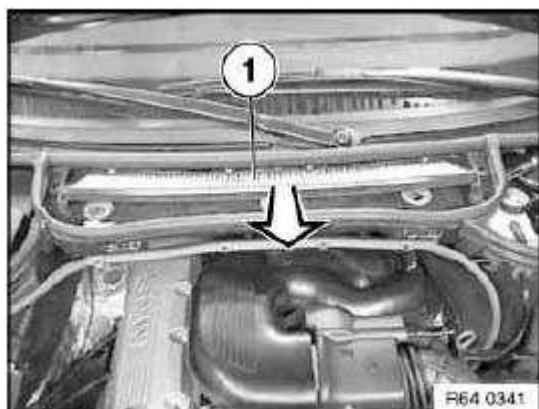


Fig. 41: Microfilter Element

Courtesy of BMW OF NORTH AMERICA, INC.

Remove microfilter element (1).

64 31 010 REPLACING MICROFILTER FOR INTERIOR VENTILATION

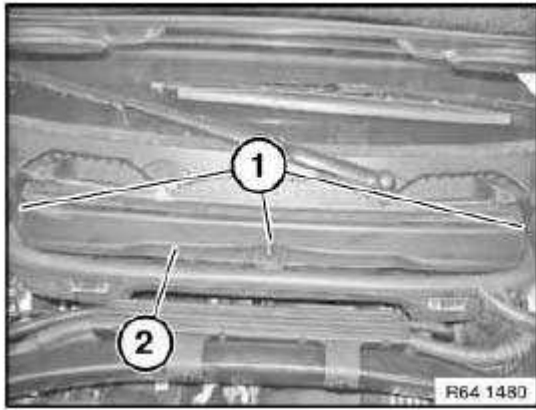


Fig. 42: Rotary Catches And Raise Cover
 Courtesy of BMW OF NORTH AMERICA, INC.

Unlock rotary catches (1), raise cover (2) and remove microfilter.

64 31 010 REPLACING MICROFILTER FOR INTERIOR VENTILATION

IMPORTANT: Risk of damage! A/C system must not be operated without the prescribed filter element.

Note on cleaning: Spray microfilter housing from inside with BMW pollen filter housing cleaner. Wipe away excess liquid. This kills off germs, bacteria and fungi that cause smells. The smell that results on the plastic parts of the microfilter housing is eliminated.

Remove sealing lips at marked points. Unclip line and water hose (1) from cover (3). Release retaining lug (2). Feed out cover (3).

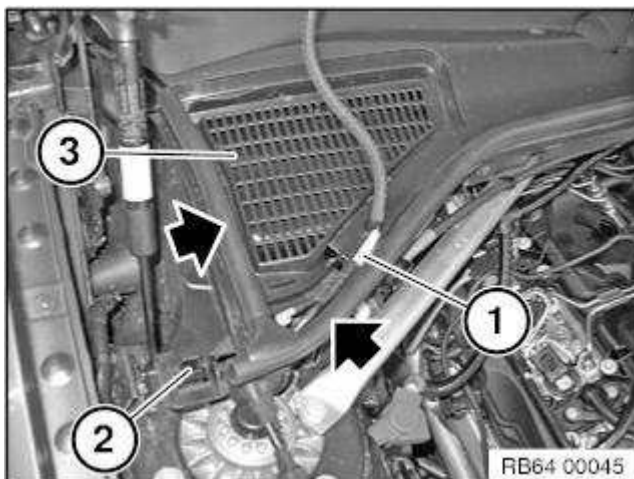


Fig. 43: Unclip Line And Water Hose (1) From Cover (3)
 Courtesy of BMW OF NORTH AMERICA, INC.

Cover tabs (1) must snap in correctly under cowl panel.

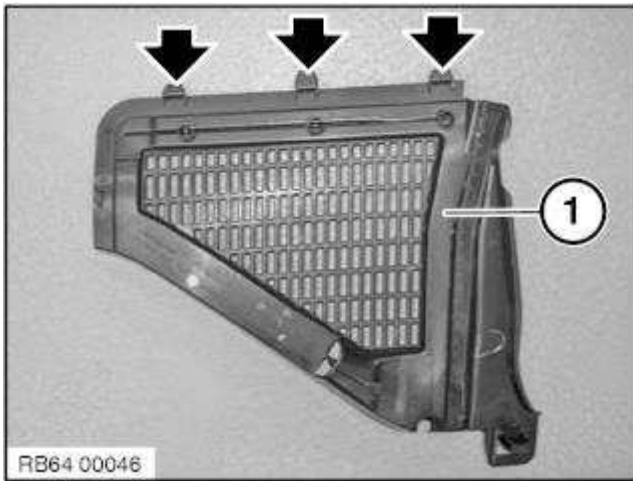


Fig. 44: Cover Tabs (1) Must Snap In Correctly Under Cowl Panel
Courtesy of BMW OF NORTH AMERICA, INC.

Remove filter cover (1) in direction of arrow.

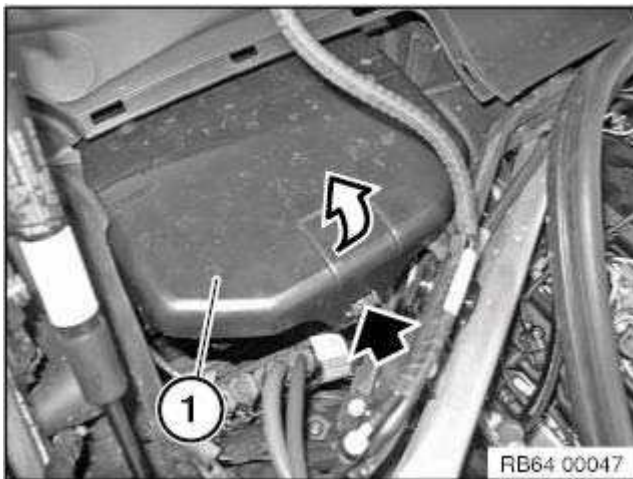


Fig. 45: Remove Filter Cover (1) In Direction Of Arrow
Courtesy of BMW OF NORTH AMERICA, INC.

Remove upper microfilter (1) in direction of arrow.

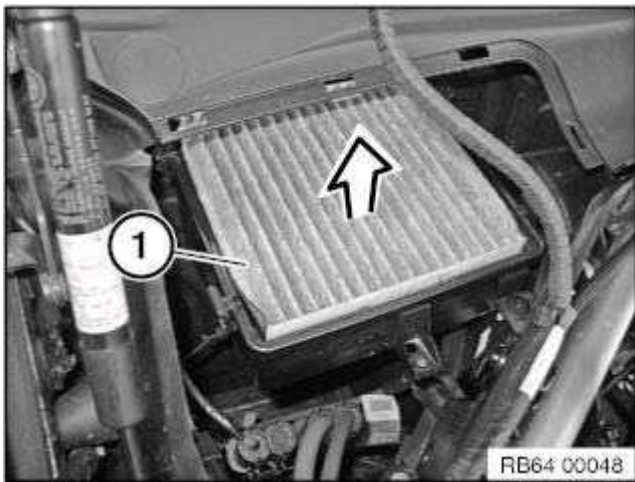


Fig. 46: Remove Upper Microfilter (1) In Direction Of Arrow
Courtesy of BMW OF NORTH AMERICA, INC.

Unclip filter frame (1) at the marked points and detach. Remove lower microfilter (2) in direction of arrow.

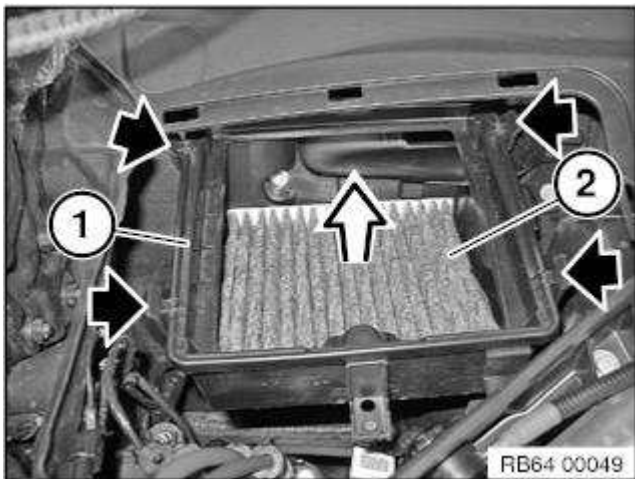


Fig. 47: Unclip Filter Frame (1) At The Marked Points And Detach
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note: Make sure upper microfilter (1) and lower microfilter (2) are installed in the correct position. The arrows mark the direction of the air intake.

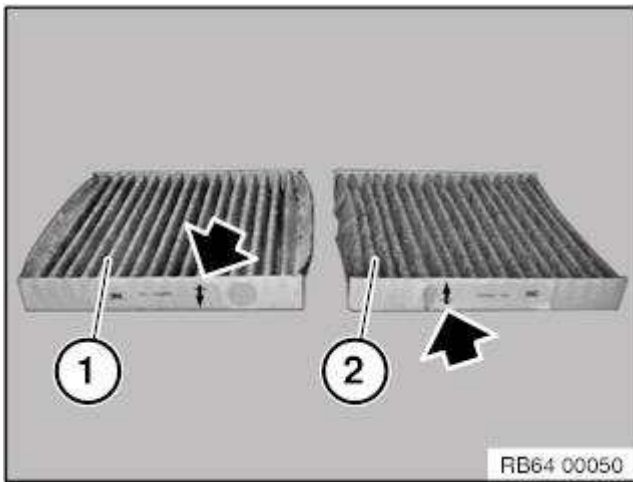


Fig. 48: Make Sure Upper Microfilter (1) And Lower Microfilter (2) Are Installed In The Correct Position

Courtesy of BMW OF NORTH AMERICA, INC.

64 31 080 REMOVING AND INSTALLING/REPLACING MICROFILTER HOUSING

Necessary preliminary tasks:

- Remove microfilter.
- Remove cable duct cover .

Release screws (1). Remove lines from cable duct (2). Feed microfilter housing (3) upwards in direction of arrow.

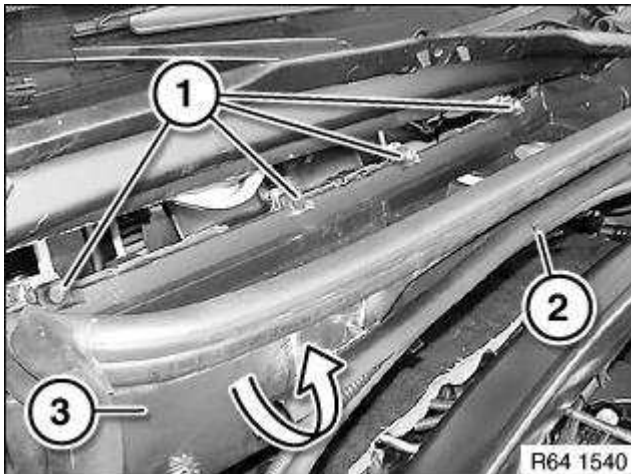


Fig. 49: Feed Microfilter Housing (3) Upwards In Direction Of Arrow
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation: Make sure water drain hoses (1) are correctly seated.

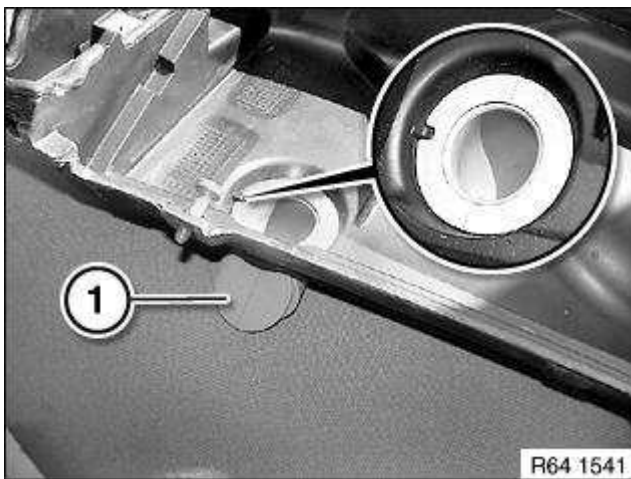


Fig. 50: Make Sure Water Drain Hoses (1) Are Correctly Seated
Courtesy of BMW OF NORTH AMERICA, INC.

50 AIR CONDITIONING SYSTEM

64 50 ... AIR CONDITIONER TEST (R 134A)

Before A/C efficiency test, satisfy following conditions:

1. Provide a MoDiC or DIS. Safeguard electrical system integrity by checking the fault memory (no faults in the fault memory).
2. Provide a thermometer with separate gauge.
3. Perform the test in a suitable work bay with an ambient temperature between 20°C and 30°C.

Re 1:

Connect MoDiC or DIS to car and display evaporator temperature.

Re 2:

Position a thermometer with a separate gauge approx. 5 cm below the roof liner at the height of the B-pillar. Lay gauge outwards out of vehicle interior.

Re 3:

Heating up vehicle interior:

- A/C button is not activated during heating up.
- Close all windows and doors.
- Set recirculated air mode.
- Select air distribution mode for footwell and defrosting.
- Maximum temperature setting.

- Maximum fan stage.
- Run engine at approx. 2000 RPM until operating temperature is reached, then idle speed.

A/C efficiency test:

Turn on A/C compressor at a vehicle interior temperature of 50°C.

After 3-4 minutes, the evaporator sensor temperature must be < or = 15°C.

Draw off A/C system if this temperature is not reached, see **64 50 009 Drawing off, evacuating and filling A/C system (R 134a)**. Measure amount of refrigerant drawn off.

If drawn-off quantity does not correspond to specified fill quantity:**64 50 A/C SYSTEM, REFRIGERANT AMOUNTS E83** supplement refrigerant and repeat test.

If fill quantity is correct, continue troubleshooting by pressure measurement .

**NOTE: A/C systems with uncontrolled compressors only:
 If necessary, then continue troubleshooting by pressure measurement .**

64 50 ... INSTRUCTIONS FOR HANDLING REFRIGERANT R 134A

WARNING: Although R 134a at normal temperature is non-toxic, non-flammable and not explosive in air in any mixture ratio, it is still essential to follow various safety precautions.

The filled refrigerant circuit of the A/C system is subject to gauge pressure. When carrying out repairs on the A/C system, it is absolutely essential to draw off the refrigerant.

Do not weld or solder on filled A/C systems or in rooms into which R 134a may have leaked. Exposure to flames or high temperatures (< or = 50°C) may give rise to toxic decomposition products (fluorine gas). For this reason, do not smoke either.

R 134a must be drawn off, cleaned and returned to the A/C system with a service station following the relevant operating instructions.

Avoid all contact with liquid or gaseous R 134a. Wear protective goggles and gloves when working on the refrigerant circuit. R 134a acting on the skin can cause frostbite. Rinse affected body parts thoroughly with cold water. If R 134a gets into your eyes, likewise rinse with plenty of water and, if necessary, remove contact lenses if worn. Then seek immediate medical attention. Likewise seek immediate medical attention if you experience problems after inhaling R 134a fumes.

As a gas, R 134a is colorless, odorless and heavier than air. If it gets into the atmosphere, this may result especially in workshop pits in an imperceptible danger of asphyxiation or in cardiac palpitations. Ventilate rooms adequately; if necessary, turn on installed extractor systems.

For a properly functioning A/C system, it is essential to have the greatest possible levels of cleanliness when working on the A/C system and the best possible evacuation (at least 30 minutes dehumidification from refrigerant circuit) before each filling of the A/C system.

R 134a absorbs moisture very easily. Therefore seal off opened pipes, condenser, evaporator, compressor and drier bottle immediately with plugs.

With replacement parts, the plugs may only be removed immediately before the lines are connected.

In the event of warranty claims, the old parts must be provided with plugs to be able to determine the cause of the damage.

If an A/C system has been completely drained by leakage, accident or repair, the drier element must be replaced as excessive moisture may have entered the system.

Store filled pressurized refrigerant bottles in such a way that they are not exposed to direct sunlight or other heat sources (max. 45°C). Also avoid exposing them to mechanical stress (e.g. by dropping).

In the event of fire, carbon dioxide (CO₂), extinguishing powder and a sprayed water jet are deemed to be suitable extinguishants. Cool reservoirs at risk with a sprayed water jet (risk of bursting!).

IMPORTANT: After each refill of an A/C system, check that protective caps of filling valves are hand-tight. They serve as additional seals.

64 50 ... INSTRUCTIONS FOR HANDLING REFRIGERANT OIL (FOR REFRIGERANT R 134A)

WARNING: Observe the following points when handling refrigerant oil:

- **Wear protective goggles.**
- **Wear gloves made from impermeable plastic.**
- **Do not swallow.**
- **Do not inhale.**

Action to be taken after contact with refrigerant oil:

- **After contact with eyes, rinse thoroughly with plenty of water and take out contact lenses (if worn). Then seek immediate medical attention.**
- **After contact with the skin, wash body parts affected with plenty of soap and water.**
- **Do not induce vomiting if oil is swallowed, seek immediate medical attention.**
- **If inhaled, introduce the person affected to fresh air. Seek medical attention if problems persist.**

WARNING: Refrigerant oil is non-combustible and non-explosive at normal temperatures. In spite of this, the following precautions must be observed:

- Do not store in the vicinity of flames, heat sources or strongly oxidizing materials.
- Suitable extinguishants: carbon dioxide (CO²), dry extinguishing, foam.

IMPORTANT: Refrigerant oil is hygroscopic and must therefore be stored in suitable containers that are sealed airtight!

Recycling:

Dispose of drawn-off refrigerant oil as hazardous waste.

Observe country-specific waste-disposal regulations.

Absorb escaping refrigerant oil with fluid-binding material.

Notify the relevant authorities if larger amounts of refrigerant oil are discharged into above-ground water supplies, drainage systems or subsoil.

64 50 ... LEAK TESTING WITH ULTRAVIOLET ADDITIVES (UV ADDITIVES) (BMW LEAK-TESTING CASE)

IMPORTANT: It is absolutely essential to read and comply with the equipment manufacturer's instructions for use provided in the equipment case!

Read and comply with the instructions for use provided with the special tool particularly with regard to accident prevention, health protection and environmental protection.

Use only BMW-approved UV-additives (e.g. TRACER).

Only the basic procedure is described in the following!

WARNING: Avoid contact with refrigerant.

Follow safety precautions when handling refrigerant, see 64 50 ... Instructions for handling refrigerant R 134a.

IMPORTANT: UV lamp gets very hot in the radiation area!

Do not use the UV lamp without the filter glass.

Eyes and skin will suffer damage if the UV lamp is used without the filter glass.

When using the UV lamp, wear the protective goggles provided in the case.

NOTE:

- Fill the hose system of the hand pump completely with UV additive PRIOR to use

- Use the UV additive exclusively for BMW-approved refrigerant oils
- Do not operate the A/C system while the hand pump is connected or in use
- The A/C system must always be filled with an adequate amount of refrigerant to enable the leak-detecting agent to be properly distributed

Necessary preliminary tasks:

Before actually testing for leaks, check the entire refrigerant circuit using the UV leak-detecting lamp to ensure that no AV additive is already in the area of the refrigerant circuit.

If already illuminated areas are found, carefully clean the area in question with the cleaning agent contained in the case.

On initial use:

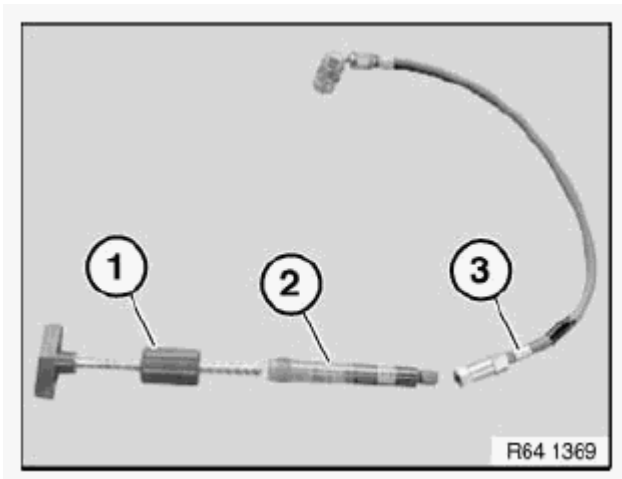


Fig. 51: Additive Cartridge And Hose Piece
Courtesy of BMW OF NORTH AMERICA, INC.

Connect hand pump (1) to additive cartridge (2) and hose piece (3).

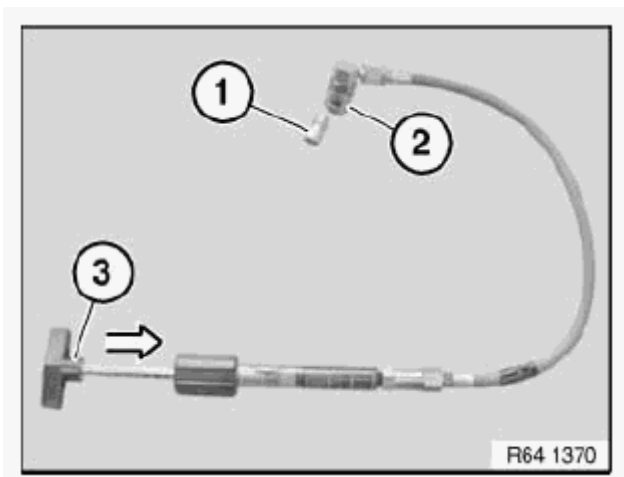


Fig. 52: Vent Valve And Quick-Connect Coupling
Courtesy of BMW OF NORTH AMERICA, INC.

On Initial use:

Attach vent valve (1) to quick-connect coupling (2).

Turn handle (3) on hand pump to advance the plunger until a small amount of UV additive emerges. This vents the hose system.

IMPORTANT: The entire hand pump with hose system must not be disassembled again once the filling work has been completed.

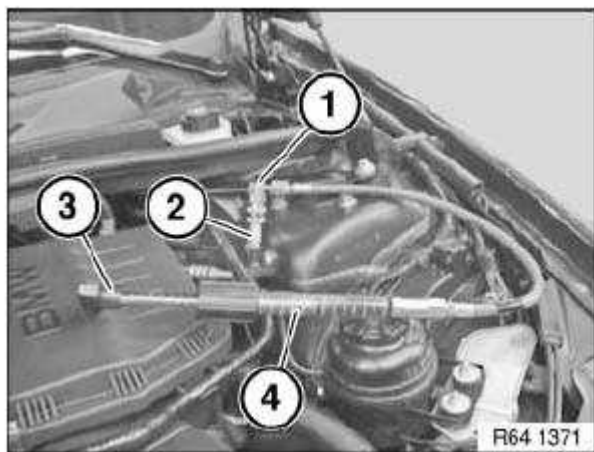


Fig. 53: Quick-Connect Coupling
Courtesy of BMW OF NORTH AMERICA, INC.

Attach quick-connect coupling (1) to low-pressure connection (2) of A/C system.

Turn handle on hand pump (3) until the required amount of UV additive is added.

The quantity of UV additive to be added is dependent on the amount of refrigerant in the refrigerant circuit, see **64 50 A/C SYSTEM, REFRIGERANT AMOUNTS E83** :

- A/C systems with refrigerant filling up to 900 g: one graduation mark (4) on additive cartridge
- A/C systems with refrigerant filling in excess of 900 g: two graduation marks (4) on additive cartridge

NOTE: After filling, remove quick-connect coupling (1) and if necessary use the cleaning agent contained in the special tool case to clean up the UV additive.

Further tasks:

- Start engine.
- Run A/C system at highest setting for 5-10 minutes in order to ensure adequate distribution of dye in the system
- Switch off engine
- Check all A/C system components for possible leaks
- Possible leaks show up in luminous green

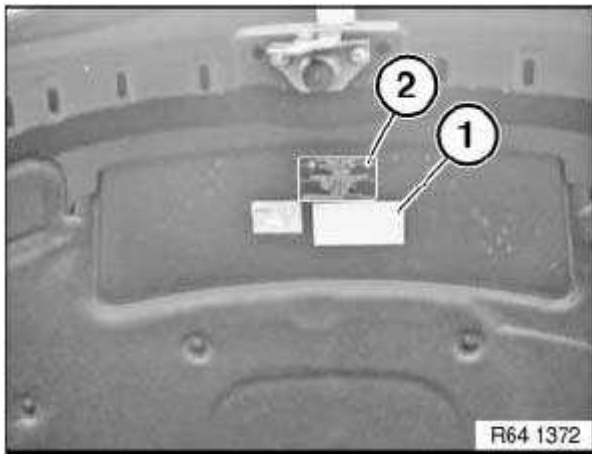


Fig. 54: Accompanying Information Label And Filling Capacity Information Label
Courtesy of BMW OF NORTH AMERICA, INC.

Complete accompanying information label (1) with the relevant data and attach in an easily visible position next to the filling capacity information label (2).

64 50 ... LEAK-TESTING WITH LEAK TESTER DEVICE

WARNING: Avoid contact with refrigerant.

Follow safety precautions when handling refrigerant, see 64 50 ... Instructions for handling refrigerant R 134a.

Carry out leak-testing with a leak tester device from the workshop equipment catalog following the device manufacturer's operating instructions.

If leaks not to be localized are already identified during evacuation, the A/C system must nevertheless be filled, see **64 50 009 Drawing off, evacuating and filling A/C system (R 134a)**. Then test for leaks with leak tester device.

NOTE: Refrigerant is heavier than air.
Therefore always conduct the leak test below the lines and components to be tested.
Shield lines and components against strong blasts of air (wind, drawing off).

Tighten down loose lines, mark leaks.

Then draw off **64 50 009 Drawing off, evacuating and filling A/C system (R 134a)** A/C system and seal off or repair leakage points.

Then refill **64 50 009 Drawing off, evacuating and filling A/C system (R 134a)** A/C system and test for leaks.

64 50 ... SAFETY INSTRUCTIONS FOR HANDLING REFRIGERANT R134A

WARNING: Risk of injury!
Refrigerant circuit is under high pressure! Work on the refrigerant circuit may only be carried out by experts!
Draw off refrigerant without fail BEFORE all repair work on the refrigerant circuit.
The refrigerant circuit is depressurized AFTER drawing off!
It is absolutely essential to read and observe the relevant operating instructions for the A/C service unit used!

Protective measures/rules of conduct:

- Wear protective goggles
- Wear oil-resistant protective gloves
- Do not smoke!
- Observe country-specific safety regulations.

First aid measures:

- Eye contact: In the event of contact with the eyes, rinse immediately with plenty of running water and consult a doctor.
- Skin contact: In the event of contact with skin, remove affected clothing immediately and rinse with plenty of water.
- After inhalation: If refrigerant vapors are inhaled in greater concentrations, remove the person affected to an area of fresh air and keep them under supervision. Consult a doctor. If breathing problems are experienced, breathe additional oxygen. If the person affected is breathing with difficulty or has stopped breathing, incline the person's head at the neck and administer the kiss of life.

64 50 009 DRAWING OFF, EVACUATING AND FILLING A/C SYSTEM (R 134A)

WARNING: Refrigerant circuit is under high pressure!
Repair work may only be carried out on a **DEPRESSURIZED** refrigerant circuit!
Avoid contact with refrigerant and refrigerant oil.
Follow safety instructions for handling refrigerant R 134a, see 64 50 ... Safety instructions for handling refrigerant R134a.
Follow safety instructions for handling refrigerant oil, see 64 50 ... Instructions for handling refrigerant oil (for refrigerant R 134a).

IMPORTANT: Risk of damage!
Restart engine only when A/C system has been correctly filled.

NOTE: Draw off, evacuate and fill the A/C system in accordance with the operating instructions of the relevant service station.

E60 only:

If necessary, to connect service station, use manufacturer's adapter for high-pressure connection (red).

Instructions for drawing off A/C system:

To help separation of refrigerant and refrigerant oil, run engine at low speed (800-1200 RPM) and with A/C system turned on for a few minutes.

The limits the entrainment of refrigerant oil while it is drawn off.

Drawn-off refrigerant oil must be changed and reintroduced via the service station.

If at the end of the drawing-off procedure the service station moisture indicator shows that the drawn-off refrigerant is excessively moist, clean the refrigerant in accordance with the service station operating instructions.

Recycling:

Dispose of drawn-off refrigerant oil as hazardous waste.

Observe country-specific waste-disposal regulations.

Instructions for evacuating off A/C system:

The evacuation procedure removes all traces of ambient air, water vapor and any other gases present from the A/C system. This enables subsequent system filling with refrigerant.

A decrease in the vacuum level indicates a leak in the refrigerant circuit. 64 50 ... Leak testing with ultraviolet

additives (UV additives) (BMW leak-testing case)



Fig. 55: Instructions For Filling A/C System Screen
Courtesy of BMW OF NORTH AMERICA, INC.

Instructions for filling A/C system:

Before filling with refrigerant, top up the refrigerant oil entrained during drawing off.

Follow instructions for opening and replacing parts in refrigerant circuit!**64 52 ... Instructions for opening and replacing parts in refrigerant circuit.**

Depending on the type of component replaced on the A/C system, it may be necessary to top up the refrigerant oil, even if no measurable losses have occurred during drawing off. Read and comply with the A/C system manufacturer's notes in this regard and the operating instructions of the relevant service station.

Information on the required refrigerant fill quantity for the entire A/C system is contained on the rating plate (1) in the engine compartment.

Installation:

Reseal refrigerant filler necks on vehicle with sealing caps.

64 52 ... INSTRUCTIONS FOR OPENING AND REPLACING PARTS IN REFRIGERANT CIRCUIT

WARNING:

- **Avoid contact with refrigerant and refrigerant oil**
- **Follow safety instructions for handling R134a refrigerant, see 64 50 ... Safety instructions for handling refrigerant R134a.**
- **Follow safety instructions for handling refrigerant oil, see 64 50 ... Instructions for handling refrigerant oil (for refrigerant R 134a).**

CAUTION:

- **Always use new O-rings each time A/C connections are opened.**

- **Moisten O-rings with refrigerant oil prior to fitting**
- **Seal all parts to be returned at openings to prevent ingress of moisture or foreign bodies**

I. Opening refrigerant circuit without part replacement, as preliminary work to further work

(e.g. engine removal):

Work sequence:

- Draw off A/C system, then determine drawn-off refrigerant oil quantity, see **64 50 009 Drawing off, evacuating and filling A/C system (R 134a)**.
- Carry out main work
- Replace removed refrigerant oil with new refrigerant oil
- Evacuate and fill A/C system, see **64 50 009 Drawing off, evacuating and filling A/C system (R 134a)**.

II. Part replacement and part replacement on account of insidious leak

(minor leak, e.g. hairline crack)

Work sequence:

- Draw off A/C system, then determine drawn-off refrigerant oil quantity, see **64 50 009 Drawing off, evacuating and filling A/C system (R 134a)**.
- Carry out part replacement
- Replace removed refrigerant oil with new refrigerant oil
- Additionally replenish new refrigerant oil in accordance with replaced parts:
 - Compressor: refer to **64 52 ... Instructions for compressor replacement**.
 - Evaporator: 10 ml
 - Condenser: 10 ml
 - Desiccant insert / desiccant bottle: 30 ml
 - Each replaced refrigerant line: 10 ml
 - Condenser with integrated dryer: 30 ml
 - Safety pressure switch and seals: no additional refrigerant oil
- Evacuate and fill A/C system, see **64 50 009 Drawing off, evacuating and filling A/C system (R 134a)**.

III. Part replacement on account of sudden leak

(major leak, e.g. pipe break due to accident)

Work sequence:

- Draw off A/C system, then determine drawn-off refrigerant oil quantity, see **64 50 009 Drawing off, evacuating and filling A/C system (R 134a)**.
- Carry out part replacement
- Replace removed refrigerant oil with new refrigerant oil
- Additionally replenish 25 ml new refrigerant oil and new refrigerant oil in accordance with replaced parts:
 - Compressor: refer to **64 52 ... Instructions for compressor replacement**.
 - Evaporator: 10 ml
 - Condenser: 10 ml
 - Desiccant insert / desiccant bottle: 30 ml
 - Each replaced refrigerant line: 10 ml
 - Condenser with integrated dryer: 30 ml
 - Safety pressure switch and seals: no additional refrigerant oil
- Evacuate and fill A/C system, see **64 50 009 Drawing off, evacuating and filling A/C system (R 134a)**.

51 A/C HOUSING/EVAPORATOR, SWITCHING ELEMENTS

64 51 522 REMOVING AND INSTALLING OR REPLACING EXPANSION VALVE

Necessary preliminary tasks:

- Draw off A/C system, then determine drawn-off refrigerant oil quantity, see **64 50 009 Drawing off, evacuating and filling A/C system (R 134a)**.
- Remove heater bulkhead, see **51 71 080 REMOVING AND INSTALLING/REPLACING HEATER BULKHEAD**.

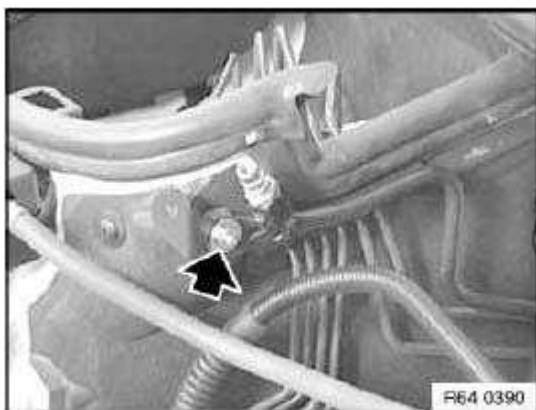


Fig. 56: Locating Nut

Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten nut.

Installation:

Tightening torque: 64 53 10AZ, see **64 11 HOUSING, HEATER/AIR CONDITIONER** .

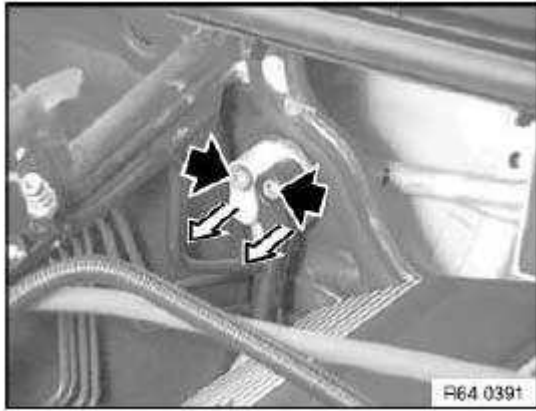


Fig. 57: Locating Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws.

Detach refrigerant lines in direction of arrow.

Installation:

Replace sealing rings.

Tightening torque: 64 53 2AZ, see **64 11 HOUSING, HEATER/AIR CONDITIONER** .

If necessary, pull lock (1) in direction of arrow and feed out flap (2).

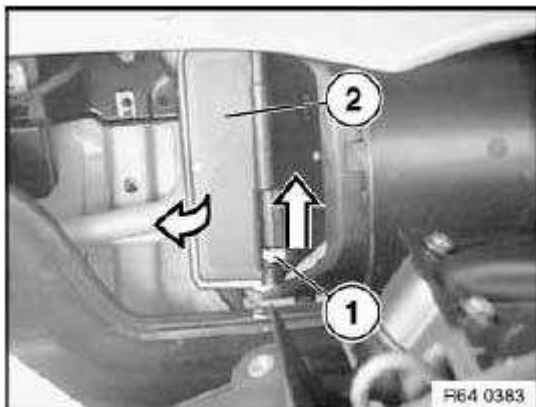


Fig. 58: Pulling Lock

Courtesy of BMW OF NORTH AMERICA, INC.

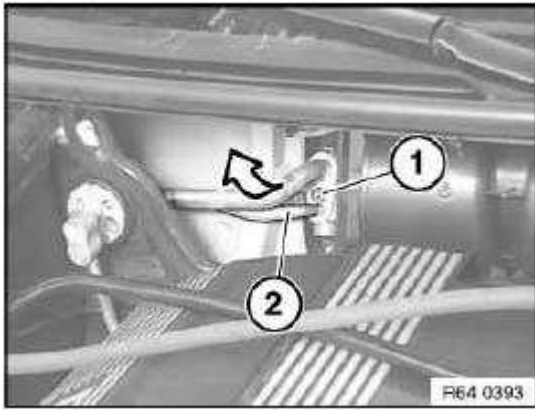


Fig. 59: Double Pipe

Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew nut (1).

Installation:

Replace sealing rings.

Tightening torque: 64 53 11AZ, see **64 11 HOUSING, HEATER/AIR CONDITIONER** .

Detach double pipe (2) in direction of arrow and lay to one side.

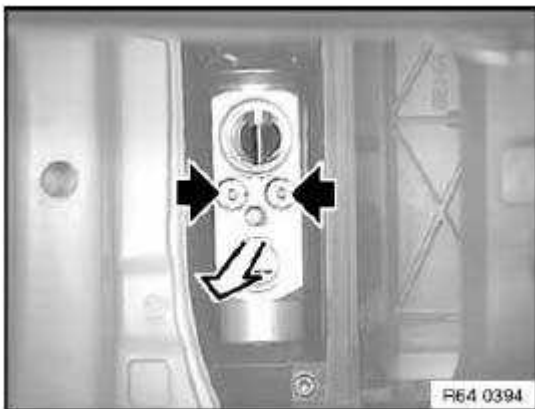


Fig. 60: Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws.

Installation:

Replace sealing rings.

Tightening torque: 64 53 9AZ, see **64 11 HOUSING, HEATER/AIR CONDITIONER** .

Pull out expansion valve in direction of arrow.

64 52 ... INSTRUCTIONS FOR OPENING AND REPLACING PARTS IN REFRIGERANT CIRCUIT

WARNING:

- **Avoid contact with refrigerant and refrigerant oil**
- **Follow safety instructions for handling R134a refrigerant, see 64 50 ... Safety instructions for handling refrigerant R134a.**
- **Follow safety instructions for handling refrigerant oil, see 64 50 ... Instructions for handling refrigerant oil (for refrigerant R 134a).**

CAUTION:

- **Always use new O-rings each time A/C connections are opened**
- **Moisten O-rings with refrigerant oil prior to fitting**
- **Seal all parts to be returned at openings to prevent ingress of moisture or foreign bodies**

I. Opening refrigerant circuit without part replacement, as preliminary work to further work

(e.g. engine removal):

Work sequence:

- **Draw off A/C system, then determine drawn-off refrigerant oil quantity, see 64 50 009 Drawing off, evacuating and filling A/C system (R 134a).**
- **Carry out main work**
- **Replace removed refrigerant oil with new refrigerant oil**
- **Evacuate and fill A/C system, see 64 50 009 Drawing off, evacuating and filling A/C system (R 134a).**

II. Part replacement and part replacement on account of insidious leak

(minor leak, e.g. hairline crack)

Work sequence:

- **Draw off A/C system, then determine drawn-off refrigerant oil quantity, see 64 50 009 Drawing off, evacuating and filling A/C system (R 134a).**
- **Carry out part replacement**
- **Replace removed refrigerant oil with new refrigerant oil**
- **Additionally replenish new refrigerant oil in accordance with replaced parts:**
 - **Compressor: refer to 64 52 ... Instructions for compressor replacement.**
 - **Evaporator: 10 ml**

- Condenser: 10 ml
- Desiccant insert / desiccant bottle: 30 ml
- Each replaced refrigerant line: 10 ml
- Condenser with integrated dryer: 30 ml
- Safety pressure switch and seals: no additional refrigerant oil
- Evacuate and fill A/C system, see **64 50 009 Drawing off, evacuating and filling A/C system (R 134a)**.

III. Part replacement on account of sudden leak

(major leak, e.g. pipe break due to accident)

Work sequence:

- Draw off A/C system, then determine drawn-off refrigerant oil quantity, see **64 50 009 Drawing off, evacuating and filling A/C system (R 134a)**.
- Carry out part replacement
- Replace removed refrigerant oil with new refrigerant oil
- Additionally replenish new refrigerant oil in accordance with replaced parts:
 - Compressor: refer to **64 52 ... Instructions for compressor replacement**.
 - Evaporator: 10 ml
 - Condenser: 10 ml
 - Desiccant insert / desiccant bottle: 30 ml
 - Each replaced refrigerant line: 10 ml
 - Condenser with integrated dryer: 30 ml
 - Safety pressure switch and seals: no additional refrigerant oil
- Evacuate and fill A/C system, see **64 50 009 Drawing off, evacuating and filling A/C system (R 134a)**.

IV. Part replacement on account of sudden leak

(major leak, e.g. pipe break due to accident)

Work sequence:

- Draw off A/C system, then determine drawn-off refrigerant oil quantity, see **64 50 009 Drawing off, evacuating and filling A/C system (R 134a)**.
- Carry out part replacement
- Replace removed refrigerant oil with new refrigerant oil
- Additionally replenish 25 ml new refrigerant oil and new refrigerant oil in accordance with replaced parts:
 - Compressor: refer to **64 52 ... Instructions for compressor replacement**.
 - Evaporator: 10 ml

- Condenser: 10 ml
- Desiccant insert / desiccant bottle: 30 ml
- Each replaced refrigerant line: 10 ml
- Condenser with integrated dryer: 30 ml
- Safety pressure switch and seals: no additional refrigerant oil
- Evacuate and fill A/C system, see **64 50 009 Drawing off, evacuating and filling A/C system (R 134a)**.

64 51 ... LEAK-TESTING CONDENSER

Special tools Required

- **00 9 030 (Wedge)**
- **64 5 121 (Connection hose with clamp)**
- **64 5 122 (Climate condenser test adapter)**
- **64 5 123 (Climate condenser seal plug)**

WARNING: Risk of injury!

Refrigerant circuit is under high pressure!

Follow safety instructions for handling refrigerant

Comply with the standard national safety instructions and precautions on handling nitrogen.

Ensure that employees are advised of how to handle pressurized vessels and nitrogen correctly (danger of asphyxiation). For this purpose, follow the notes and instructions in the technical safety specifications available from the gas supplier.

Necessary preliminary tasks:

- Drain off **air conditioner**
- Detach refrigerant lines from condenser

Tightening torque, see 64 53 6AZ in **64 53 REFRIGERANT LINES AND EXPANSION VALVE** .

IMPORTANT: Risk of damage!

Special tool 64 5 122 and special tool 64 5 123 have different diameters (A, B) at the seal plugs!

Ensure correct connection assignment on condenser.

Replace sealing rings (1) prior to each use.

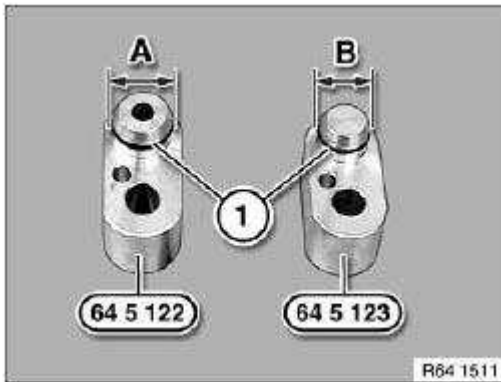


Fig. 61: Identifying Special Tool 64 5 122, 64 5 123 & Sealing Rings
Courtesy of BMW OF NORTH AMERICA, INC.

Fit and secure sealing adapter **64 5 123** to connection of low-pressure line.

Fit and secure test adapter **64 5 122** to connection of low-pressure line.

Tightening torque, see 64 53 6AZ in **64 53 REFRIGERANT LINES AND EXPANSION VALVE** .

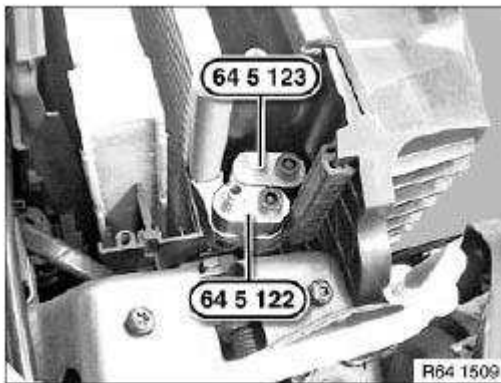


Fig. 62: Identifying Special Tool 64 5 122 & 64 5 123
Courtesy of BMW OF NORTH AMERICA, INC.

Connect special tool **64 5 122** to special tool **64 5 121** .

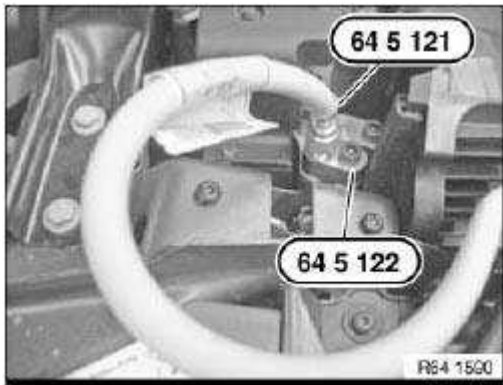


Fig. 63: Identifying Special Tool 64 5 122 & 64 5 121
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage: Use only nitrogen pressure bottles with pressure reducers for leak-testing.

Pressurize condenser to 10 bar slowly only. Excessively fast pressurization and pressures in excess of 20 bar may cause damage to the condenser.

Connect nitrogen pressure bottle with pressure reducer to pressure gauge and then connect to special tool **64 5 121** (connecting hose).

NOTE:

- **Testing apparatus must be leakproof.**
- **Ambient temperature and temperature of vehicle must not change during the test procedure.**
- **Do not move the vehicle during this period**

Apply test pressure of 10 bar **slowly** and close nitrogen pressure bottle.

Check leak-tightness of testing apparatus and of connection to refrigerant line.

Set test pressure of 10 bar is only permitted to drop by 2 bar to 8.5 bar over a test period of 1.5 hours.

If the pressure loss is greater than 1.5 bar, this indicates that there is a leak in the condenser unit.

WARNING: After leak-testing, unscrew special tool 64 5 121 slowly from special tool 64 5 122 to reduce pressure.

After leak-testing:

- Replace all sealing rings and moisten with refrigerant oil
- Assemble A/C system
- Evacuate and fill A/C system

64 51 ... LEAK-TESTING EVAPORATOR

Special tools Required

- 64 5 121
- 64 5 125

WARNING: It is essential, when handling nitrogen, to observe the standard national safety regulations.

Ensure that employees are advised of how to handle pressurized vessels and nitrogen correctly (danger of asphyxiation). For this purpose, follow the notes and instructions in the technical safety specifications available from the gas supplier.

Necessary preliminary tasks:

- Remove expansion valve .

Replace sealing rings (1) and coat with refrigerant oil

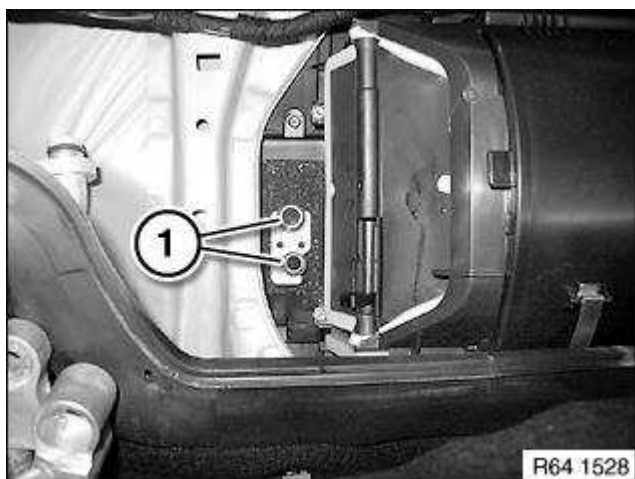


Fig. 64: Replace Sealing Rings (1) And Coat With Refrigerant Oil
Courtesy of BMW OF NORTH AMERICA, INC.

Connect special tool **64 5 125** to retainer and screws of expansion valve.

Tightening torque, see 64 53 9AZ in **64 53 REFRIGERANT LINES AND EXPANSION VALVE** .

Connect special tool **64 5 121** to special tool 64 5 125.

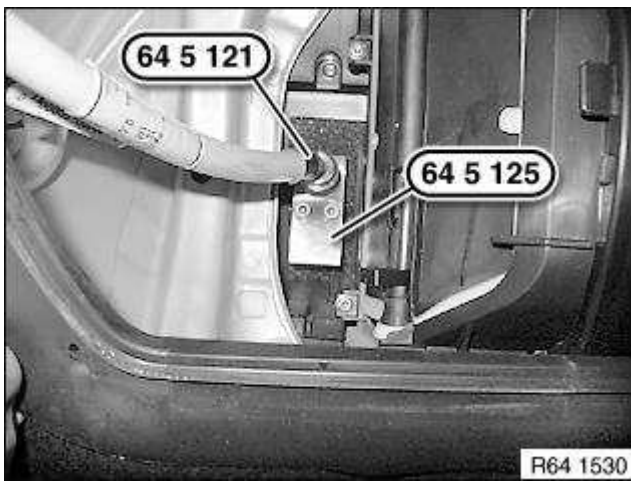


Fig. 65: Identifying Special Tool 64 5 121 & 64 5 125
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage: Use only nitrogen pressure bottles with pressure reducers for leak-testing.

Pressurize evaporator to 10 bar slowly only. Excessively fast pressurization and pressures in excess of 20 bar may cause damage to the evaporator.

Connect nitrogen pressure bottle with pressure reducer to pressure gauge and then connect to special tool **64 5 121** (connecting hose).

NOTE:

- **Testing apparatus must be leakproof.**
- **Ambient temperature and temperature of vehicle must not change during the test procedure.**
- **Do not move the vehicle during this period**

Apply test pressure of 10 bar slowly and close nitrogen pressure bottle.

Check leak-tightness of testing apparatus and of connection to refrigerant line.

Set test pressure of 10 bar is only permitted to drop by 2 bar to 8.5 bar over a test period of 1.5 hours.

If the pressure loss is greater than 1.5 bar, this indicates that there is a leak in the evaporator unit.

WARNING: After leak-testing, unscrew special tool 64 5 121 slowly from special tool 64 5 125 to reduce pressure.

After leak-testing:

- Replace all sealing rings and moisten with refrigerant oil

52 COMPRESSOR

64 52 ... INSTRUCTIONS FOR COMPRESSOR REPLACEMENT

IMPORTANT: Compressors with plastic belt pulleys:

- Avoid impacts/knocks to plastic belt pulley (caused by tools, contact with base).
- Return faulty compressors in their original packaging only.

IMPORTANT: When starting up a new compressor for the first time, it is absolutely essential to carry out the following breaking-in procedure:

- Switch on A/C system
- Set all air vents in instrument cluster to "OPEN"
- Start engine and let it stabilize at idle speed
- Set blower output to min. 75 % of max. blower output
- Switch on A/C system and run for at least 2 minutes at idle speed (risk of damage at higher speed!)

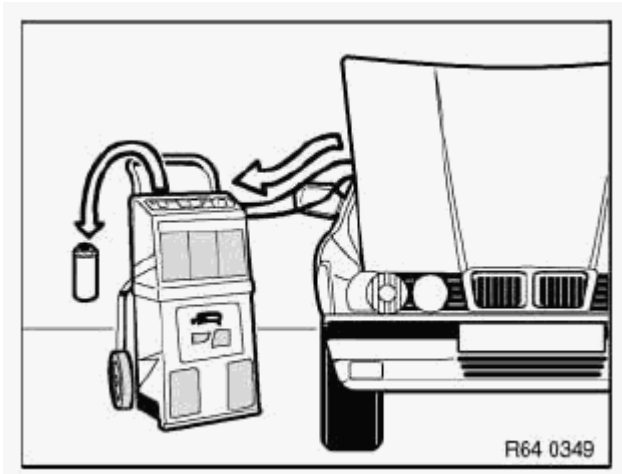


Fig. 66: Evacuating Refrigerant Oil From Air-Conditioning System
Courtesy of BMW OF NORTH AMERICA, INC.

When evacuating the air-conditioning system, refrigerant oil is also extracted and collected in the oil separator of the service station.

After evacuation, the refrigerant must be filtered in the service station as the oil separator could still contain a liquid refrigerant/oil mixture. The filtering process gasifies the refrigerant completely and only the previously bound refrigerant oil remains in the oil separator. Measure and note down this quantity of refrigerant oil, refer to Evacuate and fill A/C system, see **64 50 009 Drawing off, evacuating and filling A/C system (R 134a)**..

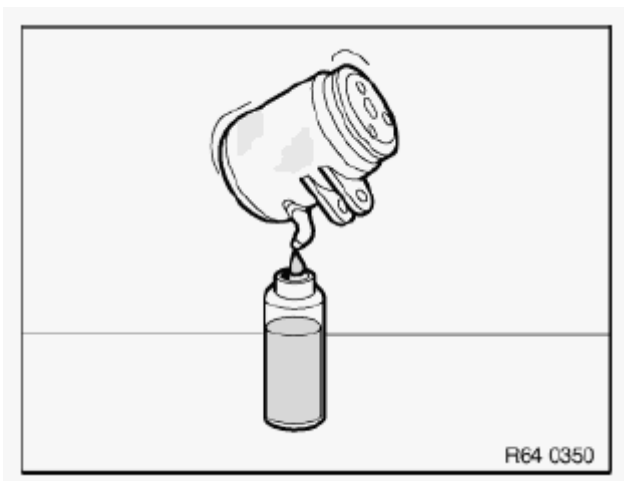


Fig. 67: Transferring Refrigerant Oil Into Container
Courtesy of BMW OF NORTH AMERICA, INC.

Transfer the refrigerant oil remaining in the previous compressor via the filler plug completely into a measuring container.

Measure the amount of refrigerant oil collected from the previous compressor.

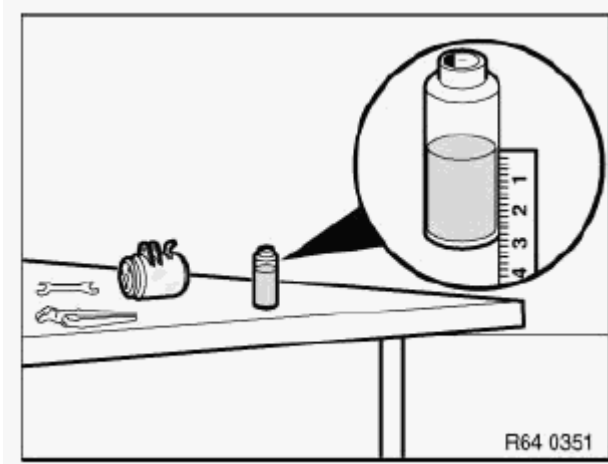


Fig. 68: Measuring Amount Of Refrigerant Oil
Courtesy of BMW OF NORTH AMERICA, INC.

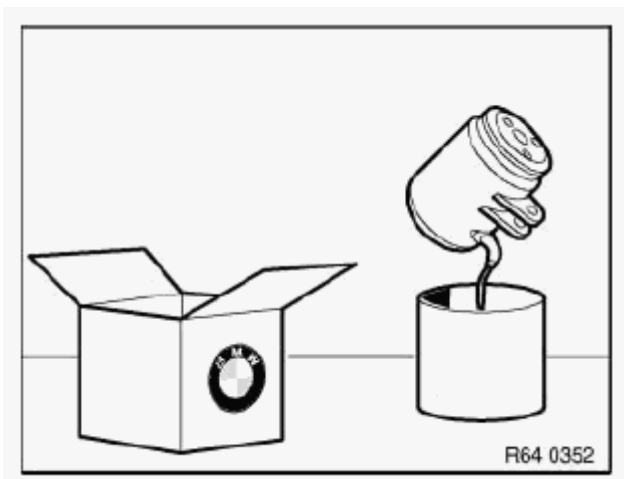


Fig. 69: Removing Refrigerant Oil Into Clean Container
 Courtesy of BMW OF NORTH AMERICA, INC.

The new compressor is filled at the factory with refrigerant oil.

Open filler plug and pour entire contents of compressor into a clean container.

Installation:

Replace sealing ring and moisten with refrigerant oil.

Observe tightening torque: 64 52 2AZ, see **64 52 A/C COMPRESSOR** .

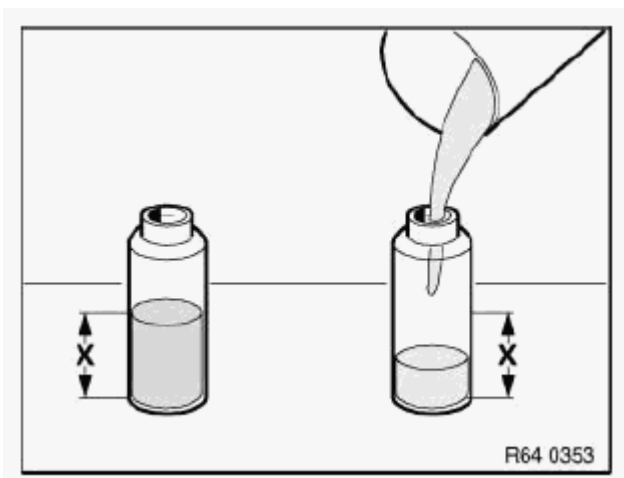


Fig. 70: Pouring Same Amount Of Refrigerant Oil Extra Into Clean Measuring Container
 Courtesy of BMW OF NORTH AMERICA, INC.

From the new compressor, pour the same amount of refrigerant oil (as drained from the previous compressor) + 10 g extra into a clean measuring container and pour again into the new compressor.

Remaining refrigerant oil can be poured into service station tank, refer to Evacuate and fill A/C system, see **64**

50 009 Drawing off, evacuating and filling A/C system (R 134a)..

Otherwise the excess refrigerant oil must be disposed of correctly.

On account of its hygroscopic properties, refrigerant oil must not be stored in open containers.

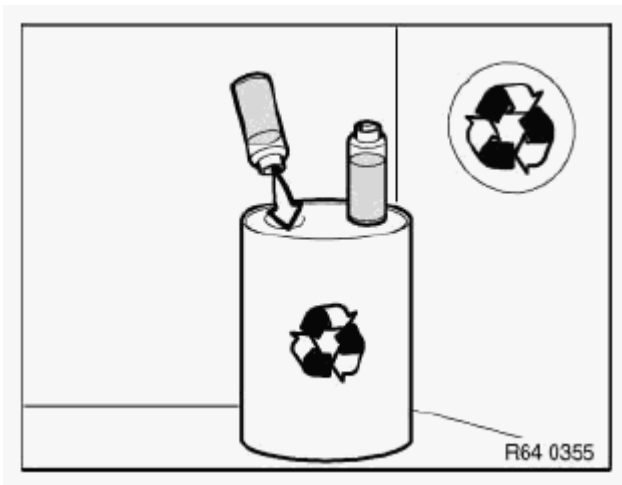


Fig. 71: Draining Refrigerant Oil
Courtesy of BMW OF NORTH AMERICA, INC.

The refrigerant oil drawn off from the oil separator of the service station and from the previous compressor must not be reused and must be correctly disposed of.

After installing the new compressor, it is essential before filling the A/C system to pour the same amount of the previously drawn off refrigerant oil into the system again, refer to Evacuate and fill A/C system, see **64 50 009 Drawing off, evacuating and filling A/C system (R 134a)..**

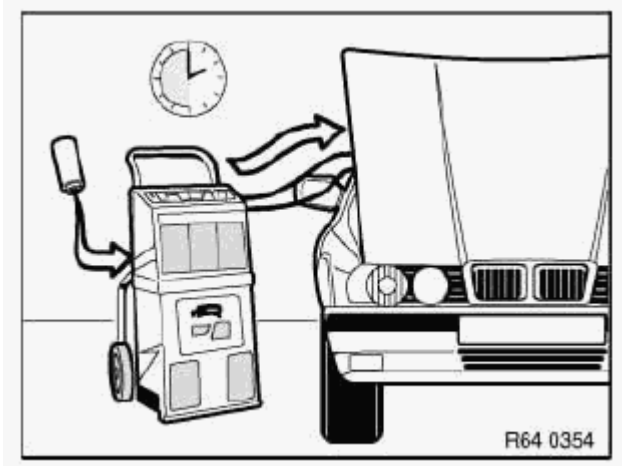


Fig. 72: Evacuating Refrigerant Oil Into A/C System
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

If A/C system is opened for more than 24 hours: Replace drier bottle/drier insert .

64 52 ... INSTRUCTIONS FOR OPENING AND REPLACING PARTS IN REFRIGERANT CIRCUIT

WARNING: Avoid contact with refrigerant and refrigerant oil

- Follow safety instructions for handling R134a refrigerant, see 64 50 ... Safety instructions for handling refrigerant R134a.
- Follow safety instructions for handling refrigerant oil, see 64 50 ... Instructions for handling refrigerant oil (for refrigerant R 134a).

CAUTION:

- Always use new O-rings each time A/C connections are opened
- Moisten O-rings with refrigerant oil prior to fitting
- Seal all parts to be returned at openings to prevent ingress of moisture or foreign bodies

I. Opening refrigerant circuit without part replacement, as preliminary work to further work

(e.g. engine removal):

Work sequence:

- Draw off A/C system, then determine drawn-off refrigerant oil quantity, see 64 50 009 Drawing off, evacuating and filling A/C system (R 134a).
- Carry out main work
- Replace removed refrigerant oil with new refrigerant oil
- Evacuate and fill A/C system, see 64 50 009 Drawing off, evacuating and filling A/C system (R 134a).

II. Part replacement and part replacement on account of insidious leak

(minor leak, e.g. hairline crack)

Work sequence:

- Draw off A/C system, then determine drawn-off refrigerant oil quantity, see 64 50 009 Drawing off, evacuating and filling A/C system (R 134a).
- Carry out part replacement
- Replace removed refrigerant oil with new refrigerant oil
- Additionally replenish new refrigerant oil in accordance with replaced parts:
 - Compressor: refer to 64 52 ... Instructions for compressor replacement.
 - Evaporator: 10 ml
 - Condenser: 10 ml
 - Desiccant insert / desiccant bottle: 30 ml

- Each replaced refrigerant line: 10 ml
- Condenser with integrated dryer: 30 ml
- Safety pressure switch and seals: no additional refrigerant oil
- Evacuate and fill A/C system, see **64 50 009 Drawing off, evacuating and filling A/C system (R 134a)**.

III. Part replacement on account of sudden leak

(major leak, e.g. pipe break due to accident)

Work sequence:

- Draw off A/C system, then determine drawn-off refrigerant oil quantity, see **64 50 009 Drawing off, evacuating and filling A/C system (R 134a)**.
- Carry out part replacement
- Replace removed refrigerant oil with new refrigerant oil
- Additionally replenish new refrigerant oil in accordance with replaced parts:
 - Compressor: refer to **64 52 ... Instructions for compressor replacement**.
 - Evaporator: 10 ml
 - Condenser: 10 ml
 - Desiccant insert / desiccant bottle: 30 ml
 - Each replaced refrigerant line: 10 ml
 - Condenser with integrated dryer: 30 ml
 - Safety pressure switch and seals: no additional refrigerant oil
- Evacuate and fill A/C system, see **64 50 009 Drawing off, evacuating and filling A/C system (R 134a)**.

64 52 521 REPLACING A/C SYSTEM COMPRESSOR (N52K)

Special tools required:

- 32 1 270 (Plug)

WARNING: Avoid contact with refrigerant and refrigerant oil.

Follow safety instructions for handling R134a refrigerant, see **64 50 ... Safety instructions for handling refrigerant R134a**.

Follow safety instructions for handling refrigerant oil, see **64 50 ... Instructions for handling refrigerant oil (for refrigerant R 134a)**.

IMPORTANT: Risk of damage! Restart engine only when A/C system has been correctly filled. Read and comply with notes on replacing compressor. Follow instructions for opening and replacing parts in refrigerant circuit. If A/C system is opened for more than 24 hours: Replace desiccant insert for A/C system.

Necessary preliminary tasks:

- Evacuate and fill A/C system, see **64 50 009 Drawing off, evacuating and filling A/C system (R 134a)**. are not included in the time value given for this work operation
- Remove A/C compressor drive belt
- Remove coolant thermostat. See **11 53 000 REMOVING AND INSTALLING/REPLACING COOLANT THERMOSTAT (N52K)** .

Release screws (1) and disconnect plug connection on compressor. Disconnect pressure and suction lines.
Installation: Replace all sealing rings and moisten with refrigerant oil. Tightening torque, see 64 52 1AZ in **64 52 A/C COMPRESSOR** .

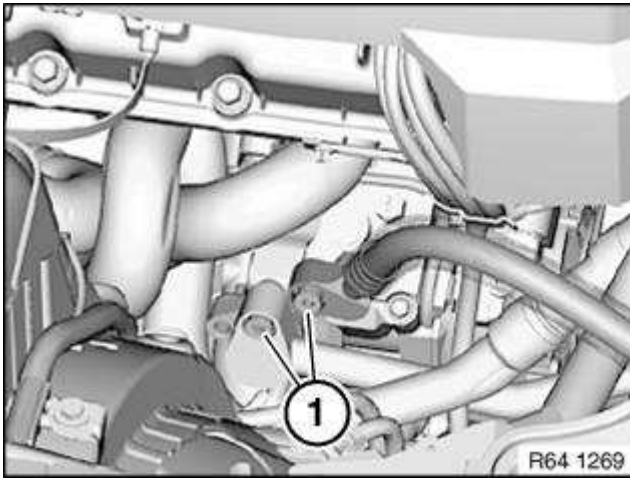


Fig. 73: Release Screws (1) And Disconnect Plug Connection On Compressor
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Seal openings or lines on compressor with special tool 32 1 270 to prevent escape of media and fouling.

NOTE: Secure compressor (3) against falling out. Release screw (1). Release screws (2) and feed out compressor towards front. Tightening torque, see 64 52 3AZ in **64 52 A/C COMPRESSOR** .

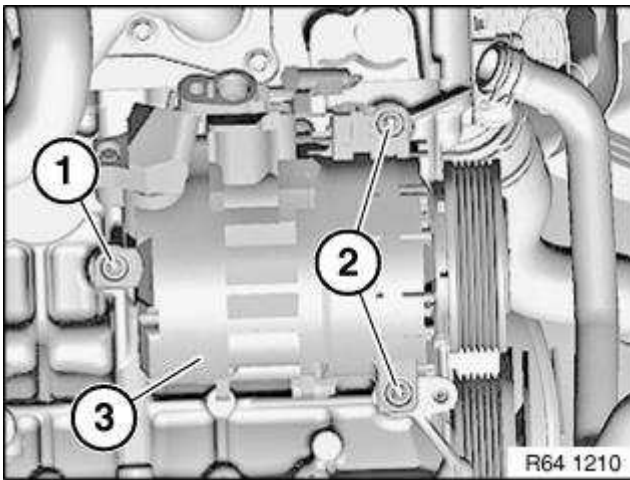


Fig. 74: Release Screws (2) And Feed Out Compressor Towards Front
 Courtesy of BMW OF NORTH AMERICA, INC.

After installation: Fill and vent cooling system. Evacuate and fill A/C system.

64 52 521 REPLACING AIR CONDITIONING COMPRESSOR (N54, N55)

Special tools required:

- 00 9 030 (Wedge)
- 32 1 270 (Plug)

WARNING: Avoid contact with refrigerant and refrigerant oil.
 Follow safety instructions for handling R134a refrigerant, see 64 50 ...
 Safety instructions for handling refrigerant R134a.
 Follow safety instructions for handling refrigerant oil, see 64 50 ...
 Instructions for handling refrigerant oil (for refrigerant R 134a).

IMPORTANT: Risk of damage! Restart engine only when A/C system has been correctly filled.
 Read and comply with notes on replacing compressor. Follow instructions for opening and replacing parts in refrigerant circuit. If A/C system is opened for more than 24 hours: Replace desiccant insert for A/C system.

Necessary preliminary tasks:

- Evacuate and fill A/C system, see 64 50 009 Drawing off, evacuating and filling A/C system (R 134a). are not included in the time value given for this work operation
- Remove A/C compressor drive belt
- Remove left charge air duct

Release screws (1) and (2). Remove refrigerant line. Tightening torque 64 52 1AZ. Installation note: Replace sealing rings. Use special tool 00 9 030 to mount sealing rings without damaging them.

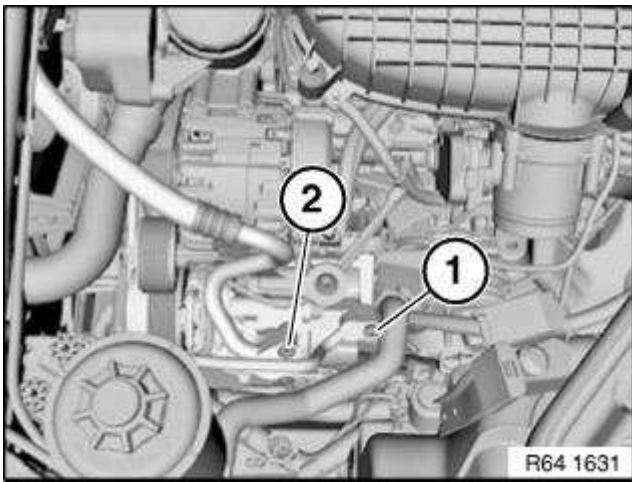


Fig. 75: Release Screws (1) And (2)

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Seal openings or lines on compressor with special tool 32 1 270 to prevent escape of media and dirt contamination.

IMPORTANT: Secure compressor against falling.

Disconnect plug connection (1). Unfasten screws (2). Release screw (3) and feed out compressor in upward direction. Tightening torque 64 52 3AZ.

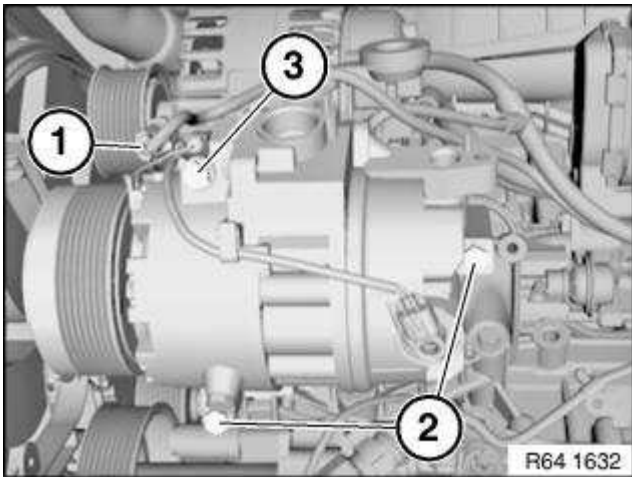


Fig. 76: Release Screw (3) And Feed Out Compressor In Upward Direction

Courtesy of BMW OF NORTH AMERICA, INC.

Replacement: Read and comply with notes on compressor replacement. If necessary, release screws (1) and modify holder (2).

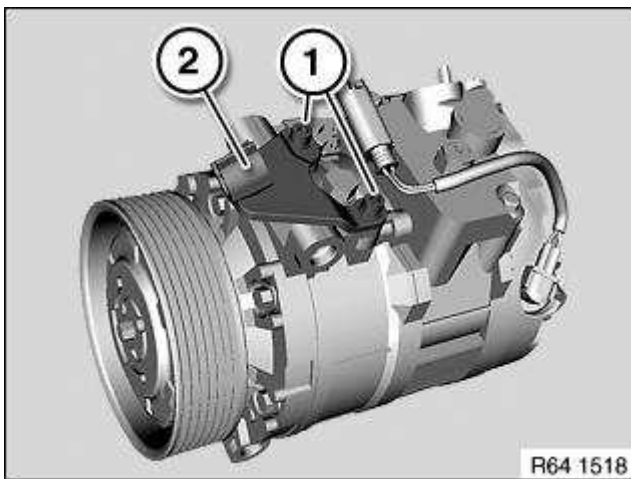


Fig. 77: Release Screws (1) And Modify Holder (2)
Courtesy of BMW OF NORTH AMERICA, INC.

After installation: Evacuate and fill air conditioning system. Assemble engine.

53 CONDENSER AND DRYER WITH LINES

64 52 ... INSTRUCTIONS FOR OPENING AND REPLACING PARTS IN REFRIGERANT CIRCUIT

WARNING:

- Avoid contact with refrigerant and refrigerant oil
- Follow safety instructions for handling R134a refrigerant, see 64 50 ... Safety instructions for handling refrigerant R134a.
- Follow safety instructions for handling refrigerant oil, see 64 50 ... Instructions for handling refrigerant oil (for refrigerant R 134a).

CAUTION:

- Always use new O-rings each time A/C connections are opened.
- Moisten O-rings with refrigerant oil prior to fitting
- Seal all parts to be returned at openings to prevent ingress of moisture or foreign bodies

I. Opening refrigerant circuit without part replacement, as preliminary work to further work

(e.g. engine removal):

Work sequence:

- Draw off A/C system, then determine drawn-off refrigerant oil quantity, see 64 50 009 Drawing off, evacuating and filling A/C system (R 134a).
- Carry out main work
- Replace removed refrigerant oil with new refrigerant oil
- Evacuate and fill A/C system, see 64 50 009 Drawing off, evacuating and filling A/C system (R

134a).

II. Part replacement and part replacement on account of insidious leak

(minor leak, e.g. hairline crack)

Work sequence:

- Draw off A/C system, then determine drawn-off refrigerant oil quantity, see **64 50 009 Drawing off, evacuating and filling A/C system (R 134a).**
- Carry out part replacement
- Replace removed refrigerant oil with new refrigerant oil
- Additionally replenish new refrigerant oil in accordance with replaced parts:
 - Compressor: refer to **64 52 ... Instructions for compressor replacement.**
 - Evaporator: 10 ml
 - Condenser: 10 ml
 - Desiccant insert / desiccant bottle: 30 ml
 - Each replaced refrigerant line: 10 ml
 - Condenser with integrated dryer: 30 ml
 - Safety pressure switch and seals: no additional refrigerant oil
- Evacuate and fill A/C system, see **64 50 009 Drawing off, evacuating and filling A/C system (R 134a).**

III. Part replacement on account of sudden leak

(major leak, e.g. pipe break due to accident)

Work sequence:

- Draw off A/C system, then determine drawn-off refrigerant oil quantity, see **64 50 009 Drawing off, evacuating and filling A/C system (R 134a).**
- Carry out part replacement
- Replace removed refrigerant oil with new refrigerant oil
- Additionally replenish 25 ml new refrigerant oil and new refrigerant oil in accordance with replaced parts:
 - Compressor: refer to **64 52 ... Instructions for compressor replacement.**
 - Evaporator: 10 ml
 - Condenser: 10 ml
 - Desiccant insert / desiccant bottle: 30 ml
 - Each replaced refrigerant line: 10 ml
 - Condenser with integrated dryer: 30 ml
 - Safety pressure switch and seals: no additional refrigerant oil
- Evacuate and fill A/C system, see **64 50 009 Drawing off, evacuating and filling A/C system (R**

134a).

64 53 ... NOTES ON REPLACING DRIER BOTTLE OR DRIER INSERT

The drier bottle or drier insert does not have to be replaced at regular service intervals in a functioning, leakproof A/C system.

However, the drier bottle or drier insert must be replaced without fail in the event of:

- fouling of the refrigerant by filings/shavings (e.g. when the compressor is clamped)
- a leaking A/C system or loss of refrigerant
- the refrigerant circuit being opened for a period exceeding 24 hours, e.g. during repair work.

64 53 ... REPLACING VALVE INSERT FOR REFRIGERANT LINE

Avoid contact with refrigerant and refrigerant oil.

Follow safety instructions for handling R134a refrigerant, see **64 50 ... Safety instructions for handling refrigerant R134a.**

Follow safety instructions for handling refrigerant oil, see **64 50 ... Instructions for handling refrigerant oil (for refrigerant R 134a).**

IMPORTANT: Risk of damage!

Restart engine only when A/C system has been correctly filled.

If A/C system is opened for more than 24 hours: Replacing drier insert for A/C system

NOTE: The special tool is available under BMW order number: 81 34 0 427 679 from the BMW workshop equipment catalogue.

Necessary preliminary tasks:

- Evacuate and fill A/C system, see **64 50 009 Drawing off, evacuating and filling A/C system (R 134a).** are not included in the time value given for this work operation

Twist valve insert out of filler neck (2) with remover (1).

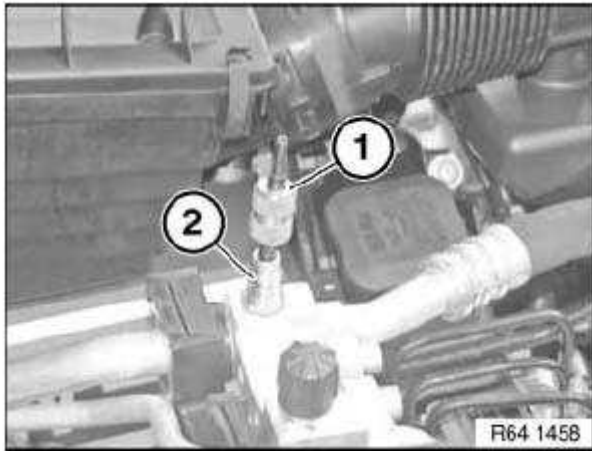


Fig. 78: Screw

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Screw in valve insert hand-tight only.

After installation:

- Evacuate and fill A/C system, see 64 50 009 Drawing off, evacuating and filling A/C system (R 134a).
- Check leak-tightness of valve insert with soapy solution

In event of leakage:

- Evacuate and fill A/C system, see 64 50 009 Drawing off, evacuating and filling A/C system (R 134a).
- Check sealing faces on line and valve insert for damage, replace line or valve insert if necessary

64 53 510 REMOVING AND INSTALLING/REPLACING DRYER BOTTLE FOR AIR CONDITIONER

WARNING: Avoid contact with refrigerant and refrigerant oil.

Follow safety instructions for handling R134a refrigerant, see 64 50 ... Safety instructions for handling refrigerant R134a.

Follow safety instructions for handling refrigerant oil, see 64 50 ... Instructions for handling refrigerant oil (for refrigerant R 134a).

IMPORTANT: Risk of damage!

Restart engine only when A/C system has been correctly filled.

A/C system is opened for more than 24 hours:

Replacing drier insert for A/C system

Necessary preliminary tasks:

- Evacuate and fill A/C system, see **64 50 009 Drawing off, evacuating and filling A/C system (R 134a)**. are not included in the time value given for this work operation
- Release fluid reservoir for windscreen washer system and place to one side
- Partially detach front right wheel arch, see **51 71 040 REMOVING AND INSTALLING/REPLACING FRONT LEFT OR RIGHT WHEEL ARCH COVER** .

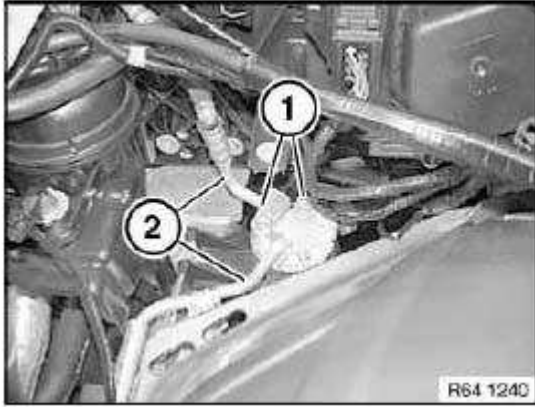


Fig. 79: Screws And Refrigerant Lines
 Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) and remove refrigerant lines (2).

Installation:

Replace all sealing rings.

Tightening torque: 64 53 1AZ, see **64 11 HOUSING, HEATER/AIR CONDITIONER** .

Slacken screws (1) and remove dryer bottle (2) towards top.

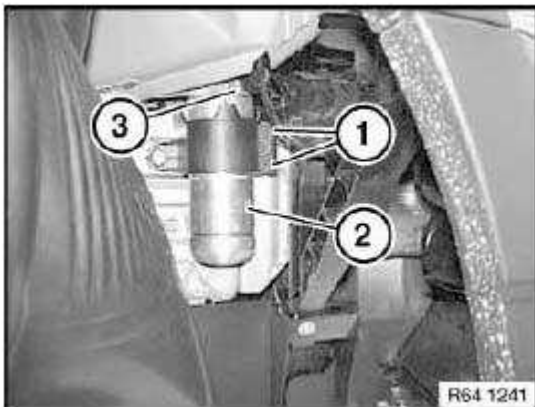


Fig. 80: Dryer Bottle And Screws
 Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (3).

Installation:

Make sure dryer bottle is securely seated.

After installation:

- Evacuate and fill A/C system, see 64 50 009 Drawing off, evacuating and filling A/C system (R 134a).

64 53 520 REPLACING SAFETY PRESSURE SWITCH

WARNING: Avoid contact with refrigerant and refrigerant oil.
Follow safety instructions for handling R134a refrigerant, see 64 50 ...
Safety instructions for handling refrigerant R134a.
Follow safety instructions for handling refrigerant oil, see 64 50 ...
Instructions for handling refrigerant oil (for refrigerant R 134a).

NOTE: The time value given for this work operation does not include drawing off, evacuating and filling the A/C system!

- Drain off air conditioner, see 64 50 009 Drawing off, evacuating and filling A/C system (R 134a).

IMPORTANT: Risk of damage!
Restart engine only when A/C system has been correctly filled.

NOTE: If A/C system is opened for more than 24 hours: Replace drier for A/C system, see 64 53 510 Removing and installing/replacing dryer bottle for air conditioner.

Necessary preliminary tasks:

- Release fluid reservoir for windscreen washer system and place to one side

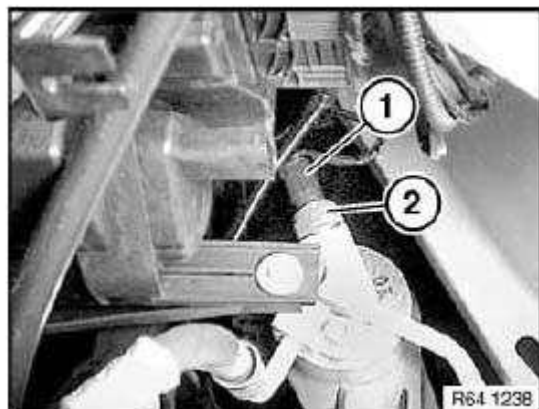


Fig. 81: Safety Pressure Switch

Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1).

Release safety pressure switch (2).

Tightening torque: 64 53 13AZ, see **64 11 HOUSING, HEATER/AIR CONDITIONER** .

64 53 550 REMOVING AND INSTALLING OR REPLACING CAPACITOR FOR THE HEATING AND AIR CONDITIONING SYSTEM

WARNING:

- **Avoid contact with refrigerant and refrigerant oil**
- **Follow safety instructions for handling R134a refrigerant, see 64 50 ... Safety instructions for handling refrigerant R134a.**
- **Follow safety instructions for handling refrigerant oil, see 64 50 ... Instructions for handling refrigerant oil (for refrigerant R 134a).**

IMPORTANT: Risk of damage! Restart engine only when heating and air conditioning system has been correctly filled.

NOTE: Follow notes for opening and replacing parts in refrigerant circuit. If Air conditioning system is opened for more than 24 hours: Replacing desiccant insert for air conditioning system

IMPORTANT: The desiccant insert can only be replaced in vehicles up to 12/08! In vehicles after 12/08, the air conditioning capacitor must be replaced!

Necessary preliminary tasks:

- Draw off A/C system, then determine drawn-off refrigerant oil quantity, see **64 50 009 Drawing off, evacuating and filling A/C system (R 134a)**.
- Remove radiator.

Release screws (1) and remove refrigerant lines. Installation note: Tightening torque 64 53 6AZ, see **64 53 REFRIGERANT LINES AND EXPANSION VALVE** . Replace all sealing rings and moisten with refrigerant oil.

Release screw (2) and remove the spacers (3). Release retaining clip (4) and remove capacitor (5).

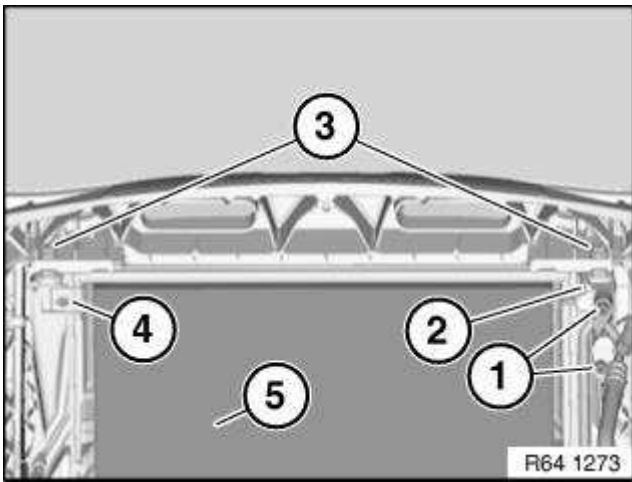


Fig. 82: Release Screw (2) And Remove The Spacers (3)
Courtesy of BMW OF NORTH AMERICA, INC.

After installation: **Evacuate and fill heating and air conditioning system.** Fill and vent cooling system and check for leaks. See **CHECKING COOLING SYSTEM** .

CABIN AIR FILTER

BMW - X3 (E83)

REMOVAL & INSTALLATION

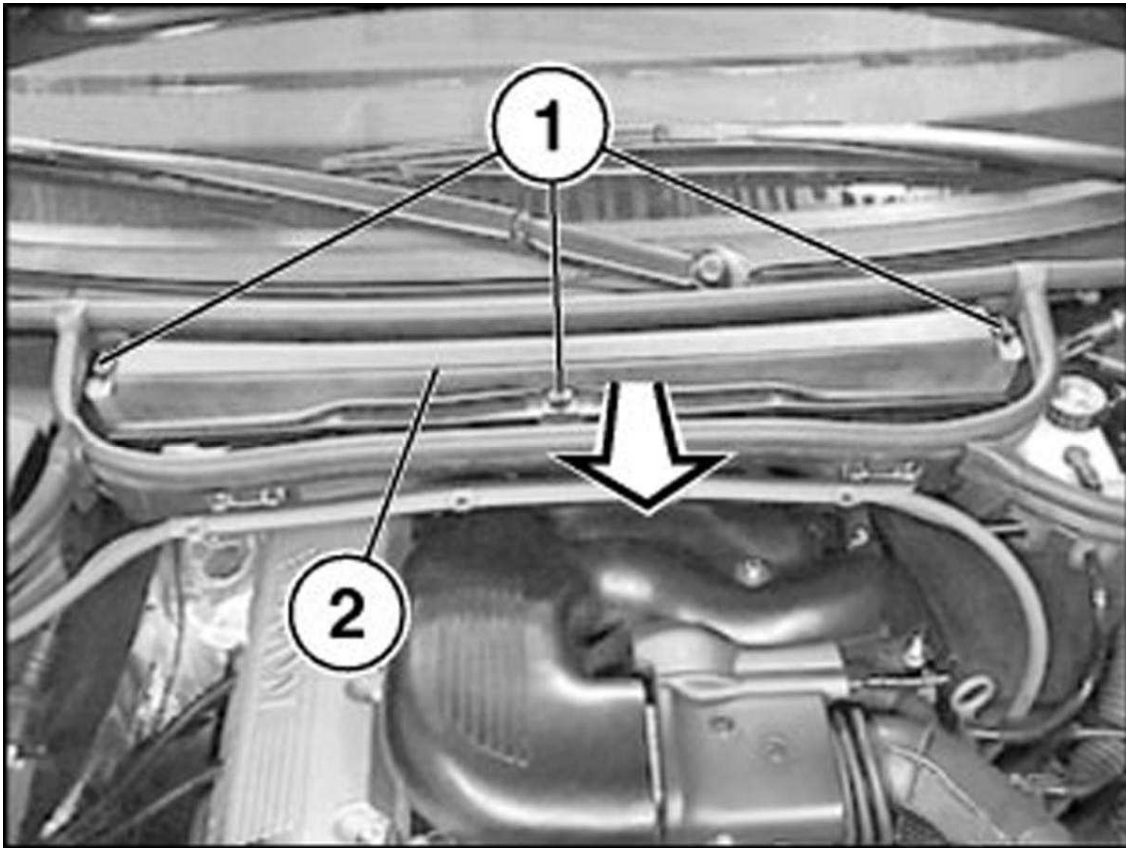
NOTE: Manufacturer's terminology for this filter is microfilter.

NOTE: Numbers in parenthesis refer to numbers in figures.

CABIN AIR FILTER

Removal & Installation

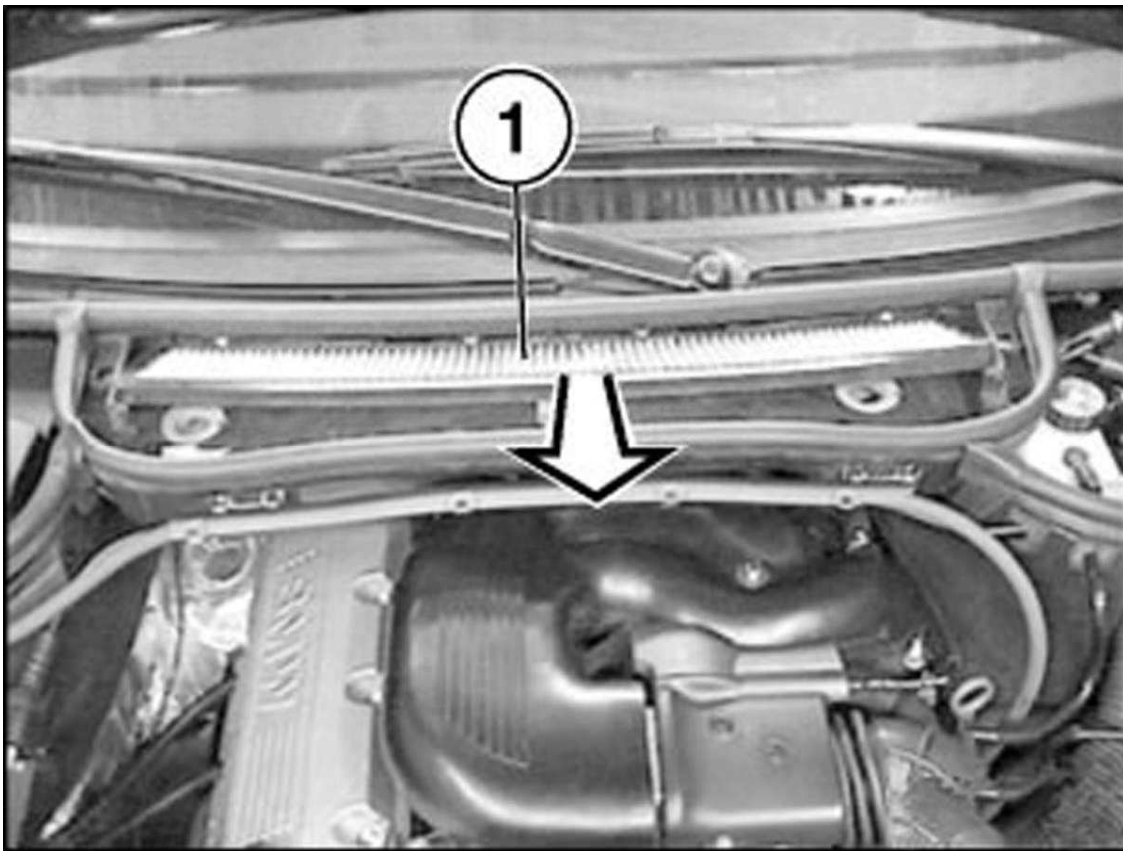
1. Turn toggle (1) approximately 90 degrees and remove cover (2) towards front. See **Fig. 1**.



G00213245

Fig. 1: Removing Cover
Courtesy of BMW OF NORTH AMERICA, INC.

2. Remove microfilter (1). See **Fig. 2**. To install microfilter, reverse removal procedure.



G00213246

Fig. 2: Removing Microfilter

Courtesy of BMW OF NORTH AMERICA, INC.

HVAC

Heating and Air Conditioning - Operating Fluids

1.0 AIR CONDITIONER REFRIGERANT

FREON®

The refrigerant Freon® R12 is used in most BMW automobiles with an air conditioner up through the 1992 model year. It has a boiling point of -29.8°C (sea level), at which the refrigerant is transformed from a liquid into a gaseous state. This boiling point, however, is not constant. It is displaced in the direction of higher temperatures as pressure increases.

Freon® R12 complies with the requirements expected of a safety refrigerant. Freon® is not combustible and does not turn into an explosive mixture with air. It is also odorless and non-toxic. Conformance with certain safety regulations is essential to the handling of refrigeration systems.

There are currently no BMW-approved alternative refrigerants to R12.

SAFETY WARNING

64 Avoid any contact with liquid refrigerant, since this could cause frostbite. Protect eyes with safety goggles and hands with gloves. Contact a doctor without delay in case of an accident.

64 Freon® R12 is heavier than air, so this refrigerant must not be discharged in closed rooms. There is danger of asphyxiation in a sunken work area (pit). Do not store bottles of refrigerant at temperatures above $113^{\circ}\text{F}/45^{\circ}\text{C}$ or heat them.

64 Never weld on or near a system filled with refrigerant. Heat could cause excessive pressure and an explosion. In addition, Freon® R12 will decompose at high temperature or when subjected to an open flame. The resulting decomposition products would be hazardous to health.

64 Make sure you read the container label instructions completely prior to use.

64 Obtain and use the correct type of refrigerant recovery/recycling machine. Follow the directions included in the machine's instruction manual.

HFC-134A

The refrigerant HFC-134a (also known as R-134a) is used as of the following models with an air conditioner:

64 1992 E32/M30 from March 1992 production

64 1993 E34, E36, 325iC. E31, E32 from August 1992 production

This environmentally friendly refrigerant performs similar functions as Freon® R12, but the refrigerants Freon® R12 and R-134a must NEVER be mixed or combined in any way under any circumstances.

SAFETY WARNING

64 Always wear eye protection and gloves while handling refrigerant or servicing air conditioning systems.

64 Avoid breathing R-134a and lubricant vapor or mist. Exposure may irritate eyes, nose, throat, and lungs. Use only approved service equipment to discharge A/C systems. If accidental system discharge occurs, ventilate work area before resuming service.

64 If refrigerant or compressor oil contacts the skin or eyes, large quantities of cool water should be used to flush the affected area.

64 Never heat a refrigerant container with an open flame. Keep all refrigerants away from open flames, since burning refrigerant can produce poisonous gas.

64 Under no circumstances should R-134a service equipment or vehicle A/C systems be pressure tested with air/R 134a mixtures. Some mixtures of air and R-134a have been shown to be combustible at elevated pressures.

The use of compressed air (shop air) for leak detection in R-134a systems could result in fire or explosion causing injury or property damage. In addition, introducing compressed air into A/C systems or components contaminates the system and/or refrigerant with moisture.

64 Obtain and use the correct type of refrigerant recovery/recycling machine. Follow the directions included in the machine's instruction manual.

2.0 REFRIGERATION OIL

OIL USED IN FREON®-CHARGED SYSTEMS

A mineral-based oil is used. The oil level in the compressor must be checked before filling an air conditioner with refrigerant. It can be checked only if the system is without refrigerant.

Always check the oil level each time a new system is filled with Freon® R12 or after repairs. The oil level is very important for the entire air conditioning system. Part of the oil (approx. 25% depending on amount of refrigerant) is mixed with the refrigerant and is continuously circulated in the system. This oil lubricates the moving parts of the system, such as the expansion valve and compressor.

Oil Used in R-134a-Charged Systems:

A synthetic oil is used, which is totally different than the mineral-based oils used in Freon® R12 systems.

R-134a systems require Polyalkylene Glycol lubricants, often referred to as "PAG" oil. Use of R-12 compressor oil in R-134a systems will cause the compressor to seize and fail. The R-12 mineral oil does not stay in solution in R-134a. In addition, R-134a compressor should not be used in an R-12 system. Long term damage and corrosion will result.

The **GREEN** R-134a system labels, usually located near the top side of the fan shroud in the engine

compartment, will display the refrigerant requirement for R-134a systems. An example is illustrated.

R-12 systems will have a **BLACK** label in a similar location.



Fig. 1: Identifying R-12 Systems - Black Label
Courtesy of BMW OF NORTH AMERICA, INC.

PAG oil should only be stored in its original container, and sealed as tightly as possible. PAG oil is totally devoid of moisture when packaged, and will absorb moisture readily (hygroscopic) if exposed to the atmosphere, rendering it useless. Dispose of all extracted lubricants from A/C systems. Never reuse old compressor oil. Contaminated PAG oil should never be added to the air-conditioning system, and old PAG oil is typically contaminated with moisture. R-134a is even more sensitive to moisture contamination than R-12 systems.

PAG oil may be obtained from BMW of North America.

BMW Part No. 82 11 1 468 042.

3.0 AIR CONDITIONING UNIT DISINFECTANTS

A musty odor may be detected in the vehicle, particularly when the air conditioner is first switched on.

This is caused by microorganisms growing on the evaporator from moisture condensation.

A disinfectant can be applied to the air conditioning system:

"Airguard" by J. J. Products, Inc.; "Airsept" by The Auto Doctor or Air Conditioning and Heating System Treatment by Wurth USA, Inc.

Such disinfectants are not available from BMW of North America.

4.0 AIR CONDITIONER REFRIGERATION/OIL FILL CAPACITIES

Note that some 1993 Model Year early production R-134a equipped vehicles have under-hood labels that

specify higher charge values than those specified in the chart. Testing has confirmed that the values given are the optimum fill capacities. Consult the chart before refilling. Labels with the lower refrigerant charge amount specified on the chart have been phased into production as of 11/92.

When performing repairs to the A/C system that require recharging, only the specifications given in this chart should be used, as well as the label part numbers, as appropriate. However, inadvertent refrigerant charging up to the fill capacity given on an "original" ('93 MY production prior to 11/92) under-hood label will not cause any problems.

See appropriate HVAC article for oil refill capacity for specifications not indicated in **A/C LABEL BMW P/N REFERENCE** table.

Refrigerant, Special Features, Production Range, Fill Capacity g (lbs), Fill Capacity ml (oz), BMW P/N

A/C LABEL BMW P/N REFERENCE

Series/Body, Refrigerant	Model or Type Special Features	Production Range	Fill Capacity g (lbs)	Refrigerant Oil Total Fill Capacity ml (oz)	A/C Label BMW P/N
1/E82, R-134a	N52K, N54	All	590 ± 10 (1.30 ± 0.02)		64 50 6 985 512
1/E88, R-134a	N52K, N54	All	590 ± 10 (1.30 ± 0.02)		64 50 6 985 512
3/E30, R-12	M3	All up to 9/92	875 ± 25 (1.93 ± 0.05)	200 ± 20 (6.8 ± 0.7)	64 50 1 381 958
3/E30, R-12	All Others	All up to 9/92	975 ± 25 (2.15 ± 0.05)	200 ± 20 (6.8 ± 0.7)	64 50 1 380 981
3/E30, R-134a	Convertible	All from 9/92	900 ± 25 (1.76 ± 0.05)	100 ± 20 (3.4 ± 0.7)	64 50 8 391 0264
3/E36, R-12	Modine Condenser I	9/91 - 3/921	1000 ± 25 (2.20 ± 0.05)	167 ± 20 (5.6 ± 0.7)	90 00 1 000 006
3/E36, R-12	Original Condenser	All up to 9/92	1200 ± 25 (2.65 ± 0.05)	200 ± 20 (6.8 ± 0.7)	71 21 2 122 023
3/E36, R-134a	All	9/92 - 11/923	1000 ± 25 (2.20 ± 0.05)	120 ± 20 (4.1 ± 0.7)	64 50 8 391 5244
3/E36, R-134a	Z3 except M coupe and M roadster	All	900 ± 25 (1.98 ± 0.05)	120 ± 20 (4.1 ± 0.7) ^{5,6} 150 ± 10 (5.1 ± 0.3) ^{5,7}	64 50 8 391 026
3/E36, R-134a	M coupe and M roadster	All	950 ± 26 (2.09 ± 0.05)		64 50 8 391 525
3/E36, R-134a	All	All from 11/92	825 ± 25 (1.82 ± 0.05)	120 ± 20 (4.1 ± 0.7) ^{5,6} 150 ± 10 (5.1 ± 0.3) ^{5,7}	64 50 8 367 947

3/E46, R-134a	All	All	740 ± 25 (1.63 ± 0.05)	160 ± 10 (5.4 ± 0.3) ^{5,6}	64 50 8 380 053
3/E90/E91, R134a	N52	All	500 ± 15 (1.10 ± 0.03)		64 50 6 952 937
3/E90/E91/E92/E93, R134a	N52KP, N54	All	590 ± 10 (1.30 ± 0.02)		64 50 6 985 512
3/E90/E92/E92, R134a	S65	All	590 ± 10 (1.30 ± 0.02)		64 50 6 985 512
5/E28, R-12	524, 535, M5	All	975 ± 25 (2.15 ± 0.05)	170 ± 20 (5.7 ± 0.7)	64 50 1 380 981
5/E28, R-12	528e, 533	All	1275 ± 25 (2.81 ± 0.05)	170 ± 20 (5.7 ± 0.7)	64 50 1 380 984
5/E34, R-12	525i, 535i, 525iT	All up to 9/92	1925 ± 25 (4.24 ± 0.05)	200 ± 20 (6.8 ± 0.7)	64 53 1 382 614
5/E34, R-12	M5	All up to 9/92	1500 ± 25 (3.31 ± 0.05)	200 ± 20 (6.8 ± 0.7)	64 53 1 378 247
5/E34, R-134a	M5	From 9/92 ²	1450 ± 25 (3.19 ± 0.05)	160 ± 20 (5.4 ± 0.7) ⁵	64 50 8 391 751 ⁴
5/E34, R-134a	All Others	All from 9/92	1550 ± 25 3.42 ± 0.05)	160 ± 20 (5.4 ± 0.7) ⁵	64 50 8 391 523 ⁴
5/E39, R-134a	All	Up to 9/98	1210 ± 25 (2.67 ± 0.05)	160 ± 15 (5.4 ± 0.5) ^{5,6} 180 ± 20 (6.1 ± 0.7) ^{5,7}	64 50 8 362 434
5/E39, R-134a	All	From 9/98	750 ± 25 (1.65 ± 0.05)	160 ± 15 (5.4 ± 0.5) ^{5,6} 180 ± 20 (6.1 ± 0.7) ^{5,7}	64 50 8 387 412
5/E60, R-134a	All (Includes M5)	From 8/03	810 ± 10 (1.78 ± 0.02)		64 50 6 920 708
5/E61, R134a	All	All	810 ± 10 (1.78 ± 0.02)		64 50 6 920 708
6/E24, R-12	Rear Air Conditioner	All	1800 ± 25 (3.97 ± 0.05)	170 ± 20 (5.7 ± 0.7)	653 1 380 728
6/E24, R-12	All Others	All	1100 ± 25 (2.43 ± 0.05)	170 ± 20 (5.7 ± 0.7)	64 50 1 380 982
6/E63/E64, R-134a	All	From 8/03	810 ± 10 (1.78 ± 0.02)		64 50 6 920 708
7/E23, R-12	733, 735	All up to 9/85	1275 ± 25 (2.81 ± 0.05)	170 ± 20 (5.7 ± 0.7)	64 50 1 380 984
7/E23, R-12	735	All from 9/85	1175 ± 25 (2.59 ± 0.05)	170 ± 20 (5.7 ± 0.7)	64 50 1 380 983
7/E32, R-12	750iL	All up to	1925 ± 25	200 ± 20 (6.8 ± 0.7)	64 53 1 382

		11/92 ²	(4.24 ± 0.05)	0.7)	614
7/E32, R-12	735i, 735iL	All up to 3/92	1925 ± 25 (4.24 ± 0.05)	200 ± 20 (6.8 ± 0.7) ⁵	64 53 1 382 614
7/E32, R-134a	735i, 735iL	From 3/92 ³	1550 ± 25 (3.42 ± 0.05)	160 ± 20 (5.4 ± 0.7) ⁵	64 50 8 391 523
7/E32, R-134a	740i, 740iL, 750iL	From 9/92	1550 ± 25 (3.42 ± 0.05)	160 ± 20 (5.4 ± 0.7) ⁵	64 50 8 391 5234
7/E38, R-134a	All	All up to 11/97	1210 ± 25 (2.67 ± 0.05)	180 ± 30 (6.1 ± 1.0) ^{5,6}	64 50 8 362 434
	All	All from 11/97	680 ± 25 (1.50 ± 0.05)	180 ± 20 (6.1 ± 0.7) ^{5,7}	64 50 8 381 241
7/E65, R-134a	745i, 750i	All	810 ± 25 (1.78 ± 0.05)		64 50 6 920 708
7/E66, R-134a	745Li, 750Li	All	810 ± 25 (1.78 ± 0.05)		64 50 6 920 708
7/E66, R-134a	760Li	All	1120 ± 25 (2.46 ± 0.05)		64 50 6 924 568
8/E31, R-12	All	All up to 9/92	1925 ± 25 (4.24 ± 0.05)	200 ± 20 (6.8 ± 0.7)	64 53 1 382 614
8/E31, R-134a	All	All from 9/92	1550 ± 25 (3.42 ± 0.05)	Nippon Denso 160 ± 30 (5.4 ± 1.0) Seiko Seiki 180 ± 20 (6.0 ± 0.7)	64 50 8 391 523
Z4/E85, R-134a	M54, N52, N52KP, S54	All	740 ± 10 (1.63 ± 0.05)		64 50 6 920 364
Z8/E52, R-134a	All	All	710 ± 25 (1.56 ± 0.05)		64 50 8 384 651
X5/E53, R-134a	3.0, 4.4i, 4.6i, 4.8iS	All	440 ± 10 (0.970 ± 0.02)		64 50 8 385 985
X5/E70, R-134a	3.0i, 4.8i	All	700 ± 10 (1.540 ± 0.02)		64 50 6 917 364
X6/xDrive35i	All	All	700 ± 10 (1.540 ± 0.02)		64 50 6 917 364
X3/E83, R134a	2.5, 3.0	All	740 ± 25g (1.63 ± 0.05)		64 50 8 385 985
X3/E83, R134a	3.0Si	All	740 ± 25g (1.63 ± 0.05)		64 50 8 380 053

NOTE:

- 1. The Modine condenser was used in many E36 vehicles over the production range 9/91-3/92. This condenser has a smaller volume, and the A/C system must be charged accordingly.**

- 2. Production start of 1993 MY E34/S38 (M5) 9/92; E32/M70 (750iL) 11/92.**
- 3. R-134a, the environmentally friendly air conditioning refrigerant, was introduced to the U.S. market beginning with 3/92 production E32/M30 (735i/iL) vehicles.**
- 4. Labels reflecting the proper charging volumes given on this chart are available from BMW Parts. These may be used in place of the original equipment labels on '93 model year vehicles produced before 11/92.**
- 5. All vehicles equipped with R-134a refrigerant require special PAG lubricant.**
- 6. Nippon Denso**
- 7. Seiko Seiki**

HVAC

Heating and Air Conditioning - Special Tools - X3

64 HEATING AND AIR CONDITIONING

64 1 020 RELEASE HOOK

Minimum set: Mechanical tools

Note: For releasing and removing fresh air grille. For removing various trims.

Series: E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E68, E70, E81, E82, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53, R56, RR1, RR2

Storage location: C33

SI number: 1 15 99 (483)

Order number: 64 1 020 Release hook

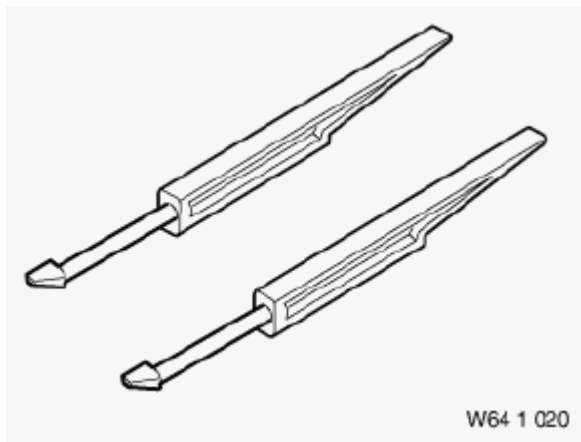


Fig. 1: Release Hook (64 1 020)

Courtesy of BMW OF NORTH AMERICA, INC.

64 1 251 SPRAY LANCE, RHD VEHICLES

In conjunction with: Guide 64 1 252

Note: from spray apparatus set 64 1 250 (RHD vehicles)

SI number: 1 26 03 (044)

Order number: 64 1 251 Spray lance, RHD vehicles

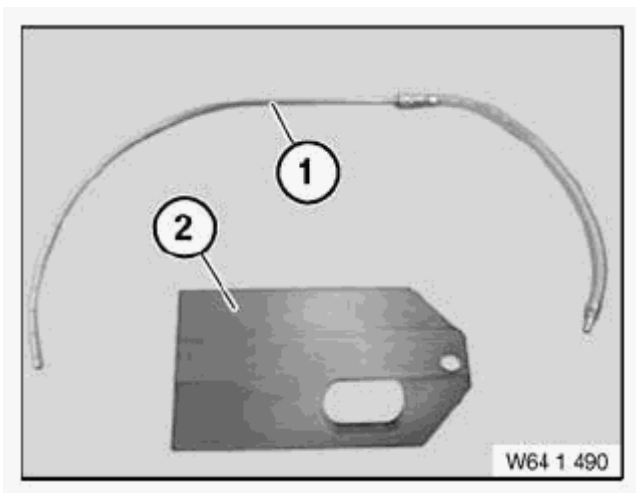


Fig. 2: Spray Lance, RHD Vehicles (64 1 251)
Courtesy of BMW OF NORTH AMERICA, INC.

64 1 252 GUIDE

In conjunction with: Lance 64 1 251

Note: Guide from spray apparatus set 64 1 250

SI number: 1 26 03 (044)

Order number: 64 1 252 Guide

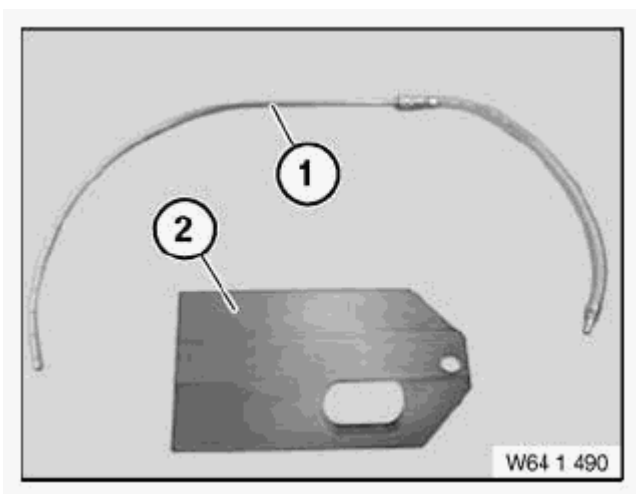


Fig. 3: Spray Lance, RHD Vehicles (64 1 251)
Courtesy of BMW OF NORTH AMERICA, INC.

64 1 450 SPRAY UNIT

In conjunction with: Pressure vessel spray gun, manufacturer: SATA (81 45 9 429 217)

Note: For cleaning and disinfecting evaporator in A/C system

Series: E39, E46, E53, E83

SI number: 1 22 00(648)

Order number: 64 1 450 Spray unit

Consisting of:

1 = 64 1 451 Spray lance

2 = 64 1 452 Drilling hole template

Note: Model series: E39, E53 IHKA

3 = 64 1 453 Center bit

Note: Model series: E39, E53 IHKA

4 = 64 1 454 Guide

Note: Model series: E39, E53 IHKA

5 = 64 1 455 Positioner

Note: Model series: E39, E53 IHKA

6 = 64 1 456 Retaining screw

Note: Model series: E39, E53 IHKA

7 = 64 1 457 Adapter

Note: Model series: E46 IHKA / R Model series: E39, E53 IHKR

8 = 64 1 458 Seal plug

Note: Model series: E46 IHKA / R Model series: E39, E53 IHKR

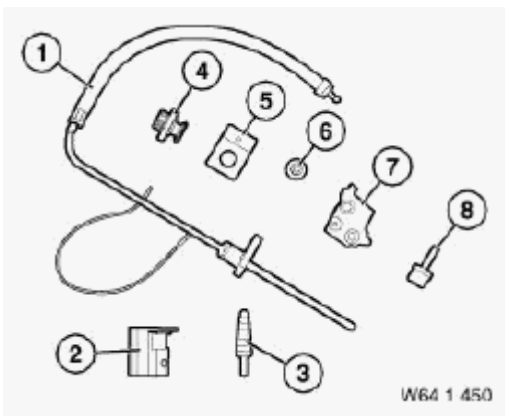


Fig. 4: Spray Unit (64 1 450)

Courtesy of BMW OF NORTH AMERICA, INC.

64 1 491 SPRAY LANCE (LHD VEHICLES)

In conjunction with: Guide 64 1 492

Order number: 64 1 491 Spray lance (LHD vehicles)

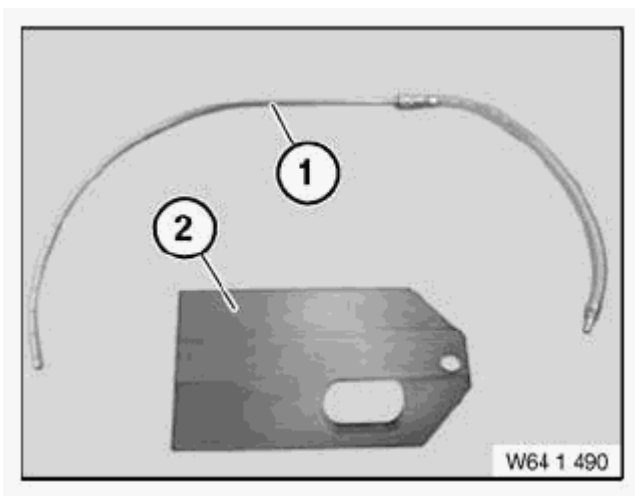


Fig. 5: Spray Lance, RHD Vehicles (64 1 251)

Courtesy of BMW OF NORTH AMERICA, INC.

64 1 492 GUIDE FOR SPRAY LANCE (LHD VEHICLES)

In conjunction with: Spray lance 64 1 491 for evaporator cleaning

Order number: 64 1 492 Guide for spray lance (LHD vehicles)

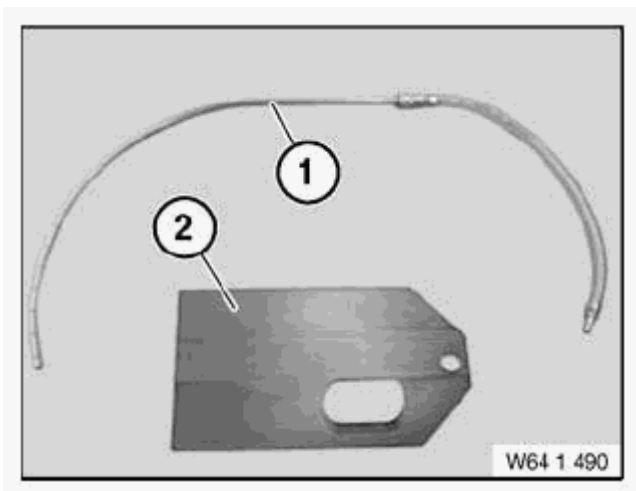


Fig. 6: Spray Lance, RHD Vehicles (64 1 251)
Courtesy of BMW OF NORTH AMERICA, INC.

64 5 100 SET OF SEALING ADAPTERS

Note: For closing off line flanges of A/C components (evaporator, condenser, compressor) for leak testing. Special tool 64 5 101 replaced by 64 5 105 (from 01/2005).

Series: E32, E34, E36, E38, E39, E46, E53, E60, E61, E63, E64, E70, E81, E83, E87, E90, E91, E92, E93

SI number: 1 17 98 (359)

Order number: 64 5 100 Set of sealing adapters

Consisting of:

1 = 64 5 104 Connecting hose

Note: For connecting pressure cylinder to filler adapter

2 = 64 5 102 Sealing adapter

Note: For closing off intake line

3 = 64 5 103 Sealing adapter

Note: For closing of intake connection on compressor

4 = 64 5 105 Filler adapter

Note: For closing off the pressure line and connection at connecting hose (replacement for special tool SWZ 64 5 101 since 01/2005)

5 = 64 5 106 Sealing adapter

Note: For closing off line during leak test (included in scope of delivery from 01/2005)

6 = 64 5 107 Sealing adapter

Note: For closing off line during leak test for E81, E87, E90, E91, E92, E93 (included in scope of delivery from 02/2007)

7 = 64 5 108 Sealing adapter

Note: For closing off line during evaporator leak test in E70 (included in scope of delivery from 02/2007)

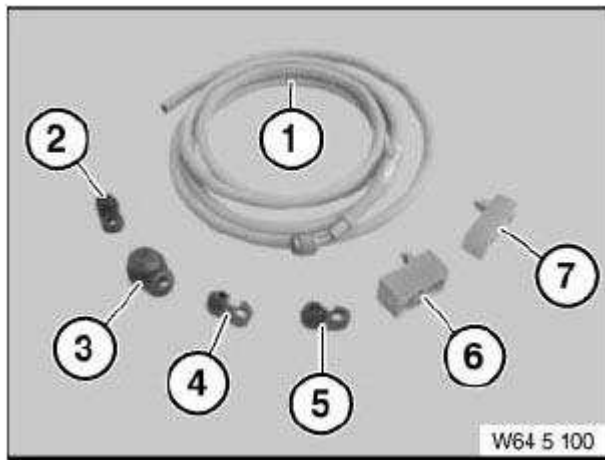


Fig. 7: Set Of Sealing Adapters (64 5 100)
Courtesy of BMW OF NORTH AMERICA, INC.

HVAC

Heating and Air Conditioning - Technical Data - X3

50 AIR CONDITIONING SYSTEM

64 50 A/C SYSTEM, REFRIGERANT AMOUNTS E83

TECHNICAL DATA - A/C SYSTEM, REFRIGERANT AMOUNTS E83

Refrigerant filling quantity R 134a Sourcing reference EPC (Electronic Parts Catalog) The data on the nameplate in the engine compartment are definitive	g	M47 T2/ M57 TU: 680 ±10
	g	M54: 740±10
	g	N46: 740±10

51 AC HOUSING-EVAPORATOR

64 51 AIR CONDITIONER (EVAPORATOR), SHIFT ELEMENTS

TECHNICAL DATA - AIR CONDITIONER (EVAPORATOR), SHIFT ELEMENTS

Resistance depending on temperature	°C/k	-5/11.4 ... 11.9 0/8.8 ... 9.2 5/6.8 ... 7.2 10/5.3 ... 5.6 15/4.2 ... 4.5 20/3.3 ... 3.6 25/2.6 ... 2.9 30/2.1 ... 2.3 35/1.7 ... 1.9
-------------------------------------	------	--

64 51 AIR CONDITIONER (EXPANSION VALVE), SHIFT ELEMENTS

TECHNICAL DATA - AIR CONDITIONER (EXPANSION VALVE), SHIFT ELEMENTS

Inlet pressure	bar	14
Outlet pressure	bar	1.8
Leak test with detector at pressure of	bar	1 ... 2

HVAC

Heating and Air Conditioning - Tightening Torques - X3

11 HEATER WITH OPERATION

64 11 HOUSING, HEATER/AIR CONDITIONER

HOUSING, HEATER/AIR CONDITIONER - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Bulkhead adapter	E85, E86			1.0 ± 0.3 Nm
2AZ Fan for heater/air conditioner	E85, E86			1.5 ± 0.3 Nm
3AZ Controller for heater - A/C system fan	E85, E86			1.0 ± 0.3 Nm
4AZ Air conditioner to bulkhead	E60, E61, E63, E64, E83, E81, E87, E90, E91, E92, E93			6 Nm
	E70			6.5 Nm
5AZ Cooler box to luggage compartment partition wall	E65, E66, E67			4.5 Nm
6AZ Air conditioner to support tube	E81, E87, E90, E91, E92, E93			9 Nm

12 AUXIL. HEATER WITH CONTROL ELEMENTS

64 12 ADDITIONAL HEATER WITH CONTROLS

ADDITIONAL HEATER WITH CONTROLS - TIGHTENING TORQUES

	Type	Thread	tightening specification	Dimension
1AZ Additional heater to body floor	All			4.5 Nm
2AZ Glow plug	E24			17.5 Nm
	E31 / E32 / E34			4 Nm
3AZ Temperature sensor	E31 / E32 / E34			0.5 Nm
4AZ Oil control plug and oil filler plug	All			16 Nm
5AZ Mounting screws	All	M5		6 Nm
	All	M6		10 Nm
	All	M8		24 Nm
	All	M10		48 Nm
6AZ Screws for filter cover	All			0.9 Nm

7AZ Central cover on heater	All			1.5 Nm
8AZ Combustion air fan unit on heater	All			1.5 Nm
9AZ Recirculating pump on heater	All			1.5 Nm
10AZ Control unit/transfers heat to heater Install screws with Loctite 243	All			4.5 Nm

64 12 ELECTRIC AUXILIARY HEATER

ELECTRIC AUXILIARY HEATER - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Battery positive and negative leads to auxiliary heater	E46	M6		8.8 Nm

52 COMPRESSOR

64 52 A/C COMPRESSOR

A/C COMPRESSOR - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Refrigerant lines to A/C compressor	E36/7 M54, E36/7 S54, E38, E39, E46, E52, E53, E60, E61, E63, E64, E65, E66, E67, E83, E85, E87, E90, E91, E92, E93	M8		20 Nm
2AZ Filler plug, A/C compressor	E36, E38, E39, E46, E52, E53, E60, E61, E63, E64, E65, E66, E67, E83, E85, E87, E90, E91, E92, E93			30± 1 Nm
3AZ A/C compressor to carrier	M54, N62, S85, N54	M8		21 Nm
	N45, N46, M47T2, M57TU, M57T2	M8		19 Nm
	N52	M8 x 87	Replace aluminium screw/bolt	
			Jointing torque	10 Nm
			Torque angle	180±15±
	E85 S54, E86 S54			20 Nm
4AZ Belt pulley/hub to A/C compressor	M47T2			35±5 Nm
5AZ Bracket, A/C compressor to lower crankcase	N54			19 Nm
6AZ Cable holder to A/C compressor	M47T2			3 Nm

53 CONDENSER AND DRYER WITH LINES

64 53 REFRIGERANT LINES AND EXPANSION VALVE

REFRIGERANT LINES AND EXPANSION VALVE - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Refrigerant lines to dryer bottle	E83, E85, E86	M8		20 Nm
2AZ Refrigerant lines to expansion valve/double pipe	E46, E83, E85, E86, E81, E87, E90, E91, E92	M8		20 Nm
	E53	M8		18 Nm
3AZ Adapter plate to expansion valve	E85, E86	M6		10±2 Nm
4AZ Expansion valve to heater - A/C	E85, E86	M5		3.5±0.7 Nm
5AZ Refrigerant line to bulkhead	E85, E86	M6		8.6 Nm
6AZ Refrigerant lines to condenser	E60, E61, E63, E64, E81, E83, E85, E86, E87, E90, E91, E92, E93	M8		20 Nm
7AZ Refrigerant lines to expansion valve	E60, E61, E63, E64	M6		8.8 Nm
8AZ Refrigerant line to assembly compartment partition reinforcement	E60, E61, E63, E64	M6		7.6 Nm
9AZ Expansion valve to heater - A/C	E46, E60, E61, E63, E64, E83	M5		5.5 Nm
	E85, E86	M5		3.5±0.7 Nm
10AZ Refrigerant line to body	E46, E83	M6		5.5 Nm
11AZ Double pipe to expansion valve	E46, E83	M6		8.0 Nm
12AZ Screw plug to condenser	E53, E81, E87, E90, E91, E92			3.0±0.5 Nm
13AZ Expansion valve to retainer	E81, E87, E90, E91, E92, E93	M6		8.0 Nm
14AZ Pressure sensor in refrigerant line	E53, E60, E61, E63, E64, E65, E66, E81, E83, E85, E86, E87, E90, E91, E92, E93			10 Nm

ACCESSORIES AND EQUIPMENT

Lighting - Repair Instructions - X3

10 LAMP SETTINGS

63 10 ... TEST REQUIREMENTS FOR HEADLIGHT VERTICAL AIM ADJUSTMENT

- Car parked on level ground.
- Replace faulty glass and mirrors and blackened light bulbs.
- Check tire pressure and correct if necessary.
- Apply load equivalent to one person on driver's seat (approx. 75 kg).
- Vehicle with full fuel tank or appropriate additional weight in luggage compartment.
- Correct adjustment of headlights in relation to engine hood (gap dimensions).
- Manual headlight vertical aim control: Turn handwheel to 0 position.
- Automatic headlight vertical aim control: Wait approx. 30 seconds after switching on lights.
- Version with xenon headlights: Wait 80 seconds after switching on lights. During this time, do not move the vehicle and avoid vibrations.
- Align headlight aimer with vehicle longitudinal axis and parallel to parking surface. Set marking line (M) on aimer to distance (e). Scale graduations on aimer are equal to a gradient in cm at a distance of 10 meters.

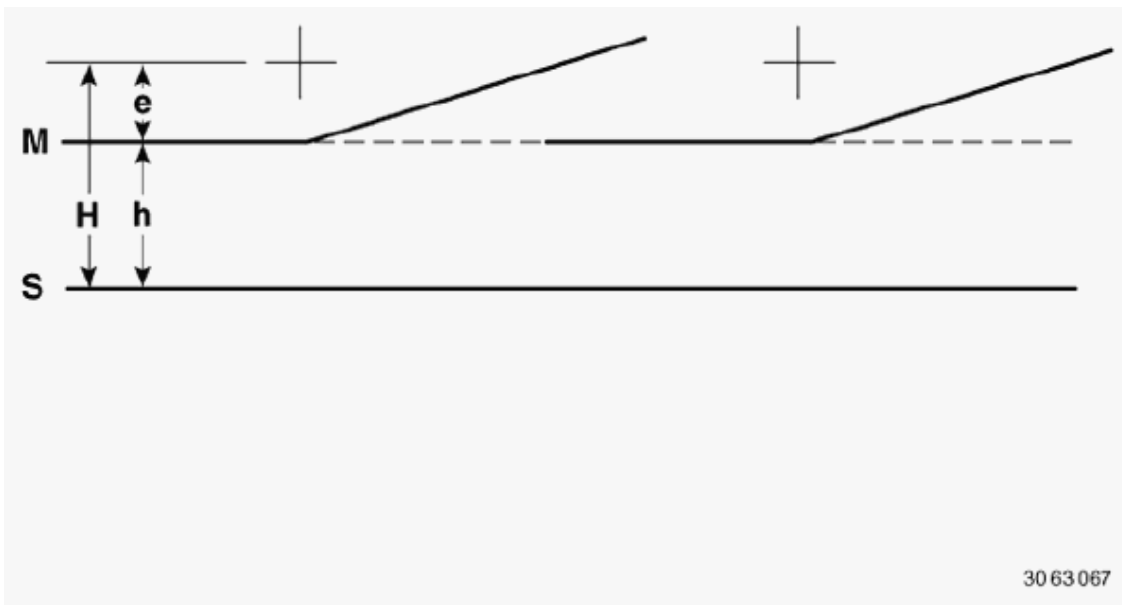


Fig. 1: Headlight Aiming

Courtesy of BMW OF NORTH AMERICA, INC.

Light/dark limit of headlights in headlight aimer

e Adjustment dimension, headlights:

- as per type plate on headlight housing in % (e.g.: 1.0 % = 10 cm / 10 m = 10 on headlight aimer).

Adjustment dimension, fog lights:

- all vehicles 2.0 % = 20 cm / 10 m = 20 on headlight aimer.

H Height of center of headlight above parking surface.

h H - e = height of marking line above parking surface

+ Central mark = center point of high-beam headlight.

M Marking line of headlamp aimer

S Parking surface of vehicle and headlight aimer

Adjustment dimension (e) is only valid for EUR. Observe differing national regulations.

63 10 004 ADJUSTING HEADLIGHTS

NOTE: Comply with test preconditions for headlight adjustment, see 63 10 ... Test requirements for headlight vertical aim adjustment.

Adjust headlights at adjusting screws (1) and (2).

A definite allocation of adjusting screws is not possible.

1. Adjustment screw primarily for vertical adjustment
2. Adjustment screw primarily for lateral adjustment

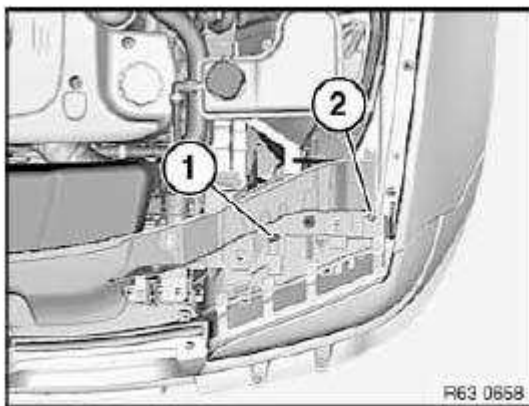


Fig. 2: Headlight Adjusting Screws
Courtesy of BMW OF NORTH AMERICA, INC.

63 10 014 ADJUSTING FOG LAMPS

Comply with test preconditions for headlight adjustment, see **63 10 ... Test requirements for headlight vertical aim adjustment.**

Unclip fog lamp trim (1) through opening (2) and remove from front bumper trim (3).

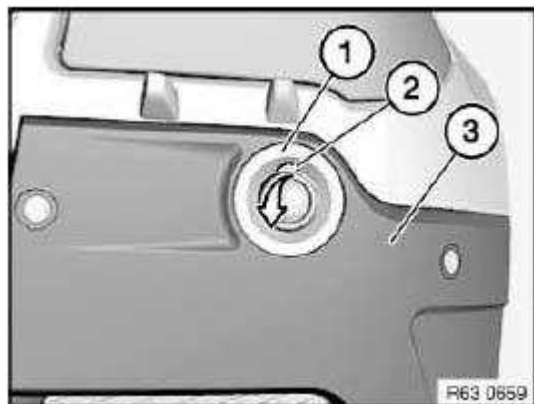


Fig. 3: Unclipping Fog Lamp Trim
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Retaining hooks (1) of fog lamp trim (2) must not be damaged. Make sure fog lamp trim (2) is correctly seated in front bumper trim.

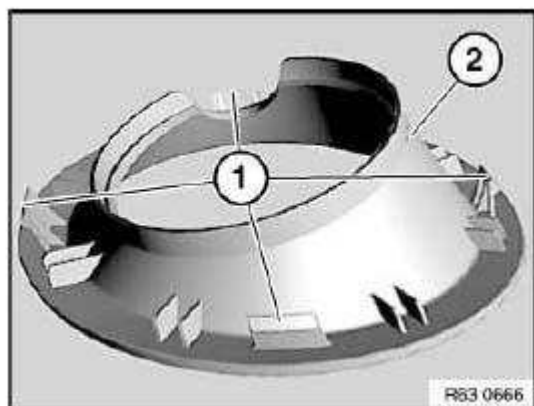


Fig. 4: Retaining Hooks Of Fog Lamp Trim
Courtesy of BMW OF NORTH AMERICA, INC.

Adjust fog lamp (1) by turning adjusting screw (2).

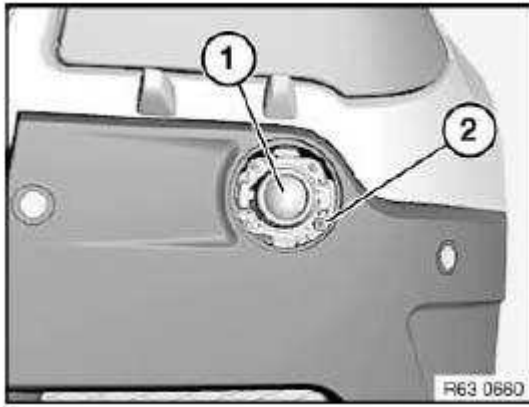


Fig. 5: Fog Lamp And Adjusting Screw
Courtesy of BMW OF NORTH AMERICA, INC.

12 HEADLIGHTS

51 11 710 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT HEADLIGHT BRACKET (M TECHNIC AERODYNAMIC KIT)

Necessary preliminary tasks:

- Remove front bumper trim, see **51 11 156 REMOVING AND INSTALLING FRONT BUMPER TRIM (FROM 09/2006)** .

Version with headlight washer system:

- Remove high-pressure nozzle, see **61 67 083 REMOVING AND INSTALLING/REPLACING HIGH - PRESSURE NOZZLE OF LEFT OR RIGHT HEADLIGHT WASHER SYSTEM (M AERODYNAMIC KIT)** .

Release screws (1) and remove bracket (2).

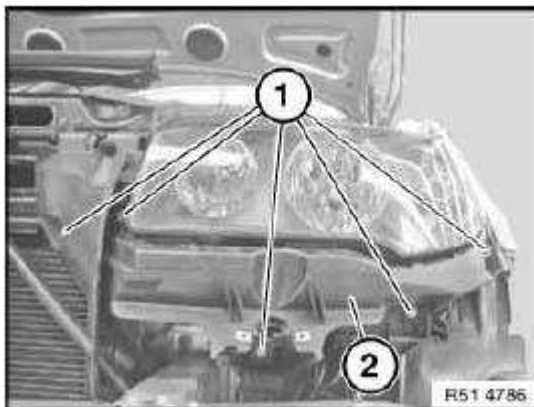


Fig. 6: Screws And Bracket

Courtesy of BMW OF NORTH AMERICA, INC.

63 12 001 REMOVING AND INSTALLING/REPLACING LEFT HEADLIGHT

Operation is described in:

Removing and installing left xenon headlight, see **63 12 010 Removing and installing/replacing left headlight (xenon headlight)**.

63 12 002 REMOVING AND INSTALLING/REPLACING RIGHT HEADLIGHT

Operation is described in:

Removing and installing left headlight, see **63 12 010 Removing and installing/replacing left headlight (xenon headlight)**.

63 12 010 REMOVING AND INSTALLING/REPLACING LEFT HEADLIGHT (XENON HEADLIGHT)

WARNING: Follow instructions for handling light bulbs (exterior lights), see 63 99 ... Instructions for handling light bulbs (exterior lights).

Necessary preliminary tasks:

- Remove front bumper trim, see **51 11 156 REMOVING AND INSTALLING FRONT BUMPER TRIM (FROM 09/2006)** .

Version with M Technic aerodynamic kit:

- Remove headlight bracket, see **51 11 710 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT HEADLIGHT BRACKET (M TECHNIC AERODYNAMIC KIT)** .

Unlock plug connections (1) and disconnect.

Release screws (2) and (3).

Installation:

- Observe gap dimensions, see **00 BODY** .
- Adjust headlight, see **63 10 004 Adjusting headlights**.

Pull out headlight (4) in direction of arrow and remove.

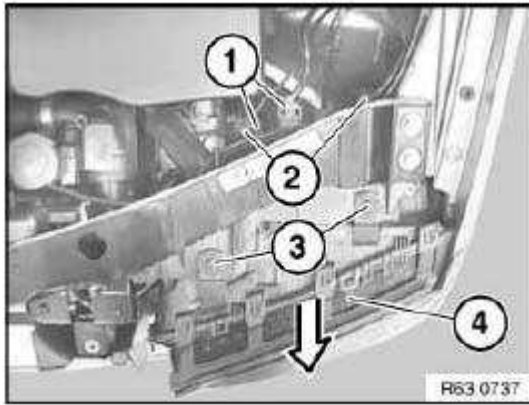


Fig. 7: Unlocking Plug Connections
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Install headlight (1) so that locators (2) fit exactly on guides (3).

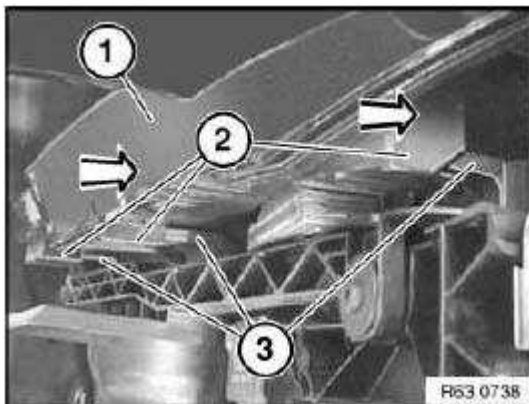


Fig. 8: Headlight Locators
 Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

- Remove ignition unit and bulb for xenon headlight, see **63 99 076 Replacing bulb for left xenon headlight.**
- Remove control unit for xenon headlights, see **63 12 860 REPLACING CONTROL UNIT FOR LEFT XENON HEADLIGHT .**

63 12 012 REMOVING AND INSTALLING RIGHT HEADLIGHT (XENON HEADLIGHT)

Operation is described in:

Removing and installing left headlight, see **63 12 010 Removing and installing/replacing left headlight**

(xenon headlight).

63 12 015 REMOVING AND INSTALLING LEFT HEADLIGHT (ADAPTIVE HEADLIGHT)

This operation is described in:

Removing and installing left xenon headlight, see **63 12 010 Removing and installing/replacing left headlight (xenon headlight).**

63 12 016 REPLACING LEFT HEADLIGHT (ADAPTIVE HEADLIGHT)

IMPORTANT: Read and comply with 61 35 ... NOTES ON ESD PROTECTION (ELECTRO STATIC DISCHARGE) .

WARNING: Follow instructions for handling light bulbs (exterior lights), see 63 99 ... Instructions for handling light bulbs (exterior lights).

Necessary preliminary tasks:

- Remove left headlight, see **63 12 010 Removing and installing/replacing left headlight (xenon headlight).**
- Remove drive unit for adaptive headlight, see **63 12 895 Replacing drive for left adaptive headlight.**
- Remove control unit for left xenon headlight, see **63 12 860 Replacing control unit for left xenon headlight.**
- Remove bulb for left xenon headlight (ignition unit), see **63 99 076 Replacing bulb for left xenon headlight.**

After installation:

- Carry out programming/coding using appropriate BMW service tool.
- Adjust headlight, see **63 10 004 Adjusting headlights.**

63 12 017 REMOVING AND INSTALLING/REPLACING RIGHT HEADLIGHT (ADAPTIVE HEADLIGHT)

Operation is described in:

Removing and installing left headlight, see **63 12 010 Removing and installing/replacing left headlight (xenon headlight).**

63 12 860 REPLACING CONTROL UNIT FOR LEFT XENON HEADLIGHT

**WARNING: Version with xenon headlights: Danger to life due to high voltage!
Therefore disconnect all components from voltage supply before removal.
Work on the entire xenon lighting system (ignition unit, control unit and**

lamp) may only be carried out by specialist personnel.

Necessary preliminary tasks:

- Remove left headlight, see 63 12 010 Removing and installing/replacing left headlight (xenon headlight).

Release screws (1).

Remove control unit for xenon headlight (2) from headlight (3).

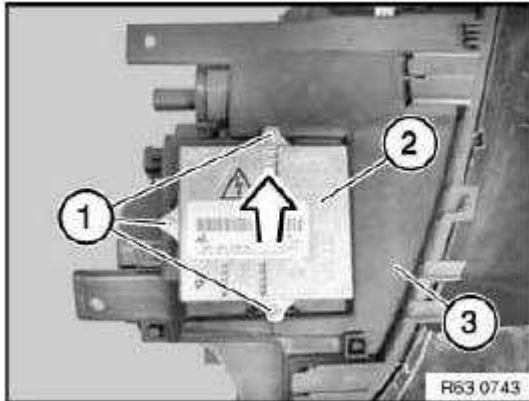


Fig. 9: Screws And Control Unit
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Fit control unit for xenon headlight (3) exactly on headlight.

Make sure plug housing (1) is correctly seated on pin housing (2).

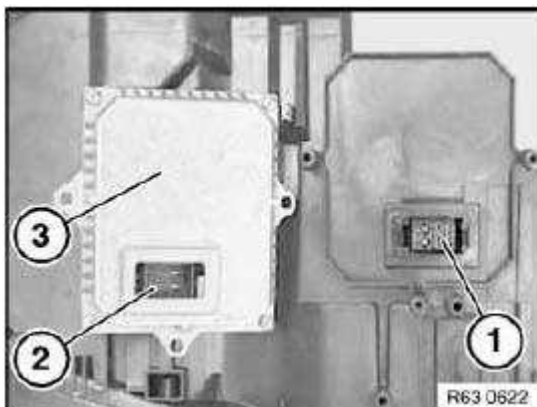


Fig. 10: Control Unit And Plug Housing
Courtesy of BMW OF NORTH AMERICA, INC.

63 12 861 REPLACING CONTROL UNIT FOR RIGHT XENON HEADLIGHT

Operation is described in:

Remove control unit for left xenon headlight, see [63 12 860 Replacing control unit for left xenon headlight.](#)

63 12 870 REPLACING IGNITION UNIT FOR LEFT XENON HEADLIGHT

**WARNING: Version with xenon headlights: Danger to life due to high voltage!
Therefore disconnect all components from voltage supply before removal.
Work on the entire xenon lighting system (ignition unit, control unit and lamp) may only be carried out by specialist personnel.**

Unlock catch (1) in direction of arrow and fold down cover (2).

Remove cover (2) from headlight (3).

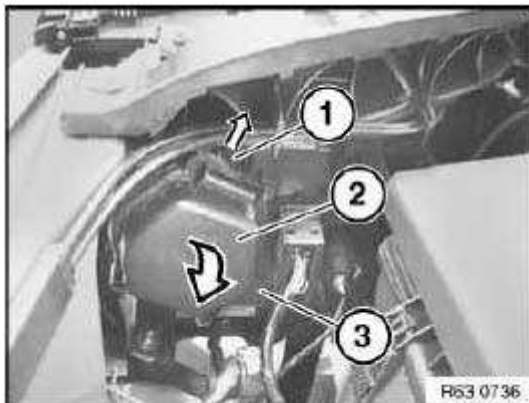


Fig. 11: Removing Cover From Headlight
Courtesy of BMW OF NORTH AMERICA, INC.

Turn ignition unit for xenon headlight (1) approx. 30° counterclockwise and detach from headlight (3).

NOTE: Plug connection (2) is automatically released by turning ignition unit for xenon headlight (1).

Feed out ignition unit for xenon headlight (1) through opening in headlight (4) and remove.

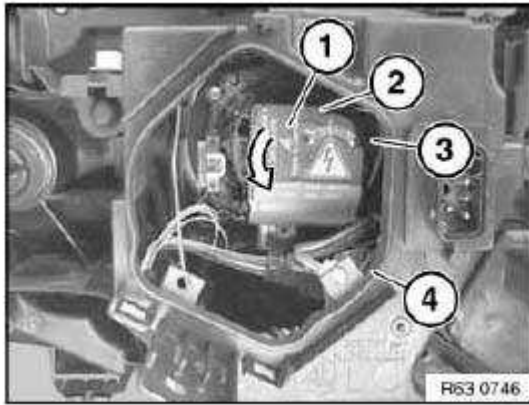


Fig. 12: Xenon Headlight

Courtesy of BMW OF NORTH AMERICA, INC.

63 12 871 REPLACING RIGHT IGNITION UNIT FOR RIGHT XENON HEADLIGHT

Operation is described in:

Remove control unit for left xenon headlight, see **63 12 860 Replacing control unit for left xenon headlight.**

63 12 895 REPLACING DRIVE FOR LEFT ADAPTIVE HEADLIGHT

IMPORTANT: Read and comply with 61 35 ... NOTES ON ESD PROTECTION (ELECTROSTATIC DISCHARGE) .

**WARNING: Version with xenon headlights: Danger to life due to high voltage!
Therefore disconnect all components from voltage supply before removal.
Work on the entire xenon lighting system (ignition unit, control unit and lamp) may only be carried out by specialist personnel.**

Necessary preliminary tasks:

- Remove left headlight, see **63 12 010 Removing and installing/replacing left headlight (xenon headlight).**

Release screws (1).

Remove drive for adaptive headlight (2) in direction of arrow from headlight (3).

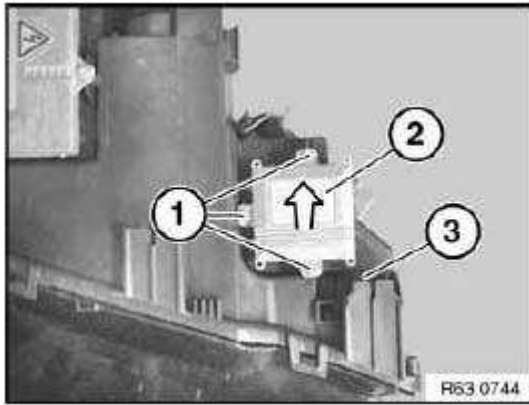


Fig. 13: Screws And Headlight
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Fit drive for adaptive headlight (1) exactly on headlight.

Make sure pin housing (2) is correctly seated in plug housing (3).

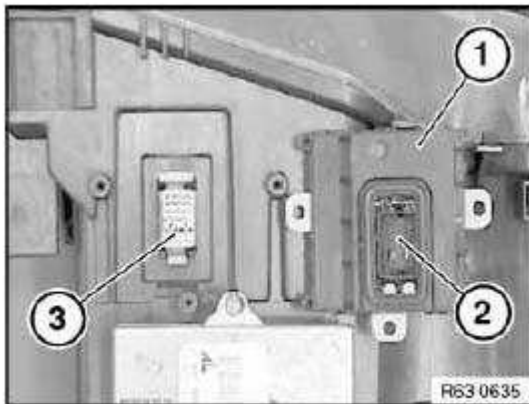


Fig. 14: Adaptive Headlight And Pin Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Carry out coding/programming using appropriate BMW service tool.

63 12 896 REPLACING DRIVE FOR RIGHT ADAPTIVE HEADLIGHT

Operation is described in:

Replacing drive for left adaptive headlight, see **63 12 895 Replacing drive for left adaptive headlight.**

63 12 950 REPLACING A LOWER HOLDER FOR HEADLIGHT MOUNTING

Necessary preliminary tasks:

- Remove headlight, see **63 12 010 Removing and installing/replacing left headlight (xenon headlight).**

Release screws (1).

Remove holder (2) from headlight (3).

Installation:

Screws (1) are also used for gap adjustment.

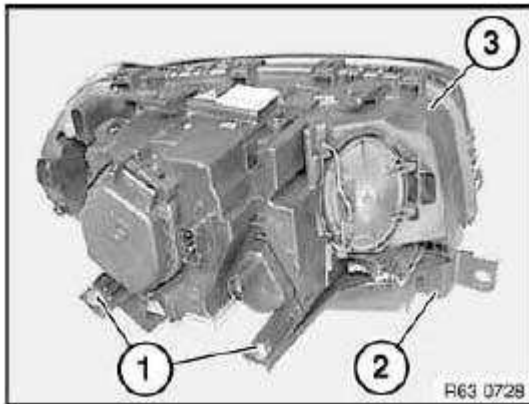


Fig. 15: Holder And Headlight
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Make sure metal nuts (1) are correctly seated.

Guides (2) must slide exactly in locators (3).

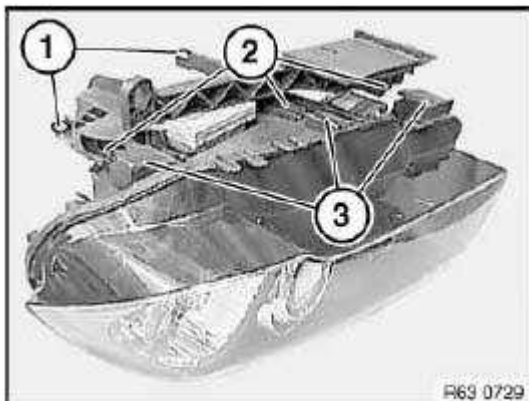


Fig. 16: Metal Nuts And Guides
Courtesy of BMW OF NORTH AMERICA, INC.

13 TURN SIGNAL INDICATOR LIGHTS

63 13 200 REMOVING AND INSTALLING/REPLACING FRONT LEFT OR RIGHT AUXILIARY TURN SIGNAL LAMP

Slide front auxiliary turn signal lamp (1) towards front and fold in direction of arrow out of front side wall (2).

Unlock associated plug connection and disconnect.

Remove front auxiliary turn signal lamp (1).

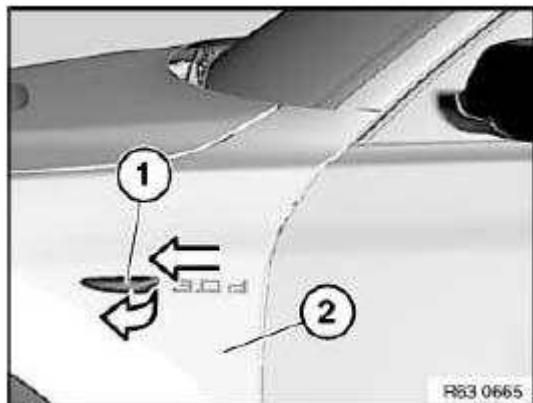


Fig. 17: Removing Front Auxiliary Turn Signal Lamp
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

If necessary, convert bulb.

WARNING: Follow instructions for handling light bulbs (exterior lights), see [63 99 ...](#)
Instructions for handling light bulbs (exterior lights).

Installation:

Note type of bulb, see [63 13 TURN SIGNALS E83](#) .

14 CLEARANCE AND SIDE MARKER LAMPS

63 14 120 REMOVING AND INSTALLING OR REPLACING REAR REFLECTOR

Unclip reflector (1) from bumper panel (2) in area (3).

Pull reflector (1) out of guide and detach towards rear from bumper panel.

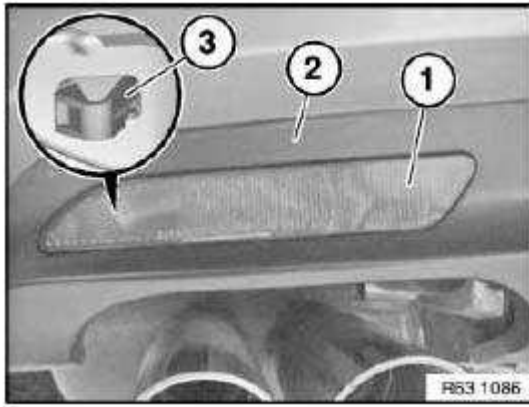


Fig. 18: Reflector And Bumper Panel
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Catches (1) on rear reflector must not be damaged.

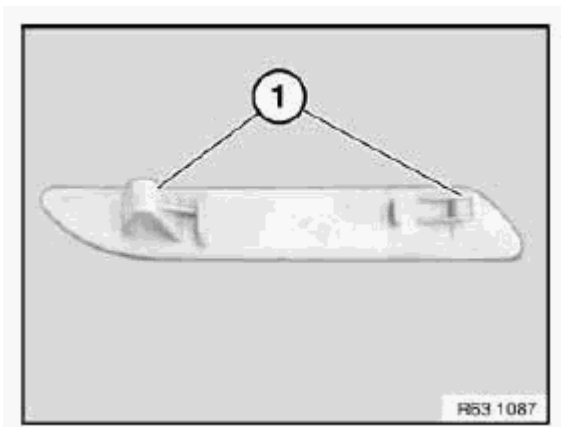


Fig. 19: Catches
Courtesy of BMW OF NORTH AMERICA, INC.

17 FOG LIGHTS, AUXILIARY LIGHTS

63 17 060 REMOVING AND INSTALLING (REPLACING) LEFT OR RIGHT FRONT FOG LAMP

WARNING: Follow instructions for handling light bulbs (exterior lights), see 63 99 ... Instructions for handling light bulbs (exterior lights).

Unclip fog lamp trim (1) through opening (2) and remove from front bumper trim (3).

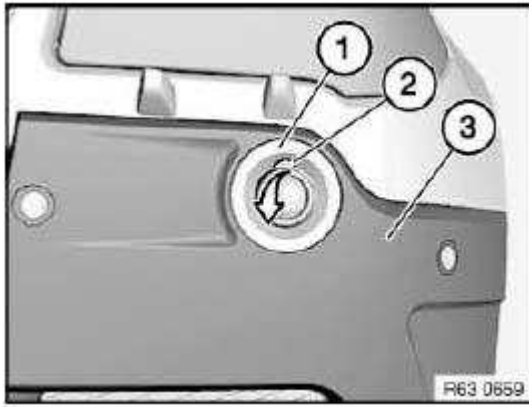


Fig. 20: Unclipping Fog Lamp Trim
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Retaining hooks (1) of fog lamp trim (2) must not be damaged.

Make sure fog lamp trim (2) is correctly seated in front bumper trim (2).

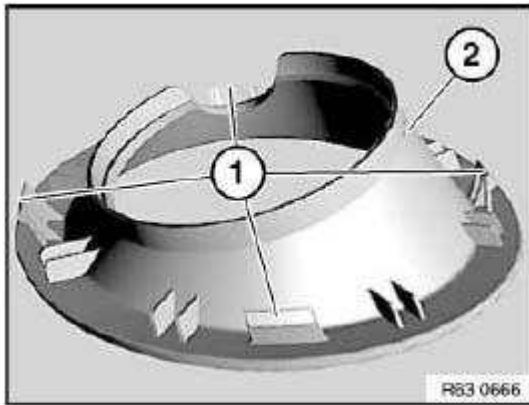


Fig. 21: Retaining Hooks Of Fog Lamp Trim
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Feed fog lamp (2) in direction of arrow out of front bumper trim (3).

Unlock associated plug connection and disconnect.

Remove fog lamp (2).

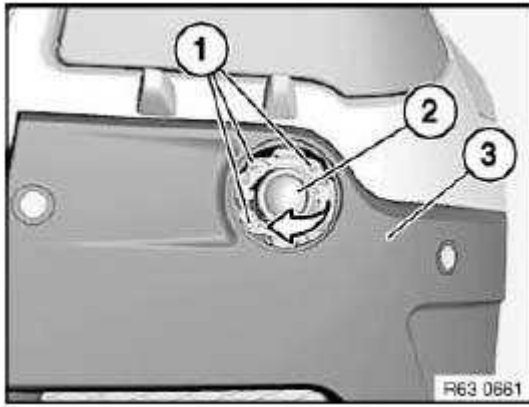


Fig. 22: Fog Lamp And Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

Adjust front fog lamps, see **63 10 014 Adjusting fog lamps.**

If necessary, convert bulb.

Installation:

Note bulb type, see **63 17 FRONT FOG LAMPS, ADDITIONAL LAMPS E83 .**

63 17 060 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT FRONT FOG LAMP (M AERODYNAMIC KIT)

WARNING: Follow instructions for handling light bulbs (exterior lights), see 63 99 ... Instructions for handling light bulbs (exterior lights).

Necessary preliminary tasks:

- Remove front fog lamp trim

Release screws (1).

Feed fog lamp (2) in direction of arrow out of front bumper trim.

Unlock associated plug connection and disconnect.

Remove fog lamp (2).



Fig. 23: Screws And Fog Lamp

Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

Adjust front fog lamps, see **63 10 014 Adjusting fog lamps.**

If necessary, convert bulb.

Installation:

Note type of bulb, see **63 13 TURN SIGNALS E83 .**

21 REAR LIGHT CLUSTER

63 21 055 REPLACING A SOCKET HOUSING FOR LEFT OR RIGHT TAIL LIGHT

WARNING: Follow instructions for handling light bulbs (exterior lights), see 63 99 ... Instructions for handling light bulbs (exterior lights).

Side panel:

Unfasten plug connection (1) and disconnect.

Fold back side panel (2) in direction of arrow.

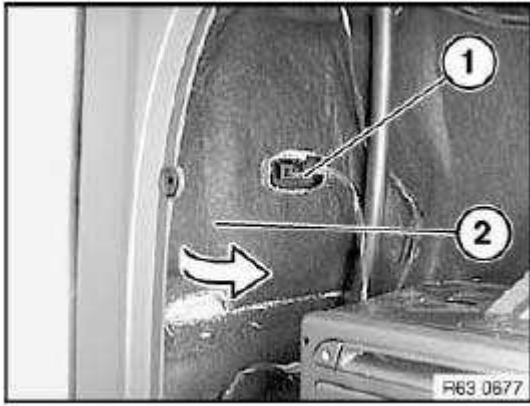


Fig. 24: Folding Back Side Panel

Courtesy of BMW OF NORTH AMERICA, INC.

Unlock catch (1) and remove socket housing for rear light (2) in direction of arrow from rear light (3).

NOTE: If necessary, remove bulbs from socket housing for rear light (2).

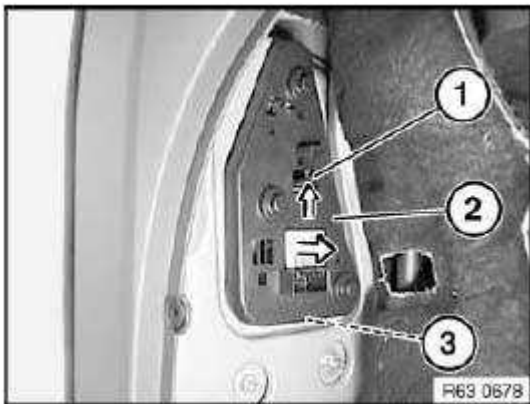


Fig. 25: Catch And Socket Housing

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Insert socket housing for rear light (1) in rear light (2) in such a way that retaining hook (3) engages associated locator (4).

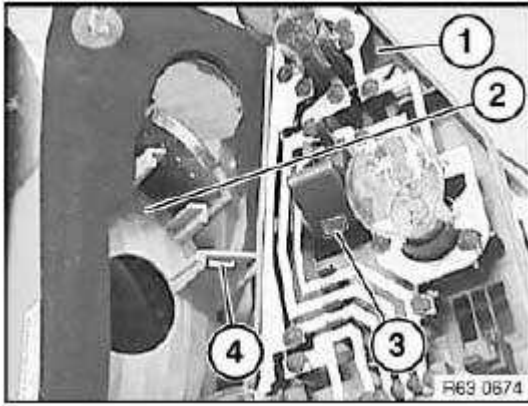


Fig. 26: Socket Housing And Rear Light
 Courtesy of BMW OF NORTH AMERICA, INC.

Rear lid:

Necessary preliminary tasks:

- Remove panel for rear lid, see **51 49 008 REMOVING AND INSTALLING/REPLACING PANEL FOR REAR LID** .

Turn socket housing for rear light to be replaced counterclockwise and remove.

- NOTE:**
- 1. Socket housing for fog warning lamp**
 - 2. Socket housing for reversing light**

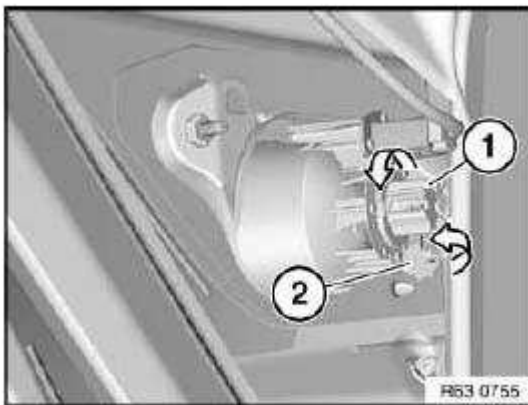


Fig. 27: Socket Housing For Fog Warning Lamp
 Courtesy of BMW OF NORTH AMERICA, INC.

- NOTE:** Convert bulbs, replace if necessary, see **63 99 312 REPLACING BULB(S) FOR LEFT OR RIGHT REAR LIGHT (REAR LID)** .

63 21 101 REPLACING SEALING FRAME FOR LEFT OR RIGHT REAR LIGHT (ON SIDE PANEL)

Necessary preliminary tasks:

- Remove rear light, see **63 21 180 Removing and installing/replacing left or right rear light (on side panel)**.

Detach sealing frame for rear light (1) in upwards direction from rear light (2).

Installation:

Sealing frame for rear light (1) is centered via openings for threaded pins (3).

Make sure sealing frame for rear light (1) is correctly bonded all round on rear light (2).

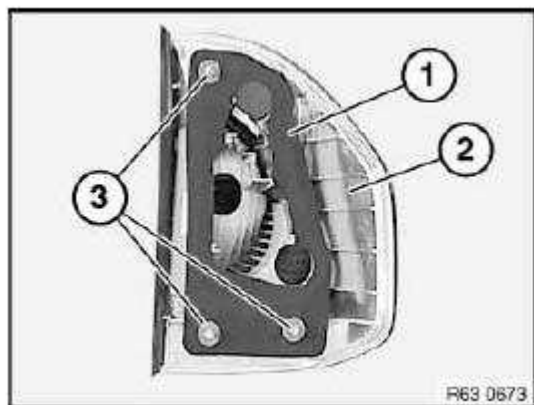


Fig. 28: Threaded Pins And Rear Light
Courtesy of BMW OF NORTH AMERICA, INC.

63 21 104 REPLACING SEALING FRAME FOR LEFT OR RIGHT REAR LIGHT (ON REAR LID)

Necessary preliminary tasks:

- Remove rear light, see **63 21 180 Removing and installing/replacing left or right rear light (on side panel)**.

Detach sealing frame for rear light (1) in direction of arrow from rear light (2).

Installation:

Make sure sealing frame for rear light (1) is correctly bonded all round on rear light (2).

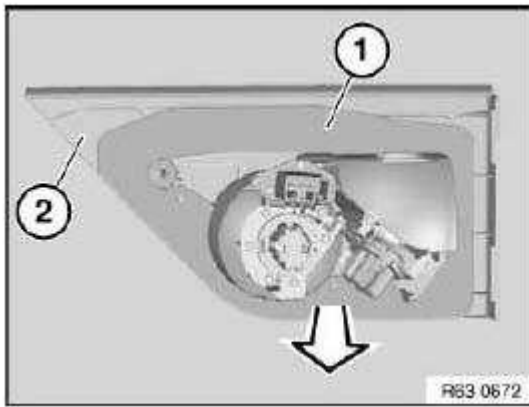


Fig. 29: Sealing Frame

Courtesy of BMW OF NORTH AMERICA, INC.

63 21 180 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT REAR LIGHT (ON SIDE PANEL)

IMPORTANT: Read and comply with 61 35 ... NOTES ON ESD PROTECTION (ELECTRO STATIC DISCHARGE) .

Necessary preliminary tasks:

- Remove socket housing for rear light, see **63 21 055 REPLACING A SOCKET HOUSING FOR LEFT OR RIGHT TAIL LIGHT** .

Unscrew nuts (1).

Tightening torque: 63 21 1AZ, see **63 21 REAR LIGHT UNIT** .

Remove rear light (2) in outwards direction from side panel (3).

Installation:

Make sure gap (outer) is uniform all round between rear light (2) and side panel (3).

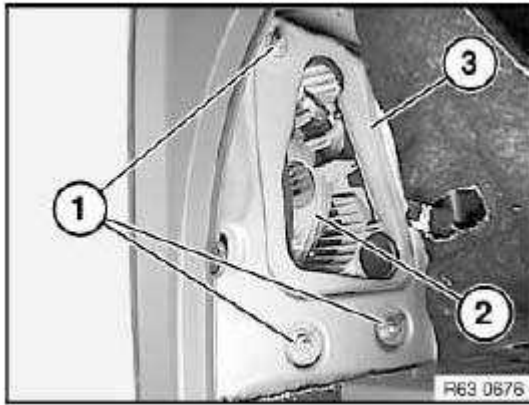


Fig. 30: Nuts And Side Panel

Courtesy of BMW OF NORTH AMERICA, INC.

63 21 183 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT TAIL LIGHT (ON REAR LID)

IMPORTANT: Read and comply with 61 35 ... NOTES ON ESD PROTECTION (ELECTRO STATIC DISCHARGE) .

Necessary preliminary tasks:

- Remove panel for rear lid, see **51 49 008 REMOVING AND INSTALLING/REPLACING PANEL FOR REAR LID .**

Disconnect plug connection (1).

Slacken nut (2).

Tightening torque: 63 21 1AZ, see **63 21 REAR LIGHT UNIT .**

Feed out rear light (3) in direction of arrow and remove in outward direction from rear lid.

Installation:

Make sure guide (4) is correctly seated in cutout for rear lid (5).

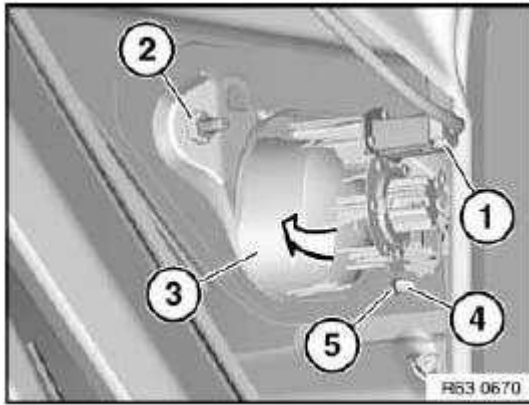


Fig. 31: Plug Connection And Rear Light
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Position lugs (1) of rear light (2) exactly over side edge of rear lid (3).

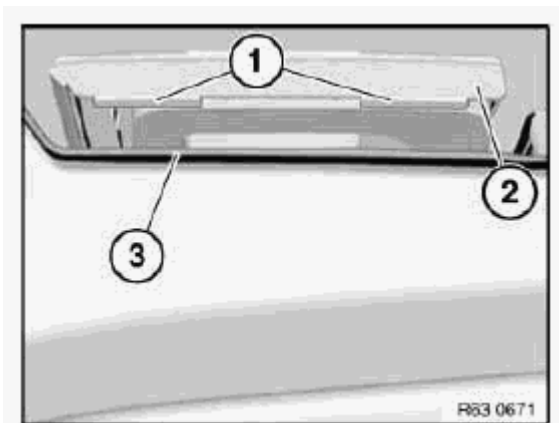


Fig. 32: Lugs Of Rear Light
 Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

If necessary, remove bulbs, see **63 99 312 Replacing bulb(s) for left or right rear light (rear lid)**.

25 BRAKE LIGHTS

63 25 000 REMOVING AND INSTALLING/REPLACING AUXILIARY BRAKE LIGHT

Necessary preliminary tasks:

- Remove rear spoiler, see **51 71 412 REMOVING AND INSTALLING REAR SPOILER** .

Release screws (1).

Installation:

Make sure hose (2) is correctly seated.

Slide additional stop light (3) slightly towards rear out of rear spoiler.

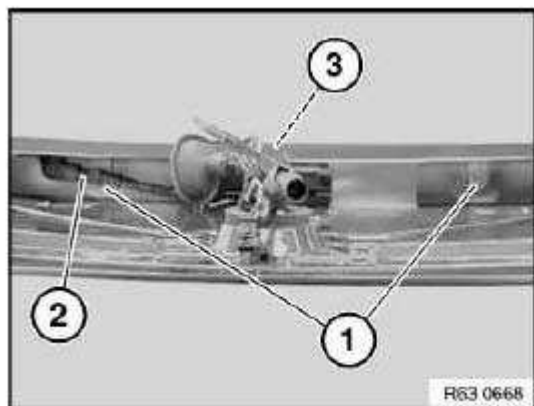


Fig. 33: Additional Stop Light And Hose
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten plug connection (1) and disconnect.

Pull additional stop light (2) in direction of arrow out of rear spoiler (3) and remove.

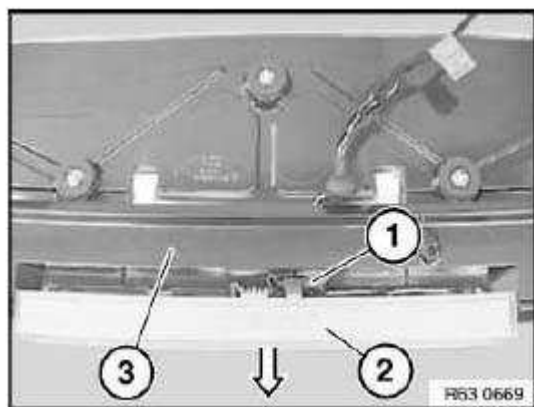


Fig. 34: Plug Connection And Additional Stop Light
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Guides (1) must be exactly seated in locators (2).

Make sure electrical leads (3) are correctly routed.

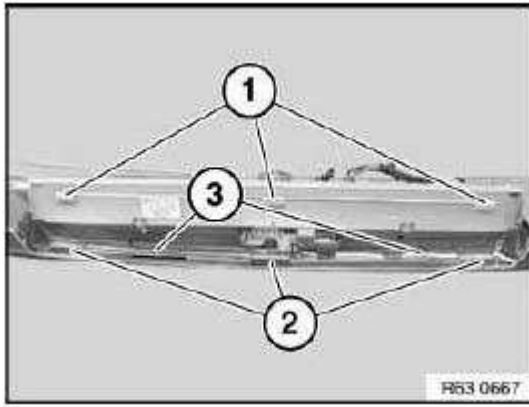


Fig. 35: Guides And Electrical Leads

Courtesy of BMW OF NORTH AMERICA, INC.

26 LICENCE PLATE LIGHTS

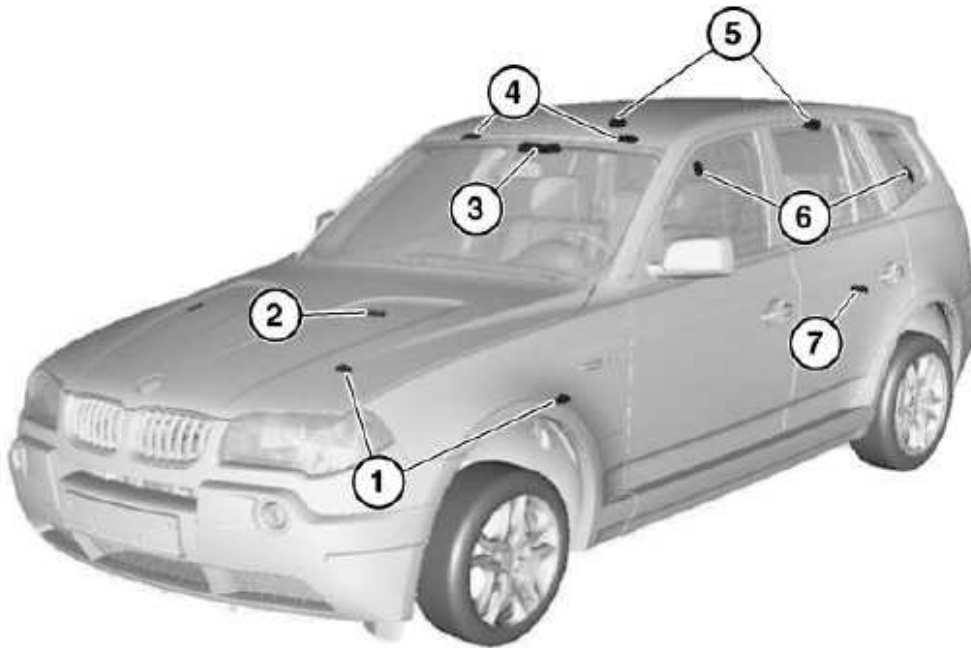
63 26 000 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT NUMBER/LICENSE PLATE LIGHT

Operation is described in:

Replacing handle strip (on rear lid), see **51 13 402 REMOVING AND INSTALLING/REPLACING HANDLE STRIP (ON REAR LID)** .

31 INTERIOR LIGHTS

63 31 .. OVERVIEW OF INTERIOR LIGHTS



H63 0943

- | | | | |
|---|---------------------------------------|---|--|
| 1 | Footwell light | 5 | Interior light |
| 2 | Glovebox light | 6 | Luggage compartment light (D-pillar) |
| 3 | Ceiling light (front) | 7 | Luggage compartment light (rear lid) |
| 4 | Mirror lights | | |

Fig. 36: Overview Of Interior Lights

Courtesy of BMW OF NORTH AMERICA, INC.

63 31 000 REMOVING AND INSTALLING/REPLACING COMPLETE CEILING LIGHT (FRONT)

Special tools required:

See **00 MAINTENANCE AND GENERAL INFORMATION**

- 00 9 317

IMPORTANT: Follow instructions for handling light bulbs (interior lights), see 63 99 ... INSTRUCTIONS FOR HANDLING LIGHT BULBS (EXTERIOR LIGHTS) .

Lever out ceiling light (1) with special tool 00 9 317 as illustrated.

Disconnect associated plug connection and remove ceiling light (1).

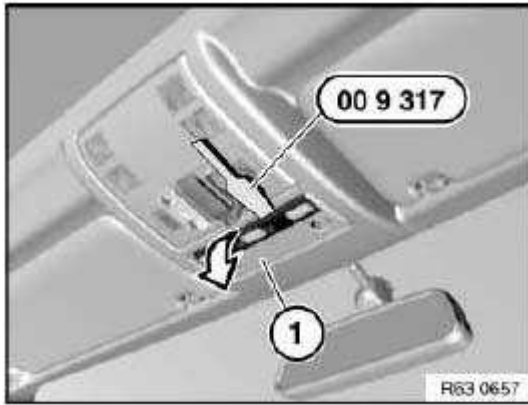


Fig. 37: Special Tool (00 9 317)

Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

- If necessary, convert bulbs.
- Note bulb type, see **63 31 INTERIOR LIGHTS E83** .

63 31 015 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT INTERIOR LIGHT (SIDE ROOFLINER)

Special tools required:

- **64 1 020 RELEASE HOOK**

IMPORTANT: Follow instructions for handling light bulbs (interior lights), see 63 99 ... INSTRUCTIONS FOR HANDLING LIGHT BULBS (EXTERIOR LIGHTS) .

Lever out lens cover (1) with special tool 64 1 020 at retaining points (2).

Feed out lens cover (1) in direction of arrow and remove.

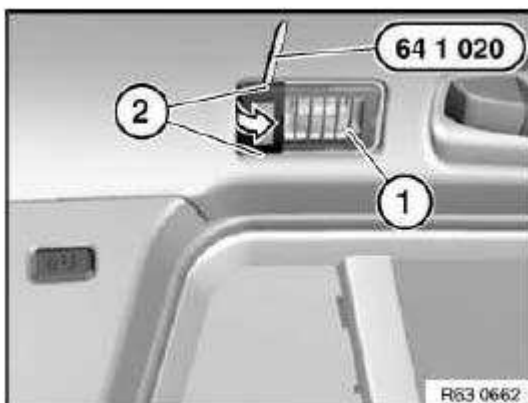


Fig. 38: Lens Cover With Special Tool (64 1 020)
Courtesy of BMW OF NORTH AMERICA, INC.

Lever out interior light (1) with special tool 64 1 020 as illustrated.

Disconnect associated plug connection and remove interior light (1).

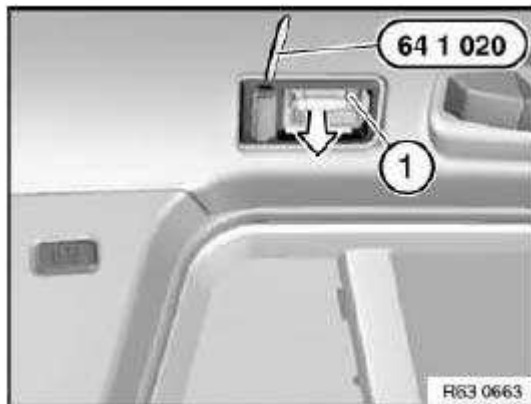


Fig. 39: Special Tool (64 1 020)
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

- If necessary, convert bulbs.
- Note bulb type, see **63 31 INTERIOR LIGHTS E83** .

63 31 020 REMOVING AND INSTALLING/REPLACING FOOTWELL LIGHT

Special tools required:

- **64 1 020 RELEASE HOOK**

IMPORTANT: Follow instructions for handling light bulbs (interior lights), see 63 99 ... INSTRUCTIONS FOR HANDLING LIGHT BULBS (EXTERIOR LIGHTS) .

Replacement:

If necessary, remove bulb.

Lever footwell light (1) with special tool 64 1 020 out of trim for pedal assembly (2).

Disconnect associated plug connection and remove footwell light (1).

Replacement:

Note bulb type, see **63 31 INTERIOR LIGHTS E83** .

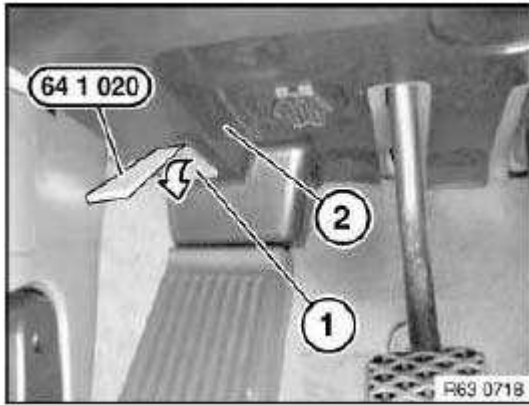


Fig. 40: Special Tool (64 1 020)

Courtesy of BMW OF NORTH AMERICA, INC.

63 31 050 REMOVING AND INSTALLING/REPLACING MIRROR LIGHT

IMPORTANT: Follow instructions for handling light bulbs (interior lights), see 63 99 ... INSTRUCTIONS FOR HANDLING LIGHT BULBS (EXTERIOR LIGHTS) .

Replacement:

If necessary, convert bulb.

Lever front mirror light (1) in direction of arrow.

Disconnect plug connection underneath and remove mirror plate light (1).

Replacement:

Note bulb type, see 63 31 INTERIOR LIGHTS E83 .

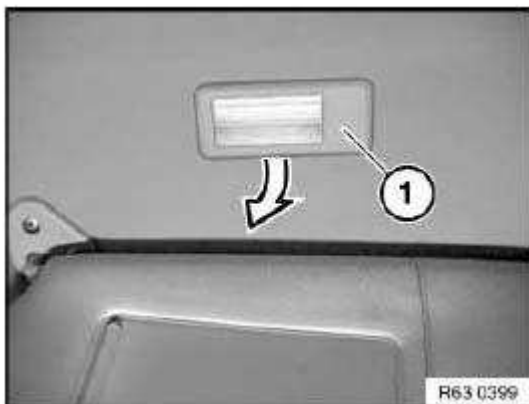


Fig. 41: Removing Front Mirror Light

Courtesy of BMW OF NORTH AMERICA, INC.

63 31 080 REMOVING AND INSTALLING/REPLACING LUGGAGE COMPARTMENT LIGHT (D-

PILLAR)

Special tools required:

- **64 1 020 RELEASE HOOK**

IMPORTANT: Follow instructions for handling light bulbs (interior lights), see 63 99 ... INSTRUCTIONS FOR HANDLING LIGHT BULBS (EXTERIOR LIGHTS) .

Lever out luggage compartment light (1) with special tool 64 1 020 as illustrated.

Disconnect associated plug connection and remove luggage compartment light (1).

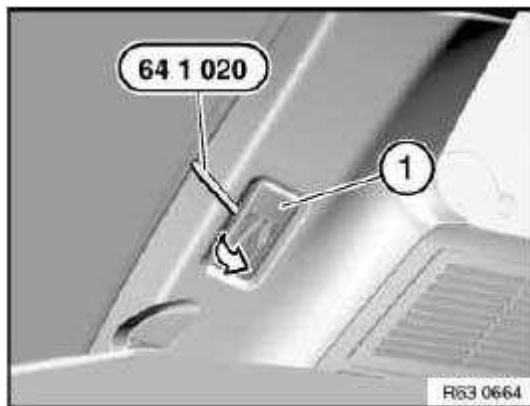


Fig. 42: Luggage Compartment Light With Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

- If necessary, convert bulbs.
- Note bulb type.

63 31 085 REMOVING AND INSTALLING/REPLACING LUGGAGE COMPARTMENT LAMP (ON REAR LID)

IMPORTANT: Follow instructions for handling light bulbs (interior lights), see 63 99 ... INSTRUCTIONS FOR HANDLING LIGHT BULBS (EXTERIOR LIGHTS) .

Lever out luggage compartment lamp (1) at openings (2) in direction of arrow.

Disconnect plug connection underneath and remove luggage compartment lamp (1).

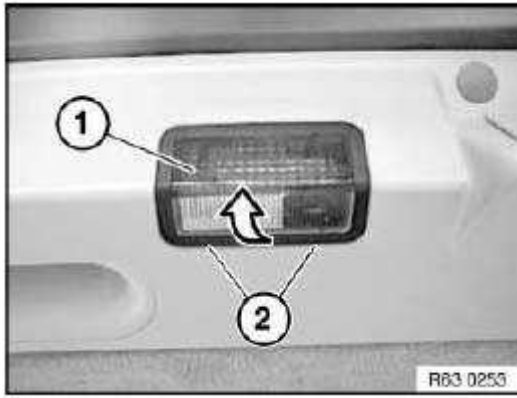


Fig. 43: Luggage Compartment Lamp
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

- If necessary, convert bulbs.
- Note bulb type, see 63 31 INTERIOR LIGHTS E83 .

63 31 150 REMOVING AND INSTALLING/REPLACING GLOVEBOX LIGHT

IMPORTANT: Follow instructions for handling light bulbs (interior lights), see 63 99 ... INSTRUCTIONS FOR HANDLING LIGHT BULBS (EXTERIOR LIGHTS) .

Lever out glovebox light (1) in direction of arrow.

Disconnect plug connection and remove glovebox light (1).

Replacement:

If necessary, remove bulb.

Note bulb type, see 63 31 INTERIOR LIGHTS E83 .

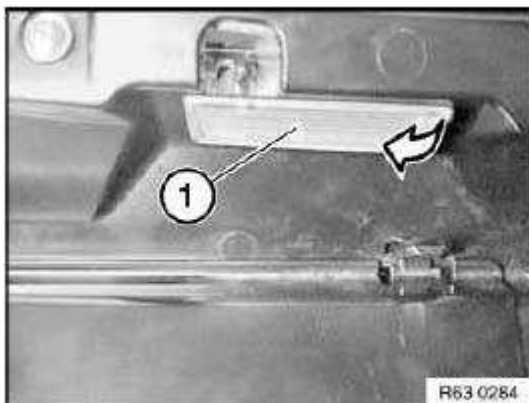


Fig. 44: Glovebox Light

Courtesy of BMW OF NORTH AMERICA, INC.

99 LIGHT BULBS

63 99 ... INSTRUCTIONS FOR HANDLING LIGHT BULBS (EXTERIOR LIGHTS)

WARNING: Xenon headlights: Danger to life due to high voltage!
Work on the entire xenon lighting system (ignition unit, control unit and lamp) may only be carried out by specialist personnel.

WARNING: Halogen lamps are under pressure:
To avoid injury, wear protective goggles and gloves.

IMPORTANT: To prevent short-circuiting, disconnect light bulbs from voltage supply prior to replacement.

Do not touch the glass bulbs in new lights bulbs as even the slightest contamination will burn in and reduce bulb service life.

Only touch light bulbs with clean gloves or a clean cloth.

Do not expose light bulbs to mechanical vibrations.

Use only recommended light bulbs.

Follow the light bulb manufacturer's instructions without fail.

63 99 ... INSTRUCTIONS FOR REPLACING LIGHT BULBS (INTERIOR LIGHTS)

CAUTION: To prevent short-circuiting, disconnect light bulbs from voltage supply prior to replacement.

Do not touch the glass bulbs in new lights bulbs as even the slightest contamination will burn in and reduce bulb service life.

Only touch light bulbs with clean gloves or a clean cloth.

Do not expose light bulbs to mechanical vibrations.

Use only recommended light bulbs.

Follow the light bulb manufacturer's instructions without fail.

63 99 002 REPLACING HALOGEN BULB FOR HIGH-BEAM HEADLIGHT ON LEFT

WARNING: Follow instructions for handling light bulbs (exterior lights), see 63 99 ... Instructions for handling light bulbs (exterior lights).

Necessary preliminary tasks:

- M54 only:

Remove suction filter housing

NOTE: **Headlight (3) removed for purposes of clarity.
Unlock clip (1) in direction of arrow.
Remove cover (2) from headlight (3).**

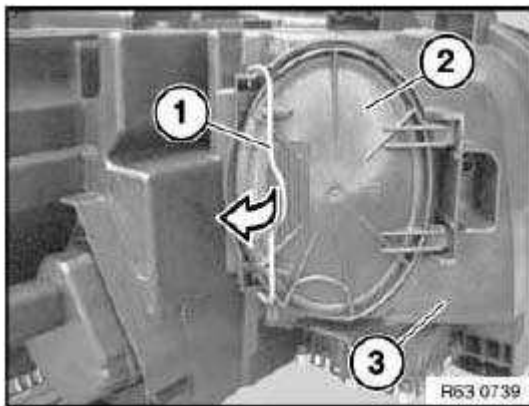


Fig. 45: Removing Clip
Courtesy of BMW OF NORTH AMERICA, INC.

Unclip bulb (1) by pressing on plug (2).

Remove bulb (1) from headlight (3) slightly, disconnect plug connection and remove bulb (1).

Installation:

Insert bulb (1) in headlight (3) at bottom at first and then tilt upwards until bulb (1) snaps audibly into place.

Make sure bulb (1) is correctly seated in catches (4).

Note type of bulb, see **63 12 HEADLIGHTS, HEADLIGHT ASSEMBLY E83** .

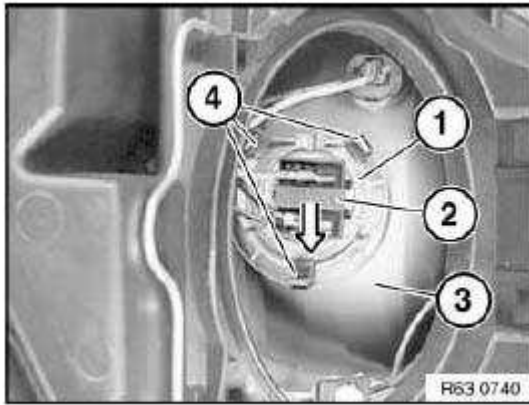


Fig. 46: Bulb And Catches

Courtesy of BMW OF NORTH AMERICA, INC.

63 99 003 REPLACING HALOGEN BULB FOR HIGH-BEAM HEADLAMP ON RIGHT

Operation is described in:

Replacing halogen bulb for high-beam headlight on left, see **63 99 002 Replacing halogen bulb for high-beam headlight on left.**

63 99 072 REPLACING HALOGEN BULB FOR LEFT (OR RIGHT) HEADLIGHT

WARNING: Follow instructions for handling light bulbs (exterior lights), see 63 99 ... Instructions for handling light bulbs (exterior lights).

NOTE: Headlight (2) removed for purposes of clarity.
Unlock cover (1) in direction of arrow.
Remove cover (1) from headlight (2).

Installation:

Make sure cover is correctly seated on headlight (2).

Guides must be exactly seated in associated mounts.

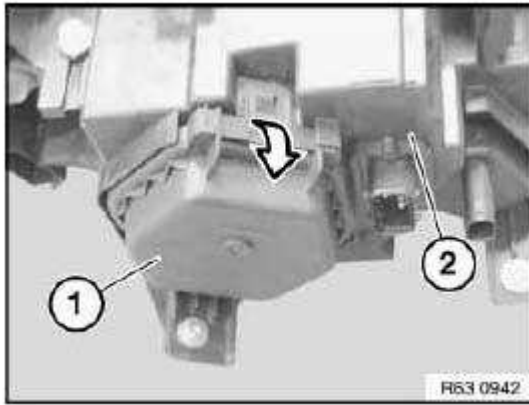


Fig. 47: Removing Cover From Headlight
Courtesy of BMW OF NORTH AMERICA, INC.

Remove bulb (1) towards rear from headlight.

Disconnect plug connection (2).

Installation:

Make sure bulb (1) is exactly seated in headlight.

Note type of bulb, see **63 12 HEADLIGHTS, HEADLIGHT ASSEMBLY E83** .

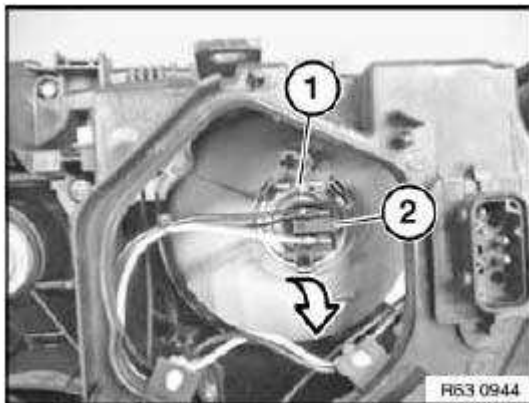


Fig. 48: Bulb And Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

63 99 076 REPLACING BULB FOR LEFT XENON HEADLIGHT

WARNING: Follow instructions for handling light bulbs (exterior lights), see **63 99 ... Instructions for handling light bulbs (exterior lights)**.

Necessary preliminary tasks:

- Removing ignition unit for left xenon headlight, see **63 12 870 Replacing ignition unit for left xenon headlight.**

Unlock retaining ring (1) in counterclockwise direction and remove.

Remove bulb for xenon headlight (2) in direction of arrow from headlight (3).

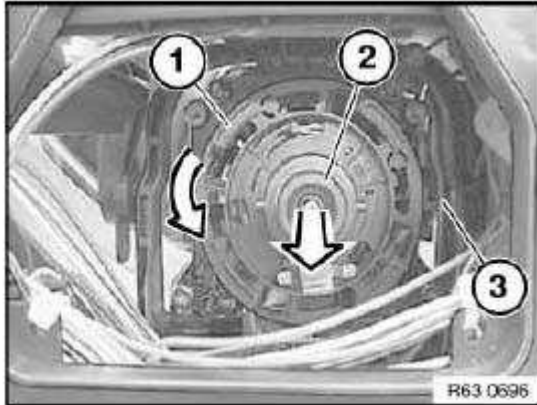


Fig. 49: Retaining Ring And Bulb
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Insert bulb for xenon headlight (1) exactly in headlight (2).

Observe "Top marking" (3).

Fit retaining ring (4) on headlight in such a way that apertures (5) slide over fixtures for ignition unit.

Installation:

Note type of bulb, see **63 12 HEADLIGHTS, HEADLIGHT ASSEMBLY E83 .**

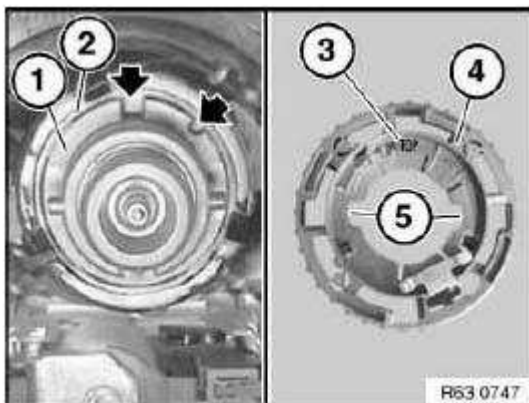


Fig. 50: Retaining Ring And Bulb

Courtesy of BMW OF NORTH AMERICA, INC.

63 99 077 REPLACING BULB FOR RIGHT XENON HEADLIGHT

Operation is described in:

Remove bulb for left xenon headlight (ignition unit), see **63 99 076 Replacing bulb for left xenon headlight.**

63 99 140 REPLACING BULB FOR SIDE MARKER LAMP, FRONT LEFT

WARNING: Follow instructions for handling light bulbs (exterior lights), see 63 99 ... Instructions for handling light bulbs (exterior lights).

Necessary preliminary tasks:

- M54 only:

Remove suction filter housing

NOTE: Headlight (3) removed for purposes of clarity.

Unlock clip (1) in direction of arrow.

Remove cover (2) from headlight (3).

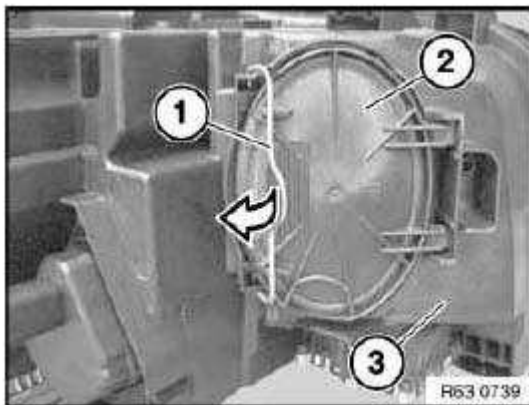


Fig. 51: Removing Clip

Courtesy of BMW OF NORTH AMERICA, INC.

Grip bulb holder (1) on both sides and pull towards rear out of headlight (2).

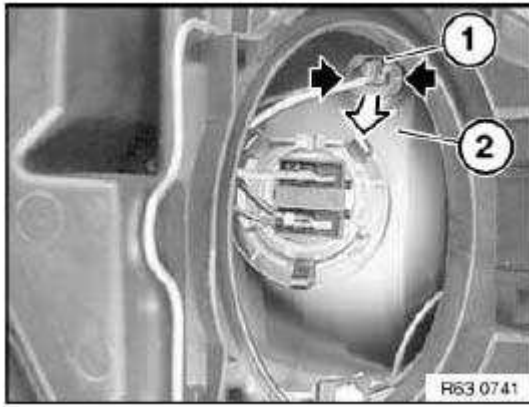


Fig. 52: Bulb Holder

Courtesy of BMW OF NORTH AMERICA, INC.

Pull bulb for side marker lamp (1) in direction of arrow out of bulb holder (2) and remove.

Installation:

Make sure guides (3) are exactly seated in mountings (4).

Note type of bulb, see **63 12 HEADLIGHTS, HEADLIGHT ASSEMBLY E83** .

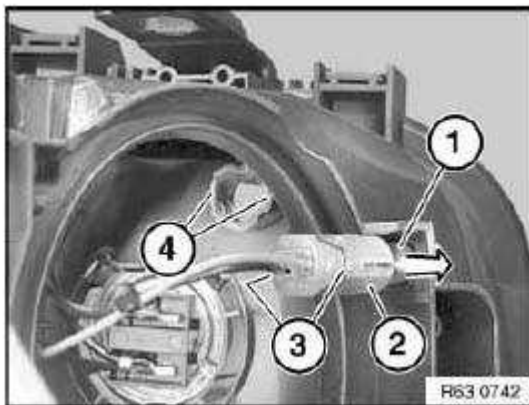


Fig. 53: Side Marker Lamp And Bulb Holder

Courtesy of BMW OF NORTH AMERICA, INC.

63 99 141 REPLACING BULB FOR SIDE MARKER LAMP, FRONT RIGHT

Operation is described in:

Replacing bulb for side marker lamp, front left, see **63 99 140 Replacing bulb for side marker lamp, front left**.

63 99 201 REPLACING HALOGEN BULB FOR LEFT OR RIGHT FRONT FOG LAMP

WARNING: Follow instructions for handling light bulbs (exterior lights), see 63 99 ... Instructions for handling light bulbs (exterior lights).

Necessary preliminary tasks:

- Remove fog lamp, see **63 17 060 Removing and installing (replacing) left or right front fog lamp.**

Turn bulb holder (1) in direction of arrow and remove from fog lamp (2).

Installation:

Note type of bulb, see **63 12 HEADLIGHTS, HEADLIGHT ASSEMBLY E83** .

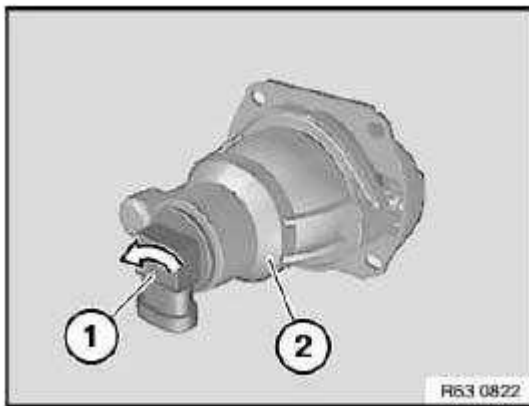


Fig. 54: Turning Bulb Holder

Courtesy of BMW OF NORTH AMERICA, INC.

63 99 273 REPLACING BULB FOR TURN INDICATOR, FRONT LEFT

WARNING: Follow instructions for handling light bulbs (exterior lights), see 63 99 ... Instructions for handling light bulbs (exterior lights).

NOTE: Headlight removed for purposes of clarity.

Turn bulb holder (1) counterclockwise and pull towards rear out of headlight (2).

Remove bulb from bulb holder (1).

Installation:

Note type of bulb, see **63 12 HEADLIGHTS, HEADLIGHT ASSEMBLY E83** .

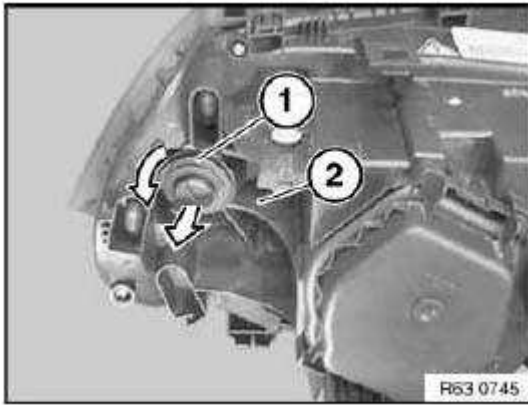


Fig. 55: Turning Bulb Holder

Courtesy of BMW OF NORTH AMERICA, INC.

63 99 275 REPLACING BULB FOR TURN INDICATOR, FRONT RIGHT

Operation is described in:

Replacing bulb for turn indicator, front left, see **63 99 273 Replacing bulb for turn indicator, front left.**

63 99 295 REPLACING BULB FOR AUXILIARY TURN SIGNAL LIGHT, FRONT LEFT OR RIGHT

**WARNING: Follow instructions for handling light bulbs (exterior lights), see 63 99 ...
Instructions for handling light bulbs (exterior lights).**

Necessary preliminary tasks:

- Remove front auxiliary turn signal light, see **63 13 200 Removing and installing/replacing front left or right auxiliary turn signal lamp.**

Turn bulb holder (1) approx. 45° and remove from front auxiliary turn signal light (2).

Pull bulb out of holder (1).

Installation:

Note type of bulb, see **63 12 HEADLIGHTS, HEADLIGHT ASSEMBLY E83 .**

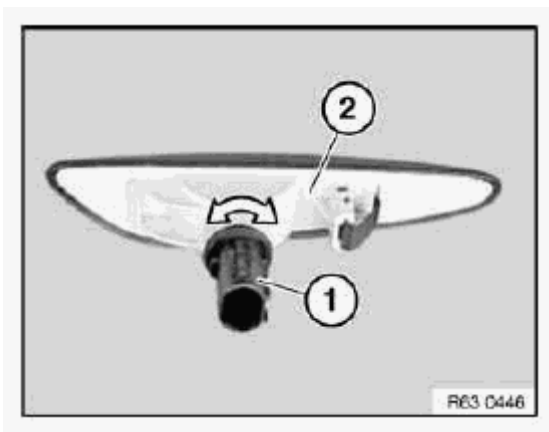


Fig. 56: Front Auxiliary Turn Signal Light
Courtesy of BMW OF NORTH AMERICA, INC.

63 99 312 REPLACING BULB(S) FOR LEFT OR RIGHT REAR LIGHT (REAR LID)

This operation is described in:

"Replacing a socket housing for left or right rear light", see [63 21 055 Replacing a socket housing for left or right tail light](#).

Installation:

Note type of bulb, see [63 12 HEADLIGHTS, HEADLIGHT ASSEMBLY E83](#) .

63 99 315 REPLACING LIGHT BULB(S) FOR LEFT OR RIGHT REAR LIGHT

WARNING: Follow instructions for handling light bulbs (exterior lights), see [63 99 ... Instructions for handling light bulbs \(exterior lights\)](#).

Rear light in side panel:

Necessary preliminary tasks:

- Remove socket housing for rear light, see [63 21 055 REPLACING A SOCKET HOUSING FOR LEFT OR RIGHT TAIL LIGHT](#) .

Turn faulty bulb and pull out of socket housing for rear light.

NOTE:

- 1. Bulb, turn indicator light**
- 2. Bulb, rear light/brake light**
- 3. Bulb, rear light**

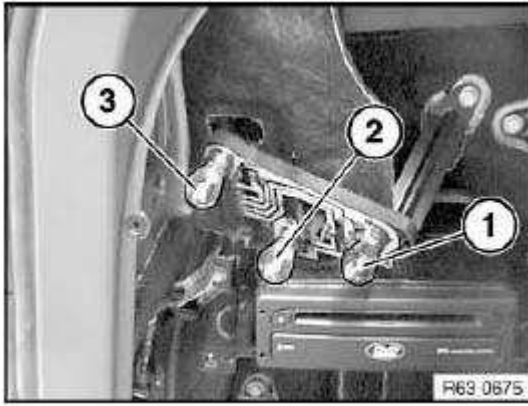


Fig. 57: Bulb, Turn Indicator Light
Courtesy of BMW OF NORTH AMERICA, INC.

Rear light in rear lid:

Necessary preliminary tasks:

- Remove socket housing for rear light, see **63 21 055 REPLACING A SOCKET HOUSING FOR LEFT OR RIGHT TAIL LIGHT** .

Remove faulty bulb (1) in direction of arrow from socket housing (2).

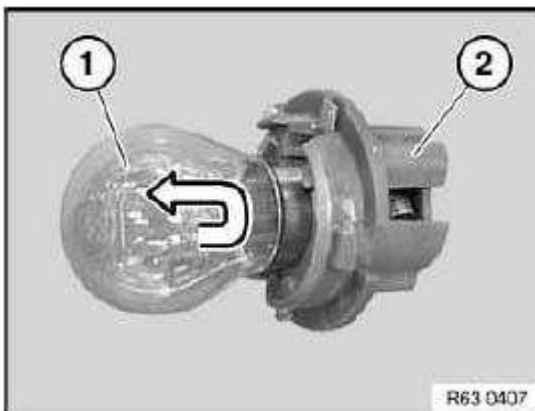


Fig. 58: Removing Bulb
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Note type of bulb, see **63 12 HEADLIGHTS, HEADLIGHT ASSEMBLY E83** .

63 99 401 REPLACING BULB FOR LEFT OR RIGHT LICENSE PLATE LIGHT

WARNING: Follow instructions for handling light bulbs (exterior lights), see 63 99 ...

Instructions for handling light bulbs (exterior lights).

Lever out lens (1) on left or right from opening (2) and remove.

Lever out bulb (3).

NOTE: Note type of bulb, see **63 12 HEADLIGHTS, HEADLIGHT ASSEMBLY E83** .

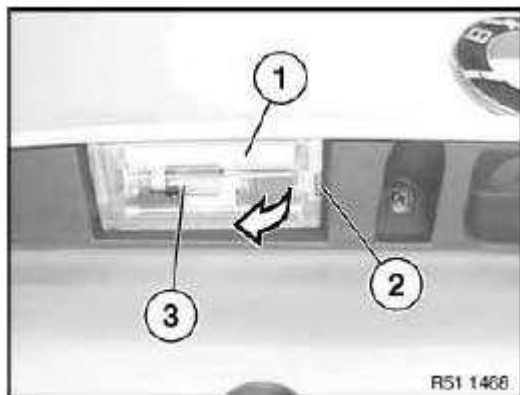


Fig. 59: Removing Lens

Courtesy of BMW OF NORTH AMERICA, INC.

63 99 431 REPLACING BULB FOR FRONT CEILING LIGHT

WARNING: Follow instructions for handling light bulbs (interior lights), see **63 99 ... INSTRUCTIONS FOR HANDLING LIGHT BULBS (EXTERIOR LIGHTS)** .

Necessary preliminary tasks:

- Remove front ceiling light

Turn bulb holder in direction of arrow and remove.



Fig. 60: Turning Bulb Holder

Courtesy of BMW OF NORTH AMERICA, INC.

Pull bulb (1) out of bulb holder (2).

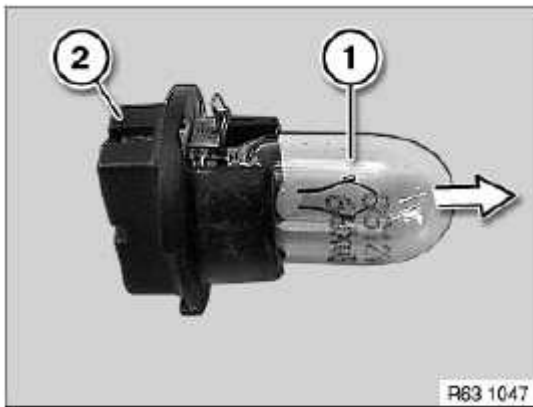


Fig. 61: Bulb Holder And Bulb

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

- Make sure bulb holder is correctly seated and engaged in ceiling light
- Note bulb type

63 99 431 REPLACING BULB FOR FRONT CEILING LIGHT

**WARNING: Follow instructions for handling light bulbs (interior lights), see 63 99 ...
INSTRUCTIONS FOR HANDLING LIGHT BULBS (EXTERIOR LIGHTS) .**

Necessary preliminary tasks:

- Remove front ceiling light

Version without inside reading lamp:

Release screws (1) and remove lens.

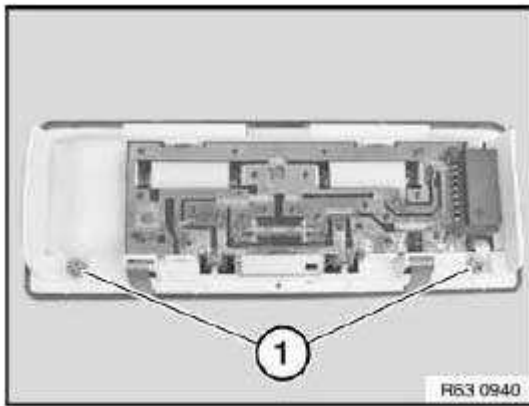


Fig. 62: Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Remove festoons (1) from lens (2).

Installation:

Note type of bulb, see **63 12 HEADLIGHTS, HEADLIGHT ASSEMBLY E83** .

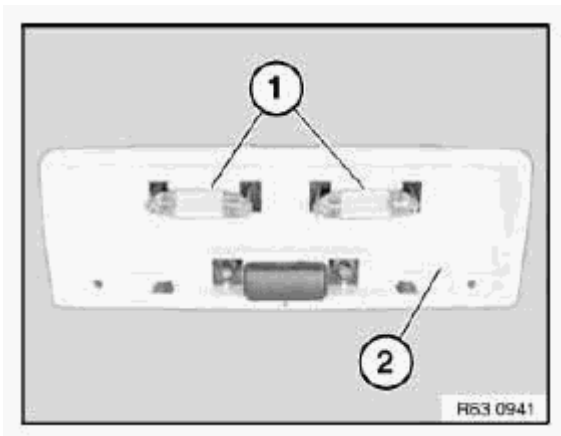


Fig. 63: Festoons And Lens

Courtesy of BMW OF NORTH AMERICA, INC.

Version with inside reading lamp:

Turn bulb in direction of arrow and remove.

Installation:

Note type of bulb, see **63 12 HEADLIGHTS, HEADLIGHT ASSEMBLY E83** .

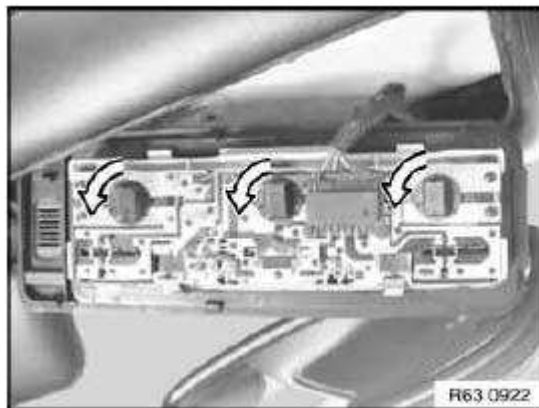


Fig. 64: Turning Bulb

Courtesy of BMW OF NORTH AMERICA, INC.

63 99 435 REPLACING LIGHT BULB FOR LEFT OR RIGHT INTERIOR LIGHT

WARNING: Follow instructions for handling light bulbs (interior lights), see 63 99 ... INSTRUCTIONS FOR HANDLING LIGHT BULBS (EXTERIOR LIGHTS) .

Open lens (1) in direction of arrow and remove festoon (2).

Installation:

Note bulb type, see **63 31 INTERIOR LIGHTS E83** .

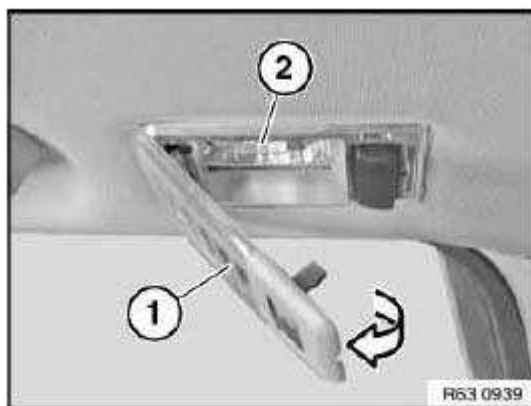


Fig. 65: Lens And Festoon

Courtesy of BMW OF NORTH AMERICA, INC.

63 99 437 REPLACING LIGHT BULB FOR FOOTWELL LIGHT

WARNING: Follow instructions for handling light bulbs (interior lights), see 63 99 ... INSTRUCTIONS FOR HANDLING LIGHT BULBS (EXTERIOR LIGHTS) .

Necessary preliminary tasks:

- Remove footwell light, see 63 31 020 Removing and installing/replacing footwell light.

Unlock catch (1) on footwell light (2).

Open cover cap (3) in direction of arrow.

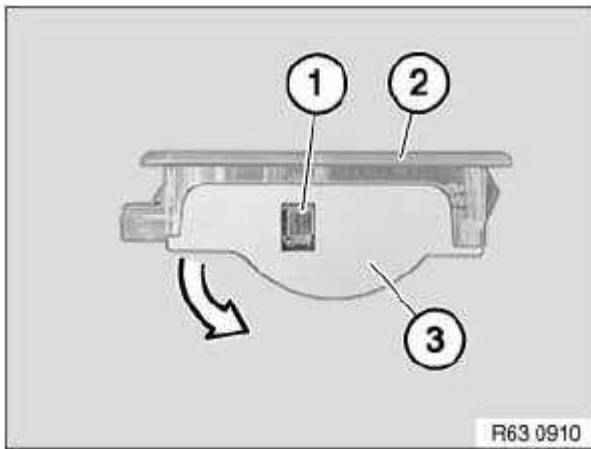


Fig. 66: Catch And Cover Cap
Courtesy of BMW OF NORTH AMERICA, INC.

Pull bulb (1) in direction of arrow out of bulb holder (2).

Installation:

Note bulb type, see 63 31 INTERIOR LIGHTS E83 .

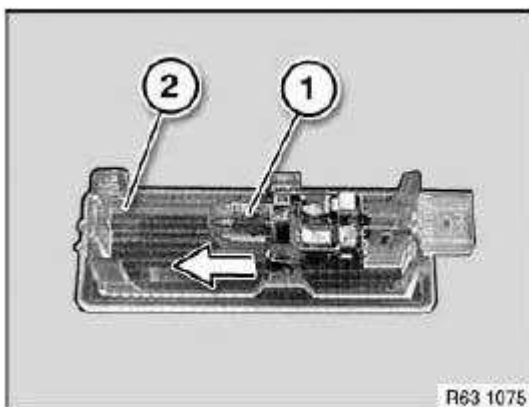


Fig. 67: Bulb Holder And Bulb

Courtesy of BMW OF NORTH AMERICA, INC.

63 99 451 REPLACING LIGHT BULB FOR LUGGAGE COMPARTMENT LIGHTING

WARNING: Follow instructions for handling light bulbs (interior lights), see 63 99 ... INSTRUCTIONS FOR HANDLING LIGHT BULBS (EXTERIOR LIGHTS) .

Necessary preliminary tasks:

- Remove luggage compartment light, see 63 31 080 Removing and installing/replacing luggage compartment light (D-pillar).

Remove bulb (1) in direction of arrow.

Installation:

Note bulb type, see 63 31 INTERIOR LIGHTS E83 .

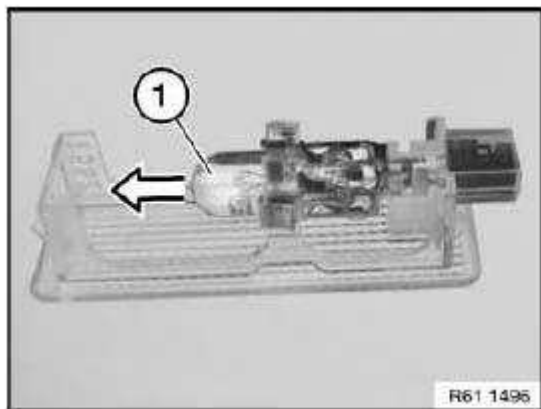


Fig. 68: Bulb

Courtesy of BMW OF NORTH AMERICA, INC.

63 99 452 REPLACING LIGHT BULB FOR LUGGAGE COMPARTMENT LIGHT (ON REAR LID)

WARNING: Follow instructions for handling light bulbs (interior lights), see 63 99 ... INSTRUCTIONS FOR HANDLING LIGHT BULBS (EXTERIOR LIGHTS) .

Necessary preliminary tasks:

- Remove luggage compartment light, see 63 31 080 Removing and installing/replacing luggage compartment light (D-pillar).

Fold back trim (1) on luggage compartment light (2).

Remove festoon (3).

Installation:

Note bulb type, see **63 31 INTERIOR LIGHTS E83** .

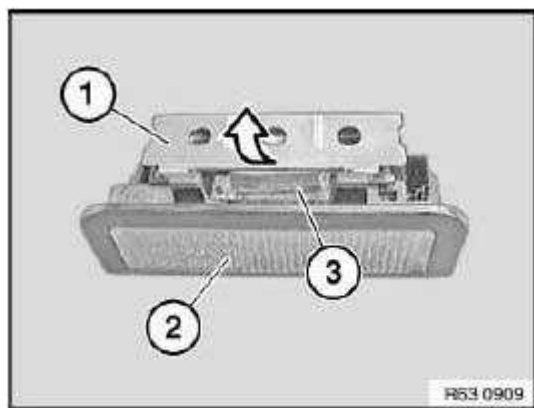


Fig. 69: Trim On Luggage Compartment Light
Courtesy of BMW OF NORTH AMERICA, INC.

63 99 461 REPLACING BULB FOR GLOVEBOX LIGHT

**WARNING: Follow instructions for handling light bulbs (interior lights), see 63 99 ...
INSTRUCTIONS FOR HANDLING LIGHT BULBS (EXTERIOR LIGHTS) .**

Necessary preliminary tasks:

- Remove glovebox light, see **63 31 150 Removing and installing/replacing glovebox light.**

Spread bow contacts (1) and remove bulb.

Installation:

Note bulb type, see **63 31 INTERIOR LIGHTS E83** .

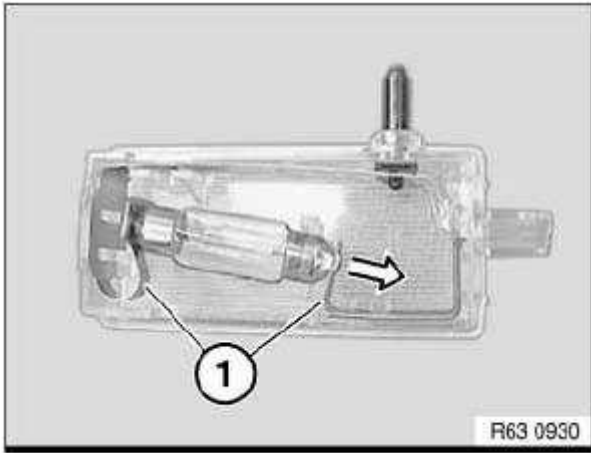


Fig. 70: Bow Contacts Of Bulb
Courtesy of BMW OF NORTH AMERICA, INC.

ACCESSORIES AND EQUIPMENT

Lights - SI Techniques - X3

GLOSSARY OF ELECTRICAL COMPONENTS

All models from E38 and MINI



Fig. 1: Glossary Of Electrical Components
Courtesy of BMW OF NORTH AMERICA, INC.

INTRODUCTION

This glossary contains electrical components from the circuit diagrams found in diagnosis, together with the respective abbreviated designations for the components.

Abbreviated designations are the descriptions of the components found in the circuit diagrams. Example: "A210" for the control unit "door module, rear passenger side".

This glossary contains approx. 2,000 abbreviated designations.

This glossary contains the following information:

- Abbreviated designation (alphanumerically sorted)
- Component
- Information: Reference to a component description in an SI Technology bulletin (SBT).

If there is not a more detailed description of the component available, a short description of the component will be given in column headed "Information".

- KoGr.: Main group for the component

Each abbreviated designation with component is assigned to a main group.

An overview of the main groups can be found in the SI Technology bulletin (SBT) "Abbreviations".

- Model series: Overview of model series in whose circuit diagrams the abbreviated designation is found.

This glossary contains the abbreviated designations for the following circuit diagrams:

- Circuit diagram-DVD "BMW V 5.0", status 03/2005 (WDS: Wiring Diagram System):

This DVD contains the circuit diagrams needed for diagnosis on BMW vehicles.

- Circuit diagram-DVD "MINI V 3.0", status 03/2005 (WDS: Wiring Diagram System):

This DVD contains the circuit diagrams needed for diagnosis on MINI vehicles.

This glossary contains the abbreviated designations used in both these DVDs. Abbreviated designations that are **only** found in the overviews "Component- and signal information" are **not** contained in this glossary.

NOTE: Assignment of abbreviated designation to model series

For technical reasons associated with the system, some model series are listed together, as follows:

- E60 and E61
- E63 and E64
- E65 and E66
- E83 and E85
- E87 and E90
- R50, R52 and R53

For this reason, it is possible that an abbreviated designation is assigned to a model series even though the component concerned is not found in that model series.

ALPHANUMERICAL OVERVIEW OF ABBREVIATED DESIGNATIONS

The WDS-DVD (Wiring Diagram System) alphanumerically lists the abbreviated designations from the

overview "Component- and signal information".

Abbreviated designations are alphabetically sorted in the following groups:

- A Control units, modules
- B Sensors, electric converters
- D Diagnosis interfaces
- E Lights, electric heating equipment
- F Fuses
- G Power supply, gas generators
- H Acoustic and visual warning systems
- I Components from BMW suppliers
- K Relays
- L Coils
- M Electric motors, drives
- N Amplifiers, regulators, control units
- P Display instruments
- R Resistors, potentiometers
- S Switches, buttons
- T Ignition coils
- U Radio systems, suppressor filters
- V Semiconductors, diodes
- W Aerials, screening
- X Connectors

Connectors are **not** listed in this glossary.

- Y Electromechanical components
- Z Blocking circuits, suppressor filters

ADAPTIVE HEADLIGHTS

E46/2, E46/C, E53, E83

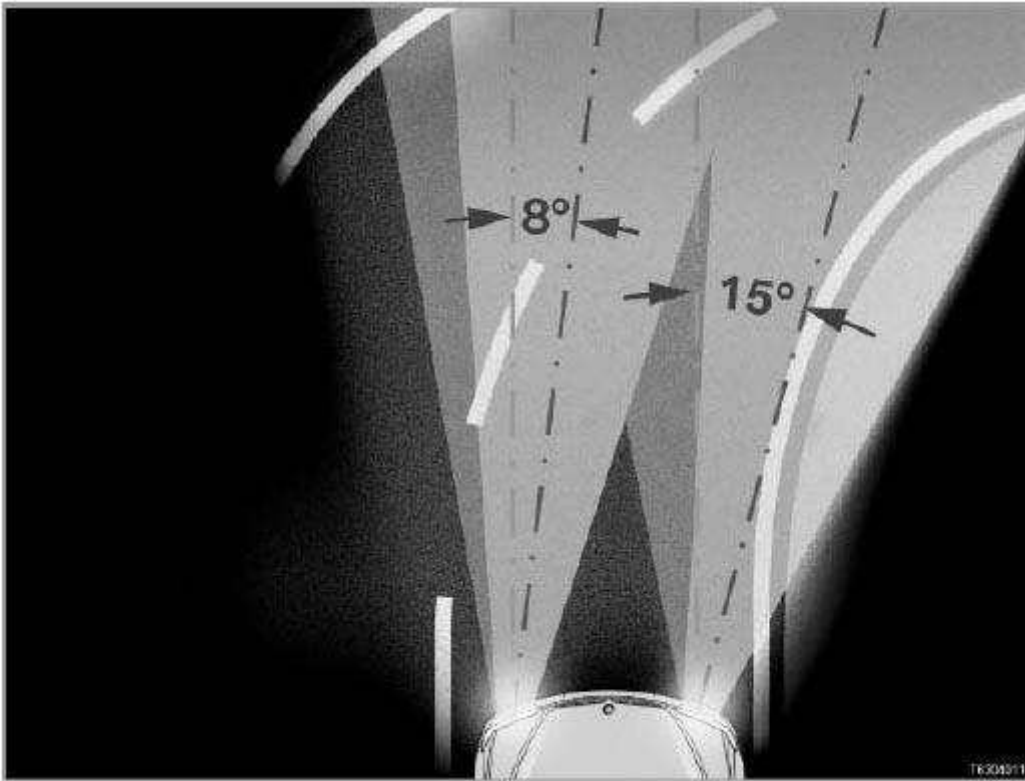


Fig. 2: Adaptive Headlights Aiming Angle
Courtesy of BMW OF NORTH AMERICA, INC.

Launch dates for option 524 "Adaptive headlights":

- E46 Coupe (E46/2) and E46 Convertible (E46/C) model revision: 03/2003
- E53: 04/2004 onwards
- E83: From 10/2003

NOTE: **Option 524 is only available in conjunction with option 522.**

Option 524 "Adaptive headlights" is only available in conjunction with option 522 "Xenon dipped and main - beam headlights".

NOTE: **ALC = AHL**
The development code for the adaptive headlights was "ALC".
ALC stood for "Adaptive Light Control".
The marketing and sales designation for option 524 in English-language markets is "adaptive headlights", abbreviated to "AHL".
This is why the abbreviation "AHL" is used even in diagnosis and technical vehicle documentation.
However, some control units may still bear the abbreviation "ALC", which may also be the abbreviation used in the EPC (Electronic Parts Catalogue).

INTRODUCTION

The adaptive headlights turn the bi-xenon headlights towards the inside of a bend when cornering. This improves illumination of the curve of the road.

Visibility is therefore improved.

When cornering, the driver is not looking into a "black hole" - instead, the adaptive headlights allow the driver to see the curve of the road.

- > E46/2, E46/C, E53 and E83 until 09/2006
- > E83 from 09/2006

NOTE: AHL control unit discontinued from 09/2006.

On the E83 from 09/2006, the software for the AHL control unit is integrated into the light module (LM). The AHL control unit is no longer fitted.

The turning lights function is new on the E83 from 09/2006.

The turning lights give the area next to the carriageway additional illumination when you are turning or cornering (driving in tight bends). The function is also active when you are parking.

The turning lights are realized using the front foglights. The front foglights have a specially shaped reflector to illuminate the areas to the sides better.

**NOTE: Turning lights only in conjunction with option 524.
Turning lights are a subfunction of option 524 "Adaptive headlights".**

BRIEF DESCRIPTION OF COMPONENTS

The following components and control units provide input signals for the adaptive headlights system:

○ **Light switch**

The rotary switch for the side lights and dipped headlights differs depending on the vehicle equipment level (adaptive headlights, automatic driving lights control, automatic or manual headlight-range adjustment). For the adaptive headlights function to operate, the light switch must be set to position "A" ("A" = "automatic driving lights control" or "adaptive headlights").

○ **Turn-signal/main-beam switch**

The main-beam headlights are switched on and off with the direction indicator / main-beam switch (by pressing or pulling the switch). The adaptive headlights function operates with both dipped and main-

beam headlights.

○ **Ride-height sensors**

If the special equipment "Adaptive headlights" is fitted, the adaptive headlights control unit evaluates the signals from the ride-height sensors.

This is because: the adaptive headlights control unit also controls the automatic headlight-range adjustment.

The automatic headlight-range adjustment feature adjusts the vertical aim of the headlights to compensate for variations in the vehicle tilt angle (e.g. when the vehicle is laden, and under braking and acceleration in dynamic driving situations).

○ **Brake light switch**

If the vehicle is equipped with the "adaptive headlights" option, the signals from the brake light switch are read by the control unit for the adaptive headlights.

The signal sent by the brake light switch is an input signal for the automatic headlight-range adjustment; see above: Ride-height sensors.

○ **Zero-position sensor**

- > E46/2, E46/C
- > E83

The zero-position sensor in the AHL headlight sends a signal for calculating the zero position of the AHL headlight. This regulates the horizontal movement of the AHL headlight.

○ **Position sensor**

- > E53

The position sensor in the positioner module for the bi-xenon headlights supplies a signal for the horizontal movement of the headlights.

○ **General module**

The basic module supplies input signals with regard to the terminal management (terminal 15 ON).

The adaptive headlights control unit is activated when terminal 15 is switched ON.

○ **EGS control unit or reversing light switch**

When reverse gear is engaged, the headlights are moved to the straight-ahead position.

On vehicles with automatic transmission, the EGS control unit (electronic transmission control) provides the "Reverse gear engaged" signal.

On vehicles with manual transmission, the signal is supplied by the reversing light switch.

○ **KOMBI: Instrument cluster**

The instrument cluster is the gateway, i.e. the data interface) between the PT-CAN data bus and the K-bus.

○ **RLS: Rain-light sensor for automatic driving lights control**

The rain-light sensor measures the ambient brightness outside the vehicle.

- In twilight conditions, the rain-light sensor transmits the message "Twilight" so that the automatic headlight-range adjustment can activate dipped headlights. The headlights are tilted up and down as required, but they are not swivelled towards the bend in the road.
- In darkness, the rain-light sensor sends the message "Darkness". The adaptive headlights are then activated when the vehicle is cornering. The headlights are moved to the left or the right:

○ **Steering-angle sensor and DSC sensor**

The steering angle sensor and DSC sensor (DSC = Dynamic Stability Control) supply signals for the adaptive headlights to the adaptive headlights control unit. These signals are evaluated as follows, depending on the vehicle's speed:

- Vehicle speeds up to **30 km/h:**

The adaptive headlights function is controlled using the information from the **steering angle sensor** (in the steering column switch cluster).

- Vehicle speeds between **30 km/h and 50 km/h:**

In the 30 to 50 km/h speed range, there is a **continuous transition** in signal evaluation: from the evaluation of signals sent by the steering angle sensor to evaluation of the signals sent by the yaw-rate sensor (in the DSC sensor).

- **In extreme dynamic driving situations**, e.g. if the vehicle starts to skid or fishtail, even at speeds less than **50 km/h**, the signals from the yaw-rate-sensor are considered.

If the vehicle starts to skid or fishtail, the headlights will move to the straight-ahead position. The headlights are not moved until the vehicle has stabilized.

- Vehicle speeds over **50 km/h:**

At speeds upwards of 50 km/h, the signals from the **yaw-rate sensor** (in the DSC sensor) form the primary basis for control of the adaptive headlights function.

Reason: For a constant cornering radius, the steering angle required increases disproportionately with speed. In addition, the steering angle required also depends on the coefficient of friction of the road surface.

The yaw rate is directly proportional to speed. For this reason, the yaw rate is always the most suitable measure for controlling the adaptive headlights at high speeds.

Even at high speeds, however, the steering angle sensor signal is used to detect (predict) the driver's commands **in advance**. This prediction is important: The yaw rate signal is not supplied until the vehicle has **responded** to the steering wheel movement.

The steering-angle sensor signal is disabled so that rapid, momentary steering adjustments do not affect the adaptive headlights function.

A number of control units are involved in the adaptive headlights system.

Depending on the series and model concerned, the adaptive headlights are actuated by the following control units:

- **AHL control unit**

- > E46/2, E46/C, E53 and E83 until 09/2006

The AHL control unit controls the adaptive headlights.

For safety reasons, the AHL control unit is also responsible for the automatic headlight-range adjustment. This is because: Oncoming traffic must not be dazzled by the adaptive headlights. If a headlight sticks in an unfavorable position, the AHL control unit will attempt to move this headlight down (using the stepper motors in the automatic headlight-range adjustment).

The AHL control unit is connected to the K-bus and the PT-CAN.

- **LM: Light module**

- > E83 from 09/2006

The AHL control unit is integrated in the light module.

The light module controls and monitors all vehicle lights. Information is received and transmitted over the data buses PT-CAN, LIN bus and K-bus.

- **Stepper motor controllers**

The stepper motor controllers (SMC) control the stepper motors in the headlights (for the automatic headlight-range adjustment and for the adaptive headlights).

- **LSZ: Light switch cluster**

- > E46/2, E46/C, E53 and E83 until 09/2006 (E53: light module)

The light switch cluster forwards the prompts from the light switch and from the turn-signal/main-beam switch to the AHL control unit (via the K-bus).

- **Xenon-headlight control unit**

The xenon-headlight control unit actuates the bulb in the bi-xenon headlights.

The following components are controlled:

○ **Stepper motors for the adaptive headlights**

The stepper motors turn the positioner modules in the bi-xenon headlights.

The stepper motors swivel the headlights along the vertical and horizontal axes. (vertical = up and down for the automatic headlight-range adjustment;

horizontal = to the left and right for the adaptive headlights).

The positioner modules execute the movement.

○ **Indicator light on the light switch**

The indicator light (green LED) next to the "A" (= "automatic driving lights control") is actuated by the adaptive headlights and has 2 display functions:

- The indicator light **lights up permanently** when the automatic driving lights control or adaptive headlights function is switched on (= light switch in position "A").
- The indicator light **flashes** if a fault develops in the adaptive headlight system.

The indicator light thus supports diagnosis of the adaptive headlights.

The indicator light is actuated by the light switch cluster or by the light module.

SYSTEM FUNCTIONS

The adaptive headlights system moves headlights horizontal (i.e. from left to right) in order to illuminate the inside of a bend when cornering.

The following functions of the adaptive headlights system are described below:

- System activation and automatic calibration
- Activation of stepper motor controllers
- Speed-dependent analysis of signals
- Adjustment of headlight horizontal aim
- Deactivation of adaptive headlights function under extreme handling conditions
- Deactivation of adaptive headlights function in response to system faults
- Setting headlights to parked position
- Automatic headlight-range adjustment
- Adaptive headlights for automatic driving lights control
- Turning light

NOTE: Different control units for adaptive headlights.

- > E46/2, E46/C, E53 and E83 until 09/2006: AHL control unit
- > E83 from 09/2006: The adaptive headlights are actuated by the light module.

For this reason, the following text refers to the general "control unit for adaptive headlights".

System activation and automatic calibration

When terminal 15 is switched ON, the headlights always perform a calibration sequence, even if the dipped headlights are not switched on. The control unit for adaptive headlights (AHL control unit or light module) sends the "perform calibration sequence" prompt to the stepper motor controllers (SMCs, control unit for the headlight stepper motors). The stepper motor controllers actuate the stepper motors in the headlights. The calibration sequence is performed.

In the calibration sequence, the headlights move as follows:

- The headlights move to the right and the left (= calibration sequence for adaptive headlights).
- The headlights move up and down (= calibration sequence for automatic headlight-range adjustment).
- At the end of the calibration sequence, the headlights are in the straight-ahead position.

Following the calibration sequence, the system is ready for operation.

When reverse gear is engaged, the headlights are moved to the straight-ahead position.

NOTE: The calibration sequence is performed only after terminal 15 has been switched OFF for at least 15 seconds.

If terminal 15 is repeatedly switched on and off (e.g. for demonstration purposes), the calibration sequence will not be executed every time terminal 15 is switched on. Terminal 15 must have been switched off for at least 15 seconds before it is switched on again. Only then is a calibration sequence performed when terminal 15 is switched on.

Activation of stepper motor controllers

The control unit for adaptive headlights (AHL control unit or light module) sends the stepper motor controllers (SMC) the nominal values for the positioner modules (position of positioner modules and speed of movement).

The control unit for adaptive headlights calculates the nominal values using the following signals:

- Vehicle road speed
- Steering angle (at speeds up to 50 km/h, dependent on encoding)
- Yaw rate (50 km/h upwards, see Steering-angle sensor and DSC sensor above)

Speed-dependent analysis of signals

The adaptive headlights are controlled by the following signals depending on the road speed: signals from the steering angle sensor or signals from yaw-rate sensor (in the DSC sensor). The encoding (at the end of the production line) determines the priority assigned to sensor signals above which speed threshold (see above).

Adjustment of headlight horizontal aim

The stepper motor controllers move the headlights to the right or left when the vehicle corners.

Horizontal range of movement of headlights:

- Inwards, i.e. towards center of vehicle: up to max. 8 °
 - > E46/2, E46/C, E83:7 °
 - > E53:8°
- Outwards: up to max. 15°

Example: Right-hand bend:

The right-hand headlight turns by up to 15° (the right-hand headlight is the "inside" headlight on a right-hand bend).

It therefore swivels outwards away from the vehicle center.

The left-hand headlight swivels through a maximum of 8 ° (the left-hand headlight swivels towards the vehicle center, i.e. inwards).

The headlight on the outside of the bend reaches its end position at the same time as the headlight on the inside of the bend, ensuring that the road is evenly illuminated.

On a right-hand bend, the left-hand headlight is on the outside of the bend. The right-hand headlight is on the inside of the bend.

Deactivation of adaptive headlights function under extreme handling conditions

If the vehicle drifts, skids and loses sideways grip, the adaptive headlights function is deactivated as follows:

- The headlights are returned to the straight-ahead position. The headlights are no longer turned.
- The dipped headlights remain on.

Deactivation of adaptive headlights function in response to system faults

In the event of a system error, the indicator light on the light switch will flash.

Dazzling of oncoming traffic must be prevented in the event of a system fault.

For this reason, the adaptive headlights function is deactivated as follows:

- If the stepper motors are still functional, the headlights are returned to the straight-ahead position. The

headlights are no longer moved towards bends in the road.

- If it is no longer possible for a headlight to be moved back to the straight-ahead position, the headlight is tilted downwards (by the stepped motors for automatic headlight-range adjustment). This prevents dazzling of oncoming traffic.
- If the headlight cannot be tilted downwards, the bi-xenon bulb in this headlight is disabled as follows:

When the vehicle is parked up, the control unit registers sleep mode for the adaptive headlights, as follows: Standstill and terminal R OFF for several minutes.

The next time the vehicle is restarted, the bi-xenon light of the defective headlight is not switched on.

The front foglights are switched on in order to ensure a minimum level of illumination.

The dipped headlight is **not** switched off while the vehicle is in motion.

Setting headlights to parked position

When terminal R is switched off, the headlights move to the parked position. The parked position is important for the headlights' next calibration sequence. From the parked position, the headlights are run through a calibration sequence in the pre-drive-check. During the calibration sequence, the control unit for adaptive headlights relearns the straight-ahead position for the headlights.

When the headlights have reached the parked position, the stepper motor controllers SMCs inform the control unit for adaptive headlights ("verification").

The control unit for adaptive headlights deactivates the stepper motor controllers. The run-down period lasts approx. 10 seconds.

Automatic headlight-range adjustment

If the special equipment "Adaptive headlights" is fitted, the control unit for adaptive headlights also controls the automatic headlight-range adjustment.

The automatic headlight-range adjustment adapts the headlight range for different operating conditions.

Variations in the vehicle tilt angle are produced by vehicle loads and braking or acceleration in extreme driving situations. The automatic headlight-range adjustment moves the headlights up and down as required.

The control unit for adaptive headlights also controls the automatic headlight-range adjustment as follows.

1. The ride-height sensors and the brake light switch supply the signals for the automatic headlight-range adjustment.
2. The control unit for adaptive headlights computes the vehicle inclination (longitudinally to the roadway) from the signals.
3. The stepper motors for the automatic headlight-range adjustment automatically and dynamically control the headlight range.

The headlight range is adjusted so that the actual headlight range conforms to the legally required headlight range as follows:

- If vehicle rear is lower than front:

The actual headlight range will be longer than the legally stipulated range. The headlight beam height is lowered to reduce the headlight range to match the legal requirement.

- If the vehicle is horizontal:

The actual headlight range will be the same as the legally stipulated range.

- If vehicle front is lower than rear:

The actual headlight range will be shorter than the legally stipulated range. The headlight beam height is raised to increase the headlight range to match the legal requirement.

Adaptive headlights for automatic driving lights control

The automatic driving lights control feature (option in conjunction with the rain-light sensor) switches the side lights and dipped headlights on and off automatically.

Switch-on conditions:

- The automatic driving lights control must be encoded in the light switch cluster or light module.
- The light switch must be in position "A" ("A" stands for automatic driving lights control and for adaptive headlights).
- The rain-light sensor must be installed and operational.

The rain-light sensor detects the brightness of the ambient light.

The rain-light sensor sends the following prompts to the light switch cluster or the light module:

- Ambient brightness low: In twilight, darkness, in an underground garage or tunnel.

"Switch on dipped headlights" request

- Ambient brightness sufficient.

"Switch off dipped headlights" request

If only the side lights are to be switched on, the light switch must be set to side lights (switch position 1).

When the light switch is set to position "A", the control unit for adaptive headlights is also activated:

- When the automatic driving lights control function switches on the dipped headlights (e.g. at twilight), the adaptive headlights function is notified at the same time.

The control unit for adaptive headlights then assumes control of the automatic headlight-range adjustment.

- In addition, the signals from the rain-light sensor are also evaluated. The headlights are not turned when the vehicle is cornering until total darkness sets in.

The message "dipped headlights on" is given individually for each headlight.

If a headlight fails, the adaptive headlights are switched off.

The front foglights are switched on in order to ensure a minimum level of illumination.

Turning lights

- > E83 from 09/2006

The turning lights are coupled to the adaptive headlights (option 524).

Depending on actuation, the right-hand and/or left-hand front foglight is switched on. The turning lights are actuated by the light module (LM). The turning light are not switched on suddenly but rather faded according to special time parameters.

Depending on the country concerned, the turning lights are switched on when cornering.

The following conditions must be satisfied for the turning lights to be **switched on**:

- Terminal 15 ON
- Light switch in position "A" ("A" stands for automatic driving lights control)
- Rain-light sensor detects twilight or darkness (threshold exceeded)

and

- Turn signal indicator ON (not one-touch turn signal)
- Speed range (forward):
 - Europe and Japan version from 0 km/h to 35 km/h
 - US version from 0 km/h to 65 km/h
- Swivel angle (theoretical):
 - when stationary $\leq 77^\circ$
 - when driving $\leq 10^\circ$

Alternatively

- Speed range (reverse):
 - 0 km/h to 35 km/h
- Swivel angle (theoretical):

- when stationary or driving $\geq 70^\circ$

If the vehicle is stationary, the turning lights will automatically be deactivated after a certain time, e.g. when waiting at traffic lights. However, the turning lights can be activated again with the turn-signal/main-beam switch.

The light module (LM) uses the following signals to actuate the turning lights:

- Steering angle
- Yaw rate
- Status of reverse gear

The following conditions must be satisfied for the turning lights to be **switched off**:

- Light switch not in position "A" ("A" stands for automatic driving lights control)
- Rain-light sensor does not detect twilight or darkness (lower threshold exceeded)

Alternatively

- Turn signal indicator OFF
- Speed range (forward):
 - Europe and Japan versions ≥ 40 km/h
 - US version ≥ 70 km/h
- Swivel angle (theoretical):
 - when stationary 77°
 - when driving 10°

Alternatively

- Speed range (reverse): ≥ 40 km/h
- Swivel angle (theoretical): when stationary and when driving below a certain value

Alternatively

- Vehicle skids and swings out.

Alternatively

- Front foglights are switched on with the front foglights switch.

PRECONDITIONS FOR ACTIVATION

The control unit for adaptive headlights is "awake" from terminal 15 ON.

The movement of the lights is subject to the following conditions:

- Reverse gear must **not** be engaged.
- No system faults must be present. The indicator light must **not** be flashing.
- The bulbs for the bi-xenon lights are OK in both headlights.
- The vehicle must not be skidding or fishtailing.
- The rain-light sensor must detect darkness.
- Additional precondition for activation: automatic driving lights control is active (light switch in position "A", see above).

National versions

The options "Daytime driving lights" and "Manual headlight-range adjustment" are available in certain countries.

Vehicles with manual headlight-range adjustment do not have adaptive headlights.

This is because vehicles with manual headlight-range adjustment have halogen dipped headlights; adaptive headlights are only available in conjunction with option 522 "Xenon dipped and main-beam headlights".

Switching on adaptive headlights in conjunction with daytime driving lights function

The "Daytime lights" option (Northern Europe and Canada) means that

The dipped headlights and the side lights are **always** switched on under the following conditions:

- Light switch in position "2"
- Terminal 15 ON

The automatic headlight-range adjustment is active (actuated by the control unit for adaptive headlights).

If terminal 15 is switched off, the dipped headlights and the side lights are automatically switched off as well.

The light switch must also be set to position "A" with the "Daytime driving lights" option. The control unit for adaptive headlights is then in standby.

System functions for "Daytime lights" option when the light switch is set to position "A":

- If the vehicle is encoded with the "Daytime driving lights" option (end of production line), the light switch can remain in position "A" at all times.

When terminal R is switched on, side lights, parking lights and licence plate lights are switched on.

As soon as terminal 15 is switched on, the dipped headlights are also switched on.

- When the dipped headlights are switched on, the adaptive headlights control unit is activated (for automatic headlight-range adjustment).

- The indicator lamp on the light switch lights up and indicates that the system is functional.
- The adaptive headlights turn when the vehicle is stationary if the steering wheel is turned (to the right only).
- The headlights are moved when the vehicle corners if the rain-light sensor registers darkness.

The switch-on conditions for the adaptive headlights in conjunction with special equipment "Daytime driving lights" are as follows:

- The vehicle must be encoded with the "Daytime driving lights" option (end of production line)
- The light switch must be in position "A"
- Terminal 15 must be switched on and reverse gear must not be engaged
- Rain-light sensor must detect darkness

Subject to change.

ACCESSORIES AND EQUIPMENT

Lights - Technical Data - X3

10 LAMP SETTINGS

63 10 ADJUSTMENT OF LIGHTS E30 / E32 / E34 / E36 / E38 / E39 / E46 / E52 / E60 / E61 / E63 / E64 / E65 / E66 / E67 / E70 / E81 / E83 / E85 / E86 / E87 / E90 / E91 / E92 / E93 WITH HEADLIGHT VERTICAL AIM ADJUSTMENT

TECHNICAL DATA - ADJUSTMENT OF LIGHTS

Low-beam dip unit	e = 10
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12 HEADLIGHTS

63 12 HEADLIGHTS, HEADLIGHT ASSEMBLY E83

TECHNICAL DATA - HEADLIGHTS, HEADLIGHT ASSEMBLY E83

Light bulb - driving light (halogen)	Type	H7 12 V 55 W
Light bulb - driving light (xenon)	Type	D2-S
Light bulb - high beam	Type	H7 12 V 55 W
Light bulb - side marker lamp EUR	Type	12 V 5 W
Bulb - side marker lamp US	Type	12 V 21 W

13 TURN SIGNAL INDICATOR

63 13 TURN SIGNALS E83

TECHNICAL DATA - TURN SIGNALS E83

Light bulb - turn signal, front EUR	Type	12 V 21 W
Light bulb - turn signal, front US	Type	12 V 21 W
Light bulb - turn signal, rear EUR	Type	12 V 21 W
Light bulb - turn signal, rear US	Type	12 V 21 W
Light bulb - auxiliary turn signal	Type	12 V 5 W

17 FOG LIGHTS, AUXILIARY LIGHTS

63 17 FRONT FOG LAMPS, ADDITIONAL LAMPS E83

TECHNICAL DATA - FRONT FOG LAMPS, ADDITIONAL LAMPS E83

Bulb, fog lamp	Type	H11 12V 55 W
Bulb, fog lamp, M-aerodynamic kit	Type	H11 12V 55 W
Bulb - rear fog lamp EUR	Type	12 V 21 W

21 REAR LIGHT CLUSTER

61 61 WINDSCREEN WIPERS E83 /

TECHNICAL DATA - WINDSCREEN WIPERS E83

Adjustment dimension - right windscreen wiper arm	Millimetres	66.0 ±3 mm
Adjustment dimension - left windscreen wiper arm	Millimetres	61.0 ±3 mm
Contact angle - right windscreen wiper blade	Degrees	85.2° ± 1
Contact angle - left windscreen wiper blade	Degrees	85.4° ±1
Adjustment dimension - rear window wiper arm	Millimetres	29.0 ± 3 mm

63 21 REAR LIGHT UNIT E83

TECHNICAL DATA - REAR LIGHT UNIT E83

Bulb - rear light	Type	12 V 21 W
Light bulb - brake/rear light	Type	12 V 21 W
Light bulb - fog warning lamp	Type	12 V 21 W
Light bulb - backup light	Type	12 V 21 W
Light bulb - turn signal	Type	12 V 21 W
Light bulb - 3rd brake light	Type	LED

26 LICENCE PLATE LIGHTS

63 26 LICENSE PLATE LIGHTS E53 / E83

TECHNICAL DATA - LICENSE PLATE LIGHTS E53 / E83

Bulb, license plate light	Type	Festoon 12 V 5 W
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31 INTERIOR LIGHTS

61 61 WINDSCREEN WIPERS E83 /

TECHNICAL DATA - WINDSCREEN WIPERS E83

Adjustment dimension - right windscreen wiper arm	Millimetres	66.0 ±3 mm
Adjustment dimension - left windscreen wiper arm	Millimetres	61.0 ±3 mm
Contact angle - right windscreen wiper blade	Degrees	85.2° ± 1
Contact angle - left windscreen wiper blade	Degrees	85.4° ±1
Adjustment dimension - rear window wiper arm	Millimetres	29.0 ± 3 mm

63 31 INTERIOR LIGHTS E83

TECHNICAL DATA - INTERIOR LIGHTS E83

Reading light, front	Type	12 V 6 W
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Interior light, front	Type	12 V 6 W
Interior light, rear	Type	Festoon 12 V 6 W
Trunk light	Type	Festoon 12 V 10 W
Glovebox light	Type	Festoon 12 V 5 W
Footwell light trim	Type	12 V 5 W
Make-up mirror light, front	Type	Festoon 12 V 10 W

ACCESSORIES AND BODY, CAB

Lights - Tightening Torques - X3

21 REAR LIGHT CLUSTER

63 21 REAR LIGHT UNIT

REAR LIGHT UNIT - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Retaining nuts, rear light	E60 / E61 / E92 / E93		Observe tightening sequence	2.5 Nm
	E63 / E64 / E70 / E85 / E86 / E90 / E91 / E93			2.5 Nm
	E83			4.0 Nm
	E81 / E82 / E87			2.8 Nm
2AZ Retaining screws, rear light	E63 / E64			1.5 Nm
3AZ Retaining clip (clamping claw), rear light	E92 / E93			4.0 Nm
	E70			2.5 Nm
4AZ Auxiliary brake light to carrier	E81 / E87			2.3 Nm

ACCESSORIES & EQUIPMENT

Vehicle Lighting - Product Information

ADAPTIVE HEADLIGHTS E60, E61, E63, E64, E65, E66, E70, E81, E87, E90, E91, E92, E93

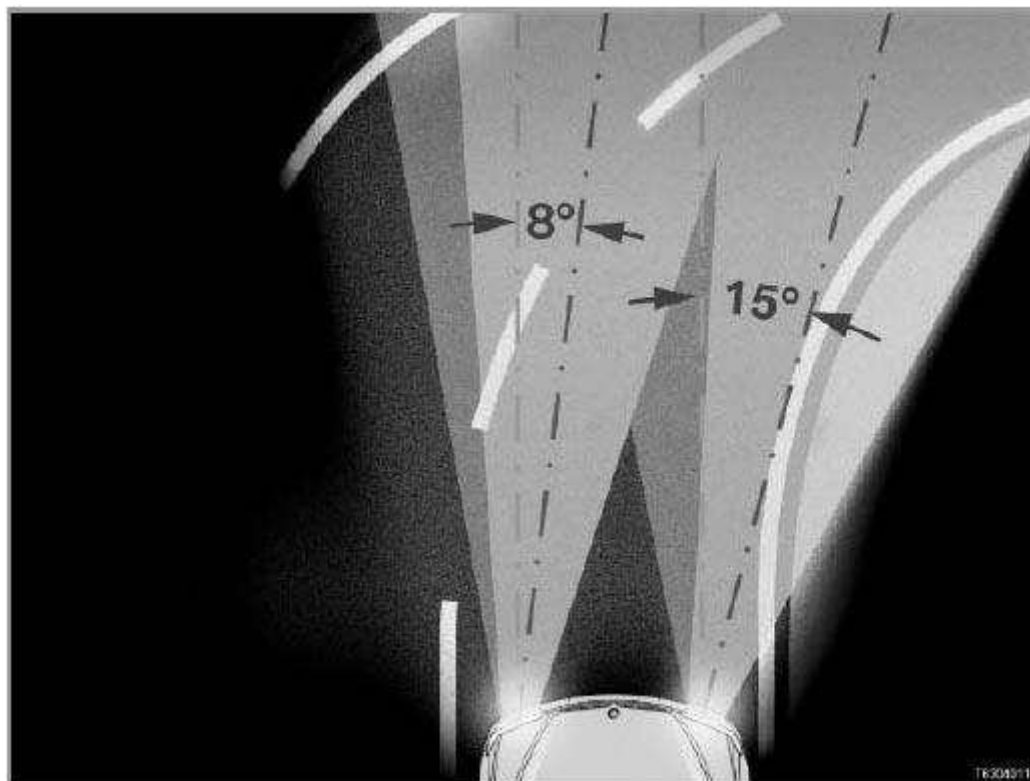


Fig. 1: Identifying Headlights Focusing Angle

Courtesy of BMW OF NORTH AMERICA, INC.

INTRODUCTION

Adaptive headlights turn the bi-xenon headlights towards the inside of a bend when cornering. This improves illumination of the curve of the road. Visibility is therefore improved.

When cornering, the driver is not looking into a "black hole" - instead, the adaptive headlights allow the driver to see the curve of the road.

This service information describes the adaptive headlights for the following model series:

> E60, E61, E63, E64 up to 03/2005:

See **SYSTEM OVERVIEW OF ADAPTIVE HEADLIGHTS (E60, E61, E63, E64, E65, E66 UP TO 03/2005)**

The system overview applies accordingly for the E65 and E66 up to 03/2005.

> E60, E61, E63, E64 from 03/2005 until 09/2005

See **SYSTEM OVERVIEW OF ADAPTIVE HEADLIGHTS (E60, E61, E63, E64, E65, E66 FROM 03/2005)**

The system overview applies accordingly for the E65 and E66 from 03/2005.

NOTE: *AHL control unit discontinued from 03/2005.*

From 03/2005, the AHL control unit software is integrated into the light module on the E60, E61, E63, E64, E65 and E66. The AHL control unit is no longer fitted.

> E60, E61, E63, E64 from 09/2005

The vehicle electrical system was changed from 09/2005.

As a result of the change, several control units were discontinued and some control unit functions were integrated into new control units.

> E70

The turning lights function is new on the E70 from the start of series production.

The turning lights give the area next to the carriage way additional illumination when you are turning or cornering (driving in tight bends). They are also active when you park the vehicle.

Depending on the country concerned, the turning lights are activated when cornering.

> E81, E87, E90, E91, E92, E93

For the E81, E92, E93 from start of series production and for the E87 from 03/2007, the turning light function is new.

NOTE: *Turning lights on E70, E81, E87, E92, E93 only in conjunction with option 524*

Turning lights are a subfunction of option 524 "Adaptive headlights".

Bi-xenon headlights are standard equipment on the E92, E93.

Option 524 is standard on the US version.

NOTE: *AHL components on E46, E53 and E83*

There is a separate system description for the adaptive headlights on the E46,

E53, E83.

NOTE: *AHL components on the E63, E64*

- The E63, E64 has a zero-position sensor.
- Otherwise, the E63 and E64 are the same as the other 5-Series models.

NOTE: *Components for adaptive headlight on E70, E81, E87, E90, E91, E92, E93*

On the E81, E87, E90, E91, E92, E93, the adaptive headlights largely correspond to those on the E60, E61, E63, E64, E65 and E66:

- E70, E81, E87, E90, E91, E92, E93 vehicles are equipped with a zero-position sensor.
- On the E70, E81, E87, E90, E91, E92, E93, the FRM (footwell module) acts as control unit for exterior lighting. The footwell module contains the functions of the light module, AHL control unit and the general module (or body general module).

BRIEF DESCRIPTION OF COMPONENTS

The following components and control units provide signals for the adaptive headlight system:

CAS: Car Access System

The Car Access System supplies signals for the terminal management (e.g. terminal 15 ON).

The adaptive headlights control unit is activated when terminal 15 is switched ON.

Light Switch

The rotary switch for the side lights and dipped headlights differs depending on the vehicle equipment level (adaptive headlights, automatic driving lights control, automatic or manual headlight-range adjustment). For the adaptive headlights function to operate, the light switch must be set to position "A" ("A" = "automatic driving lights control" and "adaptive headlights").

See **LIGHT SWITCH**

Turn-Signal/Main-Beam Switch

The main-beam headlights are switched on and off with the turn-signal/main-beam switch (by pressing or pulling the switch). The adaptive headlights function operates with both dipped and main-beam headlights.

See **DIRECTION INDICATOR/MAIN-BEAM SWITCH**

SZL: Steering Column Switch

The SZL control unit forwards the signals from the turn-signal/main-beam switch to the adaptive headlights control unit.

E60, E61, E63, E64, E65 and E66

See **SZL: STEERING COLUMN SWITCH CLUSTER**

E70, E81, E87, E90, E91, E92, E93

The steering column switch cluster forwards the signals from the turn-signal/main-beam switch to the footwell module (FRM).

Ride-Height Sensors

If the special equipment "Adaptive headlights" is fitted, the adaptive headlights control unit evaluates the signals from the ride-height sensors. This is because: the adaptive headlights control unit also controls the automatic headlight-range adjustment.

The automatic headlight - range adjustment feature adjusts the vertical aim of the headlights to compensate for variations in the vehicle tilt angle (e.g. when the vehicle is laden, and under braking and acceleration in dynamic driving situations).

See **E60, E61, E63, E64, E65, E66, E90 - RIDE-HEIGHT SENSORS**

Brake Light Switch

If the special equipment "Adaptive headlights" is fitted, the signals from the brake light switch are read by the adaptive headlights control unit.

In addition, the brake light switch signal is also a signal for automatic headlight-range adjustment, see **RIDE-HEIGHT SENSORS** above.

Position Sensor

E60, E61

E65, E66

Hella headlights have a position sensor.

The position sensor in the positioner module for the bi-xenon headlights supplies a signal for the horizontal movement of the headlights.

See **POSITION SENSOR**

Zero-Position Sensor

> E63, E64

> E70, E81, E87, E90, E91, E92, E93

Automotive Lighting headlights, previously Bosch, have a zero-position sensor.

The zero-position sensor registers the horizontal movement of the headlight.

See **ZERO-POSITION SENSOR**

EGS Control Unit or Reversing Light Switch

When reverse gear is engaged, the headlights are moved to the straight - ahead position.

- On vehicles with automatic transmission, the EGS control unit provides the "Reverse gear engaged" signal. (EGS: electronic transmission control).
- On vehicles with manual transmission, the signal is supplied by the reversing light switch.

Rain-Light Sensor For Automatic Driving Lights Control

The rain - light sensor measures the ambient brightness outside the vehicle.

- In twilight conditions, the rain - light sensor transmits the message "Twilight" so that the automatic headlight - range adjustment can activate dipped headlights. The headlights are tilted up and down as required, but they are not yet moved towards the bend in the road.
- In darkness, the rain-light sensor sends the message "Darkness". The adaptive headlights are then activated when the vehicle is cornering. The headlights are moved to the left or right:

See **RAIN-LIGHT SENSOR FOR AUTOMATIC DRIVING LIGHTS CONTROL**

Steering-Angle Sensor and DSC Sensor

The steering angle sensor and DSC sensor (DSC = Dynamic Stability Control) supply signals for the adaptive headlights to the adaptive headlights control unit. These signals are evaluated as follows, depending on the vehicle's speed:

- Vehicle speeds up to **30 km/h:**

The adaptive headlights function is controlled using the information from the steering angle sensor (in the steering column switch cluster).

- Vehicle speeds between **30 km/h and 50 km/h:**

In the 30 to 50 km/h speed range, there is a continuous transition in signal evaluation: from the evaluation of signals sent by the steering angle sensor to evaluation of the signals sent by the yaw-rate sensor (in the DSC sensor).

- **In extreme dynamic driving situations** , e.g. if the vehicle starts to skid or fishtail, even at speeds less than **50 km/h** , the signals from the yaw-rate-sensor are considered.

If the vehicle starts to skid or fishtail, the headlights will move to the straight - ahead position. The headlights are not moved until the vehicle has stabilized.

- Vehicle speeds over **50 km/h**:

At speeds upwards of 50 km/h, the signals from the **yaw-rate sensor** (in the DSC sensor) form the primary basis for control of the adaptive headlights function.

Reason: For a constant cornering radius, the steering angle required increases disproportionately with speed. In addition, the steering angle required also depends on the coefficient of friction of the road surface.

Yaw rate is directly proportional to speed. For this reason, the yaw rate is always the most suitable measure for controlling the adaptive headlights at high speeds.

Even at high speeds, however, the steering angle sensor signal is used to detect (predict) the driver's commands **in advance**. This prediction is important: The yaw rate signal is not supplied until the vehicle has **responded** to the steering wheel movement.

The steering-angle sensor signal is disabled so that rapid, momentary steering adjustments do not affect the adaptive headlights function.

A number of control units are involved in the adaptive headlights system (see above: **CAS: CAR ACCESS SYSTEM, EGS CONTROL UNIT OR REVERSING LIGHT SWITCH** and **SZL: STEERING COLUMN SWITCH**). Depending on the model series and model version concerned, the adaptive headlights are actuated by the following control units:

AHL: Adaptive Headlights

> E60, E61, E63, E64, E65, E66 up to 03/2005

The AHL control unit actuates the adaptive headlights.

For safety reasons, the AHL control unit is also responsible for the automatic headlight-range adjustment. This is because: Oncoming traffic must not be dazzled by the adaptive headlights. If a headlight sticks in an unfavorable position, the AHL control unit will attempt to move this headlight down (using the stepper motors in the automatic headlight-range adjustment).

The AHL control unit is connected to the PT-CAN.

See **AHL: ADAPTIVE HEADLIGHTS**

LM: Light Module

E60, E61, E63, E64, E65, E66 from 03/2005

From 03/2005, the AHL control unit is integrated in the light module.

The light module (LM) controls and monitors all vehicle lights. Information is transmitted and received via the K-CAN data bus.

The light module actuates the indicator light for the adaptive headlights (on the light switch).

See **E60, E61, E63, E64 FROM 03/2005** and/or **E65, E66 (FROM 03/2005)**

FRM: Footwell Module

> E70, E81, E87, E90, E91, E92, E93

The footwell module controls the exterior lighting and the adaptive headlights.

The footwell module thus takes the place of the light module and the AHL control unit.

The footwell module actuates the indicator light for the adaptive headlights (on the light switch).

See **FRM: FOOTWELL MODULE**

The footwell module has its own system description.

SMC: Stepper Motor Controllers

The stepper motor controllers control the stepper motors in the headlights (for the automatic headlight - range adjustment and for the adaptive headlights). The stepper motor controllers are not capable of self - diagnosis. The stepper motor controllers are diagnosed and encoded via the control unit for adaptive headlights.

See **SMC: STEPPER MOTOR CONTROLLERS**

SGM: Safety and Gateway Module

E60, E61, E63, E64 until 09/2005 and E65, E66

The safety and gateway module (SGM) is the interface between the two data buses K-CAN and PT-CAN. Thus, all information exchanged between the light module and the AHL control unit passes through the SGM. Information from the yaw-rate sensor (in the DSC sensor) is also fed through the SGM to the AHL control unit.

KGM: Body Gateway Module

E60, E61, E63, E64 from 09/2005

The vehicle electrical system was changed from 09/2005.

As a result of the change, several control units were discontinued and some control unit functions were integrated into new control units.

The new body gateway module (KGM) supersedes the safety and gateway module (SGM) previously fitted, the door modules and the micro - power module.

Xenon-Headlight Control Unit

The xenon-headlight control unit actuates the bulb in the bi-xenon headlights.

The xenon-headlight control unit is not capable of self-diagnosis. The xenon control unit is monitored by the light module (E70, E81, E87, E90, E91, E92, E93: footwell module).

See **E60, E61, E63, E64, E65, E66, E90 - BI-XENON HEADLIGHTS**

Headlights

Option 524 "Adaptive headlights" is only available in conjunction with option 522 "Xenon dipped and main-beam headlights". This means that bi-xenon headlights are employed.

See **E60, E61, E63, E64, E65, E66, E90 - BI-XENON HEADLIGHTS**

Stepper Motors For the Adaptive Headlights

The stepper motors turn the positioner modules in the bi-xenon headlights.

The stepper motors move the headlights vertically and horizontally (vertically = up and down for automatic headlight range adjustment;

horizontally = left and right for the adaptive headlights function).

The positioner modules execute the movement.

See **POSITIONER MODULES**

Indicator Light On the Light Switch

The indicator light (green LED) next to the "A" (= "automatic driving lights control" and "adaptive headlights") has 2 display functions:

- The indicator light **lights up permanently** when the automatic driving lights control or adaptive headlights function is switched on (= light switch in position "A").
- The indicator light **flashes** if a fault develops in the adaptive headlight system.

E60, E61, E63, E64, E65 and E66:

The indicator light is actuated by the light module.

E70, E81, E87, E90, E91, E92, E93:

The indicator light is actuated by the footwell module.

SYSTEM FUNCTIONS

The adaptive headlights system moves headlights horizontal (i.e. from left to right) in order to illuminate the inside of a bend when cornering.

The following functions of the adaptive headlights system are described below:

- System activation and automatic calibration
- Activation of stepper motor controllers
- Speed-dependent analysis of signals
- Adjustment of headlight horizontal aim
- Deactivation of adaptive headlights function under extreme handling conditions
- Deactivation of adaptive headlights function in response to system faults
- Setting headlights to parked position
- Automatic headlight-range adjustment
- Adaptive headlights for automatic driving lights control
- Turning light

NOTE: ***Different control units for adaptive headlights.***

E60, E61, E63, E64, E65, E66 up to 03/2005: The adaptive headlights are actuated by the AHL control unit.

E60, E61, E63, E64, E65, E66 from 03/2005: The adaptive headlights are actuated by the light module (LM).

E70, E81, E87, E90, E91, E92, E93: The adaptive headlights are actuated by the footwell module (FRM).

System Activation and Automatic Calibration

When terminal 15 is switched ON, the headlights always perform a calibration sequence, even if the dipped headlights are not switched on. The control unit for adaptive headlights sends the "perform calibration sequence" request to the stepper motor controllers (SMCs, control units for the headlight stepper motors). The stepper motor controllers actuate the stepper motors in the headlights. The calibration sequence is performed. In the calibration sequence, the headlights move as follows:

1. The headlights move to the right and left (= calibration sequence for adaptive headlights).
2. The headlights move up and down (= calibration sequence for automatic headlight - range adjustment).
3. At the end of the calibration sequence, the headlights are in the straight-ahead position.

Following the calibration sequence, the system is ready for operation.

When reverse gear is engaged, the headlights are moved to the straight-ahead position.

NOTE: ***The calibration sequence is performed only after terminal 15 has been switched OFF for at least 15 seconds.***

- > E66, E61, E63, E64, E65, E66 until 09/2006
- > E87, E90, E91, E92, E93 until 03/2007

If terminal 15 is repeatedly switched on and off (e.g. for demonstration purposes), the calibration sequence will not be executed every time terminal 15 is switched on.

Terminal 15 must have been switched off for at least 15 seconds before it is switched on again. Only then is a calibration sequence performed when terminal 15 is switched on.

NOTE: *Calibration sequence always after terminal 15 ON and dipped - beam headlights ON.*

- > E66, E61, E63, E64, E65, E66 from 09/2006
- > E70 from start of series production
- > E81, E87, E90, E91, E92, E93 from 03/2007

If terminal 15 is repeatedly switched on and off (e.g. for demonstration purposes), the calibration sequence will not be executed every time terminal 15 and the dipped-bead headlights are switched ON.

NOTE: *Calibration sequence with enlarged range of movement.*

- > not E65, E66

From 09/2007, starting with the E60, E61, E63, E64, a calibration sequence with larger range of movement will be introduced.

The calibration sequence with larger range of movement will then gradually be introduced on other model series.

Activation of Stepper Motor Controllers

The control unit for adaptive headlights sends the stepper motor controllers (SMC) the nominal values for the positioner modules (position of positioner modules and speed of movement).

The control unit for adaptive headlights calculates the nominal values using the following signals:

- Vehicle road speed
- Steering angle (at speeds up to 50 km/h, dependent on encoding)
- Yaw rate (50 km/h upwards, see **STEERING-ANGLE SENSOR AND DSC SENSOR** above)

Speed-Dependent Analysis of Signals

Depending on the road speed, the adaptive headlights are controlled using the following signals: Signals from the steering angle sensor and signals from yaw - rate sensor (in the DSC sensor).

The encoding (at the end of the production line) determines the priority assigned to sensor signals above which speed threshold.

Adjustment of Headlight Horizontal Aim

The stepper motor controllers move the headlights to the right or left when the vehicle corners.

Horizontal range of movement of headlights:

- Inwards, i.e. towards center of vehicle: up to max. 8°
- Outwards: up to max. 15°

Example: Right - hand bend:

The right-hand headlight turns by up to 15° (the right-hand headlight is the "inside" headlight on a right-hand bend).

Viewed from the vehicle, the right-hand headlight moves "outwards".

The left-hand headlight moves up to 8° (the left-hand headlight moves towards the middle of the vehicle, i.e. "inwards" as viewed from the vehicle).

The headlight on the outside of the bend has to reach its end position at the same time as the headlight on the inside of the bend so that the carriage way remains smoothly and evenly illuminated.

On a right-hand bend, the left-hand headlight is on the outside of the bend. The right-hand headlight is on the inside of the bend.

Deactivation of Adaptive Headlights Function Under Extreme Handling Conditions

If the vehicle drifts, skids and loses sideways grip, the adaptive headlights function is deactivated as follows:

- The headlights are returned to the straight-ahead position. The headlights are no longer turned.
- The dipped headlights remain on.

Deactivation of Adaptive Headlights Function In Response To System Faults

Until 09/2007, a system fault will be indicated by the indicator lamp on the light switch flashing.

From 09/2007 system fault will be indicated by a Check-Control message in the instrument cluster.

Dazzling of oncoming traffic must be prevented in the event of a system fault.

For this reason, the adaptive headlights function is deactivated as follows:

- If the stepper motors are still functional, the headlights are returned to the straight-ahead position. The headlights are no longer moved towards bends in the road.
- If it is no longer possible for a headlight to be moved back to the straight-ahead position, the headlight is tilted downwards (by the stepped motors for automatic headlight-range adjustment). This prevents dazzling of oncoming traffic.
- Vehicles **up to 09/2007**

If the headlight cannot be tilted downwards, the bi-xenon bulb in this headlight is disabled as follows:

When the vehicle is parked up, the control unit registers sleep mode for the adaptive headlights, as follows: Vehicle standstill and terminal R OFF for several minutes.

The next time the vehicle is restarted, the bi-xenon light of the defective headlight is not switched on.

The front foglights are switched on in order to ensure a minimum level of illumination.

The dipped beam headlights are **not** switched off while the vehicle is in motion.

NOTE: ***From 09/2007, the dipped - beam headlights will not be switched off in the event of a system fault.***

If a system fault develops in the adaptive headlights, the dipped-beam headlights for the affected headlight will *not* be switched off.

Setting Headlights To Parked Position

When terminal R is switched off, the headlights move to the parked position. The parked position is important for the headlights' next calibration sequence: From the parked position, the headlights are run through a calibration sequence in the pre-drive-check. During each calibration sequence, the control unit for adaptive headlights relearns the straight - ahead position for the headlights.

When the headlights have reached the parked position, the stepper motor controllers SMCs inform the control unit for adaptive headlights ("verification").

The control unit for adaptive headlights deactivates the stepper motor controllers.

The run-down period lasts approx. 10 seconds.

Automatic Headlight-Range Adjustment

If the special equipment "Adaptive headlights" is fitted, the control unit for adaptive headlights also controls the automatic headlight-range adjustment.

The automatic headlight - range adjustment adapts the headlight range for different operating conditions. Variations in the vehicle tilt angle are produced by vehicle loads and braking or acceleration in extreme driving situations. The automatic headlight-range adjustment moves the headlights up and down as required.

The control unit for adaptive headlights also controls the automatic headlight-range adjustment as follows:

1. The ride-height sensors and the brake light switch supply the signals for the automatic headlight-range adjustment.
2. The control unit for adaptive headlights computes the vehicle inclination (longitudinally to the roadway) from the signals.
3. The stepper motors for the automatic headlight-range adjustment automatically and dynamically control the headlight range.

The headlight range is adjusted so that the actual headlight range conforms to the legally required headlight range as follows:

- If vehicle rear is lower than front:

The actual headlight range will be longer than the legally stipulated range. The headlight beam height is lowered to reduce the headlight range to match the legal requirement.

- If the vehicle is horizontal:

The actual headlight range will be the same as the legally stipulated range.

- If vehicle front is lower than rear:

The actual headlight range will be shorter than the legally stipulated range. The headlight beam height is raised to increase the headlight range to match the legal requirement.

Adaptive Headlights For Automatic Driving Lights Control

The automatic driving lights control feature (option in conjunction with the rain-light sensor) automatically switches the side lights and dipped headlights on or off.

Switch-on conditions:

- The automatic driving lights control must be encoded (in the light module on the E60, E61, E63, E64, E65, E66, in the footwell module on the E70, E81, E87, E90, E91, E92, E93).
- The light switch must be in position "A" ("A" for automatic driving lights control and adaptive headlights).
- The rain-light sensor must be installed and operational.

The rain-light sensor detects the brightness of the ambient light.

The rain-light sensor sends the following prompts to the light module (on the E70, E81, E87, E90, E91, E92, E93: footwell module):

- Ambient brightness low: In twilight, darkness, in an underground garage or tunnel.

"Switch on dipped headlights" request

- Ambient brightness sufficient.

"Switch off dipped headlights" request

If only the side lights are to be switched on, the light switch must be set to side lights (switch position 1).

When the light switch is set to position "A", the control unit for adaptive headlights is also activated:

- When the automatic driving lights control function switches on the dipped headlights (e.g. at dawn/dusk), the adaptive headlights function is notified at the same time.

The control unit for adaptive headlights thus assumes control of the automatic headlight - range adjustment.

- In addition, signals from the rain - light sensor are evaluated (E60, E61, E63, E64, E65, E66: by the light module; E90, E91, E92, E93: by the footwell module).

The headlights are not turned when the vehicle is cornering until total darkness sets in.

The message "dipped headlights on" is given individually for each headlight.

If a headlight fails, the adaptive headlights are switched off.

The front foglights are switched on in order to ensure a minimum level of illumination.

Turning Lights

The turning lights are coupled to the adaptive headlights (option 524).

The footwell module (FRM) uses the following signals to adjust the turning lights:

- Steering angle
- Yaw rate
- Status of reverse gear

> E81, E92, E93 with start of series production and E87 from 03/2007

Instead of the main-beam headlight (H7), the main headlight with turning light has a fixed additional reflector with an H3 bulb. The special shape of the lens prevents dazzle to the front.

The **Fig. 2** shows the main headlight with turning light on the E81, E87, E92, E93

1. Bi-xenon light
2. H8 bulb for side lights and daytime driving lights

3. H3 bulb for turning lights
4. Reflector for turning lights

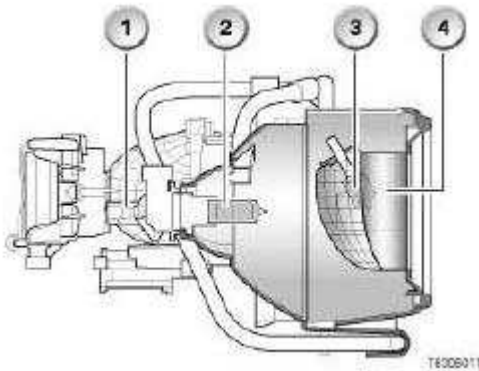


Fig. 2: Identifying Headlight Reflector For Turning Lights
Courtesy of BMW OF NORTH AMERICA, INC.

The **Fig. 3** shows the turning light on the E81, E87, E92, E93

1. Left turn
2. Right turn

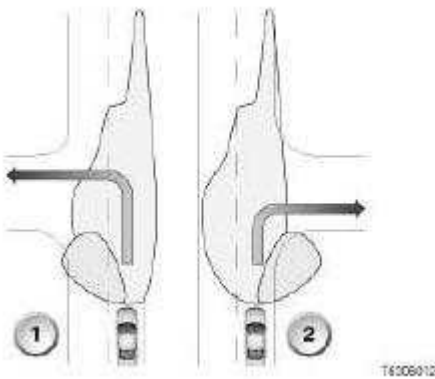


Fig. 3: Identifying Turning Light Turn
Courtesy of BMW OF NORTH AMERICA, INC.

The following conditions must be satisfied for the turning lights to be switched on:

- Terminal 15 ON
- Light switch in position "A" ("A" stands for automatic driving lights control)
- Rain-light sensor detects twilight or darkness (threshold exceeded)

The turning lights are not activated at speeds greater than 70 km/h.

> Europe version:

For legal reasons, the turning lights on the Europe version can only be activated via the turn signal indicator at speeds up to 40 km/h.

When reversing, the footwell module (FRM) activates the turning lights as follows in the speed range 0 km/h to 35 km/h:

- US version: both sides
- Other countries: outside of turn only

When the turn signal indicator is switched on:

If the vehicle is stationary, the turning lights will automatically be deactivated after approx. 4 seconds, e.g. when waiting at traffic lights. However, the turning lights can be activated again with the turn-signal/mainbeam switch (up to 3 times) until the reflector has reached a certain temperature.

A temperature model protects the headlights from excessive thermal stress.

The switching-off conditions for the turning light depend on the country concerned.

NOTE: *Temperature monitoring by temperature model*

A temperature model in the footwell module calculates the temperature of the reflector. The temperature of the reflector must not exceed a certain value. If a critical temperature is reached, the footwell module (FRM) will deactivate the turning lights. The turning lights can be activated again after a cooling-off phase.

> E70 with start of series production

The turning lights are realized using the front foglights. (Reason: The installation location of the headlights is too high for the turning lights. This prevents legal stipulations from being adhered to.)

Depending on actuation, the right - hand and/or left-hand front foglight is switched on. The turning lights are actuated by the light module (LM).

The front foglights have an additional reflector to illuminate the areas to the sides better.

When turning, the front foglight on the inside of the turn is automatically activated. The additional reflector for the turning light reflects the light beam towards the turning area.

The turning light are not switched on suddenly but rather faded according to special time parameters.

Depending on the country concerned, the turning lights are switched on when cornering.

The **Fig. 4** shows the front foglight on the E70

1. Additional reflector for the turning light

2. Reflector for the front foglights
3. Bulb

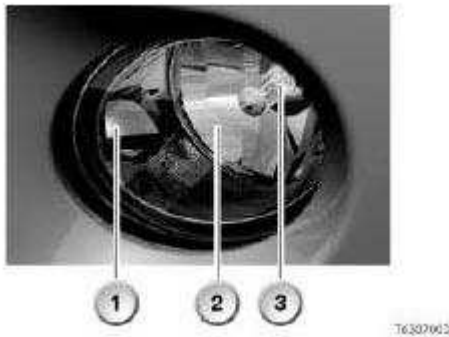


Fig. 4: Identifying Turning Light Reflector
Courtesy of BMW OF NORTH AMERICA, INC.

The following conditions must be satisfied for the turning lights to be **switched on**:

- Terminal 15 ON
- Light switch in position "A" ("A" stands for automatic driving lights control)
- Rain-light sensor detects twilight or darkness (threshold exceeded)

and

- Turn signal indicator ON (not one-touch turn signal)
- Speed range (forwards):
 - Europe and Japan version from 0 km/h to 35 km/h
 - US version from 0 km/h to 65 km/h
- Swivel angle (theoretical):
 - when stationary $\geq 77^\circ$
 - when driving $\geq 10^\circ$

Alternatively

- Speed range (reverse):
 - 0 km/h to 35 km/h
- Swivel angle (theoretical):
 - when stationary or driving $\geq 70^\circ$

If the vehicle is stationary, the turning lights will automatically be deactivated after a certain time, e.g. when waiting at traffic lights. However, the turning lights can be activated again with the turn-signal/main-beam switch.

The following conditions must be satisfied for the turning lights to be **switched off**:

- Light switch not in position "A" ("A" stands for automatic driving lights control)
- Rain-light sensor does not detect twilight or darkness (lower threshold exceeded)

Alternatively

- Turn signal indicator OFF
- Speed range (forwards):
 - Europe and Japan versions > or = 40 km/h
 - US version > or = 70 km/h
- Swivel angle (theoretical):
 - when stationary 77°
 - when driving 10°

Alternatively

- Speed range (reverse): > or = 40 km/h
- Swivel angle (theoretical): when stationary and when driving below a certain value

Alternatively

- Vehicle skids and swings out.

Alternatively

- Front foglights are switched on with the front foglights switch.

PRECONDITIONS FOR ACTIVATION

The control unit for adaptive headlights is "awake" from terminal 15 ON.

The movement of the lights is subject to the following conditions:

- Reverse gear must **not** be engaged.
- The system is free of faults (indicator lamp **not** flashing and no Check-Control message)
- The bulbs for the bi-xenon lights are OK in both headlights.
- The vehicle must not be skidding or fishtailing.
- The rain - light sensor must detect darkness.
- Additional precondition for activation: automatic driving lights control is active (light switch in position "A", see above).

Notes for service staff

CAUTION: Exercise caution when working on bi-xenon headlights

Whenever inspecting or working on the headlights, always observe the safety precautions and accident prevention rules. The headlight system has dangerously high voltage.

- General note: See **E60, E61, E63, E64, E65, E66, E90 - ADAPTIVE HEADLIGHTS, GENERAL INFORMATION FOR SERVICE STAFF**
- Diagnosis: See **E60, E61, E63, E64, E65, E66, E90 - ADAPTIVE HEADLIGHTS DIAGNOSIS**
- Encoding/programming: See **E60, E61, E63, E64, E65, E66, E90 - ENCODING/PROGRAMMING ADAPTIVE HEADLIGHTS**
- Car and Key Memory:
 - > E60, E61, E63, E64, E65, E66

The sensitivity of the driving light sensor can be set to one of 2 settings with the Car and Key Memory.

> E70, E81, E87, E90, E91, E92, E93

All Car and Key Memory functions are programmed inside the vehicle itself.

(Please refer to the "Personal profile" section of the Owner's Handbook: Personal settings for a maximum of 3 remote control units via the display in the instrument cluster or via the Central Information Display.)

NATIONAL VERSIONS

The options "Daytime driving lights" and "Manual headlight - range adjustment" are available in certain countries. Vehicles with manual headlight-range adjustment do not have adaptive headlights. This is because vehicles with manual headlight - range adjustment have halogen dipped headlights. Adaptive headlights (option 524) are only available in conjunction with option 522 "Xenon dipped and main - beam headlights".

Switching on adaptive headlights in conjunction with daytime driving lights function

The "Daytime lights" option (Northern Europe and Canada) means that dipped-beam headlights and side lights (E70, E92, E93: daytime driving lights) are always switched on:

- Light switch in position "2"
- Terminal 15 ON

The automatic headlight - range adjustment is active (actuated by the control unit for adaptive headlights).

If terminal 15 is switched off, the dipped headlights and the side lights are automatically switched off as well.

The light switch must also be set to position "A" with the "Daytime driving lights" option. The control unit for adaptive headlights is then in standby.

System functions for "Daytime lights" option when the light switch is set to position "A":

- If the vehicle is encoded with the "Daytime driving lights" option (end of production line), the light switch can remain in position "A" at all times.

When terminal R is switched on, the side lights, parking lights and licence plate lighting are switched on.

As soon as terminal 15 is switched on, the dipped headlights are also switched on.

- When the dipped headlights are switched on, the control unit for adaptive headlights is activated (for automatic headlight-range adjustment).
- The indicator lamp on the light switch lights up and indicates that the system is functional.
- The adaptive headlights turn when the vehicle is stationary if the steering wheel is turned (to the right only).
- The headlights are moved when the vehicle corners if the rain - light sensor registers darkness.

The switch-on conditions for the adaptive headlights in conjunction with special equipment "Daytime driving lights" are as follows:

- The vehicle must be encoded with the "Daytime driving lights" option (end of production line)
- The light switch must be in position "A"
- Terminal 15 must be switched on and reverse gear must not be engaged
- Rain-light sensor must detect darkness

Subject to change.

MAIN-BEAM ASSISTANT E60, E61, E63, E64, E65, E66, E70, E90, E91, E92, E93

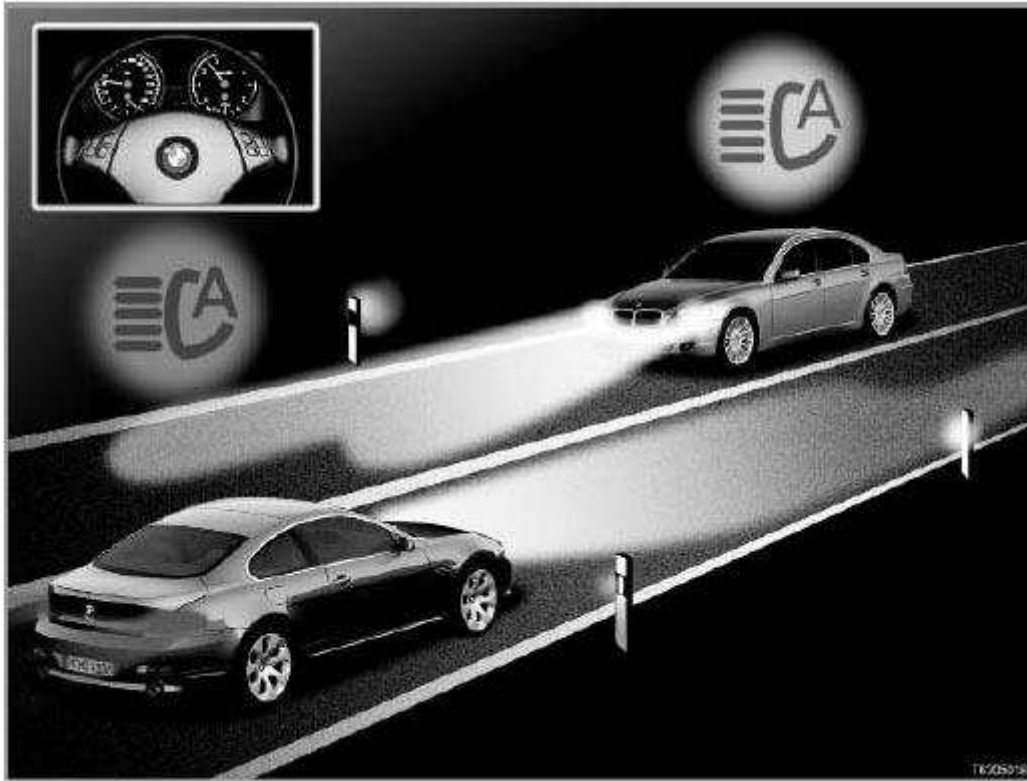


Fig. 5: Identifying Main-Beam Assistant
Courtesy of BMW OF NORTH AMERICA, INC.

INTRODUCTION

The main-beam assistant assists the driver to operate the main-beam headlights. The main-beam assistant automatically switches the main-beam headlights on and off as the traffic situation changes.

The main-beam assistant detects vehicles travelling ahead of the car and oncoming traffic, and it also detects lighted stretches of roadway. By automatically switching off the main-beam headlights in good time, the main-beam assistant ensures that the occupants of oncoming vehicles, for example, are not dazzled by the headlights.

Advantages:

Drivers do not have to concern themselves with the job of operating the main - beam headlights. This enhances the level of convenience for drivers. The main - beam headlights are switched on more frequently by the main-beam assistant than is the case with manually operated main-beam headlights. The driver's field of vision is optimally illuminated. Driving in the dark, therefore, is rendered safer.

IMPORTANT: *The driver retains full responsibility for all his/her actions, despite the assistance of the main - beam assistant.*

The main-beam assistant merely assists the driver in the task of operating the main-beam headlights.

Responsibility for switching the main-beam headlights on and off in accordance with the dictates of the traffic situation rests with the drivers.

The main-beam assistant can be deactivated at any time with the turn-signal/main-beam switch.

Option 5AC "Main-beam assistant" is available for the BMW 3, 5, 6 and 7-Series.

> E60, E61, E63, E64, E65, E66 - See **SYSTEM OVERVIEW FOR THE MAIN-BEAM ASSISTANT: E60, E61, E63, E64, E65, E66**

NOTE: ***Only the main beam of the bi-xenon headlights are switched on.***

If a main-beam assistant is fitted, only the main beam of the bi-xenon headlights are switched on.

The halogen headlights are switched on only when the headlight flasher is actuated. In countries in which daytime driving lights are required by law, the halogen headlights are used for the daytime driving lights.

BRIEF DESCRIPTION OF COMPONENTS

The following components and control units provide input signals for the main - beam assistant:

- **Light switch**

The main-beam assistant can be activated only when the light switch is in position "A".

"A" stands for "automatic headlight control".

- **Turn-signal/main-beam switch**

The main-beam assistant is activated and deactivated by mans of the turn-signal/main-beam switch.

See the section entitled **OPERATION** below.

- **Rain-light sensor**

The rain - light sensor measures the brightness of the ambient light. The light module switches the dipped headlights on when daylight fails.

The main-beam assistant can be activated only when the dipped headlights are on. The precondition is that the light switch must be in the "A" position.

- **Wheel-speed sensors**

Each of the wheel-speed sensors measures the circumferential speed of an individual wheel. The DSC control unit (DSC: Dynamic Stability Control) uses these input signals to calculate the car's road speed.

The main-beam headlights are switched on when the car's road speed is above 50 km/h.

The main-beam headlights are switched off when the car's road speed is below 38 km/h.

- **DSC sensor**

The DSC sensor registers lateral acceleration and calculates the yaw rate.

("Yaw" is the movement of the vehicle about the vertical axis, e.g. when the car is cornering).

The main-beam assistant uses the yaw rate to improve evaluation when the car corners. The DSC sensor is underneath the driver's seat. For safety reasons, cars with active front steering have a second DSC sensor underneath the front passenger's seat.

- **Image sensor**

The image sensor is a special camera for detecting light sources.

The image sensor transmits images to the control unit for the main - beam assistant.

The images are carried by an LVDS data line (LVDS: Low Voltage Differential Signalling).

The control unit for the main-beam assistant analyses the images.

The image sensor and the control unit are installed in a **common** housing and can only be supplied as a unit.

See **IMAGE SENSOR FOR THE MAIN-BEAM ASSISTANT: E60, E61, E63, E64, E65, E66**

- **Reverse gear switch**

The main-beam headlights are **not** switched on if reverse gear is engaged.

In a manual-shift car, the reverse gear switch supplies the "reverse gear engaged" information.

The reverse gear switch sends this information to the light module.

- **Selector lever position switch**

The main-beam headlights are **not** switched on if reverse gear is engaged.

In a car fitted with electronic transmission control (EGS), the selector lever position switch supplies the "reverse gear engaged" information. The selector lever position switch sends this information to the EGS control unit.

The EGS control unit sends this information to the light module or footwell module.

- **Selector angle sensor and shift travel sensor**

> E60, E61, E63, E64, E65, E66

The main-beam headlights are **not** switched on if reverse gear is engaged.

In a car fitted with sequential manual transmission (SMG), the selector angle sensor and the shift travel sensor supply the "reverse gear engaged" information. The selector angle sensor and the shift travel sensor send the information to the SMG control unit. The SMG control unit sends the information to the light module.

The following control units are involved in the main-beam assistant system:

- **FLA: Main-beam assistant**

The FLA control unit analyses the images from the image sensor. The FLA control unit receives information on road speed and yaw rate from the DSC control unit.

The FLA control unit sends a switch-on recommendation or a switch-off recommendation for the main-beam headlights to the light module. The recommendation depends on the traffic situation, the ambient light, and the car's road speed.

The FLA control unit is connected to the K-CAN.

See **FLA CONTROL UNIT FOR THE MAIN-BEAM ASSISTANT: E60, E61, E63, E64, E65, E66**

- **LM: Light module**

> E60, E61, E63, E64, E65, E66

The light module receives various input variables for the main-beam headlights:

- Switch-on or switch-off recommendation from the FLA control unit
- Switch position of the light switch
- Switch position of the direction indicator/mean - beam switch
- Information from the reverse gear switch or the selector lever position switch or the selection angle and shift travel sensor
- Information from the rain-light sensor, as to whether the dipped headlights have to be switched on

On the basis of the input variables, the light module decides whether the main-beam headlights should be switched on or off.

- The light module actuates the bi-xenon headlights.
- The light module actuates the FLA indicator light in the instrument cluster.

A Check-Control symbol appears if the main - beam assistant fails.

The light module is connected to the K-CAN.

○ **FRM: Footwell module**

> E90, E91, E92, E93, E70

The footwell module receives various input variables for the main - beam headlights:

- Switch-on or switch-off recommendation from the FLA control unit
- Switch position of the light switch
- Switch position of the direction indicator/main-beam switch
- Information from the reverse gear switch or selector lever position switch
- Information from the rain-light sensor, as to whether the dipped headlights have to be switched on

On the basis of the input variables, the footwell module decides whether the main-beam headlights should be switched on or off.

- The footwell module actuates the bi-xenon headlights.
- The footwell module actuates the FLA indicator light in the instrument cluster.

A Check-Control symbol appears if the main-beam assistant fails.

The footwell module is connected to the K-CAN.

○ **DSC: Dynamic Stability Control**

The DSC control unit calculates the car's road speed using the signals from the wheel-speed sensors. The DSC control unit sends the information on road speed to the main - beam assistant.

The DSC control unit also sends the information from the yaw-rate sensor in the DSC sensor to the main-beam assistant.

○ **EGS or SMG: Electronic gearbox control or sequential manual transmission**

The EGS control unit receives the "Reverse gear engaged" information from the selector lever position switch.

The EGS control unit is connected to the PT-CAN.

The SMG control unit receives the "Reverse gear engaged" information from the selector angle sensor and the shift travel sensor. The SMG control unit is connected to the PT-CAN.

○ **SZL: Steering Column Switch**

The switch signals from the turn - signal/main-beam switch are picked up and evaluated by the SZL

control unit.

The SZL control unit sends the position of the turn-signal/main-beam switch to the light module (E60, E61, E63, E64, E65, E66) or footwell module (E90, E91, E92, E93, E70)

The following components are controlled:

- **Bi-xenon headlights**

The bi-xenon headlights are actuated by the light module.

NOTE: *Only the main beam of the bi-xenon headlights are switched on.*

If a main-beam assistant is fitted, only the main beam of the bi-xenon headlights are switched on. The halogen headlights are switched on only when the headlight flasher is actuated. In countries in which daytime driving lights are required by law, the halogen headlights are used for the daytime driving lights.

- **Instrument cluster**

The indicators in the instrument cluster are as follows:

- Main-beam indicator lamp (legally stipulated, blue)
- FLA indicator light
 - Orange on BMW 3, 5 and 6-Series and on X5
 - Blue on BMW 7-Series
- Check-Control symbol for failure of the main-beam assistant (yellow)

See the section entitled **SYSTEM FUNCTIONS** below.

The following components provide the power supply for the main - beam assistant:

- **PM: Power module**

> E65, E66

In the BMW 7-Series, the power module supplies power to the main - beam assistant.

- **Rear power distributor**

> E60, E61, E63, E64

In the BMW 5-Series and 6-Series, the rear power distributor supplies power to the main-beam assistant.

- **Power distributor in junction box**

> E90, E91, E92, E93

On the BMW 3-Series, the power distributor in the junction box supplies voltage to the main - beam assistant.

- **Rear power distributor**
> E70

On the BMW X5, the rear power distributor provides power to the main - beam assistant.

SYSTEM FUNCTIONS

In accordance with the traffic situation, the FLA control unit sends a switch - on recommendation or a switch - off recommendation for the main - beam headlights to the light module or footwell module. On the basis of this recommendation and various other the input variables, the light module or footwell module decides whether the main-beam headlights should be switched on or off.

The following system functions of the main - beam assistant are described:

- Automatic main-beam headlight switch - off when oncoming traffic is detected
- Automatic main-beam headlight switch - off when vehicle detected ahead of the car
- Automatic main-beam headlight switch - off when adequate ambient lighting is detected
- Automatic main-beam headlight switch - on
- Indicators in the instrument cluster
- Function limitations of the main - beam assistant
- Automatic alignment of the main - beam assistant

Automatic Main - Beam Headlight Switch-Off When Oncoming Traffic Is Detected

The light cone of the main - beam headlights has a range of about 400 m. The image sensor can detect other light sources within a range of about 1000 m. This ensures that the image sensor detects oncoming vehicles before their drivers can be dazzled by the light cone of the main - beam headlights.

When the image sensor detects an oncoming vehicle, the FLA control unit sends a switch - off recommendation to the light module or footwell module. The light module or footwell module switches the main - beam headlights off.

Automatic Main - Beam Headlight Switch-Off When Vehicle Detected Ahead Of The Car

When the image sensor detects a vehicle ahead, the FLA control unit sends a switch - off recommendation to the light module or footwell module. The light module or footwell module switches the main - beam headlights off.

Automatic Main - Beam Headlight Switch-Off When Adequate Ambient Lighting Is Detected

When the image sensor detects an environment in which ambient lighting is adequate, the FLA control unit sends a switch-off recommendation to the light module or footwell module. The light module or footwell module switches the main-beam headlights off.

Adequate ambient lighting means:

- Daylight
- Twilight
- Street lighting (e. g. in illuminated towns)

Automatic Main-Beam Headlight Switch-On

If there is no reason for the lights to be dipped, the light module or footwell module switches the main-beam headlights on. The bi-xenon headlights are switched to full beam.

Displays In The Instrument Cluster

The FLA indicator light lights up in the instrument cluster as soon as the main-beam assistant is activated (blue on the BMW 7-Series, orange on the BMW 3, 5, and 6-Series and on the X5).

The main-beam indicator light also lights up (blue) in the usual way as soon as the main-beam headlights are switched on.

A Check-Control symbol appears (yellow) if the FLA control unit detects a system failure.

See **INDICATORS FOR THE MAIN-BEAM ASSISTANT AND THE MAIN-BEAM HEADLIGHTS: E60, E61, E63, E64, E65, E66**

Function Limitations Of The Main-Beam Assistant

The main-beam assistant can be subject to function limitations under the following circumstances:

- Inclement weather conditions (e.g. fog)
- Poorly lighted road users (e.g. cyclists, pedestrians)
- Certain road signs (e.g. the warning sign for a tight bend): Reflections from traffic signs may be incorrectly interpreted by the main - beam assistant as a vehicle driving ahead or as oncoming traffic.

See **FUNCTION LIMITATIONS OF THE MAIN-BEAM ASSISTANT**

- Driving over crests and through dips

See **FUNCTION LIMITATIONS OF THE MAIN-BEAM ASSISTANT**

- Certain traffic situations (e.g. tight bends, vehicles approaching from the side)
- Image sensor's field of view obstructed (e.g. by snow)

Automatic Alignment Of The Main-Beam Assistant

In order to operate correctly, the image sensor must be aligned parallel with the vehicle's centerline. When the car is driven at night, the main - beam assistant can automatically correct alignment up to 3° to the left or 3° to

the right. This correction compensates for minor deviations from the centerline.

Driving conditions for automatic directional orientation of the main - beam assistant are:

- Straight ahead for a distance of approx. 50 km: A relatively straight stretch accelerates the directional orientation.
- Road marking must be clearly visible.

See **IMAGE SENSOR FOR THE MAIN-BEAM ASSISTANT: E60, E61, E63, E64, E65, E66**

OPERATION

Operation of the main-beam assistant is described in a separate section.

The following controls of the main - beam assistant are described:

- Switching on automatic headlight control
- Activating the main - beam assistant
- Deactivating the main-beam assistant
- Reactivating the main-beam assistant
- Switching on the headlight flasher

See **OPERATION**

PRECONDITIONS FOR ACTIVATION

For technical reasons, distinctions are drawn between the following conditions required for switch - on:

- Conditions required for switch-on for the FLA control unit
- Conditions required for switch-on for the main-beam assistant
- Conditions required for switch-on for the main-beam headlights

Conditions Required For Switch - On For The FLA Control Unit

The FLA control unit is active as of terminal 15 ON.

Conditions Required For Switch - On For The Main-Beam Assistant

- Light switch set to position "A"
- Dipped headlights switched on.

When the switch is in position "A", the dipped headlights are switched on by the automatic headlight control.

- Turn-signal/main-beam switch pressed forward (in forward direction of travel).

Conditions Required For Switch - On For The Main-Beam Headlights

- Road speed greater than 50 km/h.
- Reverse gear must **not** be engaged.
- Image sensor does **not** detect an oncoming vehicle or a vehicle ahead.
- Image sensor detects adequate darkness.

Notes for service staff

The following information is available for service staff:

- General note: See **MAIN-BEAM ASSISTANT, GENERAL INFORMATION FOR SERVICE STAFF: E60, E61, E63, E64, E65, E66**
- Diagnosis: See **MAIN-BEAM ASSISTANT DIAGNOSIS: E60, E61, E63, E64, E65, E66**
- Encoding/programming: -

MAINTENANCE

Maintenance & OE General Information - X3

00 MAINTENANCE AND GENERAL INFORMATION

00 DANGER OF POISONING IF OIL IS INGESTED/ABSORBED THROUGH THE SKIN

Danger of poisoning!

Ingesting oil or absorbing through the skin may cause poisoning!

Possible symptoms are:

- Headaches
- Dizziness
- Stomach aches
- Vomiting
- Diarrhoea
- Cramps/fits
- Unconsciousness

Protective measures/rules of conduct:

- Pour oil only into appropriately marked containers
- Do not pour oil into drinking vessels (drinks bottles, glasses, cups or mugs)
- Observe country-specific safety regulations

First aid measures:

- Do not induce vomiting.

If the person affected is still conscious, he/she must rinse out their mouth with water, drink plenty of water and consult a doctor immediately.

If the person affected is unconscious, do not administer anything by mouth, place the person in the recovery position and seek immediate medical attention.

00 RISK OF INJURY IF OIL COMES INTO CONTACT WITH EYES AND SKIN

Danger of injury!

Contact with eyes or skin may result in injury!

Possible symptoms are:

- Impaired sight
- Irritation of the eyes
- Reddening of the skin
- Rough and cracked skin

Protective measures/rules of conduct:

- Wear protective goggles
- Wear oil-resistant protective gloves
- Observe country-specific safety regulations

First aid measures:

- Eye contact: Rinse eyes immediately with plenty of water for at least 15 minutes; if available, use an eye-rinsing bottle. If irritation of the eyes persists, consult a doctor.
- Skin contact: Wash off with soap and water immediately. If irritation persists, consult a doctor.

NOTE: Do not use solvents/thinners.

00 SAFETY INSTRUCTIONS FOR HANDLING OIL

WARNING: Danger of poisoning if oil is ingested/absorbed through the skin! See 00 Danger of poisoning if oil is ingested/absorbed through the skin
Risk of injury if oil comes into contact with eyes and skin! See 00 Risk of injury if oil comes into contact with eyes and skin

Recycling:

Observe country-specific waste-disposal regulations.

Measures if oil is unintentionally released:

- Personal precautionary measures: Danger of slipping! Keep non-involved persons away from the work area. Wear personal protective clothing/equipment.
- Environmental protection measures: Prevent oil from draining into drain channels, sewerage systems, pits, cellars, water and the ground.
- Limiting spread: Use oil blocks to prevent the surface spread of oil.
- Cleaning procedure: Bind and dispose of escaped oil with nonflammable absorbents.

NOTE: Do not flush oil away with water or aqueous cleaning agents.

00 ... BMW SERVICE-INSPECTION (PETROL/GASOLINE VEHICLES)

IMPORTANT: The operations set out below always refer to the maximum possible scope of a service-inspection.

The exact scope of the vehicle in question must be printed out with the vehicle identification number from the KSD CD.

Body / electrical system

- Check lighting system: instrument and indication field lighting, heater fan, signal horn, headlight flasher and hazard warning lights, see **00 00 ... Checking lighting system**
- Seat belts: check condition of belt strap, function of inertia reel mechanism, locking reel, belt buckle, see **00 00 ... Seat belts: checking condition of belt strap, function of inertia reel mechanism, locking reel, belt buckle**
- Battery:
 - Check acid level, charge state (magic eye)
 - If necessary: Charge battery, see **00 00 ... Battery: checking acid level, topping up with distilled water if necessary. If necessary, recharge battery.**
- Heating/air conditioning: change microfilter / carbon canister, see **00 00 ... Heating/air conditioning: replacing microfilter/carbon canister (shorten replacement interval accordingly in event of larger buildup of dust)**
- Body and underbody: check for corrosion and damage-except cavities, see **00 00 ... Body and underbody: checking for corrosion and damage - except cavities**

Engine compartment

- Diagnostic brief test , see **00 00 ... Diagnostic brief test**
- In event of fault memory entry "54C6" change transfer case oil , see **00 00 ... Oil change in transfer case**
- Change engine oil and oil filter , see **00 00 ... Changing engine oil and oil filter**
- Replace spark plugs , see **00 00 ... Replacing spark plugs**
- Coolant hoses: visually inspect for leaks, check coolant level and concentration, top up if necessary
Caution! Replace coolant at least every 3 years, see **00 00 ... Coolant hoses: visual inspection for leaks. Checking coolant level and concentration, topping up if necessary**
- Reset service interval indicator according to factory specifications, see **00 00 ... Resetting service interval indicator according to factory specifications**
- Windscreen washer system and intensive cleaning system: check fluid level, top up if necessary, see **00 00 ... Windscreen washer system and intensive cleaning system: checking fluid level, topping up if necessary**
- Power steering/ride-height control: visual inspection for leaks, check fluid level, top up fluid if necessary, see **00 00 ... Power steering/ride-height control: visual inspection for leaks, checking fluid level, topping up fluid if necessary**
- caution Change brake fluid in accordance with service interval indicator , no later than every 2 years, see **00 00 ... Changing brake fluid**
- Air cleaner: Replace air cleaner element, see **00 00 ... Air cleaner: replacing air cleaner element (shorten replacement interval accordingly in event of larger buildup of dust)**

Chassis / suspension area

- Front and rear disc brake pads:
 - check pad thickness with measuring gauge **00 00 ... Front and rear brake linings: checking lining thickness with measuring gauge. If linings are replaced: cleaning brake shafts, checking brake disk thickness and surface, applying grease to wheel centering on alloy wheels. If rear linings are replaced: checking parking brake linings**
 - If pads are replaced: Clean brake ducts. Brake discs: Check surface and thickness. If replacing at rear: check parking brake linings. Grease wheel centering on light alloy wheels.
- Check steering for play . Steering tie rods and axle joints, steering gear, sleeves and flexible disc: check condition, see **00 00 ... Steering components: checking for zero clearance, leaks, damage and wear**
- Underbody incl. all visible components : check for damage, leaks, corrosion, see **00 00 ... Underbody incl. all visible components: checking for damage, leaks, corrosion**
- Brake lines and connections: visual inspection for leaks, damage and correct position, see **00 00 ... Brake lines and connections: visual inspection for leaks, damage and correct position**
- Check handbrake lever travel , adjust according to setting specifications if necessary, see **00 00 ... Checking handbrake lever travel, adjusting according to setting specifications if necessary**
- Tires:
 - Check pressure, correct if necessary (including spare wheel). Check external condition (left/right), check tread depth and pattern
 - If level of wear is not uniform, measure and correct wheel alignment after consulting with customer, see **00 00 ... Tires: checking inflation pressure, correcting if necessary (incl. spare wheel), checking external condition, tread depth, pattern. In event of nonuniform wear, carry out measurement and correction of wheel alignment**

Final check

- Check roadworthiness: See **00 00 ... Checking roadworthiness**
 - check brakes (with rear disc brakes: brake in handbrake)
 - Steering/power steering
 - Clutch
 - Shock absorbers (visual inspection)
 - Indicator and warning lamps
 - Check Control

00 PRE-DELIVERY CHECK

Quality assurance by BMW Service

Model:

Vehicle identification number:

Included with the vehicle:

- Owner's Handbook(s)
- Service Booklet
- Master key/remote control
- Spare key

I hereby confirm that I have received the vehicle in perfect condition.

.....
Place and date

.....
Signature of vehicle owner

Fig. 1: BMW Service Quality Assurance Sheet
Courtesy of BMW OF NORTH AMERICA, INC.

Pre-delivery check by BMW Service**Scopes of inspection:** To be kept with the workshop documents

The following work must be carried out on the vehicle by BMW Service prior to delivery.

* Denotes optional extra or national-market specification. Observe possible changes in this regard.

Model:

Vehicle identification number:

	Not OK	OK
Battery main switch*		
Removal and connection, carry out following scopes if necessary	0	0
Power windows*: Initialize system	0	0
Glass sunroof*: Initialize system	0	0
Steering angle adjustment or initialize active front steering*	0	0
Equipment pack scopes		
Fit	0	0
<hr/>		
	Not OK	OK
Carry out "CBS pre-delivery check" in the Service Function path under Maintenance	0	0
Deactivate transportation mode	0	0
Reset average mileage, enter service telephone number	0	0
Enter first registration	0	0
Set on-board date	0	0
Set statutory inspection dates*	0	0
Enter service telephone numbers	0	0
Check battery, observe notes/information in Tester	0	0
Clear fault memory	0	0
Carry out brief diagnosis test, eliminate faults if necessary	0	0
Engine compartment		
Check for cleanliness	0	0
Washer fluid reservoir		
Check fill level and top up if necessary, where required with antifreeze additive	0	0
<hr/>		
	Not OK	OK
Sticker		
Attach sticker for BMW Group Mobile Service	0	0
Body, interior equipment, floor plate		
Check for transportation damage	0	0
Spring blocker*		
Remove	0	0
Tyres		
Check tyre pressures; if provided, also compact or spare wheel	0	0
Initialise Run Flat Indicator	0	0
Winter tyres*		
Attach V-max sticker	0	0
Service Booklet		
Stamp pre-delivery check	0	0
	Not OK	OK
Enclose documents or hand over with vehicle		
Owner's Handbook	0	0
Service Booklet	0	0
Contact brochure	0	0
Care/Upkeep brochure	0	0
BMW Group Mobile Service brochure	0	0
Include BMW key or remote control (make note of number)	0	0

Fig. 2: BMW Service Pre-Delivery Check-Sheet (1 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

Telltale/warning lamps and Check Control		
Check for incorrect indication and eliminate faults if necessary	<input type="checkbox"/>	<input type="checkbox"/>
Service and parking brake		
In event of transportation and immobilization periods of 3 -6 weeks	<input type="checkbox"/>	<input type="checkbox"/>
is to be checked for correct operation	<input type="checkbox"/>	<input type="checkbox"/>
Brake in in event of extended immobilization periods		
In event of transportation and immobilization periods of more than 6 weeks	<input type="checkbox"/>	<input type="checkbox"/>
Brake in	<input type="checkbox"/>	<input type="checkbox"/>
	Not OK	OK
Interior rearview mirror with digital compass *		
Calibrate system	<input type="checkbox"/>	<input type="checkbox"/>
Preservation, cleaning		
Remove transportation lock	<input type="checkbox"/>	<input type="checkbox"/>
Dewax and clean vehicle as prescribed	<input type="checkbox"/>	<input type="checkbox"/>
.....
Date	Mechanic	Workshop Manager

Fig. 3: BMW Service Pre-Delivery Check-Sheet (2 Of 2)
 Courtesy of BMW OF NORTH AMERICA, INC.

00 LIFTING VEHICLE WITH A LIFTING PLATFORM

WARNING: Danger to life!
 Read and follow operating instructions for lifting platform.
 Do not exceed carrying capacity of lifting platform.

NOTE: The lifting platform must comply with the relevant statutory accident prevention regulations and be serviced according to the manufacturer's instructions.

IMPORTANT: Risk of damage!
 Before driving onto a lifting platform, make sure there is sufficient ground clearance between the lifting platform and the car.
 The vehicle may only be raised with the lifting platform at the four jacking points.

Necessary preliminary tasks:

- If necessary, remove jacking points from equipment pack and insert from below into openings in front and rear sill areas

IMPORTANT: Risk of damage!
 Align support plates (2) of lifting platform arms to jacking points (1) in such a

way that no adjoining components are touched and thereby damaged.

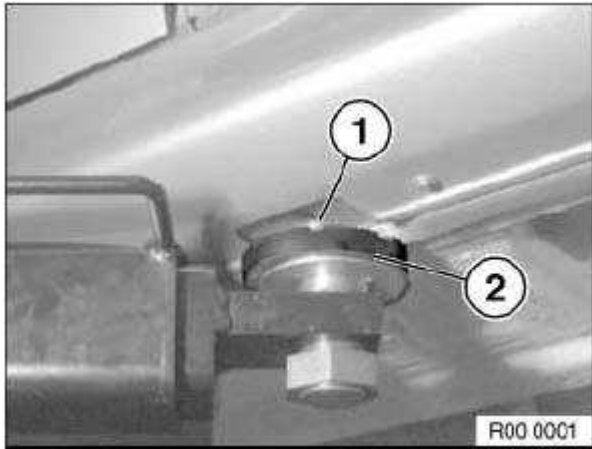


Fig. 4: Lifting Platform Support Plates And Jacking Points
Courtesy of BMW OF NORTH AMERICA, INC.

00 NOTES ON USING REPAIR INSTRUCTIONS, TECHNICAL DATA, TIGHTENING TORQUES

These repair instructions are intended to help expertly carry out maintenance and repair work.

They thus supplement the practical and theoretical training of master mechanics and fitters in BMW's Service Training Centers.

The Repair Instructions describes the removal, installation and replacement of subassemblies in the vehicle.

The Repair Instructions describe tasks which can be carried out on series-production BMW Group vehicles and vehicles which have not been subsequently converted.

Cross-references to "Technical Data" and "Tightening Torques" must be complied with.

If there are no cross-references to tightening torques in the repair instructions, the excerpts from the company standard BMW N 600 02.0 must be observed.

Cross-references to other flat rate units are intended as an aid and can refer to a complete work operation or merely to individual work steps contained therein.

Cross-references to other flat rate units must not be considered as an extension of the labor performance standard.

The structure of the Repair Instructions corresponds to the numbering system of the flat rate manuals (flat rate units).

NOTE: **With the exception of inspection operations, no flat rates are published for the**

E52 (Z8) model series. However, the numbering system (flat rate units) is retained.

Furthermore, the corresponding microfiches of the repair instructions are valid for the E12, E21, E24, E28, E30, E31 and E34 model series.

The microfiche is also valid for the E32 model series with the following exception: For the 750i, 750Li models and the job description 31 31 000 Replacing front left or right spring strut, the TIS CD must be used!

In general, the individual work steps of the Repair Instructions describe only the removal of subassemblies. All removed subassemblies are reinstalled in reverse sequence. If particular features need to be observed during installation, they are identified as notes on installation. In contrast, complicated removal and installation procedures are described separately.

Further information on repair operations can be found on the "Commercial Service Data CD (KSD CD)". For the E39, E46 and E53 model series and the following model series, it is possible after selecting the FRU items to activate the corresponding information via the Text and Inclusive Items buttons.

Improvements and modifications are published regularly in service information bulletins.

00 RAISING VEHICLE WITH TROLLEY JACK

IMPORTANT: Observe the following trolley-jack-related instructions:

1. Use only BMW-distributed/approved trolley jacks which have rubber plate contact points.
2. Trolley jacks must be regularly serviced and always checked for functional reliability before they are used!
3. Check the rubber plate on the trolley jack prior to each use, replacing if necessary.

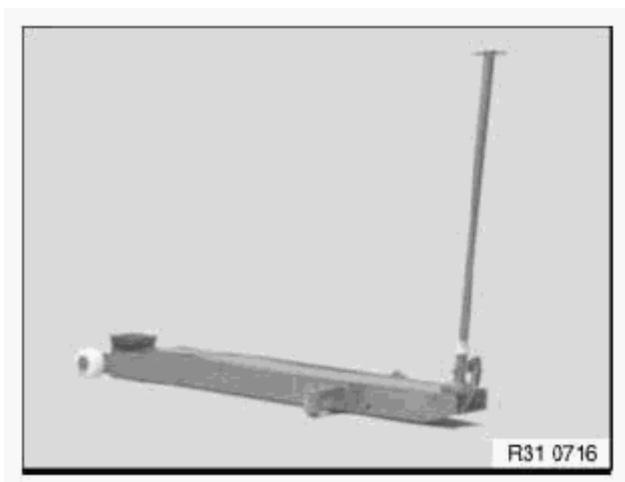


Fig. 5: BMW Trolley Jack

Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: The vehicle may be raised with a trolley jack only at the following jacking points!

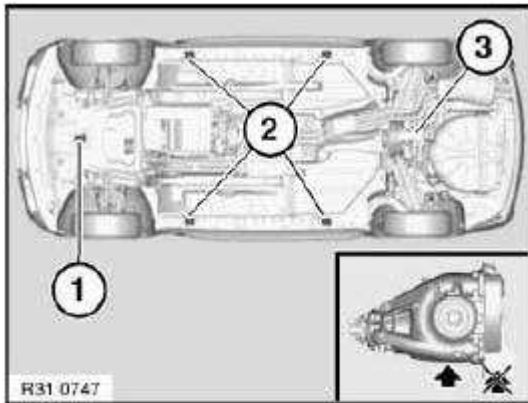


Fig. 6: Jacking Points And Rear Differential
Courtesy of BMW OF NORTH AMERICA, INC.

Risk of damage: It is not permitted to raise the vehicle at the rear differential cover!

00 ... SYMBOLS USED AND INFORMATION IN REPAIR INSTRUCTIONS

WARNING: Precautionary rules and measures which protect mechanics and other personnel against injury (including life-threatening injuries).

Example:

WARNING: Danger of scalding!
Only perform this work after engine has cooled down.

IMPORTANT: Specific instructions and precautionary measures which prevent damage to the vehicle or to vehicle parts. Failure to comply with the above will invalidate any warranty claims.

The caution symbol is used in all repair instructions.

However, use of the warning word "Caution!" is not binding in every case.

The notes, instructions and precautionary measures mentioned above retain their validity.

NOTE: Particular information on improved procedures for operation, testing, adjustment and upkeep.
Also indicates the end of a repair section.

Recycling:

Observe country-specific waste-disposal regulations

General information:

Refers to other instructions: such as e.g.:

Necessary preliminary tasks;

Further instructions: refer to operating instructions for balancing machine.

Replacement:

Carry out programming/coding.

NOTE: Many electronic control units must be programmed/coded (e.g. when replaced).

NOTE: • Connect BMW diagnosis system

IMPORTANT: Read and comply with notes on protection against electrostatic damage (ESD protection).

NOTE: Electronic control units and other electronic components - if handled incorrectly - can be damaged or destroyed by electrostatic discharge.

00 00 ... AIR CLEANER: REPLACING AIR CLEANER ELEMENT (SHORTEN REPLACEMENT INTERVAL ACCORDINGLY IN EVENT OF LARGER BUILDUP OF DUST)

- Replace air cleaner (filter) in accordance with repair instructions

00 00 ... BATTERY: CHECKING DISPLAY. IF NECESSARY, RECHARGE BATTERY.

IMPORTANT: Observe safety instructions for handling vehicle battery, see 61 00 ... SAFETY INSTRUCTIONS FOR HANDLING VEHICLE BATTERY .

Vehicles with low-maintenance battery:

Check acid level, top up with distilled water if necessary

If level drops below Max. marking, top up distilled water to Max. marking.

Vehicles with maintenance-free battery:

IMPORTANT: For information on how to proceed, refer to BATTERY CHARGING

Issue a separate invoice if the battery is recharged.

00 00 ... BATTERY: CHECKING ACID LEVEL, TOPPING UP WITH DISTILLED WATER IF

NECESSARY. IF NECESSARY, RECHARGE BATTERY.

IMPORTANT: Observe safety instructions for handling vehicle battery, see 61 00 ... SAFETY INSTRUCTIONS FOR HANDLING VEHICLE BATTERY .

Vehicles with low-maintenance battery:

Check acid level, top up with distilled water if necessary

If level drops below Max. marking, top up distilled water to Max. marking.

Vehicles with maintenance-free battery:

**IMPORTANT: For information on how to proceed, refer to BATTERY CHARGING .
Issue a separate invoice if the battery is recharged.**

00 00 ... BODY AND UNDERBODY: CHECKING FOR CORROSION AND DAMAGE

Inspect chassis, underbody and wheel arches and check for corrosion and damage.

NOTE: It is absolutely essential to rectify any identified faults after consulting the customer and to issue a separate invoice.

00 00 ... BODY AND UNDERBODY: CHECKING FOR CORROSION AND DAMAGE - EXCEPT CAVITIES

Visually inspect the underbody, wheel arches and frame members for rust and damage.

IMPORTANT: If damage to the underbody is identified:

- If necessary, remove panels from underbody.
- Check mountings and fixtures and brake and fuel lines for damage and correct installation position.

Rectify identified faults after consulting with customer and issue a separate invoice.

00 00 ... BODY: CHECK FOR CORROSION (EXCEPT CAVITIES)

Visually inspect the underbody, wheel arches and frame members for rust and damage.

IMPORTANT: If damage to the underbody is identified:

- If necessary, remove panels from underbody.

- **Check mountings and fixtures and brake and fuel lines for damage, corrosion and correct installation position.**

Rectify identified faults after consulting with customer and issue a separate invoice.

00 00 ... BRAKE LINES AND CONNECTIONS: VISUAL INSPECTION FOR LEAKS, DAMAGE AND CORRECT POSITION

Check brake lines and connections

- Visual inspection in visible area for:
 - leaks; if necessary, check brake fluid level in expansion tank
 - traces of fluid
 - damage
 - crushing/flattening
 - correct routing of brake lines
 - correct seating of brake lines in holders

NOTE: Detected faults must urgently be repaired after consultation with the customer!

00 00 ... CHANGING BRAKE FLUID

- Change brake fluid in accordance with repair instructions, see **34 00 025 REPLACING FLUID IN ABS/ASC+T BRAKE SYSTEM**
- Read and comply with general notes and information on brakes, see **34 00 ... GENERAL INFORMATION**

NOTE: Issue a separate invoice for changing the brake fluid.

00 00 ... CHANGING ENGINE OIL AND OIL FILTER

NOTE: Change engine oil and oil filter in accordance with repair instructions

00 00 ... CHECK WINDSCREEN WASH/WIPE SYSTEM

- Check wipe pattern for smearing; if necessary, replace wiper blades after consulting with customer
- The spray jet must emerge uniformly from the spray nozzle, replace nozzle if necessary and issue a separate invoice.
- The spray nozzles are preset at the factory and cannot be adjusted later

IMPORTANT: Do not under any circumstances use a needle or similar to adjust the spray

nozzles as such an implement would damage the water channels in the nozzle!

00 00 ... CHECKING CLUTCH DRIVE PLATE FOR WEAR

- Check clutch drive plate for wear during a test drive (see **FINAL CHECK**)

00 00 ... CHECKING COOLANT LEVEL AND CONCENTRATION, CORRECTING IF NECESSARY

- Check connections, hose clamps and hoses for coolant residues and damage such as e.g. cracks.
- Check coolant level in expansion tank. Coolant level must be between Min. and Max. markings. If necessary, top up coolant to max. fill level.
- In event of topping up: Check concentration with antifreeze tester (special tool) in coolant expansion tank.

If necessary, drain off the difference quantity at the coolant drain plug and top up with recommended coolant (issue a separate invoice).

00 00 ... CHECKING HANDBRAKE LEVER TRAVEL, ADJUSTING ACCORDING TO SETTING SPECIFICATIONS IF NECESSARY

- **Checking parking brake**

Check handbrake lever travel and adjust in accordance with repair instructions, see **34 10 014**
ADJUSTING HANDBRAKE

00 00 ... CHECKING LIGHTING SYSTEM

- Check lighting system for correct operation:
 - Check headlights, rear lights and associated telltale/indicator lamps
 - Check sidelamps, parking lights, dipped-beam and main-beam headlights for correct operation
 - Check headlight flasher for correct operation
 - Check signal horn
 - Check left/right direction indicators and hazard warning system for correct operation
 - Check brake lights for correct operation
 - Check reversing lights and license plate lights for correct operation
 - Check front and rear fog lights for correct operation
 - Check inside light on interior rearview mirror for correct operation
 - Check instrument and indication field lighting

NOTE: Perform a check of headlight adjustment only at the customer's request and issue a separate invoice.

00 00 ... CHECKING ROADWORTHINESS

○ **Checking roadworthiness**

- Take vehicle for a test drive, checking service and parking brakes in the process
- For vehicles with rear disc brakes, brake in parking brake as instructed, see **34 10 014**
ADJUSTING HANDBRAKE
- Check steering for play, ease of movement and directional stability
- Check clutch for problem-free disengagement and non-spasmodic driving off at normal operating temperature
- Check function of all drive positions and driving programs in cars with automatic transmissions.
- Visually inspect shock absorbers for leaks
- Check indicator/warning lamps and Check Control system for correct operation
- Check due date for statutory roadworthiness and exhaust emission tests and advise customer of test dates

00 00 ... COOLANT HOSES: VISUAL INSPECTION FOR LEAKS. CHECKING COOLANT LEVEL AND CONCENTRATION, TOPPING UP IF NECESSARY

- Check connections, hose clamps and hoses for coolant residues and damage such as e.g. cracks.
- Check coolant level in expansion tank. Coolant level must be between Min. and Max. markings. If necessary, top up coolant to max. fill level.
- Check concentration with antifreeze tester (special tool) in coolant expansion tank.

If necessary, drain off the difference quantity at the coolant drain plug and top up with recommended coolant (issue a separate invoice).

00 00 ... DIAGNOSTIC BRIEF TEST

- Connect BMW diagnosis system (DIS) to diagnosis socket or OBD socket
- Switch ignition on
- Carry out vehicle identification
- Start brief test

NOTE: **For diagnostics, the brief test is essential for evaluating possible stored diagnostic trouble codes. In the brief test, the control units are physically identified in succession and their fault memories read out. Check identified faults and if necessary rectify these faults after consulting with customer.**

00 00 ... DIAGNOSTIC BRIEF TEST

Connect diagnostic system to OBD socket.

Switch on ignition.

Carry out vehicle identification.

Click on Brief test.

The brief test is carried out.

NOTE: For motor vehicle diagnostics, the brief test is essential for evaluating possible stored diagnostic trouble codes.
In the brief test, the control units are physically identified in succession and their fault memories read out.
If the fault memory has been read out, the faults appear in the "Fault pattern selection" mask in the "Fault memory contents" field.
Check identified faults and if necessary rectify these faults after consulting with customer.

00 00 ... EXHAUST SYSTEM: CHECKING CONDITION, MOUNTING AND INSPECTING FOR LEAKS

- **Condition**
 - Check exhaust system for corrosion and cracks
 - Check screw connections on flanged joints and clamping sleeves for damage
- **Routing**
 - Check that exhaust system is correctly routed and free of obstructions on the underbody
 - Check that heat shields are fitted and securely seated
- **Mounting**
 - Check rubber mounts and rubber rings for cracks and whether any are missing
- **Leaks**
 - Check exhaust system at flanged joints and clamping sleeves for black combustion residues.

NOTE: After consultation with the customer, rectify faults and issue a separate invoice.

00 00 ... FRONT AND REAR BRAKE LININGS: CHECKING LINING THICKNESS WITH MEASURING GAUGE. IF LININGS ARE REPLACED: CLEANING BRAKE SHAFTS, CHECKING BRAKE DISK THICKNESS AND SURFACE, APPLYING GREASE TO WHEEL CENTERING ON ALLOY WHEELS. IF REAR LININGS ARE REPLACED: CHECKING PARKING BRAKE LININGS

- Check brake lining thicknesses with measuring gauge at front and rear, see **34 00 010 CHECKING THICKNESS OF BRAKE PAD**
- Clean brake shafts
- Replace brake linings if they drop below minimum thickness (refer to Technical Data)
- Replace brake discs if they drop below minimum thickness (refer to Technical Data) and in event of scoring, heat cracks, lateral runout or thickness difference
- Clean wheel centering on alloy wheels and apply a thin coating of grease

- Remove front and (if necessary) rear disc brake pads
 - Remove and install front disc brake pads, see **34 11 000 REMOVING AND INSTALLING/REPLACING BRAKE LININGS OF BOTH FRONT DISC BRAKES**
 - Remove and install rear disc brake pads, see **34 21 200 REMOVING AND INSTALLING/REPLACING BOTH REAR DISC BRAKES**

Additional tasks when changing rear linings

- Remove rear brake discs, see **34 21 320 REMOVING AND INSTALLING/REPLACING BOTH BRAKE DISKS**
- Check parking brake lining for porosity and wear
- Check ease of movement of expander lock

NOTE: Defective brake pads/linings/brake discs must be repaired after consultation with customer and a separate invoice issued

00 00 ... FUEL LINES, FUEL TANK AND FUEL HOSES: VISUAL INSPECTION FOR ROUTING, CONDITION AND LEAKS

- Check fuel lines and hoses and fuel system connections for traces of fluid and for leaks
- Check fuel tank(s) and hoses for damage such as cracks, flattening etc.
- Check that fuel lines are routed correctly
- Check that fuel lines are correctly seated in holders

NOTE: Detected faults must urgently be repaired after consultation with the customer!

00 00 ... HEATING/AIR CONDITIONING: REPLACING MICROFILTER/CARBON CANISTER (SHORTEN REPLACEMENT INTERVAL ACCORDINGLY IN EVENT OF LARGER BUILDUP OF DUST)

- Changing microfilter, refer to repair instructions:
 - Microfilter E39
 - Microfilter E46
 - Microfilter E53
 - Microfilter E85
 - Microfilter E83, see **64 31 010 REPLACING MICROFILTER FOR INTERIOR VENTILATION**

IMPORTANT: In the E39 the water drain under the brake booster must be checked for contamination and if necessary cleaned when the microfilter is changed.

NOTE: In the case of older model years, issue a separate invoice for replacing the microfilter.

00 00 ... INFORMATION/WARNING LABELS

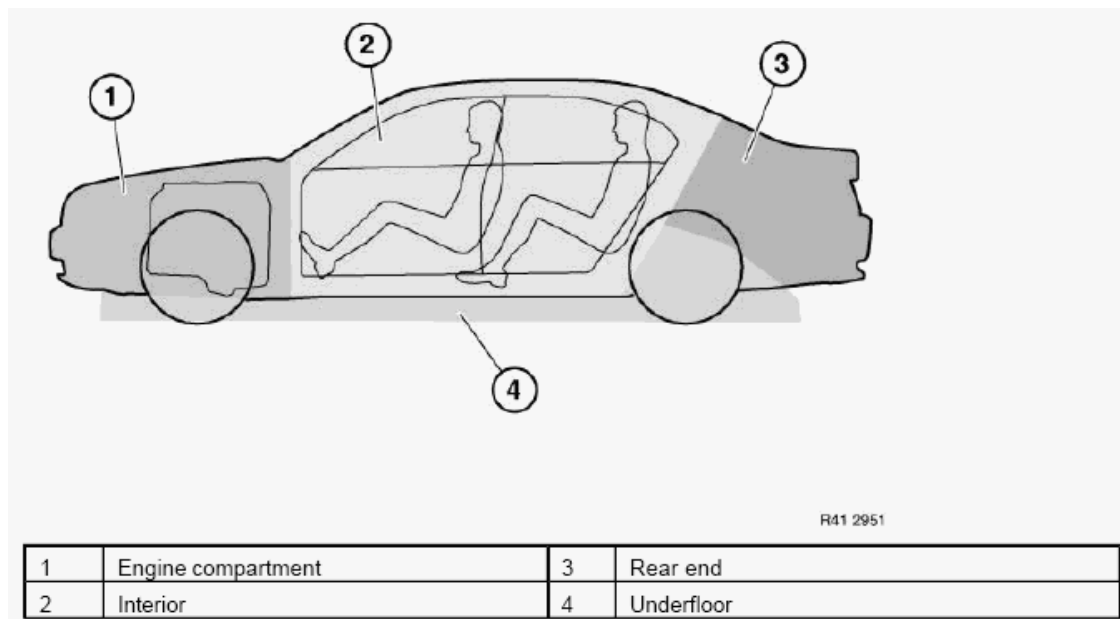


Fig. 7: Information/Warning Labels Location
 Courtesy of BMW OF NORTH AMERICA, INC.

INFORMATION/WARNING LABELS SPECIFICATION

Location:	Information/warning label:	Country:
Various components	Replacement identification-spare parts-	US, CDN
Various components	Anti-theft protection	US, CDN
Engine compartment (1):		
Battery	Battery sticker	Gulf States
Headlights/engine compartment	Mercury (xenon headlights)	Worldwide
Engine compartment/raw air snorkel	Aluminium screws/bolts	Worldwide
Cylinder head cover	Ignition coil	Worldwide
Engine compartment/end panel	BMW High Performance Oil	US, not CDN
Engine compartment/end panel	Premair	US
Engine compartment	ICES CDN	CDN
Engine compartment	EC nameplate	Worldwide, not US, CDN, Japan, Australia, Gulf States
Engine compartment/hood/bonnet	Refrigerant	Worldwide
Engine compartment/hood/bonnet	Production date	Australia, Great Britain
Engine compartment/hood/bonnet	Exhaust gas	Australia, US, CDN
Engine compartment/brake booster	Brake fluid	CDN
Engine compartment/hood/bonnet	Exterior paint	Worldwide

Engine compartment/hood/bonnet	BMW genuine spare parts	Worldwide
Interior (2):		
Windscreen, top right	Airbag-windscreen	Europe
Windscreen	CCC	China
Windscreen	Vehicle identification number	US, CDN, Gulf States, Great Britain & South Africa
I Drive	A/C menu	US, CDN
Passenger compartment/instrument panel	Airbag, instrument panel	US, CDN
Interior/sun visor	Airbag-sun visor	US, CDN
Steering wheel/speedometer	Top speed-210 km/h-Only with optional extra and for car rental	Germany
Complete vehicle, bodyshell:		
B-pillar	Airbag symbol (front passenger)	Worldwide (not US and CDN)
B-pillar	Vehicle identification number	Brazil
B-pillar	Manufacturer's certificate	US, CDN, Gulf States
B-pillar	Tyre inflation pressure	Europe, US, CDN, Australia
B-pillar	Runflat indicator	Worldwide
B-pillar	Side airbag	Worldwide
Door, driver's side	Towing	Worldwide
Rear end (3):		
Fuel cap/hood/bonnet	Independent heating	Europe
Filling area	Refuelling	US, CDN, Europe
Filling area, instrument cluster (plug)	OBD system	US, CDN
Trim, striker	Nose weight (only with optional extra)	Worldwide
Trim, cross-member (through-loading)	Lock, through-loading (only with optional extra)	Worldwide
Luggage compartment cover	Hardtop lowerable	Worldwide
Luggage compartment trim panel on side panel	Hardtop lowerable	Worldwide
Underfloor (4):		
Vehicle jack	Vehicle jack	Australia
Front axle carrier	Airbag (basic setting)	Worldwide
Tension strut with hydro - mount	Do not lash down	Worldwide
Key: US = United States CDN = Canada CCC = Car Communication Computer OBD = On-Board Diagnosis		

NECESSARY

Lock car and check that locks and central locking (incl. tank cap) work properly.

Depending on equipment specification, check comfort locking function of windows and sliding sunroof.

Check function and ease of movement at:

- Door/luggage compartment/bonnet/hood locks
- Door brakes
- Door/engine hood/bonnet/fuel filler cap/rear lid hinges
- Arrester hooks on engine bonnet/hood

and apply oil or grease if necessary.

00 00 ... MICROENCAPSULATED SCREWS

Screw locking is a means to preventing a screwed connection from being loosened by external influences.

After the screw has been coated with the adhesive, the adhesive remains inactive until it is activated by capsule breakage when the screw is inserted and then cures at room temperature.

Installation:

- Microencapsulated screws (Loctite) must be replaced and may not be reused
- Screw connection must be completed within 20 mins. (start of curing)
- Microencapsulated screws must not be retightened
- Thread of nut must be cleaned beforehand in event of repeated use

00 00 ... OIL CHANGE IN MANUAL TRANSMISSION

- Carry out oil change in manual transmission in accordance with repair instructions, see **00 11.. ... Draining/topping up gear oil in manual transmission**

00 00 ... OIL CHANGE IN REAR DIFFERENTIAL

- Carry out oil change in rear differential in accordance with repair instructions, see **00 11 259 Oil change in rear differential incl. used oil disposal**

00 00 ... OIL CHANGE IN TRANSFER CASE

- Change oil in transfer case in accordance with repair instructions

00 00 ... OUTPUT SHAFTS: CHECKING GAITERS FOR LEAKS

- Rotate rear left and right wheels by hand; in so doing, check inner and outer gaiters for damage such as

holes, cracks or porosity

- Check gaiters for leaks (emerging grease)
- Check that strap retainers are securely attached to gaiters and whether any straps are missing
- On all-wheel drive vehicles the same procedure applies to the output shafts on the front axle

00 00 ... POWER STEERING/RIDE-HEIGHT CONTROL: VISUAL INSPECTION FOR LEAKS, CHECKING FLUID LEVEL, TOPPING UP FLUID IF NECESSARY

Visual inspection and leak test

Check connections, hoses and steering gear for traces of fluid.

Checking fluid level

Check fluid level with engine switched off at expansion tank of power steering/ride-height control system.

If necessary, add hydraulic fluid (refer to Service Information Operating Fluids) up to Max. marking (1).

**IMPORTANT: If the fluid level has dropped to the Min. marking (2), you must check the power steering and ride-height control for leaks and issue a separate invoice for this work.
It is not enough merely to top up the fluid.**

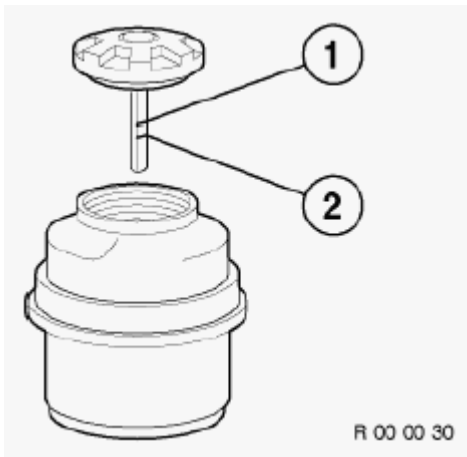


Fig. 8: Fluid Level

Courtesy of BMW OF NORTH AMERICA, INC.

00 00 ... RAISING BMW MULTI-TRAILER

**CAUTION: Twin-strut underfloor platforms and twin-pillar lifting platforms are suitable for raising the BMW multi-trailer.
Lifting platforms with drive-on surfaces are not suitable for raising in order to carry out maintenance and repair work.**

The lifting platform must comply with the relevant statutory accident prevention regulations and be serviced according to the manufacturer's instructions. It is essential to follow the lifting platform operating instructions, in particular the safety instructions and carrying capacity!

Make sure you adhere to the BMW-recommended work area of 5 x 7 m and to an escape route of 0.6 m between two lifting platforms.

Before raising the BMW multi-trailer, please observe the following points:

- Raise the trailer only when it is unloaded
- Remove a supplied loading ramp from the loading ramp frame so that all chassis areas of the BMW multi-trailer are freely accessible
- There must be sufficient clearance between the carrier arms/flat girder bridges and the GFK aprons or the front guard of the BMW multi-trailer
- The BMW multi-trailer must always be positioned in the middle of the lifting platform.

CAUTION: You will need special additional supports for the lifting platform in order to bridge the difference in height between longitudinal member and lower edge of GFK side apron or front guard of the BMW multi-trailer. The minimum height of the additional supports is 145 mm. Use only the additional supports approved by the platform manufacturer or specified in these repair instructions.

You will find appropriate examples in the repair instructions for the majority of lifting platforms present in BMW workshops. For lifting platforms that are not named, the relevant manufacturers will offer you appropriate additional supports. Please contact directly the manufacturer of the lifting platform used in your dealership.

CAUTION: The BMW multi-trailer may only be raised by its longitudinal members. Do not under any circumstances raise the BMW multi-trailer by the GFK aprons. Make sure the additional supports bear the longitudinal members over their entire width and no attachments or wiring harnesses are touched or jammed. Check the securing equipment of the additional supports for correct seating. Under no circumstances should any work be carried out underneath the BMW multi-trailer if it is not adequately secured against slipping off the lifting platform.

The areas (2) on the longitudinal members (1) marked in the adjacent diagram are the best areas for attaching the additional supports.

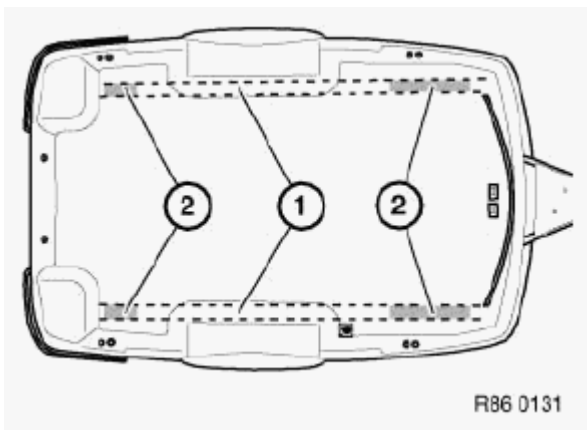


Fig. 9: Longitudinal Member Additional Support Areas
 Courtesy of BMW OF NORTH AMERICA, INC.

General notes on using twin-pillar lifting platforms

For the twin-pillar lifting platforms described, the BMW multi - trailer is positioned in the direction of travel on the platform. For lifting platforms which do not create sufficient clearance between disk wheel and carrier arms, move the BMW multi trailer against the direction of travel onto the platform.

Becker & Soumlhne twin-strut underfloor platform

The BMW multi-trailer can only be raised if it is supported at right angles to the direction of travel. For raising, use the high additional supports (1) of Becker & Soumlhne.

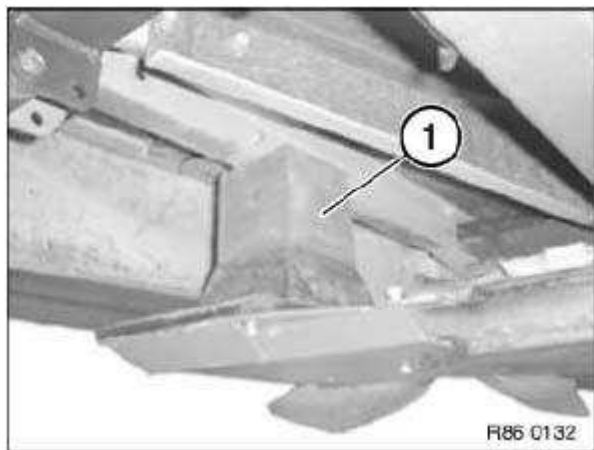


Fig. 10: High Additional Supports
 Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Also lash the BMW multi-trailer to the flat girder bridges of the lifting platform. Flag the protruding tow hitch and the drawbar member of the BMW multi-trailer conspicuously so as to prevent injury, e.g. with a red cloth.

MAHA twin-pillar lifting platform

The BMW multi-trailer can only be raised if you use the support plate attachment sleeves for transporters (1). Position the axle of the BMW multi-trailer in the direction of travel in front of the pillars of the platform in order to obtain the specified lifting ranges and to establish sufficient clearance between disk wheel and carrier arms. The long carrier arms raise the front and the short carrier arms raise the rear of the BMW multi-trailer.

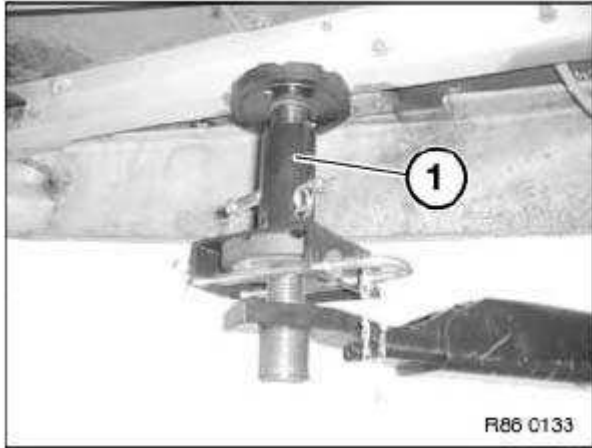


Fig. 11: MAHA Twin-Pillar Lifting Platform Transporters
Courtesy of BMW OF NORTH AMERICA, INC.

Romaico-Lift twin-pillar lifting platform

The BMW multi-trailer can only be raised if you use the 146 mm high attachments (1). Position the axle of the BMW multi-trailer in the direction of travel in front of the pillars of the platform in order to obtain the specified lifting ranges and to establish sufficient clearance between disk wheel and carrier arms. The long carrier arms raise the front and the short carrier arms raise the rear of the BMW multi-trailer.

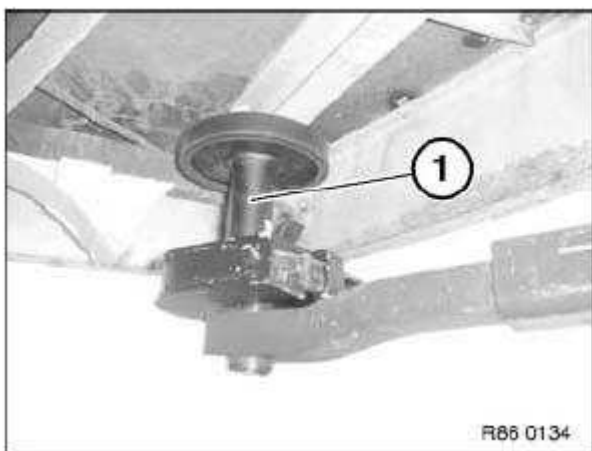


Fig. 12: Romaico-Lift Twin-Pillar Lifting Platform High Attachments
Courtesy of BMW OF NORTH AMERICA, INC.

Working pit

The BMW multi-trailer can be serviced or repaired in conjunction with a working pit if the following measures are taken into consideration. The BMW multi-trailer must be secured against slipping/tilting sideways. The drawbar jockey wheel must be firmly secured against rolling.

00 00 ... REPLACING SPARK PLUGS

- Replace spark plugs in accordance with repair instructions, see **12 12 011 REPLACING ALL SPARK PLUGS (N42, N40, N46, N45, N52, N52K, N51)**

00 00 ... RESETTING SERVICE INTERVAL INDICATOR ACCORDING TO FACTORY SPECIFICATIONS

Special tools required:

- 61 1 110

For vehicles with diagnosis socket in engine compartment:

Necessary preliminary tasks:

- Switch ignition on.
- Attach resetter (special tool 61 1 110) to diagnosis socket in engine compartment

Resetting engine oil service

Press yellow button (1) for engine oil service.

Green lamp (2) lights up.

Wait until yellow lamp (3) lights up and then goes out again.

Check that oil service indicator has been reset.

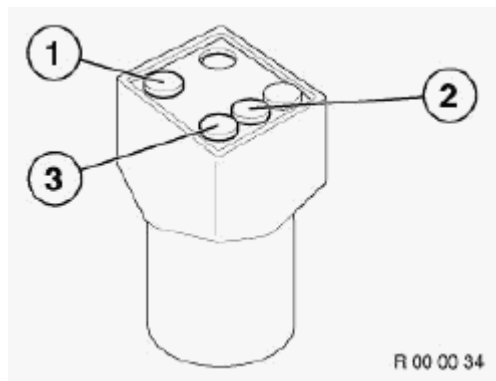


Fig. 13: Oil Service Indicator Green Lamp, Yellow Button And Lamp
Courtesy of BMW OF NORTH AMERICA, INC.

Reset service

Press red button (1) for inspection.

Green lamp (2) lights up.

Wait until red lamp (3) lights up and then goes out again.

Turn off ignition, wait 20 seconds and repeat procedure in order to adapt interval of annual inspection to inspection.

Check that service interval indicator has been reset.

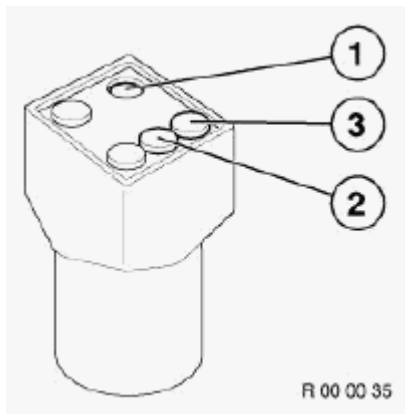


Fig. 14: Oil Service Indicator Green Lamp, Red Button And Lamp
Courtesy of BMW OF NORTH AMERICA, INC.

For vehicles without diagnosis socket in engine compartment:

For vehicles which do not have a diagnosis socket in the engine compartment, the service interval indicator is reset via the instrument cluster or the Diagnosis and Information System (DIS).

For details of the exact procedure, please refer to the Owner's Handbook for the vehicle in question or the Diagnosis and Information System (DIS).

00 00 ... SEAT BELTS: CHECKING CONDITION OF BELT STRAP, FUNCTION OF INERTIA REEL MECHANISM, LOCKING REEL, BELT BUCKLE

Belt strap, retractor mechanism, belt interlock

Pull out strap and make sure it emerges without jerking.

Check belt strap for

- folding
- unraveling

- pinches
- cracks and tears
- traces of melting

Retract belt strap; here the inertia reel mechanism must retract the strap automatically and without squeaking noises, the last section of the strap may have to be fed in.

Pull out belt strap in short tugs - locking reel must lock.

Belt buckle

The tongue on the belt strap must easily snap into place with an audible click.

When the "Press" button is pressed, the tongue must be ejected from the buckle under spring pressure.

NOTE: If the seat belt is damaged, you must replace the seat belt completely after consulting the customer; issue a separate invoice for this work. Instructions on how to proceed, refer to 72 11 ... CHECKING AUTOMATIC SAFETY BELT .

00 00 ... STEERING COMPONENTS: CHECKING FOR ZERO CLEARANCE, LEAKS, DAMAGE AND WEAR

Checking play:

- Steering wheel:

Move steering wheel back and forth and check for play

- Tie rod joint:

There must no clearance between tie rod arm (2) and tie rod joint (1).

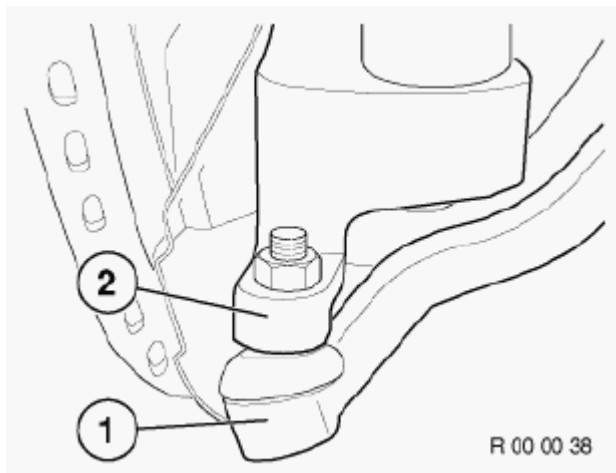


Fig. 15: Tie Rod Arm And Joint
 Courtesy of BMW OF NORTH AMERICA, INC.

Checking for leaks:

The following illustration shows the arrangement of the power steering components and lines.

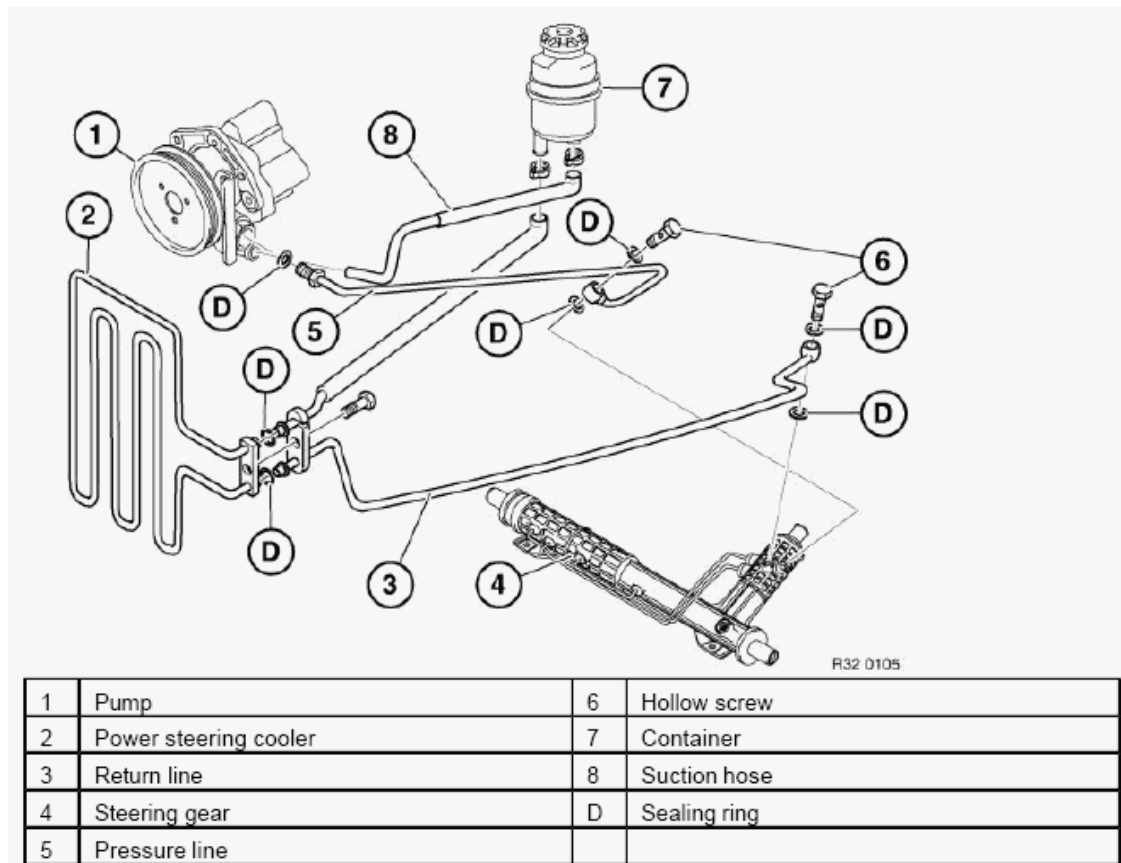


Fig. 16: Power Steering Components
 Courtesy of BMW OF NORTH AMERICA, INC.

Check all visible connections, hoses, lines and steering gear for traces of fluid.

Checking for damage and wear:

Check gaiters, flexible disc and axle and tie rod sleeves for damage (e.g. cracks, holes), for leaks or missing clamping bands on gaiters.

00 00 ... STEERING COMPONENTS: CHECKING FOR ZERO CLEARANCE, LEAKS, DAMAGE AND WEAR

Checking play:

- For hydraulically assisted steering systems, the engine must be running

- For electrically assisted steering systems, the ignition must be on

- Steering wheel:

Move steering wheel back and forth and check for play

- Tie rod joint:

There must no clearance between tie rod arm (2) and tie rod joint (1).

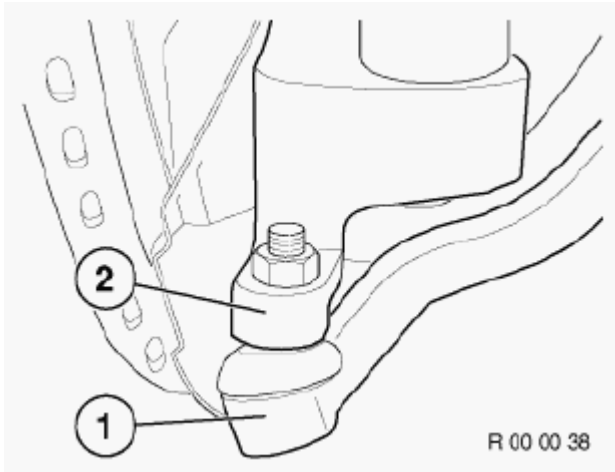


Fig. 17: Tie Rod Arm And Joint

Courtesy of BMW OF NORTH AMERICA, INC.

Checking for leaks:

The following illustration shows the arrangement of the power steering components and lines.

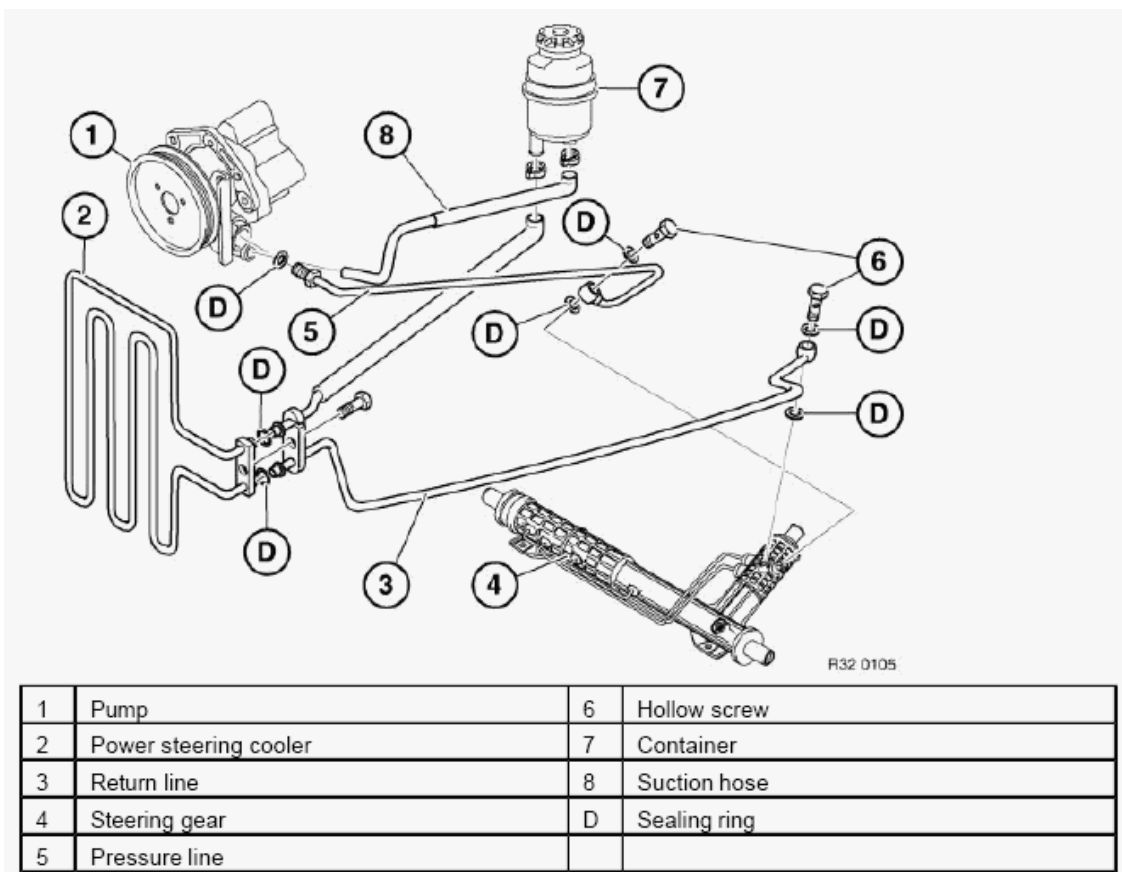


Fig. 18: Power Steering Components
 Courtesy of BMW OF NORTH AMERICA, INC.

Check all visible connections, hoses, lines and steering gear for traces of fluid.

Checking for damage and wear:

Check gaiters, flexible disc and axle and tie rod sleeves for damage (e.g. cracks, holes), for leaks or missing clamping bands on gaiters.

00 00 ... STEERING FLUID RESERVOIR: CHECK OIL LEVEL.

IMPORTANT: Adhere to the utmost cleanliness. Do not allow any dirt to enter the hydraulic system.

Using contaminated equipment to add fluid may introduce dirt particles into the fluid reservoir and significantly reduce the service life of the power steering system. Do not use any filler funnels or similar!

Visual inspection and leak test

Check connections, hoses and steering gear for traces of fluid.

Checking fluid level

Check fluid level with engine switched off at expansion tank of power steering/ride-height control system. The fluid temperature should be approx. 20°C here.

Ensure that the cap is fully screwed in prior to the fill level check.

If necessary, add hydraulic fluid up to Max. marking (1).

IMPORTANT: If the fluid level has dropped to the Min. marking (2), you must check the power steering and ride-height control for leaks and issue a separate invoice for this work.

It is not enough merely to top up the fluid.

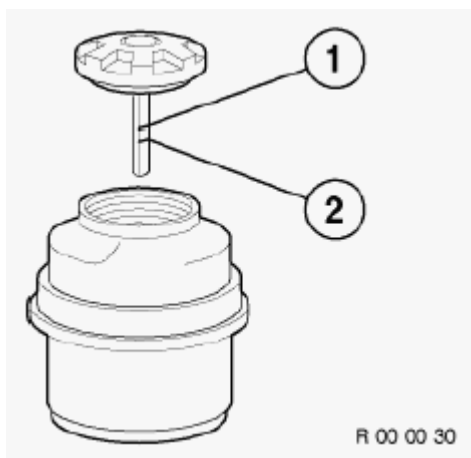


Fig. 19: Fluid Level

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: To avoid mix-ups when filling with hydraulic fluid, mark the fluid reservoirs or their caps with identification marks.

ATF Automatic transmission fluid

CHF Pentosin CHF11S

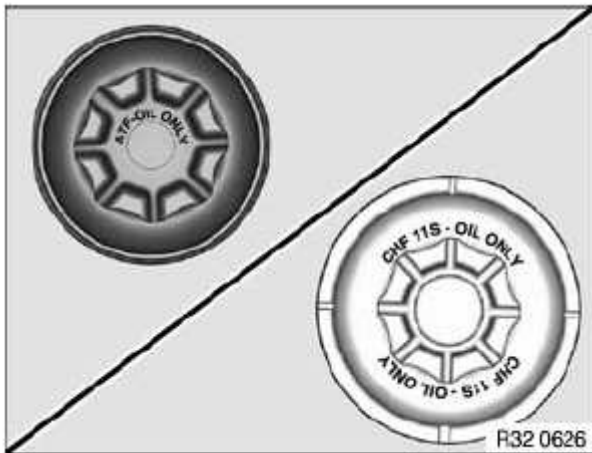


Fig. 20: Fluid Reservoir Caps With Identification Marks
 Courtesy of BMW OF NORTH AMERICA, INC.

00 00 ... TRANSMISSION (ALL GEARS): VISUAL INSPECTION FOR LEAKS.

- Inspect visible area of all transmissions for traces of fluid, remove underbody protection if necessary

Rectify identified faults after consulting with customer and issue a separate invoice

00 00 ... TIRES: CHECKING INFLATION PRESSURE, CORRECTING IF NECESSARY (INCL. SPARE WHEEL), CHECKING EXTERNAL CONDITION, TREAD DEPTH, PATTERN. IN EVENT OF NONUNIFORM WEAR, CARRY OUT MEASUREMENT AND CORRECTION OF WHEEL ALIGNMENT

○ **Checking tire inflation pressure:**

- Check tire inflation pressure in accordance with information plate on B-pillar
- The inflation pressure in the spare wheel must be 0.5 bar higher than the maximum specified value on the information plate
- If necessary, initialize Run Flat Indicator, see **36 11 500 INITIALIZING RUN FLAT INDICATOR (RPA)**

○ **Checking tire condition:**

- Check tread depth of all tires with tire tread gauge
- Check tire tread surfaces and side walls for incisions and foreign particles such as nails or screws
- Check tire tread pattern for localized flattening and wear on one side; if necessary, carry out wheel/chassis alignment after consulting with customer and issue a separate invoice for this work

NOTE:

- **For details of approved wheel/tire combinations, refer to KSD CD**
- **For reasons of driving safety, only use tires of the same type and tread pattern on a single vehicle**
- **Inform customer of any incorrect or worn tires**

00 00 ... TIRES: CHECKING INFLATION PRESSURE, CORRECTING IF NECESSARY (INCL. SPARE WHEEL), CHECKING EXTERNAL CONDITION, TREAD DEPTH, PATTERN

- **Checking tire inflation pressure:**
 - Check tire inflation pressure in accordance with information plate on B-pillar
 - The inflation pressure in the spare wheel must be 0.5 bar higher than the maximum specified value on the information plate
 - Initialize Run Flat Indicator, see **36 11 500 INITIALIZING RUN FLAT INDICATOR (RPA)**
- **Checking tire condition:**
 - Check tread depth of all tires with tire tread gauge
 - Check tire tread surfaces and side walls for incisions and foreign particles such as nails or screws
 - Check tire tread pattern for localized flattening and wear on one side; if necessary, carry out wheel/chassis alignment after consulting with customer and issue a separate invoice for this work

NOTE:

- **For details of approved wheel-tyre combinations, refer to KSD CD**
- **For reasons of driving safety, only use tires of the same type and tread pattern on a single vehicle**
- **Inform customer of any incorrect or worn tires**

00 00 ... UNDERBODY INCL. ALL VISIBLE COMPONENTS: CHECKING FOR DAMAGE, LEAKS, CORROSION

- Visually inspect underbody:
 - For leaks (transmission, brake components, steering)
 - Damage to underbody
 - Corrosion on underbody

IMPORTANT: If damage to the underbody is identified:

- **If necessary, remove panels from underbody.**
- **Check mountings and fixtures and brake and fuel lines for damage and correct installation position.**

Rectify identified faults after consulting with customer and issue a separate invoice.

00 00 ... UPKEEP MEASURES FOR STORED VEHICLES (NEW AND USED CARS) AND VEHICLES TO BE LAID UP AT CUSTOMER'S PREMISES

VEHICLES AND IMPLEMENTATION CHART

Measure	Vehicles	Implementation
---------	----------	----------------

Renew outer skin preservation (new cars must always be stored in preserved condition; preservation/depreservation instructions)	New cars	every 6 months; Tropical countries every 4 months
Release parking brake	New cars	in general
	Used cars	in general
	Customer cars to be laid up (instructions to customer)	in general
Engage gear or selector lever position "P" for automatic	New cars	in general
	Used cars	in general
	Customer cars to be laid up (instructions to customer)	in general
Check covering of interior equipment	New cars	in general
Increase tire inflation pressure to 3.5 bar	New cars	in general
	Used cars	in general
	Customer cars to be laid up (instructions to customer)	in general
If battery master switch is fitted, switch off	New cars	in general
Charge battery	New cars	every 6 weeks batteries disconnected from vehicle electrical system every 12 weeks in general before handover to customer
	Used cars	every 6 weeks batteries disconnected from vehicle electrical system every 12 weeks
	Customer cars to be laid up (instructions to customer)	every 6 weeks batteries disconnected from vehicle electrical system every 12 weeks
Change brake fluid and reset service interval indicator (clock symbol only)	New cars	lay-up periods > 6 months, change before handover of vehicle to customer
	Used cars	lay-up periods > 6 months, change before handover of

		vehicle to customer
Check convertible top for possible damage	New cars	in general before handover to customer
	Used cars	in general before handover to customer
Park convertibles, if possible, under a roof	New cars	in general
	Used cars	in general
	Customer cars to be laid up (instructions to customer)	in general
Check for damage to paintwork and exterior/interior equipment	New cars	in general before handover to customer
	Used cars	in general before handover to customer
Change engine oil and oil filter when engine is at normal operating temperature	New cars	from 12 months lay-up period before handover of vehicle to customer
	Used cars	from 12 months lay-up period before handover of vehicle to customer
	Customer cars to be laid up (instructions to customer)	from 12 months lay-up period before handover of vehicle to customer
Check coolant concentrate	Used cars	in general
	Customer cars to be laid up (instructions to customer)	in general
Apply hand and foot brakes when dry	New cars	in general
	Used cars	in general
	Customer cars to be laid up (instructions to customer)	in general
Perform surface protection: Vehicle washing with inside cleaning and subsequent preservation of paintwork and chrome. Clean rubber seals on hoods/bonnets, rear lids and doors and apply talc or glycerine. Perform cleaning, preservation and subsequent treatment of engine, engine	Used cars	in general
	Customer cars to be laid up (instructions to customer)	in general

compartment, underbody, axles and assemblies with BMW-approved materials.		
Switch on A/C system once a month for 10 minutes	Used cars	necessary in order to retain full operational capability of gaskets and expansion valve (omitted in case of R134a refrigerant, identified by rating plate in engine compartment)
	Customer cars to be laid up (instructions to customer)	necessary in order to retain full operational capability of gaskets and expansion valve (omitted in case of R134a refrigerant, identified by rating plate in engine compartment)

00 00 ... WINDSCREEN WASH/WIPE SYSTEM: CHECKING WASHER FLUID RESERVOIR AND SPRAY NOZZLE ADJUSTMENT

- Check wiper blades for cracks; if necessary, replace wiper blades after consulting with customer
- Check wipe pattern for smearing; if necessary, replace wiper blades after consulting with customer
- The spray jet must emerge uniformly from the spray nozzle, replace nozzle if necessary and issue a separate invoice.
- Check spray nozzle adjustment of windscreen washer system, adjust if necessary

(On the E85 and E83 the spray nozzles are preset at the factory and cannot be adjusted later)

- Check spray nozzle adjustment of headlight washer system, adjust if necessary, refer to (On the E85 and E83 the spray nozzles are preset at the factory and cannot be adjusted later)

IMPORTANT: Do not under any circumstances use a needle or similar to adjust the spray nozzles as such an implement would damage the water channels in the nozzle!

00 00 ... WINDSCREEN WASHER SYSTEM AND INTENSIVE CLEANING SYSTEM: CHECKING FLUID LEVEL, TOPPING UP IF NECESSARY

- Top up windscreen washer fluid reservoir, if necessary rear window washer fluid reservoir and (depending on equipment specification) intensive cleaning reservoir up to edge or mark.

IMPORTANT: A ph-neutral BMW window cleaning agent (antifreeze in winter) must always be added to the water.

00 00 ... WINDSCREEN WASHER SYSTEM: CHECKING FLUID LEVEL, TOPPING UP IF NECESSARY

- Top up windscreen washer fluid reservoir, if necessary rear window washer fluid reservoir and (depending on equipment specification) intensive cleaning reservoir up to edge or mark.

IMPORTANT: A ph-neutral BMW window cleaning agent (antifreeze in winter) must always be added to the water.

00 00 005 INTERROGATE FAULT MEMORIES IN DIAGNOSIS SYSTEM

Connect diagnostic system to OBD socket.

Switch on ignition.

Carry out vehicle identification.

Click on Brief test.

The brief test is carried out.

NOTE: For motor vehicle diagnostics, the brief test is essential for evaluating possible stored diagnostic trouble codes. In the brief test, the control units are physically identified in succession and their fault memories read out. If the fault memory has been read out, the faults appear in the "Fault pattern selection" mask in the "Fault memory contents" field.

00 00 250 BMW ENGINE OIL SERVICE INCL. SUPPLEMENTARY SERVICE (N52K)

Special tools required:

- 11 9 240

The FRU item 00 00 250 comprises the BMW engine oil service incl. supplementary service.

Only the engine oil service will be described in these repair instructions.

The supplementary service is made up of the following operations which must be taken from the relevant repair instructions:

- Reset service interval indicator according to factory specification, see **00 00 ... Resetting service interval indicator according to factory specifications**
- Replace microfilter for interior ventilation
- Check brake lining thickness, see **34 00 010 CHECKING THICKNESS OF BRAKE PAD**
- Adjust handbrake/parking brake, see **34 10 014 ADJUSTING HANDBRAKE**
- Parking brake function check

IMPORTANT: Adhere to exact filling quantities.

**Overfilling the engine with engine oil will result in engine damage .
Checking and drip-off times must be observed.**

**IMPORTANT: When working on the engine oil, coolant or fuel circuit, you must always protect the alternator against contamination.
Risk of damage!
The alternator must therefore be covered with suitable apparatus.**

Recycling:

Catch and dispose of drained engine oil in a suitable container.

Observe country-specific waste-disposal regulations.

NOTE: Adhere to the following work steps in sequence:

- 1. Open oil filter cap.**
- 2. Release screw plug in oil sump.**

NOTE: Picture shows the E93 by way of example. Other model series may differ in certain details.

Release oil filter cap with special tool 11 9 240 .

Engine oil flows out of the oil filter housing and back into the oil sump.



Fig. 21: Special Tool (11 9 240)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove and insert oil filter element (1) in direction of arrow.

Installation:

Replace oil filter element (1) and sealing rings (2).

Installation:

Moisten sealing rings (2) with engine oil.

Tightening torque: 11 42 1AZ, see **11 42 OIL FILTER ELEMENT WITH CONNECTIONS** .

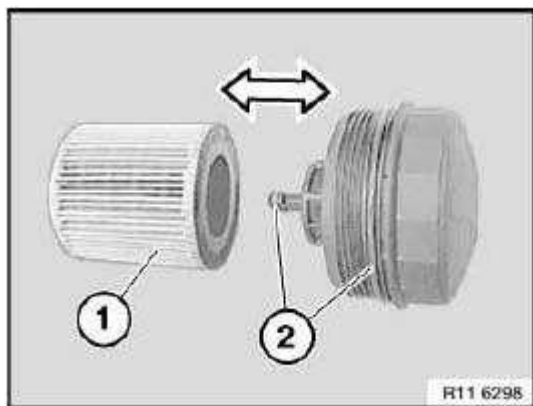


Fig. 22: Sealing Rings

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: For purposes of clarity, the picture shows the assembly underside protection and reinforcement plate removed.

Unclip service opening on reinforcement plate.

Open screw plug (1) in oil sump.

Drain engine oil.

Installation:

Replace sealing ring.

Tightening torque: 11 13 1AZ, see **11 13 OIL PAN** .

Pour in engine oil.

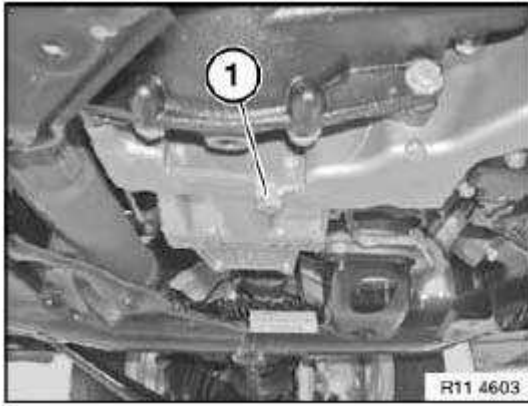


Fig. 23: Screw Plug

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Start engine and run at idle until oil pressure warning lamp goes out.

Turn off engine.

Check oil filter cap and screw plug (1) on oil sump for leaks.

Assemble engine.

Checking engine oil level:

- Park vehicle on a horizontal surface
- Allow engine at normal operating temperature to run for three minutes with increased revs (approx. 1100 rpm)
- Read off engine oil level in instrument cluster or on Control Display
- Top up engine oil if necessary

00 11 ... CHECKING/TOPPING UP OIL LEVEL IN REAR DIFFERENTIAL

IMPORTANT: Risk of damage!

To avoid serious damage to the rear differential, it is essential to use only approved gear oils in the differential.

Undo oil filler plug (1).

Check oil level.

If necessary, pour in rear differential oil up to lower edge of opening for oil filler plug (1).

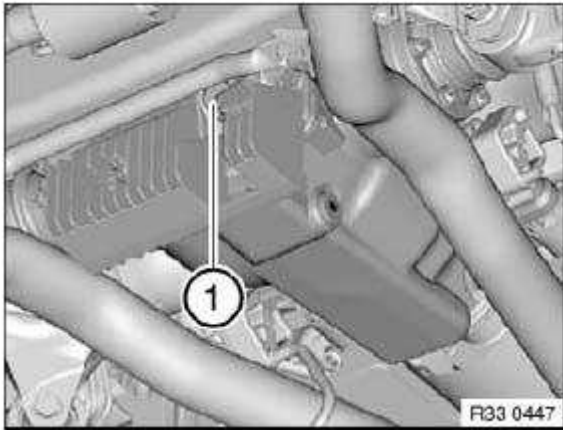


Fig. 24: Oil Filler Plug

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

- A. A) Oil filler plug with sealing ring:

Replace sealing ring (1).

Tightening torque: 33 11 3AZ, see **33 11 REAR DIFFERENTIAL CASE WITH COVER** .

- B. B) Oil filler plug with O-ring:

Replace oil filler plug (2).

Tightening torque: 33 11 9AZ, see **33 11 REAR DIFFERENTIAL CASE WITH COVER** .

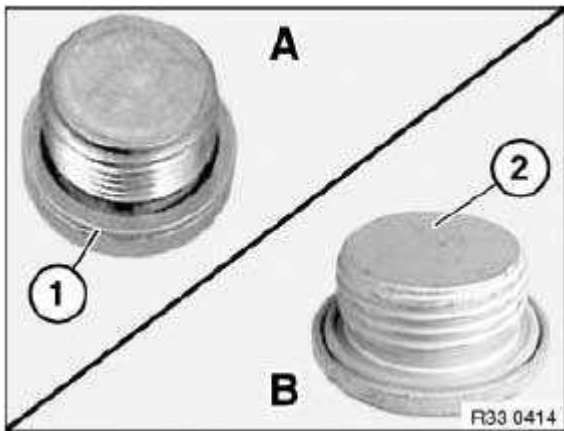


Fig. 25: Sealing Ring And Oil Filler Plug

Courtesy of BMW OF NORTH AMERICA, INC.

Draining gear oil:

- Release oil drain plug (1) and filler plug (2).
- Clean oil drain plug (1) and screw in.

Tightening torque: 23 00 4AZ, see **23 00 TRANSMISSION IN GENERAL** .

Fill transmission with ATF.

- Pour in gear oil until overflowing.
- Tighten in filler screw (2).

Tightening torque: 23 00 4AZ, see **23 00 TRANSMISSION IN GENERAL** .

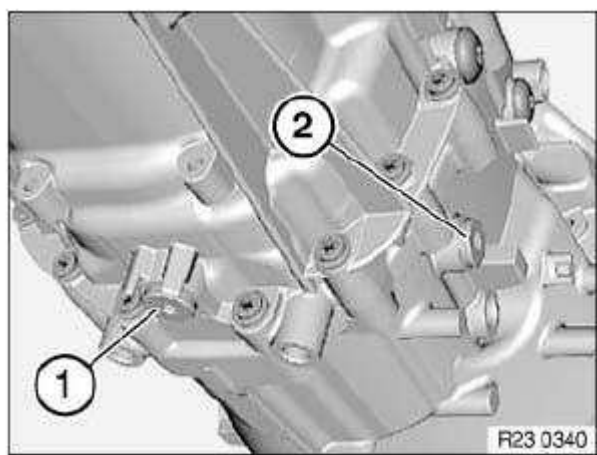


Fig. 26: Oil Drain And Filler Plug

Courtesy of BMW OF NORTH AMERICA, INC.

00 11 237 CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (GA6L45R)

IMPORTANT: Use only the approved transmission fluid.

Failure to comply with this requirement will result in serious damage to the automatic transmission!

Remove exhaust system bracket (1).

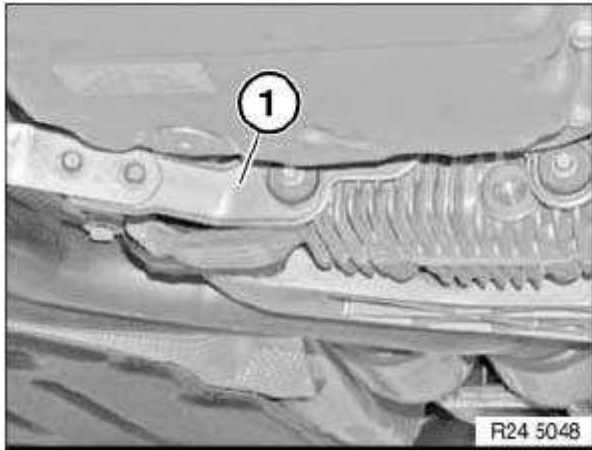


Fig. 27: Exhaust System Bracket

Courtesy of BMW OF NORTH AMERICA, INC.

Topping up transmission fluid after a repair:

Stand vehicle on a level surface and secure against rolling off.

Undo filler plug (1).

Installation:

Replace sealing ring.

Top up transmission fluid until it emerges from filling orifice.

Start engine.

Replenish transmission fluid until it emerges from filling orifice.

Screw in filler plug (1).

Tightening torque: 24 11 7AZ, see **24 11 TRANSMISSION CASE, OIL SUMP** .

Press brake pedal to floor and shift through all gears several times at idle speed. Then shift to "P" position (Park).

Then check fluid level.

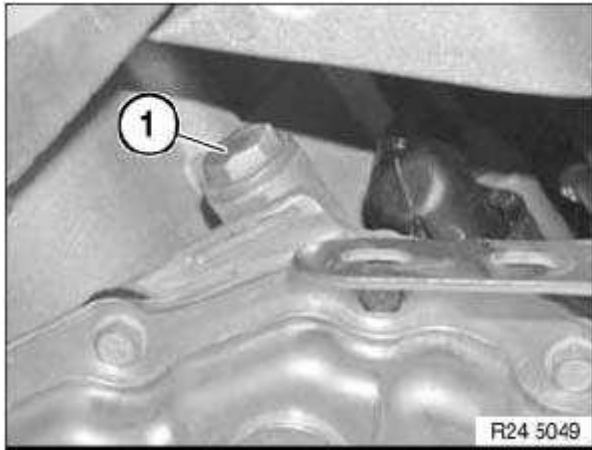


Fig. 28: Transmission Filler Plug

Courtesy of BMW OF NORTH AMERICA, INC.

Checking fluid level:

- Connect BMW Diagnosis and Information System (DIS) to vehicle.
- Call up Service functions (drive).
- Carry out fluid level check in accordance with instructions.

00 11 259 OIL CHANGE IN REAR DIFFERENTIAL INCL. USED OIL DISPOSAL

IMPORTANT: Risk of damage!

To avoid serious damage to the rear differential, it is essential to use only approved transmission oils in the differential.

NOTE: The oil does not need to be changed in rear differentials carrying the "Life-Time-Oil" sticker.

Only change oil when rear differential is at normal operating temperature.

Recycling:

Catch and dispose of emerging differential oil.

Observe country-specific waste-disposal regulations

Oil drain plug present:

Place oil collecting apparatus underneath.

Remove oil drain plug (1).

Drain and dispose of differential oil.

Undo oil filler plug (2).

Add differential oil up to lower edge of opening for oil filler plug (2).

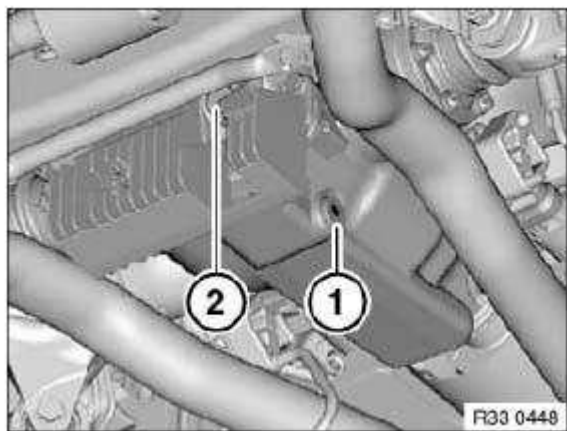


Fig. 29: Oil Drain And Filler Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

A. Oil drain or oil filler plug with sealing ring:

Replace sealing ring (1).

Tightening torque: 33 11 3AZ, see **33 11 REAR DIFFERENTIAL CASE WITH COVER** .

B. Oil drain or oil filler plug with O-ring:

Replace oil drain or oil filler plug (2).

Tightening torque: 33 11 9AZ, see **33 11 REAR DIFFERENTIAL CASE WITH COVER** .

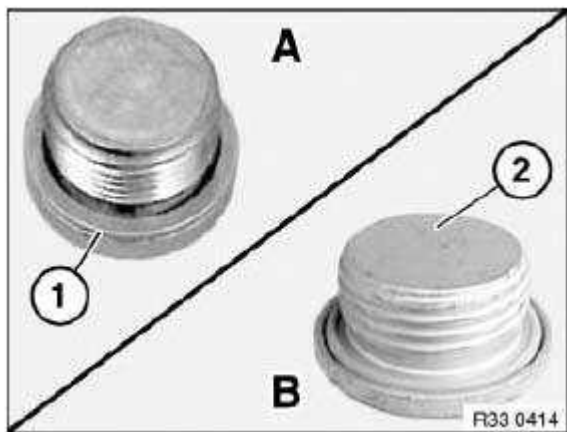


Fig. 30: Sealing Ring And Oil Filler Plug
Courtesy of BMW OF NORTH AMERICA, INC.

No oil drain plug:

Undo oil filler plug (1).

Drain and dispose of differential oil.

Add differential oil up to lower edge of opening for oil filler plug (1); if necessary, refer to Technical Data for necessary fill quantity.

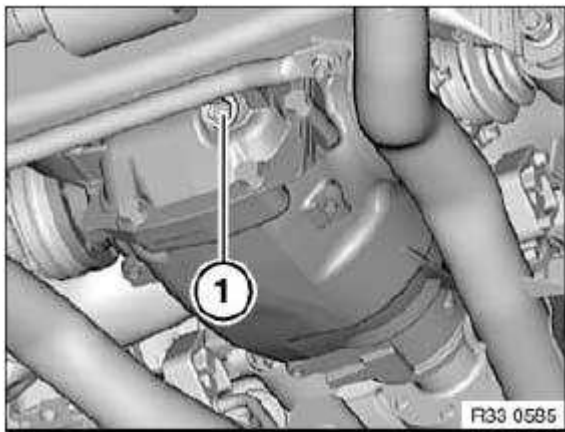


Fig. 31: Oil Filler Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

- A. Oil filler plug with sealing ring:

Replace sealing ring (1).

Tightening torque: 33 11 3AZ, see **33 11 REAR DIFFERENTIAL CASE WITH COVER** .

- B. Oil filler plug with O-ring:

Replace oil filler plug (2).

Tightening torque: 33 11 9AZ, see **33 11 REAR DIFFERENTIAL CASE WITH COVER** .

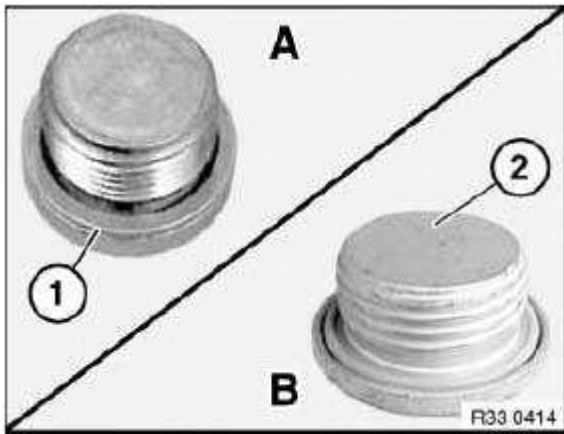


Fig. 32: Sealing Ring And Oil Filler Plug
 Courtesy of BMW OF NORTH AMERICA, INC.

00 11 572 CHANGING OIL IN TRANSFER BOX (ATC 400/500)

**IMPORTANT: When changing the gear oil, it is necessary to delete the self-adapting wear values in the transfer box control unit.
 Use only the approved transmission fluid.**

Failure to comply with this requirement will result in serious damage to the transfer box!

Catch and dispose of escaping transmission fluid.

Observe country-specific waste-disposal regulations

**NOTE: ATC 500 transfer box:
 Undo oil filler plug (1).
 Tightening torque: 27 00 11AZ, see 27 00 TRANSFER BOX IN GENERAL .**

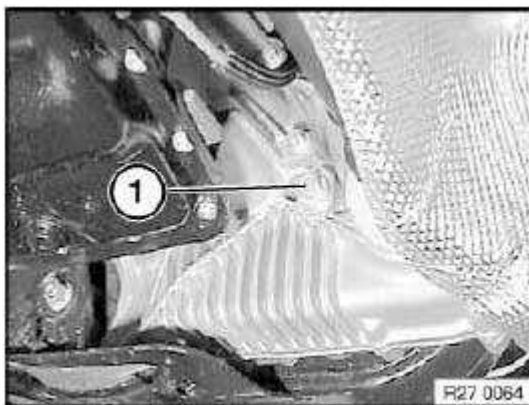


Fig. 33: Oil Filler Plug
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: **ATC 500 transfer box:**
Remove oil drain plug (2).
Tightening torque: 27 00 11AZ, see 27 00 TRANSFER BOX IN GENERAL .



Fig. 34: Oil Drain Plug
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: **ATC 400 transfer box:**

Release oil filler plug (1) and oil drain plug (2).

Tightening torque: 27 00 11AZ, see 27 00 TRANSFER BOX IN GENERAL .

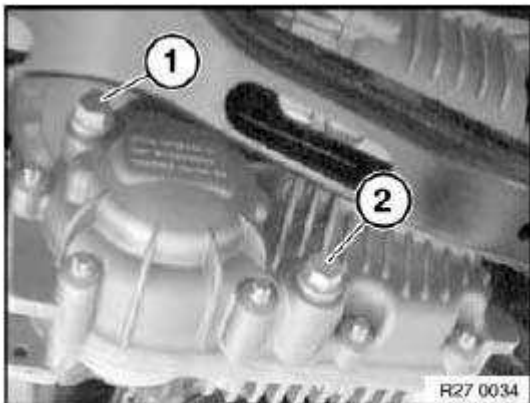


Fig. 35: Oil Filler And Drain Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace sealing rings.

Clean oil drain plug (2) and screw in.

Pour in gear oil up to lower edge of filler plug (1).

Tighten in filler screw (1).

Tightening torque: 27 00 11AZ, see 27 00 TRANSFER BOX IN GENERAL .

11 00 REMOVING AND INSTALLING/REPLACING IGNITION COIL COVER (N52K)

Release screws.

Tightening torque: 11 12 6AZ, see 11 12 CYLINDER HEAD WITH CYLINDER HEAD COVER .

Remove ignition coil cover (1).

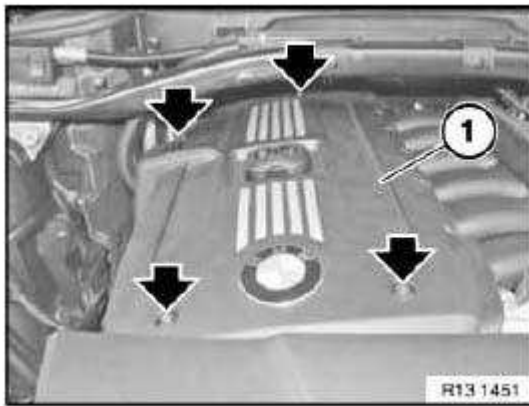


Fig. 36: Ignition Coil Cover

Courtesy of BMW OF NORTH AMERICA, INC.

86 10 ... POSITIONING OF MULTITRAILER HOOD FOR MAINTENANCE AND REPAIR WORK

IMPORTANT: At least two persons are needed to install and remove the hood from the platform.

Before installing and removing the hood, secure the BMW multitrailer and the entire combination against rolling. For this purpose, use the parking brake and the chocks of the BMW multitrailer.

The hood can also be set up and lowered with the aid of the universal lift available from BMW in conjunction with the roof racks and the hood adapter. Under no circumstances should work of any kind be carried out below the suspended hood.

For maintenance and repair work, raise the hood using a lifting platform. Twin-column lifting platforms, body lifting platforms and twin-stamp underfloor platforms are suitable. The seating plates and areas of the lifting platform must be adjustable according to the dimensions of **Fig. 37**.

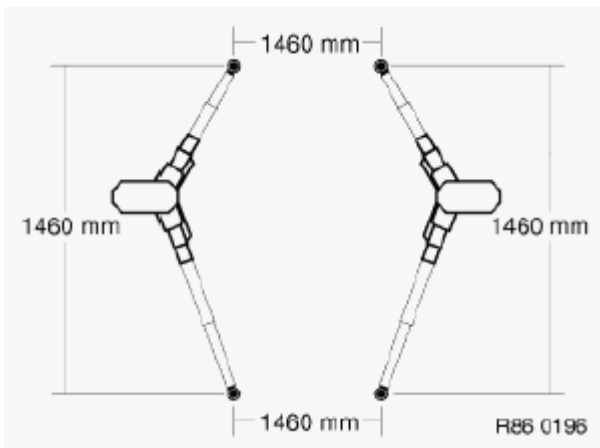


Fig. 37: Lifting Platform Adjustable Dimensions
Courtesy of BMW OF NORTH AMERICA, INC.

The lifting platform must conform to the relevant legal provisions of the accident prevention regulations and be serviced as specified. Comply with the lifting platform operating instructions, in particular the safety instructions and the carrying capacity.

Make sure you adhere to the BMW-recommended work area of 5 x 7 m and to an escape route of 0.6 m between two lifting platforms.

Please comply with the following instructions before raising the hood:

- Raise only when it is unloaded;
- Ensure sufficient clearance between the seating plates/seating areas and the GFP edge of the hood;
- The hood must always be positioned in the middle of the lifting platform.

IMPORTANT: The hood may only be raised at the pin (1). Under no circumstances may the hood be raised at the GFP edge of the hood (2). See Fig. 38. Exclusively for removal of pin (1), raise the hood in the GFP area.

Also refer to:

86 21 ... REMOVING CENTERING PIN FROM MOUNTING BRACKET .

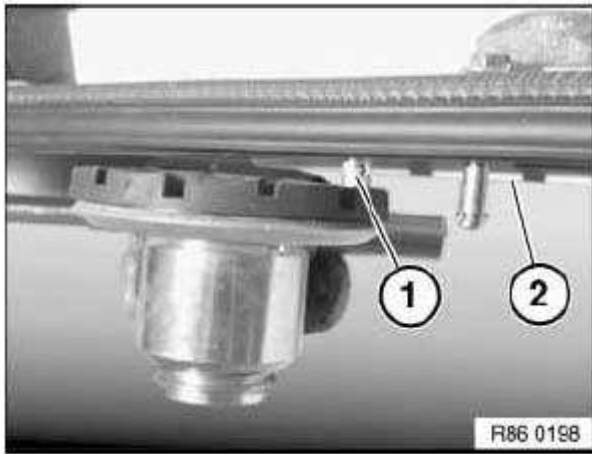


Fig. 38: Pin And Hood

Courtesy of BMW OF NORTH AMERICA, INC.

MAINTENANCE

Maintenance and General Information - Operating Fluids

1.0 INTRODUCTION

These operating fluids specifications describe the standards which are necessary for approval and application for BMW automobiles. Operating fluids are arranged in vehicle group category and are approved for all assemblies. Before applying operating fluids, it is important to make sure that the specifications and manufacturing codes on the container conform with those on the enclosed specification list.

BMW of North America has also approved various fluids for use which are not available through the Parts Department, but may be obtained locally.

2.0 CORROSION PROTECTION FOR VEHICLE IN LONG-TERM STORAGE

Location-inside of a building whenever possible or covered parking lot (especially convertibles).

Replace engine oil and filter after engine reaches operating temperature. Run engine several minutes after replacing oil. Engine oil must be replaced every 12 months. Factory engine oil (in new cars) can remain in the engine up to 12 months.

Check/correct electrolyte level in battery cells.

Disconnect battery ground lead to avoid discharging battery through current draw of electrical equipment. Or, switch off battery main disconnect switch (if equipped).

Recharge battery.

Inspect undercoating for damage and repair as necessary.

Inspect wax coating in engine compartment, on engine, underbody and axles. Repair as necessary.

Operate air conditioner monthly for 10 minutes in order to lubricate the seals and the expansion valve. Note: The air conditioner will only work at temperatures above 37°F/3°C.

PRE-DELIVERY CARS

Replace brake fluid if car has been parked outdoors longer than six (6) months.

Fill the vehicle fuel tank with fresh fuel in order to prevent condensation inside the tank (applies only to metal fuel tanks).

Check, and if needed, correct the coolant level and concentration of long-term antifreeze and corrosion inhibitor.

Apply brakes to dry the brake discs of any moisture and spray them with a corrosion inhibitor. Spray the

complete brake assemblies after parking the car at its final storage location.

Do not apply the parking brake. Brake linings could seize when the parking brake is applied for an extended period of time. Rather, engage first gear (manual transmissions) or "park" position (automatic transmissions) to hold vehicle stationary.

Increase inflation pressure on all road tires to 50 psi.

Thoroughly clean the entire car, including underside, engine and engine compartment.

3.0 CONVERSION TABLE

CONVERSION TABLE

Liters	US Gallons	US Pints	Liters	US Gallons	US Pints
0.5	0.132	1.055	8.0	2.112	16.904
1.0	0.264	2.113	9.0	2.376	19.017
2.0	0.538	4.226	10.0	2.640	21.130
3.0	0.792	6.339	11.0	2.904	23.243
4.0	1.056	8.452	12.0	3.168	25.356
5.0	1.320	10.565	13.0	3.432	27.469
6.0	1.584	12.678	14.0	3.696	29.582
7.0	1.848	14.791	15.0	3.960	31.695

Conversion Factors:

Liters in US Gallons x 0.264

US Gallons in Liters x 3.785

Liters in US Pints x 2.113

US Pints in Liters x 0.473

4.0 ALTERNATE UNIVERSAL LUBRICANTS AND WORKSHOP SUPPLIES

ALTERNATE UNIVERSAL LUBRICANTS AND WORKSHOP SUPPLIES REFERENCE

BMW P/N	Description/Application	3M P/N	Wurth P/N	Loctite P/N
81 22 9 400 208 ⁽¹⁾	Lubricant/Contact Cleaner Spray Stops electrical and mechanical faults due to water, moisture, rust, dirt and friction. Colorless, neutral, free of grease and silicone, suitable for		89360/1	24379

all applications.
Examples: Stops
moisture on distributor,
generator, ignition coil,
starter, spark plugs, coils,
relays, contacts, etc.
Prevents metal parts
from corroding. Stops
rubber and plastic parts
from aging prematurely.
Applications: from -50oC
to +150oC.

81 22 9 400 229 ⁽¹⁾	Hand Cleaner Removes stubborn stains and grit without attacking skin. Contains special skin protectant. Does not clog pipes.	893900	25108
81 22 9 400 720 ⁽¹⁾	Molybdenum Disulfide (MOS2) Spray 8876 Loosens rust, eliminates squeaking and similar noises, prevent rust seizure. Displaces water on ignition components to allow quick starting. Insulates electrical systems against moisture and stops corrosion.		24378
81 22 9 407 138 ⁽¹⁾	Stain Remover Removes tar, oil and grease stains from seat covers, leather upholstery and painted plastic components.	89024	
81 22 9 407 174 ⁽¹⁾	Bearing Grease A water repellent high- pressure grease for lubricating flywheel gear rings, starter motor pinions, etc., and also as an acid-proof grease for battery terminal posts.	893530	
81 22 9 407 301 ⁽¹⁾	Loctite 574 Anaerobic, silicone sealant for aluminum flange surfaces. Provides	893574	24018

	instant sealing when flanges are assembled.			
81 22 9 407 388 ⁽¹⁾	Adhesive Remover Removes all residual or excess adhesive, sealing and coating compounds, wax, grease or oil films from painted and plastic surfaces, i.e. before installing front or rear spoilers and decor strips.	8984		
81 22 9 407 394 ⁽¹⁾	Loctite 380 Black cyanacrylate adhesive for joining metals, rubber, PVC.	8155	893 4103	38050
81 22 9 407 524 ⁽¹⁾	Contact Cement Powerful adhesive for leather and leatherette, rubber moldings, seats, rubber mats, noise-absorbent materials, etc. Has good heat resistance and does not attack paint. See and .	1357HP		
81 22 9 407 629 ⁽¹⁾	High-Adhesion Lubricant Long-life high-adhesion lubricant for clutch and brake linkages, spring struts, stabilizers, idler levers and pivots.	8878		20029
81 22 9 407 711 ⁽¹⁾	Universal Lube Spray Colorless lubricant with high lubricant content. Eliminates squeaks and grating noises from spring seat bases. Lubricates door stops and locks, seat adjustment mechanism, etc. Resistant to temperatures between-50°C and 120°C.	8878	893106	20029

(1) *These items are no longer available through BMW NA Parts Department.

The above alternate suppliers can be contacted below:

ALTERNATE SUPPLIERS REFERENCE

3M 19460 Victor Parkway Livonia, MI 48152 (800) 521-8180	Wurth USA, Inc. 93 Grant Street Ramsey, NJ 07446 (800) 526-5228	Kem Krest, Inc. (Loctite) 1919 Superior Street Elkhart, IN 46515 (800) 285-5917
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5.0 APPROVED OPERATING FLUIDS SOURCES

APPROVED OPERATING FLUIDS SOURCES REFERENCE

Group	Description, S.I. Bulletin	Product Name, Source	Telephone
11	Engine Oil, SAE 5W-50	"Syntec FSX" Castrol Inc., Piscataway, NJ	732-980-9100
11	Oxygen Sensor Lubricant	Bostik "Never-Seez" NSBT-16 Bostik Findley, Middleton, MA	888-603-8558
11	Intake & Vacuum System Leak Detector S.I. Bulletin B 11 03 92 (3500)	"LiquiMoly (Lubro Moly) Motor Lecksucher" 2021 W.A.W.D.	800-477-9293
11	Cold Weld Epoxy	"J-B Weld" J-B Weld Company, Sulphur Springs, TX	903-885-7696
13	Loctite 290 Throttle Housing Fasteners S.I. Bulletin B 13 06 91 (3440)	"Loctite 290" Kem Krest, Inc., Elkhart, IN	800-285-5917
18	Copper Paste Exhaust System Joints S.I. Bulletin B 18 03 89 (1954)	"8945" 3M Automotive Trades Division, Livonia, MI	800-521-8180
23	Synthetic Transmission Fluid	"Mobil SHC 630" Mobil Oil Corporation	800-582-3645
34	Brake Component Lubricant S.I. Bulletins B 34 02 94 & B 34 05 98	Bostik "Never-Seez" NSBT-16 Bostik Findley, Middleton, MA	888-603-8558
36	Loctite 638 (green) Affix wheel hub covers	"Loctite 680" Kem Krest, Inc., Elkhart, IN	800-285-5917
36	Loctite Cleaner 755 Loctite 242 M5 Wheel Covers S.I. Bulletin B 36 03 90 (3182)	"Loctite Cleaning Solvent 755" "Loctite 242" Kem Krest, Inc., Elkhart, IN	800-285-5917
41	Structural Adhesive S.I. Bulletin B 41 01 95 (4150)	"DP420 Epoxy Adhesive with 3M EPX Applicator" 3M Industrial Tapes and Specialties Division, Livonia, MI	800-521-8180
54	Renax GL1	"Poliplex #1" Fuchs	800-323-7755

		Lubricants Corp., Harvey, IL	
61	Rubberized Super Glue	"893 4103" Wurth USA, Inc., Ramsey, NJ	800-526-5228
62	Contact Cleaner Spray IC Acoustic Transmitter S.I. Bulletin B 62 04 92 (3539)	"CRC QD Contact Cleaner Spray 5101" CRC Industries, Warminster, PA	800-272-8963
63	Silicone Gasket Material Turn Signals S.I. Bulletin B 63 05 91 (3313)	"Permatex Form-A- Gasket 6B-80627" Kem Krest, Inc., Elkhart, IN	800-285-5917
64	AC System Disinfectant S.I. Bulletin B 64 08 91 (3373)	"Airguard" J.J. Products, Inc., East Orange, NJ	800-654-2356
64	AC System Treatment	"Airsept" The Auto Doctor, Tucker, GA "893540-U" Wurth USA, Inc., Ramsey, NJ	404-662-6778 800-526-5228
97	Brushable Seam Sealer Seals spot-welded, riveted, or bolted seams and joints. Brushable consistency remains flexible. Retains brush marks appearance.	"8901021" Wurth USA, Inc., Ramsey, NJ	800-526-5228
97	Body Seal, Beige Underbody Seal, Black Permanent, flexible protection against stone chipping damage. Fast drying and paintable.	"0892091 U" "0893075 U" Wurth USA, Inc., Ramsey, NJ	800-526-5228
97	Seam Sealer, Grey Fast drying, paintable, silicone-free sealant for special spray gun application.	"0893228 U" Wurth USA, Inc., Ramsey, NJ	800-526-5228
99	Paint Cleaner	"Machine Cleaner 1" and "Hi-Tech Cleaner 2" Meguiar's Inc., Irvine, CA	800-854-8073
99	Machine Glaze	"Mirror Glaze 3" Meguiar's Inc., Irvine, CA	800-854-8073
99	Paint Sealer	"Sealer and Reseal Glaze 7" Meguiar's Inc., Irvine, CA	800-854-8073
99	Paint Swirl Remover	"Hi-Tech Swirl Remover 9" Meguiar's Inc., Irvine, CA	800-854-8073

GENERAL INFORMATION

Maintenance and General Information - Special Tools - X3

00 MAINTENANCE AND GENERAL INFORMATION

00 0 010 SPECIAL TOOL BOARD I

Order number: 00 0 010

Special tool board I

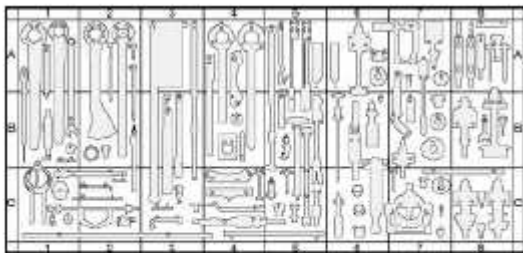
00 0 011 SPECIAL TOOL BOARD I INCL. MOUNTING FIXTURE, WITHOUT FILM SHEETING

Note: Replaced by 00 0 224

Transmission: GS6-53BZ

Order number: 00 0 011

Special tool board I incl. mounting fixture, without film sheeting



W00 0 010

Fig. 1: Special Tool Board I (00 0 011)
Courtesy of BMW OF NORTH AMERICA, INC.

00 0 020 SPECIAL TOOL BOARD II COMPLETE

In conjunction with: 00 0 230 This board can be used in a min. 4 m long moving special tool cabinet.

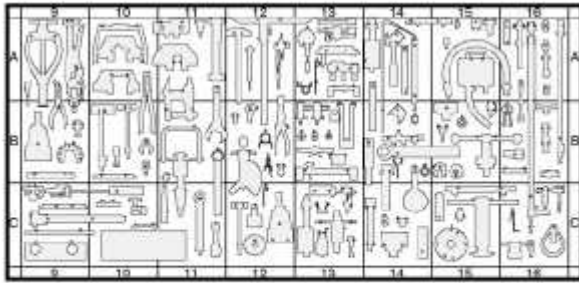
Note: Size 2 m x 1 m

Series: All models

Storage location: Tool cabinet

Order number: 00 0 020

Special tool board II complete



W00 0 020

Fig. 2: Special Tool Board II (00 0 020)

Courtesy of BMW OF NORTH AMERICA, INC.

00 0 030 SPECIAL TOOL BOARD III COMPLETE

In conjunction with: 00 0 230 This board can be used in a min. 4 m long moving special tool cabinet.

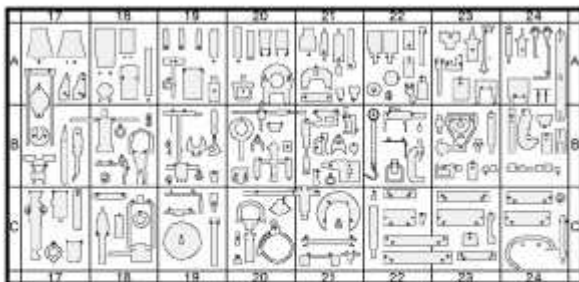
Note: Size 2 m x 1 m

Series: All models

Storage location: Tool cabinet

Order number: 00 0 030

Special tool board III complete



W00 0 030

Fig. 3: Special Tool Board III (00 0 030)

Courtesy of BMW OF NORTH AMERICA, INC.

00 0 040 SPECIAL TOOL BOARD IV COMPLETE

In conjunction with: 00 0 230 This board can be used in a min. 4 m long moving special tool cabinet.

Note: Size 2 m x 1 m

Series: All models

Storage location: Tool cabinet

Order number: 00 0 040

Special tool board IV complete

Consisting of:

3 = 00 0 043 Hook set for films 10, 11 and 12

4 = 00 0 044 Film 10 (left)

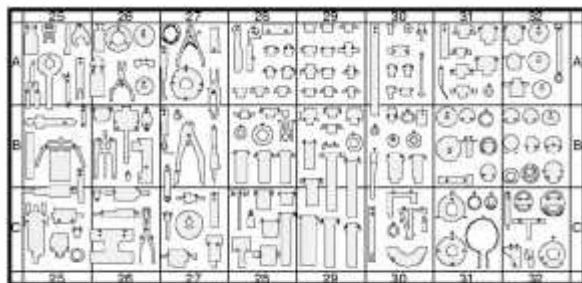
Note: For fields A/B/C 25 ... 27

5 = 00 0 045 Film 11 (center)

Note: For fields A/B/C 27/28 and 29/30

6 = 00 0 046 Film 12 (right)

Note: For fields A/B/C 30 ... 32



W00 0 040

Fig. 4: Special Tool Board IV (00 0 040)

Courtesy of BMW OF NORTH AMERICA, INC.

00 0 050 CAPTION BOARD: "SPECIAL TOOLS"

Note: With film sheet in the desired language - size 2000 mm x 215 mm

Storage location: Tool cabinet

Order number: 00 0 050

Caption board: "SPECIAL TOOLS"



Fig. 5: Caption Board "SPECIAL TOOLS" (00 0 050)
Courtesy of BMW OF NORTH AMERICA, INC.

00 0 051 FILM SHEET, GERMAN

Order number: 00 0 051

Film sheet, German



Fig. 6: Film Sheet, German (00 0 051)
Courtesy of BMW OF NORTH AMERICA, INC.

00 0 052 FILM SHEET, ENGLISH

Order number: 00 0 052

Film sheet, English



Fig. 7: Film Sheet, English (00 0 052)
Courtesy of BMW OF NORTH AMERICA, INC.

00 0 053 FILM SHEET, FRENCH

Order number: 00 0 053

Film sheet, English



Fig. 8: Film Sheet, English (00 0 052)

Courtesy of BMW OF NORTH AMERICA, INC.

00 0 054 FILM SHEET, DUTCH

Order number: 00 0 054

Film sheet, Dutch



Fig. 9: Film Sheet, English (00 0 052)

Courtesy of BMW OF NORTH AMERICA, INC.

00 0 055 FILM SHEET, ITALIAN

Order number: 00 0 055

Film sheet, Italian



Fig. 10: Film Sheet, English (00 0 052)
Courtesy of BMW OF NORTH AMERICA, INC.

00 0 056 FILM SHEET, SPANISH

Order number: 00 0 056

Film sheet, Spanish



Fig. 11: Caption Board "SPECIAL TOOLS" (00 0 050)
Courtesy of BMW OF NORTH AMERICA, INC.

00 0 059 CAPTION BOARD WITHOUT FILM

Order number: 00 0 059

Caption board without film

00 0 060 SPECIAL TOOL BOARD V COMPLETE

In conjunction with: 00 0 230 This board can be used in a min. 4 m long moving special tool cabinet.

Note: Size 2 m x 1 m

Series: All models

Storage location: Tool cabinet

Order number: 00 0 060

Special tool board V complete

Consisting of:

3 = 00 0 063 Hook set for films 13, 14 and 15

4 = 00 0 064 Film 13 (left)

Note: For fields A/B/C 33 ... 35

5 = 00 0 065 Film 14 (center)

Note: For fields A/B/C 35/36 and 37/38

6 = 00 0 066 Film 15 (right)

Note: For fields A/B/C 38 ... 40

7 = 00 0 224 Large special tool board 2 m x 1 m

Note: This special tool board serves as the back panel of basic and mounting frames and is the basis for large fixed and moving special tool boards.

In conjunction with: Hook set and films

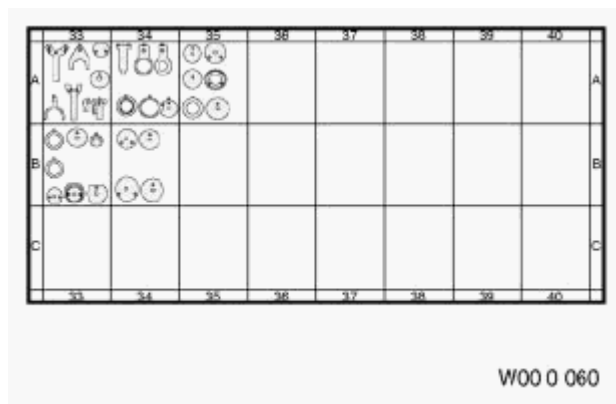


Fig. 12: Special Tool Board V Complete (00 0 060)
Courtesy of BMW OF NORTH AMERICA, INC.

00 0 070 SPECIAL TOOL CABINET, LENGTH 6 M

Note: For accommodating large or small moving special tool boards (not contained in scope of delivery) for the entire current range of special tools. Consisting of: 1x 00 0 220 complete plus 2x 00 0 221 and 2x 00 0 224

Series: All models

Order number: 00 0 070

Special tool cabinet, length 6 m

00 0 080 FOLDING INDEX

Note: Summary of tool positioning/storage locations

Storage location: Tool cabinet

SI number: 1 12 97 (202)

Order number: 00 0 080

Folding index

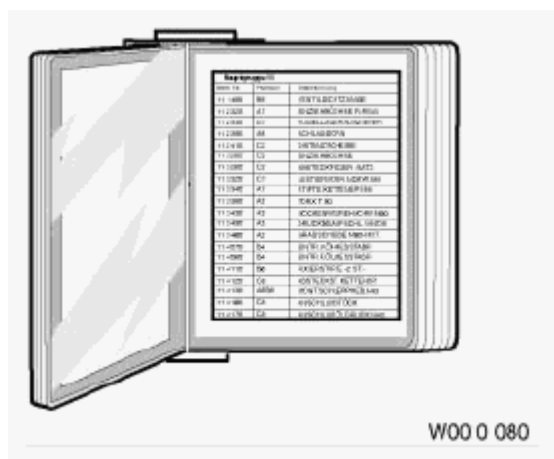


Fig. 13: Folding Index (00 0 080)
Courtesy of BMW OF NORTH AMERICA, INC.

00 0 110 CARBOARD BOX

Minimum set: Measuring and testing equipment

Note: As storage location "Y3" for MINI V-adapter leads (with launch of R56)

SI number: 2 09 06 313

Order number: 00 0 110

Cardboard box

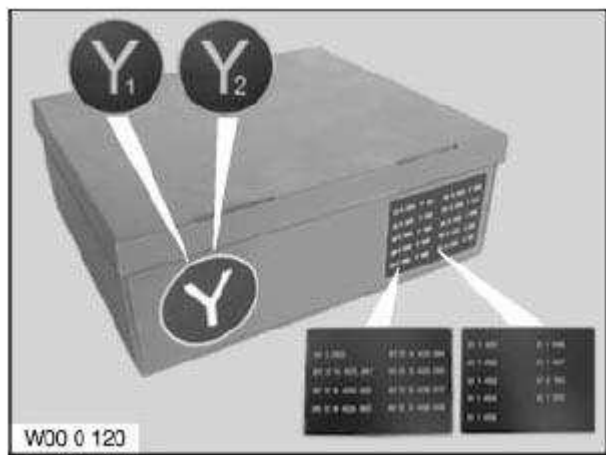


Fig. 14: Carboard Box (00 0 110)
Courtesy of BMW OF NORTH AMERICA, INC.

00 0 120 CARBOARD BOX (SET) FOR CABLE CABINET

Note: For storing adapter cables (cable cabinet reconditioning) 2 cardboard boxes are supplied at present: 00 0 121 = storage location Y1 00 0 122 = storage location Y2

SI number: 00 04 04 (104)

Order number: 00 0 120

Cardboard box (set) for cable cabinet

Consisting of:

1 = 00 0 121 Cardboard box Y1

Note: = storage location for adapter cables

2 = 00 0 122 Cardboard box Y2

Note: = storage location for adapter cables

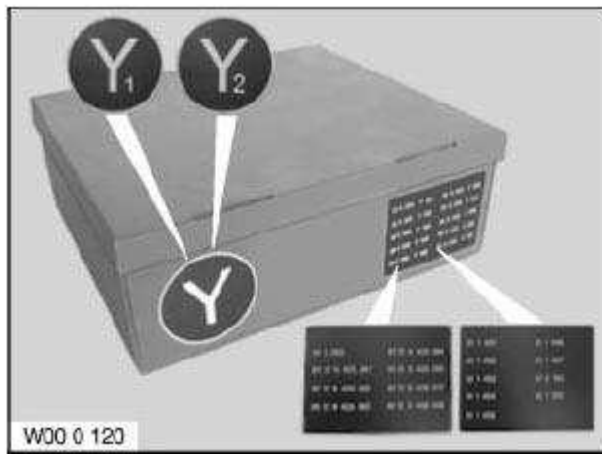


Fig. 15: Carboard Box (00 0 110)

Courtesy of BMW OF NORTH AMERICA, INC.

00 0 130 SPECIAL TOOL BOARD VI COMPLETE

In conjunction with: 00 0 230 This board can be used in a min. 4 m long moving special tool cabinet.

Note: Storage board for older tools

Series: All models

Order number: 00 0 130

Special tool board VI complete

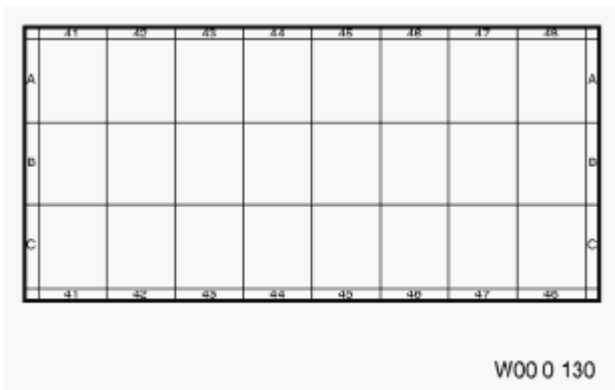


Fig. 16: Special Tool Board VI Complete (00 0 130)
Courtesy of BMW OF NORTH AMERICA, INC.

00 0 140 SUPPLEMENTARY HOOK SET

Note: Only for delivery of the supplementary hook set for converting tool boards (old to new).

Order number: 00 0 140

Supplementary hook set

00 0 150 SPECIAL TOOL CABINET

Note: To accommodate 5 special tool boards. Replaced by 1x 00 0 220 complete plus 1x 00 0 221 and 1x 00 0 224

Order number: 00 0 150

Special tool cabinet

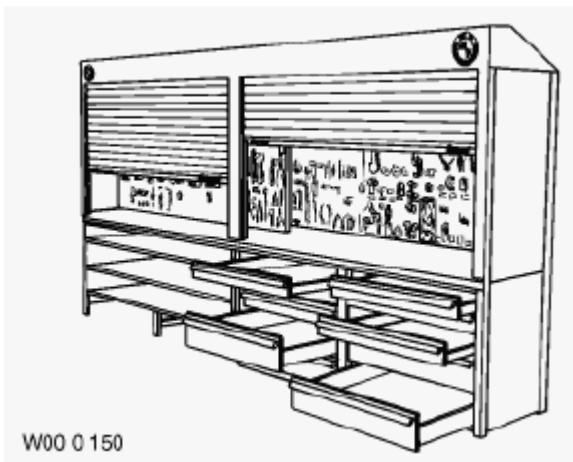


Fig. 17: Special Tool Cabinet (00 0 150)

Courtesy of BMW OF NORTH AMERICA, INC.

00 0 152 SHELF

Order number: 00 0 152

Shelf

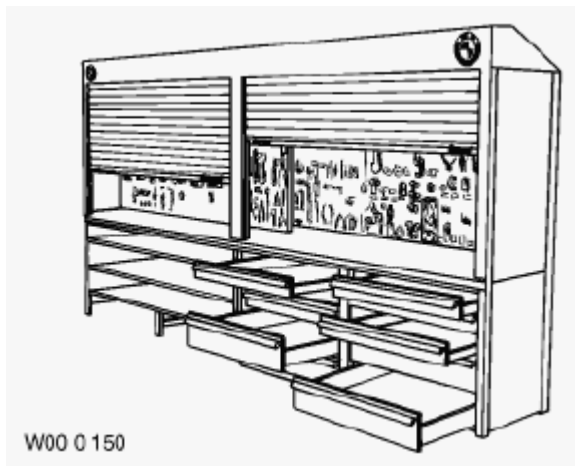


Fig. 18: Special Tool Cabinet (00 0 150)
Courtesy of BMW OF NORTH AMERICA, INC.

00 0 153 WIDE-GROOVE MAT (2 MATS)

Order number: 00 0 153

Wide-groove mat (2 mats)

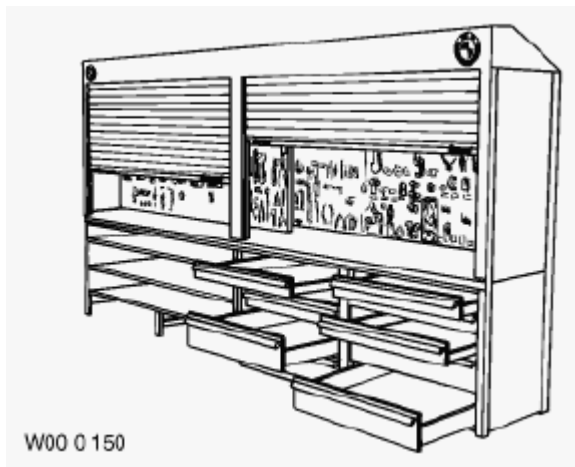


Fig. 19: Special Tool Cabinet (00 0 150)
Courtesy of BMW OF NORTH AMERICA, INC.

00 0 154 DRAWER UNIT WITH 5 DRAWERS, LOCKABLE

Order number: 00 0 154

Drawer unit with 5 drawers, lockable

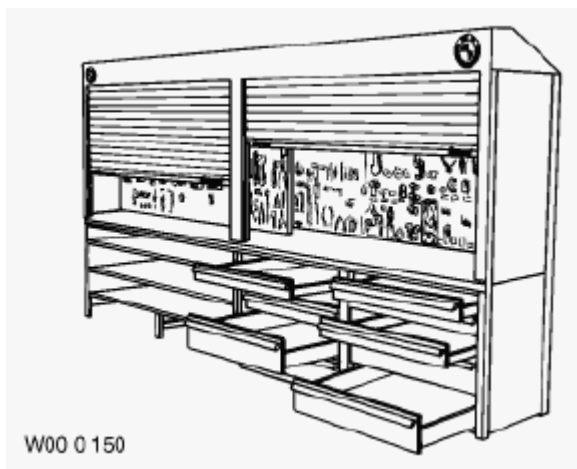


Fig. 20: Special Tool Cabinet (00 0 150)
Courtesy of BMW OF NORTH AMERICA, INC.

00 0 155 REAR PANEL

Order number: 00 0 155

Rear panel

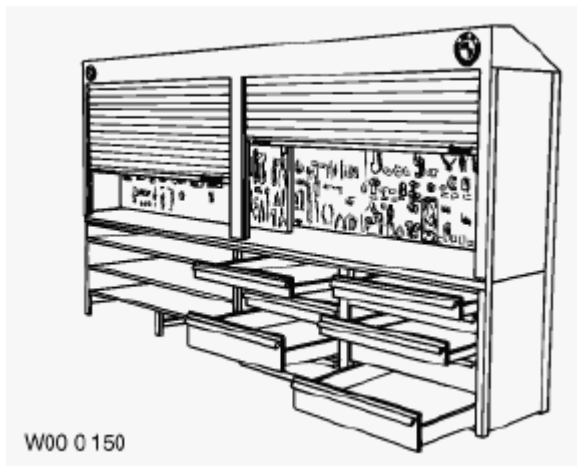


Fig. 21: Special Tool Cabinet (00 0 150)
Courtesy of BMW OF NORTH AMERICA, INC.

00 0 158 LOCKABLE ROLLER SHUTTER (2)

Order number: 00 0 158

Lockable roller shutter (2)

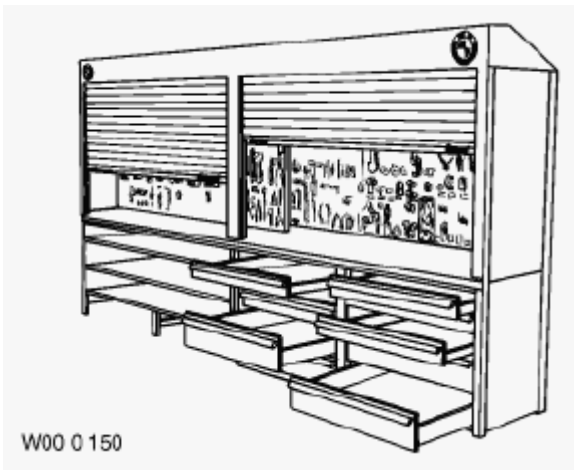


Fig. 22: Special Tool Cabinet (00 0 150)
Courtesy of BMW OF NORTH AMERICA, INC.

00 0 170 PARTS CABINET

Note: For storing removed vehicle parts

Series: All models

Storage location: Single

SI number: 8 01 94(821)

Order number: 00 0 170

Parts cabinet

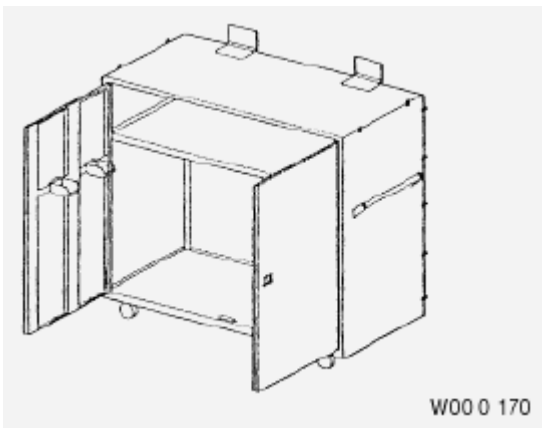


Fig. 23: Parts Cabinet (00 0 170)
Courtesy of BMW OF NORTH AMERICA, INC.

00 0 180 CABLE CABINET II, COMPLETE

Note: For extended accommodation of adapter leads as well as measuring and test equipment

SI number: 0 02 99 (399)

Order number: 00 0 180

Cable cabinet II, complete

Consisting of:

1 = 00 0 182 Film set II

Note: For identifying storage locations in cable cabinet II - Currently applicable status

2 = 00 0 183 Cable holder set - H -

Note: For cable cabinet II only 16 guide rails each with 15 straps for holding adapter cables - Currently applicable status

3 = 00 0 184 CD holder

Note: For holding two program CDs with sleeve - Can be fitted in cable cabinets I and II

4 = 00 0 186 Drawer block

Note: For cable cabinet II only

5 = 00 0 187 Holder set for test adapters

Note: For cable cabinet II only

6 = 00 0 188 Strap set (optional)

Note: 20 straps for cable holders - H - For expanding suspended cables in cable cabinets I and II

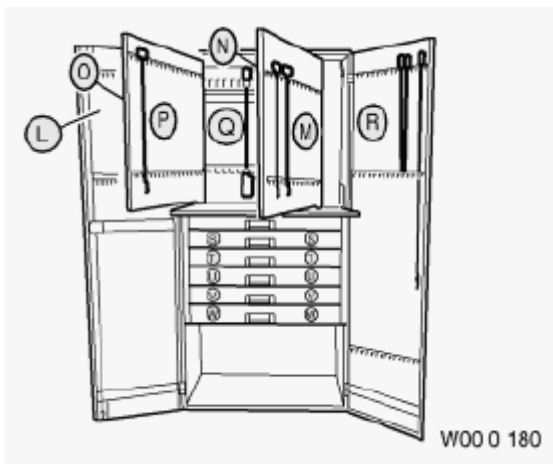


Fig. 24: Cable Cabinet II, Complete (00 0 180)
 Courtesy of BMW OF NORTH AMERICA, INC.

00 0 190 CABLE CABINET I, COMPLETE

Note: With set of films and accessories - For storing adapter cables as well as measuring devices and testers

SI number: 0 02 99 (399)

Order number: 00 0 190

Cable cabinet I, complete

Consisting of:

1 = 00 0 191 Cable cabinet

Note: Without contents or accessories Basis for cable cabinets I and II

2 = 00 0 192 Set of films I

Note: For identifying storage locations in cable cabinet I - valid status in each case

3 = 00 0 193 Cable holder set - H -

Note: For cable cabinet I only 24 guide rails each with 15 retaining straps for accommodating adapter leads

4 = 00 0 194 Cable carrier - B -

Note: For accommodating engine test leads For extending cable suspensions in cable cabinets I and II

6 = 00 0 195 Swivel board frame

Note: Carrier of cable suspensions in cable cabinets I and II

7 = 00 0 196 Drawer block

Note: For cable cabinet I only

8 = 00 0 197 Magnet with roller

Note: For improved location and spacing of swivel boards - For retrofitting in cable cabinets I and II only

9 = 00 0 198 Compartment floor

Note: For cable cabinet I only

10= 00 0 199 Index

Note: For finding BMW special tools for automotive electrics in cable cabinets I and II

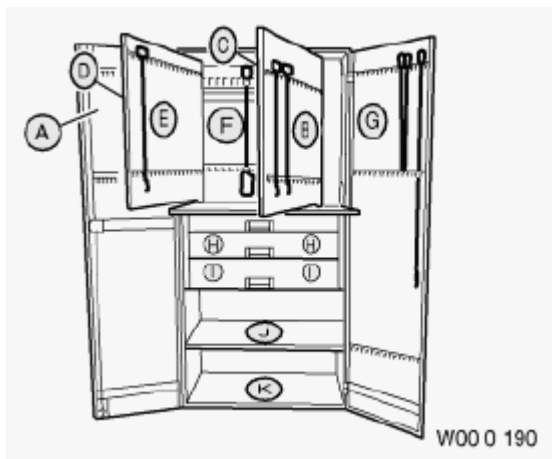


Fig. 25: Cable Cabinet I, Complete (00 0 190)

Courtesy of BMW OF NORTH AMERICA, INC.

00 0 210 CONVERSION KIT

Note: For cable cabinet

Series: All models

Storage location: Cable cabinet

SI number: 0 02 99 (399)

Order number: 00 0 210

Conversion kit

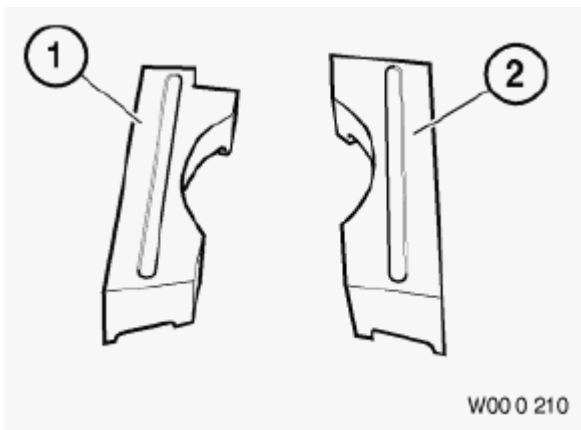


Fig. 26: Conversion Kit (00 0 210)

Courtesy of BMW OF NORTH AMERICA, INC.

00 0 220 SPECIAL TOOL CABINET, LENGTH 2 M

Note: Dimensions: (LxHxD) 2.05 m x 2.10 m x 0.65 m For extended accommodation of special tools.
IMPORTANT! Use Order No. 00 1 000 to erect a complete 6 m long special tool cabinet.

SI number: 0 01 00 (549)

Order number: 00 0 220

Special tool cabinet, length 2 m

Consisting of:

1 = 00 0 221 Frame with roller shutter

Note: Basic frame for erecting a separate 2 m long special tool cabinet. Note: If ordered individually as a mounting frame, the complete scope of delivery must already be present under Order No. 00 0 220. Overall length with a mounting frame: 4 m

In conjunction with: 00 0 225 / Not available without roller shutter for stability reasons!

2 = 00 0 222 Side panel, left

Note: Required only once for erecting the basic frame

3 = 00 0 223 Side panel, right

Note: Required only once for erecting the basic frame

4 = 00 0 224 Large special tool board 2 m x 1 m

Note: This special tool board serves as the rear panel of basic and mounting frames and is the basis for large

stationary and moving special tool boards.

In conjunction with: Hook set and films

5 = 00 0 225 Roller shutter, lockable

Note: Included in scope of delivery 00 0 221. This order number is for reordering purposes only.

6 = 00 0 226 Side frame

Note: Required only once for setting up the basic frame



Fig. 27: Special Tool Cabinet, Length 2 m (00 0 220)
Courtesy of BMW OF NORTH AMERICA, INC.

00 0 230 LARGE BOARD (2X1 M) WITH SET OF CASTORS

In conjunction with: Special tool boards, complete

Note: For retrofitting to a large special tool board for use in a special tool cabinet with a minimum length of 4 m.

Order number: 00 0 230

Large board (2x1 m) with set of castors

Consisting of:

2 = 00 0 232 Castors, top, for large board

3 = 00 0 233 Castors, bottom, for large board

00 0 240 SMALL MOVING SPECIAL TOOL BOARD WITHOUT FILMS

In conjunction with: Film and hook set

Note: For retrofitting a special tool cabinet from 2 m in length.

SI number: 0 01 02 (810)

Order number: 00 0 240

Small moving special tool board without films

Consisting of:

1 = 00 0 241 Small special tool board 0.65 m x 1 m

2 = 00 0 242 Castors, top

Note: For moving a small special tool board

3 = 00 0 243 Castors, bottom

Note: For moving a small special tool board

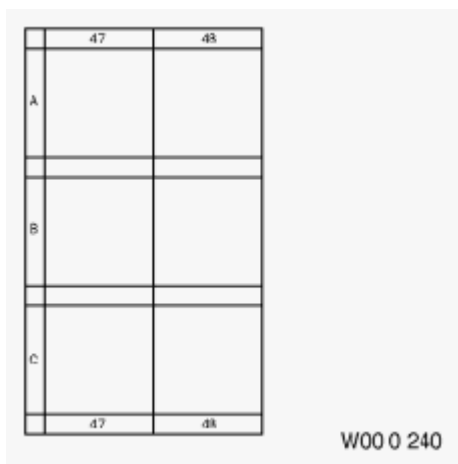


Fig. 28: Small Moving Special Tool Board Without Films (00 0 240)
Courtesy of BMW OF NORTH AMERICA, INC.

00 0 250 SHELF

Note: With mounting material.

SI number: 0 01 00 (549)

Order number: 00 0 250

Shelf

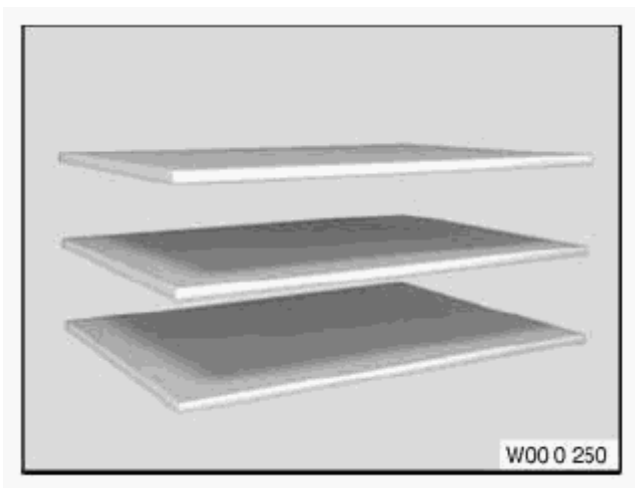


Fig. 29: Shelf (00 0 250)

Courtesy of BMW OF NORTH AMERICA, INC.

00 0 260 DRAWER BLOCK

Note: With 5 lockable drawers

SI number: 0 01 00 (549)

Order number: 00 0 260

Drawer block



Fig. 30: Drawer Block (00 0 260)

Courtesy of BMW OF NORTH AMERICA, INC.

00 0 270 REAR PANEL (2 PCS.)

Note: For sealing the rear panel (height 2 m x width 1 m) during free erection of a special tool cabinet.

SI number: 0 01 00(549)

Order number: 00 0 270

Rear panel (2 pcs.)

00 0 280 FILM SHEET AND HOOK SETS FROM SPECIAL TOOL BOARD VII

In conjunction with: 00 0 224 or appropriate number 00 0 241

Note: For retrofitting onto special tool boards. NOTE: Each film with hook set is always supplied in accordance with the current status of the special tools. Up to three films can be stuck onto a large special tool board.

Order number: 00 0 280

Film sheet and hook sets from special tool board VII

Consisting of:

1 = 00 0 281 Film sheet and hook set

Note: For fields A/B/C - 41 and 42

2 = 00 0 282 Film sheet and hook set

Note: For fields A/B/C - 43 and 44

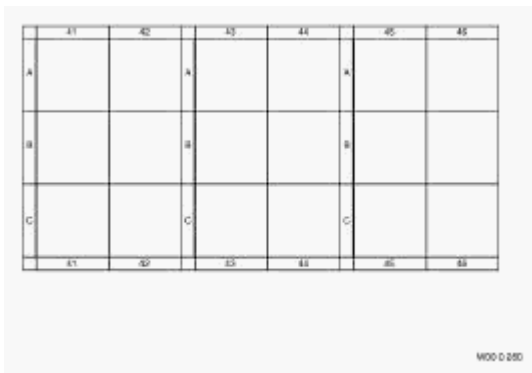


Fig. 31: Film Sheet And Hook Sets (00 0 280)
Courtesy of BMW OF NORTH AMERICA, INC.

00 0 333 SUPPLEMENTARY FILM / HOOK SET

Note: For mechanical tools in special tool cabinet - Model series: E39 - engine: M57

Order number: 00 0 333

Supplementary film / hook set

00 0 334 SUPPLEMENTARY FILM / HOOK SET

Note: For mechanical tools in special tool cabinet - Engine: S62

Order number: 00 0 334

Supplementary film / hook set

00 0 335 SUPPLEMENTARY FILM / HOOK SET

Note: For mechanical tools in special tool cabinet - Engine: S62 (Part 2)

Order number: 00 0 335

Supplementary film / hook set

00 0 336 SUPPLEMENTARY FILM / HOOK SET

Note: For mechanical tools in special tool cabinet - Engine: M67

Order number: 00 0 336

Supplementary film / hook set

00 0 337 SUPPLEMENTARY FILM / HOOK SET

Note: For mechanical tools in special tool cabinet - Transmission: F-transmission

Order number: 00 0 337

Supplementary film / hook set

00 0 338 SUPPLEMENTARY FILM / HOOK SET

Note: For mechanical tools in special tool cabinet - Model series: E53

Order number: 00 0 338

Supplementary film / hook set

00 0 339 SUPPLEMENTARY FILM / HOOK SET

Note: For mechanical tools in special tool cabinet - Special tools 24 4 137, 33 3 030, 33 3 040

Order number: 00 0 339

Supplementary film / hook set

00 0 341 SUPPLEMENTARY FILM / HOOK SET

Note: For mechanical tools in special tool cabinet - Engine: S54

Order number: 00 0 341

Supplementary film / hook set

00 0 342 SUPPLEMENTARY FILM AND HOOK SET

Note: For mechanical tools in special tool cabinet E65 / M57TU, M67

Order number: 00 0 342

Supplementary film and hook set

00 0 343 FILM AND HOOK SET

Note: For mechanical tools in special tool cabinet E65, N73

Order number: 00 0 343

Film and hook set

00 0 344 FILM AND HOOK SET

Note: For mechanical tools in special tool cabinet R50, W17

Order number: 00 0 344

Film and hook set

00 0 345 FILM AND HOOK SET

Order number: 00 0 345

Film and hook set

00 0 346 FILM AND HOOK SET

Order number: 00 0 346

Film and hook set

00 0 347 FILM AND HOOK SET

Order number: 00 0 347

Film and hook set

00 0 348 FILM AND HOOK SET

Order number: 00 0 348

Film and hook set

00 0 354 FILMS/HOOK SET E90

Order number: 00 0 354

Films/hook set E90

00 0 355 FILMS/HOOK SET

Note: 61 6 100, 61 6 110

Order number: 00 0 355

Films/hook set

00 0 356 FILMS/HOOK SET

Note: 23 0 320

Order number: 00 0 356

Films/hook set

00 0 357 FILMS/HOOK SET

Note: For 33 4 285

Order number: 00 0 357

Films/hook set

00 0 358 FILMS/HOOK SET

Order number: 00 0 358

Films/hook set

00 0 359 SUPPLEMENTARY FOILS + HOOKS FOR 24 2 354 & 24 4 166

Order number: 00 0 359

Supplementary foils + hooks for 24 2 354 & 24 4 166

00 0 361 SUPPLEMENTARY FILMS/HOOKS FOR N43, N47

Order number: 00 0 361

Supplementary films/hooks for N43, N47

00 0 415 FILM SET 1 + 2 FOR E87

Order number: 00 0 415

Film set 1 + 2 for E87

00 0 416 FILM SET CABLE CABINET 1 FOR E90

Order number: 00 0 416

Film set cable cabinet 1 for E90

00 0 418 FILM SET CABLE CABINET 2

Order number: 00 0 418

Film set cable cabinet 2

00 0 450 CROSS-MEMBER / SUB-NO.

Note: Reserved for consecutive sub-no. crossmember 00 0 200

SI number: 1 10 02 (907)

Order number: 00 0 450

Cross-member / sub-no.

00 1 000 SPECIAL TOOL CABINET, LENGTH 6 M, COMPLETE CURRENT RANGE OF EQUIPMENT.

Note: Range of equipment comprises: - Base frame - Films - Hooks - 5 large special tool boards - 4 small special tool boards Accessories such as storage shelves (00 0 250), drawer blocks (00 0 260) and rear panels (00 0 270) must be ordered separately.

SI number: 1 10 04 (092)

Order number: 00 1 000

Special tool cabinet, length 6 m, complete current range of equipment.

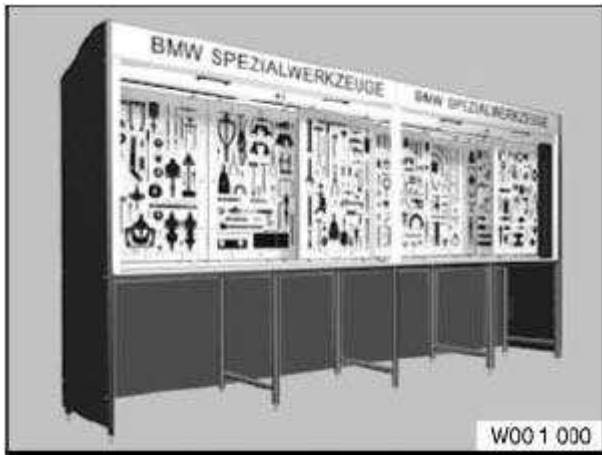


Fig. 32: Special Tool Cabinet (00 1000)
Courtesy of BMW OF NORTH AMERICA, INC.

00 1 010 SPECIAL TOOL CABINET, LENGTH 4 M AND 2 M, COMPLETE CURRENT RANGE OF EQUIPMENT.

Note: Consisting of tool cabinet 4 m and 2 m. All boards covered with film, hook set and folding index with list. Accessories such as storage shelves (00 0 250), drawer blocks (00 0 260) and rear panels (00 0 270) must be ordered separately.

Order number: 00 1 010

Special tool cabinet, length 4 m and 2 m, complete current range of equipment.

00 1 140 E87 FILM AND HOOK SET

Note: E87

Order number: 00 1 140

E87 film and hook set

Consisting of:

1 = 00 1 141 Film sheet

2 = 00 1 142 Hook set

00 1 150 N 52 FILM AND HOOK SET

Note: N52

Order number: 00 1 150

N 52 film and hook set

Consisting of:

1 = 00 1 151 Film sheet

2 = 00 1 152 Hook set

00 1 160 FILM AND HOOK SET FOR S85

Note: (for action tools)

SI number: 1 12 05 (196)

Order number: 00 1 160

Film and hook set for S85

00 1 161 FILM S85

Order number: 00 1 161

Film S85

00 1 162 HOOK SET S85

Order number: 00 1 162

Hook set S85

00 1 170 FILM AND HOOK SET FOR S85

Note: (for store tools)

SI number: 1 12 05 (196)

Order number: 00 1 170

Film and hook set for S85

00 1 171 FILM S85

Order number: 00 1 171

Film S85

00 1 172 HOOK SET S85

Order number: 00 1 172

Hook set S85

00 1 300 TOOL CABINET, USA VERSION, COMPLETE

Note: Consisting of: - Tool cabinet 4 m - All boards covered with film, USA version - including hook set - including lighting

Order number: 00 1 300

Tool cabinet, USA version, complete

Consisting of:

1 = 00 1 301 2 m tool cabinet USA basic version

Note: Consisting of: - Tool cabinet 2 m - Large bright-finish board - including lighting

2 = 00 1 302 2 m tool cabinet USA add-on version

Note: Consisting of: - Tool cabinet 2 m - Large bright-finish board - including lighting

00 1 310 TOOL BOARDS, COMPLETE, USA VERSION

Note: Consisting of: - 3 large tool boards, covered with film - including hook set - including wall mounting

Order number: 00 1 310

Tool boards, complete, USA version

00 1 320 FILM SET, COMPLETE USA VERSION

Order number: 00 1 320

Film set, complete, USA version

Consisting of:

1 = 00 1 321 Film no. 1 USA version

2 = 00 1 322 Film no. 2 USA version

3 = 00 1 323 Film no. 3 USA version

4 = 00 1 324 Film no. 4 USA version

5 = 00 1 325 Film no. 5 USA version

6 = 00 1 326 Film no. 6 USA version

7 = 00 1 327 Film no. 7 USA version

8 = 00 1 328 Film no. 8 USA version

9 = 00 1 329 Film no. 9 USA version

00 1 331 FILM NO. 10 USA VERSION

Order number: 00 1 331

Film no. 10 USA version

00 1 332 FILM NO. 11 USA VERSION

Order number: 00 1 332

Film no. 11 USA version

00 1 333 FILM NO. 12 USA VERSION

Order number: 00 1 333

Film no. 12 USA version

00 1 340 HOOK SET, COMPLETE, FOR 00 1 300, USA VERSION

Order number: 00 1 340

Hook set, complete, for 00 1 300, USA version

Consisting of:

1 = 00 1 341 Hook set for film no. 1 USA-Version

2 = 00 1 342 Hook set for film no. 2 USA version

3 = 00 1 343 Hook set for film no. 3 USA version

4 = 00 1 344 Hook set for film no. 4 USA version

5 = 00 1 345 Hook set for film no. 5 USA version

6 = 00 1 346 Hook set for film no. 6 USA version

7 = 00 1 347 Hook set for film no. 7 USA version

8 = 00 1 348 Hook set for film no. 8 USA version

9 = 00 1 349 Hook set for film no. 9 USA version

00 1 351 HOOK SET FOR FILM NO. 10 USA VERSION

Order number: 00 1 351

Hook set for film no. 10 USA version

00 1 352 HOOK SET FOR FILM NO. 11 USA VERSION

Order number: 00 1 352

Hook set for film no. 11 USA version

00 2 030 UNIVERSAL HYDRO-LIFTER BASIC UNIT

In conjunction with: 00 2 040, 23 0 040, 23 0 130, 24 0 170, 24 5 300, 25 5 350, 27 1 030, 33 4 420, 51 3 280

Note: Chassis and hydraulic jack - For removing and installing rear axle carriers and transmissions Also for convertible top take-up supports E85 and E64.

Series: E12, E21, E23, E24, E28, E30, E30/C, E30tou, E31, E32, E32/3, E34, E34tou, E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53, R56, RR1, RR2

SI number: 1 05 90 (207)

Order number: 00 2 030

Universal hydro-lifter basic unit

Consisting of:

1 = 00 2 031 Adapter for transmission brackets

Note: Model series: E30, E31, E32, E34, E36

In conjunction with: 23 0 000, 24 0 130

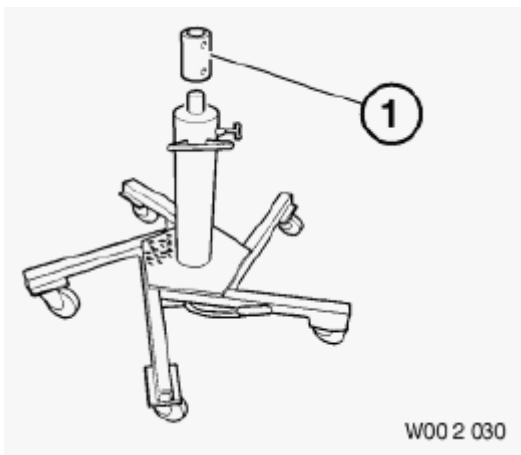


Fig. 33: Universal Hydro-Lifter Basic Unit (00 2 030)
Courtesy of BMW OF NORTH AMERICA, INC.

00 2 040 BASIC TAKE-UP FIXTURE

In conjunction with: 00 2 030, 33 3 270, 33 3 290, 33 3 300, 33 4 220, 33 4 230

Note: For removing and installing rear axle carriers, without pillar guide and lift hoist.

Series: E31, E32, E32/3, E34, E34tou, E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E81, E83, E85, E87, E90, E91, E92, E93, R56, RR1, RR2

Storage location: Single

SI number: 1 05 90 (207)

Order number: 00 2 040

Basic take-up fixture

Consisting of:

1 = 00 2 041 Base frame

2 = 00 2 042 Take-up fixtures, side

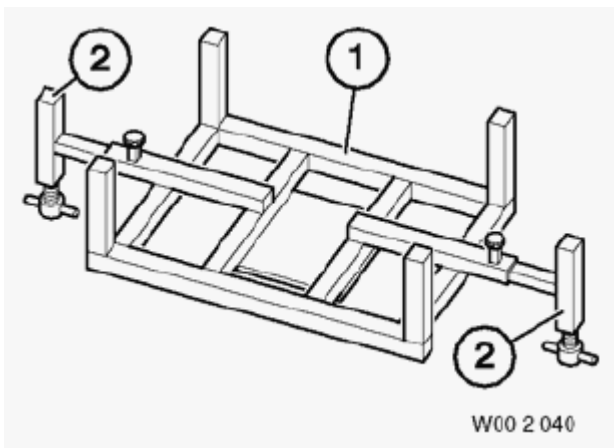


Fig. 34: Basic Take-Up Fixture (00 2 040)

Courtesy of BMW OF NORTH AMERICA, INC.

00 2 050 TORQUE WRENCH, ADJUSTABLE FROM 1 TO 36 NM

Note: For tightening ZF selector units and for adjusting brake bands BW65

Transmission: BW 65

Order number: 00 2 050

Torque wrench, adjustable from 1 to 36 Nm

Consisting of:

1 = 00 2 051 Torque wrench without socket ratchet

2 = 00 2 052 Socket ratchet

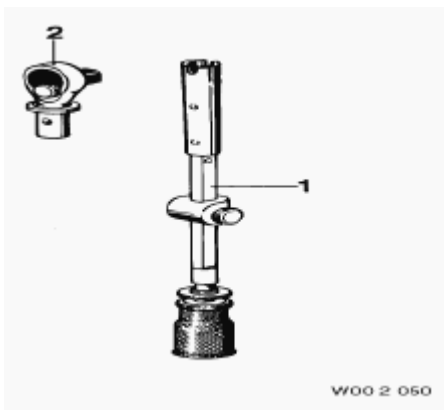


Fig. 35: Torque Wrench (00 2050)

Courtesy of BMW OF NORTH AMERICA, INC.

00 2 080 HAND PUMP

Note: For Lifetime oil filling

SI number: 1 01 98(294)

Order number: 00 2 080

Hand pump

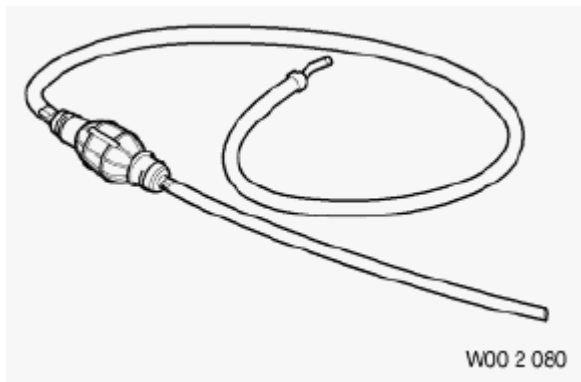


Fig. 36: Hand Pump (00 2080)

Courtesy of BMW OF NORTH AMERICA, INC.

00 2 210 EXHAUST PIPE CUTTER

Note: For V2a pipe

Series: E12, E21, E23, E24, E28, E30, E30/C, E30tou, E31, E32, E32/3, E34, E34tou, E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E68, E70, E81, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53, R56, RR1

Storage location: A9, B9

SI number: 1 03 95 (900)

Order number: 00 2 210

Exhaust pipe cutter

Consisting of:

2 = 00 2 212 Chain

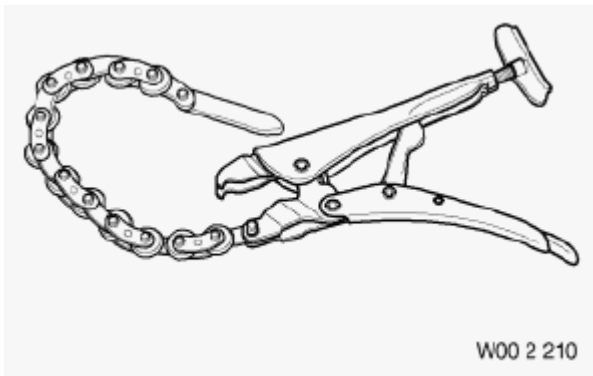


Fig. 37: Exhaust Pipe Cutter (00 2 210)
Courtesy of BMW OF NORTH AMERICA, INC.

00 2 250 SPECIAL PLIERS FOR CABLE RECONDITIONING

Note: With the market introduction of engines (N46, N52 and S85), cable 12 7 420/421 can be used for diagnosis after conditioning

SI number: 02 03 04 (106)

Order number: 00 2 250

Special pliers for cable reconditioning

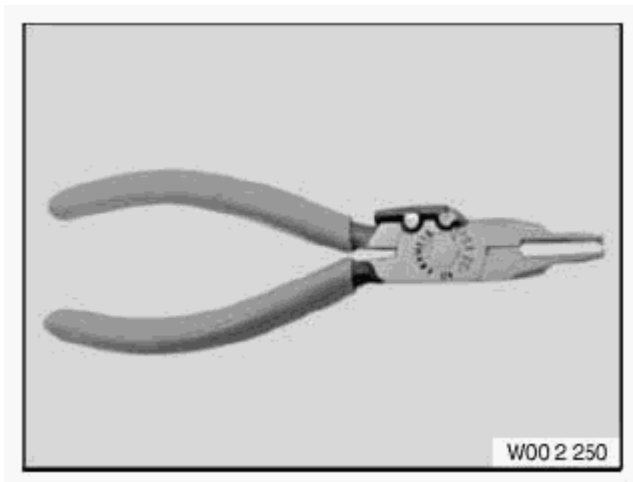


Fig. 38: Special Pliers For Cable Reconditioning (00 2 250)
Courtesy of BMW OF NORTH AMERICA, INC.

00 2 261 ADAPTER (2 X)

SI number: 01 22 06 (307)

Order number: 00 2 261

Adapter (2 x)

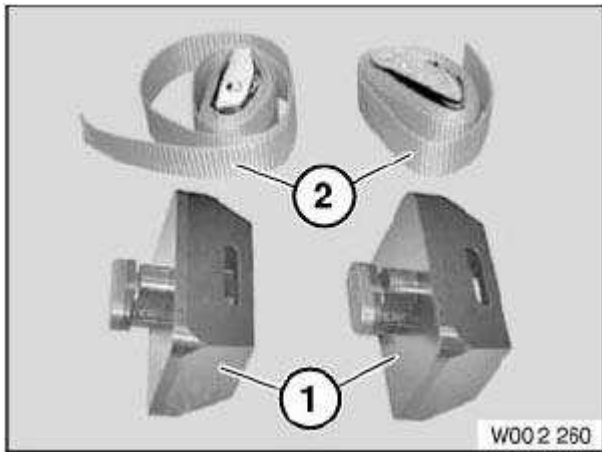


Fig. 39: Adapter (2 X) (00 2 261)

Courtesy of BMW OF NORTH AMERICA, INC.

00 2 262 TENSIONING STRAP (2 X)

SI number: 01 22 06 (307)

Order number: 00 2 262

Tensioning strap (2 x)

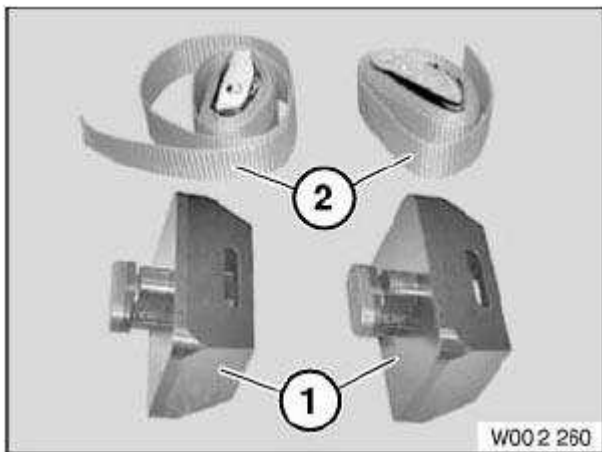


Fig. 40: Adapter (2 X) (00 2 261)

Courtesy of BMW OF NORTH AMERICA, INC.

00 2 520 TORX SOCKETS E10, E12, E14

Note: Replaced by Torx tool kit.

Order number: 00 2 520

Torx sockets E10, E12, E14

Consisting of:

1 = 00 2 521 Torx socket E10

2 = 00 2 522 Torx socket E12

3 = 00 2 523 Torx socket E14

00 2 550 DEPTH GAUGE

Note: E.g. for determining axial play of transmission shaft and basic adjustment dimension for installing bevel pinion in rear differentials

Transmission: 240/5, 242/4, 245/5, 245/5Sport, 260/5, 262/4, 265/5, 265/5Sport, 280/5Sport, A4S 200R, A5S 360R, A5S 390R, GS5-39DZ, diff. 188kom, diff. 220kom, diff. 225kom, diff. type G, diff. type K, diff. type M, S5D 200G, S5D 250G, S5D 260Z, S5D 280Z, S5D 310Z, S5D 320Z, S5D 390Z, S6S 420G, S6S 560G

Storage location: A12, B12

Order number: 00 2 550

Depth gauge

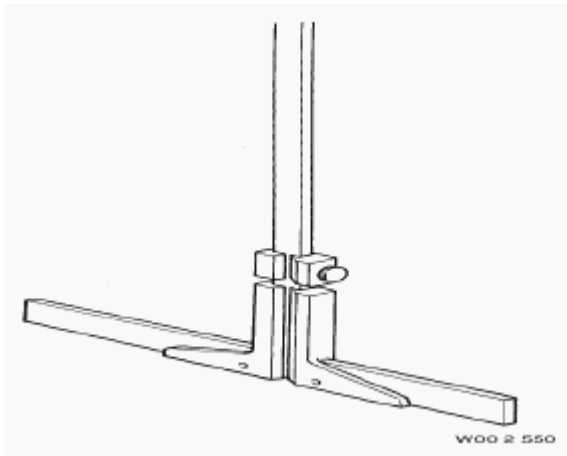


Fig. 41: Depth Gauge (00 2 550)

Courtesy of BMW OF NORTH AMERICA, INC.

00 4 420 CHARGER

Note: Charger for storage batteries in 00 4 400 and 00 4 410. > Input voltage 230 V / 50 Hz > Output voltage 1.65 V > Charge current miniature 4x400 mA > Charge current micro 4x300 mA

SI number: 1 01 05 (172)

Order number: 00 4 420

Charger



Fig. 42: Charger (00 4 420)

Courtesy of BMW OF NORTH AMERICA, INC.

00 5 010 UNIVERSAL PULLER

Minimum set: Mechanical tools

Note: For withdrawing radial seals 00 5 011 for E90

Series: E12, E21, E23, E24, E28, E30, E30/C, E30tou, E31, E32, E32/3, E34, E34tou, E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E81, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53, RR1, RR2

Storage location: B26

Order number: 00 5 010

Universal puller

Consisting of:

1 = 00 5 011 Extractor claw (3 pieces required)

2 = 00 5 012 Guide spindle

3 = 00 5 013 Pressure spindle

4 = 00 5 014 Take-up star

Note: For taking up extractor claw

5 = 00 5 015 Thrust member

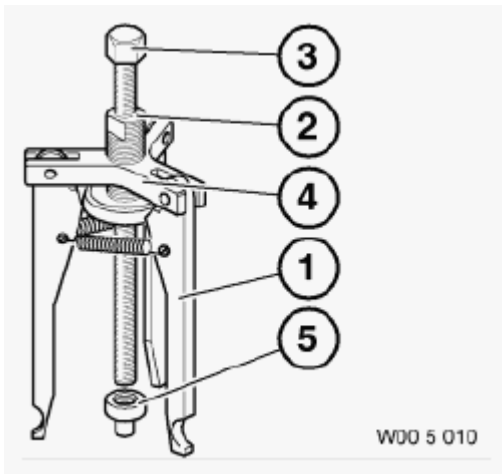


Fig. 43: Universal Puller (00 5 010)

Courtesy of BMW OF NORTH AMERICA, INC.

00 5 030 SPECIAL PLIERS FOR SEAT BELT LIMITER

Note: Replaced by 00 5 040

Order number: 00 5 030

Special pliers for seat belt limiter

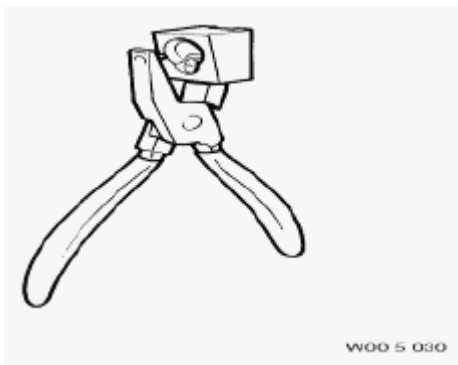


Fig. 44: Special Pliers For Seat Belt Limiter (005030)

Courtesy of BMW OF NORTH AMERICA, INC.

00 5 040 RIVETING TOOL

Note: For riveting seat belt limiter

Storage location: C10

SI number: 1 05 95(932)

Order number: 00 5 040

Riveting tool

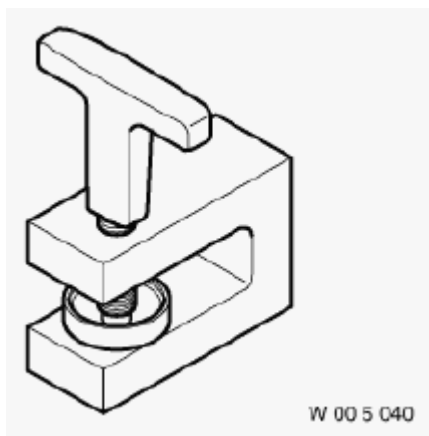


Fig. 45: Riveting Tool (00 5 040)

Courtesy of BMW OF NORTH AMERICA, INC.

00 5 101 FILM 1, BOARD I

SI number: 1 19 06 298

Order number: 00 5 101

Film 1, board I

00 5 102 FILM 2, BOARD I

SI number: 1 19 06 298

Order number: 00 5 102

Film 2, board I

00 5 103 FILM 3, BOARD I

SI number: 1 19 06 298

Order number: 00 5 103

Film 3, board I

00 5 104 FILM 4, BOARD II

SI number: 1 19 06 298

Order number: 00 5 104

Film 4, board II

00 5 105 FILM 5, BOARD II

SI number: 1 19 06 298

Order number: 00 5 105

Film 5, board II

00 5 106 FILM 6, BOARD II

SI number: 1 19 06 298

Order number: 00 5 106

Film 6, board II

00 5 107 FILM 7, BOARD II

SI number: 1 19 06 298

Order number: 00 5 107

Film 7, board II

00 5 108 FILM 8, BOARD II

SI number: 1 19 06 298

Order number: 00 5 108

Film 8, board II

00 5 109 FILM 9, BOARD 3

SI number: 1 19 06 298

Order number: 00 5 109

Film 9, board 3

00 5 111 FILM 10 A/B/C 19/20)

Note: Engine: N54

Order number: 00 5 111

Film 10 (A/B/C 19/20)

00 5 112 FILM 11 (A/B/C 21/22)

Note: Model series: E70

Order number: 00 5 112

Film 11 (A/B/C 21/22)

00 5 113 FILM 12 (A/B/C 23/24)

Note: GM6 and RHT

Order number: 00 5 113

Film 12 (A/B/C 23/24)

00 5 211 HOOK SET FOR FILM 10

Note: Engine: N54

Order number: 00 5 211

Hook set for film 10

00 5 212 HOOK SET

Note: Hook set for film 11

Order number: 00 5 212

Hook set

00 5 213 HOOK SET

Note: Hook set for film 12

Order number: 00 5 213

Hook set

00 5 301 FILM

Note: R56 "N12" N14

Order number: 00 5 301

Film

00 5 302 FILM

Note: R56/W16

Order number: 00 5 302

Film

00 5 351 HOOK SET

Note: R56 "N12" N14

Order number: 00 5 351

Hook set

00 5 352 HOOK SET

Note: R56/W16

Order number: 00 5 352

Hook set

00 5 499 SUPPLEMENTARY HOOK SET

Note: for film 1-9

SI number: 1 19 06 298

Order number: 00 5 499

Supplementary hook set

00 5 500 HANDLE FOR DRIFTS

Minimum set: Mechanical tools

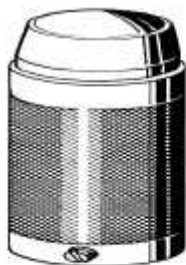
In conjunction with: 11 2 030

Series: E12, E21, E23, E24, E28, E30, E30/C, E30tou, E31, E32, E32/3, E34, E34tou, E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E81, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53, R56, RR1, RR2

Storage location: B31

Order number: 00 5 500

Handle for drifts



00 5 500

Fig. 46: Handle For Drifts (005 500)

Courtesy of BMW OF NORTH AMERICA, INC.

00 7 500 UNIVERSAL PULLER KUKKO 17/K

Note: For removing bearing inner race from drive flange at rear wheel bearing

Series: E12, E21, E23, E24, E28, E30, E30/C, E30tou, E31, E32, E32/3, E34, E34tou, E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E81, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53, R56, RR1

Order number: 00 7 500

Universal puller Kukko 17/K

Consisting of:

1 = 00 7 501 Pressure spindle with bridge

2 = 00 7 502 Adjusting spindle (2 x) with knurled nuts (4 x)

3 = 00 7 503 Pressure spindle, side

4 = 00 7 504 Adjusting jaws (2 x)

5 = 00 7 505 Adjusting screws (2 x) with nuts

Note: For adjusting jaw (2 x)

6 = 00 7 506 Extension (2 x)

7 = 00 7 507 Bridge

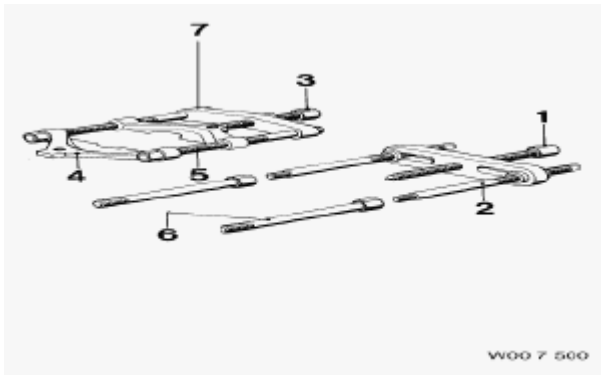


Fig. 47: Universal Puller Kukko 17/K (00 7 500)
Courtesy of BMW OF NORTH AMERICA, INC.

00 8 000 HYDRAULIC PULLER TOOL

In conjunction with: With all previous removal/installation tools for rubber mounts

Note: For removing and installing rubber mount in rear axle carrier

Series: E12, E21, E23, E24, E28, E30, E30/C, E30tou, E31, E32, E32/3, E34, E34tou, E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E83, E85, E87, R50, R52, R53, RR1

Storage location: Single

SI number: 1 02 99(417)

Order number: 00 8 000

Hydraulic puller tool

Consisting of:

1 = 00 8 001 Hydraulic pump

2 = 00 8 002 Hydraulic hose

3 = 00 8 003 Hydraulic cylinder

00 8 004 Threaded spindle

Note: M14 x 520

00 8 005 Threaded spindle

Note: M12 x 496

00 8 006 Threaded spindle (optional)

Note: M14 x 465

00 8 007 Nut M18

00 8 008 Securing line

00 8 009 Spindle with nut

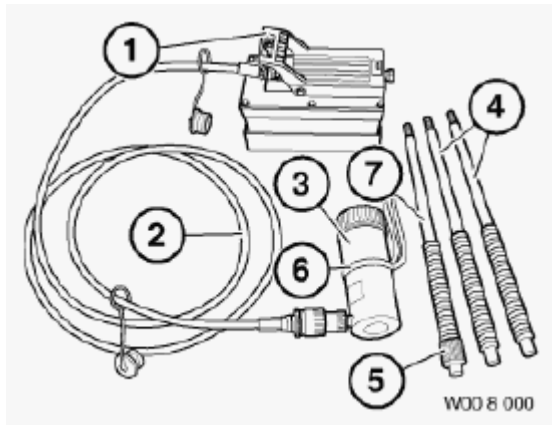


Fig. 48: Hydraulic Puller Tool (00 8 000)
Courtesy of BMW OF NORTH AMERICA, INC.

00 8 600 HOOK SET

Note: For reorganization and mounting of existing special tools on tool boards - NOTE: The following individual tools cannot be ordered in the set!

Series: All models

Order number: 00 8 600

Hook set

Consisting of:

1 = 00 8 601 Hook No. 1

10= 00 8 612 Hook No. 12

11= 00 8 613 Hook No. 13

12= 00 8 614 Hook No. 14

13= 00 8 615 Hook No. 15

14= 00 8 616 Hook No. 16

15= 00 8 617 Hook No. 17

16= 00 8 620 Hook No. 20

17= 00 8 621 Hook No. 21

18= 00 8 622 Hook No. 22

19= 00 8 625 Hook No. 25

2 = 00 8 602 Hook No. 2

20= 00 8 626 Hook No. 26

21= 00 8 628 Hook No. 28

22= 00 8 629 Hook No. 29

23= 00 8 630 Hook No. 30

3 = 00 8 603 Hook No. 3

4 = 00 8 604 Hook No. 4

5 = 00 8 606 Hook No. 6

6 = 00 8 608 Hook No. 8

7 = 00 8 609 Hook No. 9

8 = 00 8 610 Hook No. 10

9 = 00 8 611 Hook No. 11

00 8 660 MAGNET

Storage location: Tool cabinet

Order number: 00 8 660

Magnet

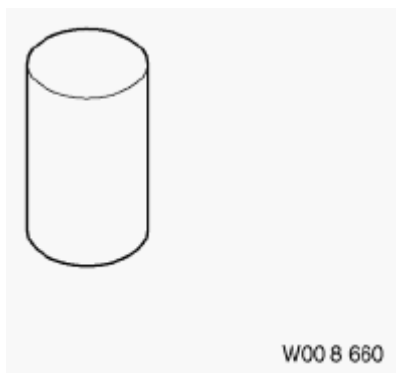


Fig. 49: Magnet (00 8660)

Courtesy of BMW OF NORTH AMERICA, INC.

00 8 690 WASHERS AND SCREWS

Order number: 00 8 690

Washers and screws

Consisting of:

1 = 00 8 691 Washers, 100 x

2 = 00 8 692 Screws, 100 x

3 = 00 8 693 Screws, 100 x

Note: For USA

4 = 00 8 694 Box 40 mm

5 = 00 8 695 Box 100 mm

6 = 00 8 696 Box 150 mm

00 9 010 TORX E18 SOCKET

Minimum set: Mechanical tools

Note: For releasing and tightening down transmission bolt connection on engine (aluminium bolts).

Series: E60, E61, E63, E64, E65, E83, E85, E87, E90, E91, E92

SI number: 1 17 04 (130)

Order number: 00 9 010

Torx E18 socket



Fig. 50: E18 Socket (00 9 010 Torx)

Courtesy of BMW OF NORTH AMERICA, INC.

00 9 110 CIRCLIP PLIERS

Note: External circlip-With long legs, 90° angle

Series: All models

Order number: 00 9 110

Circlip pliers

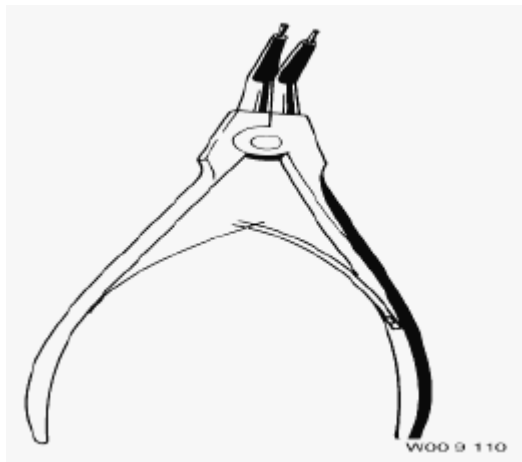


Fig. 51: Circlip Pliers (00 9 110)

Courtesy of BMW OF NORTH AMERICA, INC.

00 9 120 TORQUE ANGLE MEASURING DIAL

Minimum set: Mechanical tools

Note: For torsion angle tightening of cylinder head bolts (all engines) And reinforcement plate front axle carrier E46

Series: E12, E21, E23, E24, E28, E30, E30/C, E30tou, E31, E32, E32/3, E34, E34tou, E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E68, E70, E81, E82, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53, R56, RR1, RR2

Storage location: A12

Order number: 00 9 120

Torque angle measuring dial

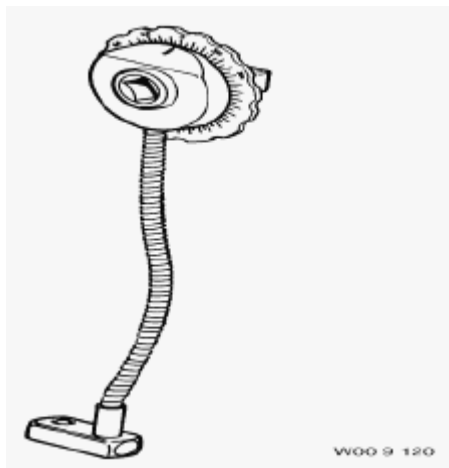


Fig. 52: Torque Angle Measuring Dial (00 9120)
Courtesy of BMW OF NORTH AMERICA, INC.

00 9 130 MAGNET WITH 1/2" CONNECTION

Minimum set: Mechanical tools

In conjunction with: 00 9 120

Note: For securing angle-of-rotation disk 00 9 120 to body.

Series: E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E81, E83, E85, E86, E87, E90, E91, E92

SI number: 1 17 04 (130)

Order number: 00 9 130

Magnet with 1/2" connection



Fig. 53: Magnet With 1/2" Connection (00 9 130)
Courtesy of BMW OF NORTH AMERICA, INC.

00 9 220 BENDING LEVER (2 X)

Minimum set: Mechanical tools

In conjunction with: 00 9 230

Note: For adjusting windshield wiper arms

Series: E12, E21, E23, E24, E28, E30, E31, E32, E34, E36, E36/7, E38, E52, E53, E81, E82, E83, E85, E86, E87, R50, R52, R53

Storage location: A14

SI number: 1 10 92 (579)

Order number: 00 9 220

Bending lever (2 x)

Consisting of:

1 = 00 9 221 Bending lever (wide)

2 = 00 9 222 Counterholder (narrow)

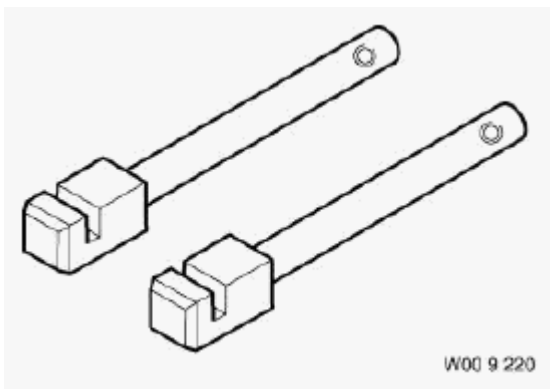


Fig. 54: Bending Lever (2 X) (00 9 220)

Courtesy of BMW OF NORTH AMERICA, INC.

00 9 290 RIVETING TOOL

Note: Is replaced by 00 2 240!

Series: All models

Order number: 00 9 290

Riveting tool

00 9 310 ASSEMBLY WEDGES (SET IN PLASTIC CASE)

Minimum set: Mechanical tools

Note: For straightening and assembly jobs on vehicle bodies, e.g. fitting trim panels, removing window weatherstrips, repairing small-scale dents, removing residual adhesive materials, measuring gap widths, levering out trim panel parts

Series: E12, E21, E23, E24, E28, E30, E30/C, E30tou, E31, E32, E32/3, E34, E34tou, E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E68, E70, E81, E82, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53, R55, R56, RR1, RR2

SI number: 1 25 05 230

Order number: 00 9 310

Assembly wedges (set in plastic case)

Consisting of:

1 = 00 9 311 Trim remover

2 = 00 9 312 Striking wedge, square

3 = 00 9 313 Striking wedge, large

4 = 00 9 314 Adjusting wedges (2 x)

5 = 00 9 315 Gap wedge

6 = 00 9 316 Sealing lip wedge

7 = 00 9 317 Trim panel wedge

8 = 00 9 318 Universal wedge

9 = 00 9 319 Striking wedge, small

10 = 00 9 321 Fishbone

11 = 00 9 322 Plastic wedge

12 = 00 9 323 Cleaning wedge (scraper)

13 = 00 9 324 Trim remover (metal plate)

Note: For removing stem trims from E60

14 = 00 9 329 Case with inlay for assembly wedges

In conjunction with: 009310

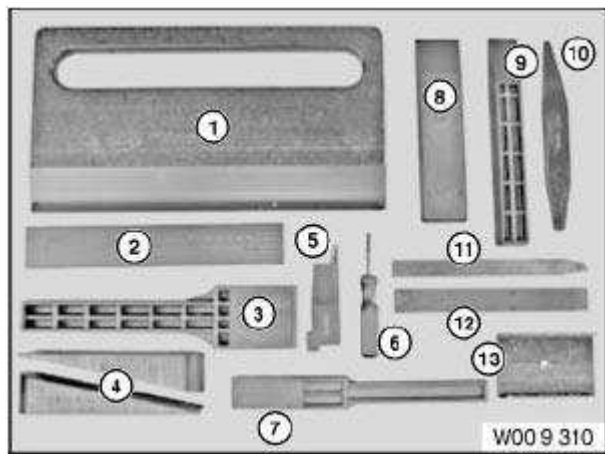


Fig. 55: Assembly Wedges (Set In Plastic Case) (00 9 310)
Courtesy of BMW OF NORTH AMERICA, INC.

00 9 330 WINDSCREEN WIPER SETTING TOOL

Minimum set: Mechanical tools

Note: For adjusting windscreen wiper arms

Series: E46, E52, E53, E60, E61, E63, E64, E65, E66, E81, E83, E85, E86, E87, RR1

Storage location: A40

SI number: 1 09 99 (432)

Order number: 00 9 330

Windscreen wiper setting tool

Consisting of:

1 = 00 9 331 Feeler gauge

2 = 00 9 332 Counter-holder

3 = 00 9 333 Bending lever

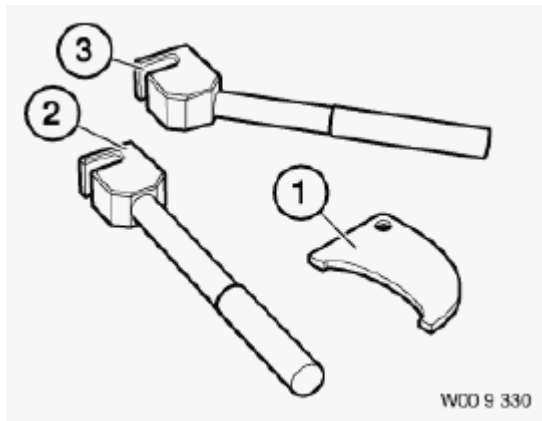


Fig. 56: Windscreen Wiper Setting Tool (00 9 330)
Courtesy of BMW OF NORTH AMERICA, INC.

00 9 340 DISASSEMBLY AID (2)

Minimum set: Mechanical tools

Note: For levering out switch block on driver's door.

Series: E12, E21, E23, E24, E28, E30, E30/C, E30tou, E31, E32, E32/3, E34, E34tou, E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C,

E52, E53, E60, E61, E63, E64, E65, E66, E67, E68, E70, E81, E82, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53, R55, R56, RR1, RR2

SI number: 1 15 99 (483)

Order number: 00 9 340

Disassembly aid (2)

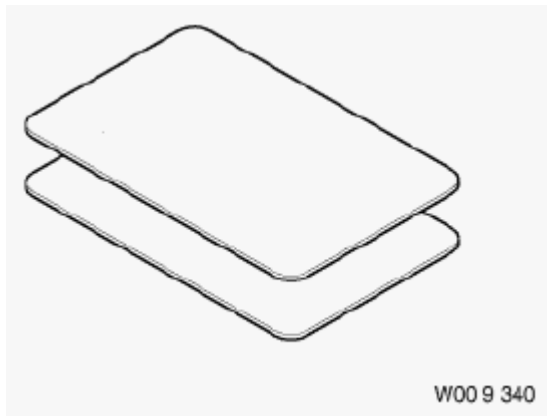


Fig. 57: Disassembly Aid (2) (00 9340)

Courtesy of BMW OF NORTH AMERICA, INC.

00 9 450 TORQUE WRENCH

Note: Infinitely adjustable from 0.05 Nm to 0.6 Nm (5 cNm to 60 cNm). 1/4" external square bit connection.

Series: E52, E53, E60, E61, E63, E64, E65, E66, E67, E68, E70, E81, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53, R56, RR1, RR2

SI number: 1 03 07 337

Order number: 00 9 450

Torque wrench



Fig. 58: Torque Wrench (00 9450)
Courtesy of BMW OF NORTH AMERICA, INC.

GENERAL INFORMATION

Maintenance and General Information - Tightening Torques - X3

00 MAINTENANCE AND GENERAL INFORMATION

00 00 EXCERPT FROM COMPANY STANDARD BMW GS 90003-2

00 00 EXCERPT FROM COMPANY STANDARD BMW GS 90003-2 TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
If there are no cross-references to tightening torques in the repair instructions, the excerpts from the company standard BMW GS 90003-2 must be observed.				
There are different screws / nuts with surface color / (surface coating) - yellow (ZN) and silver (ZNS) The maximum tightening torques are: Surface color yellow (ZN):				
Surface color silver (ZNS): The values specified in this table apply to all screw connections conforming to the aforementioned conditions. Not applicable when using a different surface or lubricant condition on the thread, or if the height of the nut differs.				
Not applicable to necked-down bolts, self-tapping screw connections or to connections between parts made of different				

materials.
Attention!
 To be able to carry out competent repairs, it is essential to comply with the specified tightening torques. This presupposes that the required torque wrenches are subjected to regular testing. Permitted tolerance of torque wrenches +/- 4 % of scale value. Approved torque wrenches and torque testers are contained in the catalogue Workshop Equipment Planning documentation.

00 00 M10 AND M10 X 1 - MAXIMUM TIGHTENING TORQUES ACC. TO BMW GS 90003-2

00 00 M10 AND M10 X 1 - MAXIMUM TIGHTENING TORQUES ACC. TO BMW GS 90003-2

	Type	Thread	Tightening specification	Measure
Scope of applicability of tightening torques, refer to <u>EXCERPT FROM COMPANY STANDARD BMW GS 90003-2</u>	Surface colour / (surface coating)			
M10 thread	yellow (ZN)	M10 8.8		47 N.m
	silver (ZNS)	M10 8.8		38 N.m
	yellow (ZN)	M10 10.9		66 N.m
	silver (ZNS)	M10 10.9		56 N.m
	yellow (ZN)	M10 12.9		79 N.m
	silver (ZNS)	M10 12.9		62 N.m
M10x1 thread	Yellow (ZN)	M10 x 1 8.8		54 N.m
	silver (ZNS)	M10 x 1 8.8		41 N.m
	yellow (ZN)	M10 x 1 10.9		75 N.m
	silver (ZNS)	M10 x 1 10.9		60 N.m
	yellow (ZN)	M10 x 1 12.9		91 N.m
	silver (ZNS)	M10 x 1 12.9		67 N.m

00 00 M12 AND M12X1.5 - MAXIMUM TIGHTENING TORQUES ACC. TO BMW GS 90003-2

00 00 M12 AND M12X1.5 - MAXIMUM TIGHTENING TORQUES ACC. TO BMW GS 90003-2

	Type	Thread	Tightening specification	Measure
Scope of applicability of tightening torques, refer to <u>EXCERPT FROM COMPANY STANDARD BMW GS 90003-2</u>	Surface colour / (surface coating)			
M12 thread	yellow (ZN)	M12 8.8		82 N.m
	silver (ZNS)	M12 8.8		66 N.m
	yellow (ZN)	M12 10.9		115 N.m
	silver (ZNS)	M12 10.9		98 N.m
	yellow (ZN)	M12 12.9		140 N.m
	silver (ZNS)	M12 12.9		108 N.m
M12x1.5 thread	yellow (ZN)	M12 x 1.5 8.8		87 N.m
	silver (ZNS)	M12 x 1.5 8.8		68 N.m
	yellow (ZN)	M12 x 1.5 10.9		123 N.m
	silver (ZNS)	M12 x 1.5 10.9		100 N.m
	yellow (ZN)	M12 x 1.5 12.9		147 N.m
	silver (ZNS)	M12 x 1.5 12.9		110 N.m

00 00 M14 AND M14X1.5 - MAXIMUM TIGHTENING TORQUES ACC. TO BMW GS 90003-2

00 00 M14 AND M14X1.5 - MAXIMUM TIGHTENING TORQUES ACC. TO BMW GS 90003-2

	Type	Thread	Tightening specification	Measure
Scope of applicability of tightening torques, refer to <u>EXCERPT FROM COMPANY STANDARD BMW GS 90003-2</u>	Surface colour / (surface coating)			
M14 thread	yellow (ZN)	M14 8.8		130 N.m
	silver (ZNS)	M14 8.8		104 N.m
	yellow (ZN)	M14 10.9		180 N.m
	silver (ZNS)	M14 10.9		155 N.m

	yellow (ZN)	M14 12.9		220 N.m
	silver (ZNS)	M14 12.9		170 N.m
M14x1.5 thread	yellow (ZN)	M14 x 1.5 8.8		143 N.m
	silver (ZNS)	M14 x 1.5 8.8		110 N.m
	yellow (ZN)	M14 x 1.5 10.9		200 N.m
	silver (ZNS)	M14 x 1.5 10.9		165 N.m
	yellow (ZN)	M14 x 1.5 12.9		240 N.m
	silver (ZNS)	M14 x 1.5 12.9		180 N.m

00 00 M16 AND M16X1.5 - MAXIMUM TIGHTENING TORQUES ACC. TO BMW GS 90003-2

00 00 M16 AND M16X1.5 - MAXIMUM TIGHTENING TORQUES ACC. TO BMW GS 90003-2

	Type	Thread	Tightening specification	Measure
Scope of applicability of tightening torques, refer to <u>EXCERPT FROM COMPANY STANDARD BMW GS 90003-2</u>	Surface colour / (surface coating)			
M16 thread	yellow (ZN)	M16 8.8		200 N.m
	silver (ZNS)	M16 8.8		160 N.m
	yellow (ZN)	M16 10.9		280 N.m
	silver (ZNS)	M16 10.9		235 N.m
	yellow (ZN)	M16 12.9		340 N.m
	silver (ZNS)	M16 12.9		260 N.m
M16x1.5 thread	yellow (ZN)	M16 x 1.5 8.8		216 N.m
	silver (ZNS)	M16 x 1.5 8.8		170 N.m
	yellow (ZN)	M16 x 1.5 10.9		303 N.m
	silver (ZNS)	M16 x 1.5 10.9		250 N.m
	yellow (ZN)	M16 x 1.5 12.9		364 N.m
	silver (ZNS)	M16 x 1.5 12.9		275 N.m

00 00 M18 AND M18X1.5 - MAXIMUM TIGHTENING TORQUES ACC. TO BMW GS 90003-2

00 00 M18 AND M18X1.5 - MAXIMUM TIGHTENING TORQUES ACC. TO BMW GS 90003-2

	Type	Thread	Tightening specification	Measure
Scope of applicability of tightening torques, refer to <u>EXCERPT FROM COMPANY STANDARD BMW</u>	Surface colour / (surface coating)			

GS 90003-2				
M18 thread	yellow (ZN)	M18 8.8		280 N.m
	silver (ZNS)	M18 8.8		225 N.m
	yellow (ZN)	M18 10.9		390 N.m
	silver (ZNS)	M18 10.9		330 N.m
	yellow (ZN)	M18 12.9		470 N.m
	silver (ZNS)	M18 12.9		365 N.m
M18x1.5 thread	yellow (ZN)	M18 x 1.5 8.8		313 N.m
	silver (ZNS)	M18 x 1.5 8.8		245 N.m
	yellow (ZN)	M18 x 1.5 10.9		440 N.m
	silver (ZNS)	M18 x 1.5 10.9		360 N.m
	yellow (ZN)	M18 x 1.5 12.9		527 N.m
	silver (ZNS)	M18 x 1.5 12.9		400 N.m

00 00 M4 AND M5 - MAXIMUM TIGHTENING TORQUES ACC. TO BMW GS 90003-2

00 00 M4 AND M5 - MAXIMUM TIGHTENING TORQUES ACC. TO BMW GS 90003-2

	Type	Thread	Tightening specification	Measure
Scope of applicability of tightening torques, refer to <u>EXCERPT FROM COMPANY STANDARD BMW GS 90003-2</u>	Surface colour / (surface coating)			
M4 thread	yellow (ZN)	M4 8.8		3 N.m
	silver (ZNS)	M4 8.8		2 N.m
	yellow (ZN)	M4 10.9		4 N.m
	silver (ZNS)	M4 10.9		3 N.m
	yellow (ZN)	M4 12.9		5 N.m
M5 thread	yellow (ZN)	M5 8.8		6 N.m
	silver (ZNS)	M5 8.8		5 N.m
	yellow (ZN)	M5 10.9		8 N.m
	silver (ZNS)	M5 10.9		7 N.m
	yellow (ZN)	M5 12.9		10 N.m
	silver (ZNS)	M5 12.9		8 N.m

00 00 M6 AND M7 - MAXIMUM TIGHTENING TORQUES ACC. TO BMW GS 90003-2

00 00 M6 AND M7 - MAXIMUM TIGHTENING TORQUES ACC. TO BMW GS 90003-2

	Type	Thread	Tightening specification	Measure
Scope of applicability	Surface colour /			

of tightening torques, refer to <u>EXCERPT FROM COMPANY STANDARD BMW GS 90003-2</u>	(surface coating)			
M6 thread	yellow (ZN)	M6 8.8		10 N.m
	silver (ZNS)	M6 8.8		8 N.m
	yellow (ZN)	M6 10.9		14 N.m
	silver (ZNS)	M6 10.9		12 N.m
	yellow (ZN)	M6 12.9		17 N.m
	silver (ZNS)	M6 12.9		13 N.m
M7 thread	yellow (ZN)	M7 8.8		15 N.m
	silver (ZNS)	M7 8.8		13 N.m
	yellow (ZN)	M7 10.9		21 N.m
	silver (ZNS)	M7 10.9		19 N.m
	yellow (ZN)	M7 12.9		26 N.m
	silver (ZNS)	M7 12.9		21 N.m

00 00 M8 AND M8 X 1 - MAXIMUM TIGHTENING TORQUES ACC. TO BMW GS 90003-2

00 00 M8 AND M8 X 1 - MAXIMUM TIGHTENING TORQUES ACC. TO BMW GS 90003-2

	Type	Thread	Tightening specification	Measure
Scope of applicability of tightening torques, refer to <u>EXCERPT FROM COMPANY STANDARD BMW GS 90003-2</u>	Surface colour / (surface coating)			
M8 thread	yellow (ZN)	M8 8.8		24 N.m
	silver (ZNS)	M8 8.8		19 N.m
	yellow (ZN)	M8 10.9		34 N.m
	silver (ZNS)	M8 10.9		28 N.m
	yellow (ZN)	M8 12.9		40 N.m
	silver (ZNS)	M8 12.9		32 N.m
M8x1 thread	yellow (ZN)	M8 x 1 8.8		26 N.m
	silver (ZNS)	M8 x 1 8.8		21 N.m
	yellow (ZN)	M8 x 1 10.9		36 N.m
	silver (ZNS)	M8 x 1 10.9		30 N.m
	yellow (ZN)	M8 x 1 12.9		44 N.m
	silver (ZNS)	M8 x 1 12.9		33 N.m

GENERAL INFORMATION

BMW - Gasoline - 1982-2012

BRAKE PAD WARNING LIGHT

- NOTE:** Most vehicles are equipped with a Malfunction Indicator Light (MIL) or check engine light. If light comes on and remains on while driving, the vehicle requires some type of repair. See appropriate service and repair information. After repairing fault(s) and clearing fault code(s), the Malfunction Indicator Light (MIL) or check engine light should go out. Some models may use a dual-function indicator light, which is also used to indicate emission component service is due. After performing required service, reset indicator light.
- NOTE:** Brake pad warning light should go out after replacement of brake pad thickness sensor. If warning light does not go out, turn ignition on, engine off, for 30-45 seconds. Warning light should go out. If the above procedure is not successful, connect vehicle to DIS tester, access Instrument Cluster/IKE, then "clear fault memory".
- NOTE:** The base instrument cluster OIL SERVICE INSPECTION display is located on the bottom of the cluster, to the right of center. The base cluster is also equipped with a graphic display of the car that shows if a door or the trunk lid is open. The high instrument cluster OIL SERVICE INSPECTION display is located on the bottom of the cluster, to the left of center.
- NOTE:** To determine the appropriate reset procedure, refer to BRAKE PAD WARNING LIGHT RESET INDEX. Only vehicles listed in this index have a specific brake pad warning light reset procedure. For other vehicles, perform PROCEDURE 1 first. If light does not reset, perform PROCEDURE 2. If the above procedures are not successful, connect vehicle to DIS tester, access Instrument Cluster/IKE, then "clear fault memory".

BRAKE PAD WARNING LIGHT RESET INDEX

Model & Year	Reset Procedure
5-Series	
1997-00 (w/High Instrument Cluster)	<u>Brake Pad Warning Light Reset - Procedure 1</u>
1997-00 (w/Base Instrument Cluster)	<u>Brake Pad Warning Light Reset - Procedure 2</u>
7-Series	
1997-00	<u>Brake Pad Warning Light Reset - Procedure 1</u>

BRAKE PAD WARNING LIGHT RESET - PROCEDURE 1

To reset light after replacing brake pads, turn ignition on with engine off. Wait 30 seconds. Brake pad warning indicator light will switch off.

BRAKE PAD WARNING LIGHT RESET - PROCEDURE 2

Start engine. Brake pad warning indicator will switch off.

OXYGEN SENSOR WARNING LIGHT

NOTE: To determine the appropriate reset procedure, refer to **OXYGEN SENSOR WARNING LIGHT RESET INDEX**. Only vehicles listed in this index have an oxygen sensor warning light.

OXYGEN SENSOR WARNING LIGHT RESET INDEX

Model & Year	Reset Procedure
All Models	
1983 & Earlier	<u>Oxygen Sensor Warning Light Reset - Procedure 1</u>
1984 & Later	<u>Oxygen Sensor Warning Light Reset - Procedure 2</u>

OXYGEN SENSOR WARNING LIGHT RESET - PROCEDURE 1

1. Every 30,000 miles (25,000 miles on 528i) the OXYGEN light in dash will come on as a reminder to replace the oxygen sensor.

NOTE: On 528e models, pull the protective metal plate off before removing oxygen sensor.

2. On 528e models, no interval reset switch is provided. After replacing sensor, remove instrument panel. Remove and discard bulb for OXYGEN sensor light.
3. On all other models, trace speedometer cable to interval switch (in-line with cable, mounted on frame rail left of transmission). Press White reset button. See **Fig. 1**. Ensure warning light is out.

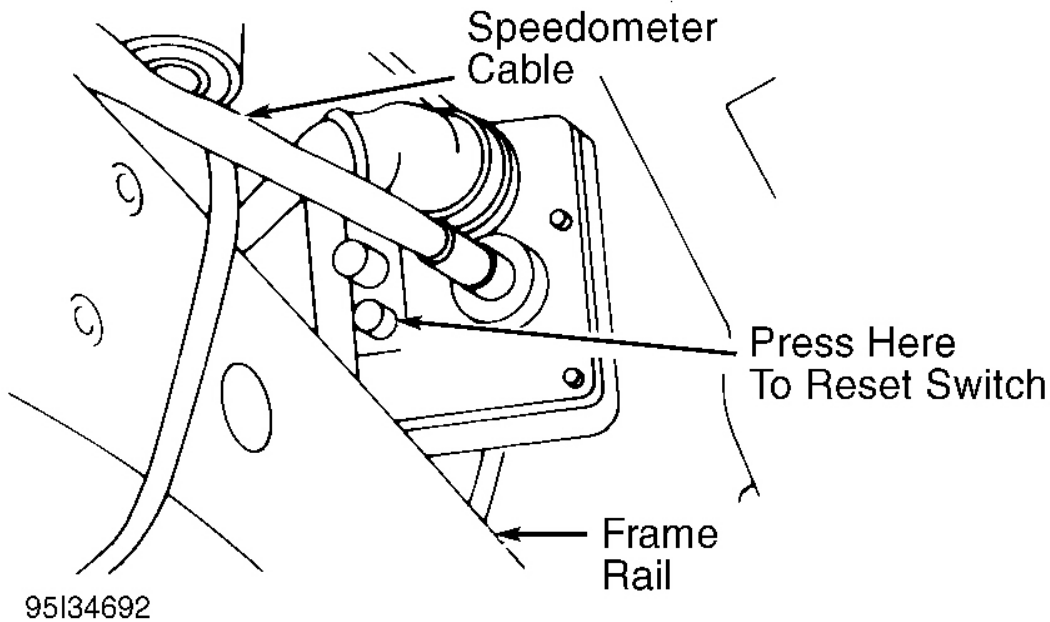


Fig. 1: Locating Oxygen Sensor Warning Light Reset Switch (All BMW Models Before 1983)
Courtesy of BMW OF NORTH AMERICA, INC.

OXYGEN SENSOR WARNING LIGHT RESET - PROCEDURE 2

NOTE: Some late production (February 1985 and later) BMW models have a reset button on rear of the light control assembly located near pedal assembly. Press button to reset light after servicing oxygen sensor.

No reset switch is provided. When oxygen sensor light comes on, service oxygen sensor. Remove and discard bulb from indicator.

SERVICE INTERVAL REMINDER LIGHTS

NOTE: This is sometimes referred to as the "Oil Change Light" or "Oil Service Light".

NOTE: The service indicator can only be reset using the reset mode in the instrument cluster or by using BMW hardware. This procedure applies to 3-Series from production date 9/99, and 5-Series and 7-Series from production date 9/00 (except 2002-05 7-Series and 2004-05 5-Series) without an engine compartment diagnostic connector.

- On models that still use the round diagnostic connector in engine compartment, use SIA reset tool to reset service lights. See SERVICE

INTERVAL LIGHT RESET - PROCEDURE 1.

- On models without the round diagnostic connector in the engine compartment, the use of the SIA reset tool is not possible. See SERVICE INTERVAL LIGHT RESET - PROCEDURE 2.
- For 2002-up models with condition based service (CBS) interval system reset procedure, see SERVICE INTERVAL LIGHT RESET - PROCEDURE 3.

NOTE: To determine the appropriate reset procedure, refer to SERVICE INTERVAL REMINDER LIGHT RESET INDEX. Only vehicles listed in this index have a service interval reminder.

SERVICE INTERVAL REMINDER LIGHT RESET INDEX

Model & Year	Reset Procedure
Models With Engine Compartment Diagnostic Connector	
1983-05	<u>Service Interval Light Reset - Procedure</u> 1
Models Without Engine Compartment Diagnostic Connector	
2001-05	<u>Service Interval Light Reset - Procedure</u> 2
Models With Condition Based Service (CBS) Interval System	
2002-12	<u>Service Interval Light Reset - Procedure</u> 3
Models Without Condition Based Service (CBS) Interval System	
2004-05	<u>Service Interval Light Reset - Procedure</u> 4

DESCRIPTION & OPERATION

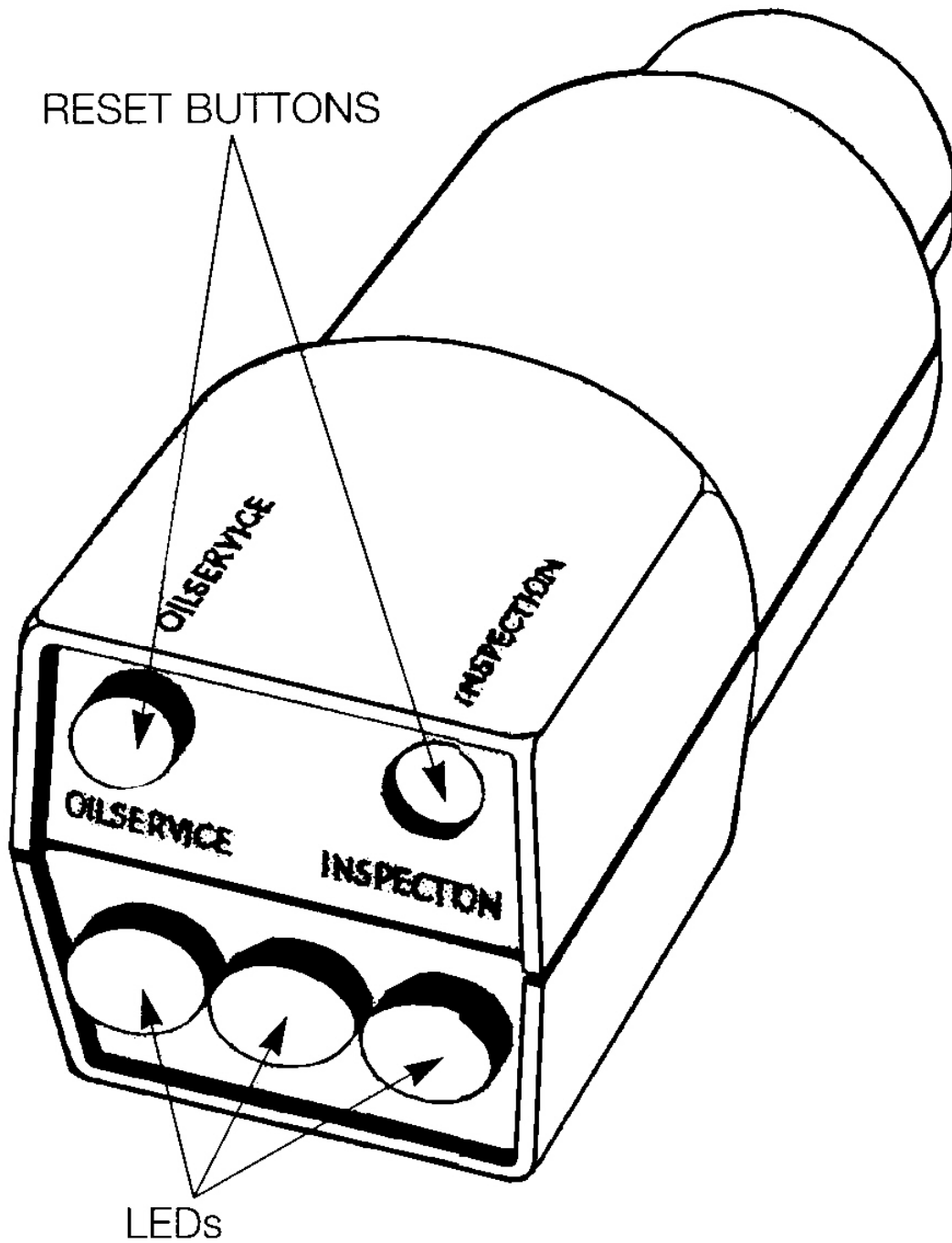
Starting in 1983 and ending on some models in 1999, service indicator on instrument panel consists of 5 Green, 3 Red and one Yellow Light Emitting Diodes (LED) and the inscriptions OIL SERVICE and INSPECTION. When ignition is on, as many as 5 Green LEDs will light up. The Green LEDs go out when the engine is started. If the Yellow LED glows and one of the inscriptions comes on and remains on when the engine is started, maintenance service is due immediately. When maintenance interval has been exceeded (after approximately 1000 miles) the Red LED's will come on in addition to the Yellow LED as a reminder for servicing.

Beginning on some models in 1999, a new method for displaying the service interval is used. Colored LEDs are no longer used to display the amount of time until the next service or inspection is due. The actual mileage remaining until the next service will be displayed for five seconds when the ignition is first switched on. The text OIL SERVICE or INSPECTION will also illuminate to show which service is due. A minus symbol (-) before the mileage display indicates that a service is past due.

The 2002-05 models with condition based service (CBS) interval system uses an entirely different service interval system. See SERVICE INTERVAL LIGHT RESET - PROCEDURE 3.

SERVICE INTERVAL LIGHT RESET - PROCEDURE 1

1. To reset instrument cluster SIA OIL SERVICE indicator, turn ignition switch to ON position. Connect Service Indicator Resetter (62 1 110) to diagnosis connector in engine compartment. See **Fig. 2**.
2. Press Yellow OIL SERVICE button. Green LED will illuminate. Wait until Yellow LED illuminates and then goes out again. Ensure that OIL SERVICE indicator has been reset.
3. To reset SERVICE INTERVAL indicator, press Red INSPECTION service button for inspection. Green LED illuminates. Wait until Red LED illuminates and then goes out again. Turn ignition switch to OFF position, wait 20 seconds and repeat procedure in order to adapt interval of annual inspection to inspection. Ensure that SERVICE INTERVAL indicator has been reset.



G00131569

Fig. 2: Identifying BMW Service Interval Reset Tool
Courtesy of BMW OF NORTH AMERICA, INC.

SERVICE INTERVAL LIGHT RESET - PROCEDURE 2

Reset service light by performing the following:

1. Ignition key must be in OFF position.
2. Press and hold trip odometer reset button in the instrument cluster (left button), and turn ignition key to first position.
3. Keep the button pressed for approximately 5 seconds until one of the following words appear in the display: "OIL SERVICE", or "INSPECTION", with "RESET".
4. Release reset button and press it again until "RESET" begins to flash in the display. See **Fig. 3** and **Fig. 4**.
5. Service due is shown with "RESET" if coded minimum consumption limit has been reached and resetting is possible. If "RESET" is not shown, minimum limit has not been reached and resetting is not possible.
6. While "RESET" is flashing, press left button briefly to reset service interval. After display has shown new interval, following will appear: "END SIA".
7. System can only be reset again after 2.5 gallons of fuel have been consumed.

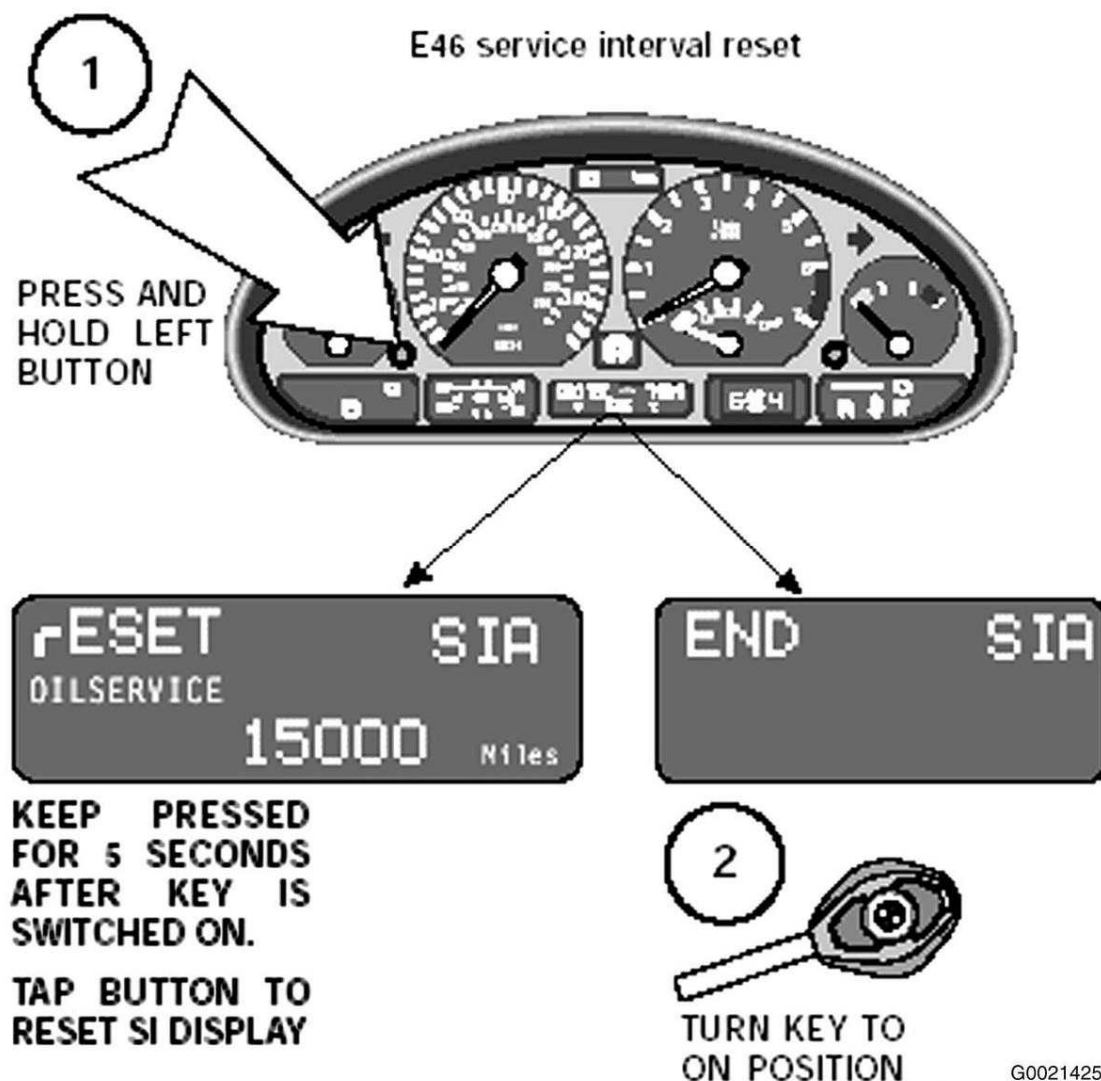


Fig. 3: Resetting Service Interval Light (E46)
Courtesy of BMW OF NORTH AMERICA, INC.

E39 service interval reset (High Version)

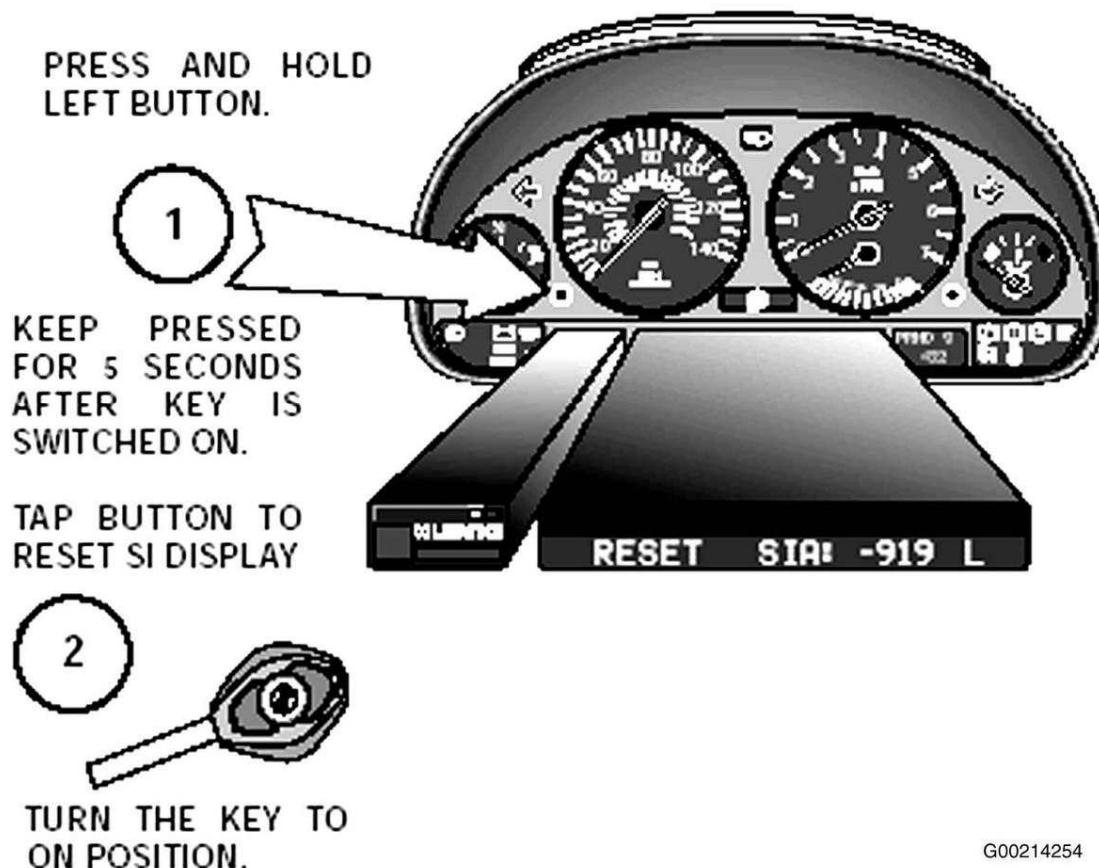


Fig. 4: Resetting Service Interval Light (E39)
Courtesy of BMW OF NORTH AMERICA, INC.

SERVICE INTERVAL LIGHT RESET - PROCEDURE 3

Models use a Condition Based Service (CBS) service interval system, which displays a Service Need Display (SND). When ignition is on, Service Need Display appears under the speedometer in the instrument cluster for 10 seconds in the place where the fuel tank level is normally displayed. The first line corresponds to the mileage dependent service items. It specifies the mileage when the next service is due.

If the mileage is exceeded (service overdue), it appears with a minus sign. The second line corresponds to the time dependent service items and is displayed by a clock symbol. It specifies the weeks/months/years when the next service is due. If the service is overdue, it appears with a minus sign. The actual service item (with additional information) can be viewed in the control display.

NOTE: On some models an appropriate scan tool may be used to reset CBS service schedules. By using suitable diagnostic equipment connected to the vehicle diagnostic connector it is possible to reset CBS service schedules at any time.

By selecting the `CBS' option, the diagnostic equipment will gather information regarding the current state of CBS items from their relevant modules on the CAN network.

Service reset is accomplished using instrument cluster:

1. Insert key into ignition.
2. Press start/stop button without depressing the clutch or brake, and wait for the service reminder to disappear.
3. Immediately after the service reminder indicator goes out, press and hold the odometer reset button. After 3 secs a warning triangle will appear, keep the odometer button pressed and after another 2-3 secs an oil can will appear.

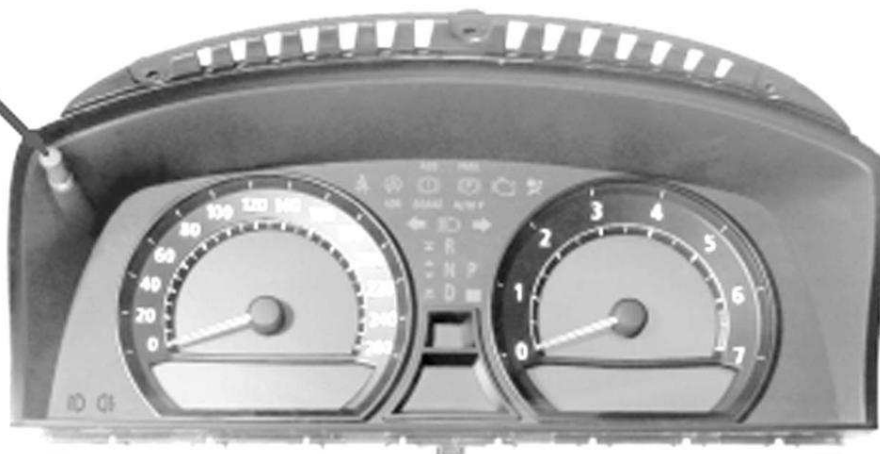
NOTE: If the odometer button is pressed too long (10 secs in total), German writing will appear (giving the software level/ can bus etc. of the vehicle). This indicates that you've overshoot the reset procedure and you need to re-start from the beginning.

4. The service menu should now be displayed. Use the toggle switch on indicator stalk (twisting the stalk) to scroll up/down through the various service items.
5. When the item to be reset is showing, press the BC button on end of indicator stalk. "Reset" should now appear in the display. Press in and hold the BC button for 2-3 secs and a whirling clock icon will be displayed. The reset procedure for the selected service item is done.
6. Scroll up/down to select another item (as in step 4), or press the start/stop button to exit.

NOTE: Residual wear or remaining time are specified (possibly with a minus sign). The "1" symbol means that you can reset service operation (early production vehicles may show an "F"), while a "0" indicates it is not resettable (the first 20 percent of the service interval is also protected against accidental reset). For additional information about Condition Based Service (CBS), see RESETTING AND CORRECTING CONDITION BASED SERVICE under PROGRAMMING in SELF-DIAGNOSIS - 7-SERIES article.

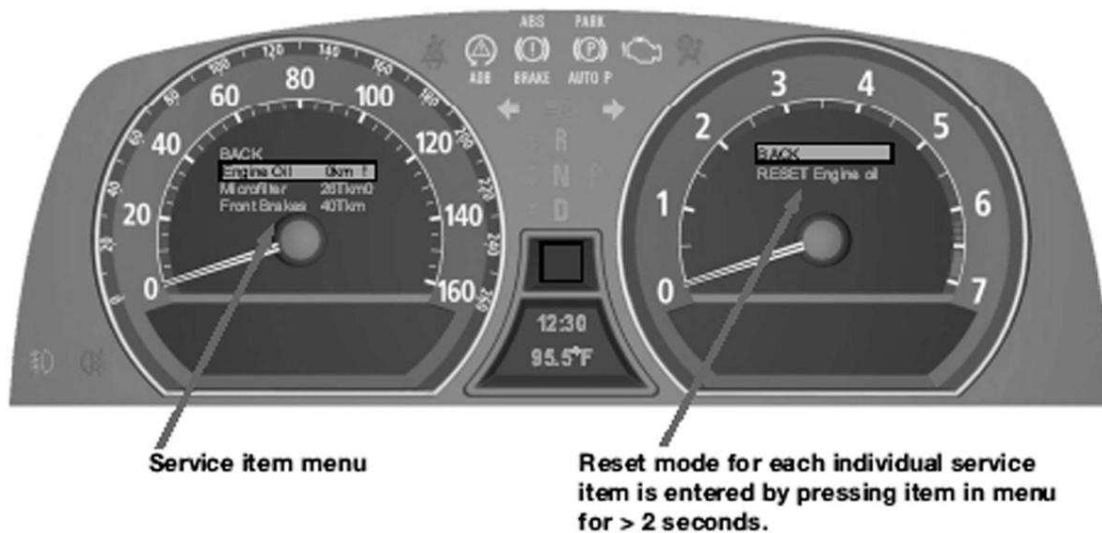
Reset Button

Press and hold for 10 seconds.



G00214255

Fig. 5: Identifying Condition Based Service (CBS) Instrument Panel Controls (1 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.



G00214256

Fig. 6: Identifying Condition Based Service (CBS) Instrument Panel Controls (2 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

SERVICE INTERVAL LIGHT RESET - PROCEDURE 4

The BMW maintenance system SIA IV (service interval indicator) is used on X3 models (E83). The service interval indicator is a system subject to constant development which in its development stages has been integrated in various model series such as E85 (Z4) and E46 (3 and M3-Series).

The service indicator appears in the LC display in the instrument cluster's speedometer. The indicator is shown for 5 seconds in the LC display after terminal R is "ON". See **Fig. 7**.

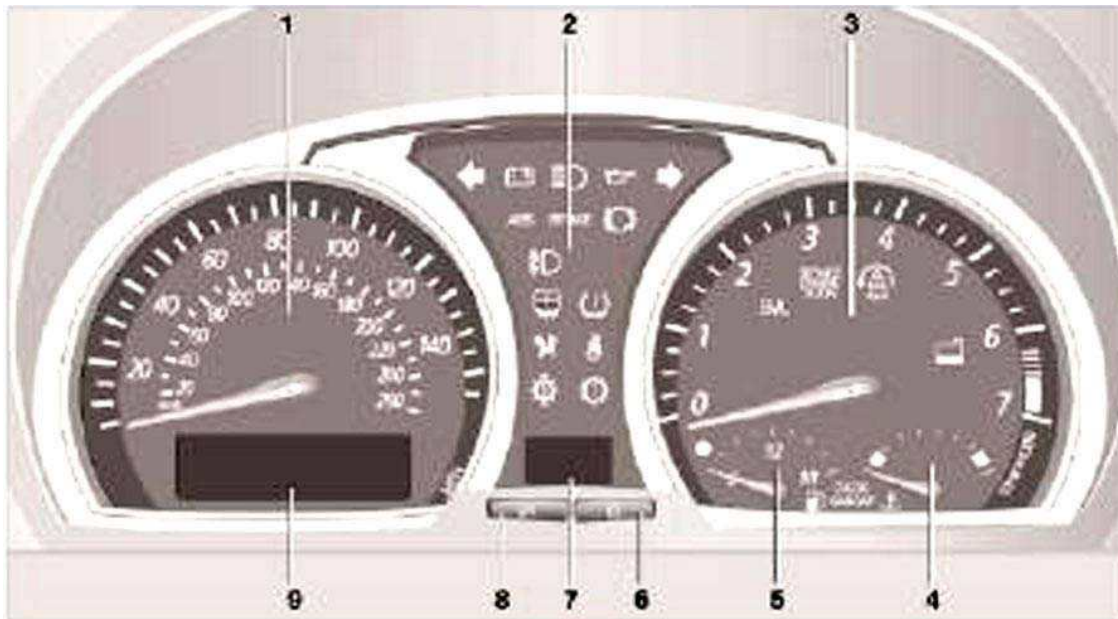


G00313209

Fig. 7: Identifying Service Interval Indicator
 Courtesy of BMW OF NORTH AMERICA, INC.

Resetting Service Interval Indicator

Resetting the service interval indicator for the oil service and inspection procedures can only be done by pressing the left button in the instrument cluster. See **Fig. 8**.



- | | |
|------------------------------|--|
| 1. Speedometer | 6. Button for display of Time and Service Interval |
| 2. Indicator Warning Lamps | 7. Display for Selector lever and program display |
| 3. Tachometer | 8. Button for reset of Trip Odometer and Time |
| 4. Coolant Temperature Gauge | 9. Display for Time, Service Interval, OBC |
| 5. Fuel Gauge | |

G00313208

Fig. 8: Identifying Service Interval Indicator Reset Button
 Courtesy of BMW OF NORTH AMERICA, INC.

TIRE PRESSURE MONITOR SYSTEM (TPMS)

NOTE: If a tire pressure has been adjusted, or a wheel or tire has been changed or replaced, or repairs have been made to air spring suspension, the TPM system must be reinitialized. System must be reinitialized both before and after pulling a trailer.

CAUTION: When driving with snow chains or a space-saver spare tire, DO NOT initialize the system.

NOTE: To determine the appropriate reset procedure, refer to TPMS RESET INDEX. Only vehicles listed in this index have a TPMS reset.

TPMS RESET INDEX

Model & Year	Reset Procedure
1-Series (128i & 135i)	
2008	<u>TPMS Reset - Procedure 6</u>
2009-12	<u>TPMS Reset - Procedure 7</u>
3-Series	
2001-08	<u>TPMS Reset - Procedure 1</u>
2009-11	<u>TPMS Reset - Procedure 7</u>
5-Series	
2001-03	<u>TPMS Reset - Procedure 1</u>
2004-09	<u>TPMS Reset - Procedure 6</u>
2010-12	<u>TPMS Reset - Procedure 7</u>
6-Series	
2004-09	<u>TPMS Reset - Procedure 6</u>
2010-10	<u>TPMS Reset - Procedure 7</u>
2012	<u>TPMS Reset - Procedure 7</u>
7-Series	
2002-05	<u>TPMS Reset - Procedure 2</u>
2006-12	<u>TPMS Reset - Procedure 7</u>
Alpina	
2007-08	<u>TPMS Reset - Procedure 4</u>
2011-12	<u>TPMS Reset - Procedure 7</u>
M3	
2001-06	<u>TPMS Reset - Procedure 1</u>
2008	<u>TPMS Reset - Procedure 6</u>
2009-13	<u>TPMS Reset - Procedure 7</u>

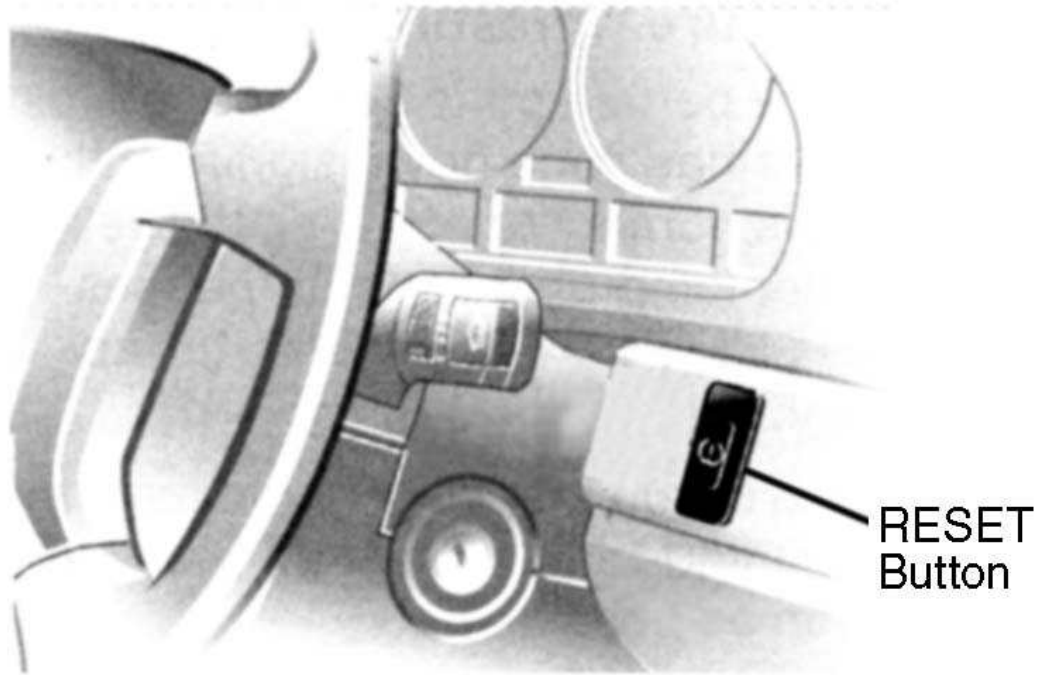
M5	
2002-03	<u>TPMS Reset - Procedure 3</u>
2006-08	<u>TPMS Reset - Procedure 6</u>
2009-10	<u>TPMS Reset - Procedure 7</u>
M6	
2006-07	<u>TPMS Reset - Procedure 6</u>
2008-10	<u>TPMS Reset - Procedure 7</u>
2012	<u>TPMS Reset - Procedure 7</u>
M-Coupe & M-Roadster	
2006-08	<u>TPMS Reset - Procedure 5</u>
X3	
2004-10	<u>TPMS Reset - Procedure 5</u>
2011-12	<u>TPMS Reset - Procedure 7</u>
X5 & X5 M	
2001-05	<u>TPMS Reset - Procedure 1</u>
2006	<u>TPMS Reset - Procedure 5</u>
2007-12	<u>TPMS Reset - Procedure 7</u>
X6 & X6 M	
2008-12	<u>TPMS Reset - Procedure 7</u>
Z3	
2001-02	<u>TPMS Reset - Procedure 1</u>
Z4	
2003-06	<u>TPMS Reset - Procedure 1</u>
2007-08	<u>TPMS Reset - Procedure 5</u>
2009-12	<u>TPMS Reset - Procedure 7</u>
Z8	
2001-03	<u>TPMS Reset - Procedure 1</u>

TPMS RESET - PROCEDURE 1

1. Set the tire pressure on all wheels to specification.
2. Turn ignition switch to ON position, with engine off.
3. Press reset button (for no longer than 10 seconds) until tire pressure warning light illuminates Yellow for a few seconds. See **Fig. 9**, **Fig. 10**, **Fig. 11** or **Fig. 12** .

NOTE: **On some X5 models, the reset button is marked "RDC".**

4. Drive vehicle. Initialization is automatically completed during the drive, without any feedback issued.



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Fig. 9: Locating TPM System Reset Button (5-Series)
Courtesy of BMW OF NORTH AMERICA, INC.

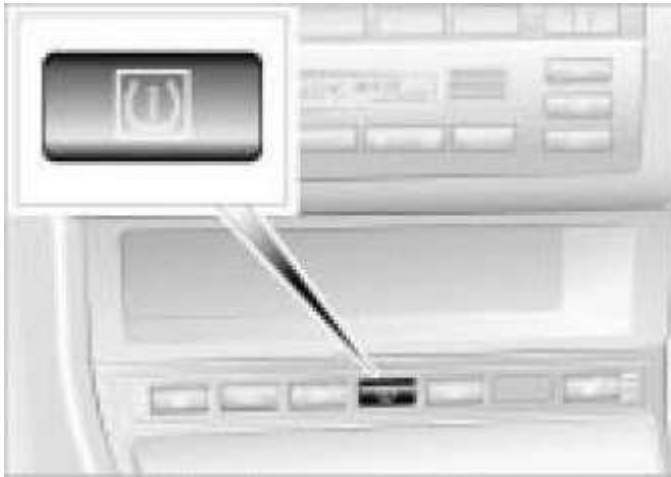
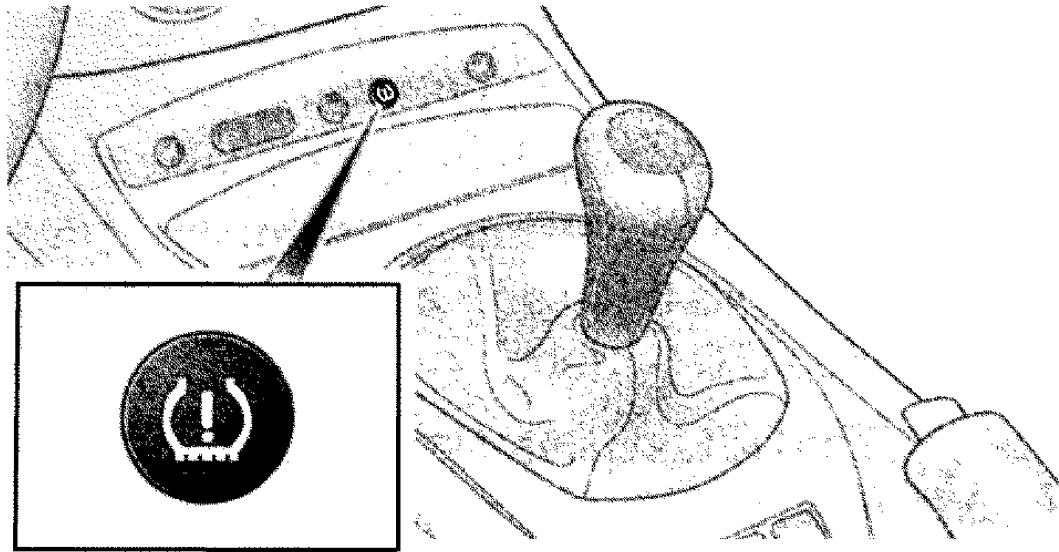
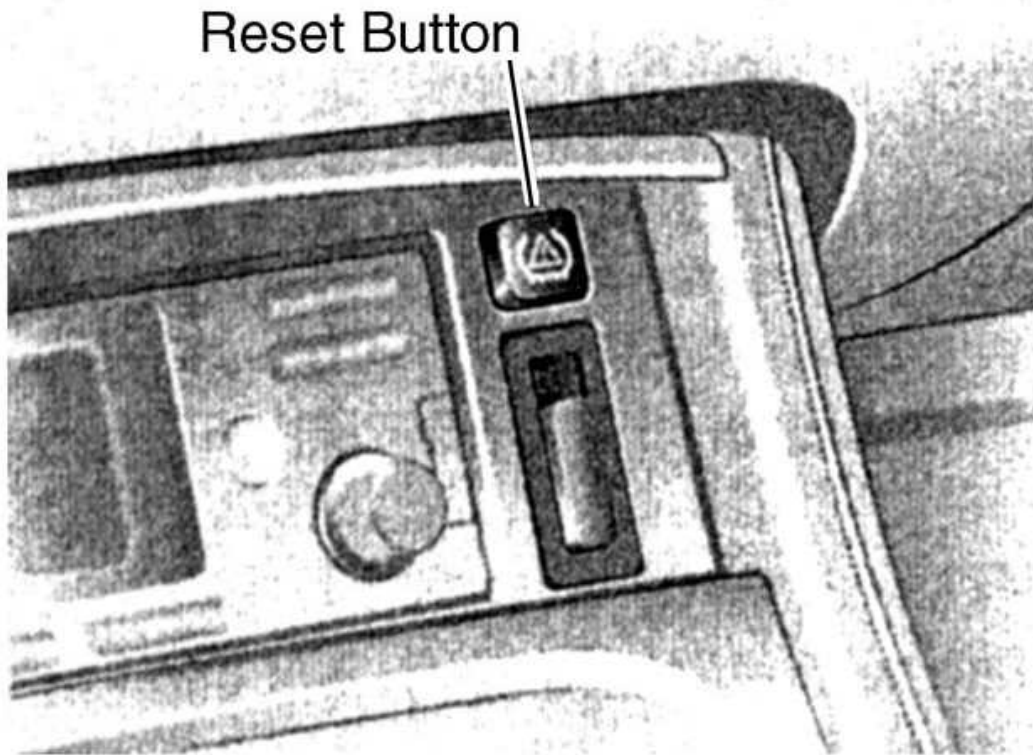


Fig. 10: Locating TPM System Reset Button (3-Series & X5 - Typical)
Courtesy of BMW OF NORTH AMERICA, INC.



G00225521

Fig. 11: Locating TPM System Reset Button (Z4)
Courtesy of BMW OF NORTH AMERICA, INC.



G00251684

Fig. 12: Locating TPM System Reset Button (Z28)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The initialization finishes during driving, which can be interrupted at any time. When driving resumes, the initialization is continued automatically.

1. Set the tire pressure of all wheels to specification.
2. Start engine, but do not start driving.
3. On Control Center, select "RPA" from the "SETTINGS" menu and confirm selection. The initialization menu will appear. See **Fig. 13**.
4. Select "SET" and confirm selection.
5. Drive vehicle. The message "FTM IS BEING INITIALIZED" will be displayed. See **Fig. 14**.

NOTE: It takes at least 10 minutes before the TPM system can detect and report a flat tire.

6. Select counterclockwise left arrow button and confirm to exit from menu.



Fig. 13: Identifying TPM System Reinitialization Messages (1 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

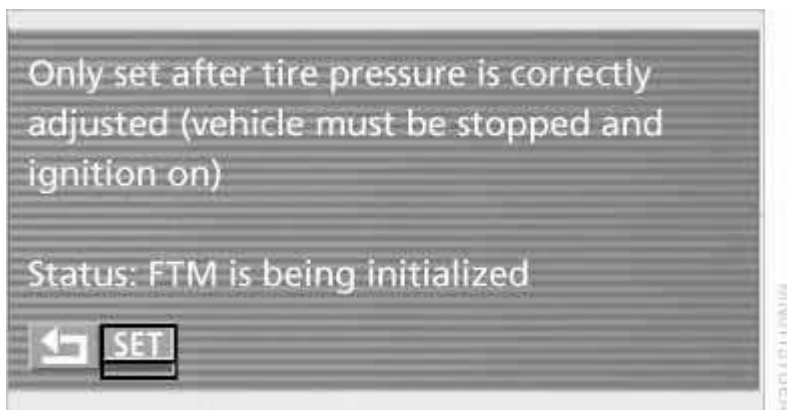


Fig. 14: Identifying TPM System Reinitialization Messages (2 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

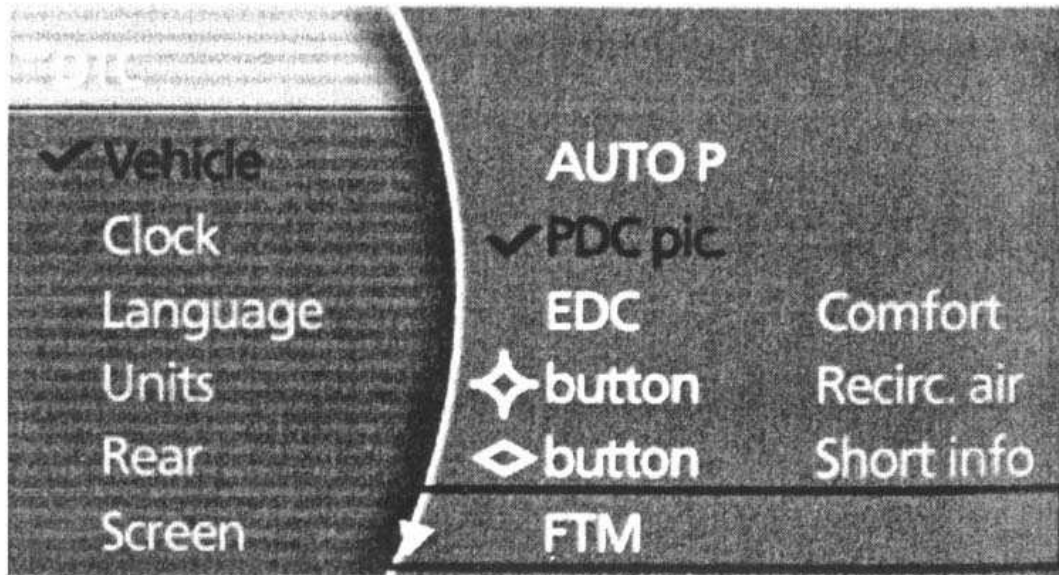
NOTE: The initialization finishes during driving, which can be interrupted at any time. When driving resumes, the initialization is continued automatically.

1. Set the tire pressure of all wheels to specification.
2. Start the engine.
3. Press iDrive knob down once to enter Vehicle Info.
4. Select Settings.
5. Select Vehicle Tires.
6. Select TPM.
7. Select Reset.
8. Scroll to Yes.
9. Select "YES" and press the controller.
10. After selecting Yes, drive vehicle until tires on iDrive screen turn green.

TPMS RESET - PROCEDURE 4

NOTE: The initialization finishes during driving, which can be interrupted at any time. When driving resumes, the initialization is continued automatically.

1. Set the tire pressure of all wheels to specification.
2. Press "MENU" button to open start menu.
3. Open the i-menu of the Control Center.
4. Select "SETTINGS" and press the controller.
5. Select "VEHICLE" and press the controller. See **Fig. 15**.
6. Select "TIRES: TPM" and press controller.
7. Start engine, but do not start driving.
8. Select "RESET" and press the controller.
9. Select "YES" and press the controller.
10. Drive vehicle. The message "RESETTING TPM...." will be displayed. Initialization is automatically completed during the drive. When initialization is complete, "STATUS: TPM ACTIVE" message will be displayed.



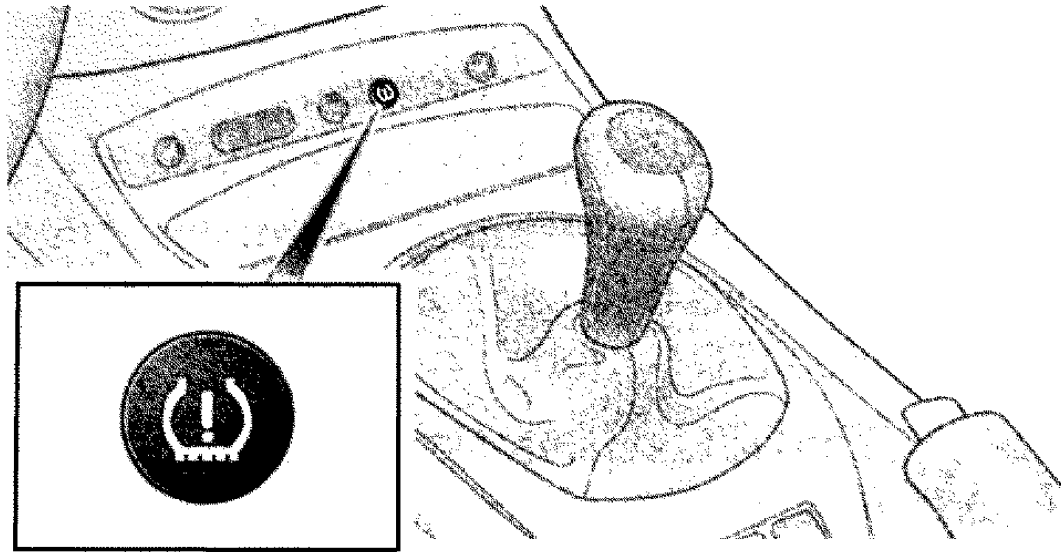
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Fig. 15: Identifying TPM System Reinitialization Messages
Courtesy of BMW OF NORTH AMERICA, INC.

TPMS RESET - PROCEDURE 5

CAUTION: When driving with snow chains or a space-saver spare tire, DO NOT initialize the system.

1. Set the tire pressure of all wheels to specification.
2. Start engine, but do not start driving.
3. Press reset button (for no longer than 10 seconds) until tire pressure warning light illuminates Yellow for a few seconds. See **Fig. 16**, **Fig. 17**, **Fig. 18** or **Fig. 19** .
4. Drive vehicle. Initialization is automatically completed during the drive, without any feedback issued.



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Fig. 16: Locating TPM System Reset Button (M-Coupe & Roadster)
Courtesy of BMW OF NORTH AMERICA, INC.

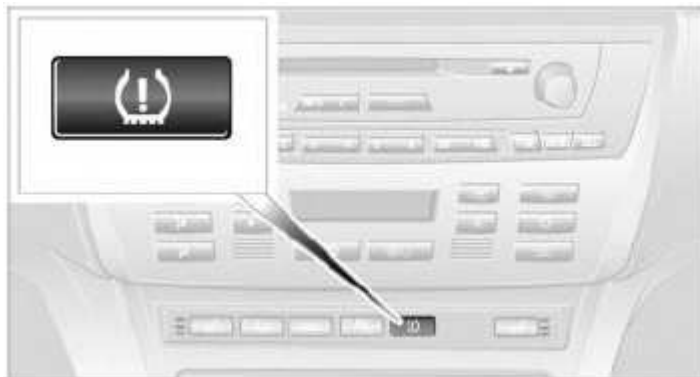
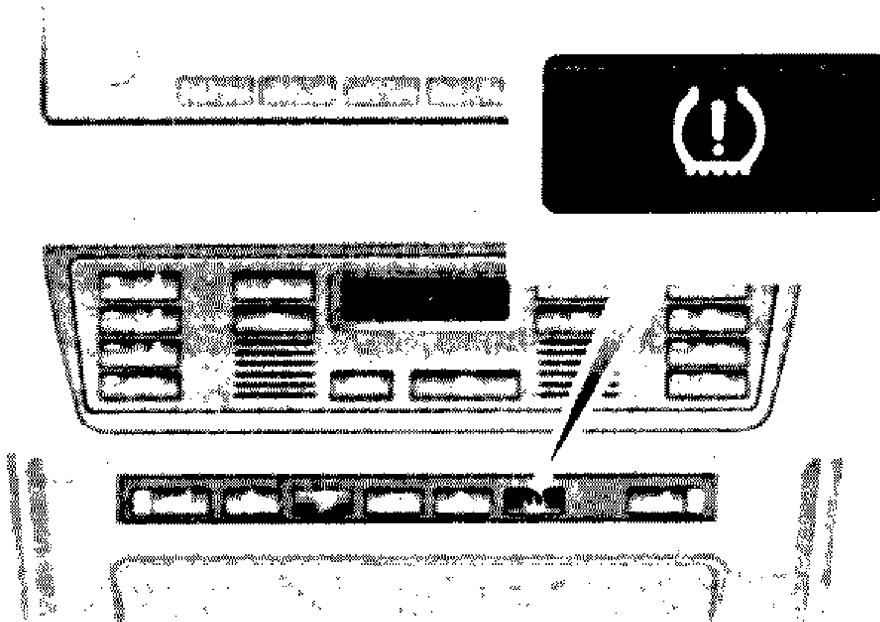
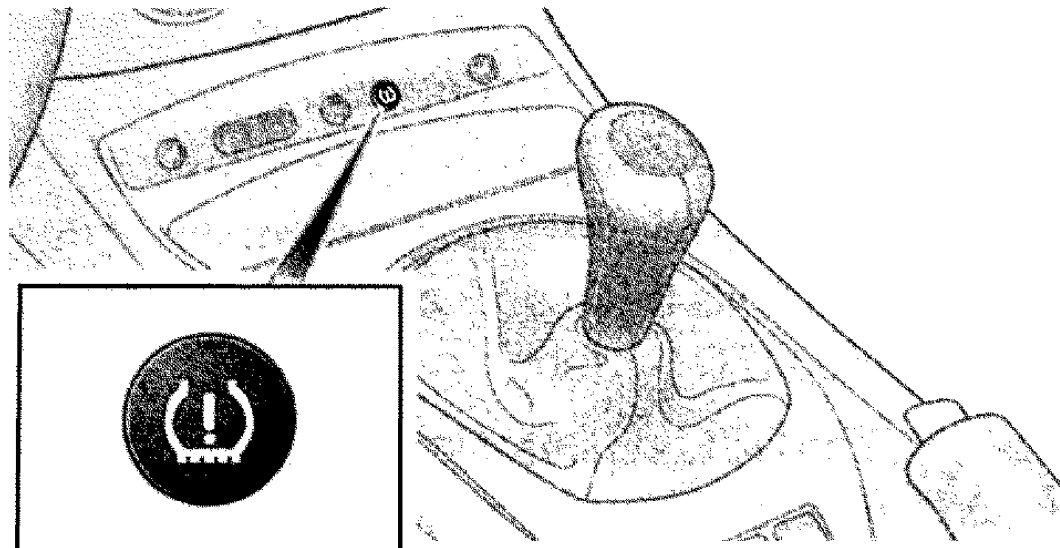


Fig. 17: Locating TPM System Reset Button (X3)
Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 18: Locating TPM System Reset Button (X5)
Courtesy of BMW OF NORTH AMERICA, INC.



G00225521

Fig. 19: Locating TPM System Reset Button (Z4)
Courtesy of BMW OF NORTH AMERICA, INC.

TPMS RESET - PROCEDURE 6

Resetting TPM With iDrive

1. Set the tire pressure of all wheels to specification.
2. Turn ignition switch ON.
3. Press controller to call up I menu. See **Fig. 20**.
4. Select SETTINGS and press controller.
5. Select CAR/TIRES and press controller.
6. If necessary, switch to top field and select TIRES/RDC and press controller.
7. Start engine.
8. Select CONFIRM TIRE PRESSURE and press controller.
9. Drive vehicle. Initialization is automatically completed during the drive, without any feedback issued.



Fig. 20: Locating TPM System Reset Button (With iDrive)
Courtesy of BMW OF NORTH AMERICA, INC.

Resetting TPM Without iDrive

1. Set the tire pressure of all wheels to specification.
2. Start engine.
3. Move turn signal lever up or down until TPM warning symbol and RESET appears. See **Fig. 21**.
4. Press BC button on end of turn signal lever to confirm selection.
5. Press and hold BC button for approximately 5 seconds until a CHECK/TICK appears after RESET.
6. Drive vehicle. Initialization is automatically completed during the drive, without any feedback issued.

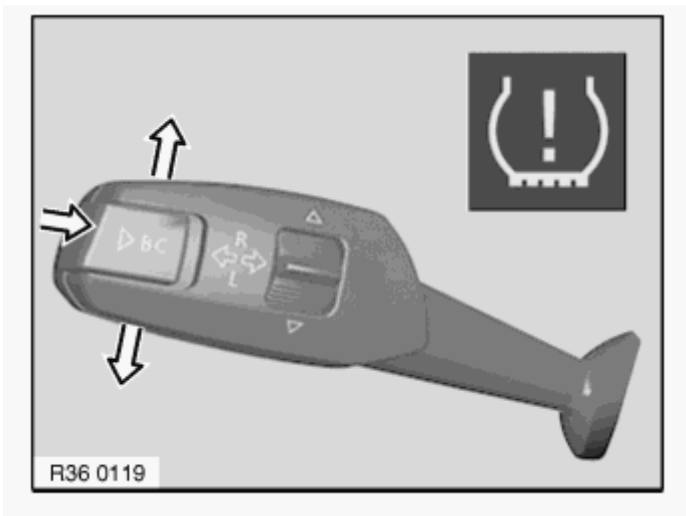


Fig. 21: Locating TPM System Reset Button (Without iDrive)
Courtesy of BMW OF NORTH AMERICA, INC.

TPMS RESET - PROCEDURE 7

With iDrive

Indirect System (Flat Tire Monitor)

CAUTION: Do not initialize the system while snow chains are attached.

NOTE: Each time a tire inflation pressure has been corrected or a wheel or tire has been changed, reset the system.

Initialization:

1. Using the iDrive MENU button, choose:
2. "Vehicle Info"
3. "Vehicle status"
4. "Reset"
5. Start the engine.
6. Start the initialization using "Reset". See **Fig. 22**.
7. Start to drive.

The initialization is completed during driving, which can be interrupted at any time. When driving resumes, the initialization is continued automatically.



Fig. 22: iDrive Showing Tire Monitor "Reset"
 Courtesy of BMW OF NORTH AMERICA, INC.

Checking FTM Status:

1. Using the iDrive MENU button, choose:
2. "Vehicle Info"
3. "Vehicle status"
4. "Flat Tire Monitor"
5. The status will be displayed. See **Fig. 23**.



Fig. 23: iDrive Showing Tire Monitor Status
 Courtesy of BMW OF NORTH AMERICA, INC.

Direct System (Tire Pressure Monitor)

NOTE: Each time a tire inflation pressure has been corrected or a wheel or tire has been changed, reset the system.

TPMS Status indicator on the Control Display:

The color of the tires represents the status of the tires and the system. TPM takes into account that tire pressures change while the vehicle is being driven. The tire pressures do not need to be corrected unless the TPM instructs you to do so by means of color indicators.

- **Green:** The tire inflation pressure corresponds to the established target value. "TPM active" appears on the Control Display.

- **One Wheel Yellow:** There is a flat tire or substantial loss of tire pressure in the indicated tire. A message appears on the Control Display.
- **All Wheels Yellow:** There is a flat tire or substantial loss of tire pressure in several tires. A message appears on the Control Display.
- **Gray:** The system cannot detect a puncture. Possible reasons for this:
 - TPM is being reset.
 - Temporary malfunction caused by systems or devices using the same radio frequency.
 - Malfunction.

Initialization (Reset):

1. Using the iDrive MENU button, choose:
2. "Vehicle Info"
3. "Vehicle status"
4. "Reset"
5. Start the engine.
6. Start the initialization using "Reset". See **Fig. 22**.
7. Start to drive.
8. The tires are shown in gray and "Resetting TPM..." is displayed.

After driving a few minutes, the set inflation pressures in the tires are accepted as the target values to be monitored. The system reset is completed during your drive, and can be interrupted at any time. When driving resumes, the reset is continued automatically. On the Control Display, the tires are shown in green and "TPM active" is displayed again.

IMPORTANT: If a flat tire is detected while the system is resetting and determining the inflation pressures, all tires on the Control Display are displayed in yellow. The message "Low tire!" is shown.

System Reset Failure:

- **Message For Unsuccessful System Reset:** The warning lamp lights up yellow. A message will appear on the Control Display. Check the tire inflation pressure and reset the system.
- **Malfunction:** The small warning lamp flashes in yellow and then lights up continuously; the larger warning lamp comes on in yellow. On the Control Display, the tires are shown in gray and a message appears. No punctures can be detected. This type of message is shown in the following situations:
 - If there is a malfunction. Have the system checked.
 - If a wheel without TPM electronics has been mounted.
 - If TPM is temporarily malfunctioning due to other systems or devices using the same radio frequency.

Without iDrive

Indirect System (Flat Tire Monitor)

CAUTION: Do not initialize the system while snow chains are attached.

NOTE: Each time a tire inflation pressure has been corrected or a wheel or tire has been changed, reset the system.

Reset:

1. Start the engine.
2. Lightly push button 1 on the turn indicator. See **Fig. 24**.
3. Lever the turn indicator up or down repeatedly until the tire monitor symbol appears in the display, accompanied by the word "RESET". See **Fig. 24**.
4. Press button 2 to confirm your choice of the Flat Tire Monitor.
5. Press button 2 for approx. 5 seconds until the a check mark is shown next to the "RESET" display.
6. Drive the vehicle.

The initialization is completed during driving, which can be interrupted at any time. When driving resumes, the initialization is continued automatically.

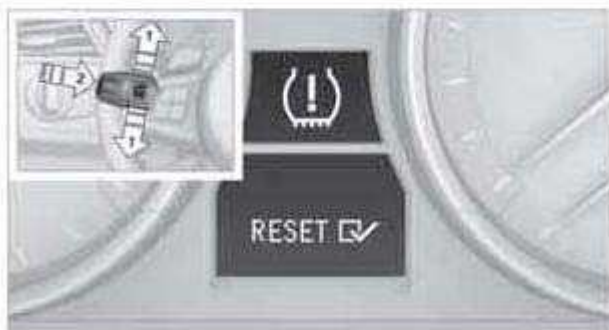


Fig. 24: Flat Tire Monitor Status Display
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Do not initialize the system while snow chains are attached.

NOTE: Each time a tire inflation pressure has been corrected or a wheel or tire has been changed, reset the system.

IMPORTANT: The system does not work correctly if it has not been reset; for example, a flat tire may be indicated even though the tire inflation pressures are correct. The system is inactive and cannot indicate a flat tire if a wheel without TPM electronics, such as a compact spare wheel, has been mounted, or if TPM is temporarily malfunctioning due to other systems or devices using the same radio frequency.

Reset:

1. Start the engine.
2. Lightly push button 1 on the turn indicator. See **Fig. 25**.
3. Lever the turn indicator up or down repeatedly until the tire monitor symbol appears in the display, accompanied by the word "RESET". See **Fig. 25**.
4. Press button 2 to confirm your choice of the Tire Pressure Monitor. In the display, "ACTIVE" will appear above "RESET". See **Fig. 25**.
5. Press button 2 for approx. 5 seconds. In the display, "RESETTING" will now appear above "RESET". See **Fig. 25**.
6. Drive the vehicle.

After driving a few minutes, the set inflation pressures in the tires are accepted as the target values to be monitored. The system reset is completed during your drive, and can be interrupted at any time. When driving resumes, the reset is continued automatically. The indicator lamp goes out after the system reset is completed.

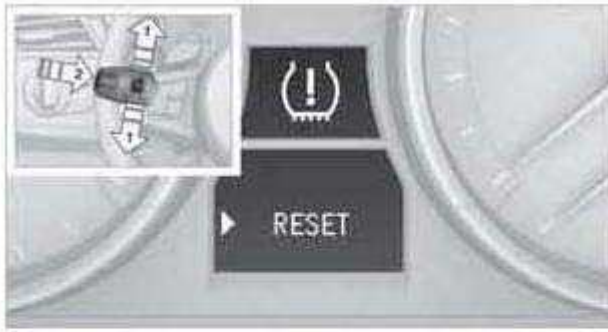


Fig. 25: Tire Pressure Monitor Status Display
Courtesy of BMW OF NORTH AMERICA, INC.

System Reset Failure:

- **Message For Unsuccessful System Reset:** The warning lamp lights up yellow. The system was not reset. Check the tire inflation pressure and reset the system.
- **Malfunction:** The small warning lamp flashes in yellow and then lights up continuously; the larger warning lamp comes on in yellow. On the Control Display, the tires are shown in gray and a message appears. No punctures can be detected. This type of message is shown in the following situations:
 - If there is a malfunction. Have the system checked.
 - If a wheel without TPM electronics has been mounted.
 - If TPM is temporarily malfunctioning due to other systems or devices using the same radio

frequency.

GENERAL INFORMATION

Air Bag Deactivation Procedures - BMW

SPECIAL CARE DURING MECHANICAL REPAIRS

WARNING: To avoid injury from accidental air bag deployment, read and carefully follow all SERVICE PRECAUTIONS and DISABLING & ACTIVATING AIR BAG SYSTEM procedures.

WARNING: Some vehicles are equipped with a passenger's side air bag ON/OFF switch. This switch should NOT be used in place of specified vehicle air bag system disabling and activating procedures.

WARNING: DO NOT use any type of back-up power supply (memory saver) from outside vehicle to avoid memory loss in memory systems, if equipped. Back-up power supplies can provide enough voltage to deploy air bags.

NOTE: When the battery is disconnected, vehicle computer and memory system may lose data. Driveability problems may exist until computer systems have completed a relearn cycle.

In some instances, it may be necessary to remove steering column or instrument panel to gain access to blower motor housing, heater assembly, evaporator assembly, or other A/C-heater system related components. Observe manufacturer service precautions when working on a vehicle equipped with an air bag system. See SERVICE PRECAUTIONS .

Electrical sources should never be allowed near inflator on back of air bag module. Never probe air bag system electrical wires with analog volt-ohmmeter or test light. Always disable air bag system before servicing vehicle. See DISABLING & ACTIVATING AIR BAG SYSTEM procedure. Failure to do so could result in accidental air bag deployment and possible personal injury.

If air bag system is not fully functional for any reason, DO NOT drive vehicle until system is repaired and is again operational. DO NOT remove bulbs, modules, sensors or other components, or in any way disable system from operating normally. If air bag system is not functional, park vehicle until system is repaired and functions properly.

SYSTEM OPERATION CHECK

1. Turn ignition switch to ON position, with engine off. SRS is operational if AIR BAG warning light comes on and then goes out after about 6 seconds with engine off.
2. If AIR BAG warning light remains on, this indicates a fault in the SRS. If AIR BAG warning light fails to illuminate when ignition is first turned on, this indicates bulb is faulty or there is a fault in the wiring circuit to the bulb.

SERVICE PRECAUTIONS

Observe these precautions when working on SRS:

- When working around steering column and before any repairs are performed, disable SRS. See **DISABLING & ACTIVATING AIR BAG SYSTEM** .
- Before straightening damaged metal or arc-welding, disable SRS and disconnect front sensors, front air bag modules, seat belt tensioners (if equipped) and side air bag modules connectors. See **DISABLING & ACTIVATING AIR BAG SYSTEM** .
- After disabling SRS, wait at least 5 minutes before servicing vehicle. SRS control unit maintains SRS voltage for about 5 minutes after system is disabled. Servicing SRS before 5 minutes may cause accidental air bag deployment and possible personal injury.
- Always wear safety glasses and gloves when handling a deployed air bag module. Air bag module may contain sodium hydroxide deposits, which irritates skin.
- Handle sensors carefully. Never strike or jar sensors. All sensors and mounting bracket bolts must be tightened to specification to ensure proper sensor operation.
- Never use any SRS component that has been dropped from a height of 2 feet or higher.
- DO NOT repair any SRS component or wiring harness; replace only. Wiring harnesses and connectors are Orange for immediate identification.
- To avoid air bag deployment, DO NOT use self-powered electrical test equipment on driver's or passenger's air bag modules. This equipment includes battery powered circuit testers, voltmeters and ohmmeters.
- Always handle air bag module with trim cover away from body. Always place air bag module on workbench with trim cover up, away from loose objects. DO NOT leave air bag modules unattended.
- Never expose SRS components to temperatures greater than 167°F (75°C).
- Front air bag modules, belt tensioners and side air bag modules (if equipped) can only be checked while installed in vehicle and using a BMW Service Tester/DIS. Only attempt SRS inspections using specified procedures and checking devices.
- Never expose any SRS system components to cleaning agents such as solvents, gasoline, lye, etc.

DISABLING & ACTIVATING AIR BAG SYSTEM

CAUTION: Ensure radio is off before disconnecting battery. This will prevent damage to radio microprocessor. On cars with radio codes, ask customer for radio code card before disconnecting battery. Make a note of stored transmitters, restore these transmitters after reconnecting the battery.

1. Before proceeding, see **SERVICE PRECAUTIONS** . Retrieve fault codes before disconnecting battery. Ensure radio and ignition is off. Disconnect and shield negative battery cable. WAIT at least 5 minutes (one minute on 7-series models) for energy capacitor in SRS control unit to discharge. System is now disabled.
2. Ensure no one is inside vehicle and connect negative battery cable. System is now activated. Perform system operation check to ensure system is functioning properly and no fault codes are set. See **SYSTEM OPERATION CHECK** .

2007 RESTRAINTS

Restraints - Tightening Torques - X3

11 SEAT BELTS

72 11 SEAT BELTS

SEAT BELTS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Seat belt, Automatic reel, Lower strap, Anchor fitting, Belt tensioner to body	E36/ E31 / E38/ E39 / E46 / E52 / E53 / E83			31 Nm
Seat belt on B-pillar	All, except E53			31 Nm
Seat belt / belt tensioner to seat, on Touring also to rear seat backrest	All, except E52 / E53			48 Nm
2AZ Screws for seatbelt height adjustment on body	All			22 Nm
3AZ Seat belt to seat Install bolt with bolt cement.	E31			47 Nm
4AZ Seat belt to backrest	E31			24 Nm
5AZ Headrest to backrest	E31			24 Nm
6AZ Seat belt at belt height adjustment (reversing clip)	All			31 Nm
7AZ Tension relief between roller sun blind bracket and backrest lock bracket	E39/2			24 Nm
8AZ Retaining angle, belt tensioner to seat rail	E46 / E83			24 Nm
9AZ Slide bar to body	E46			44 Nm
10AZ Counter-support plate to body, B- and C-pillars	E53			39 Nm
11AZ Seat belt to seat (end fitting)	All			45 Nm
12AZ Screw of seatbelt height adjuster to counter-support plate	E53			31 Nm
13AZ Belt tensioner to seat	E83			45 Nm
	E52 / E53			31 Nm
14AZ Inertial reel unit to body / B-pillar	E53 / E83			31 Nm
15AZ Automatic reel on rear seat backrest	E53			45 Nm
	E83			35 Nm
16AZ Belt guide to front seat (sash guide to head restraint clip)	E46 Convertible			8 Nm
17AZ Automatic reel to front seat				

backrest	E46 Convertible			39 Nm
18AZ Coupling gearing to centering pin	E46 Convertible			2.5 Nm
19AZ Corner hoop to side panel, inner (B-pillar)	E53 / E83			3 ±0.5 Nm
20AZ Upper belt loop to body	E83			31 Nm
21AZ Automatic reel to body	E83			31 Nm

12 AIRBAG GENERATOR/AIRBAG UNIT

72 12 AIRBAG MODULES

AIRBAG MODULES - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Airbag module in door, door trim panel or in side frame, holder	E36 / E38 / E39 / E46 / E52 / E53			8.5 Nm
2AZ Gas generator of ITS head airbag on body	E38 / E53	M6 nut		4 Nm
	E83			6.5 Nm
3AZ Bracket of ITS head airbag on body	E38 / E39 / E46	Metal screw		2.5 Nm
	E83			6.5 Nm
4AZ ITS head airbag to body (end fitting)	E38 / E39 / E46 / E53			11 Nm
	E83			6.5 Nm
5AZ Additional steel bracket for ITS head airbag on body	E38 / L7	Self-tapping screw M5		3 Nm
6AZ Gas generator of ITS head airbag on body	E39 / E46	M6 nut or oval-head screw, thread-tapping		4 Nm
7AZ Passenger airbag module on instrument panel carrier	E36 except Z3 / E52	M8		22 Nm
8AZ Passenger airbag module on instrument panel carrier	E36 Z3	M8		24 Nm
9AZ Passenger airbag module on instrument panel carrier	E38 / E39	M6 nut		10 Nm
	E83	M6 nut with pressed-on washer		6 Nm
	E85	M6		8 Nm
10AZ Retaining strap for cover, passenger airbag module on instrument panel carrier	E46 / E52 / E83	M6		9 Nm
11AZ Passenger airbag module on				

instrument panel carrier	E46 / E53	M8 nut		22 Nm
12AZ Head airbag cassette in rear compartment to body	E38 / E39	M6		11 Nm
13AZ Gas generator, head airbag in rear compartment, to body	E38	M6 nut		4 Nm
14AZ Bracket of ITS head airbag on body	E46 Coup / E53	Metal screw		4 Nm
15AZ ITS head airbag gas generator to body for conversion from 1.0 to 1.1	E38	M6		4 Nm
16AZ Gas generator, head airbag, in rear comp. to body (parcel shelf)	E39	M6		4 Nm
17AZ Head airbag cassette in rear compartment to body	E53	Metal screw		3 Nm
18AZ Gas generator, head airbag in rear compartment, to body	E53	M6		4 Nm
19AZ Airbag module for knee protection	E85	M6	Replace screws	8 Nm

ELECTRONIC POWER STEERING

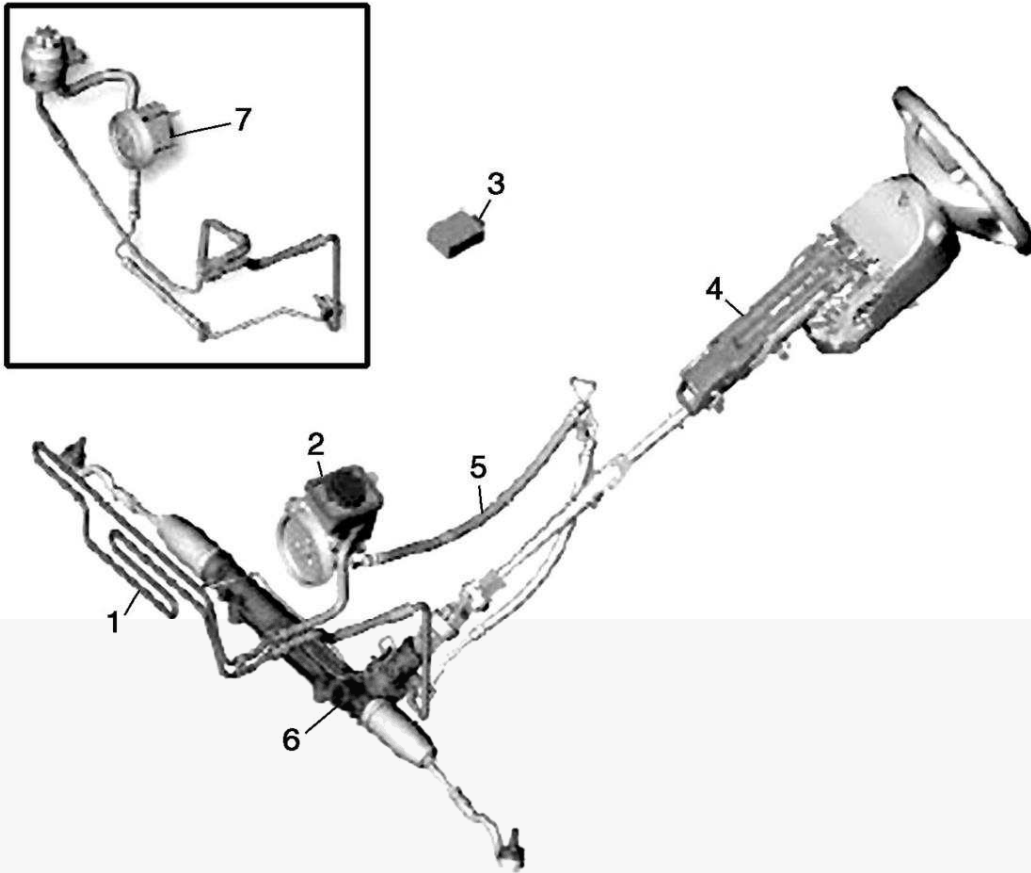
Overview - X3 (E83)

DESCRIPTION & OPERATION

RACK & PINION & SERVOTRONIC STEERING

Conventional rack and pinion power steering is used in the X3 (E83) and Servotronic is available as an option. The design and functioning principle of the Servotronic option are nothing new but have been modified as described in this chapter. The servotronic steering system controls the amount of power assistance based on the current road speed. The hydraulic pressure is electronically adapted to the current road speed, with greater power assistance available at lower road speeds and less power assistance available at greater road speeds.

The E83 is equipped with hydraulic assisted rack and pinion steering. The total ratio of the steering is: 18.9:1. The total rack stroke is 81.0 mm (1.7 turns of the steering wheel). The hydraulic ports on the steering gear have quick release couplings. The hydraulic pump maximum pressure is limited to 127 bar. E83 vehicles are equipped with "W" shaped cooling loops (hoses) to assist in cooling. The hydraulic pump does not have a pump end shutdown feature. The hydraulic pump could be damaged after approximately 1 minute if the steering is kept on full lock (end stop) for a long period.



- | | |
|---|--|
| 1. Power-steering cooler | 5. Flexible hoses |
| 2. Hydraulic pump with supply reservoir (M57TU, diesel) | 6. Steering gear |
| 3. Servotronic control unit | 7. Hydraulic pump with separate supply reservoir (M54B25 and M54B30) |
| 4. Upper steering column assembly | |

G00399850

Fig. 1: Overview Of Steering System

Courtesy of BMW OF NORTH AMERICA, INC.

SERVOTRONIC INTRODUCTION

Servotronic does not regulate the steering force support in a conventional way by using the engine speed, rather it is dependent upon the car's road speed. The Servotronic regulates the hydraulic pressure in the power-steering pump. Adaptation of the hydraulic pressure to the car's road speed has the effect of:

- High steering force support at low road speeds.
- Minimum steering force support at high road speeds.

This means that minimum force is required for steering force at slow road speeds. As the road speed increases the steering force support is continuously reduced. Contact to the road surface therefore becomes more direct and steering is more precise. Consequently, steering is very comfortable and maneuverability is maximized, for instance when parking and maneuvering at slow speeds.

COMPONENTS

NOTE: The following actuators are involved in the Servotronic.

Servotronic Control Unit (SVT)

The SVT control unit specifies the nominal values for controlling the Servotronic valve (hydraulic pressure). The SVT control unit is connected to the PT-CAN (powertrain CAN) and K-Bus (body bus).

DSC Control Unit (Dynamic Stability Control)

The DSC control unit delivers the car's road speed signal. The DSC control unit and SVT control unit are connected by the PT-CAN.

DME or DDE (Digital Engine Electronics or Digital Diesel Electronics DDE)

The Servotronic receives the signal of whether the engine is running from the DME or DDE over the PT-CAN. The Servotronic only activates the Servotronic valve when the engine is running.

Instrument Cluster (KOMBI)

The instrument cluster delivers the terminal status (e.g. terminal 15 ON) and the kilometer reading.

Servotronic Valve

The Servotronic valve is an electro-hydraulic converter located in the power-assisted steering oil circuit. The Servotronic valve restricts the hydraulic current and consequently reduces the hydraulic pressure. The Servotronic valve is activated by a characteristic curve delivered by the SVT control unit.

SYSTEM FUNCTIONS

The Servotronic is based upon the following system functions:

- Initialization of the Servotronic.
- Recording of the speed.
- Supplying the Servotronic valve with power.
- Undervoltage detection and overvoltage detection.

Initialization of the Servotronic

The Servotronic is active from terminal 15 ON. A short initialization phase for the Servotronic (under 1 second) is necessary when the engine starts in order to reach the characteristic curve for a low road speed as fast as

possible. A plausibility check for supplying the Servotronic valve is performed during the initialization phase.

Recording of the Speed

The road-speed signal is calculated by the DSC and supplied to the PT-CAN. The Servotronic specifies an acceleration value for plausibility of the road-speed signal. A road speed is calculated from the acceleration value. At a low acceleration the road-speed signal supplied by the DSC is used. At a higher acceleration the Servotronic control unit calculates the road speed internally. The road speed is stored in the Servotronic control unit.

Supplying the Servotronic Valve with Power

The Servotronic valve is supplied with power in response to the car's road speed. The power-assisted steering characteristic is memorized in a characteristic curve. The characteristic curve specifies the power based on the car's road speed. The characteristic curve is written using 16 reference points. The Servotronic valve is no longer supplied with power when the engine is OFF (over the PT-CAN). Minimum steering force support is set (high road speed) when the Servotronic valve is no longer supplied with power. Equally, the Servotronic valve is also no longer supplied with power if there is a fault-memory entry.

Undervoltage detection and overvoltage detection

The Servotronic valve is no longer supplied with power under the following conditions:

- Supply Voltage Less Than 9 Volts
- Supply Voltage Higher Than 17 Volts

Voltage dips during ignition faults are detected.

SWITCH-ON CONDITIONS

Switch-on conditions for the Servotronic are:

- Terminal 15 ON
- Engine Must Be Running

The Servotronic only activates the Servotronic valve when the engine is running. When the engine has started and a road-speed signal is not supplied, the Servotronic sets the maximum steering force support. If a plausible road-speed signal is detected, the Servotronic valve is activated by the characteristic curve. If there is still not a (or not a plausible) road-speed signal 5 seconds after the engine has started, the minimum steering force support is set.

STEERING

Steering - Operating Fluids

GEMMER STEERING

The ZF Gemmer steering is permanently filled with oil. There is no drain plug.

ZF RACK AND PINION STEERING WITHOUT POWER ASSIST

The ZF rack and pinion steering is lubricated for its service life and therefore does not require servicing.

In case of repair, steering components on E21 vehicles are to be lubricated with a sodium-based grease, with a temperature range of -30°C to +75°C.

BMW PART NUMBER SPECIFICATION

Calypsol D 4024	BMW Part No. 32 11 1 116 929
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BALL AND NUT OR RACK AND PINION POWER STEERING

Only reputable brand Automatic Transmission Fluid (ATF) of Dexron® III formulation may be used for the power steering and power steering pump.

In case of brief hydraulic noise after starting at low outside temperatures, we recommend replacing the red ATF with green CHF or LHM oil (see below).

4.0 ZF Ball and Nut Power Steering with H31 System

The approved oils for BMW models with power steering and the H31 brake booster system are identical with those oils approved for power steering without the H31 system except for the following:

E32 models with self-leveling rear suspension and mutual oil supply tank in the engine compartment.

Countries with very low outside temperatures (e.g. Canada) had their power steering systems filled at the factory with Pentosin CHF 7.1 since 9/87 through 9/91. This is also to be used on vehicles built before 9/87.

Since 9/91, vehicles now use Pentosin CHF 11S instead of CHF 7.1.

BMW PART NUMBER SPECIFICATION

Pentosin CHF 7.1	BMW Part No. 81 22 1 468 879
Pentosin CHF 11S	BMW Part No. 82 11 1 468 041

These cars are marked with a pertinent label located close to the oil tank.

LHM oils (green color) of the following manufacturers may also be used instead of Pentosin (CHF 7.1):

Shell LHM

Castrol LHM

Exxon LHM

The mixing of CHF, LHM oils and ATF is not permitted.

Pentosin CHF 4548 was used on vehicles built before 9/87 but is no longer available. However, mixing of Pentosin CHF 7.1 with residual quantities of Pentosin CHF 4548 are permitted in these earlier vehicles. Mixing of these two oils is not permitted for E32 / E38 vehicles.

The hydraulic system for power steering and power-assisted brakes must be drained as completely as possible when changing from one type of oil to the other.

All oil supply reservoirs are marked with the type of oil being used - ATF or CHF.

OIL CHANGE FOR POWER STEERING

Regular oil changing is not necessary. However, it is recommended to replace the oil after completion of repairs (unit or line replacement). Use ATF of Dexron® III formulation.

HORN SLIP RINGS

Approved grease is a copper paste (former BMW Part No. 81 22 9 400 794).

BMW PART NUMBER SPECIFICATION

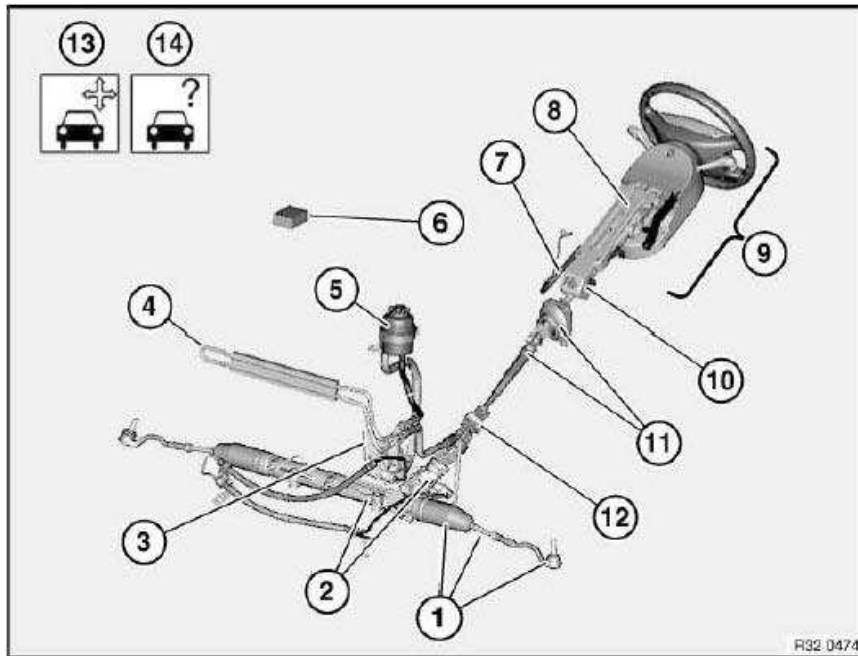
3M	Part No. 8945
CRC	Part No. 3046 010

SUSPENSION

Steering & Wheel Alignment - Repair Instructions - X3

00 ELECTRONIC CHASSIS ALIGNMENT

32 ... OVERVIEW OF STEERING

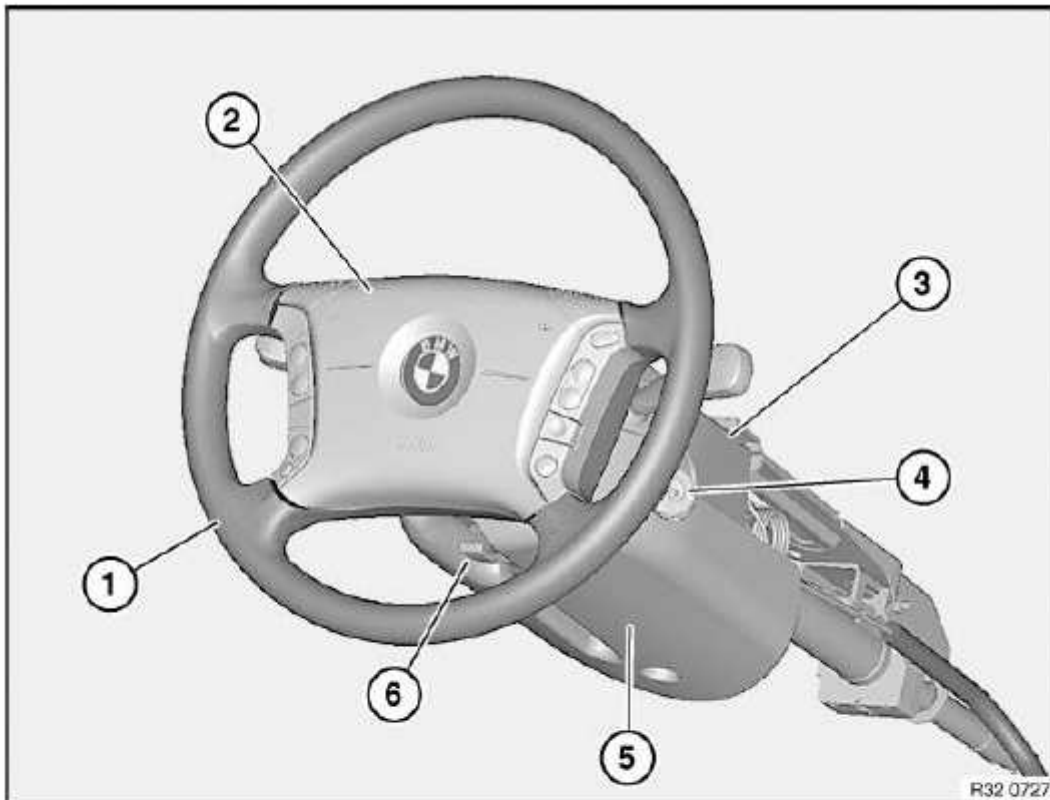


- | | | |
|---|--|----|
| 1 | Tie rod end / tie rod / gaiter | 8 |
| 2 | Power steering gear / EH converter | 9 |
| 3 | Vane pump | 10 |
| 4 | Cooling coil | 11 |
| 5 | Fluid reservoir | 12 |
| 6 | Servotronic control unit | 13 |
| 7 | Interlock cable | 14 |

- [Steering column](#)
- [Overview of steering wheel/casing components](#)
- [Steering angle sensor](#)
- [Steering spindle lower section/sleeve](#)
- [Double joint](#)
- [Adjustment work](#)
- [Troubleshooting](#)

Fig. 1: Overview Components Of Steering
Courtesy of BMW OF NORTH AMERICA, INC.

32 ... OVERVIEW OF STEERING WHEEL / CASING COMPONENTS / LOCK CYLINDER



- | | | | |
|---|--|---|--|
| 1 | Steering wheel | 4 | Lock cylinder |
| 2 | Airbag unit | 5 | Lower steering column casing |
| 3 | Upper steering column casing | 6 | Control lever |

Fig. 2: Overview Of Steering Wheel / Casing Components / Lock Cylinder
 Courtesy of BMW OF NORTH AMERICA, INC.

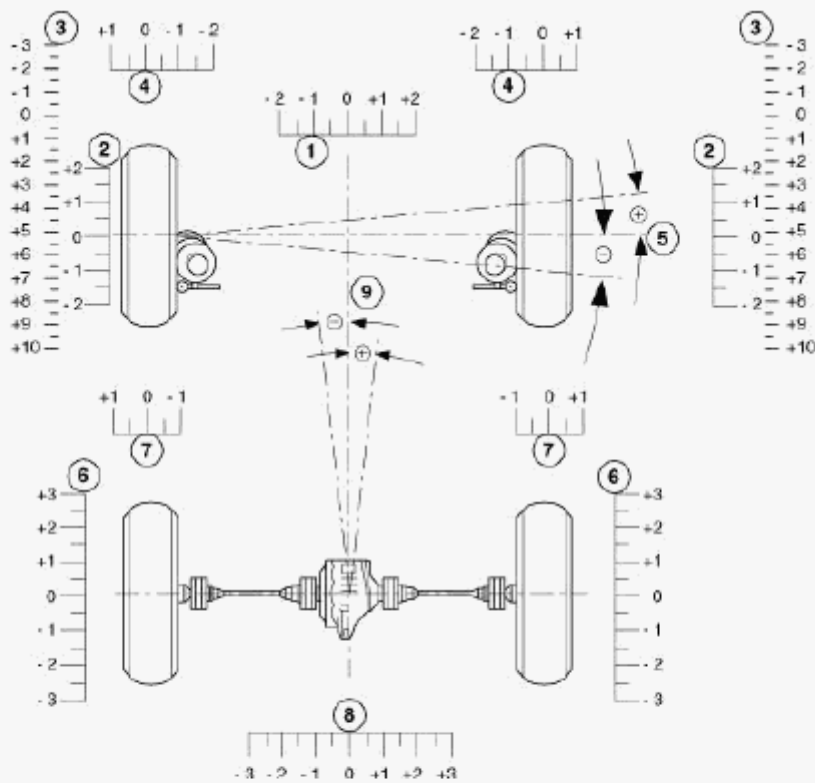
32 00 ... CHASSIS/WHEEL ALIGNMENT CHECK PROCEDURE

CHASSIS/WHEEL ALIGNMENT PROCEDURE CHART

Check adherence to <u>32 00 ... Test conditions for chassis/wheel alignment check</u>		
I V		
Position vehicle on measuring stand		
I V		
Measure vehicle ride height	OK - >	Carry out chassis/wheel alignment check with ride-height measurement without load, see <u>32 00 155 KDS chassis/wheel alignment check with ride-height measurement without load.</u>
Read off setpoint value in KDS		

Tolerance-20 / +40 mm per wheel permissible Difference between left / right max. 10 mm permissible		
Not OK / no data I V		
Move vehicle into normal position, see <u>32 00 ... Moving vehicle into normal position.</u>		
Introduce load and measure ride heights		
Read off setpoint value in KDS Tolerance \pm 10 mm per wheel permissible Difference between left / right max. 10 mm permissible	Not OK - >	
OK I V		Check suspension for damage, repair if necessary
Move vehicle into design position, see <u>32 00 ... Moving vehicle into design position.</u>	<- Not OK	
Add/distribute weights and measure ride heights		
Read off setpoint value in KDS Tolerance \pm 2 mm per wheel permissible Difference between left / right max. 2 mm permissible		
I V		
Carry out chassis/wheel alignment check with load up to design position, see <u>32 00 155 KDS chassis/wheel alignment check with ride-height measurement without load.</u>		

32 00 ... GENERAL CHASSIS AND SUSPENSION DEFINITIONS



31 32 018

- | | |
|---|------------------------|
| 1. Toe | 5. Wheel offset |
| 2. Camber | 6. Camber |
| 3. Caster (with 10° or 20° wheel lock) | 7. Rear-wheel position |
| 4. Toe angle difference (with 20° wheel lock) | 8. Toe |
| | 9. Geometrical axis |

Fig. 3: Chassis And Suspension Angle

Courtesy of BMW OF NORTH AMERICA, INC.

32 00 ... GENERAL INFORMATION AND DEFINITIONS

Toe angle difference

a Toe angle difference

D Center point of operating circle

The toe angle difference is the angle adjustment of the inner cornering wheel relative to the outer cornering wheel when negotiating a curve. Steering is designed in such a way that angular position of wheels changes as steering lock progresses.

A correctly adjusted toe angle difference produces equal values for left and right lock with consideration of factory tolerances.

Toe angle difference provides information on corresponding operation of steering trapezoid for left or right steering lock from center position.

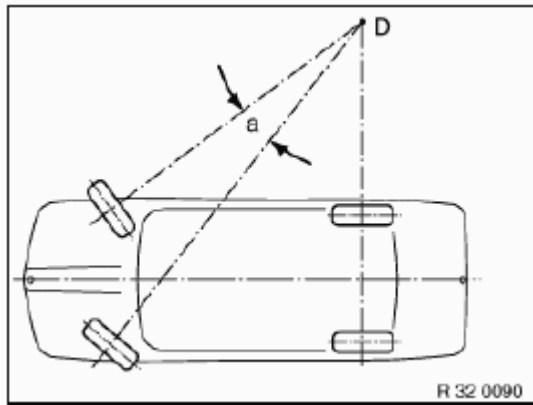


Fig. 4: Toe Angle Difference
Courtesy of BMW OF NORTH AMERICA, INC.

Camber

Inclination of the wheel from the perpendicular.

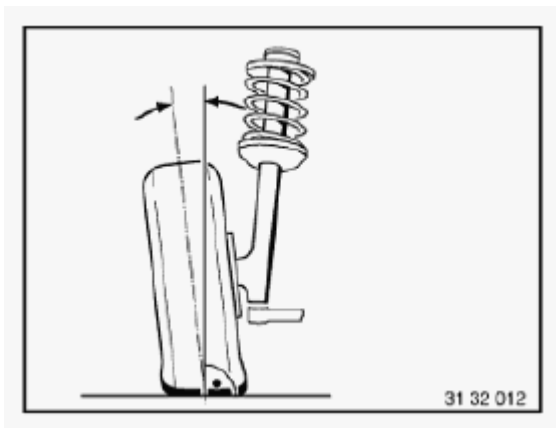


Fig. 5: Camber Inclination Of Wheel From Perpendicular
Courtesy of BMW OF NORTH AMERICA, INC.

Toe

Reduction in distance of front of front wheels to rear of front wheels. The toe-in prevents the wheels from moving apart during driving and thus:

- the wheels from vibrating and grinding
- excessive tire wear
- excessive strain on the steering linkage and its links/joints
- heavy vehicle steering

Measurement is performed in "straight-ahead mode".

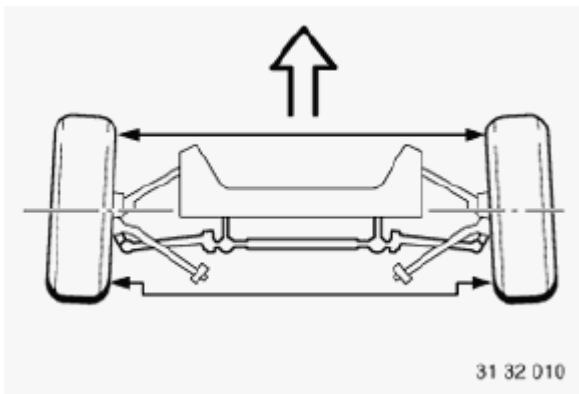


Fig. 6: Toe Angle Difference

Courtesy of BMW OF NORTH AMERICA, INC.

Caster

Is the inclination of the kingpin in the direction of travel viewed from the side. The line through the center point of the spring strut support bearing and the control arm ball joint corresponds to the "kingpin".

Thanks to caster, wheels are pulled and not pushed. In a similar manner to king pin inclination, when driving in curves or around corners, returning forces are reproduced to help return wheels to straight-ahead position.

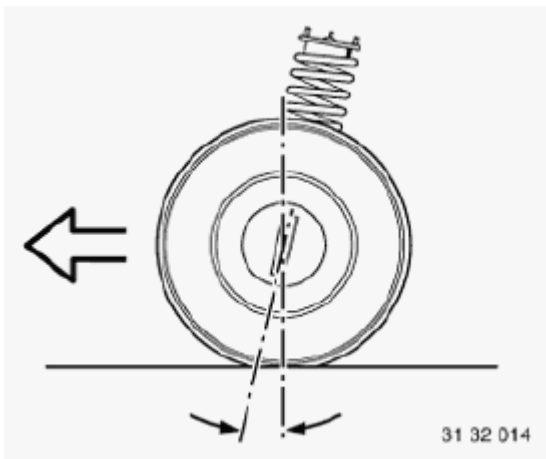


Fig. 7: Caster Angle Difference

Courtesy of BMW OF NORTH AMERICA, INC.

Geometrical axis 1

Is the angle bisector from the total rear-wheel toe.

Front-wheel measurements are taken in reference to this axis.

Symmetrical axis 2

Center line running through front and rear axles.

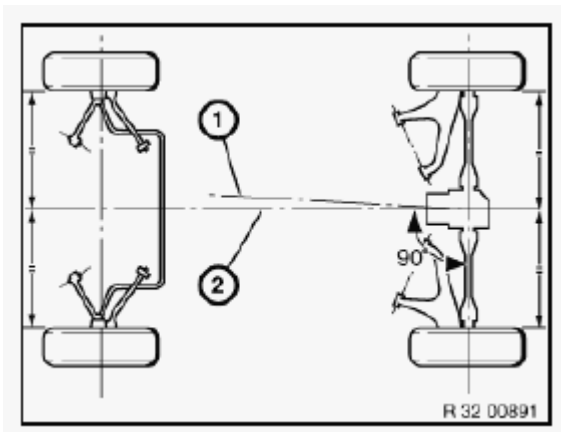


Fig. 8: Geometrical Axis And Symmetrical Axis
Courtesy of BMW OF NORTH AMERICA, INC.

Wheel offset

Angle by which one front wheel is displaced more towards front or rear than the other front wheel. The wheel offset angle is positive when the right wheel is displaced towards the front and negative when it is displaced towards the rear.

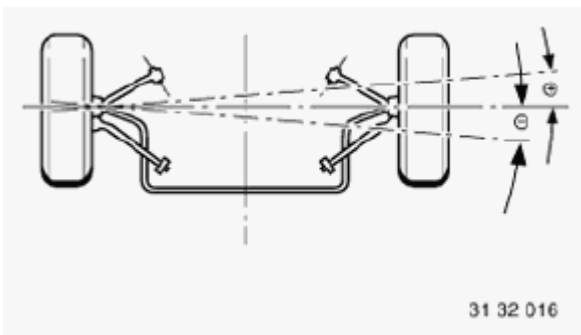


Fig. 9: Wheel Offset Angle
Courtesy of BMW OF NORTH AMERICA, INC.

Kingpin offset/scrub radius

Is the distance from the center of the wheel contact face to the intersection point of the kingpin extension. The line through the center point of the spring strut support bearing and the control arm ball joint corresponds to the "kingpin".

The scrub radius is influenced by camber, kingpin angle and wheel offset of the wheel rim.

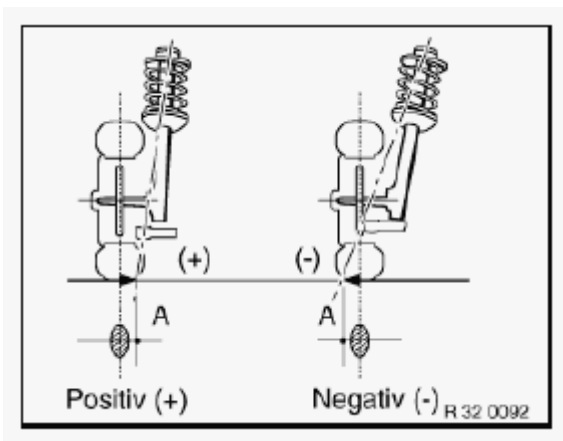


Fig. 10: Kingpin Offset/Scrub Radius

Courtesy of BMW OF NORTH AMERICA, INC.

32 00 ... IDENTIFICATION OF SUSPENSION WITHOUT LABEL

NOTE: If the front spring strut does not have a label for suspension identification, the type of suspension can be identified from the part number in the Electronic Parts Catalogue.

32 00 ... INFORMATION ON REPLACING STEERING GEAR AFTER ACCIDENT DAMAGE

Facts:

In the event of accidents or driving conditions similar to accidents, shocklike loads can cause different types of damage to steering gears. When a steering gear is externally undamaged, it is sometimes only possible to identify damage with great difficulty and with great effort. However, damage of this nature poses an unacceptable risk to the vehicle because it can result in failure of the steering system.

Because of the disproportionate amount of effort involved, it is generally not sensible to check thoroughly all the individual components of the steering gear and as an alternative it is necessary to take into account other components which can be checked more easily.

Procedure:

The steering gear must be replaced if one or more of the following points apply:

- A. Visible or noticeable damage to the steering gear
- B. Unacceptable torque increase and jamming when the steering gear is turned from lock to lock (without hydraulic assistance)
- C. Permissible tolerances exceeded during axle/wheel alignment check (if necessary, include alignment record with invoice / report)
- D. Fire damage
- E. Damage, permanent deformation or fractures to:

- Wheel rims in the event of a negative result from the wheel/axle alignment check
- Spring struts, steering knuckles, wheel carriers
- Control arms
- Compression or tension struts or stabilizer bars with this function
- Body-side screwing/bolting points for wheel guide/control components
- Front axle carrier
- Pitman arms
- Tie rods
- Steering gear fixtures
- Steering column

This guideline is binding for all accident repairs to BMW and MINI vehicles.

NOTE: If the steering gear replacement work which is required for safety reasons is refused by the customer or an insurance company for cost reasons, a memorandum to that effect must be drawn up and countersigned by the party bearing the costs of the accident repair.

IMPORTANT: The vehicle's type approval will be invalidated whenever the function of any of its safety components is compromised!

32 00 ... MOVING VEHICLE INTO DESIGN POSITION

Necessary preliminary tasks:

- Move vehicle into normal position, see **32 00 ... Moving vehicle into normal position.**
- Version with air spring system:
 - Remove ignition key
 - Pull fuse for air supply unit control unit
- Add/distribute weights in area of spring struts until the vehicle ride height is within the tolerance (refer to **31 00 FRONT AXLE - RIDE HEIGHT E83**).

Measure ride-level height of vehicle

32 00 ... MOVING VEHICLE INTO NORMAL POSITION

Necessary preliminary tasks:

- Check compliance with test conditions, bring vehicle to a stop if necessary, see **32 00 ... Test conditions for chassis/wheel alignment check.**
- Version with air spring system: Carry out ride-height-calibration
- Check vehicle interior and luggage compartment (incl. luggage compartment recess) for load, unload

vehicle if necessary

- Introduce DIN load (refer to **32 00 CHASSIS/WHEEL ALIGNMENT - NORMAL POSITION E83**) into vehicle
- Determine vehicle ride height

NOTE: **If the vehicle ride height is not inside the tolerance (refer to 31 00 FRONT AXLE - RIDE HEIGHT E83), the vehicle must be repaired (coil spring/leakage).**

32 00 ... PERFORMING RIM RUNOUT COMPENSATION

NOTE: **Rim runout compensation involves electronically recording the lateral runout of the rim and the possible clamping error of the quick-clamping unit for one wheel rotation and compensating the toe and camber for measurement/alignment.**

Raise body.

Perform rim runout compensation in accordance with equipment manufacturer's instructions.

Compress/deflect car.

32 00 ... TEST CONDITIONS FOR CHASSIS/WHEEL ALIGNMENT CHECK

Observe the following test conditions prior to the chassis/wheel alignment check:

1. Correct and identical rim and tyre sizes.
2. Correct tread depth. The tread depth for each axle may differ from left to right by max. 3-4 mm.
3. Correct tyre inflation pressure (see instruction plate on car).
4. Wheel bearing clearance OK
5. Steering backlash OK
6. Condition of suspension and shock absorbers OK
7. Cars with ride level control: Pull fuse of air supply unit so that there is no controlling down or up.

32 00 ... TROUBLESHOOTING AFTER WHEEL/CHASSIS ALIGNMENT CHECK ON FRONT AXLE

Substandard roadholding, atypical noises, tyres worn on one side and toe-in/camber values which deviate from the nominal value are all indicators of damage to the suspension caused by road traffic accidents or similar impacts.

To carry out proper repairs, you must follow the procedure set out in the troubleshooting table below depending on the condition of the vehicle in question.

You must also follow the rules and guidelines for accident-related repairs to the steering gear, see **32 00 ... Information on replacing steering gear after accident damage.**

NOTE: If after chassis/suspension components have been replaced adjustment of camber/track alignment is not possible, the vehicle must be placed on the straightening bench

TROUBLESHOOTING CHART

Fault	Cause	Remedy	
Toe deviation	Tie rod end worn	Replace tie rod end, see <u>32 21 151 Replacing left or right tie rod</u>	
	Tie rod bent	Replace tie rod, see <u>32 21 231 Replacing left or right tie rod</u>	
	Rubber mount or guide joint of tension strut faulty	Replace rubber mount or guide joint, see <u>31 12 026 REMOVING AND INSTALLING/REPLACING GUIDE JOINT IN SWIVEL BEARING</u>	
	Rubber mount or ball joint of control arm faulty	Replace rubber mount or control arm, see <u>31 12 000 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT CONTROL ARM</u>	
Camber deviation	Rubber mount or ball joint of control arm faulty	Replace rubber mount or control arm, see <u>31 12 000 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT CONTROL ARM</u>	
	Control arm deformed	Replace control arms <u>31 12 000 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT CONTROL ARM</u>	
	Rubber mount or guide joint of tension strut faulty	Replace rubber mount or guide joint, see <u>31 12 026 REMOVING AND INSTALLING/REPLACING GUIDE JOINT IN SWIVEL BEARING</u>	
	Tension strut deformed	Replace both tension struts, see <u>31 12 050 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT TENSION STRUT</u>	
	Spring strut/piston rod of shock absorber deformed	Replace front spring strut, see <u>31 31 031 REPLACING FRONT LEFT OR RIGHT SPRING STRUT SHOCK ABSORBER</u>	
	Ride height between driver's and passenger sides different		Check load, correct if necessary, see <u>32 00 CHASSIS/WHEEL ALIGNMENT - NORMAL POSITION E83</u>
			Replace coil spring, see <u>31 33 100 REMOVING AND INSTALLING/REPLACING COIL SPRING FOR LEFT OR RIGHT FRONT SPRING STRUT</u>
Front axle carrier deformed	Replace front axle carrier, see <u>31 11 001 REPLACING FRONT AXLE CARRIER (6-CYLINDER)</u>		
	Rubber mount or ball joint of control arm faulty	Replace rubber mount or control arm, see <u>31 12 000 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT CONTROL ARM</u>	
	Control arm deformed	Replace control arms <u>31 12 000 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT CONTROL ARM</u>	

Caster deviation NOTE: Caster is defined by design and cannot be adjusted	Rubber mount or guide joint of tension strut faulty	Replace rubber mount or guide joint, see <u>31 12 026 REMOVING AND INSTALLING/REPLACING GUIDE JOINT IN SWIVEL BEARING</u>	
	Tension strut deformed	Replace both tension struts, see <u>31 12 050 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT TENSION STRUT</u>	
	Spring strut/piston rod of shock absorber deformed	Replace front spring strut, see <u>31 31 031 REPLACING FRONT LEFT OR RIGHT SPRING STRUT SHOCK ABSORBER</u>	
	Front axle carrier deformed	Replace front axle carrier, see <u>31 11 001 REPLACING FRONT AXLE CARRIER (6-CYLINDER)</u>	
	Ride height between driver's and passenger sides different		Check load, correct if necessary, see <u>32 00 CHASSIS/WHEEL ALIGNMENT - NORMAL POSITION E83</u>
			Air spring strut: Carry out ride-height-calibration Check coil springs, replace if necessary, see <u>31 33 100 REMOVING AND INSTALLING/REPLACING COIL SPRING FOR LEFT OR RIGHT FRONT SPRING STRUT</u>
Toe-difference angle deviation Prerequisite: camber and caster are correct	Tie rods not adjusted uniformly	Adjust toe on left and right sides to same value, see <u>32 00 150 KDS chassis/wheel alignment check with load up to design position</u>	
Wheel-offset deviation Prerequisite: front wheels have equal single toe to geometrical axis	Front axle carrier deformed	Replace front axle carrier, see <u>31 11 001 REPLACING FRONT AXLE CARRIER (6-CYLINDER)</u>	
	Control arm deformed	Replace control arms <u>31 12 000 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT CONTROL ARM</u>	
	Tension strut deformed	Replace both tension struts, see <u>31 12 050 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT TENSION STRUT</u>	

32 00 ... TROUBLESHOOTING AFTER WHEEL/CHASSIS ALIGNMENT CHECK ON REAR AXLE

Substandard roadholding, atypical noises, tyres worn on one side and toe/camber values which deviate from the nominal value are all indicators of damage to the suspension caused by road traffic accidents or similar impacts.

To carry out proper repairs, you must follow the procedure set out in the troubleshooting table below depending on the condition of the vehicle in question.

NOTE: If after chassis/suspension components have been replaced adjustment of camber/track alignment is not possible, the vehicle must be placed on the straightening bench

TROUBLESHOOTING CHART

--	--	--

Fault	Cause	Remedy
Camber deviation	Rubber mount of upper control arm faulty	Replace rubber mount, see <u>33 32 671 REPLACING ONE RUBBER MOUNT IN THE UPPER CONTROL ARM (CONTROL ARM REMOVED)</u> .
	Upper control arm deformed	Replace upper control arm, see <u>33 32 071 REPLACING ONE UPPER CONTROL ARM</u>
	Rubber mount of lower control arm faulty	Replace rubber mount, see <u>33 32 671 REPLACING ONE RUBBER MOUNT IN THE UPPER CONTROL ARM (CONTROL ARM REMOVED)</u> .
	Lower control arm deformed	Replace lower control arm, see <u>33 32 086 REMOVING AND INSTALLING/REPLACING BOTTOM LEFT CONTROL ARM</u>
	Rubber mount/ball joint in trailing arm faulty	Replace rubber mount/ball joint, see <u>33 32 042 REPLACING A RUBBER MOUNT IN TRAILING ARM, FRONT</u> .
	Rubber mount of rear axle carrier faulty	Replace rubber mount, see <u>33 32 671 REPLACING ONE RUBBER MOUNT IN THE UPPER CONTROL ARM (CONTROL ARM REMOVED)</u> .
	Rear axle carrier deformed	Replace rear axle carrier, see <u>33 31 011 REPLACING REAR AXLE CARRIER</u> .
Toe deviation	Rubber mount of upper control arm faulty	Replace rubber mount, see <u>33 32 671 REPLACING ONE RUBBER MOUNT IN THE UPPER CONTROL ARM (CONTROL ARM REMOVED)</u> .
	Upper control arm deformed	Replace upper control arm, see <u>33 32 071 REPLACING ONE UPPER CONTROL ARM</u>
	Rubber mount of lower control arm faulty	Replace rubber mount, see <u>33 32 671 REPLACING ONE RUBBER MOUNT IN THE UPPER CONTROL ARM (CONTROL ARM REMOVED)</u> .
	Lower control arm deformed	Replace lower control arm, see <u>33 32 086 REMOVING AND INSTALLING/REPLACING BOTTOM LEFT CONTROL ARM</u>
	Rubber mount/ball joint in trailing arm faulty	Replace rubber mount/ball joint, see <u>33 32 042 REPLACING A RUBBER MOUNT IN TRAILING ARM, FRONT</u> .
	Trailing arm deformed	Replace trailing arm, see <u>33 32 021 REPLACING LEFT OR RIGHT TRAILING ARM</u> .
	Rubber mount of rear axle carrier faulty	Replace rubber mount, see <u>33 32 671 REPLACING ONE RUBBER MOUNT IN THE UPPER CONTROL ARM (CONTROL ARM REMOVED)</u> .
Rear axle carrier deformed	Replace rear axle carrier, see <u>33 31 011 REPLACING REAR AXLE CARRIER</u> .	
Rear-wheel position incorrect	Rear axle carrier displaced laterally	Replace rubber mount, see <u>33 32 671 REPLACING ONE RUBBER MOUNT IN THE UPPER CONTROL ARM (CONTROL ARM REMOVED)</u> .
Deviation of	Rubber mount/ball joint	Replace rubber mount/ball joint, see <u>33 32 042 REPLACING</u>

geometrical axis from symmetrical axis Prerequisite: single wheel toe cannot be adjusted	joint in trailing arm faulty	<u>A RUBBER MOUNT IN TRAILING ARM, FRONT .</u>
	Rubber mount of rear axle carrier faulty	Replace rubber mount, see <u>33 32 671 REPLACING ONE RUBBER MOUNT IN THE UPPER CONTROL ARM (CONTROL ARM REMOVED) .</u>

32 00 150 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH LOAD UP TO DESIGN POSITION

Except M models:

IMPORTANT: Carry out chassis/wheel alignment with DIN load only:

- A. If the technical preconditions for alignment with ride height input are not in place**
- B. If, in spite of repairs having been carried out, the car's ride height between the left and right sides is still outside the tolerance**
- C. If the vehicles in question have been involved in an accident**

NOTE:

- **Read and comply with General information and definitions, see 32 00 ... General information and definitions.**
- **Read and comply with General chassis definition, see 32 00 ... General chassis and suspension definitions.**

- If necessary, prepare lifting platform.
- Drive vehicle onto lifting platform.

NOTE: The front and rear wheels must be positioned centrally on the rotary and sliding plates.

- Remove locking pins from both rotary and sliding plates, align pickup using bubble level and activate

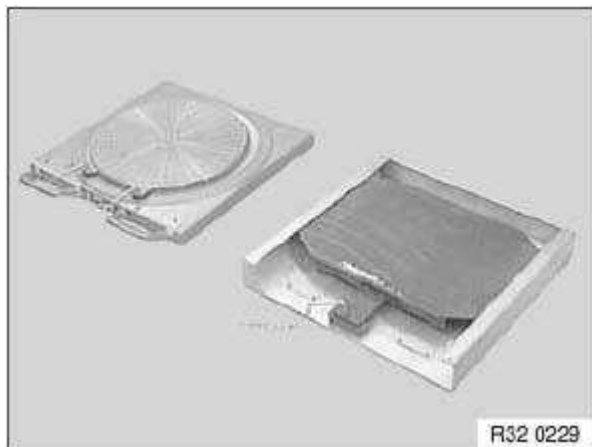


Fig. 11: Lifting Platform

Courtesy of BMW OF NORTH AMERICA, INC.

- Attach quick-clamping holder/quick-clamping unit to vehicle and remove clamping levers in area of front wheels
- Attach pickup to quick-clamping holder/quick-clamping unit, align using bubble level and connect to rotary plates

NOTE: When using quick-clamping units, perform rim runout compensation after installing the pickups, see 32 00 ... Performing rim runout compensation.



Fig. 12: Attaching Quick-Clamping Holder/Quick-Clamping
Courtesy of BMW OF NORTH AMERICA, INC.

- If necessary, attach spoiler adapter.



Fig. 13: Spoiler Adapter

Courtesy of BMW OF NORTH AMERICA, INC.

- If necessary, switch on chassis alignment system
- Enter customer and vehicle data

- Identify chassis version and select vehicle, see 32 00 ... Identification of suspension without label.
- Enter tyre pressure and tread depth
- Move vehicle into design position, see 32 00 ... Moving vehicle into design position.
- Install brake tensioner.

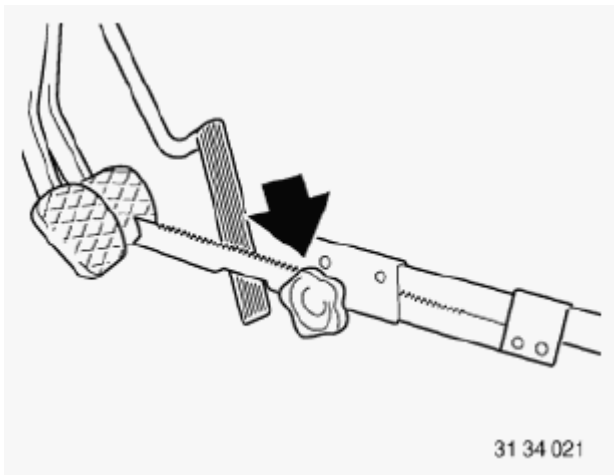


Fig. 14: Locating Brake Tensioner
 Courtesy of BMW OF NORTH AMERICA, INC.

E87, E90, E91, E92:

IMPORTANT: Risk of damage!

In order to avoid damaging the front side panel during the "Max. steering lock" drive-in routine, make sure the pickups are removed from the quick-clamping holders/quick-clamping units during output and input alignment. In the process do not detach the connecting cable from the pickups or the rotary plates.

NOTE: After the drive-in routine, reconnect the pickups to the quick-clamping holders/quick-clamping units, align using the bubble levels and secure in place.

- Perform input measurement in accordance with equipment manufacturer's instructions.
- Compare specified values with actual values, see 32 00 CHASSIS/WHEEL ALIGNMENT - NORMAL POSITION E83 .

Only in event of customer complaint (e.g. poor driving performance):

IMPORTANT: Do not remove screws/bolts (front axle carrier to engine carrier / body).

Slacken all screws/bolts (front axle carrier to engine carrier / body) and then retighten to specified torque.

Refer to 31 11 506 LOWERING/RAISING FRONT AXLE CARRIER .

- If necessary, adjust front axle and rear axle, see 32 00 610 Adjusting toe-in and camber on front axle.

- Perform output measurement in accordance with equipment manufacturer's instructions.
- Save and print out test record.
- Carry out steering angle sensor adjustment, see **61 31 996 Carry out steering angle sensor adjustment.**
- Insert locking pins into both rotary and sliding plates
- Remove chassis/wheel alignment system

32 00 155 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH RIDE-HEIGHT MEASUREMENT WITHOUT LOAD

IMPORTANT: Do not carry out chassis/wheel alignment without load:

- A. if the technical requirements for alignment with ride height input are not in place**
- B. if, in spite of repairs having been carried out, the car's ride height between the left and right sides is still outside the tolerance**
- C. if the vehicles in question have been involved in an accident**

NOTE:

- **Read and comply with General information and definitions, see 32 00 ... General information and definitions.**
- **Read and comply with General chassis definition, see 32 00 ... General chassis and suspension definitions.**

- Check compliance with test conditions, bring vehicle to a stop if necessary, see **32 00 ... Test conditions for chassis/wheel alignment check.**
- If necessary, prepare lifting platform.
- Drive vehicle onto lifting platform.

NOTE: The front and rear wheels must be positioned centrally on the rotary and sliding plates.

- Remove locking pins from both rotary and sliding plates, align pickup using bubble level and activate

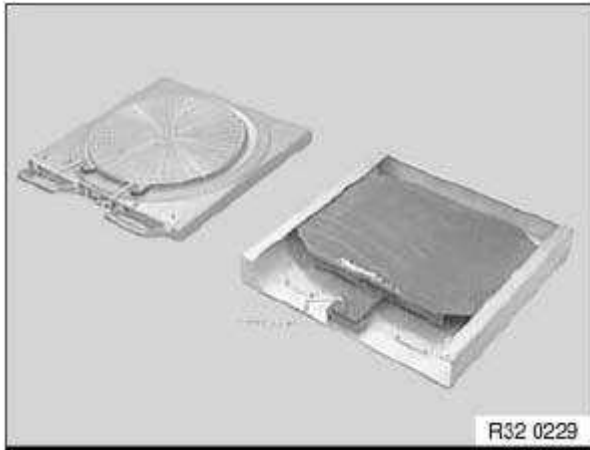


Fig. 15: Lifting Platform

Courtesy of BMW OF NORTH AMERICA, INC.

- If necessary, switch on chassis alignment system
- Enter customer and vehicle data
- Identify chassis version and select vehicle, see **32 00 ... Identification of suspension without label.**
- Enter tyre pressure and tread depth
- Measure and enter vehicle ride height
- Attach quick-clamping holder/quick-clamping unit to vehicle and remove clamping levers in area of front wheels
- Attach pickup to quick-clamping holder/quick-clamping unit, align using bubble level and connect to rotary plates

NOTE: When using quick-clamping units, perform rim runout compensation after installing the pickups, see **32 00 ... Performing rim runout compensation.**



Fig. 16: Attaching Quick-Clamping Holder/Quick-Clamping

Courtesy of BMW OF NORTH AMERICA, INC.

- If necessary, attach spoiler adapter.



R32 0241

Fig. 17: Spoiler Adapter
Courtesy of BMW OF NORTH AMERICA, INC.

- Install brake tensioner.

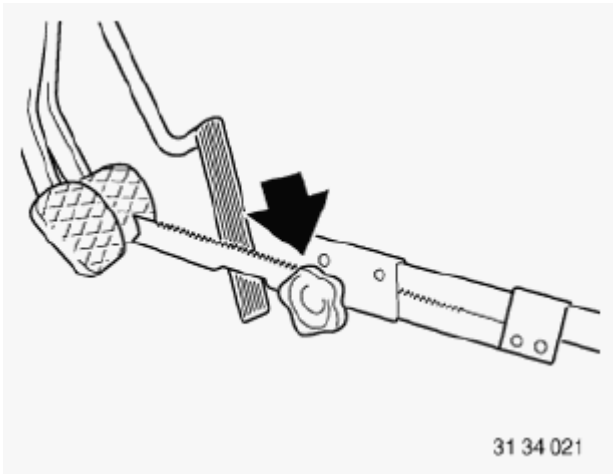


Fig. 18: Locating Brake Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

E87, E90, E91, E92:

IMPORTANT: Risk of damage!

In order to avoid damaging the front side panel during the "Max. steering lock" drive-in routine, make sure the pickups are removed from the quick-clamping holders/quick-clamping units during output and input alignment. In the process do not detach the connecting cable from the pickups or the rotary plates.

NOTE: After the drive-in routine, reconnect the pickups to the quickclamping holders/quick-clamping units, align using the bubble levels and secure in place.

- Perform input measurement in accordance with equipment manufacturer's instructions.
- Compare specified values with actual values, see **32 00 CHASSIS/WHEEL ALIGNMENT - NORMAL POSITION E83** .

Only in event of customer complaint (e.g. poor driving performance):

IMPORTANT: Do not remove screws/bolts (front axle carrier to engine carrier / body).

Slacken all screws/bolts (front axle carrier to engine carrier / body) and then retighten to specified torque.

Refer to **31 11 506 LOWERING/RAISING FRONT AXLE CARRIER** .

- If necessary, adjust front axle and rear axle, see **32 00 610 Adjusting toe-in and camber on front axle**.
- Perform output measurement in accordance with equipment manufacturer's instructions.
- Save and print out test record.
- Carry out steering angle sensor adjustment, see **61 31 996 Carry out steering angle sensor adjustment**.
- Insert locking pins into both rotary and sliding plates
- Remove chassis/wheel alignment system
- Drive vehicle off lifting platform.

32 00 610 ADJUSTING TOE-IN AND CAMBER ON FRONT AXLE

Special tools required:

- **32 3 140 SETTING TOOL**

IMPORTANT: Changes in axle geometry caused by accidents must under no circumstances be rectified by camber adjustment!

**NOTE: Camber and toe-in influence each other. Adjust the toe-in first in order to simplify the adjustment procedure.
The centering pin may only be driven or twisted out if the camber is outside the specified tolerance after toe adjustment.**

Adjust toe-in:

If necessary, remove steering gear cover at side

Move steering into straight-ahead position by means of markings on cap (1) and steering gear (2).

Align steering wheel and secure with steering wheel arrester.

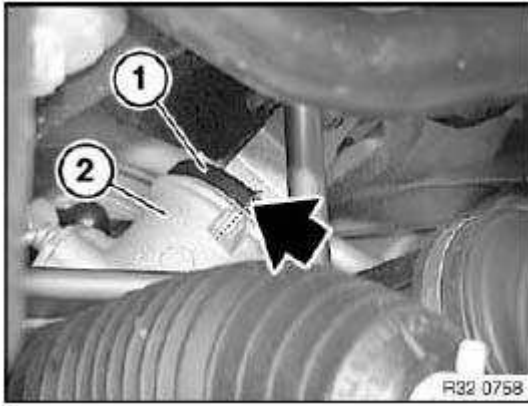


Fig. 19: Locating Markings On Cap And Steering Gear
Courtesy of BMW OF NORTH AMERICA, INC.

Clean thread on tie rod.

Slacken clamping nut (2), gripping tie rod end (1) in the process.

Remove clamp (4).

Turn tie rod (3) to adjust toe-in to specified value.

Tighten down clamping nut (2).

Tightening torque: 32 21 5AZ, see **32 21 STEERING ARMS** .

Fit clamp (4).

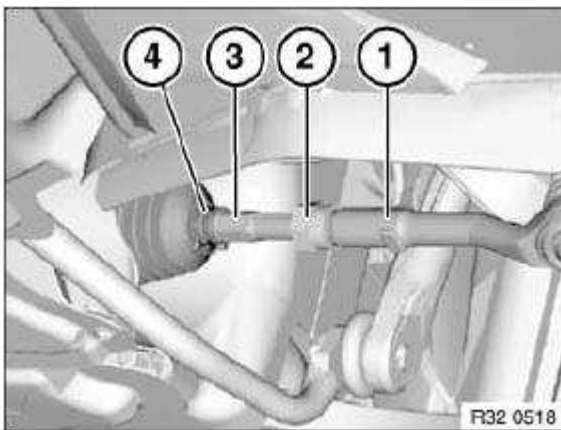


Fig. 20: Clamping Nut, Tie Rod End And Clamp
Courtesy of BMW OF NORTH AMERICA, INC.

Adjusting camber:

Remove protective cap.

Knock out centering pin (1) in downwards direction.

Clean wheel arch from below in area of support bearing with compressed air.

Slacken nut (2) approx. 1 to 1.5 turns.

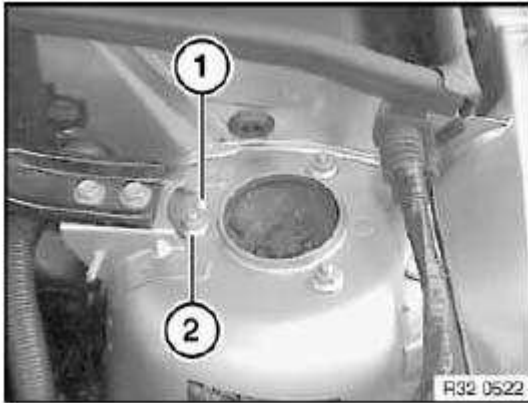


Fig. 21: Centering Pin And Slacken Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool 32 3 140 into wheel arch opening and over nut.

Replace nuts (1) and screw on but do not tighten down fully.

Turn nut in special tool 32 3 140 using open-end wrench (2) to adjust camber to specified value.

Tighten down nuts (1).

Tightening torque: 31 31 1AZ, see **31 31 SPRING STRUTS** .

Remove special tool 32 3 140.

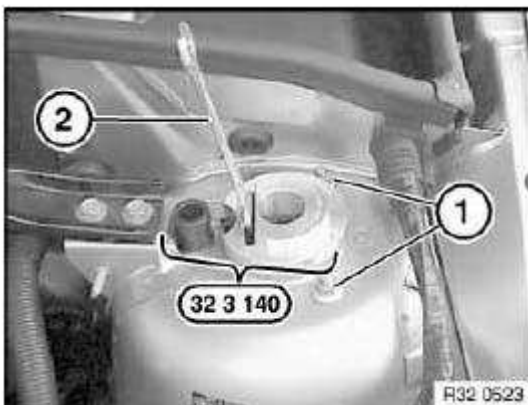


Fig. 22: Nuts And Special Tool (32 3 140)

Courtesy of BMW OF NORTH AMERICA, INC.

Replace nut (1) and tighten down.

Tightening torque: 31 31 1AZ, see **31 31 SPRING STRUTS** .



Fig. 23: Nut

Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Check directional stability of vehicle; if necessary, repeat toe-in adjustment

32 00 620 ADJUSTING REAR AXLE

Special tools required:

- **32 3 030 SETTING TOOL**

NOTE: **A camber change always means a toe change as well. The camber must therefore be adjusted first.**

Adjusting camber:

Replace nut (2) and tighten to 5 Nm.

Turn eccentric bolt (1) to adjust camber to setpoint value.

Tighten nut (2).

Tightening torque: 33 32 25AZ, see **33 32 CONTROL ARMS AND STRUTS** .

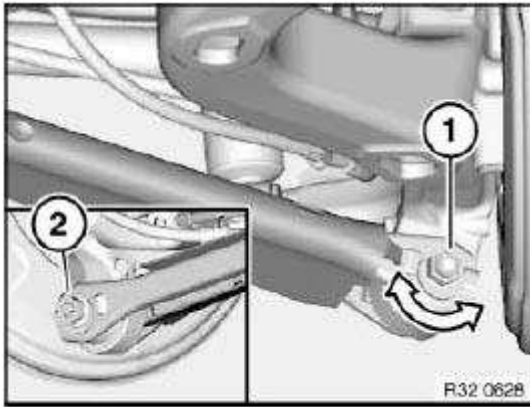


Fig. 24: Turning Eccentric Bolt To Adjust Camber
 Courtesy of BMW OF NORTH AMERICA, INC.

Adjusting toe:

Slacken bolts of bearing block by approx. 1 to 1.5 turns.

Attach special tool 32 3 030 to bolt head and pin (1).

Turn special tool 32 3 030 to adjust toe to specified value.

Tighten down bolts.

Tightening torque: 33 32 13AZ, see **33 32 CONTROL ARMS AND STRUTS** .

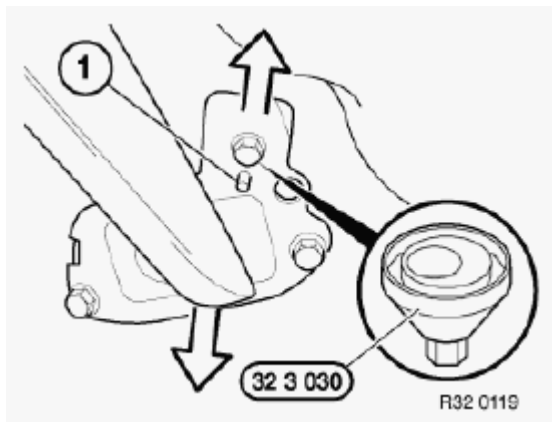


Fig. 25: Special Tool (32 3 030) And Bolt Head And Pin
 Courtesy of BMW OF NORTH AMERICA, INC.

61 31 996 CARRY OUT STEERING ANGLE SENSOR ADJUSTMENT

IMPORTANT: In vehicles with active front steering, steering angle sensor adjustment is integrated in the service function "Initial operation/adjustment for active front steering" and must not be carried out separately!

NOTE: **Steering angle sensor adjustment must be carried out:**

- after adjustment work on the front axle/steering
- after all mechanical work on the steering system
- after replacement / coding / programming of the following components:
 - Fixture for switches of steering column / switch cluster / steering angle sensor
 - Dynamic Stability Control (DSC) control unit
 - Control unit active anti-roll stabilization (ARS)

Connect vehicle to BMW diagnosis system or Software Service Station.

Select and carry out steering angle sensor adjustment under Service functions.

11 MECHANICAL STEERING GEAR

32 11 100 REPLACING GAITER FOR STEERING GEAR ON LEFT OR RIGHT

IMPORTANT: The power steering gear must be replaced if the polished surface of the rack is damaged (e.g. by corrosion).

Necessary preliminary tasks:

- Remove tie rod end, see **32 21 151 Replacing left or right tie rod**
- Only at 4th cylinder: Remove reinforcement plate, see **31 10 010 REMOVING AND INSTALLING/REPLACING REINFORCEMENT PLATE** .
- If necessary, remove steering gear cover at side

Clean tie rod.

Release band clamp (1) and ear clip (3), see **32 41 ... Instructions for removing and installing ear clips**

Detach gaiter (2) from tie rod.

Installation:

Clean rack and check surface for damage (e.g. by corrosion).

Grease rack.

Clean tie rod and apply grease to taper.

NOTE: **This ensures that the gaiter is not rotated when the tie rod is rotated.**

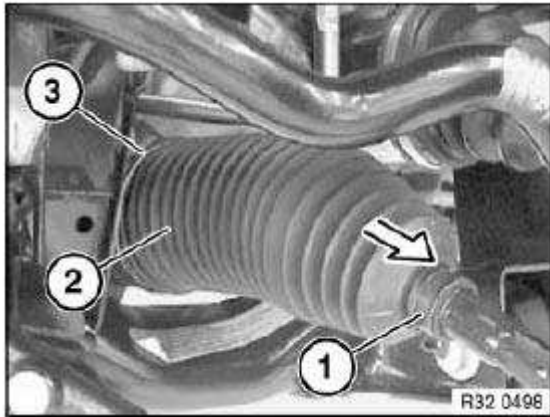


Fig. 26: Clamp, Ear Clip And Gaiter

Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Perform 32 00 150 KDS chassis/wheel alignment check with load up to design position.
- Carry out steering angle sensor adjustment, see 61 31 996 Carry out steering angle sensor adjustment.

13 STEERING GEAR WITH SERVO UNIT

32 13 ... FITTING REPAIR KIT FOR FCD COUPLING

Special tools required:

- 32 1 021 32 1 020 SET OF TOOLS
- 32 1 022 32 1 020 SET OF TOOLS
- 32 1 023 32 1 020 SET OF TOOLS

Remove FCD coupling.

Only following parts can be replaced on coupling head:

1. FCD dirt seal
2. Support ring
3. O-ring

IMPORTANT: Support ring and O-ring must not be mixed up! Always fit repair kit for FCD coupling completely.

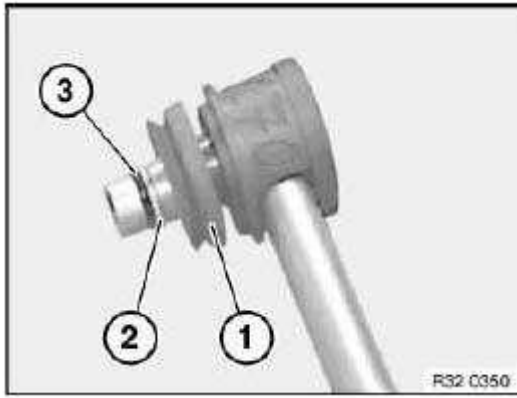


Fig. 27: FCD Dirt Seal, Support Ring And O-Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Press in special tool 32 1 023 as far as it will go in connecting piece on hydraulic steering gear. Then pull out again.

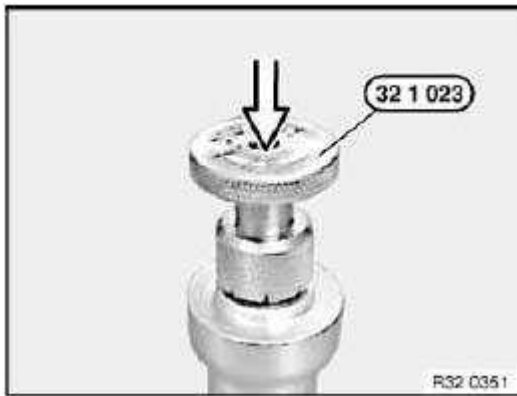


Fig. 28: Pressing Special Tool (32 1 023)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove spring ring (1) from special tool 32 1 023.

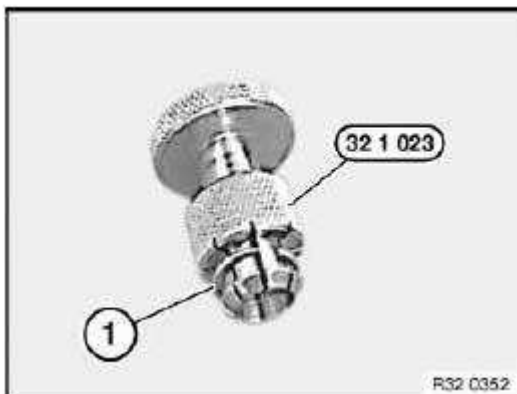


Fig. 29: Spring Ring And Special Tool (32 1 023)
Courtesy of BMW OF NORTH AMERICA, INC.

Lay new spring ring (1) in special tool 32 1 021.

Using special tool 32 1 022 , press spring ring (1) into connection. In so doing, press through special tool as far as it will go.

Installation:

Bore hole in special tool 32 1 021 is conical. Special tool must rest with stepped side securely on connection of hydraulic steering gear.

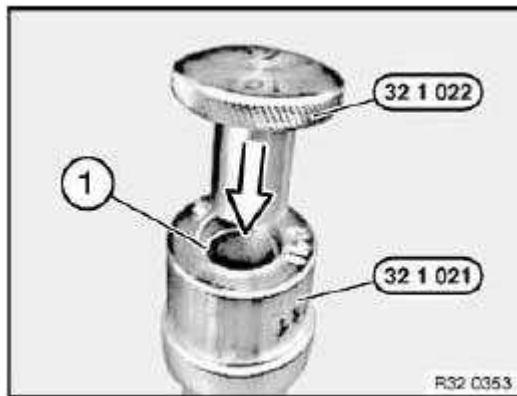


Fig. 30: Pressing Spring Ring Into Connection Using Special Tool (32 1 022)
Courtesy of BMW OF NORTH AMERICA, INC.

32 13 ... NOTES ON REMOVING/INSTALLING FCD CLUTCHES

Special tools required:

- **32 1 030 LEVER**
- **32 1 300 FORK**

There are 2 different types of FCD clutches:

1. FCD clutches with plastic caps
2. Metal FCD clutches (N73 only!)

FCD clutches without plastic caps must be replaced with a suitable special tool!

FCD coupling with plastic caps:

Removal

To release quick-release coupling, turn cap from position (A) - closed - to position (B) - open.

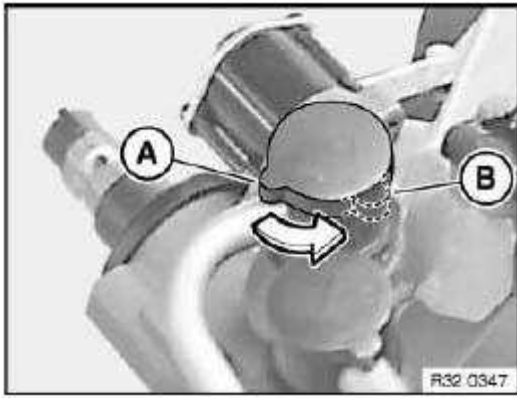


Fig. 31: Turning Cap From Position (A)
 Courtesy of BMW OF NORTH AMERICA, INC.

Unlock quick-release coupling by pressing on cap (1).

Detach line while pressing cap.

In event of removal while installed, use special tool 32 1 030.

Position special tool close to locking head.

If necessary, fit repair kit for FCD coupling.

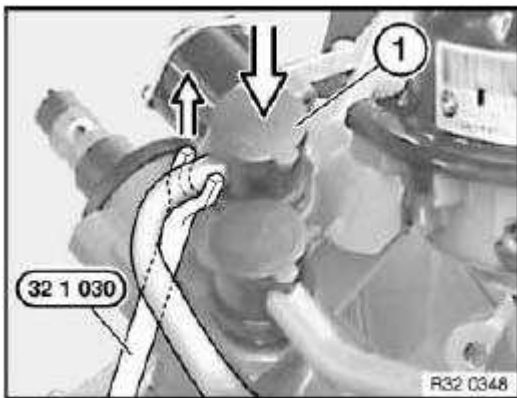


Fig. 32: Cap And Special Tool (32 1 030)
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Coat seal pack (O-ring (1), support ring (2)) with hydraulic fluid before sliding in.

Slide quick-release coupling into housing by pressing on coupling cover.

Quick-release coupling must snap into place with an audible "click".

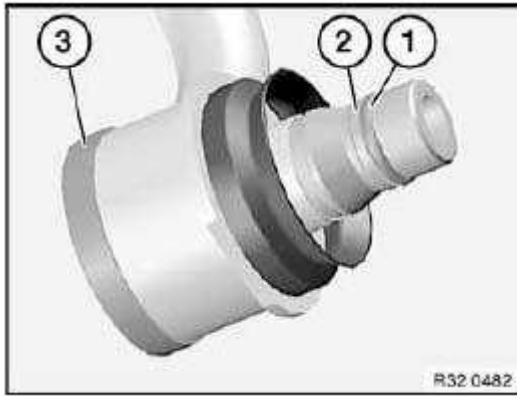


Fig. 33: Seal Pack (O-Ring And Support Ring)
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, lock coupling by turning cap from position (B) to position (A).

Lug of coupling must be over line outlet - position (A).

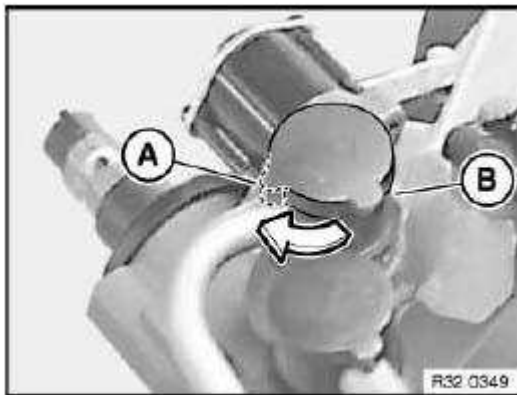


Fig. 34: Turning Cap From Position (B) To Position (A)
Courtesy of BMW OF NORTH AMERICA, INC.

Metal FCD clutches:

Removal

Metal quick-release couplings can only be opened with special tool 32 1 300.

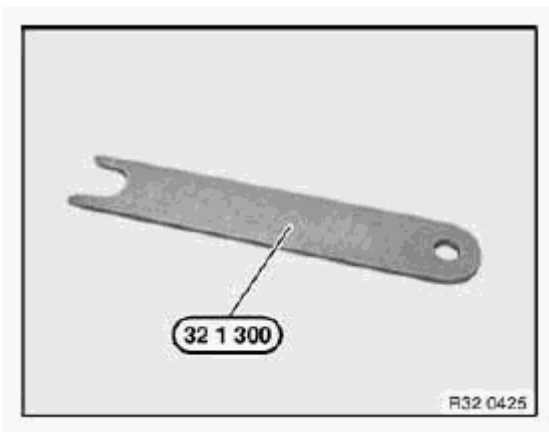


Fig. 35: Special Tool (32 1 300)
Courtesy of BMW OF NORTH AMERICA, INC.

Slide special tool 32 1 300 between metal head (1) and rubber lip (2) of quick-release coupling.

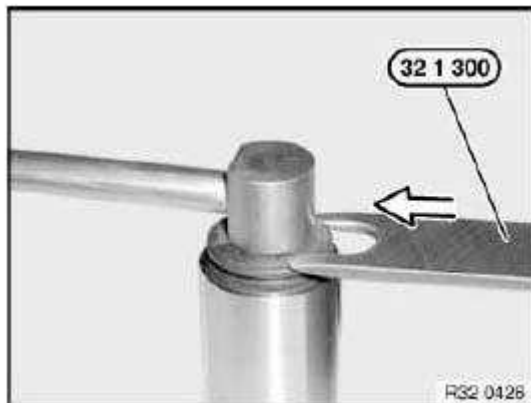


Fig. 36: Sliding Special Tool (32 1 300) Between Metal Head And Rubber Lip Of Quick-Release Coupling
Courtesy of BMW OF NORTH AMERICA, INC.

Slide in special tool 32 1 300 as far as it will go. Quick-release coupling unlocks with a light click.

Then pull off coupling and tool towards top.

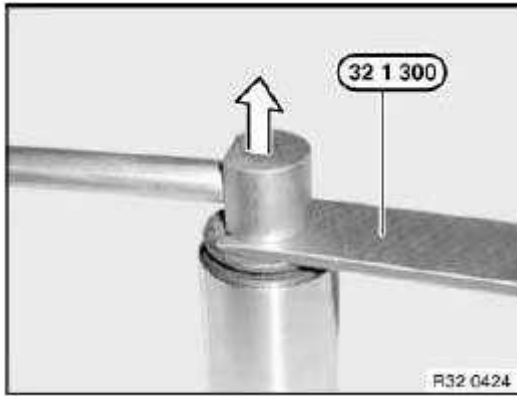


Fig. 37: Pulling Off Coupling
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Remove tool.

Press quick-release coupling into steering gear.

Quick-release coupling must snap into place with an audible click.

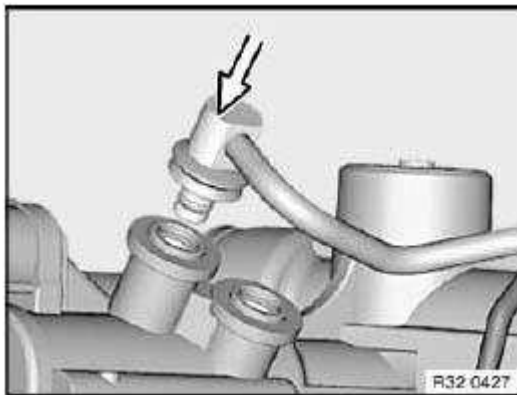


Fig. 38: Pressing Quick-Release Coupling Into Steering Gear
Courtesy of BMW OF NORTH AMERICA, INC.

32 13 006 BLEEDING POWER STEERING UNIT

WARNING: Danger of poisoning if oil is ingested/absorbed through the skin! See 00 DANGER OF POISONING IF OIL IS INGESTED/ABSORBED THROUGH THE SKIN .

Risk of injury if oil comes into contact with eyes and skin! See 00 RISK OF INJURY IF OIL COMES INTO CONTACT WITH EYES AND SKIN .

IMPORTANT: Adhere to the utmost cleanliness. Do not allow any dirt to enter the hydraulic system.

Using contaminated equipment to add fluid may introduce dirt particles into the fluid reservoir and significantly reduce the service life of the power steering system. Do not use any filler funnels or similar!

The fill level may only be checked or adjusted when the engine is stopped! The fluid temperature should be approx. 20°C here.

Ensure that the cap is fully screwed in prior to the fill level check.

NOTE: To avoid mix-ups when filling with hydraulic fluid, mark the fluid reservoirs or their caps with identification marks.

ATF Automatic transmission fluid

CHF Pentosin CHF11S

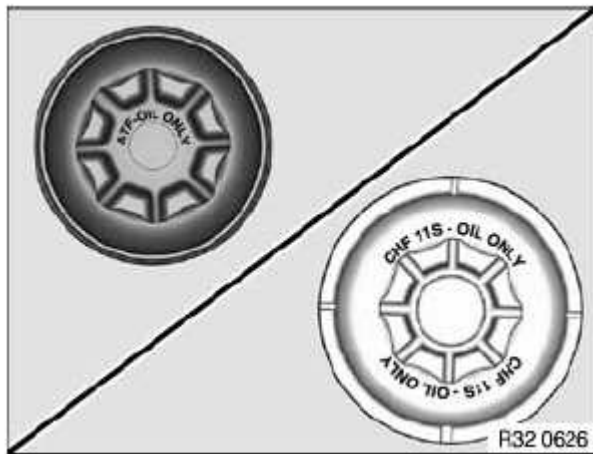


Fig. 39: Reservoirs Wire Caps

Courtesy of BMW OF NORTH AMERICA, INC.

1. Thoroughly clean fluid reservoir and its immediate surroundings
2. Check and correct fill level

NOTE: The fill level can come to rest above the "MAX" mark when the engine is at normal operating temperature. This is dictated by the design in that the marking on the dipstick is referred to a fluid temperature of 20°C. With the engine at normal operating temperature (approx. 50-60°C fluid temperature) adjust a fill height 10 mm above the "MAX" mark. Do not under any circumstances draw off the fluid to the "MAX" mark when the engine is at normal operating temperature.

Hydraulic fluid: BMW Service Operating Fluids

3. Start engine
4. Turn steering wheel left and right twice in each case up to full lock; if necessary, top up hydraulic fluid (e.g. if hydraulic system is completely drained)
5. Move steering wheel to straight-ahead position and turn off engine
6. Check and correct fill level with engine stopped
7. Check hydraulic system for leaks

32 13 060 REMOVING AND INSTALLING/REPLACING POWER STEERING GEAR

**IMPORTANT: Adhere to the utmost cleanliness. Do not allow any dirt to enter the hydraulic system.
Seal off pipe connections with plugs.**

Necessary preliminary tasks:

- Draw off and dispose off hydraulic fluid from fluid reservoir
- If necessary, remove assembly underside protection, see **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION** .
- Remove reinforcement plate, see **31 10 010 REMOVING AND INSTALLING/REPLACING REINFORCEMENT PLATE** .
- If necessary, remove steering gear cover on both sides
- Remove double joint from power steering gear, see **32 31 219 Removing and installing/replacing double joint with flexible disk**.
- Remove tie rod end from swivel bearing, see **32 21 151 Replacing left or right tie rod**.
- Replacement only:
 - Remove tie rod end at both ends of tie rod, see **32 21 151 Replacing left or right tie rod**.
- Remove stabilizer link on both sides from stabilizer, see **31 35 005 REMOVING AND INSTALLING/REPLACING PUSH ROD (STABILIZER LINK) FOR LEFT/RIGHT STABILIZER** .

If necessary, remove heat shield from power steering gear. Release FCD couplings, see **32 13 ... Notes on removing/installing FCD clutches** , disconnect hydraulic lines and lay to one side.

Disconnect plug connection on EH converter

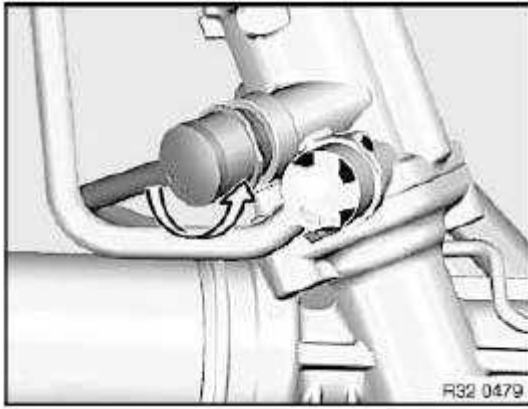


Fig. 40: Disconnecting Plug Connection On EH Converter
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Turn left swivel bearing to left.

If necessary, detach pressure line from front axle carrier.

Turn power steering gear and remove through left wheel arch.

Installation:

Replace screws and self-locking nuts.

Tightening torque: 32 00 1AZ, see **32 00 STEERING** .

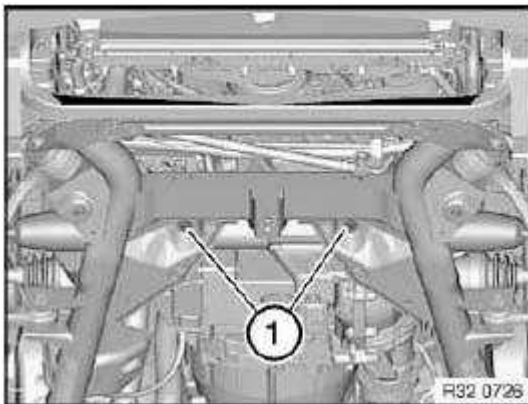


Fig. 41: Screws
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Fill and bleed hydraulic system, see **32 13 006 Bleeding power steering unit.**

- Check pipe connections for leaks
- Perform **32 00 150 KDS chassis/wheel alignment check with load up to design position.**
- Carry out steering angle sensor adjustment, see **61 31 996 Carry out steering angle sensor adjustment.**

32 13 650 REMOVING AND INSTALLING/REPLACING EH CONVERTER FOR SERVOTRONIC

IMPORTANT: Adhere to the utmost cleanliness. Do not allow any dirt to enter the hydraulic system.

Necessary preliminary tasks:

- If necessary, remove steering gear cover at side

Disconnect plug connection (1).

Unfasten screws (2).

Remove EH converter (3).

Installation:

Clean side return orifice with compressed air.

Align EH converter (3) to opening in power steering gear, press by hand into power steering gear up to stop, insert screws (2) and tighten down.

Tightening torque: 32 13 12AZ, see **32 13 POWER STEERING GEAR** .

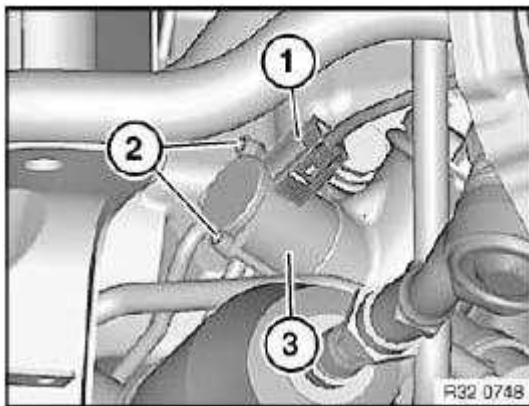


Fig. 42: Plug Connection, Screws And EH Converter
 Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Fill and bleed hydraulic system, see **32 13 006 Bleeding power steering unit.**

21 STEERING ARMS, TIE RODS, STEERING DAMPER

32 21 151 REPLACING LEFT OR RIGHT TIE ROD

Special tools required:

- **31 2 300 EXTRACTOR**

Necessary preliminary tasks:

- Remove front wheel, see **36 10 300 REMOVING OR INSTALLING FRONT OR REAR WHEEL** .

After installation:

- Perform **32 00 150 KDS chassis/wheel alignment check with load up to design position**.
- Carry out steering angle sensor adjustment, see **61 31 996 Carry out steering angle sensor adjustment**.

Release nut; if necessary, grip brace at Torx socket.

Force tie rod end off swivel bearing with special tool 31 2 300.

Installation:

Keep journal on tie rod end and bore hole in swivel bearing clean and free from grease.

Replace self-locking nut.

Tightening torque: 32 21 3AZ, see **32 21 STEERING ARMS** .

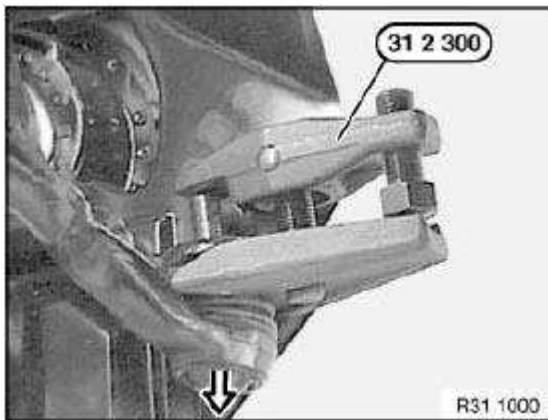


Fig. 43: Special Tool (31 1 300)

Courtesy of BMW OF NORTH AMERICA, INC.

Determine measurement (A) to simplify following adjustment of front axle.

Release clamping nut.

Screw off tie rod end; if necessary, grip tie rod with open-end wrench.

Installation:

Check gaiter , replace if necessary.

Mount clamping ring (1).

Screw in tie rod end to measurement (A).

Tightening torque: 32 21 5AZ, see **32 21 STEERING ARMS** .

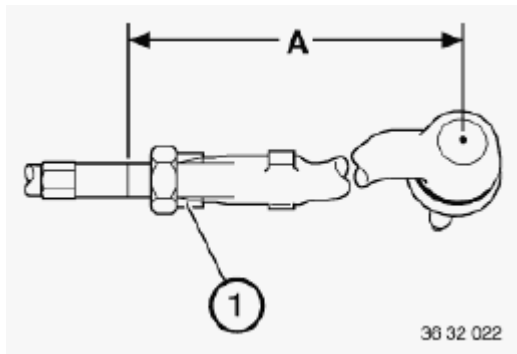


Fig. 44: Measurement (A) Of Front Axle
Courtesy of BMW OF NORTH AMERICA, INC.

32 21 231 REPLACING LEFT OR RIGHT TIE ROD

Necessary preliminary tasks:

- Remove tie rod end from swivel bearing, see **32 21 151 Replacing left or right tie rod.**
- Remove gaiter from power steering gear and slide back, see **32 11 100 Replacing gaiter for steering gear on left or right.**

IMPORTANT: To avoid damage to rack and to suspension mounting, move rack in as far as possible.

Screw tie rod off rack of power steering gear.

Installation:

Clean rack and check surface for damage (e.g. by corrosion).

Replace O-ring.

Grease rack and O-ring.

Tightening torque: 32 21 2AZ, see **32 21 STEERING ARMS** .

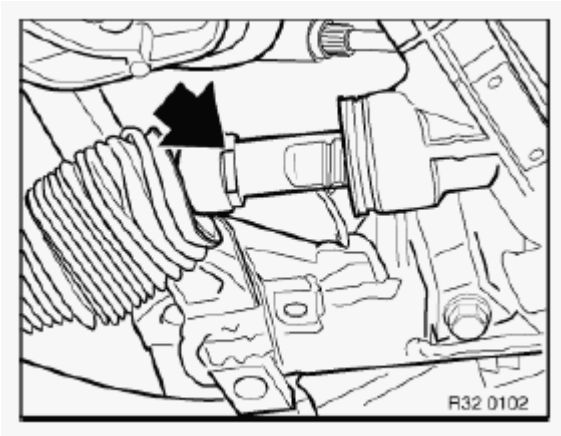


Fig. 45: Locating Rack

Courtesy of BMW OF NORTH AMERICA, INC.

Assembling new component with gaiter:

Release clamping nut (2).

Screw off tie rod end; if necessary, grip tie rod with open-end wrench.

Remove clamping ring (1) and screw off clamping nut (2).

Slide gaiter (4) and band clamp (3) onto tie rod.

Screw clamping nut (2) onto tie rod.

Slide clamping ring (1) onto tie rod.

Determine measurement (A) on old part to simplify following adjustment of front axle.

Screw tie rod end onto tie rod to measurement (A).

Tighten down clamping nut (2).

Tightening torque: 32 21 5AZ, see **32 21 STEERING ARMS** .

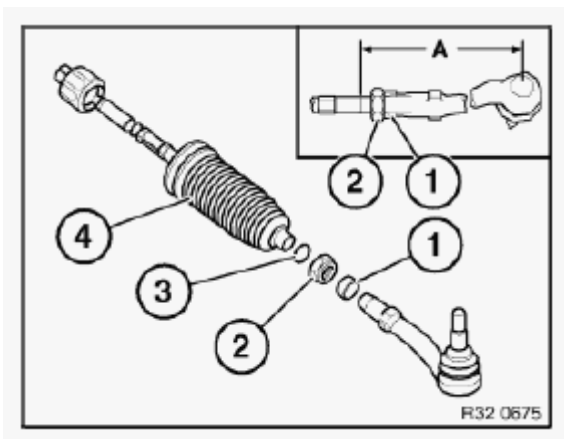


Fig. 46: Clamping Ring, Clamping Nut, Clamp And Gaiter
 Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Perform **32 00 150 KDS chassis/wheel alignment check with load up to design position.**
- Carry out steering angle sensor adjustment, see **61 31 996 Carry out steering angle sensor adjustment.**

31 STEERING COLUMN

32 31 003 REPLACING UPPER SECTION OF STEERING COLUMN TRIM

Necessary preliminary tasks:

Remove lower section of steering column trim, see **32 31 020 Removing and installing / replacing lower section of steering column trim.**

Move steering column in "bottom" and "extended" position.

Release expander rivet.

Installation:

If necessary, replace expansion rivet.

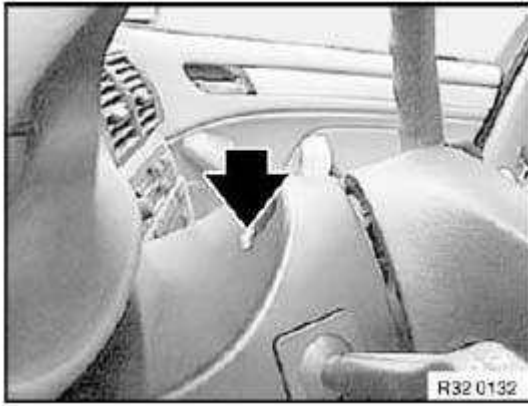


Fig. 47: Locating Expander Rivet

Courtesy of BMW OF NORTH AMERICA, INC.

Tilt steering column trim forwards.

Unclip steering column gap cover from steering column trim.

Remove steering column trim.

Installation:

Make sure steering column gap cover is in correct installation position.

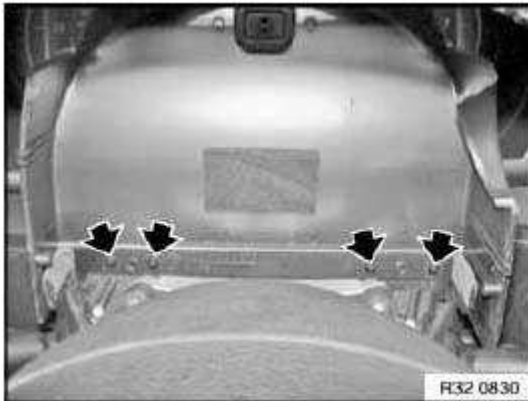


Fig. 48: Locating Steering Column Trim

Courtesy of BMW OF NORTH AMERICA, INC.

32 31 020 REMOVING AND INSTALLING / REPLACING LOWER SECTION OF STEERING COLUMN TRIM

Necessary preliminary tasks:

- Unclip panel for pedals in area of steering column trim, see **51 45 185 REMOVING AND INSTALLING/REPLACING TRIM FOR PEDAL ASSEMBLY** .

Move steering column in "top" and "extended" position.

Remove expander rivets (1).

NOTE: Press pin approx. 5 mm into expander rivet (1).

Installation:

Expander rivet can be reused. Insert rivet and push in pin until flush.

Release adjusting lever (2) for steering column.

Reach into opening underneath and pull off lower section of steering column trim (3) towards bottom.

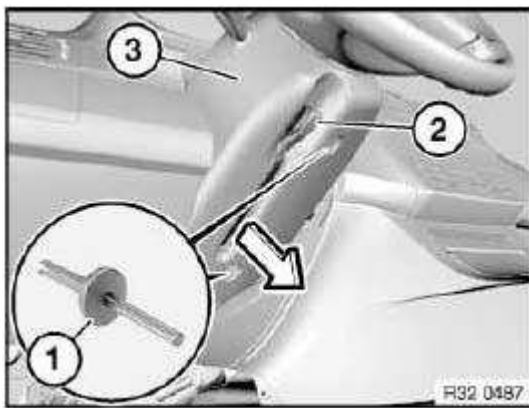


Fig. 49: Expander Rivets And Adjusting Lever
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Catch (1), guide (2), pin (3) and lock (4) must not be damaged.

Insert pin (3) at both ends into bore until lower section of steering column trim can be heard to engage with upper section via lock (4).

Press lower section of steering column trim against steering column until catch (1) locks.

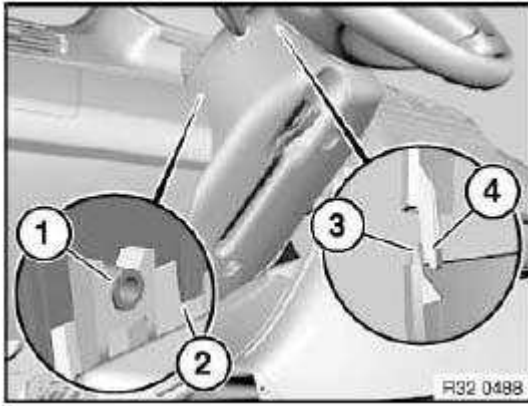


Fig. 50: Catch, Guide, Pin And Lock
Courtesy of BMW OF NORTH AMERICA, INC.

32 31 070 REMOVING AND INSTALLING / REPLACING LOWER SECTION OF STEERING SPINDLE

IMPORTANT: If the lower section of the steering spindle is separated from the power steering gear/steering column, this can result in damage to the steering column switch cluster when the steering wheel is turned!

Release clamping screw.

Move steering wheel to straight-ahead position and remove ignition key.

Detach lower steering spindle from steering column and remove with double joint towards bottom.

Installation:

Recut thread.

Replace clamping screw.

Clamping screw must rest in groove of steering column.

Tightening torque: 32 31 1AZ, see **32 31 STEERING COLUMN** .

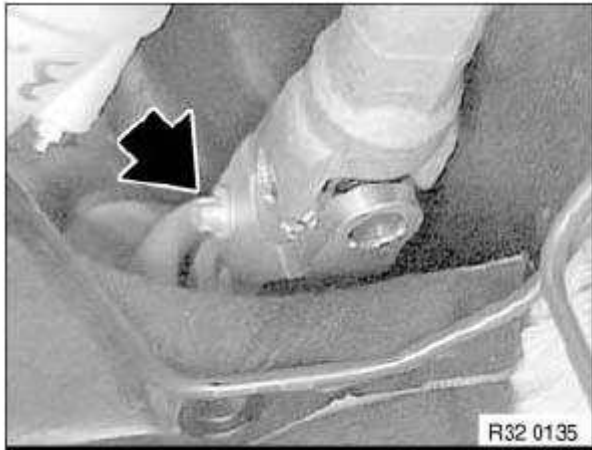


Fig. 51: Locating Clamping Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

Release clamping screw.

Pull lower section of steering spindle (1) out of double joint with flexible disk.

Installation:

Recut thread.

Replace clamping screw.

Clamping screw must rest in groove of lower steering spindle (1).

Tightening torque: 32 31 13AZ, see **32 31 STEERING COLUMN** .

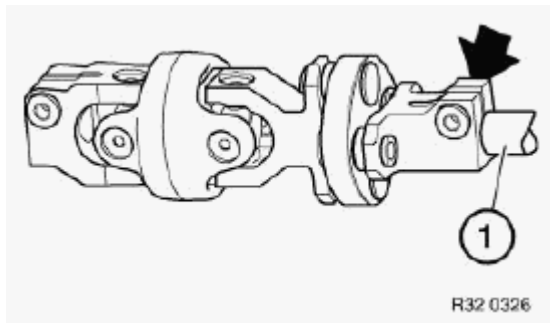


Fig. 52: Lower Section Of Steering Spindle
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Carry out steering angle sensor adjustment, see 61 31 996 Carry out steering angle sensor adjustment.
- Turn steering wheel in both directions to full lock

NOTE: **The airbag warning lamp must not light up in the process.**

- Check directional stability of vehicle

32 31 082 REMOVING AND INSTALLING/REPLACING STEERING ANGLE SENSOR

Necessary preliminary tasks:

- Slide upper steering spindle into steering column (see 32 31 102 Replacing steering spindle sleeve)

After installation:

- Replacement only: Carry out programming/coding using appropriate BMW service tool.
- Carry out steering angle sensor adjustment, see 61 31 996 Carry out steering angle sensor adjustment.

Release screw (1).

NOTE: **For the following work step, the plug connection does not have to be disconnected nor does the brake pedal return spring have to be disengaged.**

Remove holder (3) with brake light switch from pedal assembly bearing block (2).

Installation:

Insert holder (3) with guide (4) into opening in pedal assembly bearing block (2).

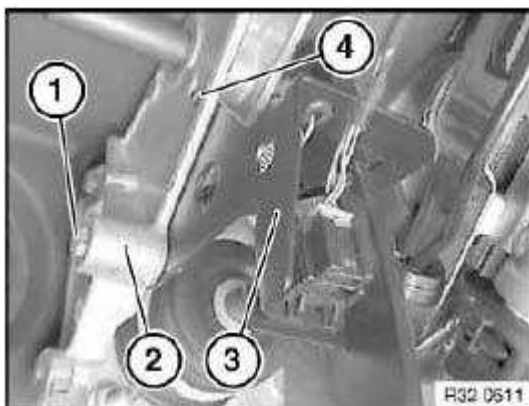


Fig. 53: Screw, Bearing, Holder And Guide
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew nut (1).

Tightening torque: 32 31 16AZ, see **32 31 STEERING COLUMN** .

Press brake pedal forwards.

Press out screw (2) with a suitable tool.

Remove plug connection for steering angle sensor (4) from holder, unlock and disconnect.

Expose cable up to steering angle sensor (4).

Installation:

Align guide bushes (3) to bores in mounting plate (5).

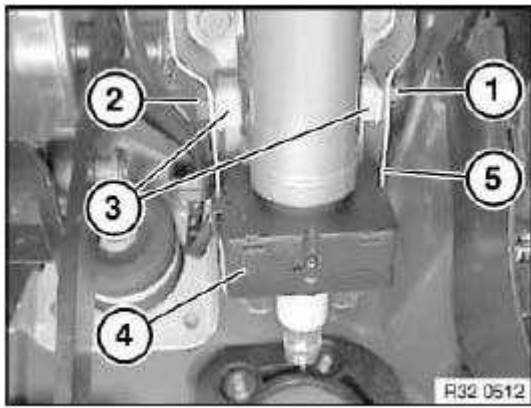


Fig. 54: Nut, Screw, Steering Angle Sensor, Guide Bushes And Mounting Plate
Courtesy of BMW OF NORTH AMERICA, INC.

Pull steering column (3) downwards a little.

Insert a spacer (2) with a height of 4 to 5 cm between mounting plate (1) and steering column (3).

Detach sleeve (5) from upper steering spindle.

Press both hooks inwards and detach steering angle sensor (4) towards bottom.

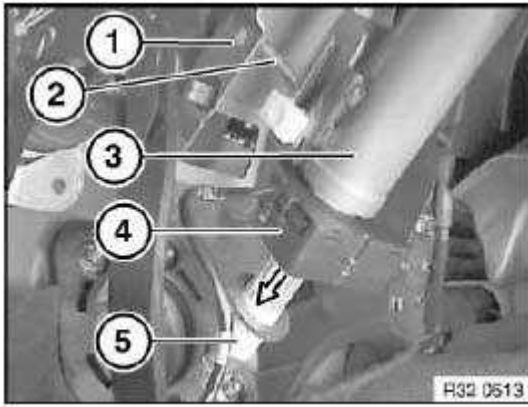


Fig. 55: Mounting Plate, Spacer, Steering Column, Steering Angle Sensor And Sleeve
 Courtesy of BMW OF NORTH AMERICA, INC.

32 31 090 REMOVING AND INSTALLING/REPLACING STEERING COLUMN

Necessary preliminary tasks:

- Slide upper section of steering spindle into steering column (see **REPLACING STEERING SPINDLE SLEEVE**)
- Remove fixture for steering column stalks

Disconnect plug connections (1, 2).

If necessary, remove interlock cable from steering column, see **32 32 170 Removing and installing/replacing interlock cable**.

Expose wiring harness and remove from cable duct (3).

Turn holder (5) approx. 45° downwards and remove.

Remove plug connection (4) from holder (5) and disconnect.

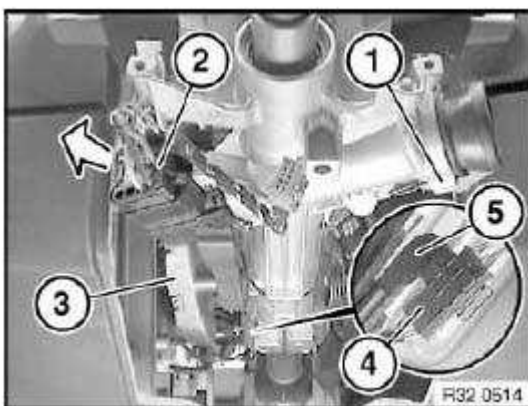


Fig. 56: Plug Connections And Holder
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1, 2).

Tightening torque: 32 31 6AZ, see **32 31 STEERING COLUMN** .

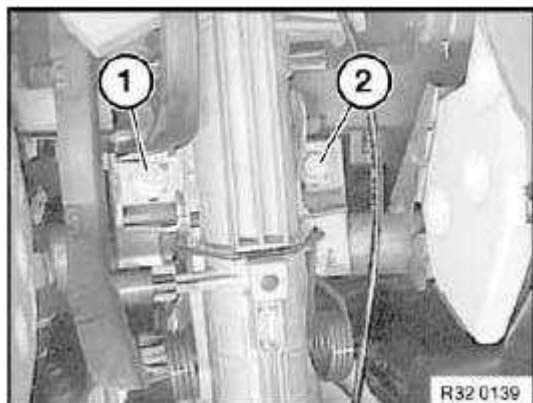


Fig. 57: Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew nuts.

Remove steering column towards rear through instrument panel.

Installation:

Replace self-locking nuts.

Tightening torque: 32 31 15AZ, see **32 31 STEERING COLUMN** .

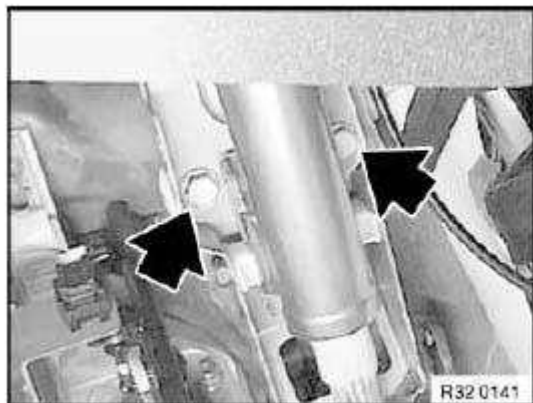


Fig. 58: Locating Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

- Modify cable duct
- Modify lock cylinder, see **32 32 050 Removing and installing/replacing steering lock cylinder.**
- Modify steering angle sensor, see **32 31 082 Removing and installing/replacing steering angle sensor.**

After installation:

- Carry out steering angle sensor adjustment, see **61 31 996 Carry out steering angle sensor adjustment.**
- Perform function check:
 - I. Check for ease of movement in overall adjustment range of steering column to adjoining components/wires
 - II. Turn steering wheel in both directions to full lock. The airbag warning lamp must not light up in the process.
 - Check directional stability of vehicle

32 31 102 REPLACING STEERING SPINDLE SLEEVE

Necessary preliminary tasks:

- Remove lower section of steering spindle, see **32 31 070 Removing and installing / replacing lower section of steering spindle.**
- Remove trim for pedal assembly, see **51 45 185 REMOVING AND INSTALLING/REPLACING TRIM FOR PEDAL ASSEMBLY .**

Press crash disk (2) off crash sleeve (1).

Open crash sleeve (1) slightly and remove from upper steering spindle (3).

Slide upper steering spindle (3) into steering column.

Remove crash disk (2).

Installation:

Replace crash sleeve (1).

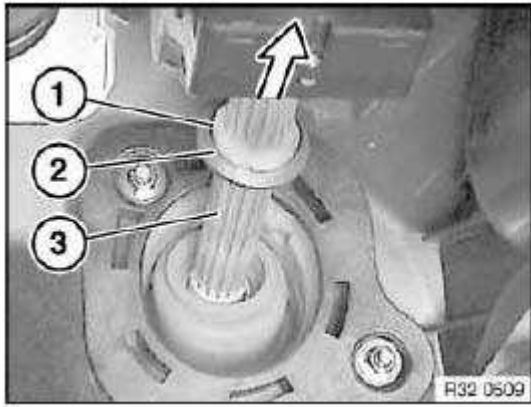


Fig. 59: Crash Sleeve, Crash Disk And Upper Steering Spindle
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew nuts (1).

Remove sleeve bracket (2).

Installation:

Replace self-locking nuts.

Tightening torque: 32 31 10AZ, see **32 31 STEERING COLUMN** .

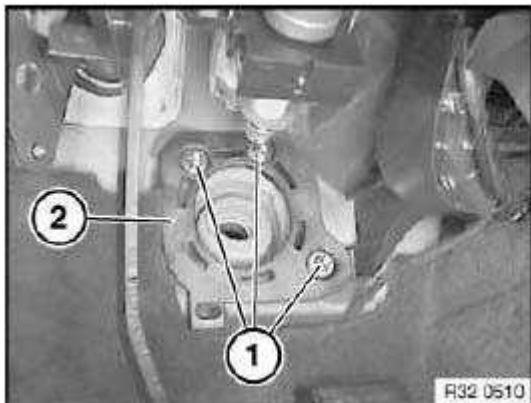


Fig. 60: Nuts And Sleeve Bracket
Courtesy of BMW OF NORTH AMERICA, INC.

Remove sleeve from bulkhead.

Installation:

Make sure sleeve is correctly seated in relation to opening in bulkhead.

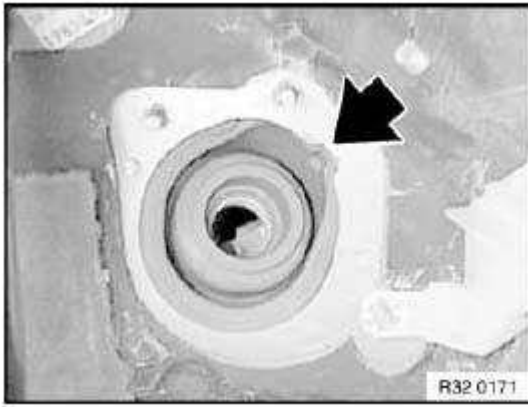


Fig. 61: Locating Sleeve

Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Carry out steering angle sensor adjustment, see **61 31 996 Carry out steering angle sensor adjustment.**

32 31 219 REMOVING AND INSTALLING/REPLACING DOUBLE JOINT WITH FLEXIBLE DISK

Necessary preliminary tasks:

- If necessary, remove steering gear cover at side

Release clamping screw, turn power steering if necessary.

Move steering wheel to straight-ahead position and remove ignition key.

Detach double joint with flexible disk from power steering gear.

Installation:

If necessary, move power steering gear to straight-ahead position - markings on cap and housing must match up.

Replace clamping screw.

Tightening torque: 32 31 1AZ, see **32 31 STEERING COLUMN** .

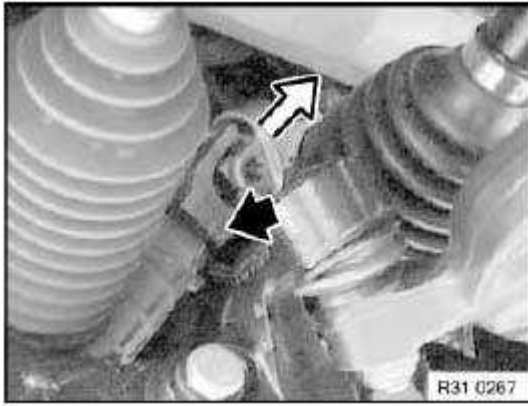


Fig. 62: Detaching Double Joint With Flexible Disk From Power Steering Gear
Courtesy of BMW OF NORTH AMERICA, INC.

Release clamping screw.

Detach double joint with flexible disk from lower steering spindle (1).

Installation:

Clamping screw must rest in groove of lower steering spindle (1).

Replace clamping screw.

Tightening torque: 32 31 13AZ, see **32 31 STEERING COLUMN** .

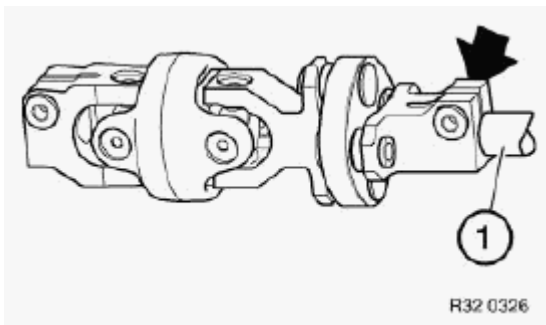


Fig. 63: Lower Section Of Steering Spindle
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Carry out steering angle sensor adjustment, see **61 31 996 Carry out steering angle sensor adjustment.**

32 31 241 REPLACING ADJUSTING LEVER FOR STEERING COLUMN

Necessary preliminary tasks:

- Remove lower section of trim, see 32 31 020 Removing and installing / replacing lower section of steering column trim.

Disconnect plug connections (1).

Remove wiring harness (2) from cable guide (3).

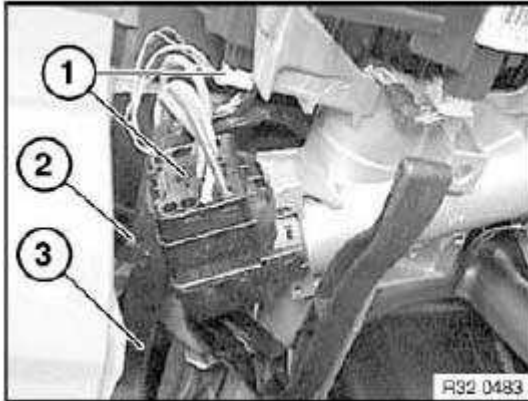


Fig. 64: Plug Connections, Wiring Harness And Cable Guide
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1), remove cable guide (2).

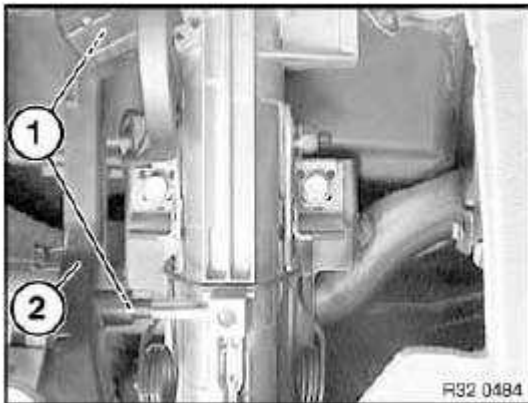


Fig. 65: Screws And Cable Guide
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Clamping bearing must be held down until secured.

Securing clamping bearing:

- Pull retaining tab (1) in direction of steering column.
- Turn clamping bearing head (3) so that pin (2) on clamping bearing is held by retaining tab (1).

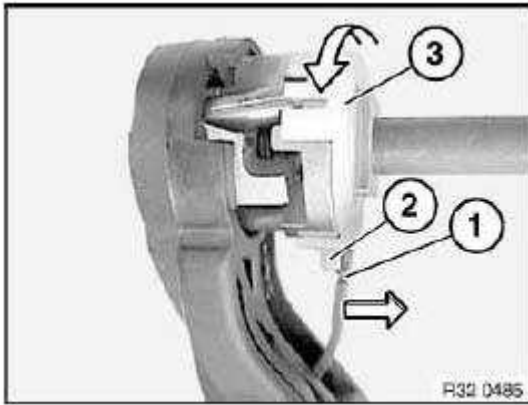


Fig. 66: Pulling Retaining Tab

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: The secure fitting must not be released when the adjusting

Unscrew nut (1).

Remove needle bearing (2) and washer.

Pull out adjusting lever (3).

Installation:

- Replace nut (1).
- Move adjusting lever (3) into locked position.
- Fit washer and needle bearing (2) and screw on nut (1) until it contacts needle bearing (2).

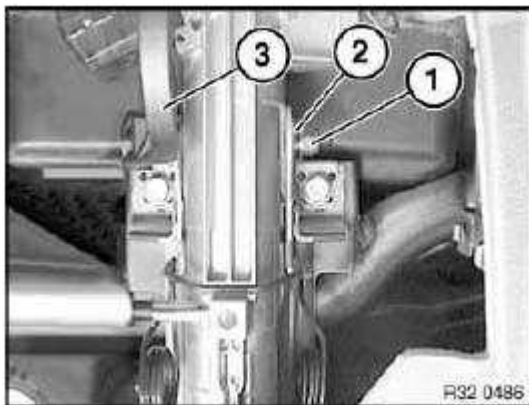


Fig. 67: Nut, Needle Bearing And Adjusting Lever

Courtesy of BMW OF NORTH AMERICA, INC.

- Open and close adjusting lever (3).
- Tighten nut (1) to torque value 1.

Tightening torque: 32 31 3AZ, see **32 31 STEERING COLUMN** .

- Open and close adjusting lever (3) again.
- Tighten nut (1) to torque value 2.

Tightening torque: 32 31 3AZ, see **32 31 STEERING COLUMN** .

- Open and close adjusting lever (3) again.
- Tighten nut (1) again to torque value 2.

Tightening torque: 32 31 3AZ, see **32 31 STEERING COLUMN** .

IMPORTANT: Observe tightening torques without fail!

The clamping force is adjusted by means of the tightening torque.

32 STEERING LOCK

32 32 050 REMOVING AND INSTALLING/REPLACING STEERING LOCK CYLINDER

Special tools required:

- **32 3 110 RELEASING TOOL**

Necessary preliminary tasks:

- Remove ring antenna

If necessary, unlock interlock through bore (1).

With ignition lock key, turn lock cylinder to required position "R" = radio, windscreen wipers, etc.

Press special tool 32 3 110 into locking cylinder hole and remove locking cylinder.

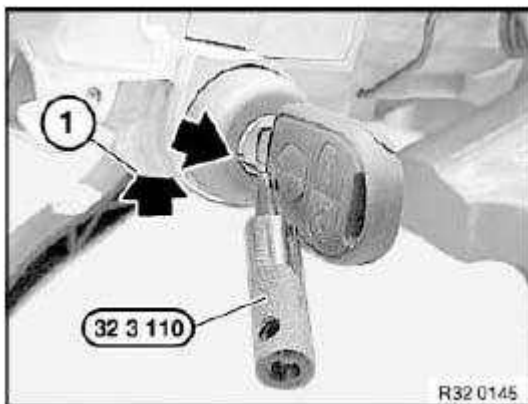


Fig. 68: Bore And Special Tool (32 3 110)

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Use special tool 32 3 110 to disengage lock (1). If necessary, special tool 32 3 110 must be turned in bore.

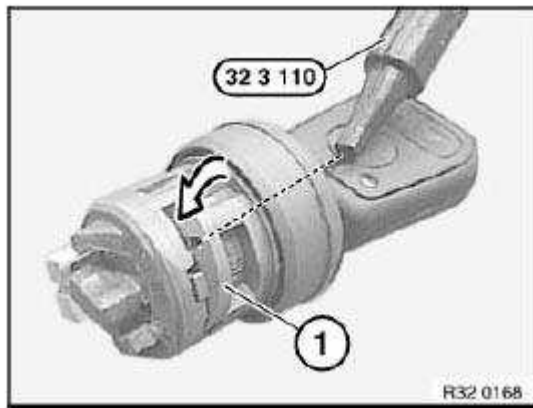


Fig. 69: Disengaging Lock

Courtesy of BMW OF NORTH AMERICA, INC.

32 32 170 REMOVING AND INSTALLING/REPLACING INTERLOCK CABLE

Necessary preliminary tasks:

- Remove function carrier on trim for instrument panel, see **51 45 106 REMOVING AND INSTALLING/REPLACING FUNCTION CARRIER ON INSTRUMENT PANEL TRIM**
- Remove lower section of steering column trim, see **32 31 020 Removing and installing / replacing lower section of steering column trim.**

After installation:

- Check function of interlock cable, see **25 16 175 ADJUSTING INTERLOCK CABLE** .
- Adjust interlock cable, see **25 16 175 ADJUSTING INTERLOCK CABLE** .

Release screw (1).

Take off holder (2).

Press interlock cable (3) in area of switch block to driver's side and remove towards front.

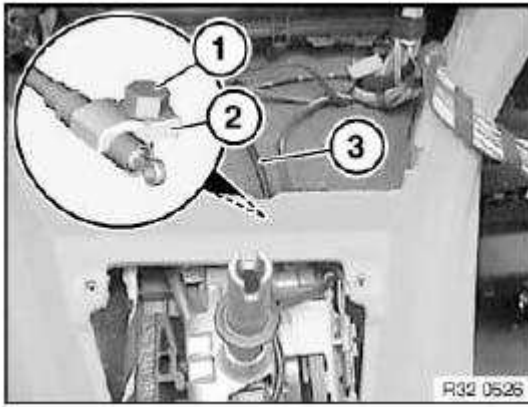


Fig. 70: Screw, Holder And Interlock Cable
Courtesy of BMW OF NORTH AMERICA, INC.

Turn guide sleeve (1) through approx. 45°.

Pull interlock cable (2) out of steering column.

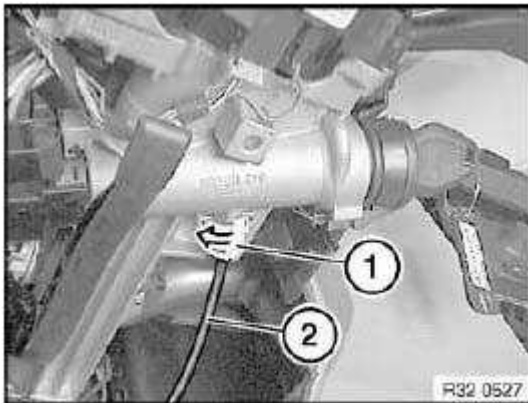


Fig. 71: Guide Sleeve And Interlock Cable
Courtesy of BMW OF NORTH AMERICA, INC.

Tie wire or cord to end of interlock cable (1) in area of switch block.

Pull out interlock cable (1) in direction of steering column.

IMPORTANT: Do not kink interlock cable (1).

If necessary, remove wire or cord from interlock cable (1).

Installation:

Check installation position of interlock cable (1) in area of footwell heating duct (2), correct if necessary.

L = steering column, S = switch block

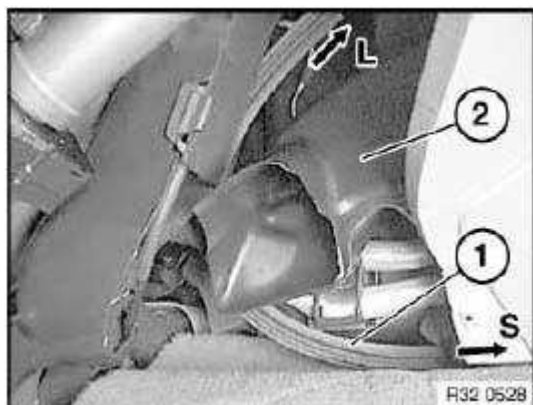


Fig. 72: Interlock Cable And Heating Duct
Courtesy of BMW OF NORTH AMERICA, INC.

Pull through interlock cable (1) in direction of switch block.

Replacement only:

Tie wire of cord to end of new interlock cable.

33 STEERING WHEEL

32 33 ... REPLACING LEFT OR RIGHT COVER FOR STEERING WHEEL (FROM 09/2006)

Necessary preliminary tasks:

- Remove airbag unit, see **32 34 020 Removing and installing/replacing airbag unit (from 09/2006).**

NOTE: For simplification purposes, the illustration shows how to release the screws on the removed steering wheel.

Release screws (1) with Torx screwdriver (T10).



Fig. 73: Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Unclip cover (1).



Fig. 74: Cover
Courtesy of BMW OF NORTH AMERICA, INC.

32 33 000 REMOVING AND INSTALLING/REPLACING STEERING WHEEL (FROM 09/2006)

Necessary preliminary tasks:

- Remove airbag unit, see **32 34 020 Removing and installing/replacing airbag unit (from 09/2006)**.

Move wheels/steering wheel into straight-ahead position.

Release screw (1).

Tightening torque: 32 33 1AZ, see **32 33 STEERING WHEEL** .

Remove steering wheel (2).



Fig. 75: Screw And Steering Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Align steering wheel by way of marking (1) to steering column marking (2) and attach.

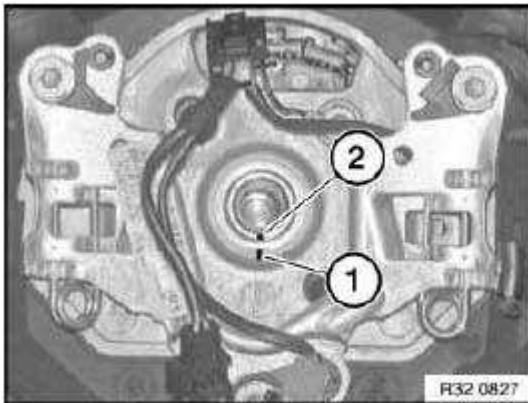


Fig. 76: Aligning Steering Wheel By Way Of Marking To Steering Column Marking
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

Modify multifunction steering wheel covers/switches, see **32 33 ... Replacing left or right cover for steering wheel (from 09/2006)**.

32 33 010 REMOVING AND INSTALLING SPORTS STEERING WHEEL

Necessary preliminary tasks:

- Remove airbag unit, see **32 34 020 Removing and installing/replacing airbag unit (from 09/2006)**.
- Move steering wheel/wheels to straight-ahead position

Unscrew bolt (1).

Tightening torque: 32 33 1AZ, see **32 33 STEERING WHEEL** .

Unlock plug connections (2) and disconnect.

Remove sports steering wheel.

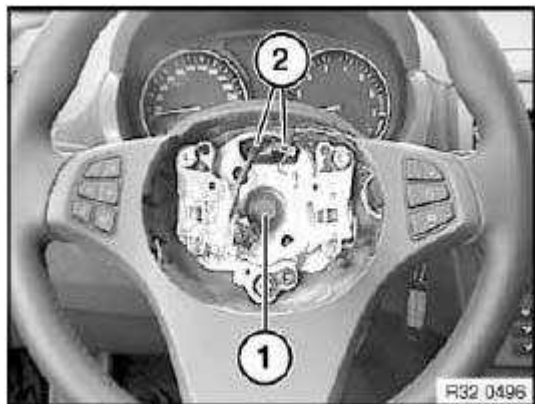


Fig. 77: Bolt And Plug Connections
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Move wheels to straight-ahead position.

Attach sports steering wheel. Markings (1) on sports steering wheel and steering spindle must match up. The retaining pins (2) must also appear in the openings in the sports steering wheel.

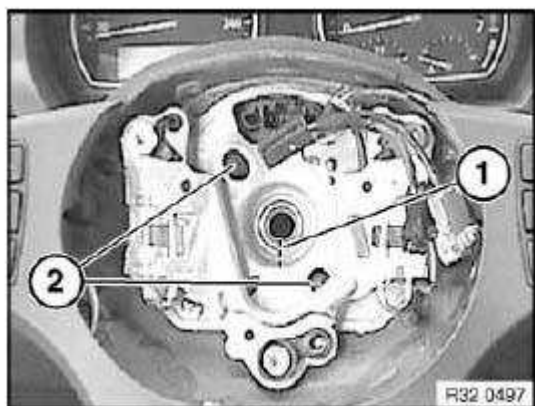


Fig. 78: Marking On Sports Steering Wheel And Steering Spindle
Courtesy of BMW OF NORTH AMERICA, INC.

32 33 015 REPLACING SPORTS STEERING WHEEL

Necessary preliminary tasks:

- Remove sports steering wheel, see 32 33 010 Removing and installing sports steering wheel.

Remove cover (1).

If necessary, remove switch (2) for multifunction unit.



Fig. 79: Cover

Courtesy of BMW OF NORTH AMERICA, INC.

34 STEERING WHEEL FOR AIRBAG

32 34 020 REMOVING AND INSTALLING/REPLACING AIRBAG UNIT (FROM 09/2006)

WARNING: Observe the following instructions to avoid any risk of injury by the airbag unit.

- Comply with 72 00 ... SAFETY REGULATIONS FOR HANDLING COMPONENTS WITH GAS GENERATORS .
- Do not exert any force on the airbag unit.
- Use only specified tools for releasing the airbag unit.

NOTE: Incorrect handling may result in triggering of the airbag unit and thereby cause serious injury.

IMPORTANT: Steering wheel must be replaced if airbag unit has been triggered! See 32 33 000 Removing and installing/replacing steering wheel (from 09/2006).

Follow 72 12 ... PROCEDURE AFTER AIRBAG TRIGGERING AS RESULT OF AN ACCIDENT .

Necessary preliminary tasks:

- Disconnect battery negative lead

Insert Torx screwdriver T30 (1) horizontally into opening on reverse side of steering wheel until a spring resistance is felt (approx. 4 cm).

Press spring leg (2) with Torx screwdriver (1) up to stop and pull airbag unit away from steering wheel.

Repeat procedure on other side.

Installation:

Make sure electrical leads are correctly positioned.

Snap airbag unit with uniform pressing force plane-parallel in direction of steering column shaft into steering wheel.

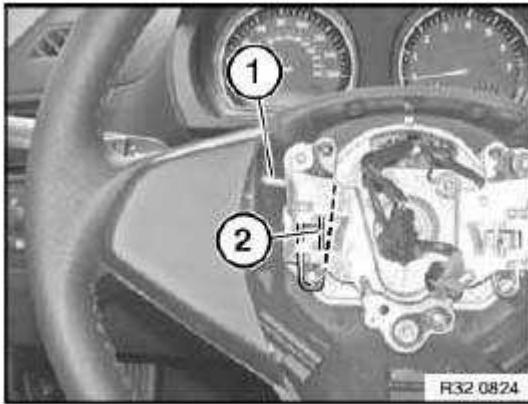


Fig. 80: Torx Screwdriver T30 And Spring Leg
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Danger of injury!

Airbag unit may only be set down with the airbag itself facing upwards.

Tilt airbag unit (1) towards rear.

Disconnect plug connections (2) and remove airbag unit (1), see **72 12 ... UNLOCKING/LOCKING AIRBAG PLUG CONNECTIONS** .

Installation:

Connect plugs to connections of same colour on airbag unit.

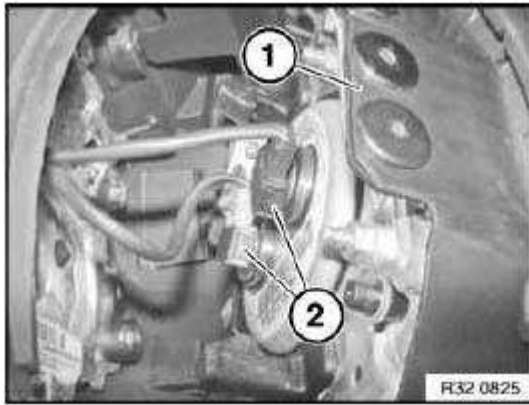


Fig. 81: Airbag Unit And Plug Connections

Courtesy of BMW OF NORTH AMERICA, INC.

32 34 030 REMOVING AND INSTALLING / REPLACING AIRBAG UNIT (SPORT STEERING WHEEL)

WARNING: Observe the following instructions to avoid any risk of injury by the airbag unit.

- Comply with **72 00 ... SAFETY REGULATIONS FOR HANDLING COMPONENTS WITH GAS GENERATORS** .
- Do not exert any force on the airbag unit.
- Use only specified tools for releasing the airbag unit.

NOTE: Incorrect handling may result in triggering of the airbag unit and thereby cause serious injury.

IMPORTANT: Steering wheel must be replaced if airbag unit has been triggered! See **32 33 000 Removing and installing/replacing steering wheel (from 09/2006)**.

Follow 72 12 ... PROCEDURE AFTER AIRBAG TRIGGERING AS RESULT OF AN ACCIDENT .

Necessary preliminary tasks:

- Disconnect battery negative lead

Insert Torx screwdriver (T30) horizontally into opening on reverse side of steering wheel up to stop (approx. 4.5 cm).



Fig. 82: Inserting Torx Screwdriver (T30) Horizontally Into Opening On Reverse Side Of Steering Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

Increase pressure with Torx screwdriver T30 (1) on spring leg (2) until airbag unit is unlocked.

Repeat procedure on other side.

Installation:

Make sure electrical leads are correctly positioned.

Snap airbag unit with uniform pressing force plane-parallel in direction of steering column shaft into steering wheel.

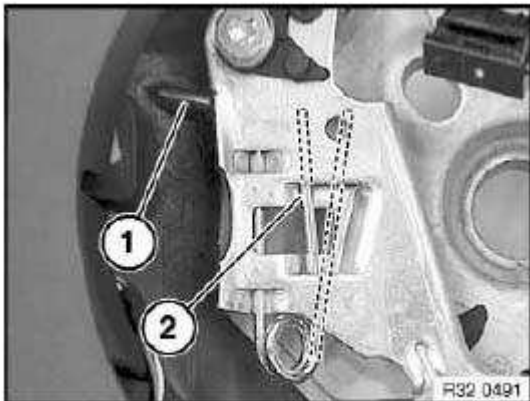


Fig. 83: Torx Screwdriver T30 And Spring Leg
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Danger of injury!

Airbag unit may only be set down with the airbag itself facing upwards.

Tilt airbag unit (1) slightly to one side.

Slide screwdriver (2) from front into both plug connections (3) until cover lifts off.

Disconnect plug connections (3).

Remove airbag unit (1).

Installation:

Connect plugs to connections of same colour on airbag unit.

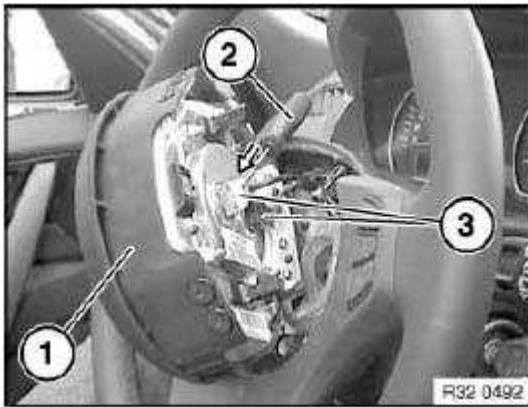


Fig. 84: Airbag Unit, Screwdriver And Plug Connections
Courtesy of BMW OF NORTH AMERICA, INC.

41 PUMP AND OIL SUPPLY

32 41 ... INSTRUCTIONS FOR REMOVING AND INSTALLING EAR CLIPS

Special tools required:

- **32 1 260 PLIERS**

NOTE: The work steps are show on assorted components. Ear clip must always be replaced.

To remove an ear clip, place special tool 32 1 260 at right angles to ear and cut ear open.

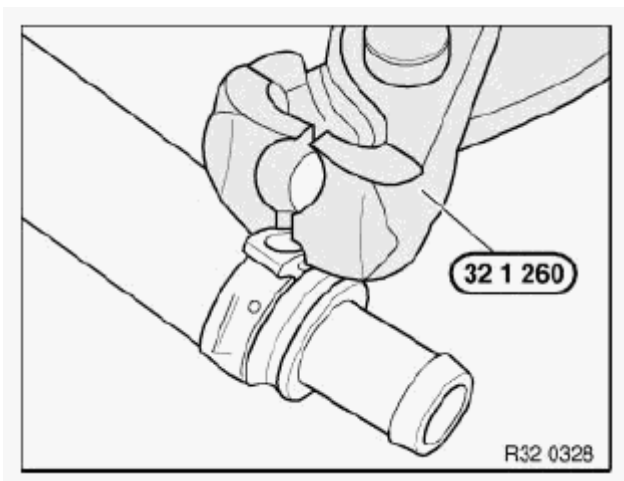


Fig. 85: Special Tool (32 1 260)

Courtesy of BMW OF NORTH AMERICA, INC.

The ear clip can be fitted not only axially but also radially after the hook fastener has been opened.

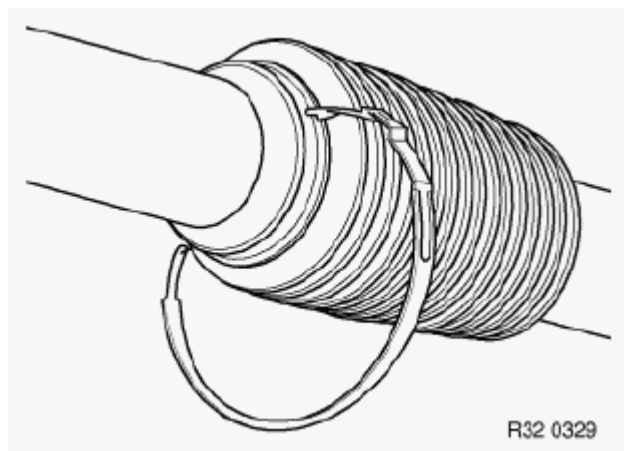


Fig. 86: Ear Clip

Courtesy of BMW OF NORTH AMERICA, INC.

Attach hook fastener and press ear together with special tool 32 1 260.

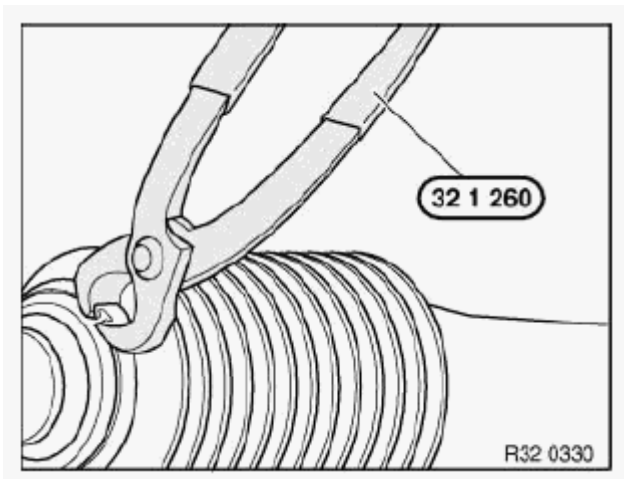


Fig. 87: Special Tool (32 1 260)
Courtesy of BMW OF NORTH AMERICA, INC.

Side cutter of special tool 32 1 260 can be used in areas which are difficult to access.

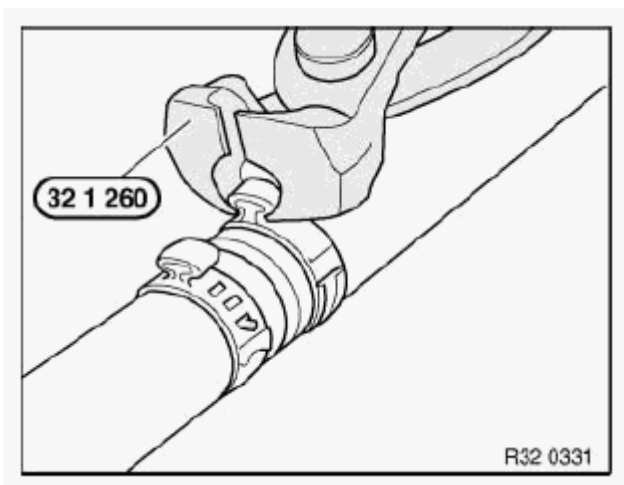


Fig. 88: Special Tool (32 1 260)
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Gap (A) max. 1 mm!

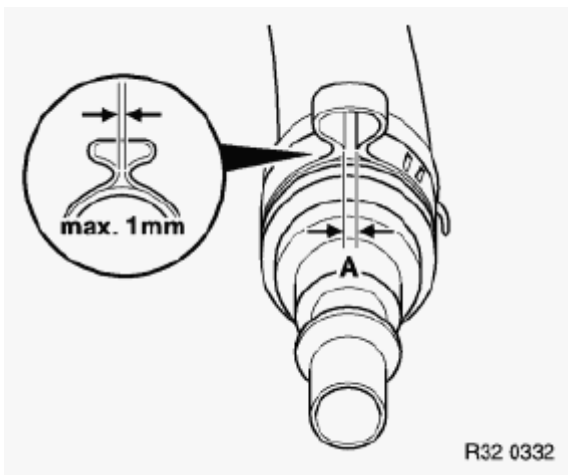


Fig. 89: Gap (A)

Courtesy of BMW OF NORTH AMERICA, INC.

32 41 ... INSTRUCTIONS FOR USING SPECIAL TOOL 32 4 000

Special tools required:

- **32 4 000 FIXTURE**
- 32 4 004 **32 4 000 FIXTURE**
- 32 4 005 **32 4 000 FIXTURE**
- 32 4 006 **32 4 000 FIXTURE**
- 32 4 011 **32 4 000 FIXTURE**
- 32 4 012 **32 4 000 FIXTURE**

Depending on the pressure hose connection on the pump, the special tool 32 4 000 must be assembled.

1 = Connection, pump

2 = Connection, steering gear

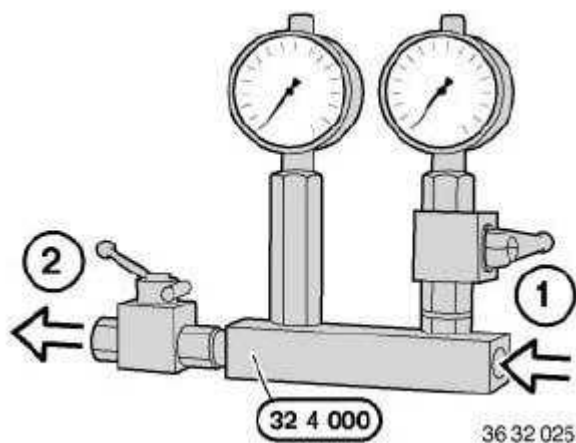


Fig. 90: Special Tool (32 4 000) And Connections
Courtesy of BMW OF NORTH AMERICA, INC.

Pressure hose connection to pump with M14 x 1.5 banjo bolt:

Screw special tool 32 4 004 with M14 x 1.5 banjo bolt (1) and 2 sealing rings to special tool 32 4 000.

Screw special tool 32 4 011 onto pump and connect special tool 32 4 004.

Screw special tools 32 4 006 / 32 4 012 onto special tool 32 4 000 and connect pressure hose with M14 x 1.5 banjo bolts and 2 sealing rings.

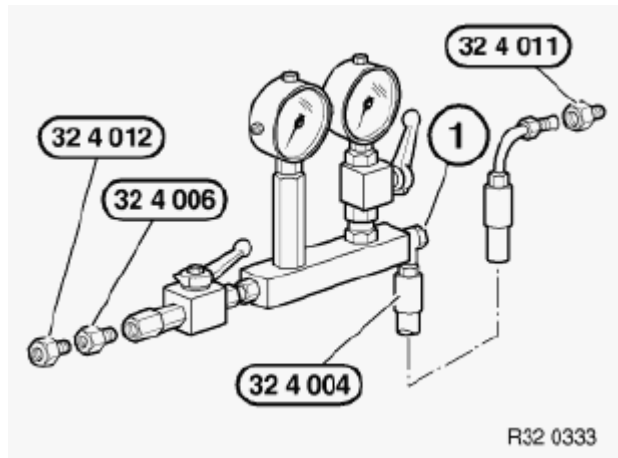


Fig. 91: Special Tools (32 1 030)
Courtesy of BMW OF NORTH AMERICA, INC.

Pressure hose connection to pump with M16 x 1.5 banjo bolt:

Screw special tool 32 4 004 with M14 x 1.5 banjo bolt (1) and 2 sealing rings to special tool 32 4 000.

Screw special tool 32 4 005 onto pump and connect special tool 32 4 004.

Screw special tool 32 4 006 onto special tool 32 4 000 and connect pressure hose with M16 x 1.5 banjo bolt and 2 sealing rings.

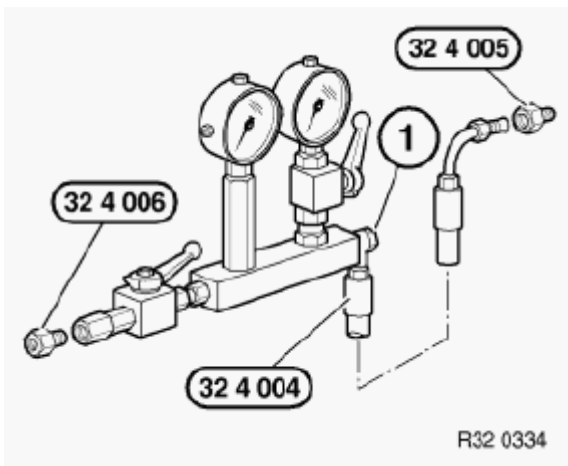


Fig. 92: Special Tools (32 4 006), (32 4 004) And (32 4 005)
Courtesy of BMW OF NORTH AMERICA, INC.

Pressure hose connection to pump with M16 x 1.5 union screw: Screw special tool 32 4 004 with M14 x 1.5 banjo bolt (1) and 2 sealing rings to special tool 32 4 000.

Connect special tool 32 4 004 to pump.

Screw special tools 32 4 006 / 32 4 005 onto special tool 32 4 000 and connect pressure hose.

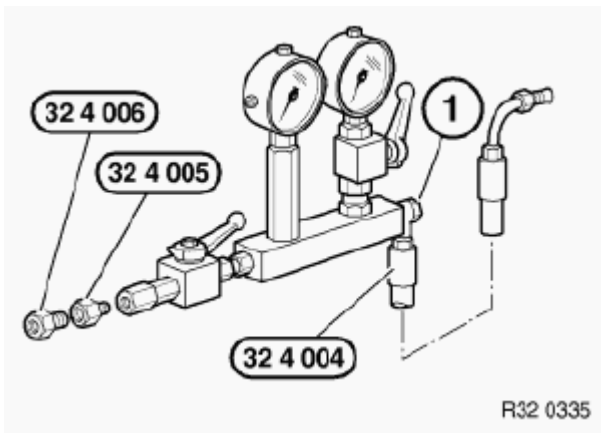


Fig. 93: Special Tools (32 4 006), (32 4 004) And (32 4 005)
Courtesy of BMW OF NORTH AMERICA, INC.

32 41 ... NOTES ON HYDRAULIC LINE WITH QUICK-CONNECT COUPLING

1. **Quick-connect coupling with ID marking**

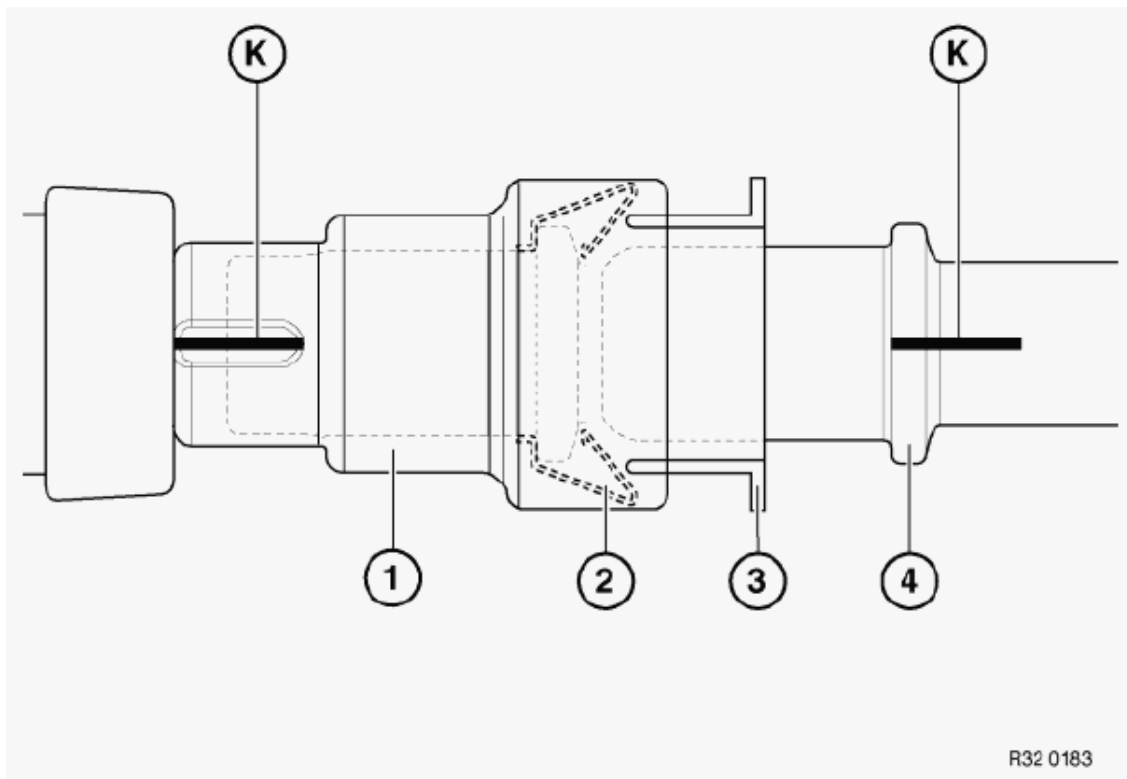


Fig. 94: Quick-Connect Coupling Component With ID Marking
Courtesy of BMW OF NORTH AMERICA, INC.

Removing:

Push quick-connect coupling (1) against pipe (4) (thereby relieving strain on spring (2)).

Press plastic ring (3) into quick-connect coupling (1) and remove coupling (1).

Assembly:

Markings (K) on coupling (1) and pipe (4) must be flush.

Push quick-connect coupling (1) onto pipe (4) until a "click" can clearly be heard.

To check that quick-connect coupling (1) has been installed correctly, pull it back forcefully.

2. Quick-connect coupling with indication pins

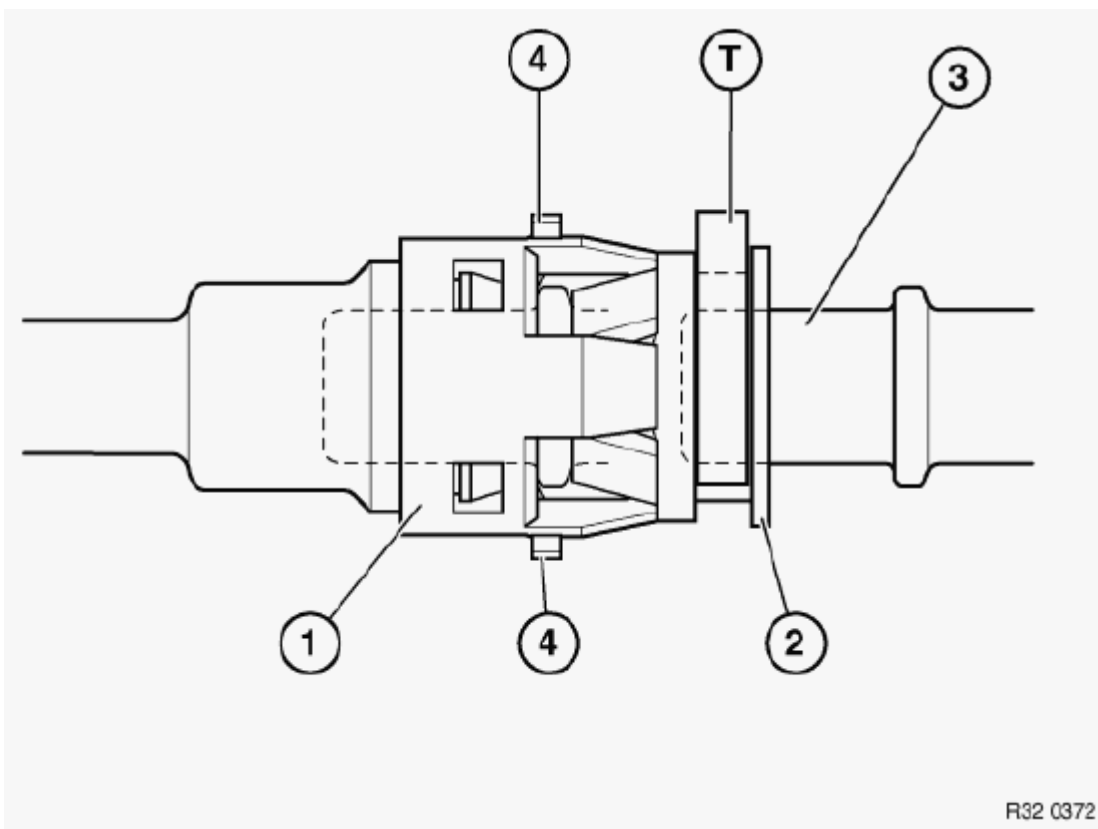


Fig. 95: Quick-Connect Coupling Component With Indication Pins
 Courtesy of BMW OF NORTH AMERICA, INC.

Removing:

Press plastic ring (2) into quick-connect coupling (1) and remove coupling (1).

Assembly:

When replacing hydraulic line: remove transportation lock (T).

Push quick-connect coupling (1) onto pipe (3) until both indication pins (4) can be seen and felt to point outwards at outside diameter of housing.

To check that quick-connect coupling (1) has been correctly fitted, feel indication pins (4) at outside diameter of housing. When correctly seated, indication pins (4) cannot be pressed into housing.

IMPORTANT: Coupling is not correctly engaged if both indication pins (4) fail to protrude from housing. Leakage is thus unavoidable.

32 41 001 SERVOTRONIC TROUBLESHOOTING

Refer to the following two Service Information bulletins for all the necessary information.

- Diagnostic aid for power steering
- Diagnosis of power steering systems

32 41 009 CHECKING FUNCTION OF POWER STEERING VANE PUMP

Special tools required:

- 32 4 000 FIXTURE

IMPORTANT: Prior to this check, first check all hose connections, the vane pump and the power steering gear for leaks.
Adhere to the utmost cleanliness. Do not allow any dirt to enter the hydraulic system.

Necessary preliminary tasks:

- Draw off and dispose off hydraulic fluid from fluid reservoir
- If necessary, remove front assembly underside protection, see 51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION .
- Disconnect pressure line from vane pump, see 32 41 060 Removing and installing/replacing power steering vane pump (N52).

Connecting special tool:

Connect special tool 32 4 000 (refer to 32 41 ... Instructions for using special tool 32 4 000) with new sealing rings to vane pump and pressure line.

1. Connection, vane pump
2. Connection, power steering gear

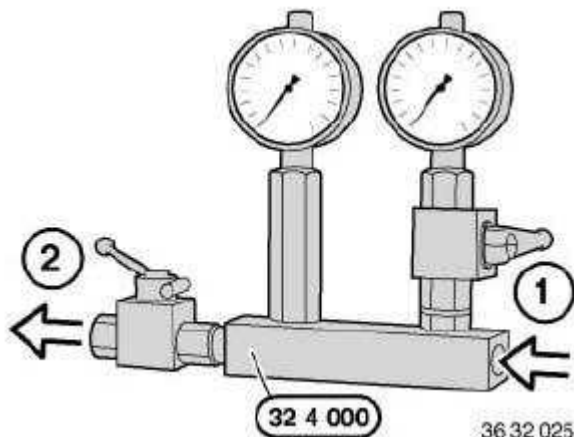


Fig. 96: Special Tool (32 4 000) And Connections
 Courtesy of BMW OF NORTH AMERICA, INC.

Checking pump pressure:

1. Close valve (A).
2. Open valve (B).
3. Fill and bleed hydraulic system, see **32 13 006 Bleeding power steering unit.**
4. Start engine.
5. Heat hydraulic fluid to approx. 50°C by moving steering wheel at increased engine speed.
6. Close valve (B) for max. 10 secs. and read off pressure.
7. Compare measured pressure with specified nominal pressure.

Replace vane pump if the nominal pressure is exceeded by more than 10 %, see **32 41 060 Removing and installing/replacing power steering vane pump (N52)**

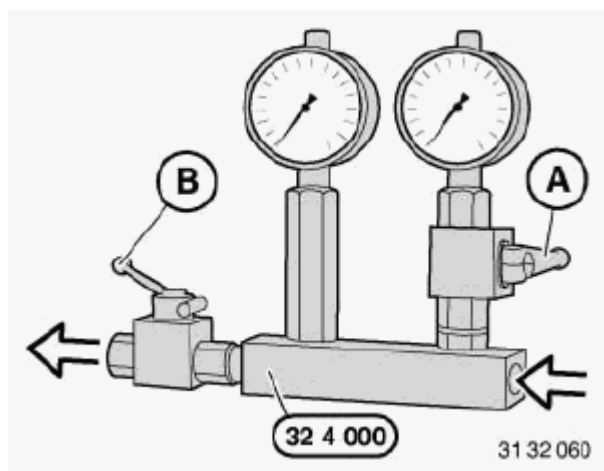


Fig. 97: Special Tool (32 4 000) And Valve
Courtesy of BMW OF NORTH AMERICA, INC.

Check belt tension if the nominal pressure is undershot by more than 10 %. Replace vane pump if belt tension is OK, see **32 41 060 Removing and installing/replacing power steering vane pump (N52)**

After installation:

- Fill and bleed hydraulic system, see **32 13 006 Bleeding power steering unit.**
- Check pipe connections for leaks

32 41 060 REMOVING AND INSTALLING/REPLACING POWER STEERING VANE PUMP (N52)

IMPORTANT: Aluminium-magnesium materials.

No steel screws/bolts may be used due to the threat of electrochemical corrosion.

A magnesium crankcase requires aluminium screws/bolts exclusively.

Aluminium screws/bolts must be replaced each time they are released.

The end faces of aluminium screws/bolts are painted blue for the purposes of

reliable identification.

Jointing torque and angle of rotation must be observed without fail (risk of damage).

**IMPORTANT: Adhere to the utmost cleanliness. Do not allow any dirt to enter the hydraulic system.
Close off pipe connections with plugs.**

Necessary preliminary tasks:

- Draw off and dispose of hydraulic fluid from fluid reservoir
- Remove intake filter housing, see **13 71 000 REMOVING AND INSTALLING/REPLACING INTAKE FILTER HOUSING (N52K)** .
- Remove belt pulley, see **32 41 100 Removing and installing/replacing belt pulley on vane pump for power steering**.

Release hose clamp (1) and detach suction line (2) from vane pump.

Installation:

Align suction line by way of marking to connection on vane pump.

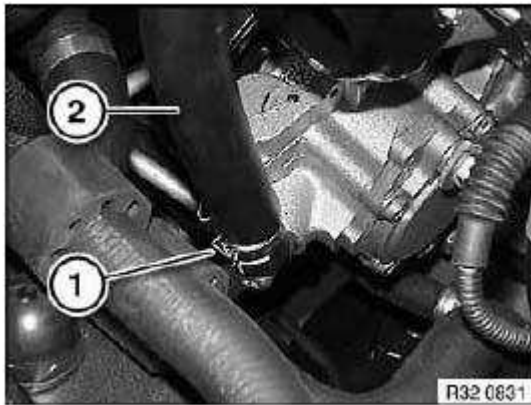


Fig. 98: Hose Clamp And Suction Line
Courtesy of BMW OF NORTH AMERICA, INC.

Release bolts (1).

Installation:

Replace aluminium screws.

Observe screwing sequence.

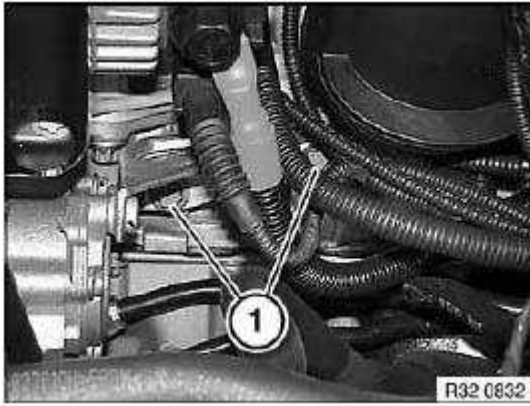


Fig. 99: Bolts

Courtesy of BMW OF NORTH AMERICA, INC.

Remove front underbody protection, see **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION** .

Release banjo bolt (1) and disconnect pressure line.

Installation:

Replace sealing ring.

Make sure pressure line is laid without tension and with sufficient spacing to adjoining components.

Tightening torque: 32 41 3AZ, see **32 41 PUMP AND OIL SUPPLY** .

Release screws (2) and remove vane pump towards top.

Installation:

Replace aluminium screws.

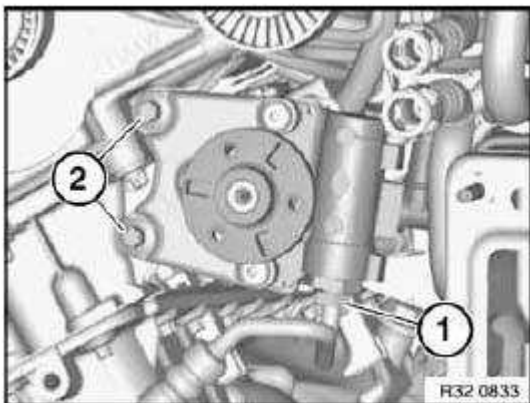


Fig. 100: Banjo Bolt And Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Observe screwing sequence.

Screw-fastening sequence:

1. Secure vane pump with screws
2. Tighten side screws to 2 Nm
3. Tighten front screws to 2 Nm
4. Tighten down front screws to jointing torque and angle of rotation

Tightening torque: 32 41 1AZ, see **32 41 PUMP AND OIL SUPPLY** .

5. Release screws at side and check screw fastening points for gap freedom
6. Tighten down side screws to jointing torque and angle of rotation

Tightening torque: 32 41 1AZ, see **32 41 PUMP AND OIL SUPPLY** .

After installation:

- Fill and bleed hydraulic system, see **32 13 006 Bleeding power steering unit**.
- Check pipe connections for leaks

32 41 100 REMOVING AND INSTALLING/REPLACING BELT PULLEY ON VANE PUMP FOR POWER STEERING

NOTE: Carry out preliminary work as described in the document "Replacing drive belt".

Slacken screws (1)

Relieve tension on drive belt and remove from belt pulley (2).

Unscrew bolts (1) and remove belt pulley (2).

Installation:

Lettering on belt pulley (2) must point forwards.

Tightening torque: 32 41 14AZ, see **32 41 PUMP AND OIL SUPPLY** .

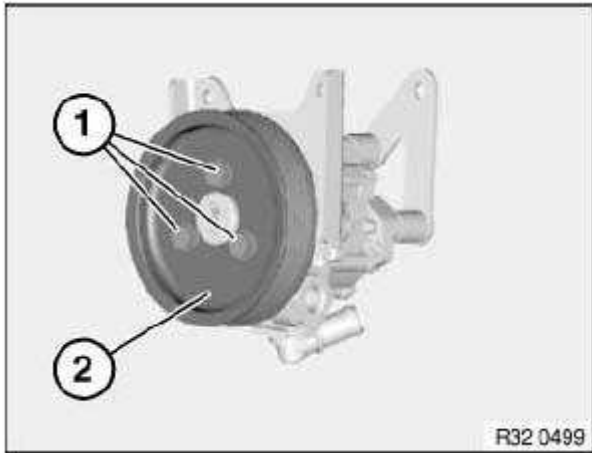


Fig. 101: Screws And Belt Pulley

Courtesy of BMW OF NORTH AMERICA, INC.

32 41 250 REMOVING AND INSTALLING/REPLACING FLUID RESERVOIR FOR POWER STEERING (M54, N46, N52)

Special tools required:

- **32 1 260 PLIERS**

**IMPORTANT: Adhere to the utmost cleanliness. Do not allow any dirt to enter the hydraulic system.
Seal off pipe connections with plugs.**

Necessary preliminary tasks:

- Draw off and dispose of hydraulic fluid from fluid reservoir
- Remove intake filter housing, see **13 71 000 REMOVING AND INSTALLING/REPLACING INTAKE FILTER HOUSING (N52K)** .
- N46: Remove intake duct

N52:

IMPORTANT: Cover alternator with a suitable covering to prevent ingress of hydraulic fluid.

Release screw (1).

Tightening torque: 32 41 9AZ, see **32 41 PUMP AND OIL SUPPLY** .

Remove hose clamps if necessary with special tool 32 1 260.

NOTE: If necessary, raise and/or turn fluid reservoir in order to gain better access to

hose clamps.

Disconnect suction line and radiator return line from fluid reservoir.

Lift out fluid reservoir.

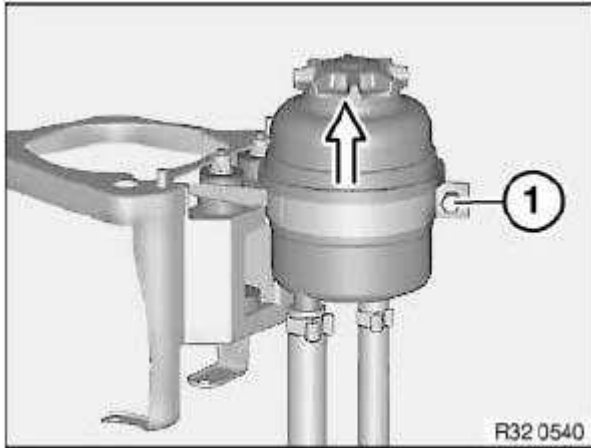


Fig. 102: Lifting Out Fluid Reservoir
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Fill and bleed hydraulic system, see **32 13 006 Bleeding power steering unit.**
- Check pipe connections for leaks

32 41 311 REPLACING SUCTION LINE FOR POWER STEERING (N52)

IMPORTANT: Adhere to the utmost cleanliness. Do not allow any dirt to enter the hydraulic system.

Seal off hydraulic lines with plugs.

Necessary preliminary tasks:

- Draw off and dispose of hydraulic fluid from fluid reservoir
- Remove front underbody protection, see **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION .**
- Remove intake filter housing, see **13 71 000 REMOVING AND INSTALLING/REPLACING INTAKE FILTER HOUSING (N52K) .**

Remove fluid reservoir from mounting bracket/body.

Release hose clamp (1) and detach suction line (2) from fluid reservoir.

Installation:

Make sure hydraulic line is laid without tension and with sufficient spacing to adjoining components.

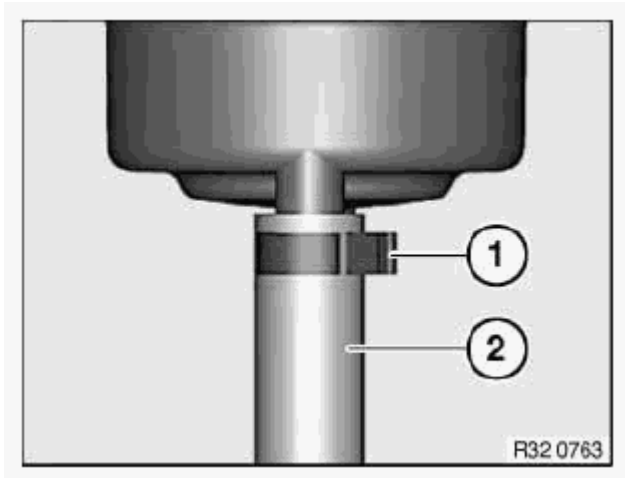


Fig. 103: Hose Clamp And Suction Line
Courtesy of BMW OF NORTH AMERICA, INC.

Expose suction line up to connection on vane pump.

Release hose clamp (1) and detach suction line (2) from vane pump.

Installation:

Markings (3) on suction line and vane pump must match up.

If a marking is missing, it is important to ensure when installing the hydraulic line that it is laid without tension and with sufficient spacing to adjoining components.

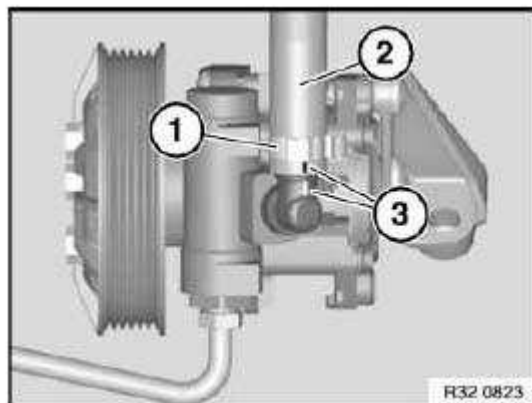


Fig. 104: Hose Clamp And Suction Line
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Fill and bleed hydraulic system, see **32 13 006 Bleeding power steering unit.**
- Check pipe connections for leaks

32 41 331 REPLACING PRESSURE LINE FOR POWER STEERING (N52)

**IMPORTANT: Adhere to the utmost cleanliness. Do not allow any dirt to enter the hydraulic system.
Seal off hydraulic lines with plugs.**

Recycling:

Catch and dispose of hydraulic fluid in a suitable container.

Necessary preliminary tasks:

- Draw off and dispose of hydraulic fluid from fluid reservoir
- Remove front underbody protection, see **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION .**

Release union screw (1) and detach pressure line (2) from vane pump.

Installation:

Replace sealing ring.

Make sure hydraulic line is laid without tension and with sufficient spacing to adjoining components.

Tightening torque: 32 41 3AZ, see **32 41 PUMP AND OIL SUPPLY .**

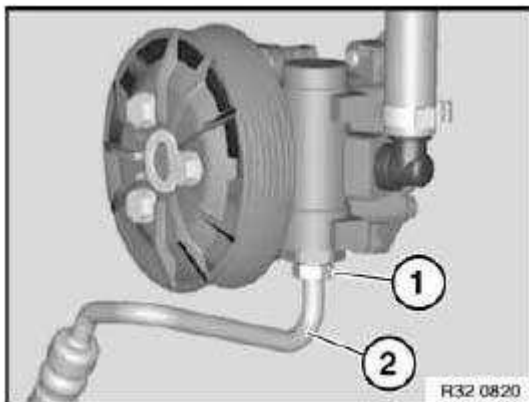


Fig. 105: Union Screw And Pressure Line
Courtesy of BMW OF NORTH AMERICA, INC.

Expose pressure line up to connection on power steering gear.

Release FCD coupling and disconnect pressure line.

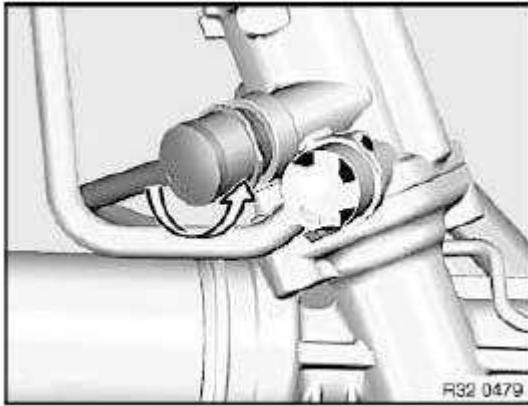


Fig. 106: Disconnecting Plug Connection On EH Converter
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Fill and bleed hydraulic system, see **32 13 006 Bleeding power steering unit.**
- Check pipe connections for leaks

32 41 341 REPLACING COOLER RETURN LINE FOR POWER STEERING (M54, N46, N52)

**IMPORTANT: Adhere to the utmost cleanliness. Do not allow any dirt to enter the hydraulic system.
Seal off hydraulic lines with plugs.**

Recycling:

Catch and dispose of hydraulic fluid in a suitable container.

Necessary preliminary tasks:

- Draw off and dispose of hydraulic fluid from fluid reservoir
- N46: Remove intake duct
- Remove intake filter housing, see **13 71 000 REMOVING AND INSTALLING/REPLACING INTAKE FILTER HOUSING (N52K) .**

Remove fluid reservoir from mounting bracket/body.

Release hose clamp (1) and detach cooler return line (2) from fluid reservoir.

Installation:

Make sure hydraulic line is laid without tension and with sufficient spacing to adjoining components.

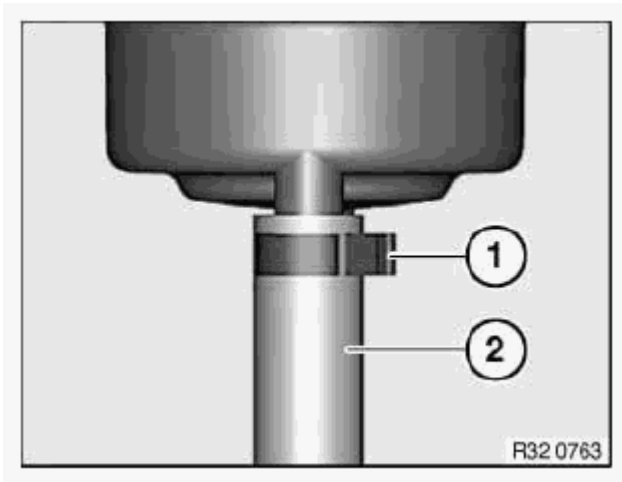


Fig. 107: Hose Clamp And Suction Line
Courtesy of BMW OF NORTH AMERICA, INC.

Expose cooler return line up to connection on power steering coil.

Release quick-connect coupling and seal power steering coil connection with a suitable plug, see **32 41 ... Notes on hydraulic line with quick-connect coupling.**

Installation:

Make sure hydraulic line is laid without tension and with sufficient spacing to adjoining components.

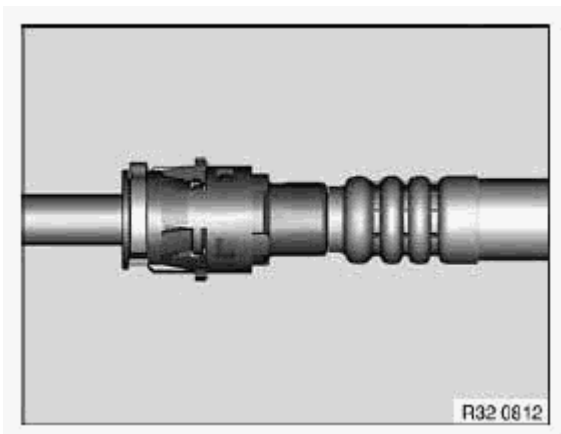


Fig. 108: Quick-Connect Coupling And Seal Power Steering Coil
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Fill and bleed hydraulic system, see **32 13 006 Bleeding power steering unit.**
- Check pipe connections for leaks

32 41 351 REPLACING RETURN LINE FOR POWER STEERING

**IMPORTANT: Adhere to the utmost cleanliness. Do not allow any dirt to enter the hydraulic system.
Seal off hydraulic lines with plugs.**

Recycling:

Catch and dispose of hydraulic fluid in a suitable container.

Necessary preliminary tasks:

- Draw off and dispose of hydraulic fluid from fluid reservoir
- Remove intake filter housing, see **13 71 000 REMOVING AND INSTALLING/REPLACING INTAKE FILTER HOUSING (N52K)** .

Release quick-connect coupling and seal power steering coil connection with a suitable plug, see **32 41 ... Notes on hydraulic line with quick-connect coupling**.

Installation:

Make sure hydraulic line is laid without tension and with sufficient spacing to adjoining components.

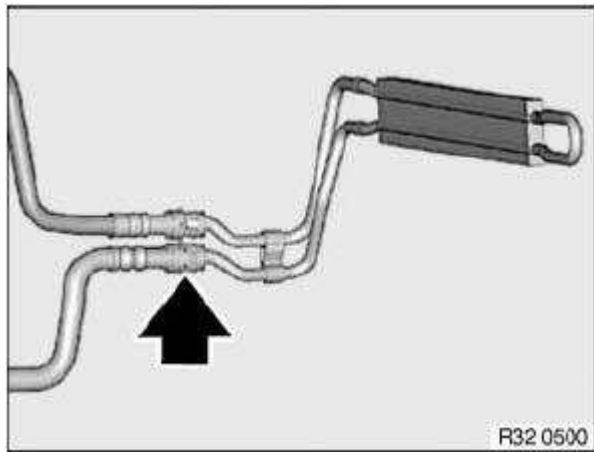


Fig. 109: Locating Quick-Connect Coupling
Courtesy of BMW OF NORTH AMERICA, INC.

Remove reinforcement plate, see **31 10 010 REMOVING AND INSTALLING/REPLACING REINFORCEMENT PLATE** .

Diesel engines: Partially detach steering gear cover.

Expose return line up to connection on power steering gear.

Release FCD coupling and disconnect return line.

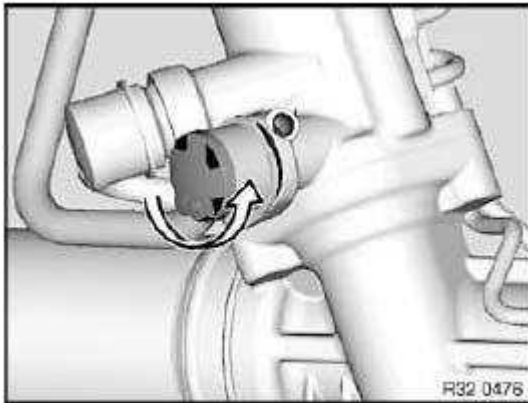


Fig. 110: Disconnecting Return Line
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Fill and bleed hydraulic system, see **32 13 006 Bleeding power steering unit.**
- Check pipe connections for leaks

43 ELECTRONIC POWER STEERING

32 43 521 REPLACING SERVOTRONIC CONTROL UNIT

IMPORTANT: Read and comply with 61 35 ... NOTES ON ESD PROTECTION (ELECTROSTATIC DISCHARGE)

Necessary preliminary tasks:

- Remove ignition key
- Disconnect battery negative lead
- Remove glovebox, see **51 16 360 REMOVING AND INSTALLING RIGHT GLOVEBOX .**

Disconnect plug connection (1).

Unlock catch (2) and remove control unit (3).

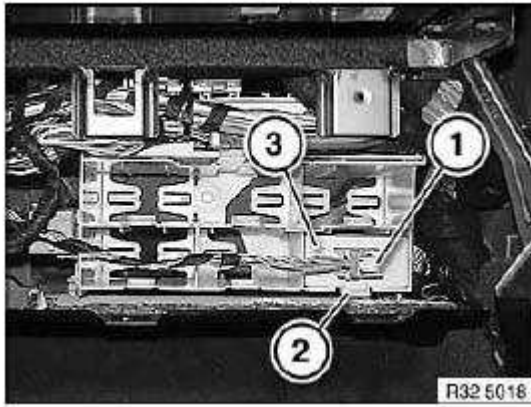


Fig. 111: Plug Connection, Catch And Control Unit
 Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Replacement only: Carry out programming/coding using appropriate BMW service tool.

90 TROUBLESHOOTING

32 90 ... TROUBLESHOOTING ON STEERING

Observe troubleshooting on front axle and diagnosis help for steering (SI), see **31 90 ... FRONT AXLE TROUBLESHOOTING** .

FRONT AXLE TROUBLESHOOTING CHART

Fault	Cause	Remedy
Excessive steering wheel play/steering wheel shake	Screws at lower section of steering spindle to steering gear/steering column loose	Replace screws and tighten down (refer to <u>32 31 070 Removing and installing / replacing lower section of steering spindle</u>)
	Bolt connection, universal joint/double joint, to lower section of steering spindle/steering gear/steering column loose	Replace and tighten down bolts (refer to <u>32 31 219 Removing and installing/replacing double joint with flexible disk</u>)
	Journal of tie rod end deformed	Replace steering gear and tie rod ends, see <u>32 13 060 Removing and installing/replacing power steering gear</u>
	Tie rod end worn	Check steering gear rack; if necessary, replace steering gear, see <u>32 13 060 Removing and installing/replacing power steering gear</u> Check tie rods, replace if necessary, see <u>32 21 231 Replacing left or right tie rod</u> Replace tie rod end, see <u>32 21 151 Replacing left or right tie rod</u>

	Steering gear rack damaged	Replace steering gear, see <u>32 13 060</u> <u>Removing and installing/replacing power steering gear</u>
	Refer to <u>31 90 ... FRONT AXLE TROUBLESHOOTING</u>	
Steering wheel inclination	Tie rod end worn	Replace tie rod end, see <u>32 21 151</u> <u>Replacing left or right tie rod</u>
	Front axle alignment incorrectly adjusted	Carry out chassis/wheel alignment check, adjust toe/track if necessary, see <u>32 00 ... Chassis/wheel alignment check procedure</u>
	Refer to <u>31 90 ... FRONT AXLE TROUBLESHOOTING</u>	

STEERING

Steering and Wheel Alignment - SI Techniques - X3

32 STEERING AND WHEEL ALIGNMENT

SERVOTRONIC

E83

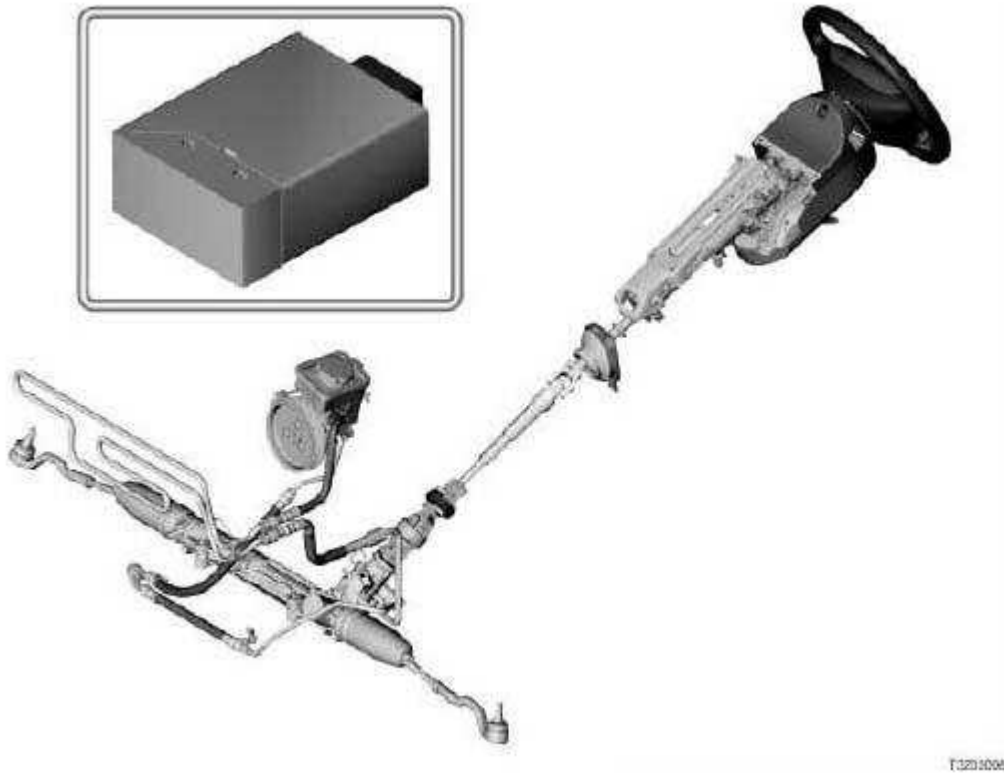


Fig. 1: Servotronic
Courtesy of BMW OF NORTH AMERICA, INC.

INTRODUCTION

The Servotronic does not regulate the steering force support in a conventional way by using the engine speed, rather it is dependent upon the car's road speed. The Servotronic regulates the hydraulic pressure in the power-steering pump. Adaptation of the hydraulic pressure to the car's road speed has the effect of:

- High steering force support at low road speeds
- Minimum steering force support at high road speeds

This means that minimum force is required for steering force at slow road speeds. As the road speed increases the steering force support is continuously reduced. Contact to the road surface therefore becomes more direct

and steering is more precise. Consequently, steering is very comfortable and maneuverability is maximized, for instance when parking and maneuvering at slow speeds.

New: In E83 the Servotronic is integrated in its own control unit.

The Servotronic is available as special equipment (option 216).

BRIEF DESCRIPTION OF COMPONENTS

The following control units are involved in the Servotronic:

- **Servotronic control unit (SVT)**

The SVT control unit specifies the nominal values for controlling the Servotronic valve (hydraulic pressure). The SVT control unit is connected to the PT-CAN (powertrain CAN) and K-Bus (body bus).

- **DSC control unit (Dynamic Stability Control)**

The DSC control unit delivers the car's road speed signal. The DSC control unit and SVT control unit are connected by the PT-CAN.

- **DME or DDE (Digital Engine Electronics or Digital Diesel Electronics DDE)**

The Servotronic receives the signal of whether the engine is running from the DME or DDE over the PT-CAN. The Servotronic only activates the Servotronic valve when the engine is running.

- **Instrument cluster (KOMBI)**

The instrument cluster delivers the terminal status (e.g. terminal 15 ON) and the kilometer reading.

The following actuators are controlled by the Servotronic:

- **Servotronic valve**

The Servotronic valve is an electro-hydraulic converter located in the power-assisted steering oil circuit. The Servotronic valve restricts the hydraulic current and consequently reduces the hydraulic pressure.

The Servotronic valve is activated by a characteristic curve delivered by the SVT control unit.

System functions

The Servotronic is based upon the following system functions:

- Initialisation of the Servotronic
- Recording of the speed
- Supplying the Servotronic valve with power
- Undervoltage detection and overvoltage detection

Initialisation of the Servotronic

The Servotronic is active from terminal 15 ON.

A short initialization phase for the Servotronic (under 1 second) is necessary when the engine starts in order to reach the characteristic curve for a low road speed as fast as possible.

A plausibility check for supplying the Servotronic valve is performed during the initialization phase.

Recording of the speed

The road-speed signal is calculated by the DSC and supplied to the PT-CAN. The Servotronic specifies an acceleration value for plausibility of the road-speed signal. A road speed is calculated from the acceleration value.

At a low acceleration the road-speed signal supplied by the DSC is used.

At a higher acceleration the Servotronic control unit calculates the road speed internally. The road speed is stored in the Servotronic control unit.

Supplying the Servotronic valve with power

The Servotronic valve is supplied with power in response to the car's road speed. The power-assisted steering characteristic is memorized in a characteristic curve. The characteristic curve specifies the power based on the car's road speed.

The characteristic curve is written using 16 reference points.

The Servotronic valve is no longer supplied with power when the engine is OFF (over the PT-CAN). Minimum steering force support is set (high road speed) when the Servotronic valve is no longer supplied with power.

Equally, the Servotronic valve is also no longer supplied with power if there is a fault-memory entry.

Undervoltage detection and overvoltage detection

The Servotronic valve is no longer supplied with power under the following conditions:

- Supply voltage less than 9 volts
- Supply voltage higher than 17 volts

Voltage dips during ignition faults are detected.

SWITCH-ON CONDITIONS

Switch-on conditions for the Servotronic are:

- Terminal 15 ON

- The engine must be running

The Servotronic only activates the Servotronic valve when the engine is running.

When the engine has started and there a road-speed signal is not supplied the Servotronic sets the maximum steering force support.

If a plausible road-speed signal is detected the Servotronic valve is activated by the characteristic curve.

If there is still not a (or not a plausible) road-speed signal 5 seconds after the engine has started the minimum steering force support is set.

KINEMATIC DIAGNOSIS SYSTEM AND ENVIRONMENT

BMW KDS (Beissbarth)

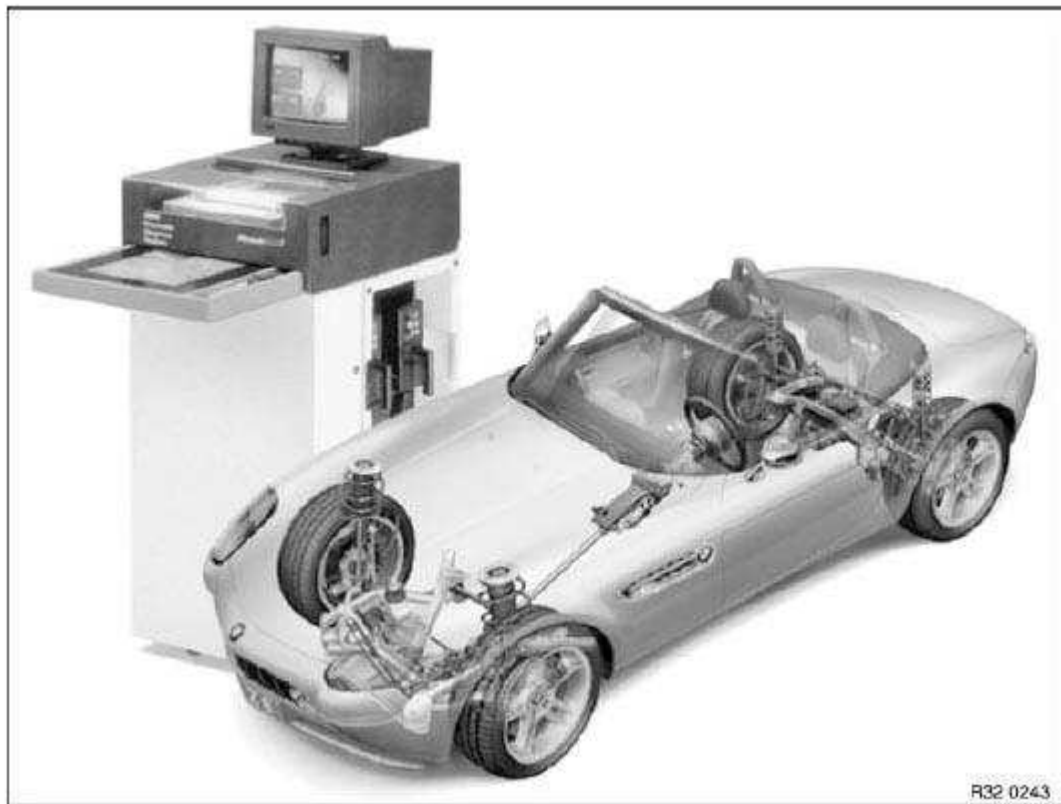


Fig. 2: Kinematic Diagnosis System

Courtesy of BMW OF NORTH AMERICA, INC.

1. FOREWORD

1.1 Objectives

Wheel alignment has become an increasingly complex subject. The aim of this BMW Service Technology bulletin, therefore, is to achieve several objectives:

- Creation of guidelines for working with the BMW Kinematic Diagnosis System (KIDS).
- Familiarization with wheel alignment technology for current vehicles and clarifying any questions which arise in this connection.
- Transparency and clarification of different terms.
- Clarification of the causes of errors in the past, such that they can be avoided after reading this document.
- Creation of conditions for dealing safely with the BMW KIDS.

1.2 Further development of the BMW Kinematic Diagnosis System

- The BMW Kinematic Diagnosis System is an integrated part of automotive system concepts. It ensures that work is carried out in a particularly rational manner which is appropriate for BMW requirements, such that you can also be certain of being prepared for future technological developments. As far as precision and performance in wheel alignment and tuning is concerned, BMW, together with leading manufacturers, has made the best of what is technically feasible: the BMW Kinematic Diagnosis System.
- The BMW Kinematic Diagnosis System manufactured by Beissbarth is more than just the further development of conventional wheel alignment equipment. It sets new standards in precision, performance, speed and handling. It is a guarantor for the perfection which BMW service customers rely on.
- Ride comfort, road safety and tyre wear depend to a large extent on the perfect interplay of the vehicle's kinematic functions. BMW is constantly launching new generations of chassis which are even better than their predecessors. This is why there are fewer kinematics system adjusting points and narrower tolerances when measuring and tuning the chassis.
- With the use of the multi-link rear suspension and the E36, the electronic wheel alignment devices are no longer suitable for BMW wheel alignment purposes. This applies to both the measuring procedure and measuring precision. The generation of equipment which was approved with the E36 series still fulfils all the requirements placed on a modern wheel alignment device, including the use of the latest computer technology.
- Only BMW Kinematic Diagnosis Systems manufactured by Beissarath and Bosch may be used for wheel alignment.

1.3 Technical Data



Fig. 3: Display Kinematic Diagnosis System Technical Data
 Courtesy of BMW OF NORTH AMERICA, INC.

KINEMATIC DIAGNOSIS SYSTEM TECHNICAL DATA

1. Display	17" graphic screen with high-resolution graphics (640x480 pixels with 256 colours)
2. On-screen text	in the appropriate national language
3. Wheel dimensions	12"-20"
4. Vehicle memory locations	unlimited
5. Rotating plates	Loadbearing capacity 1000 kg, angle of rotation $\pm 360^\circ$, 450 x 450 x 50 mm (L x W x H), sliding range ± 50 mm, weight 18 kg
6. Sliding plates	Loadbearing capacity 1000 kg, angle of rotation $\pm 10^\circ$, 450 x 450 x 50mm (L x W x H), sliding range ± 65 mm, weight 17 kg
7. Electrical connection	100-115 V / 220-240 V 50/60 Hz, 0.5 kW (other connections on request)

1.4 Scope of delivery

- 1 PC display device with graphic screen, graphical tablet, small or large equipment cabinet including automatic charging station, DIN A4 dot matrix printer
- 4 Measuring sensors with CCD camera technology and infrared data transmission with built-in power supply
- 1 Cable set (comprising 4 cables)
- 1 Brake clamping device
- 1 Steering lock device

- 2 Electronic precision rotating plates with integrated sensor without access ramps
- 2 Sliding plates without access ramps
- 4 BMW quick-clamping units, comprising a P8-68 locating bell and P267 01 quick-acting clamp including coated holding claws
- 1 Operating instructions for BMW KIDS (8 languages)
- 1 BMW software and the BMW vehicle setpoint data with setting screens as well as text for the measurement preparations

1.5 Accessories required

- 2 Locating rods for positioning the vehicle
- 1 Set of sand bags for the prescribed loading

1.6 Accessories recommended

- 4 Quick-clamping units
- 2 Sets of access ramps
- 1 Remote control / display
- 1 Trolley (for ballast bags, rotating and sliding plates and 4 quick-acting clamps)

2. MEASURING OPTIONS USING THE BMW KINEMATIC DIAGNOSIS SYSTEM

2.1 Front axle

- Toe-in (single and total toe-in in relation to the geometrical drive axis)
- Camber (with steering wheel pointing straight ahead)
- Wheel displacement (in relation to the left-hand front wheel)
- Castor, kingpin inclination and toe-differential angle

2.2 Rear axle

- Toe-in (single and total toe-in in relation to the longitudinal center plane of the vehicle --> previously called symmetrical axis)
- Geometrical drive axis
- Camber

2.3 Other measuring options

- Rear wheel displacement
- Wheelbase difference
- Lateral displacement on right
- Lateral displacement on left
- Track difference

- Axial displacement

3. SYSTEM DESCRIPTION

3.1 BMW Kinematic Diagnosis System 1, based on the Beissbarth ML4000

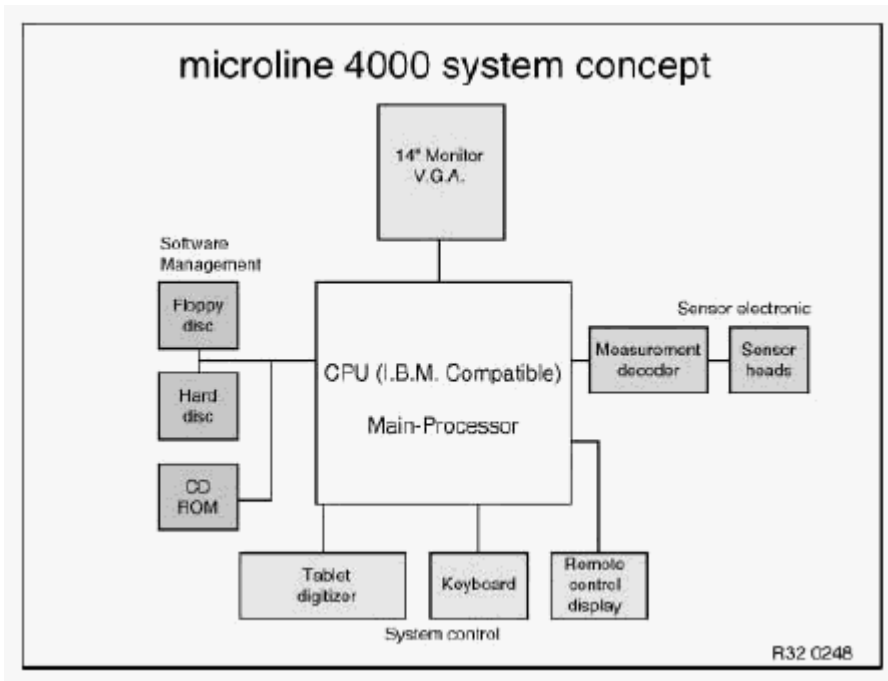


Fig. 4: BMW Kinematic Diagnosis System Diagram
Courtesy of BMW OF NORTH AMERICA, INC.

The KIDS 1 is available in two different designs at no extra charge:

1. MOBILE WORKSTATION



Fig. 5: Mobile Workstation
Courtesy of BMW OF NORTH AMERICA, INC.

2. MOBILE COMPACT CABINET



Fig. 6: Mobile Compact Cabinet
Courtesy of BMW OF NORTH AMERICA, INC.

The larger workstation offers a small storage area for accessories, while the compact cabinet is mobile and ideal for restricted working areas. Both variants can be supplied as a cableless measuring system (infrared). From the point of view of measuring technology, there is only a difference in the handling and equipping of the system. For both designs, the four measuring sensors are stored in integrated inserts with rechargeable battery charging points. When automatically charged over night, the measuring sensor batteries provide enough power for 10 hours of continuous use.

3.2 Computer

- The KIDS 1 system comprises tested and reliable industrial components. The computer is an IBM-compatible, 32-bit Intel processor with CD ROM drive to the industry standard.



Fig. 7: Computer
Courtesy of BMW OF NORTH AMERICA, INC.

3.3 Graphical tablet

- All functions are shown in graphical form on a "pictogram" panel. The panel is protected by a plexiglass

cover. It can easily be replaced if more extensive design modifications are necessary. The operator interface has no membrane and is thus protected against damage. The main functions are activated by clicking the icon with the digital pen.

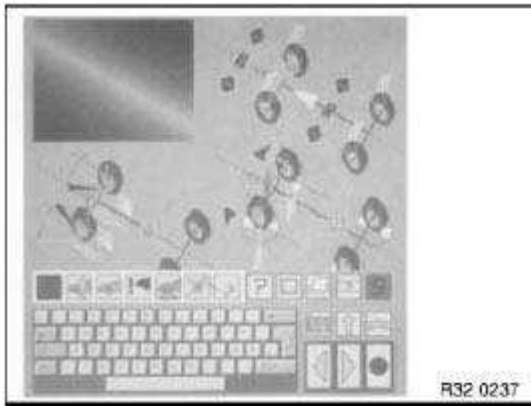


Fig. 8: Graphical Tablet

Courtesy of BMW OF NORTH AMERICA, INC.

3.4 Equipment cabinet

- The PC with graphic monitor and removable operating panel, supports for the measuring sensors, the remote control and the A4 printer are integrated into the workstation. The charging station is located in the cabinet and can also be connected to the measuring sensors and the remote control using the plug-in cables (operating while simultaneously charging the batteries).

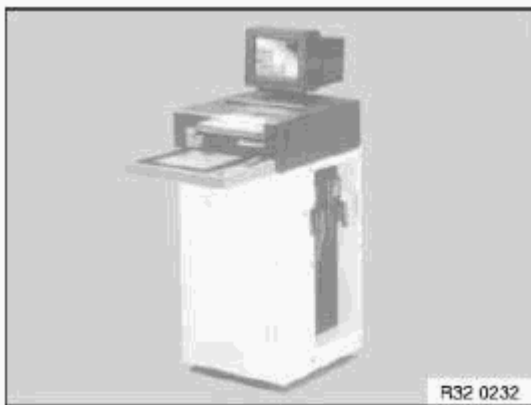


Fig. 9: Equipment Cabinet

Courtesy of BMW OF NORTH AMERICA, INC.

3.5 Remote display

A cableless remote display can be supplied on request. The remote control keys are only active during measuring and adjustment (not for customer data input, or if selecting a vehicle or editing the setpoint data etc.). The following displays are supported by the remote control:

- Measured value with setpoint / actual comparison and tolerance bar
- Steering graphics for steering routines
- Live overview of the track / camber values with a setpoint / actual comparison
- Rim run-out compensation



Fig. 10: Remote Display
 Courtesy of BMW OF NORTH AMERICA, INC.

3.6 Measuring sensors with CCD camera

The measuring sensors are each equipped for automatic measurement with two CCD cameras and their own processor for the cableless infrared transmission of data with integrated batteries. Benefits:

- No temperature deviation
- Very high measuring resolution (the track could theoretically be measured in angular seconds)
- Single track range of more than ± 9 degrees for the constant display of toe-in when changing the tie-rod ends
- Exact system accuracy, i.e. when carrying out measurements at the vehicle following rim run-out compensation, the toe-in and camber measurements are accurate to 2 angular minutes



Fig. 11: Measuring Sensors With CCD Camera
Courtesy of BMW OF NORTH AMERICA, INC.

3.7 BMW Quick-acting clamp

- BMW quick-acting clamp for holding the measuring sensors precisely in position and measuring without rim run-out compensation.

NOTE: Any existing quick-acting clamps, e.g. from older F1600s or ML-3000s, must not be used on the BMW KIDS.

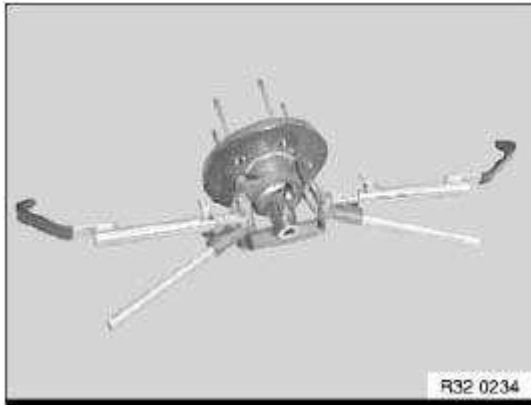


Fig. 12: BMW Quick-Acting Clamp
Courtesy of BMW OF NORTH AMERICA, INC.

3.8 Rotating / sliding plates

- Electronic precision rotating plates for the front wheels with integrated sensor (360 degree measuring range)
- Stable sliding plates for the rear wheels with a swivelling / rotating top plate
- Accessories: Cover hood for aluminium rotating plates

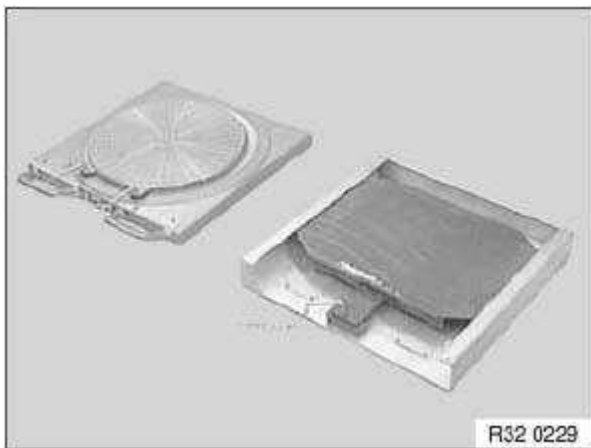


Fig. 13: Rotating/Sliding Plates

Courtesy of BMW OF NORTH AMERICA, INC.

3.9 Sensor pins

- A new BMW light alloy wheel (styling no. 18) has been available as optional equipment from April 1993. When measurements are being made on vehicles with these wheels, new sensor pins are required for the quick-acting clamps of the recommended wheel alignment equipment.
- The new sensor pins are included in the scope of supply for new deliveries of KIDS 1 (order number: BS 90 19 11).

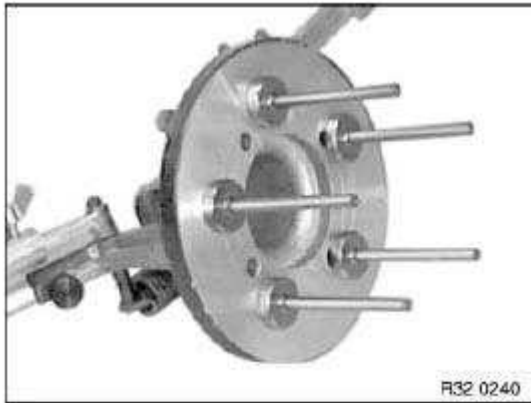


Fig. 14: Sensor Pins

Courtesy of BMW OF NORTH AMERICA, INC.

3.10 Spoiler adapter

- In the case of vehicles with very low spoilers, the sensor beam may be broken by the spoiler between the measuring sensors. This primarily occurs in front of the front axle.
- The spoiler adapter is used here as a connecting element between the measuring equipment clamp and the measuring sensor. Thanks to the adapter, the sensors are placed 50 mm lower, thus allowing the sensor beam to move freely below the spoiler.



Fig. 15: Spoiler Adapter

Courtesy of BMW OF NORTH AMERICA, INC.

3.11 Quick-clamping units

- Quick-clamping units for wheel alignment on non-BMW vehicles with rim run-out compensation.
- Rims without sensors boreholes (rims for BMW vehicles from other manufacturers)

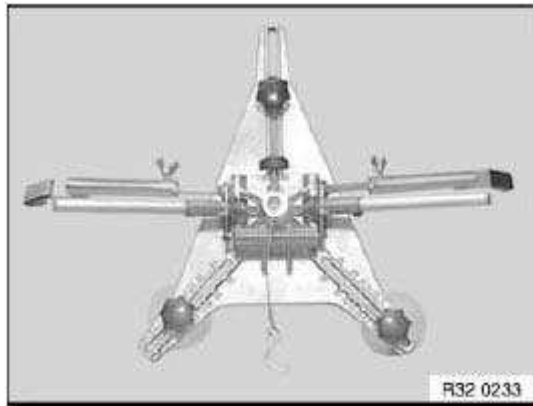


Fig. 16: Quick-Clamping Units

Courtesy of BMW OF NORTH AMERICA, INC.

3.12 Retainers

- The most varied clamping options for the measuring equipment are possible thanks to the versatile retainers and the rubber - coated thrust pieces, even on exotic light-alloy rims.

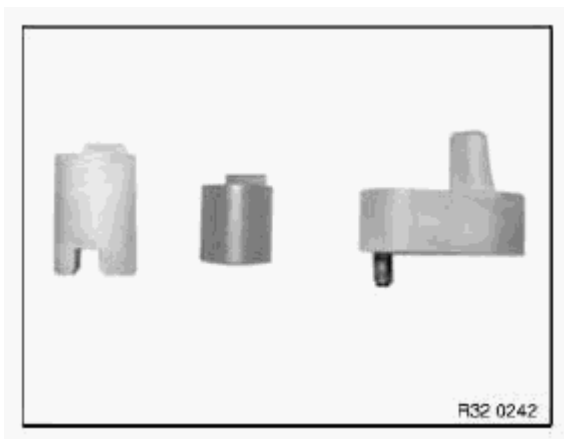


Fig. 17: Retainers

Courtesy of BMW OF NORTH AMERICA, INC.

4. WORKSTATION

4.1 Environment

DESCRIPTION AND REQUIREMENTS REFERENCE

Description:	Requirements:
<p>All lifting platforms currently recommended by BMW (see) for wheel alignment meet the requirements for the BMW KDS.</p>	<ul style="list-style-type: none"> ○ Wheel alignment pits ○ Pillar-type lifts with set-down device ○ 2 plunger-type lifting platforms with set-down device
<p>No particular requirements have to be met in respect of the location at which the BMW KDS is used. The measuring device can be installed over working pits or on lifting platforms.</p>	<ul style="list-style-type: none"> ○ Repair stands with set-down device ○ One measuring area (approx. 4.5 m x 7.0 m). ○ The rotating plates must be pinned to the platform

The support surfaces for the rotating and sliding plates may only display the following maximum height difference:

- from left to right ± 0.5 mm
- from front to back ± 1.0 mm
- diagonally ± 1.0 mm.

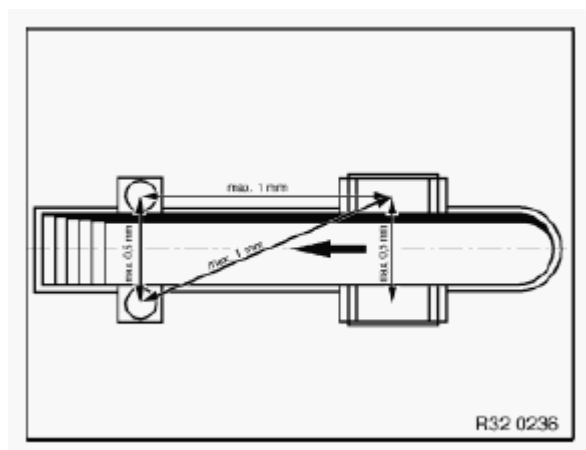


Fig. 18: Rotating And Sliding Plates Height Difference
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: A difference in the height of the rotary plates of ± 2 mm from left to right results in a measuring error of 4.8° in the camber.

As a comparison: The camber tolerance on the E36 is $\pm 10'$. The tyre tread difference or varying tyre pressure cause measuring errors of the same magnitude.

4.2 Preconditions for alignment

When carrying out the wheel alignment, the front and rear wheels must be centered on the rotating and sliding plates in order that all wheel suspensions remain free of tension during the steering routine and adjustment work. As a result, the rotating and sliding plates for the relevant wheel bases and track widths of the vehicle to be aligned must be moved.

4.3 Measuring tolerance

All measuring tolerances are system tolerances. This means that the sum of all individual tolerances gives the value shown in the example. Example of camber: Quick-acting clamp + measuring sensor + computer = 1' at a measuring range of $\pm 3^\circ$ (all BMW vehicles are within this measuring range).

4.4 Levelling the measuring station

The manufacturers of the BMW KIDS (Beissbarth / Bosch) are able to measure the measuring area to the required accuracy using levelling devices. Any "normal" water level is not suitable for this. Lifting platforms must be levelled under load so that the uneven deflection in the travel rails is taken into account.

IMPORTANT: Adjustment work for the lifting platform concerned must be executed by a specialist (manufacturer's after - sales service).

5. CHASSIS-RELATED TERMS

5.1 Toe-differential angle

- The toe-differential angle (a) is the angular position of the internal wheel on the curve in relation to the external wheel on the curve when driving round bends. The steering is designed such that the angular position of the wheels in relation to each other changes as the steering angle increases.
- In ideal cases, the wheel axes meet at point D in any steering position (except for straight ahead).

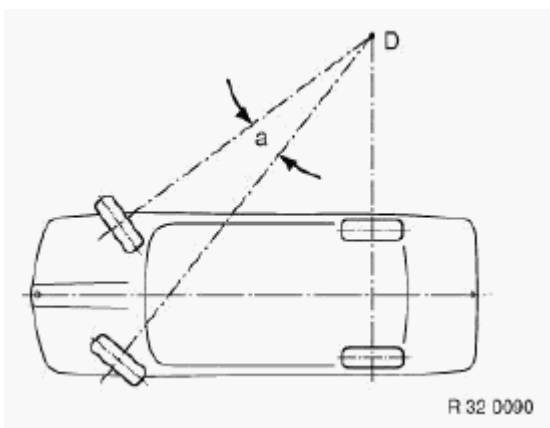


Fig. 19: Toe-Differential Angle
Courtesy of BMW OF NORTH AMERICA, INC.

5.2 Camber

- The camber is the angle of inclination of the wheel in relation to the vertical.

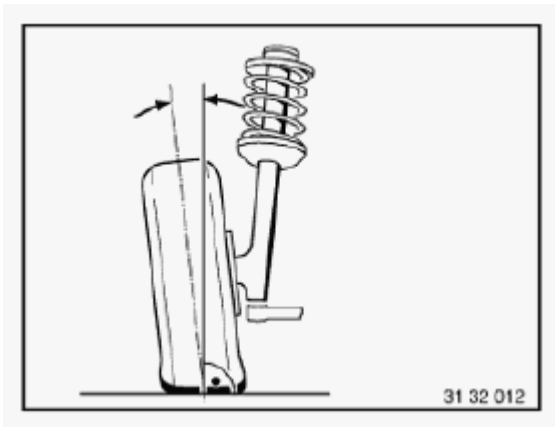


Fig. 20: Camber Angle

Courtesy of BMW OF NORTH AMERICA, INC.

5.3 Toe-in

- The toe-in is the reduction in the distance between the front of the wheels and the rear. The toe-in prevents the wheels from moving apart while driving (wobbling and grinding).

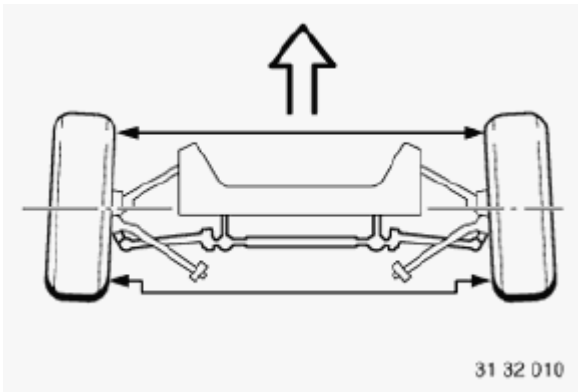


Fig. 21: Toe-In

Courtesy of BMW OF NORTH AMERICA, INC.

5.4 Castor

- The castor is the kingpin angle seen from the side in the opposite direction of travel. The line through the center of the spring strut mount and control arm ball joint corresponds to the kingpin.

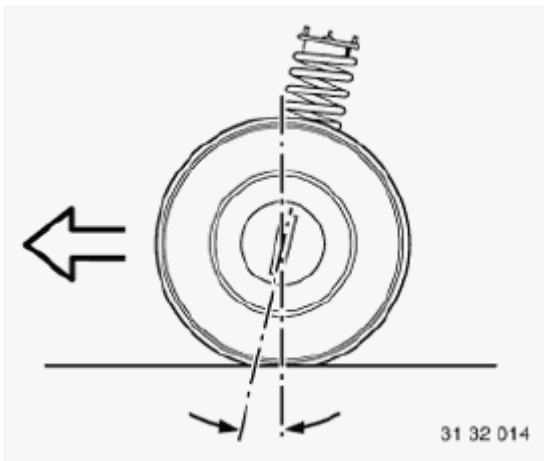


Fig. 22: Castor Angle
 Courtesy of BMW OF NORTH AMERICA, INC.

5.5 Geometrical drive axis / symmetrical axis

- (1) The geometrical drive axis is the line bisecting the angle of the overall rear wheel toe. The measurements of the front wheels relate to this axis.
- (2) The symmetrical axis represents the center line through the front and rear axes.

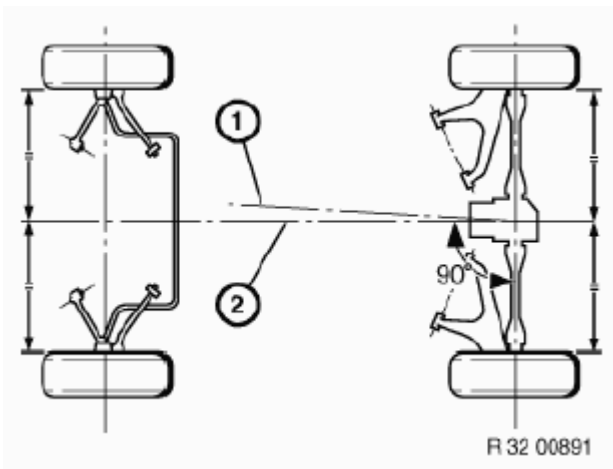


Fig. 23: Geometrical Drive Axis/Symmetrical Axis
 Courtesy of BMW OF NORTH AMERICA, INC.

5.6 Wheel displacement angle

- The wheel displacement angle is the angular deviation of the connecting line of the wheel contact points in relation to a line running at 90° to the geometrical drive axis. The wheel displacement angle is positive if the right - hand wheel is displaced to the front, and is negative if it is displaced to the rear.

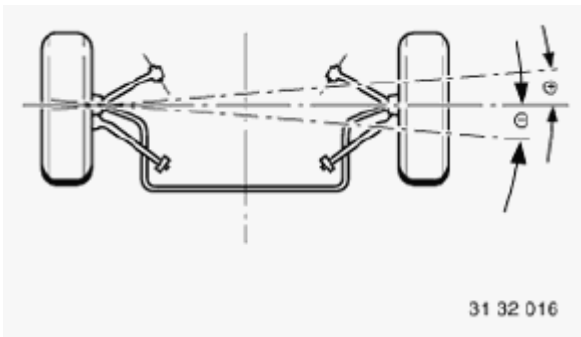


Fig. 24: Wheel Displacement Angle
 Courtesy of BMW OF NORTH AMERICA, INC.

5.7 Kingpin offset

- The kingpin offset is the distance from the center of the wheel contact point to the contact point of the kingpin extrapolation.

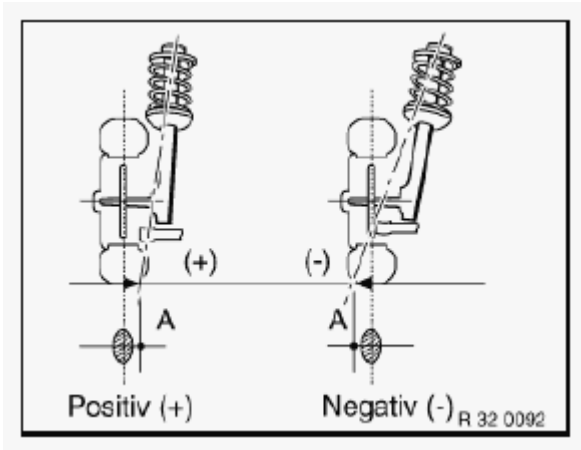


Fig. 25: Kingpin Offset
 Courtesy of BMW OF NORTH AMERICA, INC.

6. WHEEL SUSPENSION

Those parts which connect the wheel to the mostly load-bearing floor elements of the bodywork and guide it in the required direction belong to the wheel suspension. They are connected by axles or other comparable structures and guided by the arms. The wheel suspension plays a decisive role in the handling characteristics of a vehicle. Two main groups have to be distinguished: 1. Rigid axle suspension and 2. Independent wheel suspension.

6.1 Rigid axle suspension

RIGID AXLE SUSPENSION ADVANTAGES AND DISADVANTAGES

Description	Advantages	Disadvantages
The rigid axle suspension has a rigid connection between both wheels or wheel	In the event of deflection taking place, there are no	Non-driven rear axles may also acquire negative camber

pairs. Any change in one wheel is more or less transferred to the other. It is now only fitted as a rear axle, if at all. However it is frequently used for lorries or busses.	changes to the camber or wheel toe. This means: less tyre wear and good track stability.	as well as increasing tyre lateral guidance, thus increasing tyre wear.
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6.2 Independent wheel suspension

INDEPENDENT WHEEL SUSPENSION ADVANTAGES AND DISADVANTAGES

Description	Advantages	Disadvantages
State-of-the-art individual wheel suspension is available on BMW vehicles on the front and rear axles. This development has its cause in mass inertia, as a reduction in the non-suspended mass improves wheel and ground contact, and the wheel stays better on the road. Control arms and trailing arms, which have to absorb high longitudinal and lateral forces to some extent, are required for guiding independently suspended wheels.	Wheels suspended independently from each other have no mutual influence on each other.	Depending on the type, changes may occur in the camber, wheel toe, track width, castor and wheelbase.

7. WHEEL ALIGNMENT / PROCEDURE

7.1 Measuring options

An overview of all measuring options and values (VA = front axle, HA = rear axle) is shown below.

WHEEL ALIGNMENT SPECIFICATION

Measuring options	Measuring accuracy	In measuring range	Total measuring range
Total wheel toe (VA + HA)	±2'	± 2°	± 18°
Single wheel toe (VA + HA)	± 2'	± 2°	± 9°
Camber (VA + HA)	± 1'	± 3°	± 10°
Wheel displacement (VA)	±2'	± 2°	± 9°
Geometrical drive axis	± 2'	± 2°	± 9°
Castor	± 4'	± 18°	± 22°
Kingpin inclination	± 4'	± 18°	± 22°
Toe-differential angle	± 4'	± 20°	± 20°
Maximum steering angle (VA)	± 4'	± 60°	± 300°
Maximum steering angle (HA)	± 4'	± 9°	± 9°
Castor correction range	± 4'	± 7°	± 10°

NOTE: The measuring accuracy details only apply when using the precision rotating and sliding plates as well as the BMW quick-acting clamps.

7.2 Preparatory work

Before commencing the measurement, preparatory work must be carried out at the measuring area and on the vehicle. Preparatory work includes:

- Easy-running rotating and sliding plates
- Aligning the rotating and sliding plates in relation to the track width and wheelbase
- Centering the vehicle on the plates
- Applying the parking brake
- Removing the lock pins on the plates to prevent tension in the chassis under loading
- Checking the rim and tyre size, tread depth, tyre pressure, steering wheel play, wheel bearings and condition of suspension and shock absorbers
- Fastening the measuring equipment to the wheels
- Loading the vehicle according to BMW KIDS specifications
- Rock the vehicle firmly with the brakes released to ensure a stable center position
- Lock the service brake using the brake clamping device

7.3 Initial / final measurement

This measurement can be carried out as a program-guided measurement in the same way as any subsequent adjusting work and the final measurement. The sequence of the chassis measuring points to be called up is specified and controlled by the system software. The individual steps comprise:

- Driving straight ahead to correctly record the wheel toe and camber values for the rear axle
- Steering routine for recording the castor, kingpin inclination and toe-differential angle
- Recording the wheel toe and camber of the front axle (adjust the steering center point in advance)
- Steering routine for measuring the maximum steering angle on the left/right
- Checking the overview of measured values with the setpoint and actual comparison of all measured values

7.4 Printing out the data

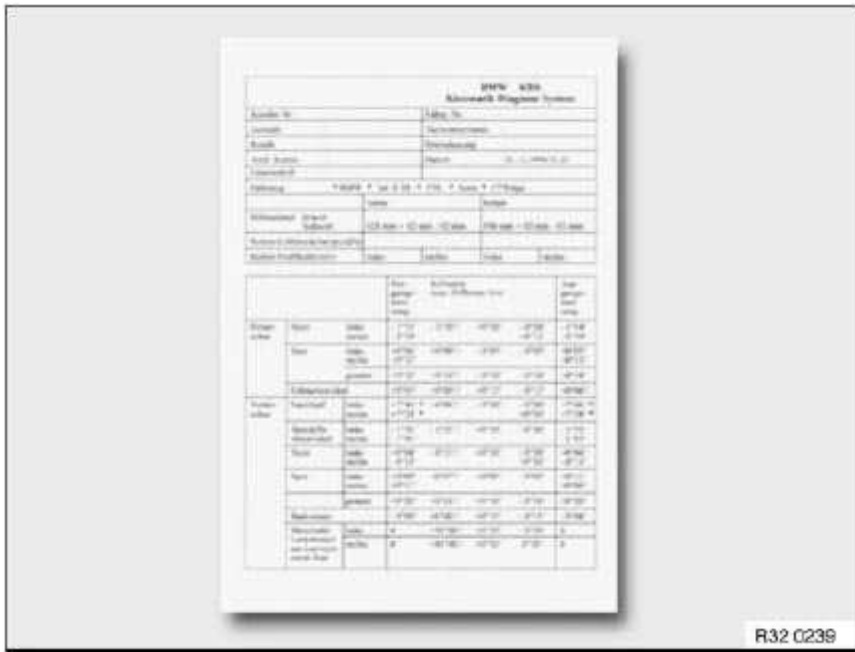


Fig. 26: Printing Layout Of Customer And Vehicle Identification Data
 Courtesy of BMW OF NORTH AMERICA, INC.

The report printout from the integrated DIN A4 printer is subdivided into three sections:

- Header lines with customer and vehicle identification data --> the customer data entered before beginning the measurement as well as vehicle data are printed out here.
- Centre section with vehicle data --> this includes the make, type, model and vehicle model year defined when the setpoint data record was selected. The values previously measured for height level, tyre pressure and tread depth are also printed in this section.
- The end section with all vehicle alignment values comprises the 3 columns initial measurement, setpoint values and output measurement. The measured values are recorded separately in these three columns.

8. SPECIAL FEATURES

8.1 Free wheel alignment

With free wheel alignment the selection and sequence of the measuring points is freely selectable. The following points must be observed for attaining the correct measurement results:

- Carry out all work in the same way as with the program-guided measurement.
- Before measuring the wheel toe and camber values for the rear axle, the steering must be in the "straight ahead" position to ensure that it is perfectly aligned in relation to the longitudinal center plane of the vehicle.
- Before measuring the single wheel toe values on the front axle, the center of steering must be established to ensure the correct position of the steering wheel.

8.2 System settings

The following settings must only be entered or set once: language, display format, date/time, advertising text, remote control with display, rotating plate selection and printer settings. They remain stored.

9. BMW KINEMATIC DIAGNOSIS SYSTEM COMPARISON (BOSCH - BEISSBARTH)

BMW KINEMATIC DIAGNOSIS SYSTEM COMPARISON (BOSCH - BEISSBARTH)

	Bosch	Beissbarth
Measured value recording	Infrared	CCD camera
Data transmission	Cable	Infrared / cable
Measuring sensor power supply	Cable	Battery / cable
Remote control	Infrared	Infrared
Remote control with measured value display	Cable	Infrared
Setpoint data memory	Floppy disk	Hard disk
Measured value memory	Always the last vehicle measured	Unlimited vehicle memory
Operating system	-	MS-DOS
Languages	English and one language on request	EN, DE, NI, SV, IT, FR, SP (further languages can be called up)
Update	3.5" floppy disk	3.5" floppy disk using TIS/DIS
Monitor	20"	17"
Computer	-	Pentium
Disk drives	2 x floppy disk	1 x floppy, 1 x CD ROM

10. CONTROL MODIFICATION (MENU)

10.1 Remote control with display

The following steps show how the remote control with display is activated:

1. Call up the "**Service**" menu in special functions ("S" key)
2. Call up the "**Remote control**" sub-menu in the "**Service**" menu.
3. Select the "**Remote control with display**" item in the "**Remote control**" sub-menu - this configuration is retained.

IMPORTANT: In the case of equipment without remote control, this must be configured to "No remote control".

10.2 Brief operating instructions

1. Activate the remote control with the "**ON**" button (it may also be switched on during alignment). The title page will appear on the LCD.
2. Select "**Straight ahead**" of the "**Initial measurement**", "**Adjustment work**" or "**Final measurement**" at the measuring equipment cabinet. The steering graphics for "**Straight ahead**" will appear on the LCD.

3. Use the **"Forward arrow"** to change to the next measurement image. Display blocks will appear on the LCD with the designation of the measured value and tolerance bar with the measured value. If the measured value is within the tolerance range, it is shown in dark figures against a light background. If the measured value is outside the tolerance range, it will be shown in inverse video (light figures against a dark background).
4. By pressing the **"F"** key shortly, you can move alternately between the designation of the measured value and the setpoint value with the tolerance inside the display blocks.
5. You can scroll through the measured values using the **"Forward arrow"**, **"Backward arrow"** and **"Cancel" (red dot)** keys. The function of these keys is identical to that of the keys on the graphics panel.
6. Even with **"Free alignment"**, it is possible to scroll through the measured values in the same way as with **"Program-guided alignment"**.
7. During measurement, the report print-out can be initiated using the **"Printer"** key. The remote control keys are only active during measurement and adjustment (not during customer data input, vehicle selection etc.).

10.3 Display support

- Measured values with a setpoint/actual comparison and tolerance bar (setpoint figures can be displayed with the **"F"** key)
- Steering graphics for steering routines
- Overview of measured values with current setpoint/actual comparison
- Rim run-out compensation
- With all other functions (e.g. customer input), the title illustration appears on the LCD display

NOTE: If the data transmission from the remote control to the computer is interrupted, the remote control icon in the bottom right-hand corner of the screen changes color from green to red and the illustration on the LCD display is shown inversely - black turns to white, white to black. This change does not take place in the title illustration. Once the line-of-sight connection has been re-established, the remote control continues to operate from the point of interruption in the program. A continuous visual connection during alignment is therefore not necessary.

- The **"Hour glass"** icon in the LCD display means: **"Please wait"**.
- The **"Battery"** icon in the top right-hand corner of the LCD display means that the battery reserve has been reached.
- To switch off the remote control: press the **"F"** key for 5 seconds, then return it to its charging unit or connect it to a charge cable. The title illustration will again appear as a charging check.
- If, during the measurement, the remote control has been placed back in the charging unit, it must be switched on again using the **"ON"** button.

11. UPDATING THE SOFTWARE / SETPOINT DATA

Floppy disks will no longer be sent to BMW partners who have acquired a **"BMW KIDS (Beissbarth / Bosch)"**.

For cost-related reasons, you can create these disks yourself on the "**DIS-tester**" or on the "**TIS/EPC server**". The data for this is regularly updated on the TIS CD.

11.1 REQUIREMENTS

- BMW KIDS (Beissbarth / Bosch)
- TIS CD program status (Beissbarth): from CD 12/95
- EPC program status: from 12/95
- TIS CD program status (Bosch): from CD 08/97
- DIS program status: from V6.0
- 3.5" diskettes, 1.44 MB (Beissbarth 5 diskettes / Bosch 1 diskette)

11.2 Procedure (Beissbarth)

1. Go to the "Administration" screen
2. Select the **KIDS button**
3. Select **Beissbarth**
4. Insert "**Diskette 1**" on request and confirm with "**OK**" (program diskette 1 of 2 is created, label it)
5. Insert "**Diskette 2**" on request and confirm with "**OK**" (program diskette 2 of 2 is created, label it)
6. Insert "**Diskette 3**" on request and confirm with "**OK**" (setpoint data diskette 1 of 3 is created, label it)
7. Insert "**Diskette 4**" on request and confirm with "**OK**" (setpoint data diskette 2 of 3 is created, label it)
8. Insert "**Diskette 5**" on request and confirm with "**OK**" (setpoint data diskette 3 of 3 is created, label it)
9. Perform update and/or setpoint data on the KIDS in the usual manner with the diskettes which have just been created.

11.3 Procedure (Bosch)

1. Go to the "Administration" screen
2. Select the **KIDS button**
3. Select **Bosch**
4. Label "**Diskette 3.1**", insert it into the drive on request and confirm with "**OK**" (2x) --> Setpoint data is copied to the diskettes.
5. Insert setpoint data diskette 3.1 into the 3.1 floppy disk drive, insert operating system diskette 3.0 into the 3.0 drive.
6. Switch on the machine in the usual manner.

IMPORTANT: When creating the KIDS diskettes, all data on the diskettes used is overwritten.

NOTE: In the event of an error, a corresponding message is shown and the program is cancelled completely. The procedure must be run from the beginning again and all data on the diskette will be deleted. A new diskette may have to be used.

12. CREATING, COPYING AND EDITING SETPOINT DATA

12.1 Copying

- Press the "C" button and select the vehicle to be copied.
- Select the "**Edit setpoint data**" menu item from the special functions. Create a new vehicle in the usual manner. The setpoint values for the last vehicle selected will appear in the data input screen. Enter the data and save the data record.

12.2 Creating

- Press the "C" button and select the "**Edit setpoint data**" menu item from the special functions. Create a new vehicle in the usual manner. An empty data input screen will appear. Enter the data and save the data record.

12.3 Editing

- Factory-programmed setpoint data can neither be deleted nor modified. If this data does need to be modified, a new vehicle with modified setpoint data must be created. New vehicles created by the user are identified by a "+" in the selection menu. These vehicles can be deleted by the user using the "-" key or modified using the " " key. These keys only appear if vehicles have been entered by the user.

13. SPECIAL FUNCTIONS

13.1 Customer-specific printer report header

The sub-item "**Customer-specific text**" must be called up in the "**Special functions**" menu. An input screen will appear on the monitor. This input screen must be filled out with the name and address and stored with the "S" screen key. The text entered is inserted into the report header.

13.2 Adjusting options

- Call up the "**Service**" menu in the special functions ("S" key).
- Select the "**Wheel toe adjustment**" item or the "**Camber adjustment**" item from the "**Adjustment**" sub-menu. The toe and camber adjustment program will guide the user step by step through the adjustment using text and images. The measuring deviation for each measuring sensor will be shown on the screen when the adjustment has been completed.
- You can store the adjustment values in the measuring sensor using the "**Store**" key or you can quit the program with the "**Red dot key**" without saving them (check). The adjustment values can be printed out.

13.3 Rotating plate test

- Call up the "**Service**" menu in the special functions ("S" key).
- Call up the "**Rotating plate**" item in the "**Service**" menu. Turn the left-hand and right-hand rotating plate and check the display on the screen. Important: The measuring range is ± 306 degrees.

13.4 Viewing and deleting customer entries from database

- Call up the menu item "**Delete**" in the "**Database**" menu in the special functions. The data input screen will appear. Fill in the search fields with the data to be deleted.
- Use the "-" button to delete this data record. A new data record can then be highlighted and deleted with the digital pen.
- You can scroll through the entire database with the "**Arrow up**" and "**Arrow down**" keys.
- You can quit the delete function by pressing the cancel key (red dot).

14. MODIFICATIONS WITHIN PROGRAM

Further modifications were carried out within the program which only slightly change the program sequence but which optimizes the alignment in respect of comfort and speed. This is described below:

- Optimization of the rim run-out compensation in respect of speed.
- Optimization of the steering routines: Highlighted values within the gate can still be corrected. The message "**Rotating plates not connected**" no longer causes the steering routine to be cancelled. Further measurements can be carried out after the rotating plates have been connected.
- Standardization of screen colors with the colors on the tablet.
- Addition of texts in several foreign languages.
- Elimination of program-related and cosmetic faults.
- Electronic water level.
- Omission of kingpin inclination measurement.

15. FAULTS

15.1 Tyre faults

TYRE FAULTS DESCRIPTION CHART

Fault	Effect
1 Wheel toe, camber, toe-differential angle and castor not correct	1 Severe tyre squeaking even at relatively low speeds
2 Excessive toe-in and excessive positive camber	2 Tyres are worn down on one outside edge in the longitudinal direction
3 Excessive negative camber	3 Tyre wear on inside edge
4 Worn front-axle suspension on front-wheel-drive vehicles	4 Increased noise / Vehicle pulls on one side when accelerating
5 Incorrect wheel alignment	5 Wheels scrubbing / Tyre surface shows feathering in the tread
6 Play in the suspension due to mechanical parts (suspension, steering)	6 Washout / Wobbling of front wheels
7 Tyre pressure too low	7 Outside tyre surface wear

15.2 Front axle faults

FRONT AXLE FAULTS DESCRIPTION CHART

Fault	Cause	Remedy
1. Toe deviation	a) Vehicle not in normal position	a) Correct height level
	b) Tie rod(s) bent	b) Replace tie rod(s)
	c) Tie rod ball joints worn	c) Replace tie rod(s)
	d) Rubber mount in control arm defective	d) Replace control arm
2. Camber deviation: The camber is fixed during the design stage and cannot be adjusted.	Rubber mount in control arm defective	Replace control arm
	b) Control arm deformed	b) Replace control arm
	c) Spring strut deformed	c) Replace spring strut
	d) Traction strut worn	d) Replace control arm
	e) Spring deflection too great	e) Replace coil spring, height level
	f) Front axle carrier deformed	f) Replace front axle carrier
	g) Spring strut mount deformed	g) Repair forward structure
	h) Distortion in the floor assembly (engine bracket)	h) Repair body
3. Castor deviation: The castor is fixed during the design stage and cannot be adjusted.	Rubber mount for tension / traction strut defective	Replace rubber mount
	b) Tension / traction strut deformed	b) Replace tension / traction strut
	c) Control arm deformed	c) Replace control arm
	d) Spring strut deformed	d) Replace spring strut
	e) Wheelhouse deformed (spring strut mount)	e) Repair forward structure
	f) Distortion in the floor assembly (engine bracket)	f) Repair body
4. Toe-differential angle deviation	Requirement: camber and castor are correct	
	Tie rods unevenly adjusted	Set wheel toe on left and right to identical values
5. Wheel displacement deviation	Requirement: Front wheels have same single toe in relation to the geometrical axis	
	a) Front axle carrier deformed	Replace front axle carrier
	b) Engine bracket deformed	b) Repair body
	c) Control arm deformed	c) Replace control arm
		d) Replace tension /

15.3 Rear axle faults

REAR AXLE FAULTS DESCRIPTION CHART

Fault	Cause	Remedy
1. Camber deviation	a) Vehicle not in normal position: spring deflection too great	a) Correct height level
	b) Rubber mount on rear axle carrier defective	b) Replace rubber mount
	c) Rear axle carrier deformed	c) Check rear axle carrier and replace, if necessary
	d) Control arm deformed	d) Check control arm and replace, if necessary
	e) Traction strut deformed	e) Check traction strut and replace, if necessary
	f) Distortion in the floor assembly	f) Repair body
	g) Swinging arm deformed	g) Replace swinging arm
2. Rear wheel position is not correct	a) Rear axle carrier has been shifted laterally	a) Check the rubber mounts on the rear axle carrier and replace, if necessary
	b) Distortion in the floor assembly	b) Repair body
3. Toe deviation	a) Vehicle not in normal position, i.e. spring deflection too great	a) Correct height level
	b) Rubber mount in rear axle carrier defective	b) Replace rubber mount
	c) Control arm deformed	c) Replace control arm
	d) Rubber mount and swinging arm defective	d) Replace swinging arm
	e) Rear axle carrier deformed	e) Check rear axle carrier and replace, if necessary
	f) Traction strut deformed	f) Check traction strut and replace, if necessary
4. Deviation from the geometrical drive axis	Requirement: Total wheel toe is correct	
	a) Distortion in the floor assembly	a) Repair body

Further details on the "Kinematic Diagnosis System" can be found in the operating instructions for the BMW KIDS (Beissbarth / Bosch).

Functional and system descriptions are not subject to change. Parts availability and immediate ordering availability cannot be derived from this information. The specialist departments will be providing further details at the relevant time.

SUSPENSION

Steering and Wheel Alignment - Special Tools - X3

32 STEERING AND WHEEL ALIGNMENT

32 1 020 SET OF TOOLS

Minimum set: Mechanical tools

Note: For changing wear parts on hydraulic lines (steering gear)

Series: E60, E61, E65, E66, E67, E83, RR1, RR2

Storage location: A45

SI number: 1 14 01 (766)

Order number: 32 1 020

Set of tools

Consisting of:

1 = 32 1 021 Slip bush

2 = 32 1 022 Thrust piece

3 = 32 1 023 Extractor

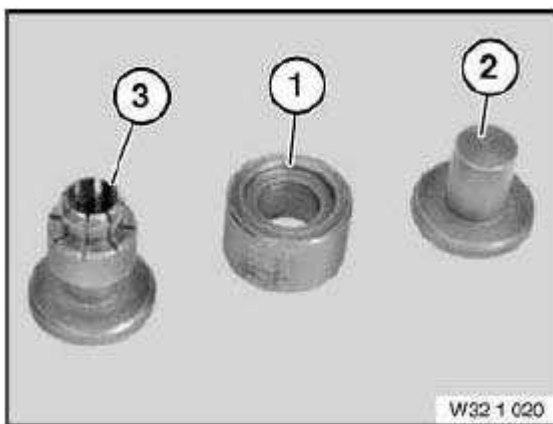


Fig. 1: Set Of Tools (32 1 020)

Courtesy of BMW OF NORTH AMERICA, INC.

32 1 030 LEVER

Minimum set: Mechanical tools

Note: For disconnecting hydraulic lines from steering gear and for locking adjustment unit (ASZE) at handbrake lever

Series: E60, E61, E63, E64, E65, E66, E67, E83, E85, E86, E87, E90, E91, E92, E93, RR1, RR2

Storage location: B45, C45

SI number: 1 14 01 (766)

Order number: 32 1 030

Lever

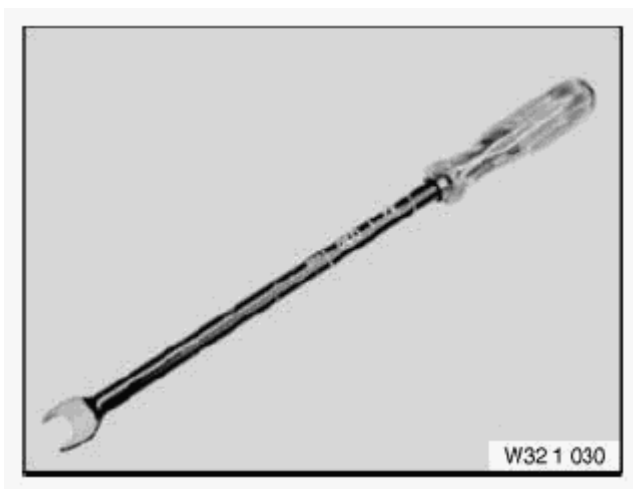


Fig. 2: Lever (32 1 030)

Courtesy of BMW OF NORTH AMERICA, INC.

32 1 060 DRIFT

In conjunction with: 00 5 500

Note: For rotary shaft seal of inner segment shaft in steering gear

Series: E24, E28, E30, E31, E32, E34, E36, E38, E38/3, E39, E46, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E83, E85, E86, E87, E90, E91, E92, E93, RR2

Storage location: B30

Order number: 32 1 060

Drift



Fig. 3: Drift (32 1 060)

Courtesy of BMW OF NORTH AMERICA, INC.

32 1 260 PLIERS

Note: For opening and fastening hose clamps

Series: E12, E21, E23, E24, E28, E30, E30/C, E30tou, E31, E32, E32/3, E34, E34tou, E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E81, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53, RR1, RR2

SI number: 1 02 01 (667)

Order number: 32 1 260

Pliers

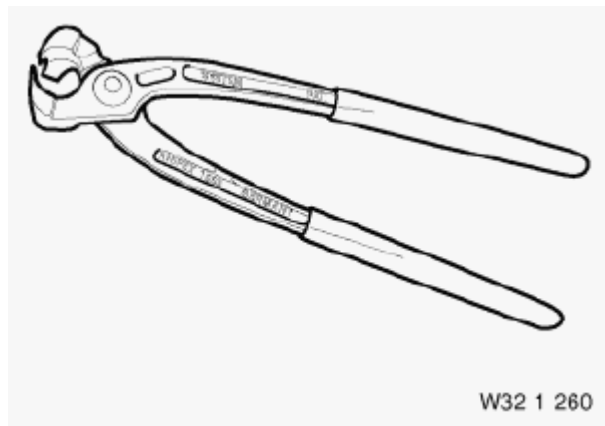


Fig. 4: Pliers (32 1 260)

Courtesy of BMW OF NORTH AMERICA, INC.

32 1 270 PLUGS (SET)

Minimum set: Mechanical tools

Note: 27-piece, 3x per size - For sealing off hydraulic lines for brakes, steering etc.

Series: E12, E21, E23, E24, E28, E30, E30/C, E30tou, E31, E32, E32/3, E34, E34tou, E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E68, E70, E81, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53, R56, RR1, RR2

SI number: 1 14 01 (766)

Order number: 32 1 270

Plugs (set)



Fig. 5: Plugs (32 1 270)

Courtesy of BMW OF NORTH AMERICA, INC.

32 1 300 FORK

Minimum set: Mechanical tools

Note: For disconnecting hydraulic lines Engine: N73

Series: E60, E61, E65, E66, E67, E83

Storage location: B47

SI number: 1 05 03 (969)

Order number: 32 1 300

Fork



Fig. 6: Fork (32 1 300)

Courtesy of BMW OF NORTH AMERICA, INC.

32 3 030 SETTING TOOL

Minimum set: Mechanical tools

Note: For setting toe-in on rear axle - rear axle with KDS

Series: E36, E46, E83, E85, E86

Storage location: C36

SI number: 1 02 98(302)

Order number: 32 3 030

Setting tool

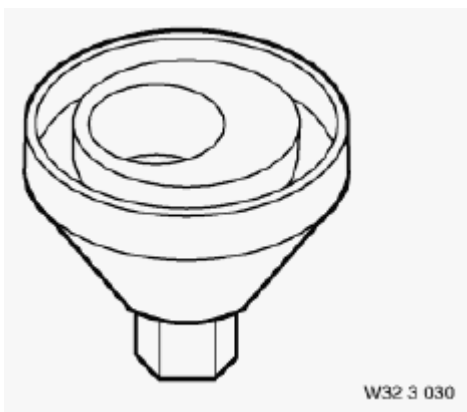


Fig. 7: Setting Tool (32 3 030)

Courtesy of BMW OF NORTH AMERICA, INC.

32 3 110 RELEASING TOOL

Minimum set: Mechanical tools

Note: For unlocking lock cylinder in steering wheel lock during removal

Series: E31, E32, E34, E36, E36/7, E38, E39, E46, E60, E61, E63, E64, E83, E85, E86, R50, R52, R53

Storage location: A31

SI number: 1 06 94 (801)

Order number: 32 3 110

Releasing tool

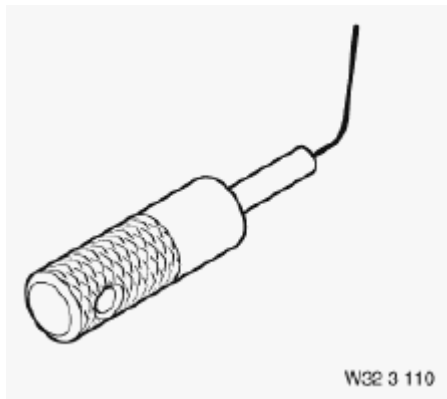


Fig. 8: Releasing Tool (32 3 110)

Courtesy of BMW OF NORTH AMERICA, INC.

32 3 140 SETTING TOOL

Minimum set: Mechanical tools

Note: For setting front camber.

Series: E38, E39, E46, E53, E65, E66, E67, E81, E83, E85, E86, E87, E90, E91, E92, E93

Storage location: C35

SI number: 1 15 05 (200)

Order number: 32 3 140

Setting tool

Consisting of:

5 = 32 3 145 Disc

Note: For adjusting camber on front axle

6 = 32 3 146 Spindle

7 = 32 3 147 Knurled screw

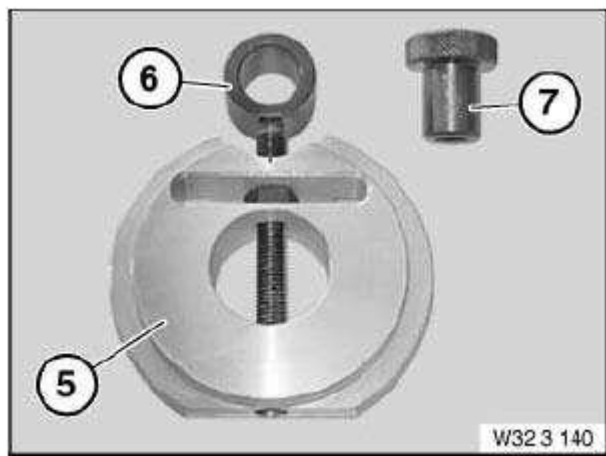


Fig. 9: Setting Tool (32 3 140)

Courtesy of BMW OF NORTH AMERICA, INC.

32 3 160 T-HANDLED SOCKET WRENCH WAF 38

Minimum set: Mechanical tools

Note: For setting camber on front axle

Series: E53, E60, E61, E63, E64, E65, E66, E67, E70, E81, E83, E87, E90, E91, E92, E93

Storage location: A39

SI number: 1 15 99 (483)

Order number: 32 3 160

T-handled socket wrench WAF 38

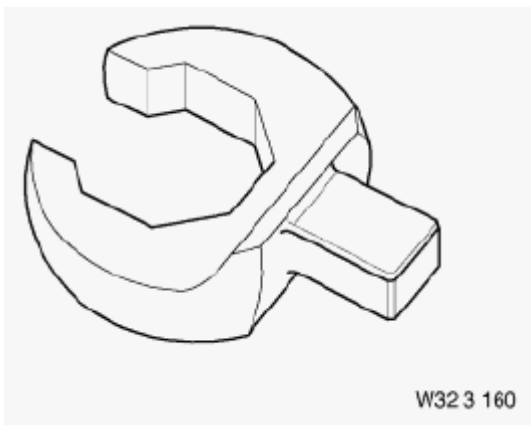


Fig. 10: T-Handled Socket Wrench WAF 38 (32 3 160)
Courtesy of BMW OF NORTH AMERICA, INC.

32 4 000 FIXTURE

Note: For checking pump pressure in power steering system

Series: E12, E21, E23, E24, E28, E30, E31, E32, E34, E36, E38, E39, E46, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E81, E83, E85, E86, E87, E90, E91, E92, E93

Order number: 32 4 000

Fixture

Consisting of:

1 = 32 4 001 Pressure gauge 16 bar

2 = 32 4 002 Pressure gauge 160 bar

3 = 32 4 003 Test fixture without pressure gauge

4 = 32 4 004 Line

5 = 32 4 005 Connecting piece

Note: For screwing into hydraulic pump / model series: E23, E46, E52, E53, E64, E65, E66, E85

6 = 32 4 006 Connecting piece

Note: For screwing into test fixture 32 4 003 / model series: E23, E46, E52, E53, E64, E65, E66, E85

7 = 32 4 007 Connecting piece M18x1.5

Note: For screwing into pressure regulator / model series: E32, E34

8 = 32 4 008 Connecting piece M14x1.5

Note: For screwing into test fixture / model series: E32, E34

9 = 32 4 009 Ball valve

11 = 32 4 011 Adapter M14 x 1.5

12 = 32 4 012 Adapter M16 x 1.5

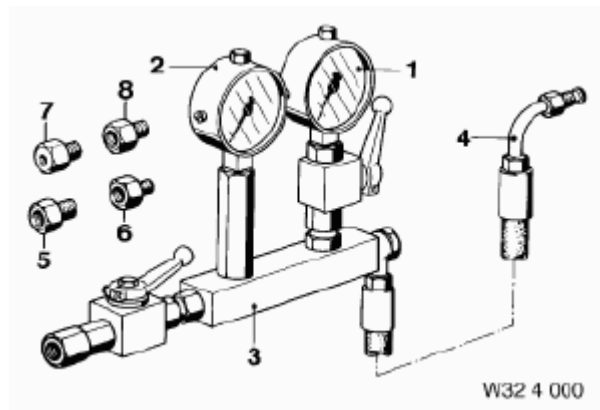


Fig. 11: Fixture (32 4 000)

Courtesy of BMW OF NORTH AMERICA, INC.

SUSPENSION

Steering and Wheel Alignment - Technical Data - X3

00 ELECTRONIC CHASSIS ALIGNMENT

32 00 CHASSIS/WHEEL ALIGNMENT - NORMAL POSITION E83

TECHNICAL DATA - CHASSIS/WHEEL ALIGNMENT - NORMAL POSITION E83

Car loaded down to normal position		Vehicle with complete equipment for normal operation with: 2 x 68 kg on front seats (seats in central position); 1 x 68 kg on rear seat (center); 1 x 21 kg in luggage compartment (center) and full fuel tank.
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32 00 WHEEL ALIGNMENT E83 SERIES SPORT SUSPENSION (NOT LOW SLUNG)

TECHNICAL DATA - WHEEL ALIGNMENT E83 SERIES SPORT SUSPENSION (NOT LOW SLUNG)

<u>Observe test conditions, see 32 00 ... TEST CONDITIONS FOR CHASSIS/WHEEL ALIGNMENT CHECK .</u>		
Front axle:		
Total toe		0° 6' ± 12'
Camber (difference between left/right max. 30')		-20' ± 30'
Toe angle difference		(difference between left/right max. 30')
- with 20° lock on inside wheel		2° 16' ± 30'
Caster angle		(difference between left/right max. 30')
Front wheel displacement		0° ± 15'
Maximum wheel lock		
- Inside wheel		38°
- Outside wheel		31°
Rear axle:		
Total toe		0° 16' ± 12'
Camber (difference between left/right max. 15')		-2° ± 25'
Geometrical axis deviation		0° ± 12'

SUSPENSION

Steering and Wheel Alignment - Tightening Torques - X3

00 ELECTRONIC CHASSIS ALIGNMENT

32 00 STEERING

STEERING - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Steering gear to front axle carrier	E21			50 Nm
	E21 (power steering)			41 Nm
	E12, E23, E24			42 Nm
	E24 / from 5.82, E28, E31, E32, E34	M12		80 Nm
	E28, E30, E36, E46	M10		42 Nm
	E32/3 / 750iLs	M10 10.9		110 Nm
	E38	M10 8.8	Press steering gear outwards to stop on front axle support and first tighten both front screws.	42 Nm
	E38 / Ball-and-nut steering, E39 / Ball-and-nut steering	M10 10.9		62 Nm
	E39 / Rack-and-pinion steering gear, E52	M10	Replace screws	42 Nm
	E53	M12 10.9		
			Jointing torque	50 Nm
			Torque angle	90 °
	E60 / REAR END, E61 / REAR END, E63, E64, E65, E66, E67		Replace screws & nuts	
			Jointing torque	56 Nm
			Torque angle	90 °
	E61 / Four Wheel Drive, E60 / Four Wheel Drive	M12	Replace screws & nuts	120 Nm
	E83	M12	Replace screws & nuts	100 Nm
	E85, E86	M10	Replace screws & nuts	42 Nm

13 STEERING GEAR

32 13 POWER STEERING GEAR

POWER STEERING GEAR - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
6AZ Ring nut	E30	with 2.5 mm dia. wire		120 Nm
	E30	with 3.5 mm dia. wire		150 Nm
7AZ Valve housing to case	E30			18 Nm
8AZ Pressure piece cover	E30			18 Nm
9AZ Internal lines to steering gear	E30	M10		10 Nm
	E30 / E60 / E61 / E63 / E64 / E67	M12		20 Nm
	E65 / E66	M12		30 Nm
	E60 / E61 / E63 / E64	M18		25 Nm
	E65 / E66	M18		60 Nm
10AZ Coupling bolt with hexagon socket	E34 (AWD)			20 Nm
11AZ Pipe (pipe cringe) to steering gear	E30 / E36			8 Nm
12AZ Servotronic converter to power steering gear	E60 / E61 / E63 / E64 / E65 / E66 / E67 / E83			3 Nm

21 STEERING ARMS, TIE RODS, STEERING DAMPER

32 21 STEERING ARMS

STEERING ARMS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Tie rod to ball joint (castle nut)	E21			60 Nm
2AZ Tie rod / axial joint to rack	E21, E30		Replace retaining plate	75 Nm
	E34, E36		Replace retaining plate	71 Nm
	E39, E52			71 Nm
	E46, E85 / except S54, E86 / except S54			100 + 10 Nm
	E53, E60, E61, E63, E64, E65, E66, E67, E83, E85 / S54, E86 / S54			110 Nm
3AZ Tie rod end to				

steering knuckle / swivel bearing	E34 / Four Wheel Drive		Replace nut	50 Nm
	E36		Replace nut	36 Nm
	E38, E39, E52		Replace nut	65 Nm
	E46, E85, E86		Use of impact screwdriver not permitted! Replace nut	65 Nm
	E53, E60 / Four Wheel Drive, E61 / Four Wheel Drive, E67, E83		Replace nut	80 Nm
	E60 / REAR END, E61 / REAR END, E63, E64, E65, E66		Replace nut	165 Nm
4AZ Tie rod clamping screw	E38, E39			27 Nm
	E12, E23, E24, E28, E30, E31, E32, E34			14 Nm
5AZ Tie rod end to tie rod (clamping nut)	E34 / Four Wheel Drive, E36, E46, E85, E86			45 Nm
	E39, E52, E53, E60, E61, E63, E64, E65, E66, E67, E83			51 Nm
6AZ Steering drop arm to steering gear	E32, E34 / Four Wheel Drive			59 Nm
	E23	M26	Tightening value may be exceeded up to correct position to locking plate	at least 180 Nm
	E12, E23, E24, E28	M22	Tightening value may be exceeded up to correct position to locking plate	at least 140 Nm
	E31			70 Nm
	E38, E39		Note direction of screw thread. In direction of travel: from left on LHD or from right on RHD vehicle	61 Nm
7AZ Steering guide arm to front axle carrier	E39			62 Nm
	E23, E24, E28, E31, E32, E34, E38	M10		42 Nm
	E12, E23, E24	M12		85 Nm
8AZ Track rod arm to strut	E12, E24(upto 5.82)		Bolts secured with: Wire	55 Nm
	E23, E24 (from 5.82), E28		Bolts secured with: Loctite No. 270 Clean threads of tapped bores and bolts.	62 Nm
	E31, E32, E34		Bolts secured with: Loctite No. 270 Clean threads of tapped bores and	110 Nm

			bolts.	
	E30 / M3		Bolts secured with: Loctite No. 270 Clean threads of tapped bores and bolts.	30 Nm
9AZ Tie rod arm to control arm	E12, E23, E24 (up to 5.82)			66 Nm
	E30 / M3			66 Nm
	E24 (from 5.82), E28, E31, E32, E34			93 Nm
10AZ Leading strut to tie rod arm	E23			93 Nm
11AZ Trailing strut to tie rod arm	E31, E32, E34			93 Nm

31 STEERING COLUMN

32 31 STEERING COLUMN

STEERING COLUMN - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Universal joint / coupling to steering gear / steering spindle	E12, E24 / until 5.82		Replace clamping screw	25 Nm
	E21, E23, E24 / from 5.82, E28, E30, E31, E32, E34, E46, E52, E60, E61, E63, E64, E65, E66, E67, E83		Recut thread Replace clamping screw	22 Nm
	E36, E38, E39		Recut thread Replace clamping screw	19 Nm
	E53 / Steel joint	M8 10.9	Recut thread Replace clamping screw	24 Nm
	E53 / Aluminium joint	M8 10.9	Recut thread Replace clamping screw	28 Nm
	E85, E86	M8	Recut thread Replace clamping screw	30 Nm
2AZ Bearing block for steering column adjustment to instrument panel carrier and pedal bearing block	E31, E32, E34	M8		22 Nm
3AZ Hexagon screw to bearing				

block for steering column adjustment	E12, E24 / until 5.82	M10 x 115		25 Nm
	E28, E24 / from 5.82	M8 x 110		22 Nm
	E23	M10 x 170		27 Nm
	E31, E32, E34		Observe repair instruction.	
	E38, E39, E53	M8	Adjustment lever in clamped position	3.0 Nm
	E46, E83	M8	Value 1	4.0 Nm
			Value 2	4.8 Nm
	E85, E86	M8	Adjusting lever without needle bearing	6 Nm
			Adjusting lever with needle bearing	3.2 Nm
4AZ Clamp / shackle for outer steering tube	E12, E21, E24, E28			22 Nm
	E23			10 Nm
5AZ Airbag: Steering column to holder	E23, E24, E28			18 Nm
6AZ Steering column to instrument panel / support tube	E60, E61, E63, E64, E65, E66, E67, E83, E85, E86			21 Nm
7AZ Steering column to dashboard	E12, E23, E24, E28			14 Nm
8AZ Sliding piece (screw / nut)	E46			9.5 Nm
9AZ Control unit, steering column (CIM) to steering column	E65, E66, E67			2.5 Nm
10AZ Bracket for sleeve to body	E85, E86	M6		2.4 Nm
	E83	M6		2.8 Nm
11AZ Cable holder to steering column	E46	M5 (silver)		8.8 Nm
	E46	M5 (black)		4 Nm
12AZ Electric drive to steering column	E65, E66	M6		8 Nm
	E60, E61, E63, E64			6 Nm
13AZ Steering spindle to double universal joint / universal joint	E53, E65, E66, E67, E83		Recut thread Replace clamping	28 Nm

			screw	
14AZ Universal joint with corrugated tube to steering gear	E65, E66, E67		Recut thread Replace clamping screw	22 Nm
15AZ Bearing block of steering column to bulkhead	E83	M8	Replace nuts	21.4 Nm
16AZ Steering column to bearing block	E83	M6	Stick in nut again	8.8 Nm
17AZ Steering spindle middle section to assembly partition wall	E60 / Four Wheel Drive, E61 / Four Wheel Drive			6 Nm

33 STEERING WHEEL

32 33 STEERING WHEEL

STEERING WHEEL - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Steering wheel to steering column	E12, E21, E24, E23, E28, E30	Nut		80 Nm
	E31, E32, E34, E36, E38, E39, E46, E52, E53, E60, E61, E63, E64, E65, E66, E67, E83, E85, E86	Screw		62.5 Nm
2AZ Retaining plate to steering wheel	E60, E61, E63, E64	M5		6 Nm
3AZ Voltage regulator to steering wheel	E60, E61	M5x12	Replace screws	3 Nm
4AZ Engine electrics, Lane Departure Warning, to steering wheel	E60, E61	M5x12	Replace screws	4 Nm

34 STEERING WHEEL FOR AIRBAG

32 34 AIRBAG AND AIRBAG STEERING WHEEL

AIRBAG AND AIRBAG STEERING WHEEL - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Airbag unit to steering wheel	E23 / E24 / E28 / E30 / E31 / E32 / E34		Airbag unit I	8 Nm
	E36 / E38 / E39 / E46		Airbag unit II	2 Nm
	E53 / E83	M6		8 Nm

41 PUMP AND OIL SUPPLY

32 41 PUMP AND OIL SUPPLY

PUMP AND OIL SUPPLY - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Power steering pump / bearing block of power steering pump to crankcase / oil sump / oil filter unit carrier / A / C compressor carrier	E39 / M5		Observe tightening sequence	25 Nm
	E46 / M57TU, E53 / M57TU, E60 / M57TU / M57T2, E61 / M57TU / M57T2, E65 / M57TU / M57T2, E66 / M57T2, E83 / M47T2 / M57TU / M57T2	M6		8 Nm
	E65 / N62 / N73, E66 / N62 / N73, E67 / N62 / N73	M8	Replace nuts	21 Nm
	E60 / N52 / N53, E61 / N52 / N53, E63 / N52 / N53, E64 / N52 / N53, E65 / N52, E66 / N52, E83 / N52	M10 x 33	Replace aluminium screws Observe repair instruction	
			Jointing torque	20 Nm
			Torque angle	90 °
	E60 / N54, E61 / N54	M10	Observe repair instruction	38 Nm
	E36, E38, E39, E46, E52, E53, E60, E61, E63, E64, E65, E66, E67, E83		Note shims, refer also to Service Information Gr. 32	21 Nm
	E85 / S54, E86 / S54	M8		21 Nm
2AZ Pump bracket on engine support	E38 / M60 / 1 / M60 / 2 / M62, E39 / M62			22 Nm
3AZ Hydraulic line connections to vane pump / power steering pump and steering gear / banjo bolts, steering hydraulics	E38	Banjo bolt M12	Replace sealing rings	33 Nm
	E36, E39, E46, E52	Banjo bolt M14	Replace sealing rings	35 Nm
	E38	Banjo bolt M14	Replace sealing rings	39 Nm
	E53, E60, E61, E63, E64, E65, E66, E85 / S54, E86 / S54	Banjo bolt M14	Replace sealing rings	33 Nm
	E36, E38, E39, E46 / S54, E52	Banjo	Replace sealing	40 Nm

		bolt M16	rings	
	E46 / N40 / N42 / N45 / N46	Banjo bolt M16	Replace sealing rings	42 Nm
	E53, E60, E61, E63, E64, E65, E66	Banjo bolt M16	Replace sealing rings	39 Nm
	E83 / N46, E85 / S54, E86 / S54	Banjo bolt M16	Replace sealing rings	35 Nm
	E38, E53	Banjo bolt M18	Replace sealing rings	45 Nm
	E36, E38, E39, E46, E53, E60, E61, E63, E64, E83	Cap screw	Replace sealing ring	36 Nm
	E65, E66, E67	Cap screw	Replace sealing ring	39 Nm
4AZ Hydraulic line connections to DS controller	E31, E32, E34			40 Nm
5AZ Mounting of hydraulic line	E60, E61, E63, E64, E65, E66, E67	M6	Screw, nut or rubber-metal body	7.5 Nm
	E60, E61, E65, E66, E67	M8	Screw, nut or rubber-metal body	19 Nm
	E83, E85 / S54, E86 / S54	M6	Screw, nut or rubber-metal body	8 Nm
6AZ Holder, expansion hose, to vane pump / power steering pump	E60, E61, E63, E64, E65, E66	M6 8.8		7.5 Nm
	E65 / M67	M8-8		19 Nm
7AZ Mounting hydraulic pump to engine block / oil sump	E65			3 Nm
8AZ Oil reservoir to body (Dynamic Drive / active front steering)	E60, E61	M6		5.5 Nm
9AZ Oil reservoir to holder	E60, E61, E63, E64, E67, E83	M6		4 Nm
	E85 / S54, E86 / S54	M6		5.5 Nm
10AZ Expansion hose part 1 to part 2	E60, E61, E63, E64, E65, E66			30 Nm
11AZ Expansion hose mounting	E60	M6		10 Nm
12AZ Line fastening steering hydraulics	E60	M6		7.5 Nm
	E60	M8		19 Nm
13AZ Oil tank holder to body	E83	M8		19 Nm
14AZ Belt pulley to power steering pump	E60, E61, E63, E64, E65, E66, E67	M8 8.8		22 Nm
	E39, E46, E53, E65, E66, E67	M8 10.9		27 Nm
	E83 / M54 / N46	M8		28 Nm

	E83 / M57TU / M57T2 / M47T2, E85 / S54, E86 / S54	M8		22 Nm
15AZ Bracket, pressure line, Dynamic Drive, to oil sump	E65 / M57TU / M57T2, E66 / M57T2			19 Nm
16AZ Bracket, pressure line, to steering gear	E60, E61, E63, E64	M8		19 Nm
17AZ Bracket, hydraulic line, to stabilizer bar mounting	E60, E61, E63, E64	M6		12 Nm
18AZ Bracket, power steering pump, to crankcase	E63 / N52, E64 / N52	M10	Replace aluminium screws	
			Jointing torque	20 Nm
			Torque angle	90 °
19AZ				
20AZ Power steering pump to water pump	E46 / N40 / N42 / N45 / N46	M8		32 Nm
	E83 / N46	M8		28 Nm
21AZ Bracket, pressure line (ARS), to crankcase	E63 / N52, E64 / N52	M10	Replace aluminium screws	
			Jointing torque	20 Nm
			Torque angle	90 °
	E60 / N52, E61 / N52, E63 / N52, E64 / N52, E65 / N52, E66 / N52	M8x17.5	Replace aluminium screw	
			Jointing torque	8 Nm
			Torque angle	45 °
22AZ Pressure line to power steering gear	E85 / S54, E86 / S54	M14	Replace sealing rings	33 Nm
23AZ Return line to power steering gear	E85 / S54, E86 / S54	M16	Replace sealing rings	35 Nm

SUSPENSION

Front Axle - Special Tools - X3

31 FRONT AXLE

31 1 050 TOOL

Note: For removing and installing silentblocks in control arms and compression struts.

Series: E24, E28, E32, E34, E53, E83

Storage location: B32

Order number: 31 1 050

Tool

Consisting of:

1 = 31 1 051 Thrust sleeve

Note: For removing and installing silentblocks in control arm.

3 = 31 1 053 Thrust sleeve

Note: For bracing compression strut. Model series: E24, E28, E32, E34

31 1 054 Thrust sleeve

Note: For bracing control arm and for removing and installing silentblocks in compression strut.

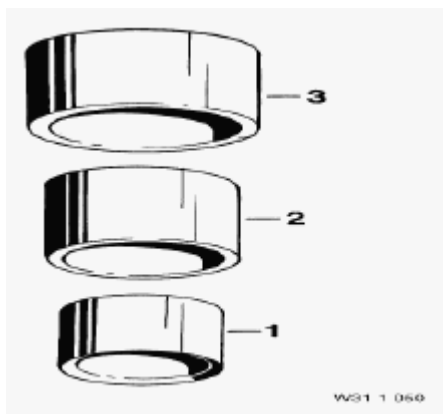


Fig. 1: Tool (31 1 050)

Courtesy of BMW OF NORTH AMERICA, INC.

31 1 060 TEST FIXTURE

Minimum set: Mechanical tools

Note: For testing wheel guide joints on front axle.

Series: E46, E53, E83, E85, E86

SI number: 1 13 02 (933)

Order number: 31 1 060

Test fixture

Consisting of:

1 = 31 1 061 Bracket

2 = 31 1 062 Sensor with plug

3 = 31 1 063 Magnetic retainer E46

4 = 31 1 064 Evaluation electronics unit

5 = 31 1 065 Magnetic retainer E53

6 = 31 1 066 Plug-in tool

7 = 31 1 067 Bracket

10 = 31 1 071 Contour disc

Note: For securing magnetic retainer 31 1 063 to cover of wheel control joint E46 (M3). SI 01 09 06 (261)

In conjunction with: 31 1 079

11 = 31 1 072 Contour disc

Note: For securing magnetic retainer 31 1 063 to cover of wheel control joint E85.

In conjunction with: 31 1 079

19 = 31 1 079 Adhesive dots (adherent on both sides), 10 x

31 1 068 Cardboard box with insert

31 1 069 Instructions for use

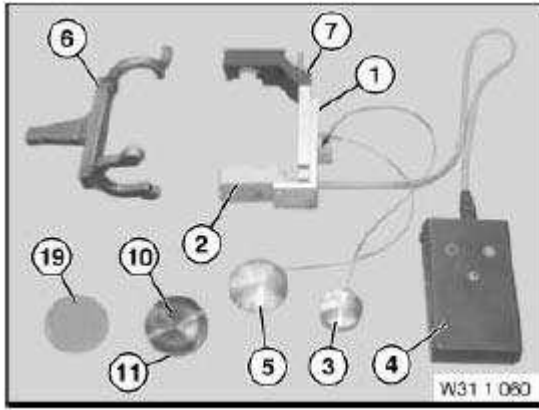


Fig. 2: Test Fixture (31 1 060)

Courtesy of BMW OF NORTH AMERICA, INC.

31 1 140 OPEN-END WRENCH WAF 16/18

Minimum set: Mechanical tools

Note: For bracing ball joint of hinged bracket.

Series: E81, E83, E85, E87, E90, E91, E92, E93

Storage location: C47, C48

SI number: 1 24 03 (040)

Order number: 31 1 140

Open-end wrench WAF 16/18

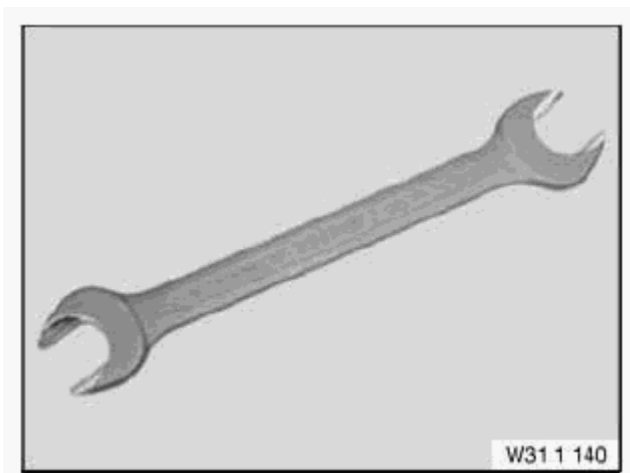


Fig. 3: Open-End Wrench WAF 16/18 (31 1 140)

Courtesy of BMW OF NORTH AMERICA, INC.

31 2 100 FIXTURE

Minimum set: Mechanical tools

Note: For detaching drive flange from all rear differentials

Series: E28, E30, E31, E32, E36, E36/7, E38, E39, E46, E52, E53, E60, E61, E63, E64, E65, E66, E67, E83, E85, E86, E87, E90, E91, E92, E93, RR1, RR2

Transmission: Rear diff. 188kom, rear diff. 220kom, rear diff. type G, rear diff. type K, rear diff. type M

Storage location: C7

Order number: 31 2 100

Fixture

Consisting of:

1 = 31 2 101 Spindle

Note: All rear differentials

2 = 31 2 102 Frame

Note: All rear differentials

3 = 31 2 103 Pull-off plate

Note: Model series: E28

4 = 31 2 104 Pull-off plate

Note: Model series: E30 and all rear differentials

6 = 31 2 106 Thrust piece

Note: Model series: E31, E32, E36

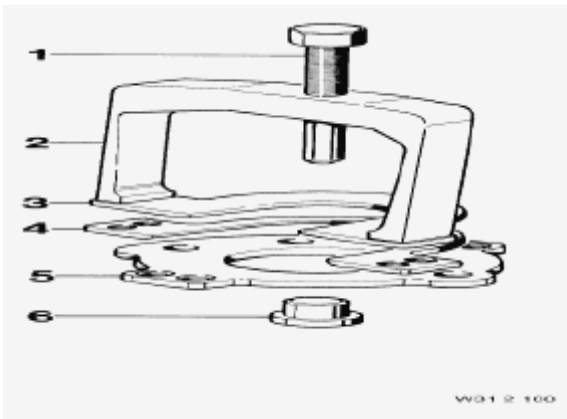


Fig. 4: Fixture (31 2 100)

Courtesy of BMW OF NORTH AMERICA, INC.

31 2 110 FIXTURE

Minimum set: Mechanical tools

Note: For installing front wheel bearing unit special tool 31 2 113 for E67 and RR

Series: E28, E36, E46, E53, E60, E61, E67, E83, E85, E86, E90, E91, E92, RR1

Storage location: B6

Order number: 31 2 110

Fixture

Consisting of:

1 = 31 2 111 Spindle

Note: With guide sleeve

2 = 31 2 112 Thrust sleeve

3 = 31 2 113 Nut with bearing

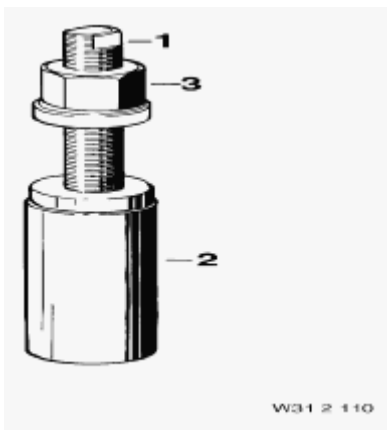


Fig. 5: Fixture (31 2 110)

Courtesy of BMW OF NORTH AMERICA, INC.

31 2 200 EXPANDER TOOL

Minimum set: Mechanical tools

Note: For expanding wheel carrier (front axle) while disassembling McPherson strut

Series: E38, E39, E46, E52, E65, E66, E67, E83, E85, E86

Storage location: B21

SI number: 1 06 94(801)

Order number: 31 2 200

Expander tool

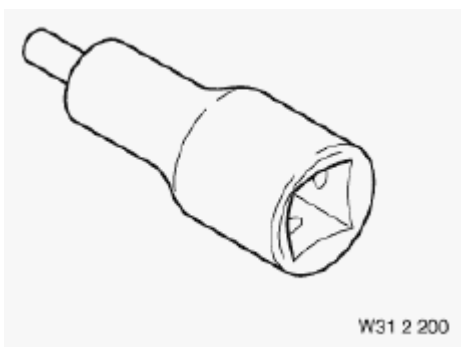


Fig. 6: Expander Tool (31 2 200)

Courtesy of BMW OF NORTH AMERICA, INC.

31 2 210 SOCKET WRENCH SOCKET WAF 21

Minimum set: Mechanical tools

Note: For releasing shock absorber threaded connection (front axle with EDC)

Series: E38, E39, E46, E52, E53, E60, E61, E63, E64, E65, E66, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53

Storage location: C18

SI number: 1 06 94 (801)

Order number: 31 2 210

Socket wrench socket WAF 21

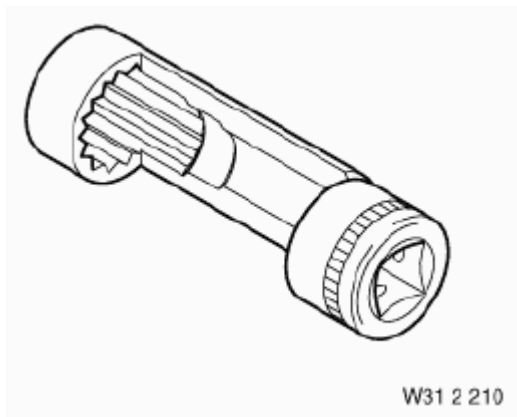


Fig. 7: Socket Wrench Socket WAF 21 (31 2 210)
Courtesy of BMW OF NORTH AMERICA, INC.

31 2 220 SUPPORT PLATE

In conjunction with: 00 2 030 (not included in minimum kit)

Note: For supporting front axle and exhaust system during installation work

Series: E12, E21, E23, E24, E28, E30, E30/C, E30tou, E31, E32, E32/3, E34, E34tou, E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E68, E70, E81, E83, E85, E86, E87, E90, E91, E92, E93, R50, R53, RR1

Storage location: B37

SI number: 1 06 94 (801)

Order number: 31 2 220

Support plate

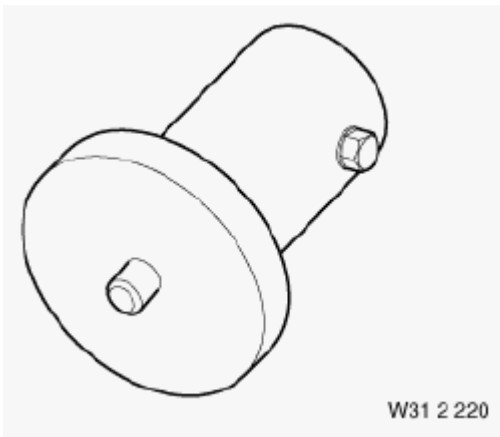


Fig. 8: Support Plate (31 2 220)

Courtesy of BMW OF NORTH AMERICA, INC.

31 2 230 SOCKET

Minimum set: Mechanical tools

Note: For expanding steering knuckle during spring strut removal

Series: E60, E61, E63, E64, E65, E66, E67, E70, E81, E83, E85, E86, E87, E90, E91, E92, E93

Storage location: C47

SI number: 1 05 03 (969)

Order number: 31 2 230

Socket

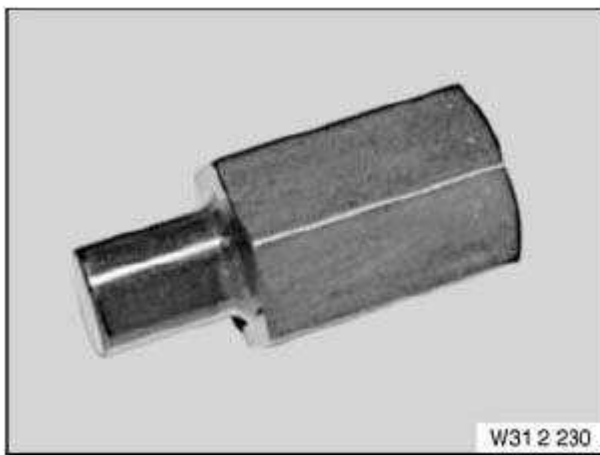


Fig. 9: Socket (31 2 230)

Courtesy of BMW OF NORTH AMERICA, INC.

31 2 240 PULLER

Minimum set: Mechanical tools

Note: For removing control arms from steering knuckle.

Series: E38, E39, E52, E53, E60, E61, E70, E83, E90, E91, E92, R50, R52, R53, RR1, RR2

Storage location: A11, B11

SI number: 1 06 94 (801)

Order number: 31 2 240

Puller

Consisting of:

1 = 31 2 241 Upper part

2 = 31 2 242 Lower part

3 = 31 2 243 Spindle

4 = 31 2 244 Pressure screw

5 = 31 2 245 Straight pin

6 = 31 2 246 Lower part

Note: For forcing control arm off wheel guide joint E53, E83

7 = 31 2 247 Lower part

Note: For forcing control arm off wheel guide joint E70. SI 1 01 07 (333)

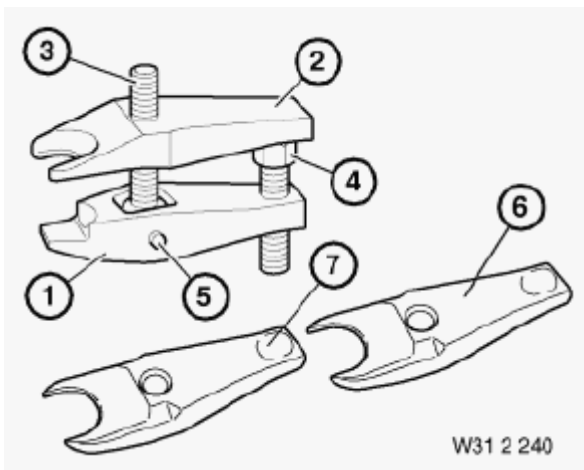


Fig. 10: Puller (31 2 240)

Courtesy of BMW OF NORTH AMERICA, INC.

31 2 260 PRESSURE SLEEVE TOOL

Minimum set: Mechanical tools

Note: For removing and installing rubber mounts in tension and pressure struts and in control arms (E46/5)

Series: E38, E39, E46/5, E53, E83, E85, E86

Storage location: A35

SI number: 1 03 99(418)

Order number: 31 2 260

Pressure sleeve tool

Consisting of:

1 = 31 2 261 Thrust sleeve

Note: For bracing during removal and installation. Model series: E38, E39, E83 For removing and installing rubber mounts in control arms / model series: E46/5

In conjunction with: 31 2 134 (E46/5)

3 = 31 2 263 Thrust sleeve

Note: For removal and installation Model series: E38, E39

4 = 31 2 264 Thrust sleeve

Note: For removal and installation. Model series: E53, E83

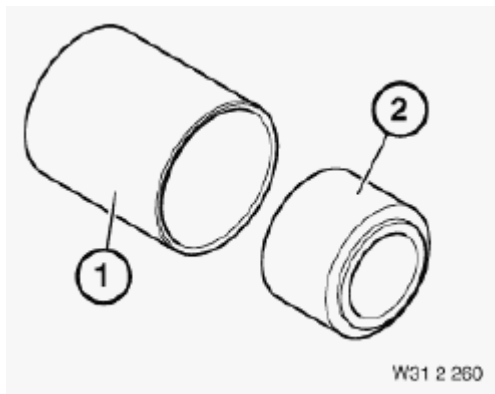


Fig. 11: Pressure Sleeve Tool (31 2 260)
Courtesy of BMW OF NORTH AMERICA, INC.

31 2 300 EXTRACTOR

Minimum set: Mechanical tools

Note: For pressing steering tie rod off wheel carrier.

Series: E60, E61, E83, E90, E91, E92

Storage location: C48

SI number: 1 24 03 (040)

Order number: 31 2 300

Extractor

Consisting of:

1 = 31 2 301 Pressure bolt

2 = 31 2 302 Lower section

3 = 31 2 303 Upper section

4 = 31 2 304 Spindle and dowel pin

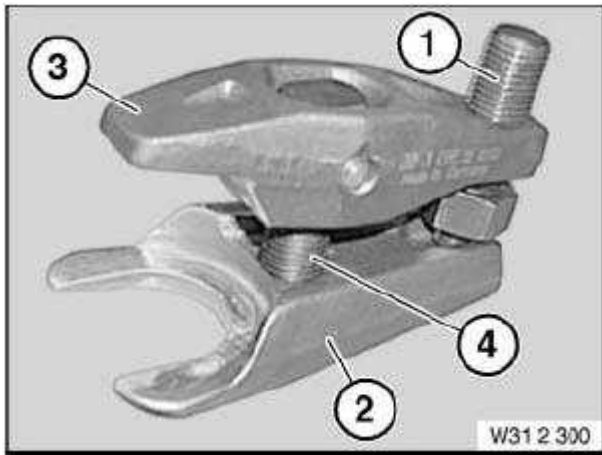


Fig. 12: Extractor (31 2 300)

Courtesy of BMW OF NORTH AMERICA, INC.

31 2 310 EXTRACTOR

Minimum set: Mechanical tools

Note: For pressing steering tie rod off wheel carrier.

Series: E60, E61, E83, E90, E91, E92, R56

SI number: 01 23 06 (308)

Order number: 31 2 310

Extractor

Consisting of:

1 = 31 2 311 Pressure bolt

2 = 31 2 312 Lower section

3 = 31 2 313 Upper section

4 = 31 2 314 Spindle and dowel pin

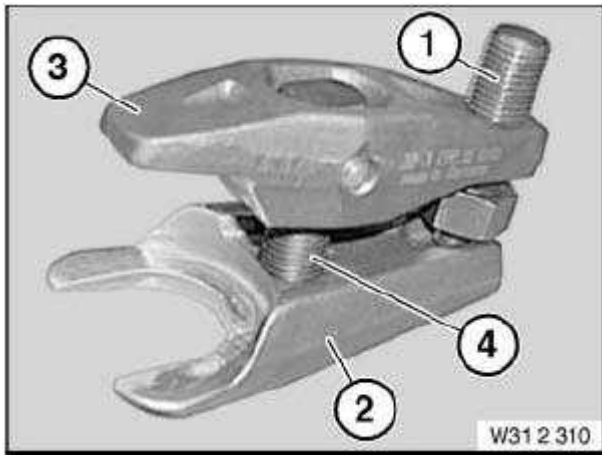


Fig. 13: Extractor (31 2 310)

Courtesy of BMW OF NORTH AMERICA, INC.

31 3 030 PRESS-IN AND PRESS-OUT TOOL

Minimum set: Mechanical tools

Note: For rubber bearings on trailing arm

Series: E60, E61, E63, E64, E65, E66, E67, E70, E81, E83, E87, E90, E91, E92, E93

Storage location: B46

SI number: 1 14 01 (766)

Order number: 31 3 030

Press-in and press-out tool

Consisting of:

1 = 31 3 031 Thrust piece

2 = 31 3 032 Bushing

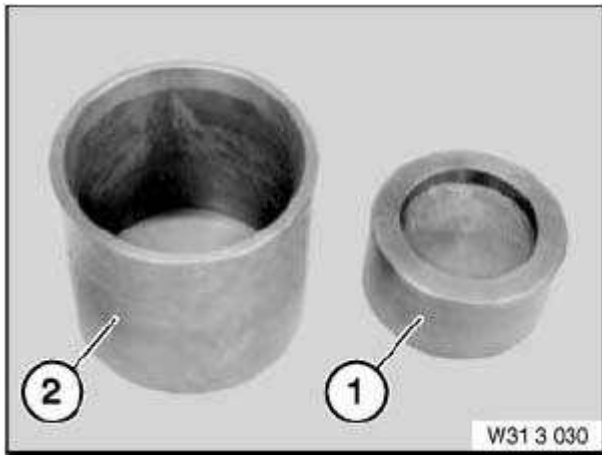


Fig. 14: Press-In And Press-Out Tool (31 3 030)
Courtesy of BMW OF NORTH AMERICA, INC.

31 3 140 PIN WRENCH

Note: For loosening and tightening McPherson strut threaded connection when replacing shock absorber

Model: 2002

Order number: 31 3 140

Pin wrench

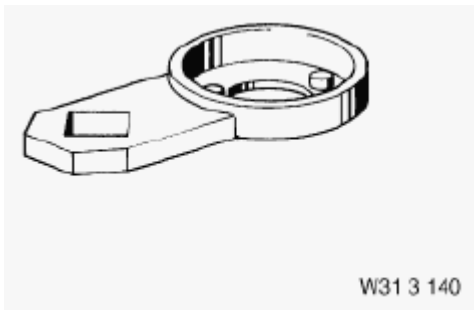


Fig. 15: Pin Wrench (31 3 140)
Courtesy of BMW OF NORTH AMERICA, INC.

31 3 210 SPANNER

Minimum set: Mechanical tools

Note: For releasing and tightening piston rod in shock absorber support bearing - model year: from 92

Series: E31, E32, E34, E36, E38, E39, E83

Storage location: A21

SI number: 1 10 91 (443)

Order number: 31 3 210

Spanner

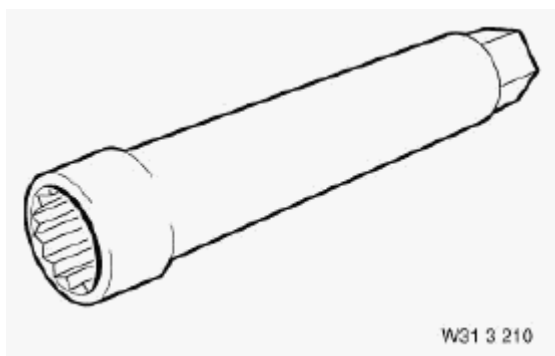


Fig. 16: Spanner (31 3 210)

Courtesy of BMW OF NORTH AMERICA, INC.

31 3 340 SPRING TENSIONER

Minimum set: Mechanical tools

Note: For tensioning coil springs when removing and installing spring strut. Used only in conjunction with repair instructions.

Series: E31, E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E81, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53, R56

Storage location: Single

SI number: 1 11 99 (438)

Order number: 31 3 340

Spring tensioner

Consisting of:

1 = 31 3 341 Spring tensioner, individual

2 = 31 3 342 Replacement pin



Fig. 17: Spring Tensioner (31 3 340)
Courtesy of BMW OF NORTH AMERICA, INC.

31 3 350 SPRING HOLDER

Minimum set: Mechanical tools

In conjunction with: 31 3 340 and 31 3 360

Note: For locating coil springs during tensioning. No. 31 3 350 reserved for consecutive sub-number spring tensioner 31 3 340.

Series: E31, E36, E36/7, E38, E39, E46, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E81, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53, R56

Storage location: Single

SI number: 1 11 99 (438)

Order number: 31 3 350

Spring holder

Consisting of:

1 = 31 3 351 Spring retainer (2 x)

Note: For use only with repair instructions

2 = 31 3 352 Spring retainer (2 x)

Note: For use only with repair instructions

3 = 31 3 353 Spring retainer (2 x)

Note: For use only with repair instructions

4 = 31 3 354 Spring retainer ring

Note: For use only with repair instructions

5 = 31 3 355 Spring retainer

Note: For use only with repair instructions

6 = 31 3 356 Centering ring

Note: For use only with repair instructions

7 = 31 3 357 Spring retainer (2 x)

Note: For use only with repair instructions.

In conjunction with: 31 3 340

8 = 31 3 381 Spring retainer ring

Note: For use only with repair instructions.

9 = 31 3 382 Spring retainer

Note: For use only with repair instructions.

10 = 31 3 358 Insert ring

Note: For use only with repair instructions. For insertion in spring retainer ring 31 3 354. Model series: E87

11 = 31 3 383 Spring retainer

Note: To be used with repair instructions only.

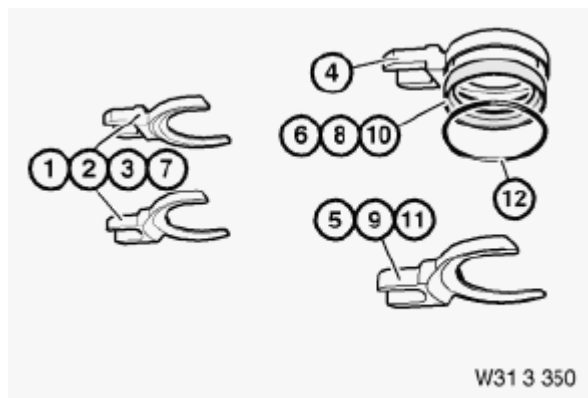


Fig. 18: Spring Holder (31 3 350)

Courtesy of BMW OF NORTH AMERICA, INC.

31 3 358 INSERT RING

Note: For inserting spring retainer ring 31 3 354 model series (PL2)

Order number: 31 3 358

Insert ring

31 4 050 TAKE-UP SET

In conjunction with: 00 2 030 Hydr. lifter, 00 2 040 Basic take-up

Note: Take-up of front axle

Series: E70, E81, E83, E87, E90, E91, E92, E93, R56

SI number: 1 24 03 (040)

Order number: 31 4 050

Take-up set

Consisting of:

1 = 31 4 051 Take-up fixture 1 and 2

2 = 31 4 052 Take-up fixture 3 and 4

Note: Model series: E83

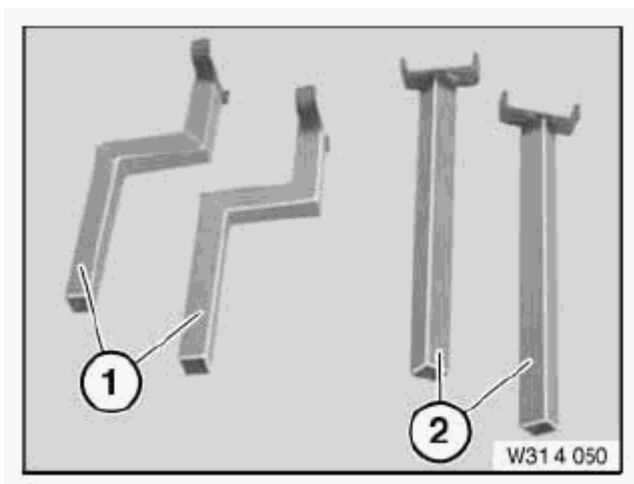


Fig. 19: Take-Up Set (31 4 050)

Courtesy of BMW OF NORTH AMERICA, INC.

31 5 110 REMOVAL FORK

Note: For removing output shaft from front axle gearbox (AWD)

Series: E53, E60, E61, E83, E90, E91, E92

SI number: 1 17 05 (212)

Order number: 31 5 110

Removal fork

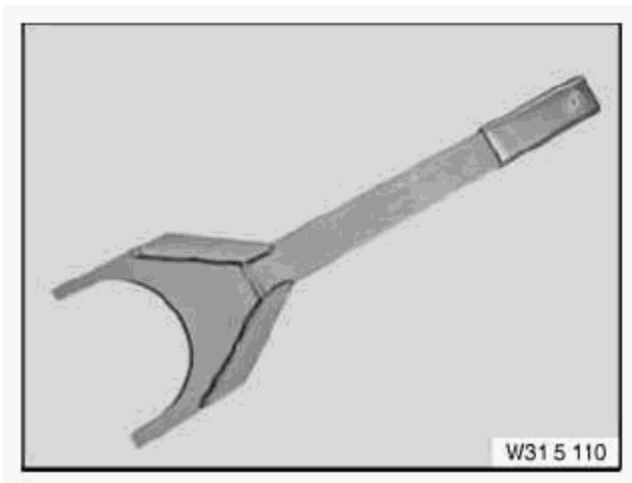


Fig. 20: Removal Fork (31 5 110)

Courtesy of BMW OF NORTH AMERICA, INC.

31 5 130 SET OF IMPACT DRIFTS

Minimum set: Mechanical tools

In conjunction with: 00 5 500

Note: For fitting rotary shaft seals of output shafts at front axle differential

Series: E46/16, E53, E60, E61, E70, E83, E90, E91, E92

Storage location: C40

SI number: 1 15 99 (483)

Order number: 31 5 130

Set of impact drifts

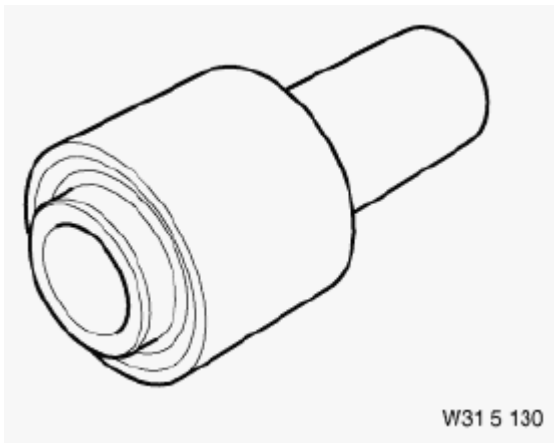


Fig. 21: Set Of Impact Drifts (31 5 130)

Courtesy of BMW OF NORTH AMERICA, INC.

31 5 220 SUPPORT

Note: For securing wheel hub when removing and installing spring strut.

Series: E46, E70, E83, E85, E86, E90, E91, E92, R56, RR1, RR2

SI number: 1 23 05 (224)

Order number: 31 5 220

Support



Fig. 22: Support (31 5 220)

Courtesy of BMW OF NORTH AMERICA, INC.

31 5 250 UNIVERSAL AXLE BRACKET

In conjunction with: 00 2 030

Note: For accommodating all front and rear axles during removal and installation.

Series: E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E83, E85, E86, E87, E90, E91, E92, E93, RR1

SI number: 1 24 06 (309)

Order number: 31 5 250

Universal axle bracket

Consisting of:

1 = 31 5 251 Basic unit

2 = 31 5 252 Telescopic supports (4 x)

3 = 31 5 253 Mounting adapter, U-profile (2 x)

4 = 31 5 254 Mounting adapter (2 x)

5 = 31 5 255 Mounting adapter for bores (2 x)

6 = 31 5 256 Mounting adapter for bores (2 x)

7 = 31 5 257 Tensioning strap

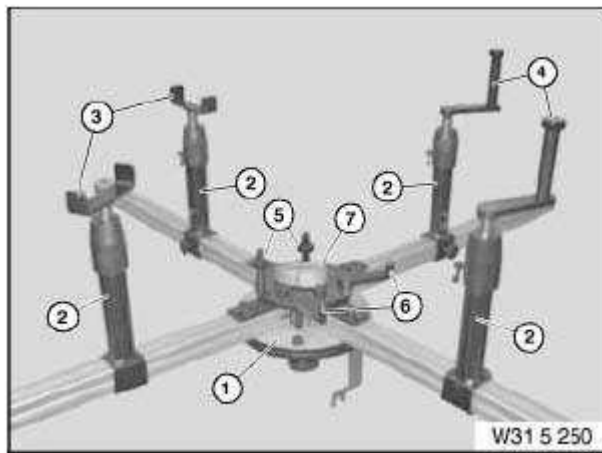


Fig. 23: Universal Axle Bracket (31 5 250)
Courtesy of BMW OF NORTH AMERICA, INC.

SUSPENSION

Front Axle - Technical Data - X3

00 GENERAL

31 00 FRONT AXLE - RIDE HEIGHT E83

TECHNICAL DATA - FRONT AXLE - RIDE HEIGHT E83

Ride height specification		in normal position (attach tape measure to rim flange at bottom middle and measure to lower edge of wheel arch)
Deviation from nominal value for all wheels together	Max. mm	10
Series		
17" rim	mm ± 10	686
18" rim	mm ± 10	699
19" rim	mm ± 10	711
20" rim	mm ± 10	- -
SPORT SUSPENSION (not low slung)		
17" rim	mm ± 10	686
18" rim	mm ± 10	699
19" rim	mm ± 10	711
20" rim	mm ± 10	- -

31 00 GENERAL - TRACK WIDTH / WHEELBASE E83 SERIES

TECHNICAL DATA - TRACK WIDTH / WHEELBASE E83 SERIES

Track width for normal position and press-in depth (ET)		
- ET39	mm	1538
- ET46	mm	1524
Wheelbase	mm	2795

10 FRONT AXLE SUSPENSION

31 00 FRONT AXLE - RIDE HEIGHT E83

TECHNICAL DATA - FRONT AXLE - RIDE HEIGHT E83

Ride height specification		in normal position (attach tape measure to rim flange at bottom middle and measure to lower edge of wheel arch)
Deviation from nominal value for all wheels together	Max. mm	10
Series		
17" rim	mm ± 10	686
18" rim	mm ± 10	699
19" rim	mm ± 10	711
20" rim	mm ± 10	--
SPORT SUSPENSION (not low slung)		
17" rim	mm ± 10	686
18" rim	mm ± 10	699
19" rim	mm ± 10	711
20" rim	mm ± 10	--

21 WHEEL BEARINGS AND STUB AXLE

31 21 WHEEL BEARINGS AND STEERING KNUCKLE ALL

TECHNICAL DATA - WHEEL BEARINGS AND STEERING KNUCKLE ALL

Bearing units lubricated for entire service life and cannot be disassembled		
max. axial runout of wheel hub at wheel bearing flange	max. mm	< 0.03

32 SHOCK ABSORBER

31 32 SHOCK ABSORBERS E83 SERIES

TECHNICAL DATA - SHOCK ABSORBERS E83 SERIES

Note:		Currently no details! Reason: Avoidance of incorrect assessments on account of different measurement procedures
Front Axle	mm	--
Rear Axle	mm	--

31 32 SHOCK ABSORBERS E83 SPORTS SUSPENSION

TECHNICAL DATA - SHOCK ABSORBERS E83 SPORTS SUSPENSION

Note:		Currently no details! Reason: Avoidance of incorrect assessments on account of different measurement procedures
Front Axle	mm	- -
Rear Axle	mm	- -

50 FRONT AXLE GEARBOX

31 50 FRONT DIFFERENTIAL UNIT E83

TECHNICAL DATA - FRONT DIFFERENTIAL UNIT E83

New oil filling volume	ltr.	0.7
Oil change volume	ltr.	0.7

SUSPENSION

Front Axle - Tightening Torques - X3

10 FRONT AXLE SUSPENSION

31 10 FRONT AXLE SUSPENSION

FRONT AXLE SUSPENSION - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Front axle carrier to engine carrier	E30, E31, E32, E34	M10 8.8	Replace screws (E30 AWD insert with Loctite)	42 Nm
	E30, E31, E32, E34	M10 9.8	Replace screws	47 Nm
	E36	M12 12.9	Replace screws	105 Nm
	E36, E46	M12 10.9	Replace screws	110 Nm
	E38, E39	M12 8.8	Replace screws	77 Nm
	E52	M12 front 10.9 middle 8.8 rear 8.8	Replace screws	75 Nm
	E53, E60 / REAR END, E61 / REAR END, E63, E64, E65, E66, E67, E85, E86	M12 10.9	Observe repair instruction.	100 Nm
	E60 / Four Wheel Drive, E61 / Four Wheel Drive	M12 10.9	Observe repair instruction. Replace screws	
			Jointing torque	100 Nm
			Torque angle	90 °
2AZ Front end of front axle carrier to body	E34 / Four Wheel Drive	M10 8.8		47 Nm
	E83	M12 10.9		113 Nm
3AZ Front axle subframe rear / middle to body	E34 / Four Wheel Drive	(collar screw)		59 Nm
	E83	M10 10.9		50 Nm
	E83	M12 10.9		100 Nm
4AZ Front axle carrier with reinforcement to engine carrier	E31			47 Nm
5AZ Cruciform reinforcement to door sill	E31			42 Nm
6AZ Reinforcement to bracket body	E31			42 Nm

7AZ Reinforcement (sleeve) to body	E31			127 Nm
8AZ Front end reinforcement on front axle carrier/engine carrier	E46		Replace screws; first tighten down rear screws	
			Jointing torque	59 Nm
			Torque angle	90+30 °
9AZ Reinforcement plate to front axle support/engine carrier	E53		Replace screws & nuts	
			Jointing torque	56 Nm
			Torque angle	90 °
	E60 / REAR END, E61 / REAR END, E63, E64, E65, E66, E67		Replace screws & insertion nuts	56 Nm
			Jointing torque	56 Nm
			Torque angle	90 °
	E60 / Four Wheel Drive, E61 / Four Wheel Drive		Replace screws	
			Jointing torque	56 Nm
			Torque angle	90 °
	E83	M10	Replace screws	74 Nm
10AZ Adapter to body	E46 / Four Wheel Drive		Replace screws	59 Nm
11AZ Front axle support to adapter	E46 / Four Wheel Drive		Replace screws	110 Nm
12AZ Heat shield to front axle carrier	E60, E61, E63, E64			8 Nm
13AZ Mounting bracket to front axle carrier / engine carrier	E60 / Four Wheel Drive, E61 / Four Wheel Drive	M8 x 26		19 Nm

12 STRUTS WITH RUBBER MOUNTS

31 12 CONTROL ARMS AND STRUTS

CONTROL ARMS AND STRUTS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Tension strut to front axle support	E12, E24 / until 5.82		tighten in normal position	80 Nm
	E23		tighten in normal position	135 Nm
	E39, E52		tighten in normal position	110 Nm
			Replace screw tighten in	

	E53		normal position	165 Nm
	E60, E61, E63, E64, E65, E66, E67	M12 10.9	Replace screw & nut tighten in normal position	
			Jointing torque	100 Nm
			Torque angle	90 °
	E83		Replace screw tighten in normal position	
			Jointing torque	165 Nm
			Torque angle	90 °
2AZ Control arm to front axle support	E24 / from 5.82, E28, E31, E32, E34, E38, E39 / 8 cyl.		tighten in normal position	77,5 Nm
	E39 / 6 cyl., E52		tighten in normal position	110 Nm
	E12, E21, E23, E24 / until 5.82		tighten in normal position	85 Nm
	E53, E60, E61, E63, E64, E65, E66, E67, E83	M12 10.9	Replace screw & nut tighten in normal position	
			Jointing torque	100 Nm
			Torque angle	90±15°
3AZ Control arm (ball joint) on front axle support	E30		Replace nut	85 Nm
	E36, E46		Replace nut	90 Nm
	E30 / Four Wheel Drive		Replace nut	100 Nm
	E85, E86	M14x1.5	Replace nut	80 Nm
4AZ Control arm to spring strut	E21, E30			65 Nm
5AZ Control arm to pivot mount/spring strut	E30 / Four Wheel Drive			85 Nm
	E30 / Four Wheel Drive	Polystop nut		93 Nm
	E34 / Four Wheel Drive			80 Nm
6AZ Control arm on steering knuckle/swivel bearing	E36, E46, E85, E86		Use of impact screwdriver not permitted! Replace nut	65 Nm
	E38		Replace nut	93 Nm
	E39, E53, E52, E83, E60 / Four Wheel Drive, E61 / Four Wheel Drive, E67		Replace nut	80 Nm
	E60 / REAR END, E61 / REAR END, E63, E64, E65, E66		Replace nut	165 Nm
7AZ Bracket for control arm				

to engine carrier	E30			42 Nm
	E36			47 Nm
	E46		Replace screws	59 Nm
	E85, E86	M10 10.9	Replace screws	56 Nm
8AZ Ball joint for control arm to front axle carrier	E34 / Four Wheel Drive, E46 / Four Wheel Drive			77 Nm
9AZ Control arm to ball joint	E34 / Four Wheel Drive, E46 / Four Wheel Drive			80 Nm
10AZ Control arm holder to front axle support	E34 / Four Wheel Drive			47 Nm
	E46 / Four Wheel Drive		Replace screws	59 Nm
11AZ Pressure strut to body	E24 / from 5.82, E28		tighten in normal position	130 Nm
12AZ Traction strut on tie rod lever/steering knuckle/swivel bearing	E24, E28 / from 5.82, E31, E32, E34, E38			93 Nm
	E39			80 Nm
13AZ Pressure strut to connecting pipe/front axle support	E31, E32, E34, E38, E39		tighten in normal position	127 Nm
14AZ Pressure strut to cruciform reinforcement	E31		tighten in normal position	127 Nm
15AZ Connecting pipe to body	E31, E32, E34			127 Nm
16AZ Connecting pipe support to body	E31, E32, E34			59 Nm
17AZ Connecting pipe to trailing spring mount	E24 / from 5.82, E28			60 Nm
18AZ Leading strut to tie rod arm	E23			85 Nm
19AZ Tension strut on steering knuckle/swivel bearing	E39, E52, E67			80 Nm
	E60 / REAR END, E61 / REAR END, E63, E64, E65, E66			165 Nm
20AZ Tension strut to guide joint	E53, E83		Replace nut	80 Nm
	E60 / Four Wheel Drive, E61 / Four Wheel Drive		Replace nut	165 Nm
21 AZ Guide joint to swivel bearing	E53, E60 / Four Wheel Drive, E61 / Four Wheel Drive, E83		Replace screws	60 Nm

21 WHEEL BEARINGS AND STUB AXLE

31 21 WHEEL BEARINGS AND STEERING KNUCKLE

WHEEL BEARINGS AND STEERING KNUCKLE - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Collar nut (bearing unit)	E24 / from 5.82, E28, E30, E31, E32, E34, E36, E38, E46, E85, E86			290 Nm
	E67			420 Nm
2AZ Drive flange to axle shaft	E30 / Four Wheel Drive, E34 / Four Wheel Drive		Replace collar nut	250 Nm
	E46 / Four Wheel Drive, E53, E60 / Four Wheel Drive, E61 / Four Wheel Drive, E67, E83		Replace collar nut	420 Nm
3AZ Castle nut - adjustment specification	E12, E21, E23, E24 / from 5.82		Observe repair instruction.	
4AZ Steering knuckle to spring strut	E36	M12x20	Replace screws	107 Nm
	E36	Fitting screw M12x42		107 Nm
	E39	Screw with flange M12x1.5x95		81 Nm
	E38, E46, E85, E86	M12	Replace screw	81 Nm
5AZ Bearing unit on swivel bearing	E39, E52, E60 / REAR END, E61 / REAR END, E63, E64, E65, E66		Replace screws	110 Nm

31 SPRING STRUT

31 31 SPRING STRUTS

SPRING STRUTS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Spring strut support bearing / adapter for rough road package to wheel arch / adapter for rough road package	E60, E61, E63, E64, E65, E66, E67, E83, E85, E86	Flanged hexagon nut	Replace nuts	34 Nm
	E28, E30, E31, E32, E34, E36 / S50 / S52, E38, E39	Hexagon flange nut dia. 18 mm	Replace nuts	24 Nm
	E36 / S50 / S52	Flanged hexagon nut dia. 21 mm	Replace nuts and secure with Loctite 242	27 Nm

	E32, E34, E36, E46, E53	Flanged hexagon nut dia. 21 mm	Replace nuts	34 Nm
	E52	Hexagon flange nut dia. 18 mm	Replace nuts	28 Nm
2AZ Shock absorber piston rod on thrust bearing	E12, E21, E23, E24 / until 5.82			80 Nm
	E24 / from 5.82, E30, E31, E32, E34	M12 (with external hexagon piston rod)		64 Nm
	E24 / from 5.82, E30, E31, E32, E34	M12 (with internal hexagon piston rod)		44 Nm
	E36, E38, E39, E46, E52, E53, E60, E61, E63, E64, E65, E66, E67, E83, E85, E86		Replace nut	64 Nm
3AZ Spring strut shock absorber to pivot mount	E34 / Four Wheel Drive			80 Nm
	E53		Replace screw & nut	250 Nm
	E52, E60 / except AWD, E61 / except AWD, E63, E64, E65, E66		Replace screw & nut	81 Nm
	E60 / Four Wheel Drive, E61 / Four Wheel Drive, E67, E83		Replace screw & nut	100 Nm

35 STABILIZER BAR

31 35 STABILIZER BAR

STABILIZER BAR - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Retaining bar for stabilizer to front axle carrier / body	E21			50 Nm
	E12, E24 / until 5.82			45 Nm
	E36, E46, E39, E52, E85, E86	M8	tighten in normal position	21 Nm

	E60 / except AWD, E65, E66, E67		Replace nuts	28 Nm
	E60 / Four Wheel Drive, E61, E63, E64		Replace nuts	30.5 Nm
	E83	M10 10.9		56 Nm
2AZ Stabilizer to control arm	E21		tighten in normal position	130 Nm
3AZ Stabilizer link to control arm and stabilizer	E23	M8	tighten in normal position	25 Nm
	E23	M10	tighten in normal position	50 Nm
4AZ Stabilizer link to control arm	E34 / Four Wheel Drive			22 Nm
5AZ Stabilizer link to stabilizer	E34 / Four Wheel Drive			78 Nm
	E38, E46, E83			65 Nm
	E85, E86	M10		58 Nm
6AZ Stabilizer link on spring strut shock absorber and stabilizer	E28	(yellow chrome-plated)		30 Nm
	E24 / from 5.82, E28 / from 5.82	(white chrome-plated)		33 Nm
	E24 / from 5.82, E28, E31, E32, E34	(yellow)	(wrench surface on ball head must be parallel to absorber axle)	59 Nm
7AZ Stabilizer link on spring strut shock absorber and stabilizer (wrench surface on ball head must be parallel to absorber axle)	E36			59 Nm
	E30 / Four Wheel Drive			47 Nm
	E52			65 Nm
	E53			100 Nm
8AZ Stabilizer link (with bracket) on stabilizer	E30 / Four Wheel Drive			47 Nm
9AZ Bracket for stabilizer link on control arm	E30, E36			42 Nm
10AZ Bracket for stabilizer link on swivel bearing	E39, E60, E61, E63, E64			59 Nm

11AZ Stabilizer link on stabilizer/bracket	E39, E60, E61, E63, E64		Replace nut	65 Nm
	E65, E66, E67			
12AZ Stabilizer link to stabilizer			Replace nut	58 Nm

50 FRONT AXLE GEARBOX

31 50 FRONT AXLE DIFFERENTIAL

FRONT AXLE DIFFERENTIAL - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Front axle final drive to engine oil pan	E30 / E34			42 Nm
2AZ Oil filler plug	E30			53 Nm
	E34			70 Nm
3AZ Oil drain plug	E30			20 Nm
	E34			70 Nm
4AZ Pinion/ring gear to front axle final drive	E30			22 Nm
5AZ Bearing cap to front axle final drive	E30			22 Nm
6AZ Front axle final drive case bolts	E34			74 ± 4 Nm
7AZ Front axle final drive to engine oil pan	E46 / E53			55 Nm
	E60 / E61			65 Nm
	E83	M10 10.9 (with ribbed shim)		65 Nm
	E83	M10 10.9		55 Nm
8AZ Oil filler/drain plug	E46 / E53 / E60 / E61 / E83			60 Nm

60 OUTPUT SHAFT

31 60 OUTPUT SHAFT

OUTPUT SHAFT - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Output shaft console to engine oil sump	E30, E34			22 Nm
	E46, E53, E83			26,5 Nm

	E60, E61			21,4 Nm
2AZ Bearing block support to bearing block	E83 / N46			20,5 Nm
3AZ Heat shield to bearing block	E83 / N46			4,6 Nm

SUSPENSION

Front Suspension - Repair Instructions - X3

00 GENERAL

00 DANGER OF POISONING IF OIL IS INGESTED/ABSORBED THROUGH THE SKIN

Danger of poisoning!

Ingesting oil or absorbing through the skin may cause poisoning!

Possible symptoms are:

- Headaches
- Dizziness
- Stomach aches
- Vomiting
- Diarrhoea
- Cramps/fits
- Unconsciousness

Protective measures/rules of conduct:

- Pour oil only into appropriately marked containers
- Do not pour oil into drinking vessels (drinks bottles, glasses, cups or mugs)
- Observe country-specific safety regulations

First aid measures:

- Do not induce vomiting.

If the person affected is still conscious, he/she must rinse out their mouth with water, drink plenty of water and consult a doctor immediately.

If the person affected is unconscious, do not administer anything by mouth, place the person in the recovery position and seek immediate medical attention.

00 RISK OF INJURY IF OIL COMES INTO CONTACT WITH EYES AND SKIN

Danger of injury!

Contact with eyes or skin may result in injury!

Possible symptoms are:

- Impaired sight
- Irritation of the eyes
- Reddening of the skin
- Rough and cracked skin

Protective measures/rules of conduct:

- Wear protective goggles
- Wear oil-resistant protective gloves
- Observe country-specific safety regulations

First aid measures:

- Eye contact: Rinse eyes immediately with plenty of water for at least 15 minutes; if available, use an eye-rinsing bottle. If irritation of the eyes persists, consult a doctor.
- Skin contact: Wash off with soap and water immediately. If irritation persists, consult a doctor.

NOTE: Do not use solvents/thinners.

00 SAFETY INSTRUCTIONS FOR HANDLING OIL

WARNING: Danger of poisoning if oil is ingested/absorbed through the skin! See 00 DANGER OF POISONING IF OIL IS INGESTED/ABSORBED THROUGH THE SKIN .

Risk of injury if oil comes into contact with eyes and skin! See 00 RISK OF INJURY IF OIL COMES INTO CONTACT WITH EYES AND SKIN .

Recycling:

Observe country-specific waste-disposal regulations.

Measures if oil is unintentionally released:

- Personal precautionary measures: Danger of slipping! Keep non-involved persons away from the work area. Wear personal protective clothing/equipment.
- Environmental protection measures: Prevent oil from draining into drain channels, sewerage systems, pits, cellars, water and the ground.
- Limiting spread: Use oil blocks to prevent the surface spread of oil.
- Cleaning procedure: Bind and dispose of escaped oil with nonflammable absorbents.

NOTE: Do not flush oil away with water or aqueous cleaning agents.

00 RAISING VEHICLE WITH TROLLEY JACK

IMPORTANT: Observe the following trolley-jack-related instructions:

1. Use only BMW-distributed/approved trolley jacks which have rubber plate contact points.
2. Trolley jacks must be regularly serviced and always checked for functional reliability before they are used!
3. Check the rubber plate on the trolley jack prior to each use, replacing if necessary.

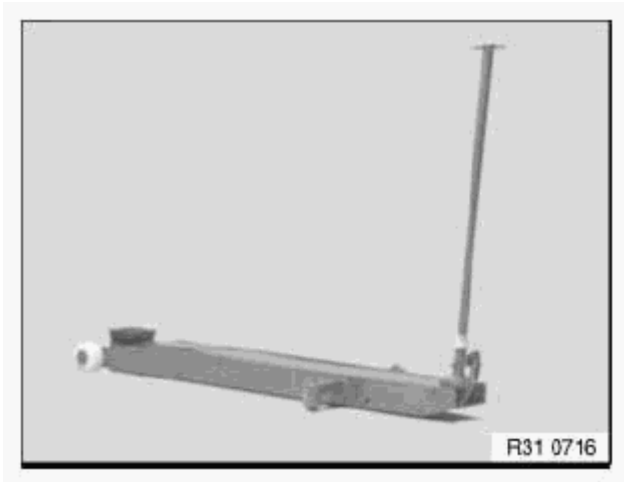
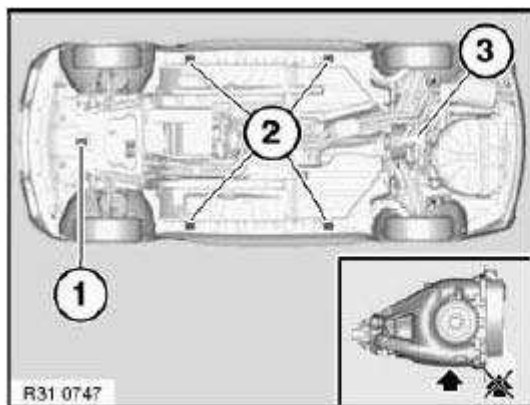


Fig. 1: BMW Trolley Jacks

Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: The vehicle may be raised with a trolley jack only at the following jacking points!

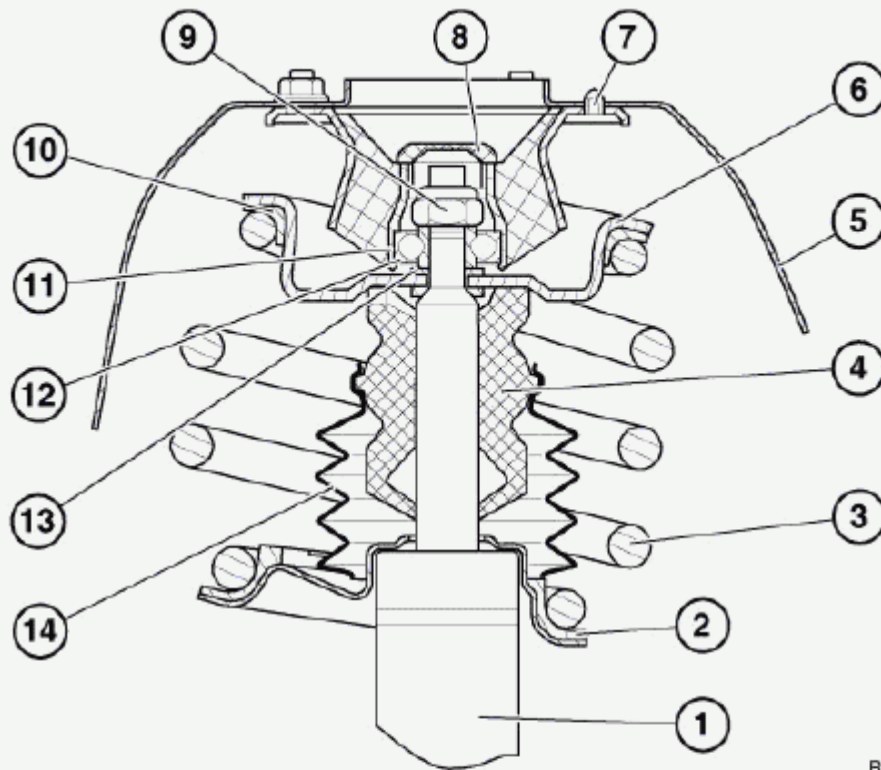


- 1 Car jacking point
- 2 Side car jacking points
- 3 Rear differential

Fig. 2: Car Jacking Points And Rear Differential

Courtesy of BMW OF NORTH AMERICA, INC.

Risk of damage: It is not permitted to raise the vehicle at the rear differential cover!

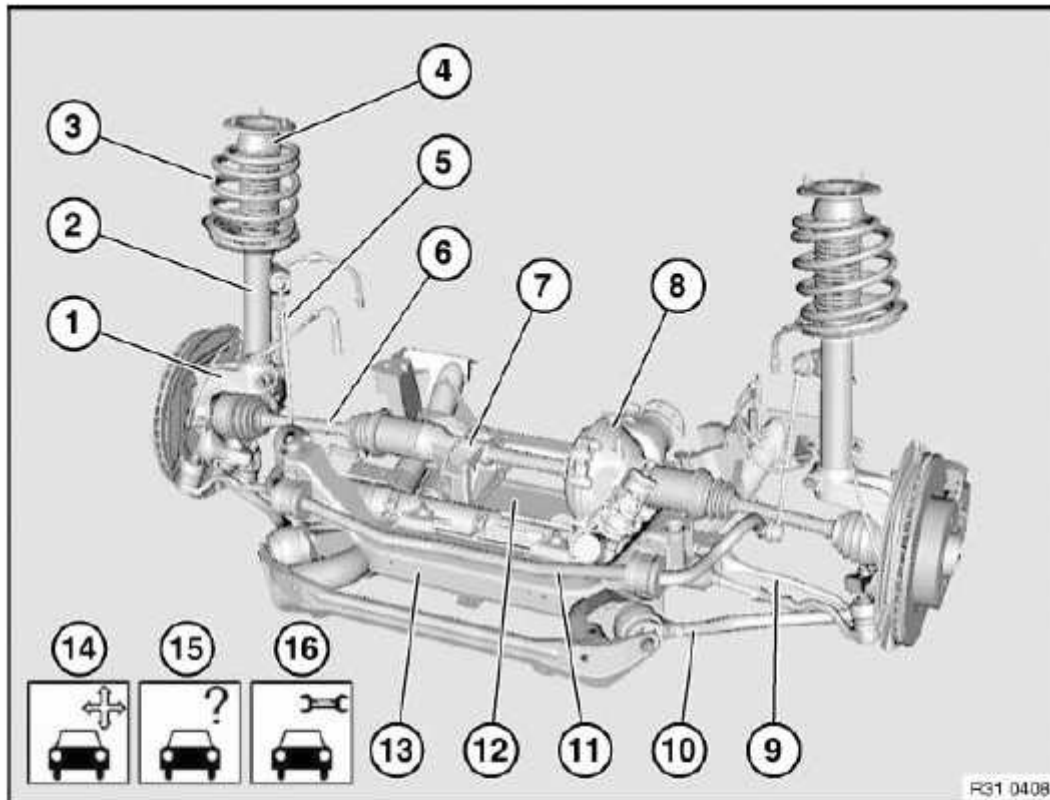


R31 0140

- | | | | |
|---|---|----|----------------------------------|
| 1 | Spring strut shock absorber | 10 | Upper spring pad |
| 2 | Lower spring pad | 11 | Thrust bearing |
| 3 | Coil spring | 12 | Dust sleeve |
| 4 | Auxiliary spring | 13 | Thrust washer/shim |
| 5 | Wheel arch | 14 | Rubber gaiter |
| 6 | Upper spring plate | | |
| 7 | Centering pin | | |
| 8 | Grease cap | | |
| 9 | Nut | | |

Fig. 3: Spring Strut Shock Absorber Components
 Courtesy of BMW OF NORTH AMERICA, INC.

31 ... FRONT AXLE OVERVIEW



0 [Safety precautions and general information](#)

- | | | | |
|---|---|----|-------------------------------------|
| 1 | Swivel bearing | 10 | Tension strut |
| 2 | Spring strut shock absorber | 11 | Stabiliser |
| 3 | Coil spring | 12 | Reinforcement plate |
| 4 | Thrust bearing | 13 | Front axle support |
| 5 | Stabiliser link | 14 | Adjustment work |
| 6 | Output shaft | 15 | Troubleshooting |
| 7 | Mounting block | 16 | Testing |
| 8 | Front differential | | |
| 9 | Control arm | | |

Fig. 4: Front Axle Components

Courtesy of BMW OF NORTH AMERICA, INC.

31 00 ... FRONT AXLE + STEERING: WHEEL/CHASSIS ALIGNMENT CHECK MUST BE CARRIED OUT AFTER THE FOLLOWING WORK

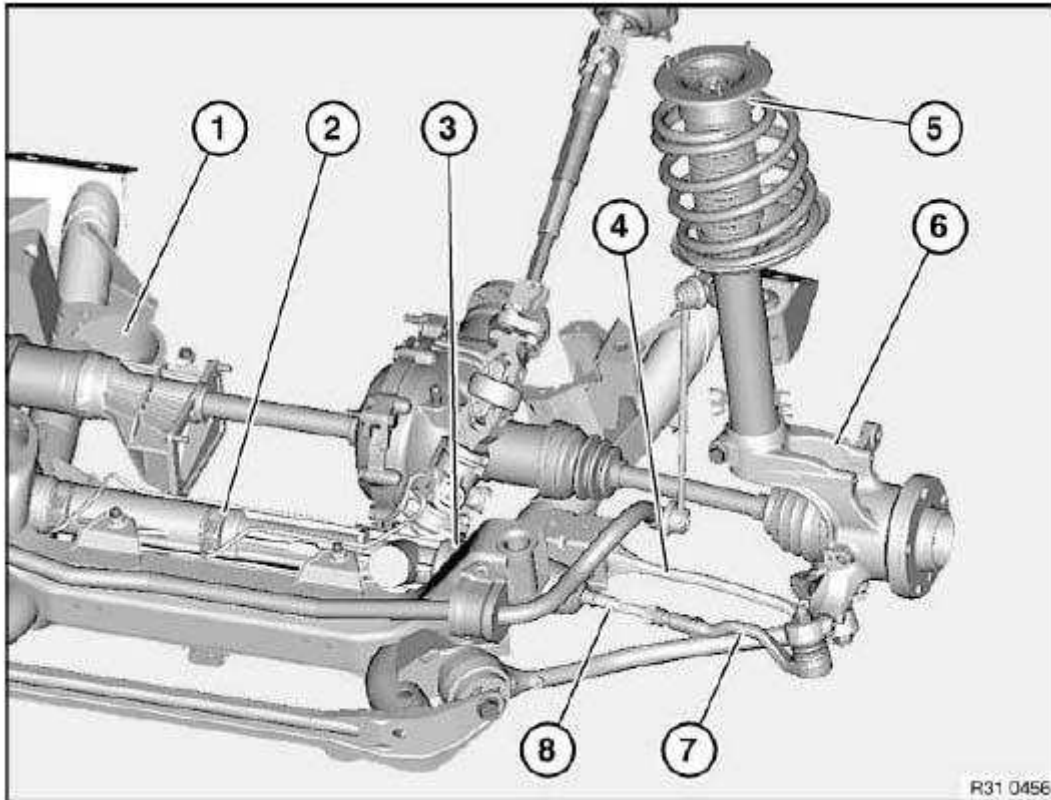


Fig. 5: Front Axle Carrier, Steering Gear, Gaiter, Swivel Bearing And Tie Rod
 Courtesy of BMW OF NORTH AMERICA, INC.

A wheel/chassis alignment check, see **32 00 150 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH LOAD UP TO DESIGN POSITION** , must be carried out after the following work:

- Release of following screw/bolt connections:
 - Steering gear to front axle carrier
 - Control arm to front axle carrier
 - Support bearing to body (if centering pin is missing)
 - Tie rod end to tie rod
- Replacement of following parts:
 1. Front axle carrier
 2. Steering gear
 3. Gaiter (if the tie rod end has to be screwed off)
 4. Control arm / rubber mount
 5. Support bearing (if centering pin is missing)
 6. Swivel bearing
 7. Tie rod end
 8. Tie rod

31 00 ... INFORMATION ON REPLACING SHOCK ABSORBERS

Facts:

When a shock absorber is faulty on one side (leaking, noises, limit values exceeded on the shock tester), often both shock absorbers on the axle in question are replaced.

Consequence:

This is not necessary for technical reasons and causes the manufacturer not to recognize the unnecessarily removed shock absorbers as damaged parts. Unnecessarily high costs for the customer can be avoided by replacing the shock absorber on one side only.

Procedure:

Shock absorbers may be replaced on one side only until they have completed 50 000 km service.

Exception: On all M-GmbH models, when a limit value is exceeded on one side, it is still necessary always to replace both shock absorbers on the relevant axle.

31 00 ... NOTES ON REPAIRING THREADS

IMPORTANT: Install Helicoil thread inserts so that they are flush with the original thread.

NOTE: Damaged threads in engine carrier may be repaired with Helicoil thread inserts. Comply with the procedure described in the example.



Fig. 6: Helicoil Thread Insert
Courtesy of BMW OF NORTH AMERICA, INC.

Procedure:

1. Create a clean core hole; if necessary, drill out screw remnants

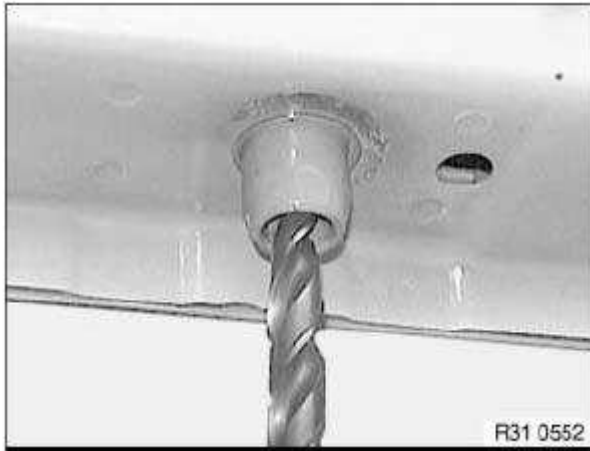


Fig. 7: Creating Clean Core Hole
Courtesy of BMW OF NORTH AMERICA, INC.

2. Create locating thread for Helicoil thread insert



Fig. 8: Creating Locating Thread For Helicoil Thread Insert
Courtesy of BMW OF NORTH AMERICA, INC.

3. Pick out Helicoil thread insert in accordance with the table: **41 00 ... NOTES ON REPAIRING THREADS** and screw into the locating thread until flush with the original thread

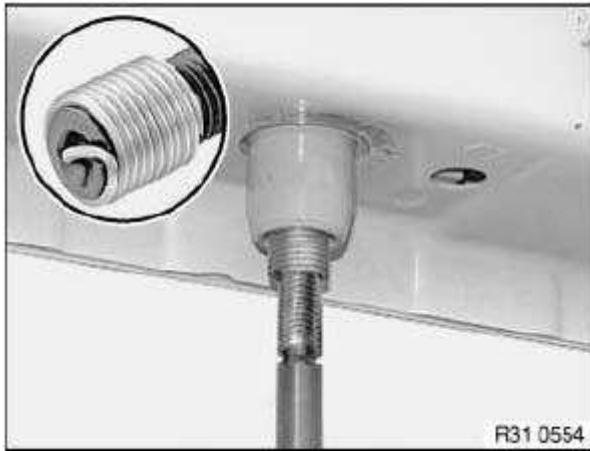


Fig. 9: Screwing Helicoil Thread Insert Into Locating Thread
Courtesy of BMW OF NORTH AMERICA, INC.

4. Break drive pin and remove

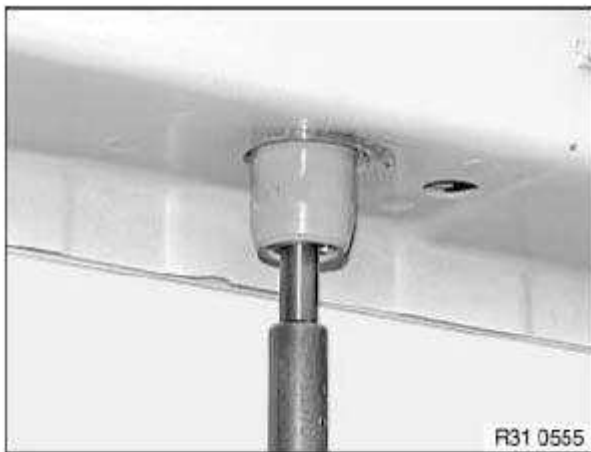


Fig. 10: Removing Drive Pin
Courtesy of BMW OF NORTH AMERICA, INC.

10 FRONT AXLE SUSPENSION

31 10 010 REMOVING AND INSTALLING/REPLACING REINFORCEMENT PLATE

**IMPORTANT: Observe safety instructions for raising the vehicle, see 00 LIFTING VEHICLE WITH A LIFTING PLATFORM .
Driving without reinforcement plate is not permitted!**

If necessary, release screws (1).

Remove expander rivet (2).

If necessary, remove rear assembly underside protection or shield on reinforcement plate, see **51 47 491 Removing and installing/replacing rear underbody protection.**

Release screws (3).

Remove reinforcement plate.

Installation:

Replace screws.

Tightening torque: 31 10 9AZ, see **31 10 FRONT AXLE SUSPENSION** .

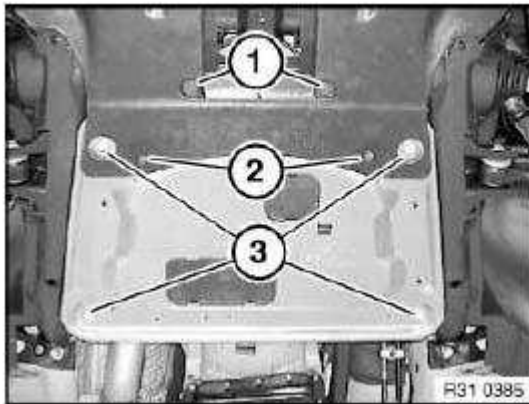


Fig. 11: Expander Rivet And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

If necessary, modify absorber, cover, cover with absorber and air routing duct.

51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION

NOTE: Illustration created using 3.0d as an example. There may be differences in detail in the case of other models.

Release expansion rivet (1).

Unfasten screws (2).

Pull out underbody protection (3) towards rear.

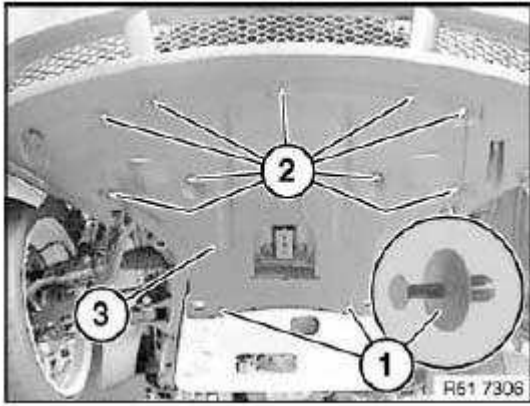


Fig. 12: Underbody Protection, Expansion Rivet And Screws
 Courtesy of BMW OF NORTH AMERICA, INC.

51 47 491 REMOVING AND INSTALLING/REPLACING REAR UNDERBODY PROTECTION

NOTE: Illustration created using 3.0d as an example. There may be differences in detail in the case of other models.

Unfasten screws (1) and nuts (2).

Feed out assembly underside protection (3) towards rear and remove.

Installation:

Ensure correct seating.

Centre assembly underside protection (3) and tighten down with screws (1) and nuts (2).

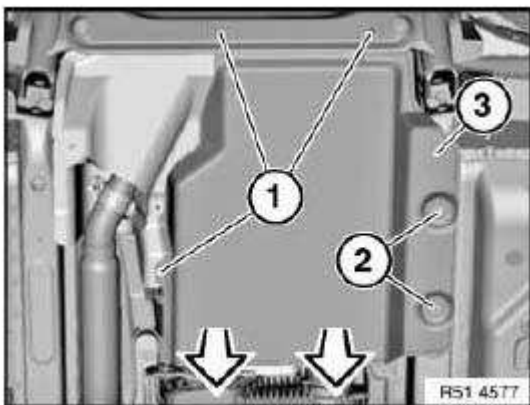


Fig. 13: Removing Rear Underside Protection
 Courtesy of BMW OF NORTH AMERICA, INC.

11 FRONT SUB-FRAME

31 11 001 REPLACING FRONT AXLE CARRIER (6-CYLINDER)

Special tools required:

- **00 2 040 BASIC TAKE-UP FIXTURE**
- 31 4 051
- 31 4 052
- 33 3 274

WARNING: Danger to life!

Secure engine in installation position to prevent it from falling down, see 11 00 670 SECURING ENGINE IN INSTALLATION POSITION (N52) .

Necessary preliminary tasks:

- Disconnect battery negative lead, see **THE BATTERY** .
- Secure engine in installation position, see **11 00 670 SECURING ENGINE IN INSTALLATION POSITION (N52)** .
- Remove front wheels, see **36 10 300 REMOVING OR INSTALLING FRONT OR REAR WHEEL** .
- Remove underbody protective plate, see **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION** .
- Remove reinforcement plate, see **31 10 010 Removing and installing/replacing reinforcement plate.**
- If necessary, remove steering gear cover on both sides
- Partially detach front wheel arch trim on both sides in rear area, see **51 71 040 REMOVING AND INSTALLING/REPLACING FRONT LEFT OR RIGHT WHEEL ARCH COVER**
- If necessary, disconnect plug connection from EH converter and remove line from front axle carrier
- If necessary, disconnect plug connection from ride-height sensor and remove line from front axle carrier
- If necessary, disconnect vacuum line for electrically operated valve at T-piece
- Remove tension strut on both sides from front axle carrier, see **31 12 050 Removing and installing/replacing left or right tension strut.**
- Remove control arm on both sides from front axle carrier, see **31 12 000 Removing and installing/replacing left or right control arm.**
- Disconnect pressure line for power steering from front axle carrier
- Remove power steering gear from front axle carrier and tie up, see **32 13 060 REMOVING AND INSTALLING/REPLACING POWER STEERING GEAR** .

WARNING: Danger of injury!

Failure to comply with the following instructions may result in the vehicle slipping off the lifting platform and critically injuring other persons.

When supporting components, make sure that

- the vehicle can no longer be raised or lowered

- the vehicle does not lift off the locating plates on the lifting platform

If necessary, position special tool 00 2 040 with a 2nd person helping on workshop jack.

Insert special tools 31 4 051 and 31 4 052 into corresponding mountings of special tool 00 2 040 .

Align special tool 00 2 040 to front axle subframe.

If necessary, lower special tool 33 3 274 .

Support front axle subframe by raising special tool 00 2 040.

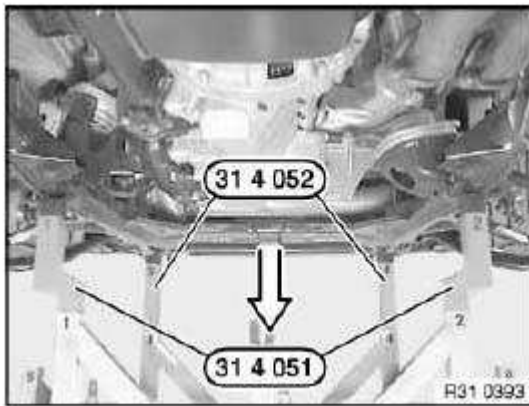


Fig. 14: Special Tools (31 4 052) And (31 4 051)
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Pay attention to power steering hoses and lines when lowering and raising. Hoses/lines must not be kinked/tensioned/bent!

Release screws (1).

Tightening torque: 31 10 2AZ, see **31 10 FRONT AXLE SUSPENSION** .

Release screws (2, 3).

Tightening torque: 31 10 3AZ, see **31 10 FRONT AXLE SUSPENSION** .

If necessary, disconnect pressure line for power steering from front axle carrier.

Lower front axle carrier.

Installation:

Check threads for damage; if necessary, repair with Helicoil thread inserts, see **31 00 ... Notes on repairing threads**.

Replace all bolts.

Tighten down bolts (1) and then bolts (2, 3).

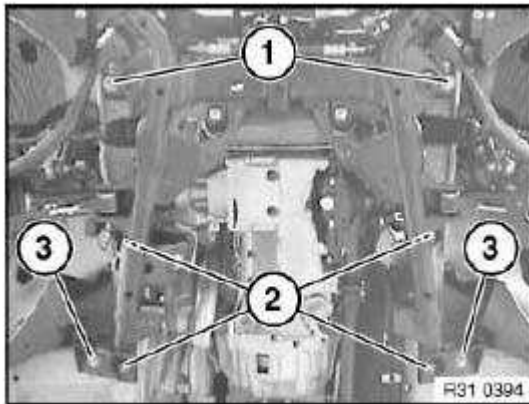


Fig. 15: Front Axle Carrier Bolts

Courtesy of BMW OF NORTH AMERICA, INC.

Remove stabilizer from front axle carrier and tie up, see **31 35 000 Removing and installing/replacing front stabilizer.**

Continue lowering front axle carrier, remove and set down on a suitable surface.

Remove engine mounts on both sides and if necessary remove with vacuum lines from front axle carrier, see **22 11 001 REPLACING RIGHT ENGINE MOUNT (N52K) .**

If necessary, remove stoneguard on both sides.

Installation:

Use previous front axle subframe as a template for modifying or replacing small parts.

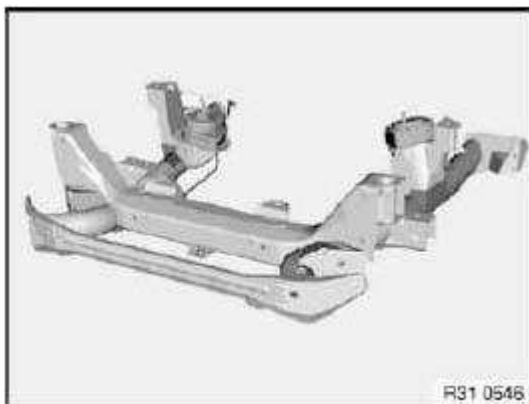


Fig. 16: Front Axle Carrier

Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Perform chassis alignment check, see **32 00 ... CHASSIS/WHEEL ALIGNMENT CHECK PROCEDURE** .
- Carry out steering angle sensor adjustment

31 11 506 LOWERING/RAISING FRONT AXLE CARRIER

Special tools required:

- **00 2 040 BASIC TAKE-UP FIXTURE**
- 31 4 051 , see **31 4 050 TAKE-UP SET**
- 31 4 052 , see **31 4 050 TAKE-UP SET**
- 33 3 274 , see **33 3 270 SET OF SUPPORTS**

WARNING: Danger to life!

Secure engine in installation position to prevent it from falling down, see **11 00 670 SECURING ENGINE IN INSTALLATION POSITION (N52)** .

Necessary preliminary tasks:

- Secure engine in installation position, see **11 00 670 SECURING ENGINE IN INSTALLATION POSITION (N52)** .
- If necessary, remove assembly underside protection, see **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION** .
- Remove reinforcement plate, see **31 10 010 Removing and installing/replacing reinforcement plate.**
- If necessary, remove steering gear cover on both sides
- Partially detach front wheel arch trim on both sides in rear area, see **51 71 040 REMOVING AND INSTALLING/REPLACING FRONT LEFT OR RIGHT WHEEL ARCH COVER**
- Remove double pivot of lower steering spindle from power steering gear, see **32 31 219 REMOVING AND INSTALLING/REPLACING DOUBLE JOINT WITH FLEXIBLE DISK** .
- If necessary, disconnect plug connection from EH converter and remove line from front axle carrier
- If necessary, disconnect plug connection from ride-height sensor and remove line from front axle carrier
- If necessary, disconnect vacuum line of electrically operated valve at T-piece

WARNING: Danger of injury!

Failure to comply with the following instructions may result in the vehicle slipping off the lifting platform and critically injuring other persons.

When supporting components, make sure that

- the vehicle can no longer be raised or lowered
- the vehicle does not lift off the locating plates on the lifting platform

If necessary, position special tool 00 2 040 with a 2nd person helping on workshop jack.

Insert special tools 31 4 051 and 31 4 052 into corresponding mountings of special tool 00 2 040 .

Align special tool 00 2 040 to front axle subframe.

If necessary, lower special tool 33 3 274 .

Support front axle subframe by raising special tool 00 2 040 .

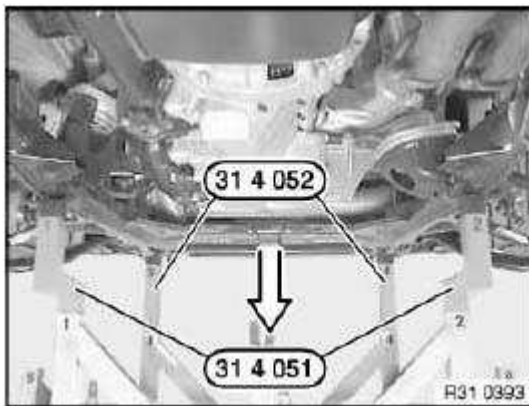


Fig. 17: Special Tools (31 4 052) And (31 4 051)
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Pay attention to power steering hoses and lines when lowering and raising. Hoses/lines must not be kinked/tensioned/bent!

Release screws (1).

Tightening torque: 31 10 2AZ, see **31 10 FRONT AXLE SUSPENSION** .

Release screws (2, 3).

Tightening torque: 31 10 3AZ, see **31 10 FRONT AXLE SUSPENSION** .

If necessary, disconnect pressure line for power steering from front axle carrier.

Lower front axle carrier.

Installation:

Check threads for damage; if necessary, repair with Helicoil thread inserts, see **31 00 ... Notes on repairing**

threads.

Replace all bolts.

Tighten down bolts (1) and then bolts (2, 3).

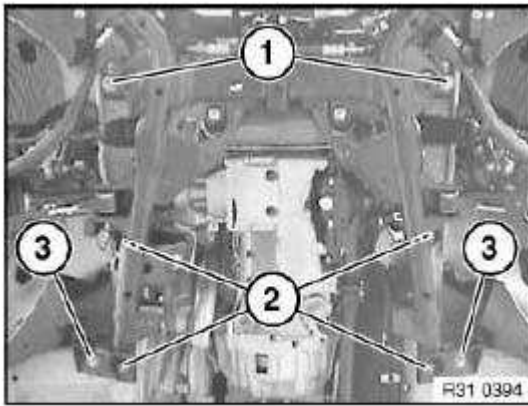


Fig. 18: Front Axle Carrier Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Carry out steering angle sensor adjustment

12 STRUTS WITH RUBBER MOUNTS

31 12 000 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT CONTROL ARM

Special tools required:

- **31 2 240 PULLER**

NOTE: If the control arm is detached from the front axle carrier, it is necessary after reinstallation to carry out a wheel/chassis alignment check.

NOTE: **Checking control arm:**

Refer to **Measuring play of wheel control joints**, see **31 12 023 Measuring play of wheel control joints.**

Necessary preliminary tasks:

- Remove front wheels, see **36 10 300 REMOVING OR INSTALLING FRONT OR REAR WHEEL** .
- If necessary, remove jointed rod of ride-height sensor from control arm

Release nut and remove bolt towards front.

Only on right side: If necessary, remove holder with ride-height sensor.

Installation:

Replace self-locking nut.

Tightening torque: 31 12 2AZ, see **31 12 CONTROL ARMS AND STRUTS** .

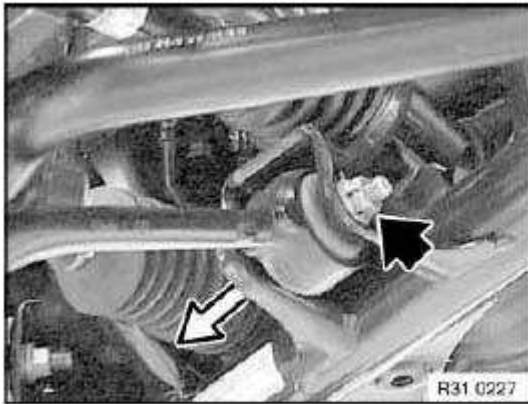


Fig. 19: Locating Self-Locking Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Release nut by only 3 thread turns so that control arm is not flung away unchecked when forced off.

Press control arm off swivel bearing with special tool 31 2 240 .

Unscrew nut and remove control arm.

Installation:

Keep journal on ball head and bushing in swivel bearing clean and free from oil and grease.

Replace self-locking nut.

Tightening torque: 31 12 6AZ, see **31 12 CONTROL ARMS AND STRUTS** .

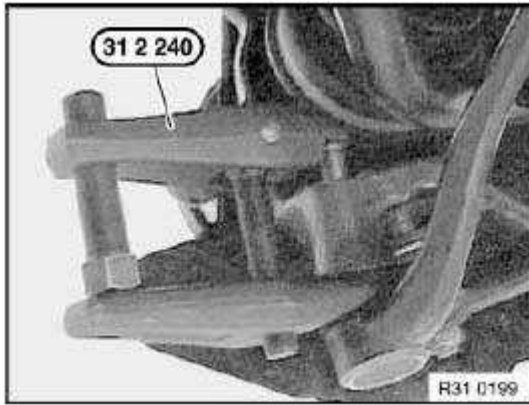


Fig. 20: Special Tool (31 2 240)

Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Perform chassis alignment check, see **32 00 ... CHASSIS/WHEEL ALIGNMENT CHECK PROCEDURE** .
- Carry out steering angle sensor adjustment

31 12 003 REMOVING AND INSTALLING / REPLACING TOP RIGHT WISHBONE

NOTE: Control arms with + or - marking (see illustration) are camber correction arms:

- - Underdimension variant
- + Overdimension variant

These camber correction arms are used to correct the camber values by 30 minutes. To be used only if the tolerance values are exceeded or undershot! An unmarked control arm is a standard part.

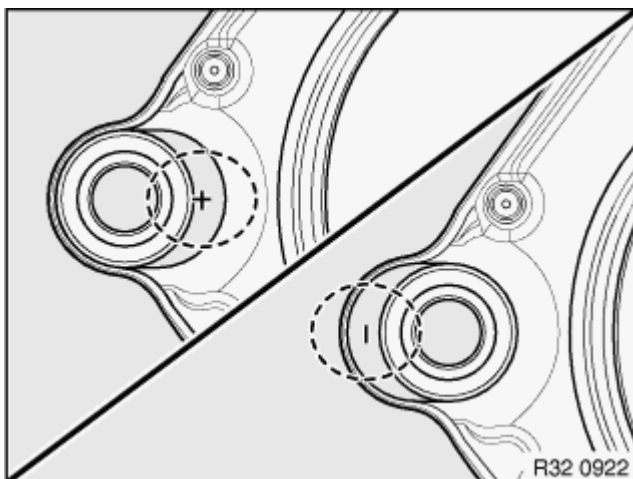


Fig. 21: Identifying Control Arms

Courtesy of BMW OF NORTH AMERICA, INC.

Necessary preliminary tasks: Remove control unit box

Important! The spring strut/lower wishbone screw connection does not have to be released!

Further procedure is identical to: **Removing and installing/replacing top left control arm.**

31 12 023 MEASURING PLAY OF WHEEL CONTROL JOINTS

Special tools required:

- **31 1 060 TEST FIXTURE**

Test apparatus (31 1 060):

1. Slide (31 1 061)
2. Measuring electronics (31 1 062)
3. Magnetic retainer (31 1 063)
4. Evaluation electronics (31 1 064)
5. Magnetic retainer (31 1 065)
6. Hook wrench (31 1 066)
7. Measuring clip (31 1 067)

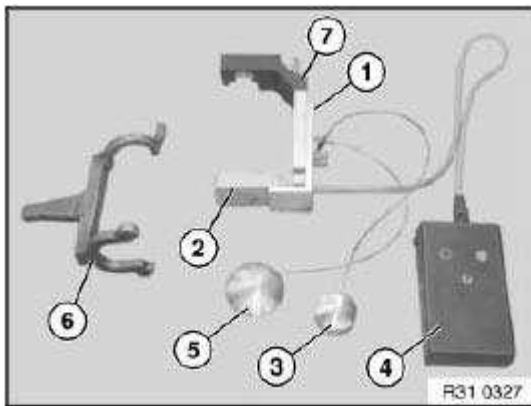


Fig. 22: Magnetic Retainer, Hook Wrench, Evaluation Electronics And Measuring Clip
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Carry out check using DIS Tester (Service functions). To substantiate that the check has been carried out properly, include the diagnosis report (paper printout) with the warranty application.

On vehicles with 17" or 18" rims, Remove front wheels if necessary, see **36 10 300 REMOVING OR INSTALLING FRONT OR REAR WHEEL** .

IMPORTANT: Make sure magnetic retainer is correctly seated.

Position magnetic retainers (1) on housing cover of control arm (2).

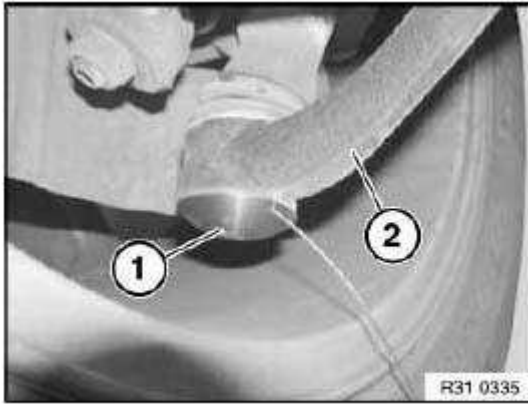


Fig. 23: Magnetic Retainers And Housing Cover Of Control Arm
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Measuring clip must not contact the control arm.

Fit measuring clip (2) on threaded stem (3) of joint and screw down with locating screw (1).

Press button on evaluation electronics.

NOTE: The device performs a self-test.

Both LEDs flash, then the red LED lights up permanently.

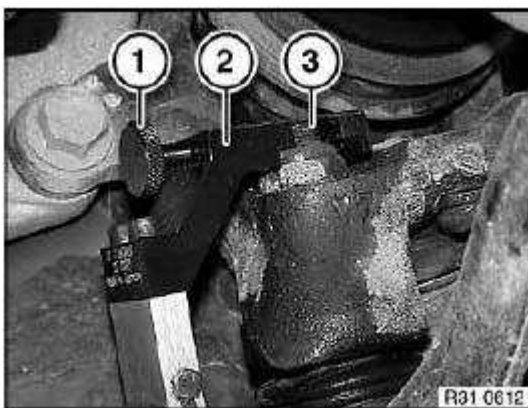


Fig. 24: Measuring Clip, Threaded Stem And Locating Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Move slide with measuring electronics upwards until green LED lights up.

NOTE: Gap (A) between measuring electronics and magnetic retainer must be approx. 5-7 mm.

Then secure slide with clamping screw (1).

Press evaluation electronics button for approx. 2 seconds until the green LED flashes.

NOTE: The device is now calibrated and ready for measuring.

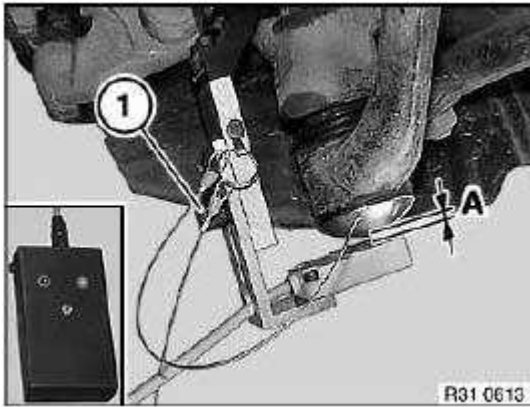


Fig. 25: Gap Between Measuring Electronics And Magnetic Retainer
Courtesy of BMW OF NORTH AMERICA, INC.

1. Test:

Set torque wrench to 60 Nm.

Introduce a force with hook wrench (1) in the direction shown until torque is obtained.

Read off test result:

- Red LED flashes: Joint must be replaced
- Green LED flashes: Carry out 2nd test

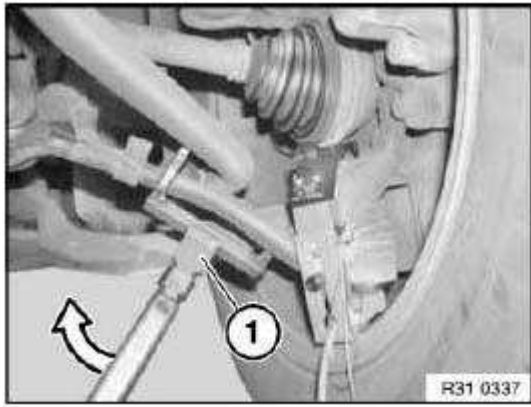


Fig. 26: Hook Wrench
Courtesy of BMW OF NORTH AMERICA, INC.

2. Test:

Reposition hook wrench.

Introduce a force with hook wrench (1) in the direction shown until torque is obtained.

Read off test result:

- Red LED flashes: Joint must be replaced
- Green LED flashes: Joint must not be replaced

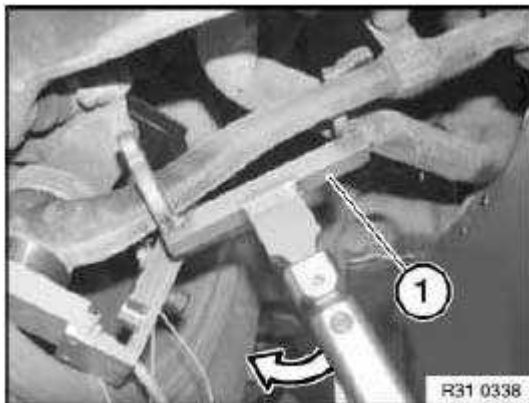


Fig. 27: Hook Wrench
Courtesy of BMW OF NORTH AMERICA, INC.

31 12 024 REPLACE WHEEL CONTROL JOINT IN WISHBONE (ALL-WHEEL DRIVE VEHICLE)

Necessary preliminary tasks: Remove front wheel

Release screws (1). If necessary, push wheel control joint (2) off swivel bearing using a suitable tool.

Installation note: Recondition thread in swivel bearing. Keep recess for wheel control joint, bushing in trailing link and wheel control joint journal clean and free from grease. Replace microencapsulated screws. Tightening torque, see 31 12 21AZ in **31 12 CONTROL ARMS AND STRUTS** .

31 12 026 REMOVING AND INSTALLING/REPLACING GUIDE JOINT IN SWIVEL BEARING

Special tools required:

- **31 2 240 PULLER**
- **33 4 200 TOOL KIT / STRIKER FIXTURE**
- 33 4 205 , see **33 4 200 TOOL KIT / STRIKER FIXTURE**

Necessary preliminary tasks:

- Remove front wheels, see **36 10 300 REMOVING OR INSTALLING FRONT OR REAR WHEEL** .

Slacken nut (1), grip if necessary.

Release screws (2).

Remove tension strut with guide joint from swivel bearing.

Installation:

Recondition thread in swivel bearing.

Keep recess for guide joint, bore in tension strut and guide joint journal clean and free from grease.

Replace screws.

Tightening torque: 31 12 21AZ, see **31 12 CONTROL ARMS AND STRUTS** .

Replace self-locking nut.

Tightening torque: 31 12 20AZ, see **31 12 CONTROL ARMS AND STRUTS** .

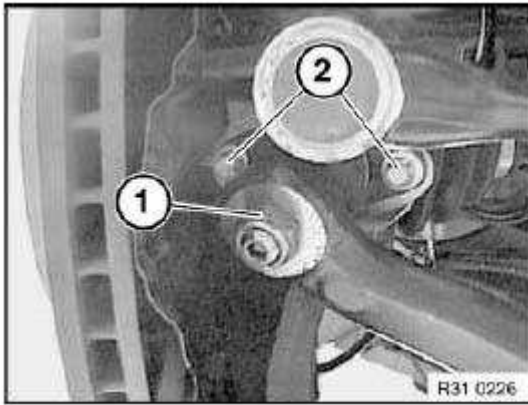


Fig. 28: Guide Joint Screws And Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Guide joint tightly seated in swivel bearing:

IMPORTANT: The guide joint must be replaced once it has been driven out with the special tools.

Secure special tool 33 4 205 to guide joint.

Drive guide joint out of swivel bearing with special tool 33 4 200.

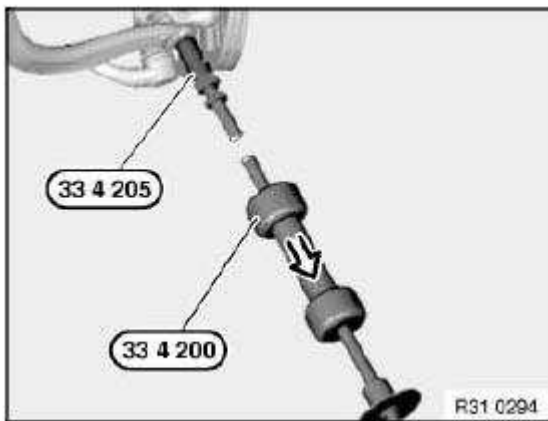


Fig. 29: Driving Guide Joint Out Of Swivel Bearing With Special Tool (33 4 200)
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Screw on nut a few turns so that guide joint does not slip off unchecked when forced off.

Screw on nut a few turns.

Press guide joint with special tool 31 2 240 out of tension strut.

Unscrew nut and remove guide joint.

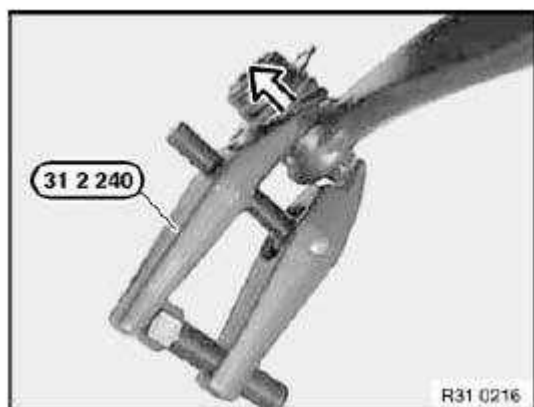


Fig. 30: Removing Guide Joint

Courtesy of BMW OF NORTH AMERICA, INC.

31 12 050 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT TENSION STRUT

IMPORTANT: With build date 12/2006 the tension strut to guide joint connection was increased by 10 mm. The upshot of this is that on vehicles up to 12/2006 the guide joint, see **31 12 026 Removing and installing/replacing guide joint in swivel bearing** must also be replaced.
Mixed fitting of tension struts is permitted!

Necessary preliminary tasks:

- Remove front assembly underside protection, see **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION** .
- If necessary, remove steering gear cover.
- Detach front wheel arch trim, see **51 71 040 REMOVING AND INSTALLING/REPLACING FRONT LEFT OR RIGHT WHEEL ARCH COVER**
- Remove guide joint, see **31 12 026 Removing and installing/replacing guide joint in swivel bearing**.

Release screw (1).

Release nut on rear side.

Swivel holder (2) for engine shielding at front towards center of vehicle and remove towards bottom.

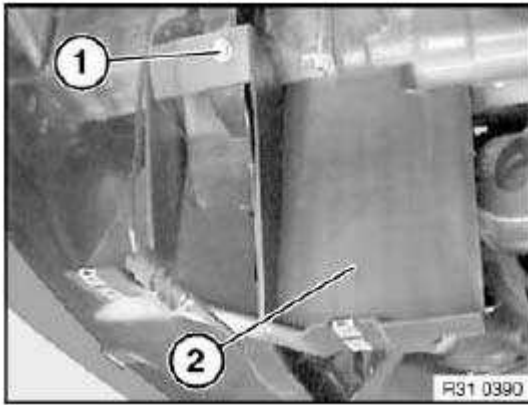


Fig. 31: Holder And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten nut.

Remove screw towards front.

Remove tension strut.

Installation:

Replace self-locking nut.

Tighten bolt connection in normal position, see **32 00 ... MOVING VEHICLE INTO NORMAL POSITION** .

Tightening torque: 31 12 1AZ, see **31 12 CONTROL ARMS AND STRUTS** .

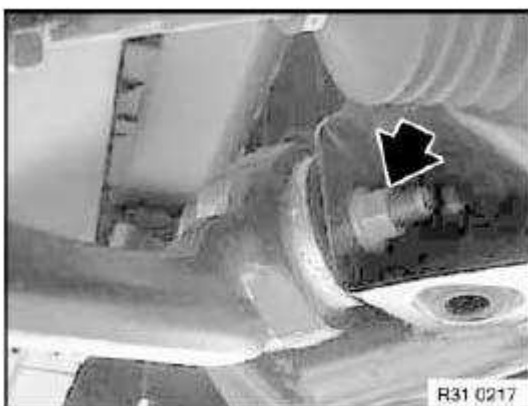


Fig. 32: Self-Locking Nut
Courtesy of BMW OF NORTH AMERICA, INC.

31 12 135 REPLACING RUBBER MOUNTS ON BOTH CONTROL ARMS

Special tools required:

See **31 FRONT AXLE** , **33 REAR AXLE**

- 31 1 051
- 31 1 054
- 33 3 051
- 33 3 052
- 33 3 054
- 33 3 310

Necessary preliminary tasks:

- Remove front wheels, see **36 10 300 REMOVING OR INSTALLING FRONT OR REAR WHEEL** .
- Check ball joint of control arm while installed, replace control arm if necessary, see **31 12 000 Removing and installing/replacing left or right control arm**.
- Remove control arm from front axle carrier and tie up, see **31 12 000 Removing and installing/replacing left or right control arm**.

After installation:

- Perform chassis alignment check, see **32 00 ... CHASSIS/WHEEL ALIGNMENT CHECK PROCEDURE** .
- Carry out steering angle sensor adjustment

IMPORTANT: Tie control arm back with wire; this prevents ball joint from being damaged.

Withdraw rubber mount with special tools 31 1 051 , 31 1 054 , 33 3 051 , 33 3 052 , 33 3 054 and 33 3 310 .

Installation:

Keep rubber mount and bore in control arm clean and free from grease.

Draw in rubber mount from chamfered side of control arm bore.

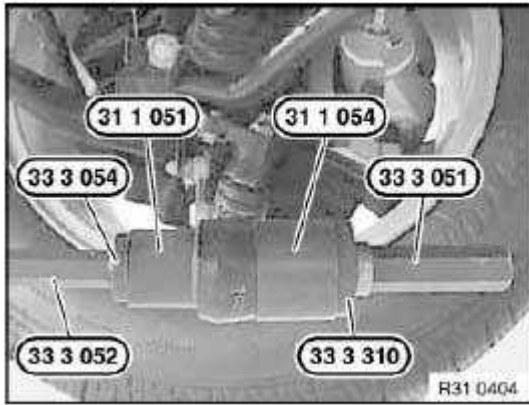


Fig. 33: Special Tools (33 3 051), (33 3 052) And (33 3 054)
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Protrusion (A) = 5.75 ± 0.7 mm.

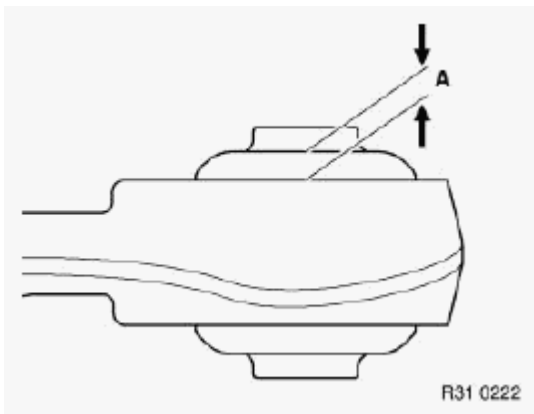


Fig. 34: Rubber Mount Protrusion
 Courtesy of BMW OF NORTH AMERICA, INC.

31 12 138 REPLACING RUBBER MOUNTS ON BOTH TENSION STRUTS

Special tools required:

See **31 2 260 PRESSURE SLEEVE TOOL**

- 31 2 261
- 31 2 264

IMPORTANT: The rubber mounts on both tension struts must be replaced! Note that the rubber mounts may only be changed once.

Carry out check:

There must always be a minimum amount of play in the guide joint.

1. Check guide joint play

NOTE: For this purpose, apply light pressure to the tension strut (in the area of the guide joint) in the horizontal and vertical directions.

- Play is OK: Check bolt connection (see Point 2)
 - Play is not OK: Replace rubber mount and guide joint, see **31 12 026 Removing and installing/replacing guide joint in swivel bearing.**
2. Check bolt connection (tension strut to guide joint) by tightening to 60 % of Tightening torque: 31 12 20AZ, see **31 12 CONTROL ARMS AND STRUTS** and listening for cracking sound
- Torque wrench cracking sound: Replace rubber mount
 - Bolt connection turns: Replace tension strut and guide joint, see **31 12 CONTROL ARMS AND STRUTS** .

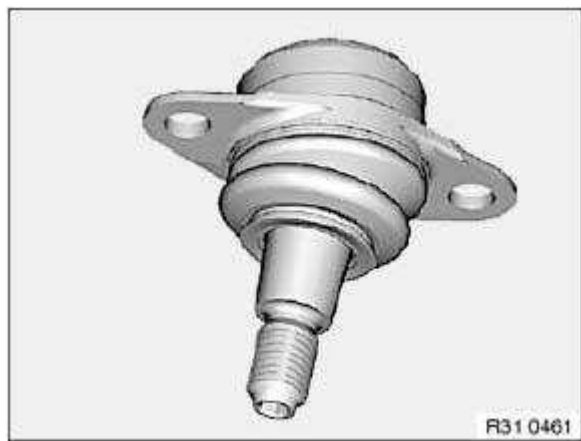


Fig. 35: Guide Joint

Courtesy of BMW OF NORTH AMERICA, INC.

Replacing rubber mount:

Remove both tension struts, see **31 12 050 Removing and installing/replacing left or right tension strut.**

Using a press and special tools 31 2 261 and 31 2 264 , press rubber mount out of tension strut.

NOTE: Special tool 31 2 264 must be exactly flush with rubber mount bushing.

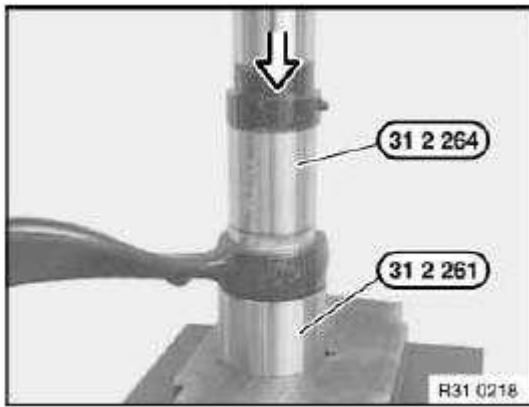


Fig. 36: Removing Rubber Mount From Tension Strut
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Keep rubber mount and bushing in tension strut clean and free from grease.

Align rubber mounts to each other using markings (K) and press in. The deviation must not exceed $\pm 3^\circ$.

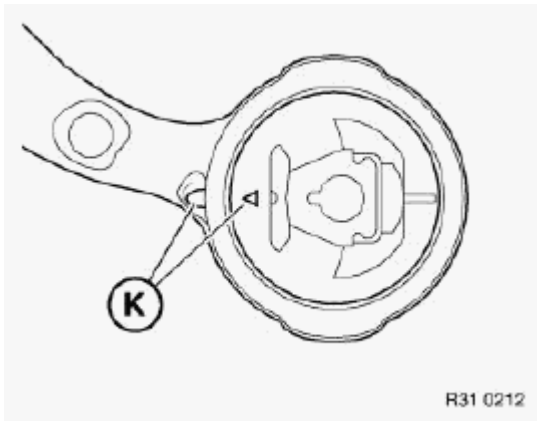


Fig. 37: Rubber Mounts Alignment Mark
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Protrusion (A) = 12.5 ± 0.7 mm

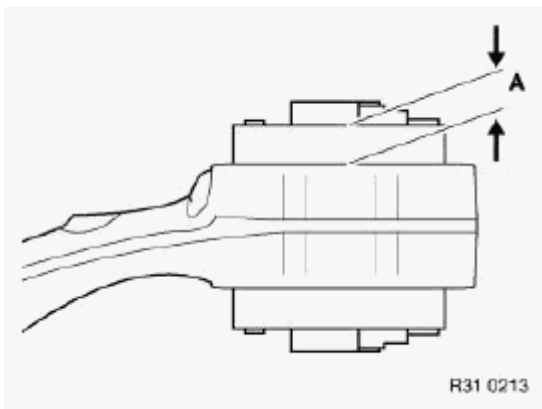


Fig. 38: Rubber Mount Protrusion

Courtesy of BMW OF NORTH AMERICA, INC.

31 12 640 REPLACING RUBBER MOUNTS IN BOTH CONTROL ARMS (CONTROL ARMS REMOVED)

Special tools required:

See **31 FRONT AXLE** , **33 REAR AXLE**

- 31 1 051
- 31 1 054
- 33 3 054

Press out rubber mount with special tools 31 1 051 , 31 1 054 and 33 3 054 .

Installation:

Keep rubber mount and bore in control arm clean and free from grease.

Press in rubber mount from chamfered side of control arm bore.

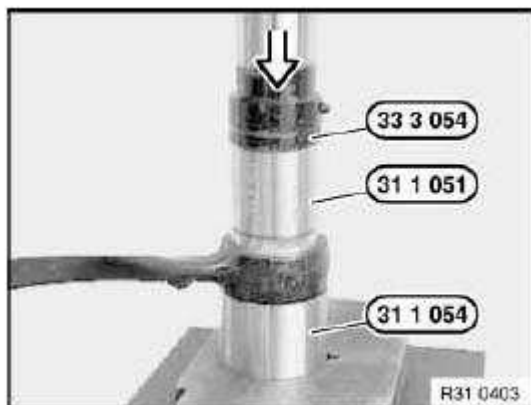


Fig. 39: Pressing Rubber Mount Into Control Arm Bore

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Protrusion (A) = 5.75 ± 0.7 mm.

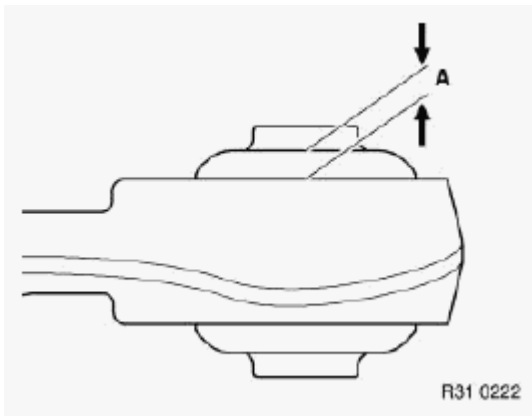


Fig. 40: Rubber Mount Protrusion

Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Perform chassis alignment check, see **32 00 ... CHASSIS/WHEEL ALIGNMENT CHECK PROCEDURE** .
- Carry out steering angle sensor adjustment

21 WHEEL BEARINGS AND STUB AXLE

31 21 090 REPLACING (REMOVING AND INSTALLING) LEFT OR RIGHT SWIVEL BEARING

Special tools required:

- 31 2 230

Remove front wheels, see **36 10 300 REMOVING OR INSTALLING FRONT OR REAR WHEEL** .

Release collar nut; to do so, press brake pedal to floor.

Installation:

Replace collar nut, apply a light coating of oil to contact surface and tighten down.

Tightening torque: 31 21 2AZ, see **31 21 WHEEL BEARINGS AND STEERING KNUCKLE** .

Secure collar nut by peening on flat areas of output shaft.

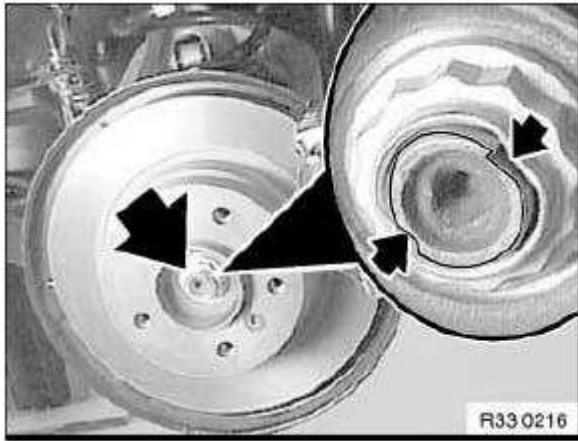


Fig. 41: Locating Collar Nut

Courtesy of BMW OF NORTH AMERICA, INC.

Remove brake disc, see **34 11 220 REMOVING AND INSTALLING/REPLACING BOTH FRONT BRAKE DISCS** .

Replacement only: Drive out drive flange, see **31 21 180 Replacing bearing for front wheel.**

Remove front pulse generator from swivel bearing, see **34 52 525 REPLACING ONE FRONT PULSE GENERATOR** .

Remove tie rod end from swivel bearing, see **32 21 151 REPLACING LEFT OR RIGHT TIE ROD** .

Remove guide joint from swivel bearing, see **31 12 026 Removing and installing/replacing guide joint in swivel bearing.**

Remove control arm from swivel bearing, see **31 12 000 Removing and installing/replacing left or right control arm.**

Remove stabilizer link from spring strut, see **31 35 005 Removing and installing/replacing push rod (stabilizer link) for left/right stabilizer.**

Turn swivel bearing to one side.

Replacement only: Drive out drive flange, see **31 21 180 Replacing bearing for front wheel.**

Support swivel bearing (1) with workshop jack and a suitable mounting.

Release nut and remove bolt (2) towards front.

Expand swivel bearing (1) with special tool 31 2 230.

Lower workshop jack.

Remove swivel bearing (1).

Installation:

Replace self-locking nut.

Tightening torque: 31 31 3AZ, see **31 31 SPRING STRUTS** .

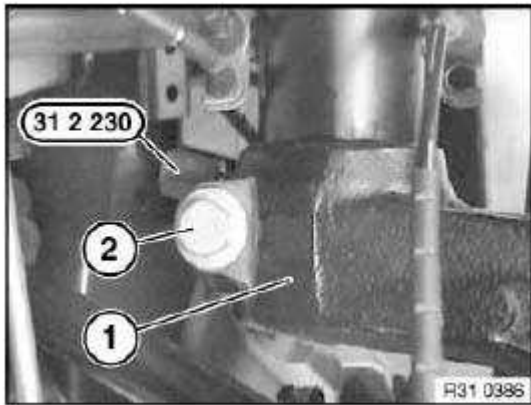


Fig. 42: Special Tool (31 2 230), Swivel Bearing And Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Keep press fit of swivel gearing and spring strut in lower area clean and free from oil and grease.

Spread swivel bearing (1) with special tool 31 2 230 , align by means of gap to positioning pins (2) on back of spring strut and raise as far as it will go.

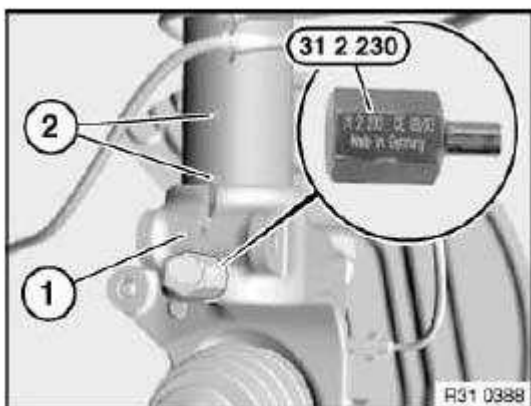


Fig. 43: Special Tool (31 2 230) And Swivel Bearing
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

Modify dust sleeve (1).

Modify brake guard plate (2).

Installation:

Install new wheel bearing, see **31 21 180 Replacing bearing for front wheel.**

Replacement only: Draw in drive flange, see **31 21 180 Replacing bearing for front wheel.**

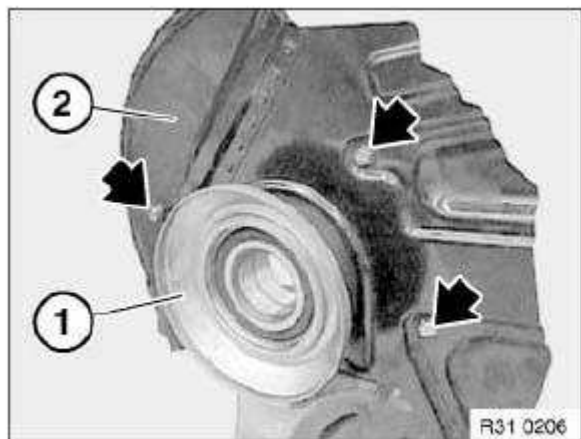


Fig. 44: Dust Sleeve And Brake Guard Plate
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Perform chassis alignment check, see **32 00 ... CHASSIS/WHEEL ALIGNMENT CHECK PROCEDURE** .

31 21 180 REPLACING BEARING FOR FRONT WHEEL

Special tools required:

See **22 ENGINE AND GEARBOX SUSPENSION** , **31 FRONT AXLE** , **REAR AXLE - SPECIAL TOOLS** .

- 22 1 018
- 31 2 113
- 33 1 367
- 33 2 116
- 33 2 160
- 33 2 201
- 33 3 261

- 33 3 266
- 33 3 268
- 33 4 036
- 33 4 200
- 33 4 261

**IMPORTANT: Bearing cannot be dismantled.
Do not wash out bearing.**

Remove front wheels, see **36 10 300 REMOVING OR INSTALLING FRONT OR REAR WHEEL** .

Release collar nut; to do so, press brake pedal to floor.

Remove brake disc, see **34 11 220 REMOVING AND INSTALLING/REPLACING BOTH FRONT BRAKE DISCS** .

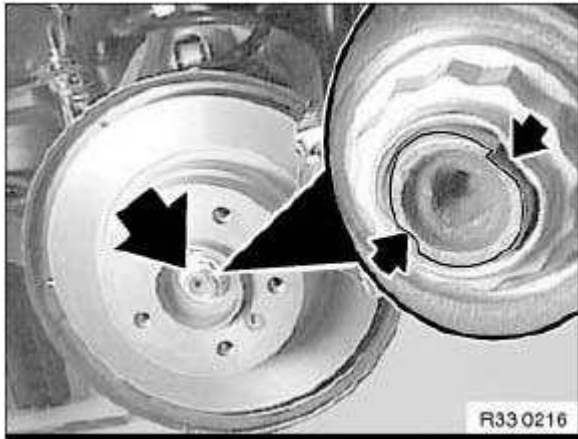


Fig. 45: Locating Collar Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Force drive flange with special tools 33 2 116 / 33 2 201 , 33 2 160 , 33 4 200 and 5 wheel studs out of wheel bearing.

NOTE: Rounded inside edge of special tool 33 2 160 must point to drive flange.

Detach wheel bearing inner race from drive flange.

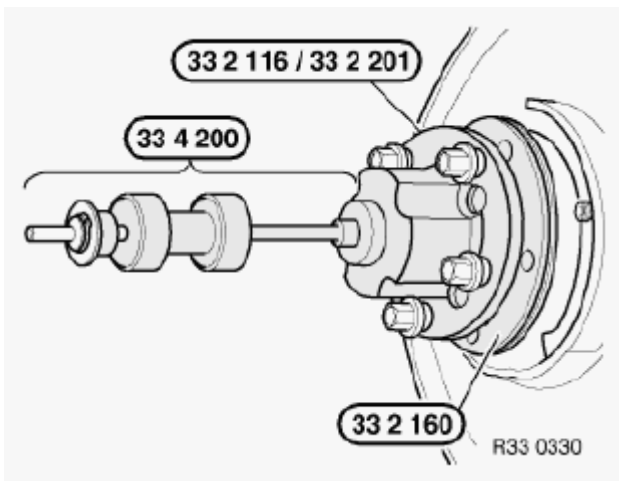


Fig. 46: Special Tool (33 2 160) And (33 4 200)
 Courtesy of BMW OF NORTH AMERICA, INC.

Remove swivel bearing, see **31 21 090 Replacing (removing and installing) left or right swivel bearing** and clamp with aluminium clamping jaws in vice.

IMPORTANT: The bearing is destroyed when the drive flange is removed and must not be reused!

Lift out retaining ring (1).

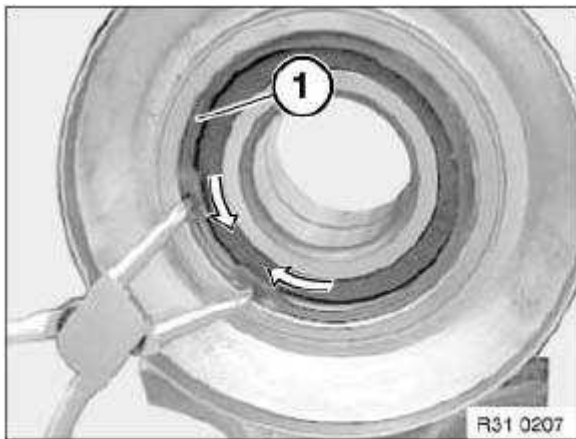


Fig. 47: Removing Retaining Ring
 Courtesy of BMW OF NORTH AMERICA, INC.

Pull out bearing with special tools 31 2 113 , 33 4 261 , 33 4 036 and 33 3 261.

NOTE: The bearing can be forced out of the swivel bearing on a press.

Check dust sleeve, replace if necessary.

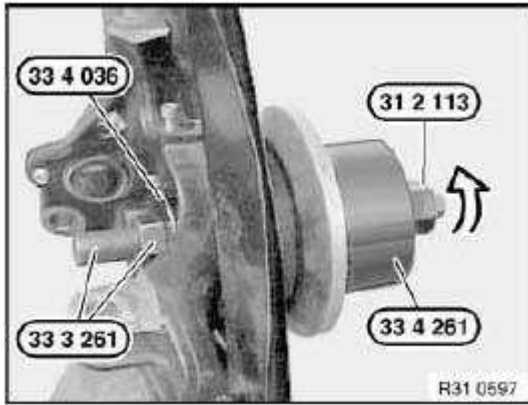


Fig. 48: Pulling Out Bearing With Special Tools
 Courtesy of BMW OF NORTH AMERICA, INC.

**IMPORTANT: Keep press-fit areas clean and free of oil and grease.
 Wider chamfer of bearing must point to swivel bearing!**

Clean press-fit area of new bearing.

Clean bearing seat in swivel bearing.

IMPORTANT: Wider chamfer (1) of bearing must point to swivel bearing!

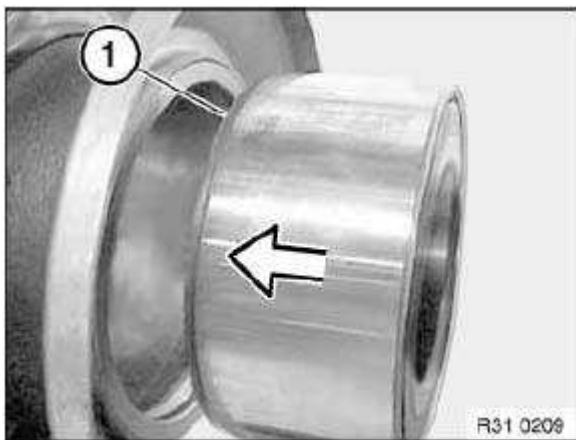


Fig. 49: Bearing Wider Chamfer
 Courtesy of BMW OF NORTH AMERICA, INC.

Align bearing by way of wider chamfer to swivel bearing and draw in with special tools 31 2 113 , 22 1 018 , 33 1 367 and 33 3 261.

NOTE: The bearing can be forced out of the swivel bearing on a press.

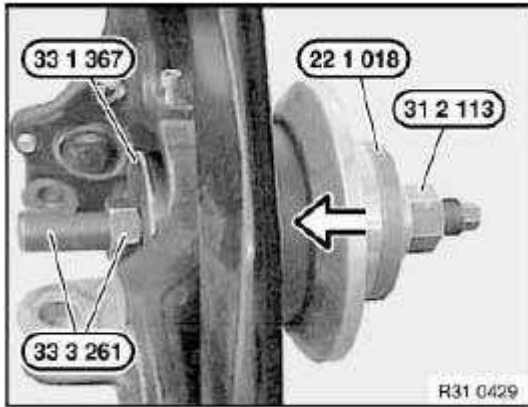


Fig. 50: Special Tools (33 3 261), (33 1 367) And (31 2 113)
Courtesy of BMW OF NORTH AMERICA, INC.

Install new circlip (1).

NOTE: Make sure circlip (1) is correctly seated.

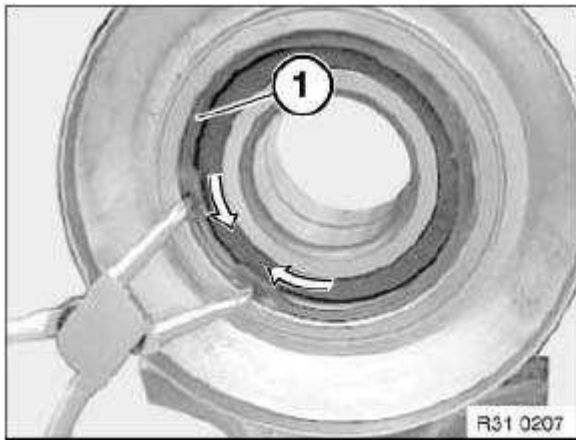


Fig. 51: Removing Retaining Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Draw in drive flange (1) with special tools 31 2 113 , 33 3 268 , 33 3 266 and 33 3 261.

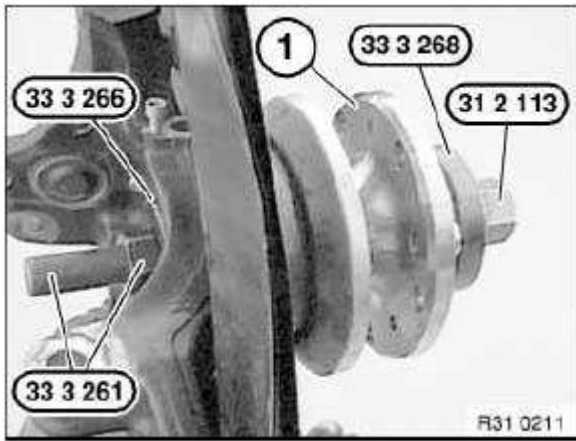


Fig. 52: Drive Flange With Special Tools (33 3 261), (33 3 266) And (31 2 113)
Courtesy of BMW OF NORTH AMERICA, INC.

Install swivel bearing, see **31 21 090 Replacing (removing and installing) left or right swivel bearing.**

Draw output shaft into drive flange, see **31 60 ... Pressing output shaft out of drive flange (wheel hub) and drawing in.**

Remove brake disc, see **34 11 220 REMOVING AND INSTALLING/REPLACING BOTH FRONT BRAKE DISCS .**

Install front brake calliper, see **34 11 519 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT FRONT BRAKE CALIPER .**

Replace collar nut, apply a light coating of oil to contact surface and tighten down.

Tightening torque: 31 21 2AZ, see **31 21 WHEEL BEARINGS AND STEERING KNUCKLE .**

Secure collar nut by peening on flat areas of output shaft.

Remove front wheels, see **36 10 300 REMOVING OR INSTALLING FRONT OR REAR WHEEL .**

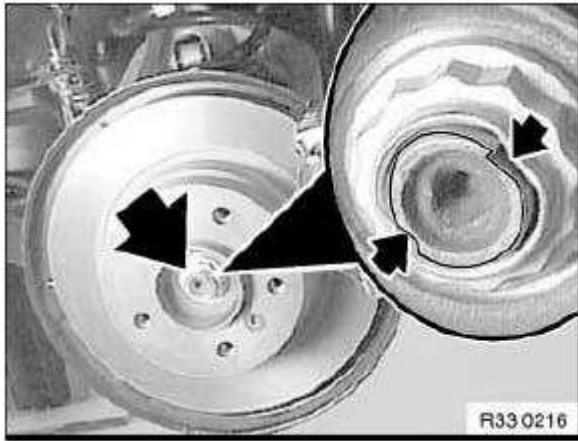


Fig. 53: Locating Collar Nut

Courtesy of BMW OF NORTH AMERICA, INC.

31 SPRING STRUT

31 31 000 REMOVING AND INSTALLING COMPLETE LEFT OR RIGHT SPRING STRUT SHOCK ABSORBER

Special tools required:

- **31 2 230 SOCKET**

IMPORTANT: If the centering pin is missing from the support bearing, the position of the studs to the wheel arch must be marked so that the original camber is approximately maintained.

Only one nut may ever be released for marking.

Necessary preliminary tasks:

- Remove brake caliper, see **34 11 519 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT FRONT BRAKE CALIPER** and tie back
- Remove stabilizer link from spring strut, see **31 35 005 Removing and installing/replacing push rod (stabilizer link) for left/right stabilizer**.
- Remove tie rod end from swivel bearing, see **32 21 151 REPLACING LEFT OR RIGHT TIE ROD** .

IMPORTANT: Risk of damage!

When the swivel bearing is removed from the spring strut, the tripod (2) can be pulled out of the tulip (1) and fall into the rubber gaiter (3). In this event, it will be necessary to install a new output shaft because the tripod (2) can jam or a roller of the tripod (2) can slip off the molding. The roller would then be located in the gaiter (3) or bellows and result in rapid failure.

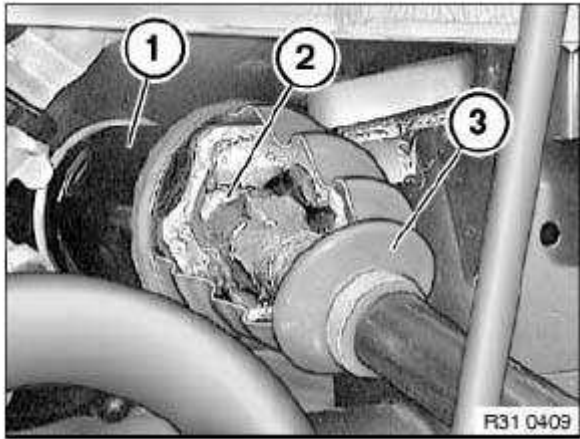


Fig. 54: Tripod, Tulip And Gaiter
Courtesy of BMW OF NORTH AMERICA, INC.

Remove line for pulse generator from spring strut.

If necessary, remove line for brake pad wear sensor from spring strut.

Support swivel bearing (1) with workshop jack and a suitable mounting.

Release nut and remove bolt (2) towards front.

Expand swivel bearing (1) with special tool 31 2 230.

Lower workshop jack.

Remove swivel bearing (1) and tie up.

Installation:

Replace self-locking nut.

Tightening torque: 31 31 3AZ, see **31 31 SPRING STRUTS** .

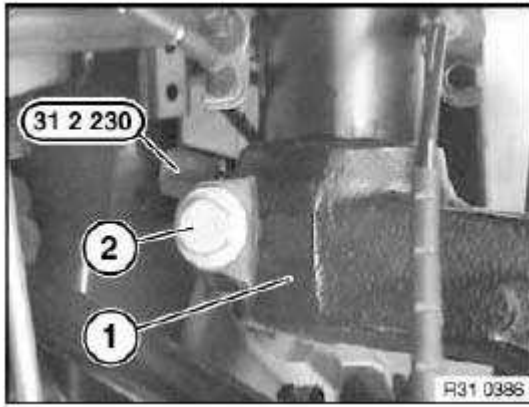


Fig. 55: Special Tool (31 2 230), Swivel Bearing And Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Keep press fit of swivel gearing and spring strut in lower area clean and free from oil and grease.

Spread swivel bearing (1) with special tool 31 2 230 , align by means of gap to positioning pins (2) on back of spring strut and raise as far as it will go.

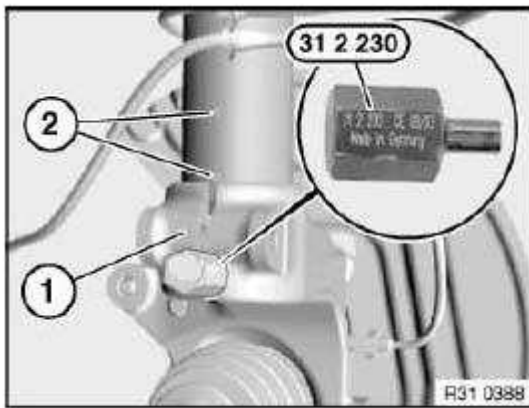


Fig. 56: Special Tool (31 2 230) And Swivel Bearing
Courtesy of BMW OF NORTH AMERICA, INC.

Centering pin missing: Make position of studs in relation to wheel arch.

Secure spring strut against falling out.

Unscrew nuts.

Remove spring strut downwards out of wheel arch.

Installation:

Align spring strut using centering pin (1) to bore (2) in wheel arch or studs to wheel arch and push upwards.

Replace self-locking nuts.

Tightening torque: 31 31 1AZ, see **31 31 SPRING STRUTS** .

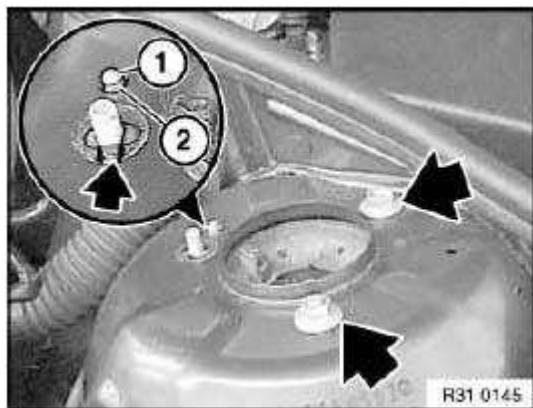


Fig. 57: Centering Pin Into Bore

Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Carry out wheel alignment check, see **32 00 150 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH LOAD UP TO DESIGN POSITION** if a spring strut with support bearing was or has been installed without centering pin.

31 31 031 REPLACING FRONT LEFT OR RIGHT SPRING STRUT SHOCK ABSORBER

Special tools required:

See **31 FRONT AXLE**

- 31 2 210
- 31 3 210
- 31 3 341
- 31 3 382
- 31 3 383

WARNING: Observe the following instructions to avoid any risk of injury by the coil springs.

1. Prior to each use, check the special tools for defects, modifications and operational reliability.
2. Damaged/modified special tools must not be used!
3. No changes or modifications may be made to the special tools!

4. These special tools are intended solely for the purpose of tightening and relieving cylindrical and tapered suspension springs.
5. Keep special tools dry, clean and free of grease.
6. Impact screwdrivers may not be used!
7. Do not compress coil spring to full extent.
8. Observe manufacturer's instructions.

NOTE: **Read and comply with Information on replacing shock absorbers, see 31 00 ... Information on replacing shock absorbers.**

Necessary preliminary tasks:

- Remove front spring strut, see 31 31 000 Removing and installing complete left or right spring strut shock absorber.

Removing:

Clamp special tool 31 3 341 in vice.

Fit special tools 31 3 382 and 31 3 383 from above on special tool 31 3 341 until locking pins (1) can be felt and heard to snap into place.

Check seating of special tools 31 3 382 and 31 3 383 , correct if necessary.

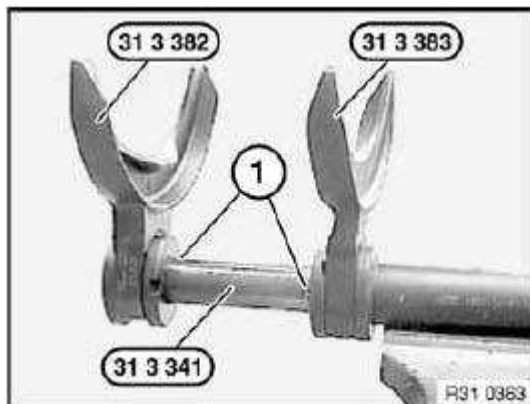


Fig. 58: Locking Pins And Special Tool (31 3 341), (31 3 382) And (31 3 383)
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Coils of coil spring must be located completely in recess of special tools 31 3 382 and 31 3 383 when tensioned!

Compress coil spring until stress on piston rod is relieved.

Clean coil spring to remove coarse contamination and take up with special tools 31 3 382 and 31 3 383 .

Turn spring strut until special tool 31 3 382 rests in indentation (1) of spring strut.

NOTE: In this way, the coil spring rests to optimum effect on special tools 31 3 382 and 31 3 383.

Compress coil spring until stress on piston rod is relieved.

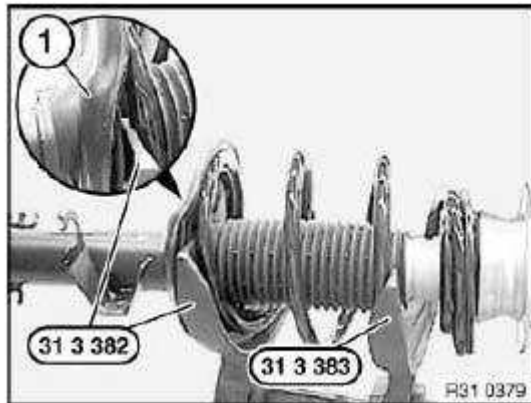


Fig. 59: Special Tools (31 3 382) And (31 3 383)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove cap.

Release nut with special tool 31 3 210 , grip piston rod if necessary.

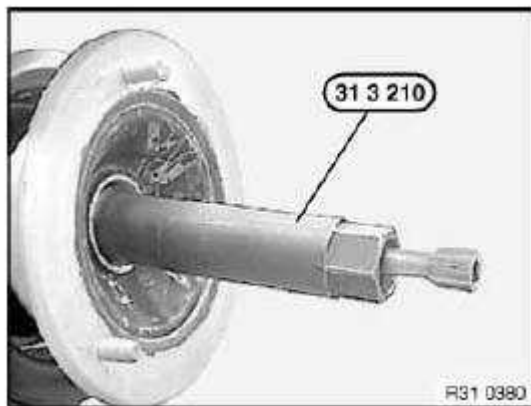


Fig. 60: Special Tool (31 3 210)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove support bearing (1), dust sleeve and shim (2).

Remove spring plate (3) with spring pad (4).

Remove spring strut with auxiliary damper, gaiter and lower spring pad sideways from tensioned coil spring.

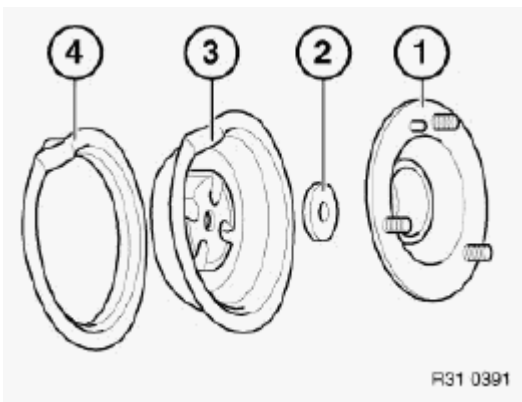


Fig. 61: Spring Plate, Support Bearing And Dust Sleeve And Shim
 Courtesy of BMW OF NORTH AMERICA, INC.

Remove auxiliary damper (1), gaiter (2) and lower spring pad (3).

Assembly:

Check auxiliary damper (1), gaiter (2) and lower spring pad (3) for damage, replace if necessary.

Attach lower spring pad (3) to spring plate.

Attach auxiliary damper (1) and gaiter (2) to piston rod.

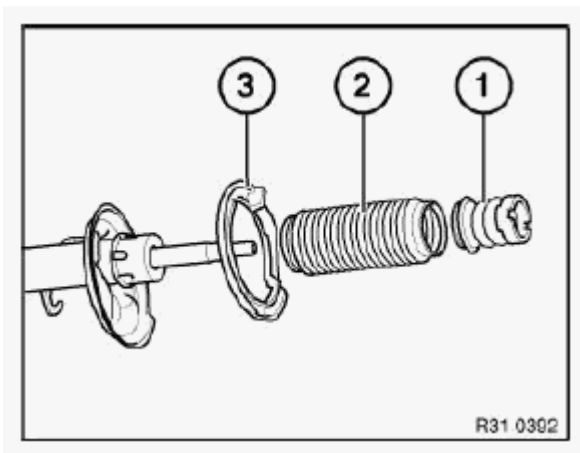


Fig. 62: Lower Spring Pad, Auxiliary Damper And Gaiter
 Courtesy of BMW OF NORTH AMERICA, INC.

Insert spring strut in tensioned coil spring and align to end of coil spring using lower spring pad.

Check support bearing (1) and upper spring pad (4) for damage, replace if necessary.

Attach upper spring plate (3) with upper spring pad (4) and shim (2) to piston rod.

Attach support bearing (1) with dust sleeve to piston rod.

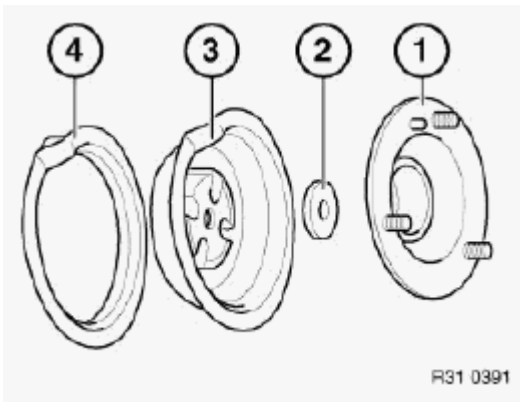


Fig. 63: Spring Plate, Support Bearing And Dust Sleeve And Shim
 Courtesy of BMW OF NORTH AMERICA, INC.

Replace self-locking nut and screw on as far as possible to avoid damaging the piston rod when relieving tension on the coil spring.

Relieve tension on coil spring slightly.

NOTE: **Make sure that lower and upper coils of coil spring rest completely in recess of spring plate.**

Tighten down nut with special tool 31 2 210 (grip piston rod in the process).

Tightening torque: 31 31 2AZ, see **31 31 SPRING STRUTS** .

Fully relieve tension on coil spring.

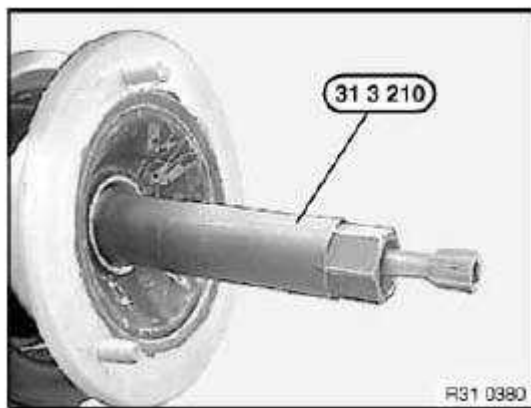


Fig. 64: Special Tool (31 3 210)
 Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Carry out wheel alignment check, see **32 00 150 KDS CHASSIS/WHEEL ALIGNMENT CHECK**

WITH LOAD UP TO DESIGN POSITION if a spring strut with support bearing was or has been installed without centering pin.

51 71 373 REMOVING AND INSTALLING/REPLACING TENSION STRUT ON SPRING STRUT DOME

**IMPORTANT: Vehicles must not be driven without tension struts.
Driving without tension struts may damage the vehicle body.**

Release screws (1) and remove tension strut (2).

Tightening torque: 51 71 4AZ, see **51 71 SEALS AND LOOSE BODY PARTS** .

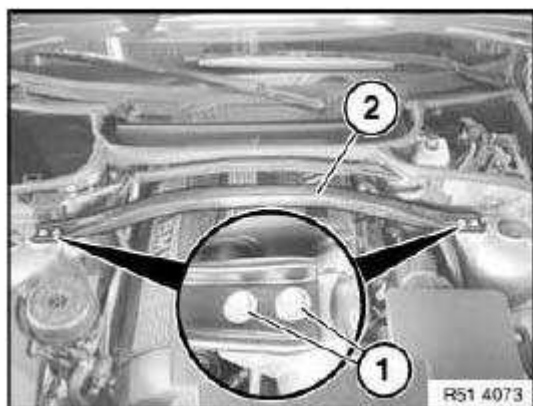


Fig. 65: Tension Strut And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

33 SPRING WITH SUSPENSION

31 33 001 REPLACING FRONT LEFT OR RIGHT SPRING STRUT SUPPORT BEARING

Special tools required:

See **31 FRONT AXLE**

- 31 2 210
- 31 3 210
- 31 3 341
- 31 3 382
- 31 3 383

WARNING: Observe the following instructions to avoid any risk of injury by the coil springs.

1. Prior to each use, check the special tools for defects, modifications and operational reliability.
2. Damaged/modified special tools must not be used!
3. No changes or modifications may be made to the special tools!
4. These special tools are intended solely for the purpose of tightening and relieving cylindrical and tapered suspension springs.
5. Keep special tools dry, clean and free of grease.
6. Impact screwdrivers may not be used!
7. Do not compress coil spring to full extent.
8. Observe manufacturer's instructions.

Necessary preliminary tasks:

- Remove front spring strut, see **31 31 000 Removing and installing complete left or right spring strut shock absorber.**

Removing:

Clamp special tool 31 3 341 in vice.

Fit special tools 31 3 382 and 31 3 383 from above on special tool 31 3 341 until locking pins (1) can be felt and heard to snap into place.

Check seating of special tools 31 3 382 and 31 3 383 , correct if necessary.

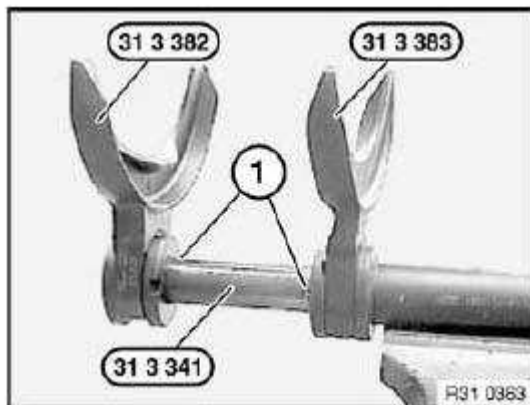


Fig. 66: Locking Pins And Special Tool (31 3 341), (31 3 382) And (31 3 383)
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Coils of coil spring must be located completely in recess of special tools 31 3 382 and 31 3 383 when tensioned!

Compress coil spring until stress on piston rod is relieved.

Clean coil spring to remove coarse contamination and take up with special tools 31 3 382 and 31 3 383 .

Turn spring strut until special tool 31 3 382 rests in indentation (1) of spring strut.

NOTE: In this way, the coil spring rests to optimum effect on special tools 31 3 382 and 31 3 383 .

Compress coil spring until stress on piston rod is relieved.

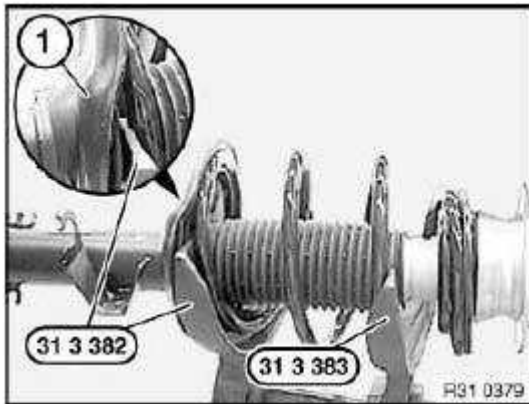


Fig. 67: Special Tools (31 3 382) And (31 3 383)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove cap.

Release nut with special tool 31 3 210 , grip piston rod if necessary.

Remove support bearing and dust sleeve.

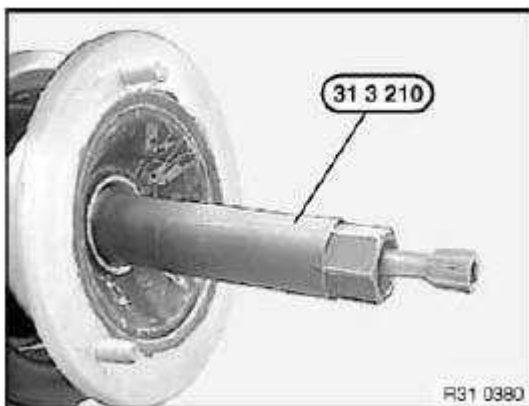


Fig. 68: Special Tool (31 3 210)
Courtesy of BMW OF NORTH AMERICA, INC.

Version with rough road package:

Unscrew nuts.

Remove adapter (A) from support bearing.

Installation:

Align adapter (A) using centering pin (1) to support bearing and place in position.

Replace self-locking nuts.

Tightening torque: 31 31 1AZ, see 31 31 SPRING STRUTS .

Drive in centering pin (1) of adapter (A).

NOTE: If an adapter (A) without a centering pin was fitted, centering pin (1) of new adapter (A) must be driven in.

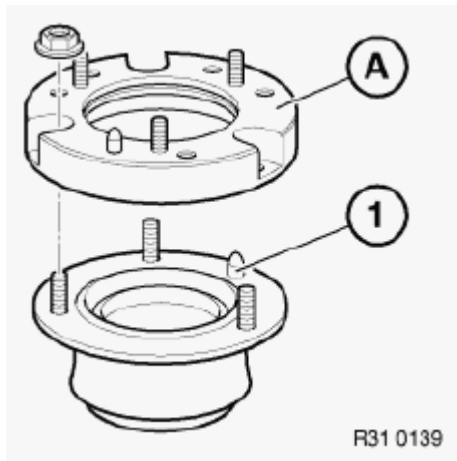


Fig. 69: Adapter And Centering Pin
Courtesy of BMW OF NORTH AMERICA, INC.

Version with rough road package:

If necessary, drive out centering pin (1).

NOTE: If a support bearing (2) was fitted without centering pin (1), the centering pin (1) of the new support bearing (2) must be driven out.

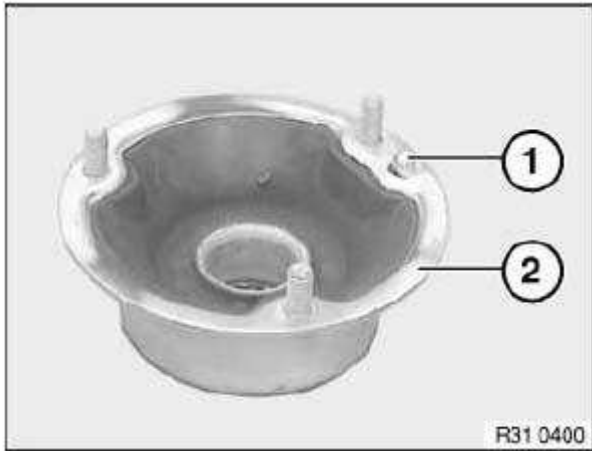


Fig. 70: Support Bearing And Centering Pin
Courtesy of BMW OF NORTH AMERICA, INC.

Replace self-locking nut and screw on as far as possible to avoid damaging the piston rod when relieving tension on the coil spring.

Relieve tension on coil spring slightly.

NOTE: Make sure that lower and upper coils of coil spring rest completely in recess of spring plate.

Tighten down nut with special tool 31 2 210 (grip piston rod in the process).

Tightening torque: 31 31 2AZ, see **31 31 SPRING STRUTS** .

Fully relieve tension on coil spring.

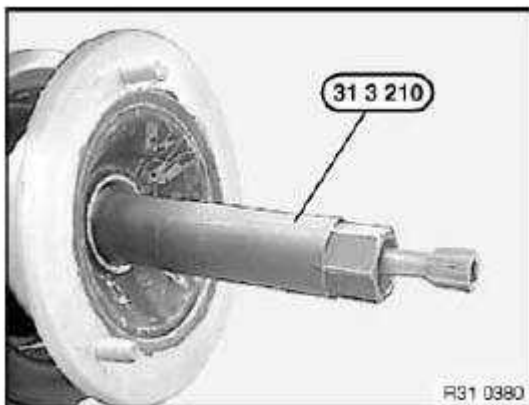


Fig. 71: Special Tool (31 3 210)
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Carry out wheel alignment check, see **32 00 150 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH LOAD UP TO DESIGN POSITION** if a spring strut with support bearing was or has been installed without centering pin.

31 33 095 MEASURING RIDE-LEVEL HEIGHT OF VEHICLE

Necessary preliminary tasks:

- Tighten bolt connection in normal position, see **32 00 ... MOVING VEHICLE INTO NORMAL POSITION** .

Determine actual ride height (A) - to do so, attach tape measure to rim flange (2) at bottom middle and measure to lower edge of wheel arch (1).

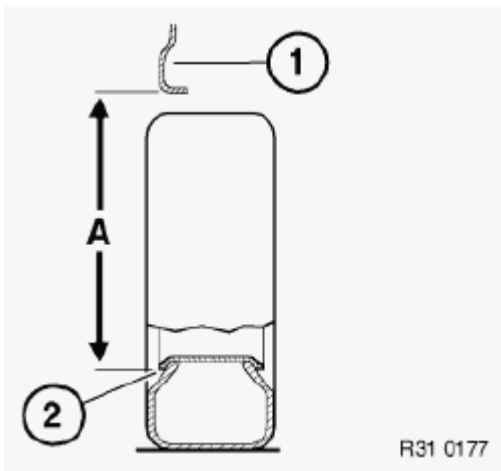


Fig. 72: Actual Ride Height

Courtesy of BMW OF NORTH AMERICA, INC.

31 33 100 REMOVING AND INSTALLING/REPLACING COIL SPRING FOR LEFT OR RIGHT FRONT SPRING STRUT

Special tools required:

See **31 FRONT AXLE**

- 31 2 210
- 31 3 210
- 31 3 341
- 31 3 382
- 31 3 383

WARNING: Observe the following instructions to avoid any risk of injury by the coil springs.

1. Prior to each use, check the special tools for defects, modifications and operational reliability.
2. Damaged/modified special tools must not be used!
3. No changes or modifications may be made to the special tools!
4. These special tools are intended solely for the purpose of tightening and relieving cylindrical and tapered suspension springs.
5. Keep special tools dry, clean and free of grease.
6. Impact screwdrivers may not be used!
7. Do not compress coil spring to full extent.
8. Observe manufacturer's instructions.

IMPORTANT: Both coil springs on the relevant axle must be replaced only in the event of corrosion breakage!

NOTE: The coil spring is assigned after the vehicle identification number has been entered and the optional extras of the relevant vehicle selected.

Necessary preliminary tasks:

- Remove front spring strut, see **31 31 000 Removing and installing complete left or right spring strut shock absorber.**

Removing:

Clamp special tool 31 3 341 in vice.

Fit special tools 31 3 382 and 31 3 383 from above on special tool 31 3 341 until locking pins (1) can be felt and heard to snap into place.

Check seating of special tools 31 3 382 and 31 3 383 , correct if necessary.

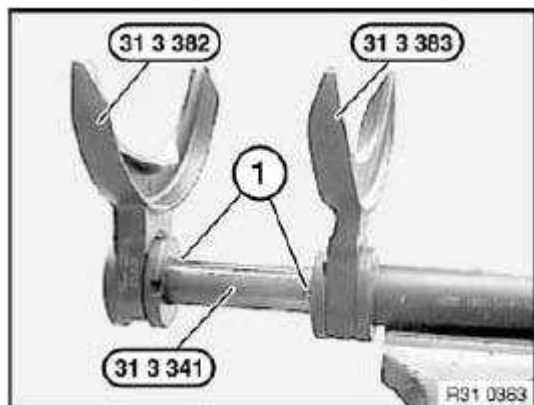


Fig. 73: Locking Pins And Special Tool (31 3 341), (31 3 382) And (31 3 383)
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Coils of coil spring must be located completely in recess of special tools 31 3 382 and 31 3 383 when tensioned!

Compress coil spring until stress on piston rod is relieved.

Clean coil spring to remove coarse contamination and take up with special tools 31 3 382 and 31 3 383 .

Turn spring strut until special tool 31 3 382 rests in indentation (1) of spring strut.

NOTE: In this way, the coil spring rests to optimum effect on special tools 31 3 382 and 31 3 383 .

Compress coil spring until stress on piston rod is relieved.

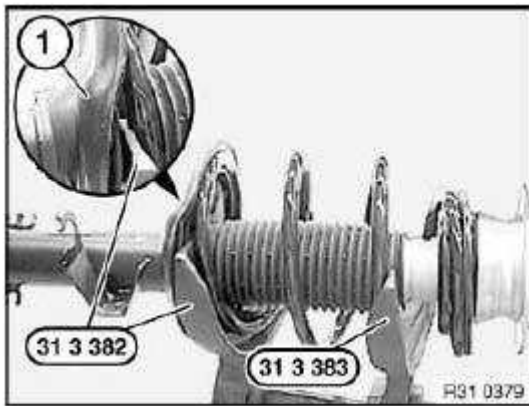


Fig. 74: Special Tools (31 3 382) And (31 3 383)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove cap.

Release nut with special tool 31 3 210 , grip piston rod if necessary.

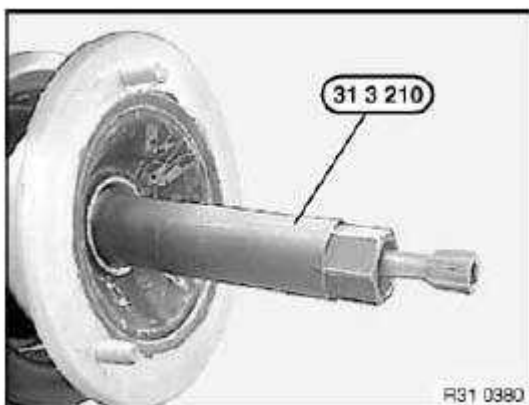


Fig. 75: Special Tool (31 3 210)

Courtesy of BMW OF NORTH AMERICA, INC.

Remove support bearing (1), dust sleeve and shim (2).

Remove spring plate (3) with spring pad (4).

Remove spring strut with auxiliary damper, gaiter and lower spring pad sideways from tensioned coil spring.

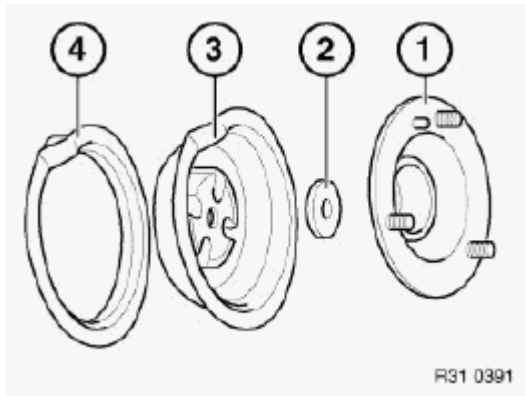


Fig. 76: Spring Plate, Support Bearing And Dust Sleeve And Shim
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Coils of coil spring must be located completely in recess of special tools 31 3 382 and 31 3 383 when untensioned/tensioned!

Relieve tension on coil spring.

Remove coil spring from special tools 31 3 382 and 31 3 383 .

Installation:

Twist coil spring until lower end of coil spring (1) is flush with end (2) of special tool 31 3 383 .

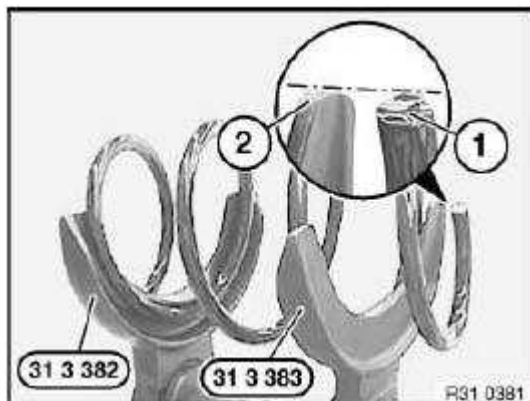


Fig. 77: Coil Spring And Coil Spring End With Special Tools

Courtesy of BMW OF NORTH AMERICA, INC.

Assembly:

Check auxiliary damper (1), gaiter (2) and lower spring pad (3) for damage, replace if necessary.

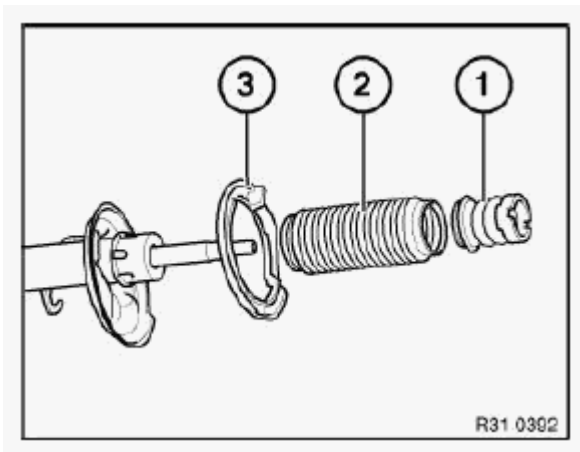


Fig. 78: Lower Spring Pad, Auxiliary Damper And Gaiter
Courtesy of BMW OF NORTH AMERICA, INC.

Insert spring strut in tensioned coil spring and align to end of coil spring using lower spring pad.

Check support bearing (1) and upper spring pad (4) for damage, replace if necessary.

Attach upper spring plate (3) with upper spring pad (4) and shim (2) to piston rod.

Attach support bearing (1) with dust sleeve to piston rod.

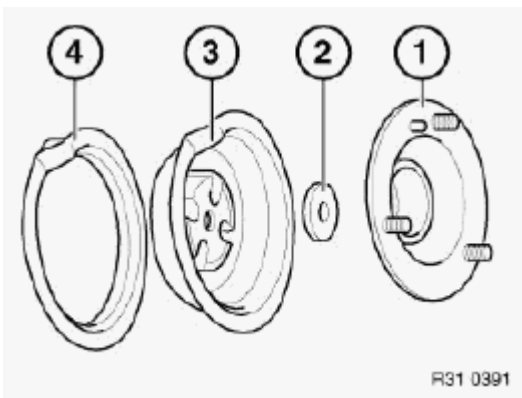


Fig. 79: Spring Plate, Support Bearing And Dust Sleeve And Shim
Courtesy of BMW OF NORTH AMERICA, INC.

Replace self-locking nut and screw on as far as possible to avoid damaging the piston rod when relieving tension on the coil spring.

Relieve tension on coil spring slightly.

NOTE: **Make sure that lower and upper coils of coil spring rest completely in recess of spring plate.**

Tighten down nut with special tool 31 2 210 (grip piston rod in the process).

Tightening torque: 31 31 2AZ, see **31 31 SPRING STRUTS** .

Fully relieve tension on coil spring.

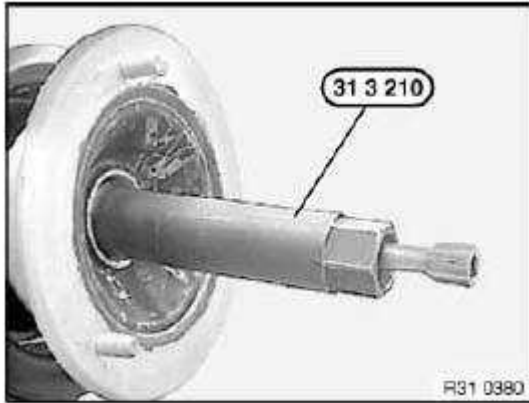


Fig. 80: Special Tool (31 3 210)
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Carry out wheel alignment check, see **32 00 150 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH LOAD UP TO DESIGN POSITION** if a spring strut with support bearing was or has been installed without centering pin.

35 STABILIZER BAR

31 35 000 REMOVING AND INSTALLING/REPLACING FRONT STABILIZER

Special tools required:

See **00 MAINTENANCE AND GENERAL INFORMATION** , **31 FRONT AXLE** , **33 REAR AXLE**

- 00 2 040
- 31 4 051
- 31 4 052
- 33 3 274

WARNING: Danger to life!

Secure engine in installation position to prevent it from falling down, see 11 00 670 SECURING ENGINE IN INSTALLATION POSITION (N52) .

Necessary preliminary tasks:

- Secure engine in installation position, see 11 00 670 SECURING ENGINE IN INSTALLATION POSITION (N52) .
- If necessary, remove assembly underside protection, see 51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION .
- Remove reinforcement plate, see 31 10 010 Removing and installing/replacing reinforcement plate.
- If necessary, remove steering gear cover on both sides
- Partially detach front wheel arch trim on both sides in rear area, see 51 71 040 REMOVING AND INSTALLING/REPLACING FRONT LEFT OR RIGHT WHEEL ARCH COVER
- Remove double pivot of lower steering spindle from power steering gear, see 32 31 219 REMOVING AND INSTALLING/REPLACING DOUBLE JOINT WITH FLEXIBLE DISK .
- If necessary, disconnect plug connection from EH converter and remove line from front axle carrier
- If necessary, disconnect plug connection from ride-height sensor and remove line from front axle carrier
- If necessary, disconnect vacuum line for electrically operated valve at T-piece
- If necessary, remove bracket for pressure line from front axle carrier
- Remove stabilizer link on both sides from stabilizer, see 31 35 005 Removing and installing/replacing push rod (stabilizer link) for left/right stabilizer.

WARNING: Danger of injury!

Failure to comply with the following instructions may result in the vehicle slipping off the lifting platform and critically injuring other persons.

When supporting components, make sure that

- the vehicle can no longer be raised or lowered
- the vehicle does not lift off the locating plates on the lifting platform

If necessary, position special tool 00 2 040 with a 2nd person helping on workshop jack.

Insert special tools 31 4 051 and 31 4 052 into corresponding mountings of special tool 00 2 040 .

Align special tool 00 2 040 to front axle subframe.

If necessary, lower special tool 33 3 274 .

Support front axle subframe by raising special tool 00 2 040 .

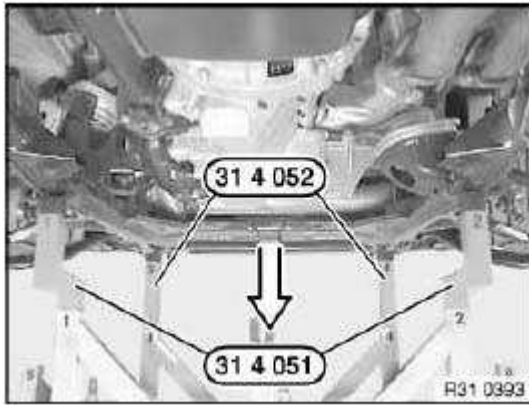


Fig. 81: Special Tools (31 4 052) And (31 4 051)
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Pay attention to power steering hoses and lines when lowering and raising. Hoses/lines must not be kinked/tensioned/bent!

Release screws (1).

Tightening torque: 31 10 2AZ, see **31 10 FRONT AXLE SUSPENSION** .

Release screws (2, 3).

Tightening torque: 31 10 3AZ, see **31 10 FRONT AXLE SUSPENSION** .

If necessary, disconnect pressure line for power steering from front axle carrier.

Carefully lower front axle carrier with workshop jack.

Installation:

Check threads for damage; if necessary, repair with Helicoil thread inserts, see **31 00 ... Notes on repairing threads**.

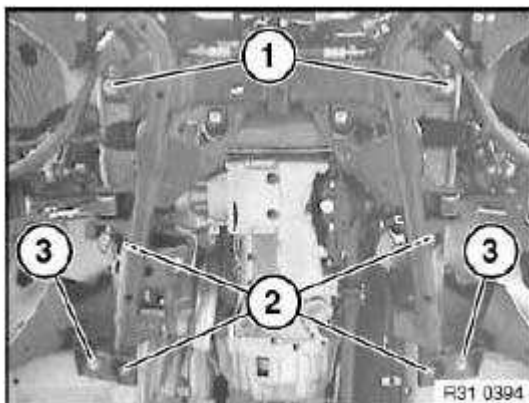


Fig. 82: Front Axle Carrier Bolts

Courtesy of BMW OF NORTH AMERICA, INC.

Replace all bolts.

Tighten down bolts (1) and then bolts (2, 3).

Release screws (1) and twist stabilizer towards front.

Remove retaining bracket (2) and rubber mount (3) on both sides.

Remove stabilizer sideways through wheel arch.

Installation:

Check rubber mount (3) on both sides, replace if necessary.

Keep retaining bracket (2), rubber mount (3) and stabilizer clean and free from oil and grease.

Tightening torque: 31 35 1AZ, see **31 35 STABILIZER BAR** .

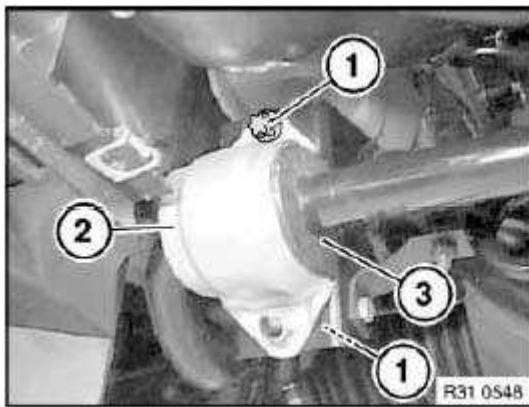


Fig. 83: Retaining Bracket, Rubber Mount And Screws

Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Carry out steering angle sensor adjustment

31 35 005 REMOVING AND INSTALLING/REPLACING PUSH ROD (STABILIZER LINK) FOR LEFT/RIGHT STABILIZER

Special tools required:

- **31 1 140 OPEN-END WRENCH WAF 16/18**

Release nut - grip with special tool 31 1 140 .

Remove hinged bracket (1) from stabilizer (2).

Installation:

Replace self-locking nut.

Tightening torque: 31 35 5AZ, see **31 35 STABILIZER BAR** .

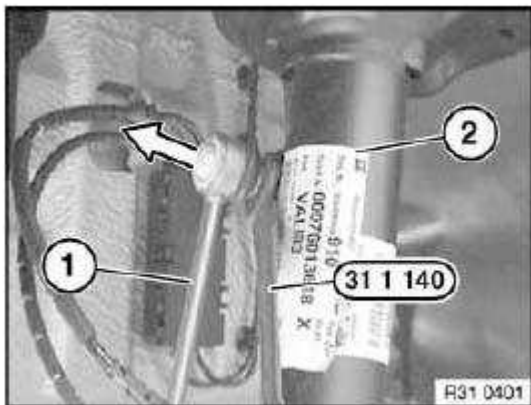


Fig. 84: Removing Hinged Bracket From Stabilizer
Courtesy of BMW OF NORTH AMERICA, INC.

Release nut - grip with special tool 31 1 140 .

Remove hinged bracket (1) from stabilizer (2).

Installation:

Replace self-locking nut.

Tightening torque: 31 35 5AZ, see **31 35 STABILIZER BAR** .

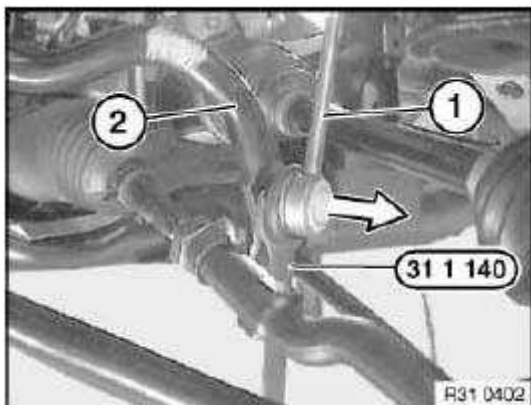


Fig. 85: Removing Hinged Bracket From Stabilizer
Courtesy of BMW OF NORTH AMERICA, INC.

31 35 021 REPLACING RUBBER MOUNTS OF STABILIZER RETAINING FIXTURE ON FRONT AXLE SUBFRAME

Necessary preliminary tasks:

- Remove front underbody protection, see **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION** .
- If necessary, remove steering gear cover on both sides

Release screws (1) and remove stabilizer bar forward from front axle subframe.

Remove retaining bracket (2) and rubber mount (3) on both sides.

Installation:

Keep retaining bracket (2), rubber mount (3) and stabilizer clean and free from oil and grease.

Tightening torque: 31 35 1AZ, see **31 35 STABILIZER BAR** .

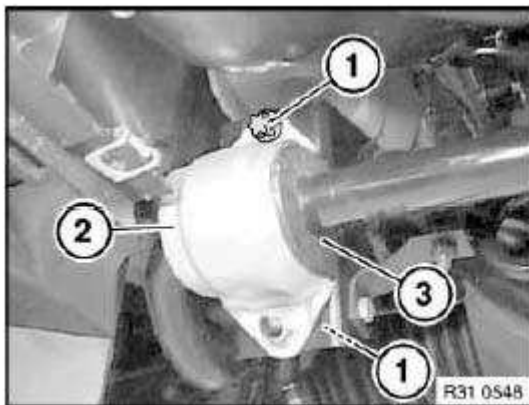
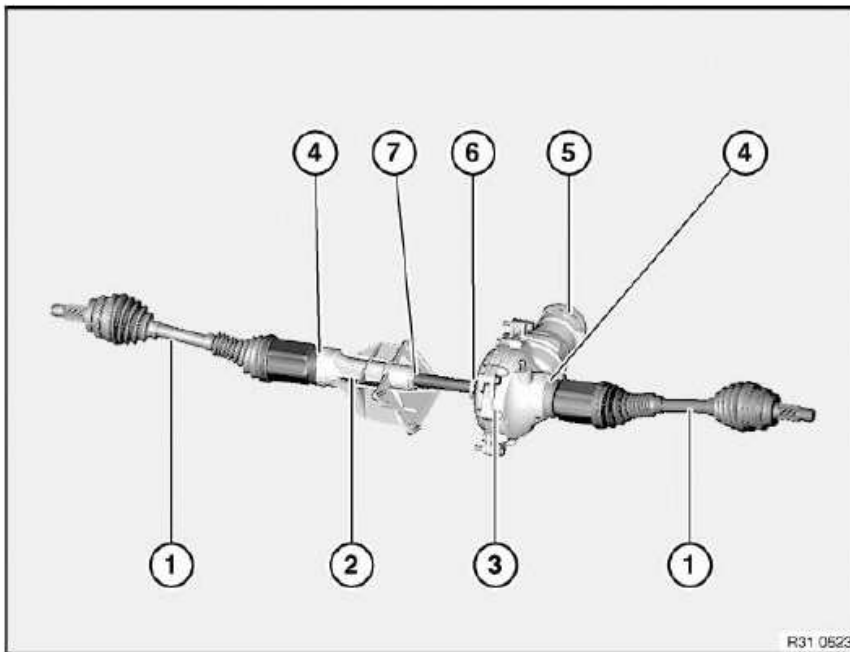


Fig. 86: Retaining Bracket, Rubber Mount And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

50 FRONT AXLE GEARBOX

31 50 ... OVERVIEW OF FRONT DIFFERENTIAL / OUTPUT SHAFTS



[Safety precautions & general information](#)

- 1 [Output shaft / gaiters](#)
- 2 [Bearing block](#)
- 3 [Front differential](#)
- 4 [Shaft seal \(output shaft\)](#)

- 5
- 6
- 7

- [Shaft seal \(drive flange\)](#)
- [O-ring \(front differential\)](#)
- [O-ring \(bearing block\)](#)

Fig. 87: Front Differential / Output Shafts Components

Courtesy of BMW OF NORTH AMERICA, INC.

31 50 ... CHANGING FRONT DIFFERENTIAL OIL

IMPORTANT: Use only the approved front differential oil in this front differential.
Failure to comply with this requirement will result in serious damage to the differential!

NOTE: Only change oil when front differential is at normal operating temperature.

Necessary preliminary tasks:

- Remove reinforcement plate, see [31 10 010 Removing and installing/replacing reinforcement plate](#).

Checking/correcting front differential oil level:

Undo oil filler plug (1).

Check front differential oil level.

If necessary, pour in front differential oil up to lower edge of opening for oil filler plug (1).

Installation:

Replace sealing ring.

Tightening torque: 31 50 8AZ, see **31 50 FRONT AXLE DIFFERENTIAL** .

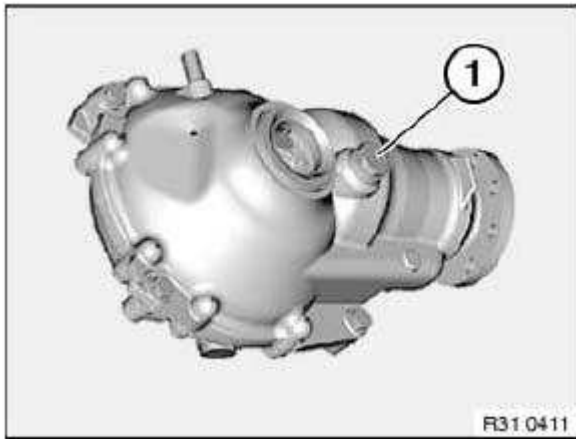


Fig. 88: Front Differential Oil Filler Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Changing front differential oil:

Place oil collecting apparatus underneath.

Remove oil drain plug (1).

Drain front differential oil.

Replace sealing ring, screw in oil drain plug (1) and tighten down.

Tightening torque: 31 50 8AZ, see **31 50 FRONT AXLE DIFFERENTIAL** .

Undo oil filler plug (2).

Pour in front differential oil up to lower edge of opening for oil filler plug (2).

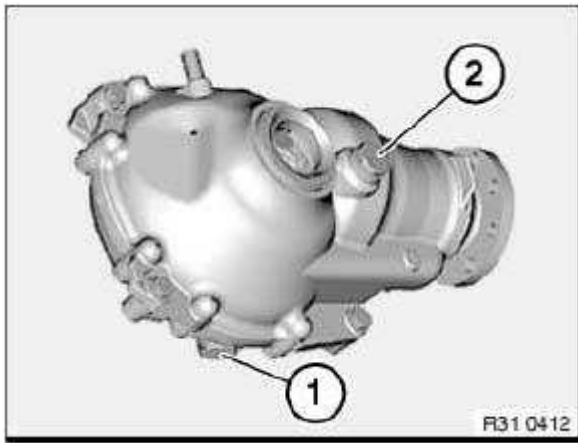


Fig. 89: Front Differential Oil Filler And Drain Plug
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace sealing ring.

Tightening torque: 31 50 8AZ, see **31 50 FRONT AXLE DIFFERENTIAL** .

31 50 001 REMOVING AND INSTALLING/REPLACING FRONT DIFFERENTIAL

Necessary preliminary tasks:

- Remove front underbody protection, see **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION** .
- Drain and dispose of front differential oil, see **31 50 ... Changing front differential oil.**
- Remove left output shaft, see **31 60 000 Removing and installing/replacing left or right output shaft.**
- Press right output shaft approx. 7 to 8 cm out of front differential, see **31 60 ... Pressing output shaft out of drive flange (wheel hub) and drawing in.**
- Remove front propeller shaft, see **REMOVAL & INSTALLATION** .
- Replacement only:
 - Replace front axle output flange on transfer case.

NOTE: **Replace the output flange to ensure a clean seal on the transfer case.**

IMPORTANT: **Grip front differential firmly while releasing last bolt in order to avoid damage caused by the differential falling.**

Version with automatic transmission: If necessary, disconnect hydraulic lines from oil sump.

Release screws (1).

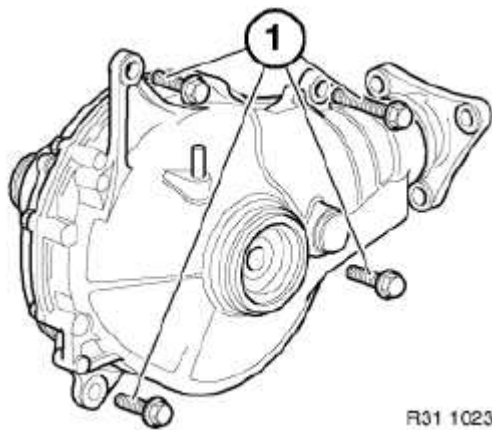
Tightening torque: 31 50 7AZ, see **31 50 FRONT AXLE DIFFERENTIAL** .

Detach front differential from oil sump and carefully feed out towards bottom.

Installation:

Replace O-ring if necessary.

Coat O-ring with front differential oil.



R31 1023

Fig. 90: Front Differential Screws

Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Drain and dispose of front differential oil, see **31 50 ... Changing front differential oil.**
- Check transfer case oil level, see **27 00 ... TOPPING UP/CHANGING TRANSFER CASE OIL** , correct if necessary
- Check fluid level in automatic transmission, correct if necessary

NOTE: Only necessary if the hydraulic lines have been disconnected from the automatic transmission / transmission oil cooler.

51 SEAL AND O-RINGS

31 51 010 REPLACING RADIAL SEAL FOR DRIVE FLANGE OF FRONT DIFFERENTIAL

Special tools required:

See **23 MANUAL TRANSMISSION** , **31 FRONT AXLE** , **33 REAR AXLE**

- 23 0 020
- 31 5 130

- 33 1 150

Necessary preliminary tasks:

- Remove reinforcement plate, see **31 10 010 Removing and installing/replacing reinforcement plate.**
- Remove front propeller shaft, see **26 11 000 REMOVING AND INSTALLING PROPELLER SHAFT (CARDAN UNIVERSAL JOINT) COMPLETELY .**

Mark position of nut with respect to shaft with punch marks (arrow).

Lever out lockplate (1) with a suitable tool.

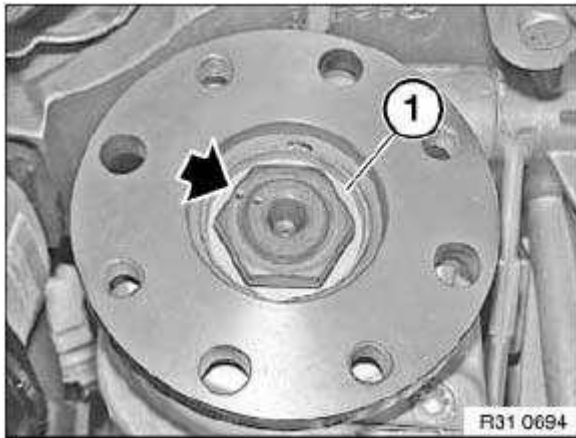


Fig. 91: Locating Lockplate Punch Marks
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage!
Do not place special tool on threaded holes of drive flange.

Secure drive flange with special tool 23 0 020 against turning and release nut (1).

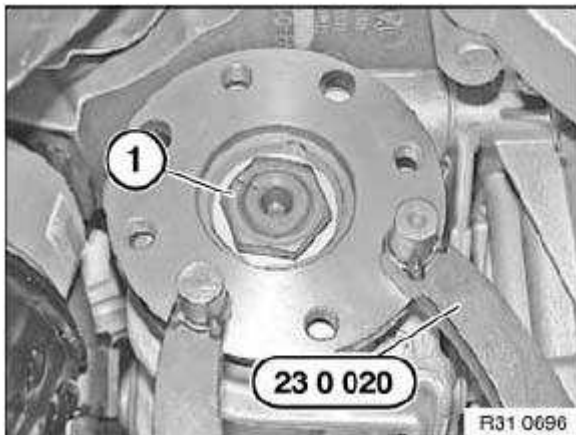


Fig. 92: Special Tool (23 0 020) And Nut
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage!
Mount special tool only with longer screws (M10x30) on drive flange.

Pull drive flange off drive shaft with special tool 33 1 150 .

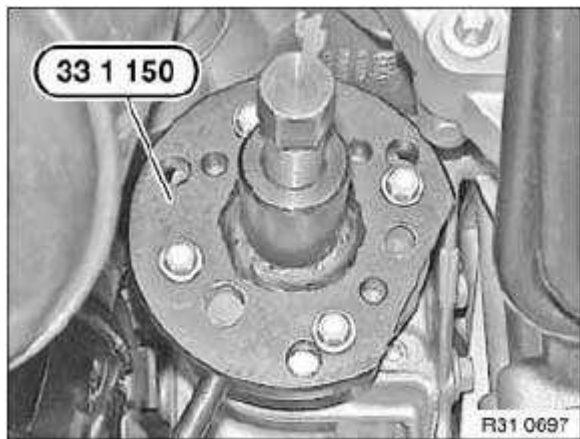


Fig. 93: Special Tool (33 1 150)
Courtesy of BMW OF NORTH AMERICA, INC.

Lever shaft seal (1) out of front differential with a suitable screwdriver (2).

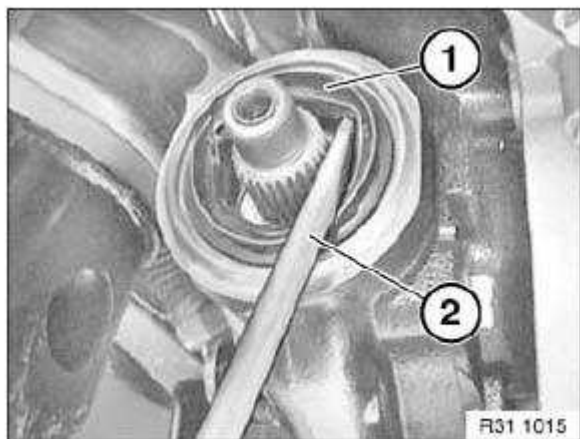


Fig. 94: Shaft Seal And Screwdriver
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Drive in shaft seal with special tool 31 5 130 as far as it will go.

Coat sealing lips of new shaft seal (1) with front differential oil.

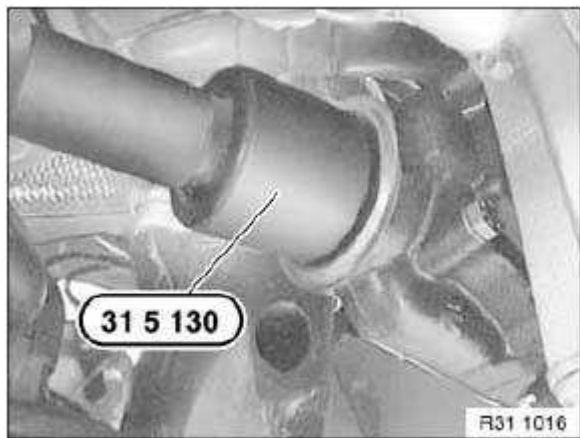


Fig. 95: Special Tool (31 5 130)

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage!

Do not tighten nut beyond punch marks. Otherwise the clamping sleeve will be damaged.

Clean drive flange and attach.

Tighten down nut until punch marks on nut and shaft are aligned.

Install new lockplate (1).

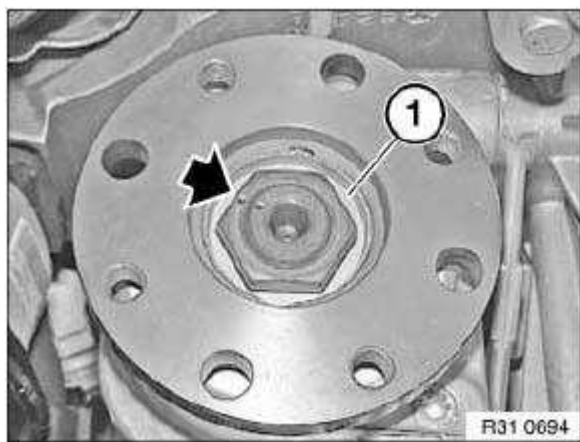


Fig. 96: Locating Lockplate Punch Marks

Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Check front differential oil, see 31 50 ... Changing front differential oil.

31 51 015 REPLACING SHAFT SEAL FOR LEFT OUTPUT SHAFT

Special tools required:

- 31 5 130 SET OF IMPACT DRIFTS

Necessary preliminary tasks:

- Remove left output shaft, see 31 60 000 Removing and installing/replacing left or right output shaft.

Lever shaft seal (1) with a screwdriver (2) out of front differential (3).

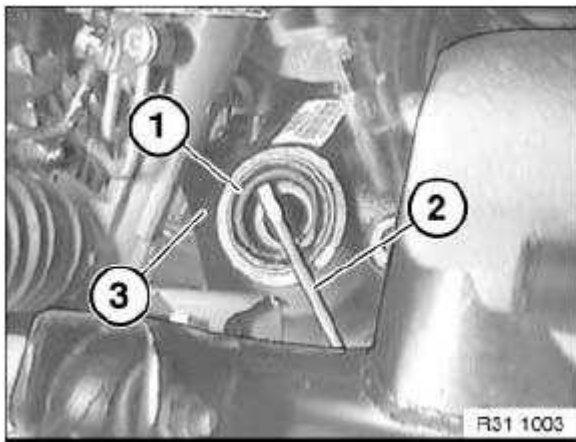


Fig. 97: Shaft Seal, Screwdriver And Front Differential
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Protective sleeve (2) serves to protect the sealing lips of shaft seal (1) from being damaged when the output shaft is inserted into the front differential.



Fig. 98: Protective Sleeve And Shaft Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Drive in shaft seal with special tool 31 5 130 as far as it will go.

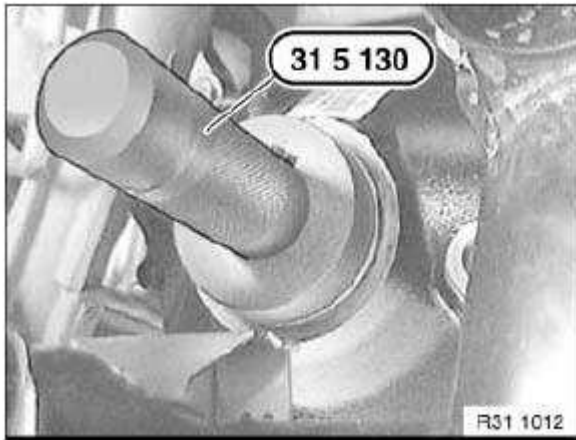


Fig. 99: Special Tool (31 5 130)
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Check front differential oil, see **31 50 ... Changing front differential oil.**

31 51 020 REPLACING SHAFT SEAL FOR RIGHT OUTPUT SHAFT

Special tools required:

- 31 5 130

Necessary preliminary tasks:

- Press right output shaft approx. 7 to 8 cm out of front differential, see **31 60 ... Pressing output shaft out of drive flange (wheel hub) and drawing in.**

Lever shaft seal (1) with a screwdriver (2) out of bearing block (3).

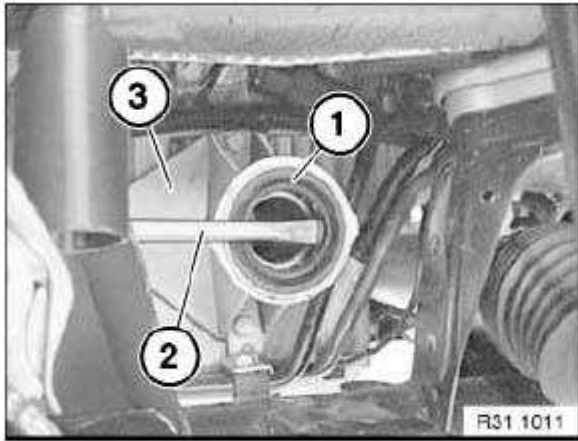


Fig. 100: Shaft Seal, Screwdriver And Bearing Block
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Protective sleeve (2) serves to protect the sealing lips of shaft seal (1) from being damaged when the output shaft is inserted into the bearing block.

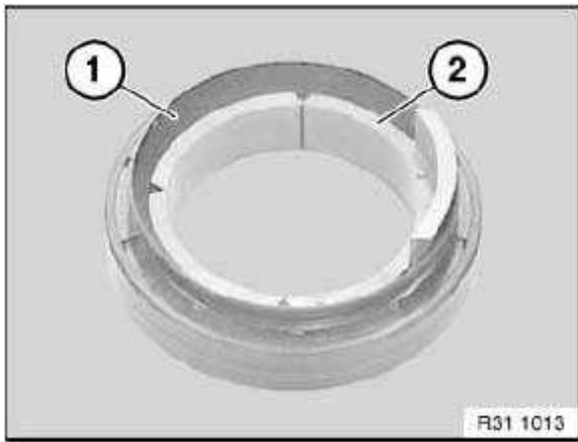


Fig. 101: Protective Sleeve And Shaft Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Drive in shaft seal with special tool 31 5 130 as far as it will go.

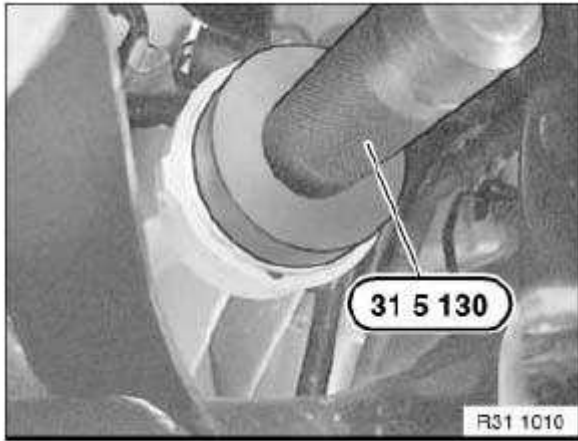


Fig. 102: Special Tool (31 5 130)

Courtesy of BMW OF NORTH AMERICA, INC.

31 51 060 REPLACING O-RING FOR FRONT DIFFERENTIAL ON RIGHT

Necessary preliminary tasks:

- Remove front differential, see **31 50 001 Removing and installing/replacing front differential.**

Remove O-ring (1) with a suitable tool from front differential.

Installation:

Insert O-ring (1) in groove and coat with front differential oil.

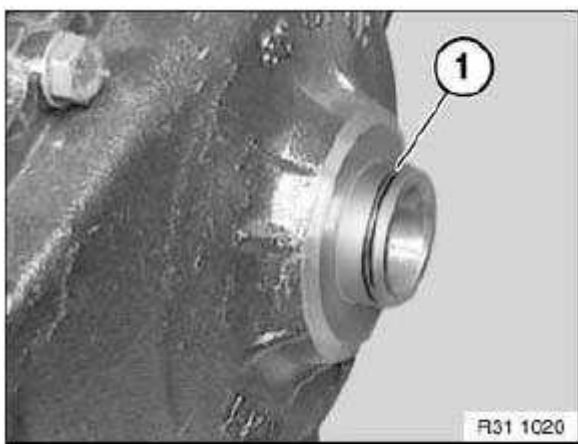


Fig. 103: O-Ring

Courtesy of BMW OF NORTH AMERICA, INC.

31 51 065 REPLACING O-RING FOR BEARING BLOCK

Necessary preliminary tasks:

- Remove bearing block, see **31 53 040 Removing and installing/replacing right output shaft bearing block**.

Remove O-ring (1) with a suitable tool from bearing block (2).

Installation:

Insert O-ring (1) in groove and coat with front differential oil.

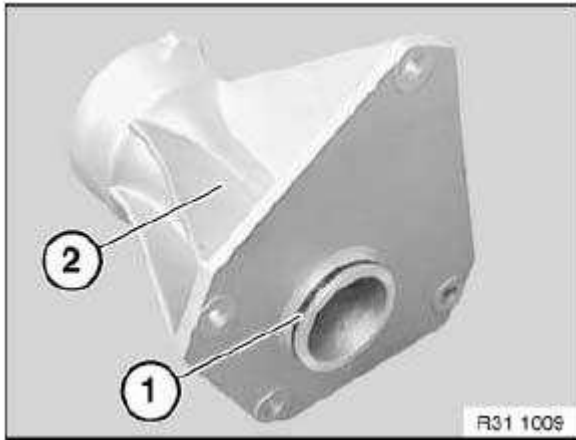


Fig. 104: O-Ring And Bearing Block
 Courtesy of BMW OF NORTH AMERICA, INC.

53 DIFFERENTIAL WITH BEARINGS

31 53 040 REMOVING AND INSTALLING/REPLACING RIGHT OUTPUT SHAFT BEARING BLOCK

Necessary preliminary tasks:

- Press right output shaft approx. 7 to 8 cm out of front differential, see **31 60 ... Pressing output shaft out of drive flange (wheel hub) and drawing in**.

N46:

Release screw (1) and remove heat shield from bearing block.

Tightening torque: 31 60 3AZ, see **31 60 OUTPUT SHAFT** .

Release screws (2) and remove bearing block support with heat shield.

Tightening torque: 31 60 2AZ, see **31 60 OUTPUT SHAFT** .

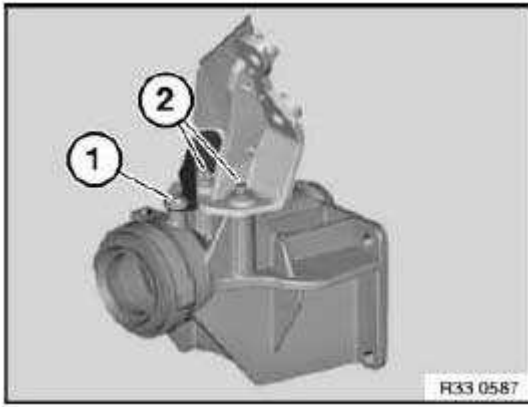


Fig. 105: Heat Shield Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Release grounding strap on bearing block.

Release screws and remove bearing block (1) from oil sump.

Installation:

Replace O-ring / remove protective caps.

Tightening torque: 31 60 1AZ, see **31 60 OUTPUT SHAFT** .

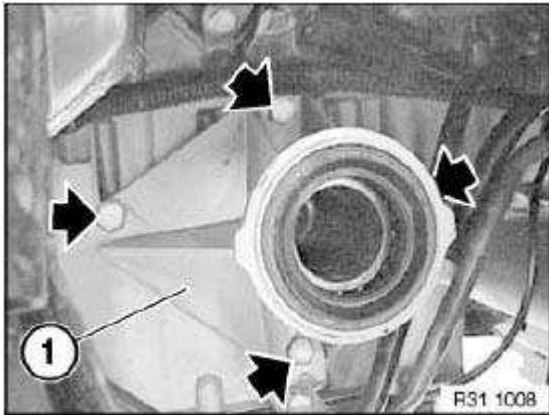


Fig. 106: Locating Bearing Block Screws

Courtesy of BMW OF NORTH AMERICA, INC.

60 OUTPUT SHAFT

31 60 ... PRESSING OUTPUT SHAFT OUT OF DRIVE FLANGE (WHEEL HUB) AND DRAWING IN

Special tools required:

See **33 REAR AXLE**

- 33 2 111
- 33 2 115
- 33 2 116
- 33 2 117
- 33 2 118
- 33 2 160
- 33 2 201
- 33 2 202
- 33 2 203
- 33 2 205
- 33 2 207
- 33 2 208
- 33 5 070

WARNING: Risk of injury!

It is not permitted to use the impact screwdriver to press out and draw in the output shaft.

IMPORTANT: Risk of damage!

To avoid damaging the output shaft and adjoining parts, it is essential during the pressing-out process to repeatedly check and if necessary correct the position of the output shaft.

IMPORTANT: To avoid damaging the dust sleeve, use special tool 33 2 160 to press out and draw in the output shaft after removing the brake disk.

NOTE: Rounded inside edge of special tool 33 2 160 must point to drive flange.

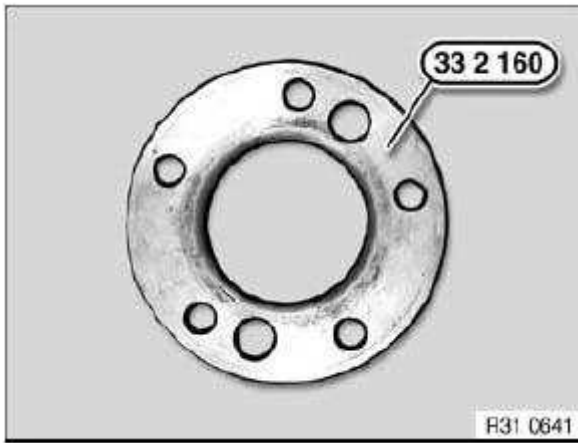


Fig. 107: Special Tool (33 2 160)

Courtesy of BMW OF NORTH AMERICA, INC.

Special tool 33 2 200:

Screw on special tool 33 2 203 , 33 2 207 and 33 2 201 with all wheel studs to drive flange.

Press output shaft out of drive flange; in so doing, grip basic body 33 2 201 with special tools 33 2 202 and 33 5 070 .

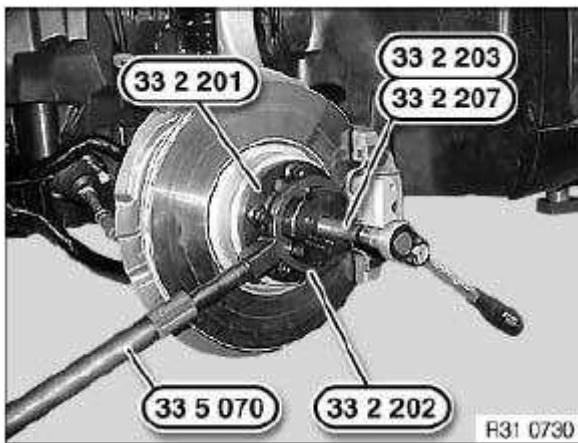


Fig. 108: Special Tools (33 2 201), (33 2 202) And (33 2 203)

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: No oil permitted on shaft journal thread!

Lightly oil spline teeth of output shaft.

Insert output shaft into drive flange.

Screw special tool 33 2 205 onto output shaft.

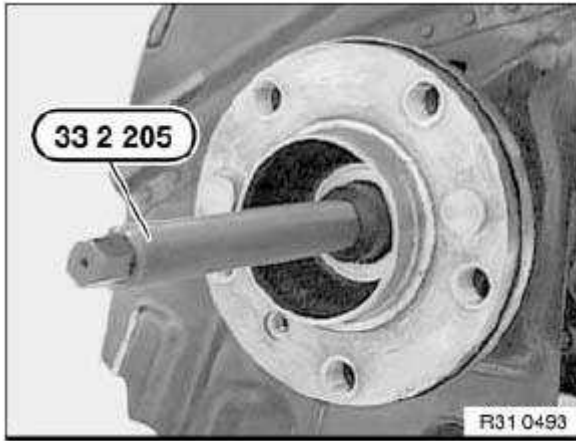


Fig. 109: Special Tool (33 2 205)
 Courtesy of BMW OF NORTH AMERICA, INC.

Mount special tool 33 2 201 with three wheel studs to drive flange.

Draw in output shaft with special tool 33 2 208 up to stop; in so doing, grip basic body 33 2 201 with special tools 33 2 202 and 33 5 070 .

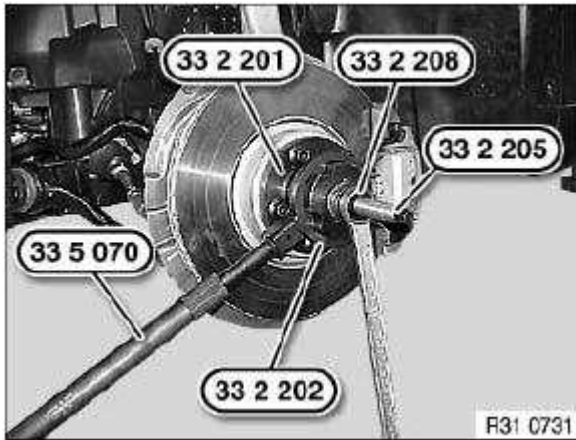


Fig. 110: Special Tools (33 2 201), (33 2 202) And (33 2 208)
 Courtesy of BMW OF NORTH AMERICA, INC.

Special tool 33 2 100:

Screw on special tool 33 2 111 , 33 2 117 and 33 2 116 with all wheel studs to drive flange.

Press output shaft out of drive flange; in so doing, grip basic body 33 2 116 with special tools 33 2 202 and 33 5 070 .

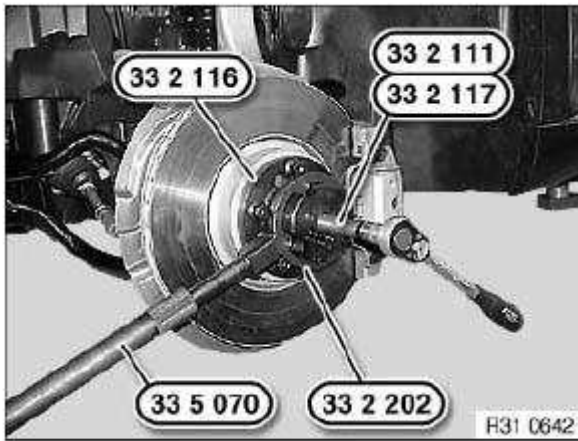


Fig. 111: Special Tools (33 2 116), (33 2 111) And (33 2 117)
 Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: No oil permitted on shaft journal thread!

Lightly oil spline teeth of output shaft.

Insert output shaft into drive flange.

Screw special tool 33 2 118 onto output shaft.

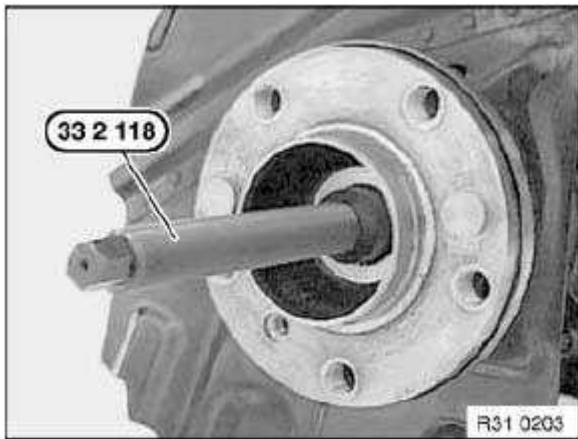


Fig. 112: Special Tool (33 2 118)
 Courtesy of BMW OF NORTH AMERICA, INC.

Mount special tool 33 2 116 with three wheel studs to drive flange.

Draw in output shaft with special tool 33 2 115 up to stop; in so doing, grip basic body 33 2 116 with special tools 33 2 202 and 33 5 070 .

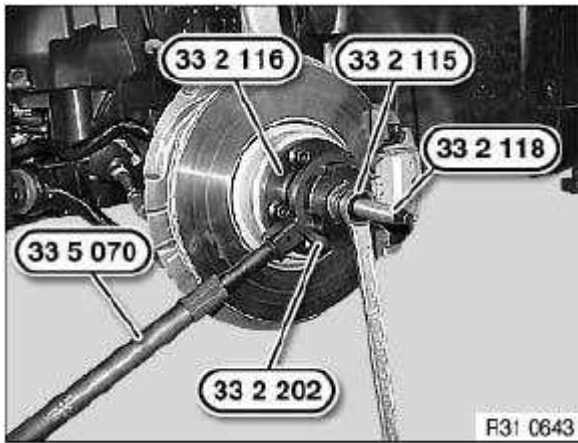


Fig. 113: Special Tools (33 2 116), (33 2 115) And (33 2 118)
Courtesy of BMW OF NORTH AMERICA, INC.

31 60 000 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT OUTPUT SHAFT

Special tools required:

- **31 5 110 REMOVAL FORK**

IMPORTANT: Risk of damage!

Do not drive output shaft out of drive flange with an impact tool.

Remove front wheels, see **36 10 300 REMOVING OR INSTALLING FRONT OR REAR WHEEL** .

Release collar nut; to do so, press brake pedal to floor.

Installation:

Replace collar nut, apply a light coating of oil to contact surface and tighten down.

Tightening torque: 31 21 2AZ, see **31 21 WHEEL BEARINGS AND STEERING KNUCKLE** .

Secure collar nut by peening on flat areas of output shaft.

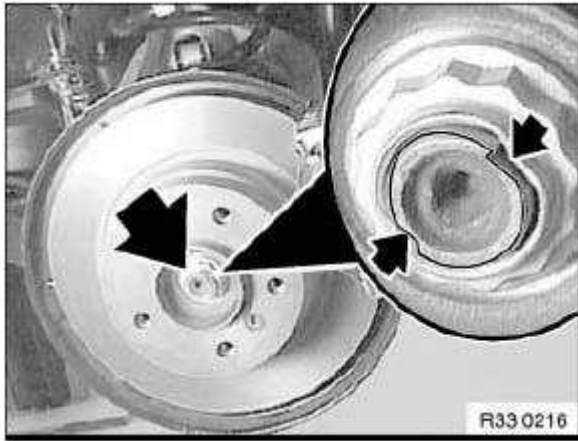


Fig. 114: Locating Collar Nut

Courtesy of BMW OF NORTH AMERICA, INC.

Remove reinforcement plate, see **31 10 010 Removing and installing/replacing reinforcement plate.**

If necessary, remove steering gear cover at side

Remove tie rod end from swivel bearing, see **32 21 151 REPLACING LEFT OR RIGHT TIE ROD .**

Remove guide joint from swivel bearing, see **31 12 026 Removing and installing/replacing guide joint in swivel bearing.**

Remove control arm from swivel bearing, see **31 12 000 Removing and installing/replacing left or right control arm.**

Remove stabilizer link from stabilizer, see **31 35 005 Removing and installing/replacing push rod (stabilizer link) for left/right stabilizer.**

Remove front pulse generator, see **34 52 525 REPLACING ONE FRONT PULSE GENERATOR** from swivel bearing.

Turn swivel bearing to one side.

Press output shaft out of drive flange, see **31 60 ... Pressing output shaft out of drive flange (wheel hub) and drawing in.**

Press output shaft with special tool 31 5 110 out of front differential/bearing block and remove.

Installation:

Replace shaft seal, see **31 51 015 Replacing shaft seal for left output shaft** in front differential/bearing block and coat sealing lips with front differential oil.

Replace retaining ring and slide in output shaft over resistance of retaining ring. Output shaft must snap audibly

into place.

**IMPORTANT: High installation forces indicate that the spline teeth on the output shaft/rear differential side gear are damaged/deformed!
Check spline teeth, replaced damaged parts.**

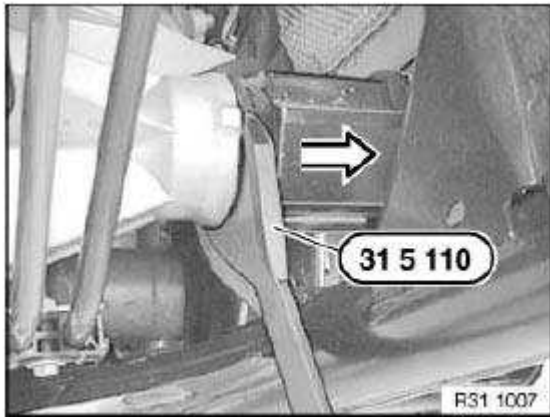


Fig. 115: Removing Output Shaft From Front Differential/Bearing Block
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Check front differential oil, see **31 50 ... Changing front differential oil.**

31 60 530 REPLACING AN OUTPUT SHAFT GAITER (ON TRANSMISSION SIDE) (OUTPUT SHAFT REMOVED)

NOTE: Procedure is described in the document " both output shaft gaiters..." see **31 60 535 Replacing both gaiters on left and right of output shaft.**

31 60 535 REPLACING BOTH GAITERS ON LEFT AND RIGHT OF OUTPUT SHAFT

Necessary preliminary tasks:

- Remove and clean output shaft, see **31 60 000 Removing and installing/replacing left or right output shaft.**

Grip output shaft (1) in vice with aluminium clamping jaws.

NOTE: 2 = Joint, wheel side
3 = Joint, transmission side

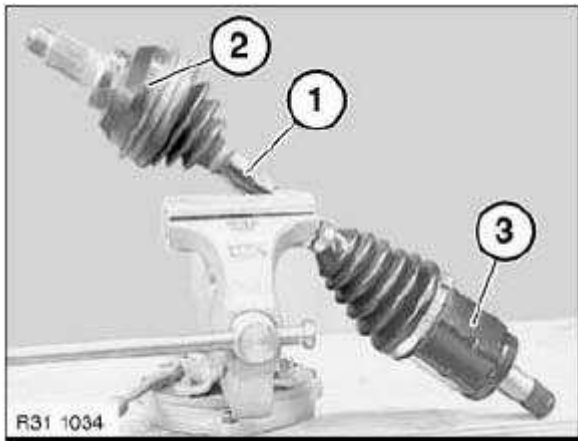


Fig. 116: Output Shaft, Wheel And Transmission Side Joint
Courtesy of BMW OF NORTH AMERICA, INC.

Replacing gaiter of wheel-side joint:

Release band clamps (1, 2).

Pull back gaiter (3).

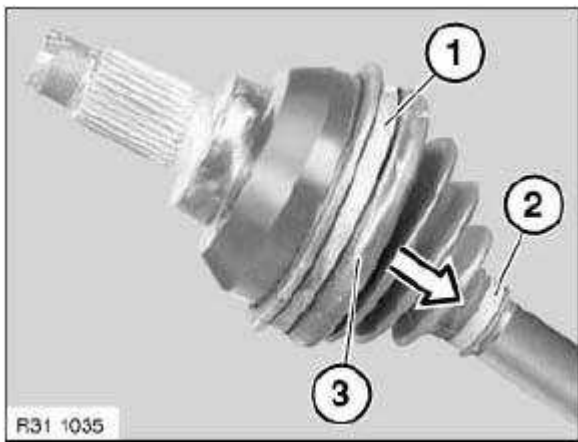


Fig. 117: Pulling Back Gaiter
Courtesy of BMW OF NORTH AMERICA, INC.

Press off joint (1) via contact pressure of retaining ring on shaft (2).

Installation:

Push on joint until retaining ring can be heard to snap into place.

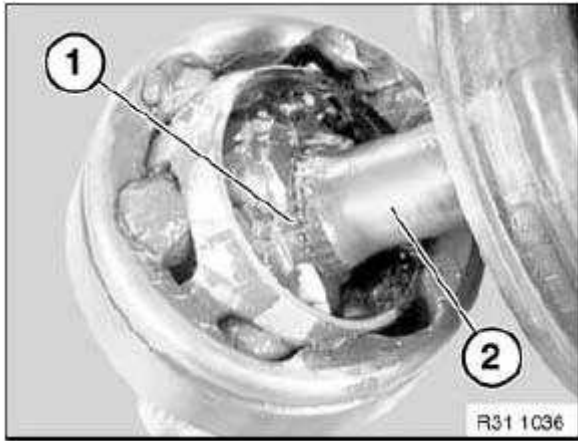


Fig. 118: Joint And Shaft

Courtesy of BMW OF NORTH AMERICA, INC.

Lift out retaining ring (1).

Installation:

Replace retaining ring (1).

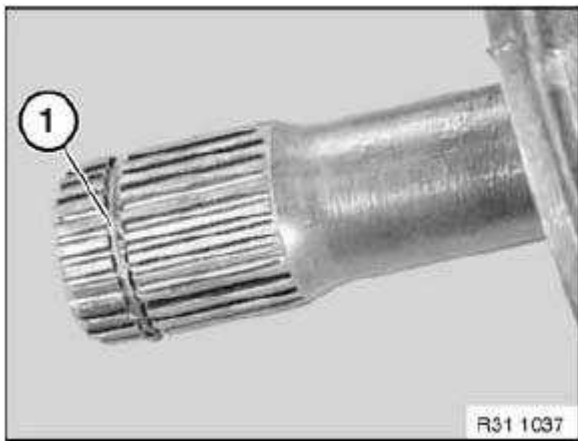


Fig. 119: Retaining Ring

Courtesy of BMW OF NORTH AMERICA, INC.

Pull off gaiter (1) over shaft (2).

Carefully clean all parts with a cloth.

NOTE: Regrease constant-velocity joint with the grease from the repair kit.

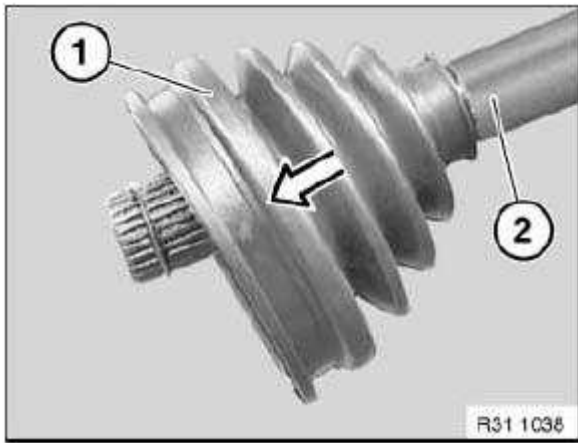


Fig. 120: Pulling Gaiter Over Shaft

Courtesy of BMW OF NORTH AMERICA, INC.

Replacing gaiter of transmission-side joint:

Release band clamps (1, 2).

Pull back gaiter (3).

Detach tulip element (4).

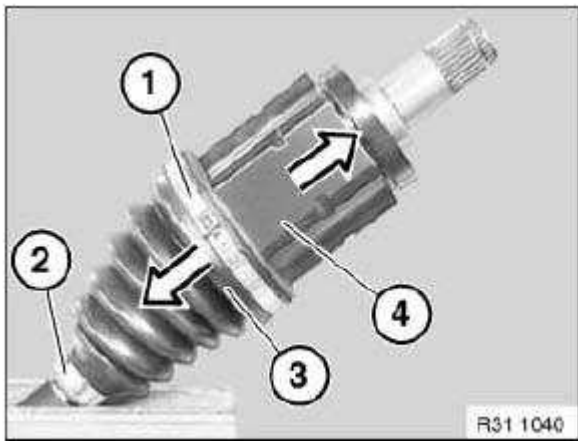


Fig. 121: Detaching Tulip Element

Courtesy of BMW OF NORTH AMERICA, INC.

Remove retaining ring (1).

Installation:

Replace retaining ring (1).

Detach tripod element (2) from shaft (3).

Pull off gaiter over shaft (3).

Carefully clean all parts with a cloth.

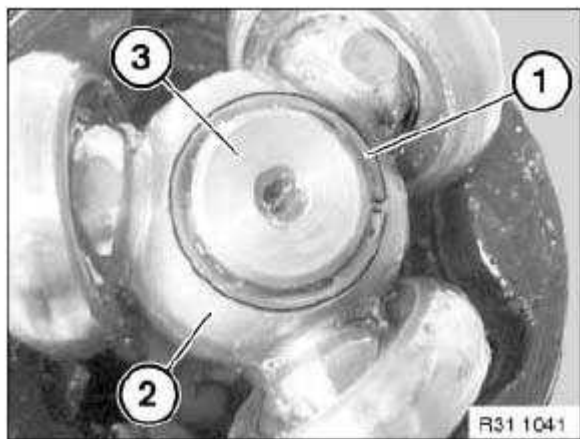


Fig. 122: Retaining Ring, Tripod Element And Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Flat side (2) of tripod element (1) must point to retaining ring.

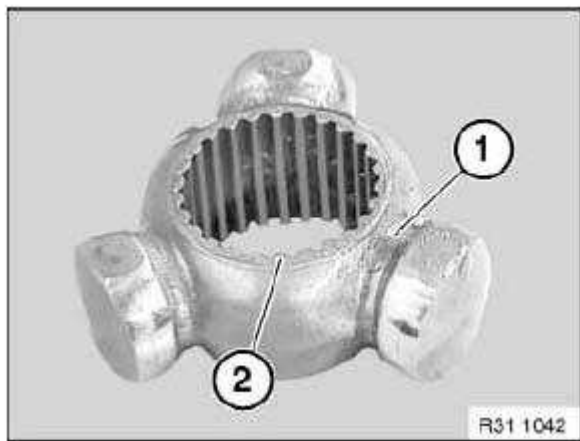


Fig. 123: Tripod Element Flat Side
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Before pushing gaiter onto shaft: assemble gaiter (1) and gaiter adapter (2).

NOTE: Regrease constant-velocity joint (tripod element) with the grease from the repair kit.

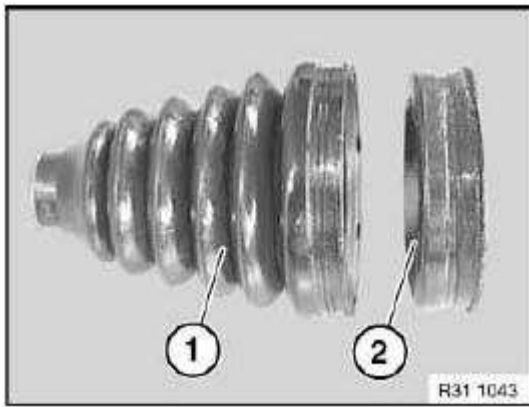


Fig. 124: Gaiter And Gaiter Adapter
 Courtesy of BMW OF NORTH AMERICA, INC.

90 TROUBLESHOOTING

31 90 ... FRONT AXLE TROUBLESHOOTING

Follow troubleshooting for steering/shock absorbers, see **31 90 ... Troubleshooting shock absorber.**

STEERING/SHOCK ABSORBERS TROUBLESHOOTING CHART

Fault	Cause	Remedy
Grinding noise (louder when negotiating bends)	Wheel bearings faulty	Replace wheel bearings 31 21 180 Replacing bearing for front wheel
Vibration	Wheel imbalance	Balance wheels 36 10 508 STATIONARY WHEEL BALANCING
	Radial/lateral rim runout	Check rims 36 12 001 REPLACING A TYRE , replace if necessary
	Radial tire runout	Match or replace tires 36 10 209 CHECKING FRONT AND REAR WHEEL FOR FACE AND RADIAL RUNOUT
Steering-wheel shake	Wheel imbalance	Balance wheels 36 10 508 STATIONARY WHEEL BALANCING
	Radial/lateral rim runout	Check rims 36 12 001 REPLACING A TYRE , replace if necessary
	Rubber mount of control arm faulty	Replace rubber mounts on both control arms 31 12 135 Replacing rubber mounts on both control arms
	Ball joint in control arm worn	Replace control arms 31 12 135 Replacing rubber mounts on both control arms
	Rubber mount of tension strut faulty	Replace rubber mounts on both tension struts 31 12 138 Replacing rubber mounts on both tension struts
	Guide joint of tension strut worn	Replace guide joint, see 31 12 026 Removing and installing/replacing guide joint in swivel bearing

	Refer to <u>32 90 ... TROUBLESHOOTING ON STEERING</u>	
Excessive steering wheel play/steering wheel inclination	Rubber mount of control arm faulty	Replace rubber mounts on both control arms <u>31 12 135 Replacing rubber mounts on both control arms</u>
	Ball joint in control arm worn	Replace control arms <u>31 12 135 Replacing rubber mounts on both control arms</u>
	Rubber mount of tension strut faulty	Replace rubber mounts on both tension struts <u>31 12 138 Replacing rubber mounts on both tension struts</u>
	Guide joint of tension strut worn	Replace guide joint, see <u>31 12 026 Removing and installing/replacing guide joint in swivel bearing</u>
	Refer to <u>32 90 ... TROUBLESHOOTING ON STEERING</u>	
Rattling noise	Bolts for reinforcement plate loose	Tighten down bolts (refer to <u>31 10 010 Removing and installing/replacing reinforcement plate</u>)
	Bolts for front axle carrier to engine carrier loose	Replace bolts (refer to <u>31 11 506 Lowering/raising front axle carrier</u>)
	Bolt for spring strut to swivel bearing loose	Replace bolt & nut (refer to <u>31 31 031 Replacing front left or right spring strut shock absorber</u>)
	Ball joint in control arm worn	Replace control arms <u>31 12 135 Replacing rubber mounts on both control arms</u>
	Guide joint of tension strut worn	Replace guide joint, see <u>31 12 026 Removing and installing/replacing guide joint in swivel bearing</u>
	Rubber mounts for stabilizer bar bracket faulty	Replace both rubber mounts of stabilizer bar bracket <u>31 35 021 Replacing rubber mounts of stabilizer retaining fixture on front axle subframe</u>
Excessive tire wear	Ball joints on stabilizer link(s) worn	Replace both stabilizer links <u>31 35 005 Removing and installing/replacing push rod (stabilizer link) for left/right stabilizer</u>
	Front or rear axle alignment incorrectly adjusted	Check suspension components for damage; if necessary, carry out chassis/wheel alignment check <u>32 00 150 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH LOAD UP TO DESIGN POSITION</u>

31 90 ... TROUBLESHOOTING SHOCK ABSORBER

Read and comply with Information on replacing shock absorbers, see 31 00 ... Information on replacing shock absorbers.

SHOCK ABSORBER TROUBLESHOOTING CHART

Fault	Cause	Remedy
Wheel knocking (bottoming)	Rubber damper faulty	Visually inspect auxiliary spring for cracking, replace auxiliary spring <u>31 31 031 Replacing front left or right spring strut shock absorber</u>
	Shock absorber leaking	Replace shock absorber <u>31 31 031 Replacing</u>

	(oil/gas)	<u>front left or right spring strut shock absorber</u>
Rattling noise	Shock absorber mounting loose	Replace shock absorber <u>31 31 031 Replacing front left or right spring strut shock absorber</u>
	Support bearing faulty/hardened	Replace support bearing <u>31 31 031 Replacing front left or right spring strut shock absorber</u>
	Shock absorber leaking (oil/gas)	Replace shock absorber <u>31 31 031 Replacing front left or right spring strut shock absorber</u>
Worn down areas (flattened areas) on tire profile	Shock absorber leaking (oil/gas)	Replace shock absorber <u>31 31 031 Replacing front left or right spring strut shock absorber</u>
Long after-swinging of body after driving over rough road	Shock absorber leaking (insufficient shock absorber effect)	Replace shock absorber <u>31 31 031 Replacing front left or right spring strut shock absorber</u>
Building-up of body in case of successive uneven surfaces	Shock absorber leaking (insufficient shock absorber effect)	Replace shock absorber <u>31 31 031 Replacing front left or right spring strut shock absorber</u>
Wheels jumping even on normal road surfaces	Shock absorber leaking (insufficient shock absorber effect)	Replace shock absorber <u>31 31 031 Replacing front left or right spring strut shock absorber</u>
Whistling noises	Separating skin in vent holes of auxiliary spring	Remove separating skin

SUSPENSION

Integrated Suspension Systems - Operating Fluids

1.0 GENERAL INFORMATION

LHM hydraulic fluid has a favorable viscosity range and permits problem-free operation of the self-leveling rear suspension at very low and very high temperatures. The solidification point is $-78^{\circ}\text{F}/-61^{\circ}\text{C}$.

2.0 APPROVED HYDRAULIC FLUIDS

E24, E28 produced prior to 9/87

Pentosin CHF 4548 was used for initial factory filling.

For filling up and replacement the following oil is to be used:

Pentosin CHF 7.1 BMW Part No. 81 22 1 468 879

Pentosin CHF 4548 and CHF 7.1 can be mixed in these cars.

For complete system oil replacement:

Reputable brand name LHM oils (green color) can also be used (Shell, Castrol, Exxon, etc.)

NOTE: Mixing of CHF and LHM oils is not permitted.

E24, E28 produced since 9/87

Pentosin CHF 7.1 is used for initial factory filling.

For filling up and replacement use only Pentosin CHF 7.1

BMW Part No. 81 22 1 468 879

For complete oil replacement:

Reputable brand name LHM oils (green color) can also be used.

NOTE: Mixing of CHF 7.1 and LHM oils is not permitted.

E32 produced prior to 9/91

Use only Pentosin CHF 7.1.

Mixing with other oils is not permitted.

E32, E34 produced since 9/91

Use only Pentosin CHF 11S

NOTE: All cars have a label indicating the respective type on the hydraulic fluid reservoir. Since both Pentosin CHF 11S and CHF 7.1 are green in color, the reservoir label must be carefully checked prior to adding fluid.

Mixing CHF 11S and CHF 7.1 is not permitted.

Pentosin CHF 11S BMW Part No. 82 11 1 468 041

E38 produced since 1/94

Use only Pentosin CHF 11S

NOTE: All cars have a label indicating the respective type on the hydraulic fluid reservoir. Since both Pentosin CHF 11S and CHF 7.1 are green in color, the reservoir label must be carefully checked prior to adding fluid.

Mixing CHF 11S and CHF 7.1 is not permitted.

Pentosin CHF 11S BMW Part No. 82 11 1 468 041

3.0 CHECKING HYDRAULIC FLUID LEVELS

The hydraulic fluid level must be checked on an unloaded car and at every Inspection I or, for cars without a Service Indicator, at 10,000 mi/15,000 km intervals.

NOTE: Not required as of 1993 model year vehicles.

Special checking instructions apply to the E32.

NOTE: Never fill above the "max" mark. There are no replacement intervals for hydraulic fluid.

SUSPENSION

Integrated Suspension Systems - Repair Instructions - X3

00 GENERAL

00 DANGER OF POISONING IF OIL IS INGESTED/ABSORBED THROUGH THE SKIN

Danger of poisoning!

Ingesting oil or absorbing through the skin may cause poisoning!

Possible symptoms are:

- Headaches
- Dizziness
- Stomach aches
- Vomiting
- Diarrhoea
- Cramps/fits
- Unconsciousness

Protective measures/rules of conduct:

- Pour oil only into appropriately marked containers
- Do not pour oil into drinking vessels (drinks bottles, glasses, cups or mugs)
- Observe country-specific safety regulations

First aid measures:

- Do not induce vomiting.

If the person affected is still conscious, he/she must rinse out their mouth with water, drink plenty of water and consult a doctor immediately.

If the person affected is unconscious, do not administer anything by mouth, place the person in the recovery position and seek immediate medical attention.

00 RISK OF INJURY IF OIL COMES INTO CONTACT WITH EYES AND SKIN

Danger of injury!

Contact with eyes or skin may result in injury!

Possible symptoms are:

- Impaired sight
- Irritation of the eyes
- Reddening of the skin
- Rough and cracked skin

Protective measures/rules of conduct:

- Wear protective goggles
- Wear oil-resistant protective gloves
- Observe country-specific safety regulations

First aid measures:

- Eye contact: Rinse eyes immediately with plenty of water for at least 15 minutes; if available, use an eye-rinsing bottle. If irritation of the eyes persists, consult a doctor.
- Skin contact: Wash off with soap and water immediately. If irritation persists, consult a doctor.

NOTE: Do not use solvents/thinners.

00 SAFETY INSTRUCTIONS FOR HANDLING OIL

WARNING: Danger of poisoning if oil is ingested/absorbed through the skin! See 00 DANGER OF POISONING IF OIL IS INGESTED/ABSORBED THROUGH THE SKIN .

Risk of injury if oil comes into contact with eyes and skin! See 00 RISK OF INJURY IF OIL COMES INTO CONTACT WITH EYES AND SKIN .

Recycling:

Observe country-specific waste-disposal regulations.

Measures if oil is unintentionally released:

- Personal precautionary measures: Danger of slipping! Keep non-involved persons away from the work area. Wear personal protective clothing/equipment.
- Environmental protection measures: Prevent oil from draining into drain channels, sewerage systems, pits, cellars, water and the ground.
- Limiting spread: Use oil blocks to prevent the surface spread of oil.
- Cleaning procedure: Bind and dispose of escaped oil with nonflammable absorbents.

NOTE: Do not flush oil away with water or aqueous cleaning agents.

14 ELECTRICAL COMPONENTS

37 14 511 REPLACING FRONT RIDE-HEIGHT SENSOR

IMPORTANT: Read and comply with 61 35 ... NOTES ON ESD PROTECTION (ELECTRO STATIC DISCHARGE) .

Disconnect plug connection (1).

Release nut (2) and disconnect jointed rod.

Tightening torque: 37 14 7AZ , see 37 14 ELECTRIC COMPONENTS .

Release screws and remove ride-height sensor (4).

Installation:

Sensor lever (3) must point from ride-height sensor (4) to right front wheel.

Tightening torque: 37 14 6AZ , see 37 14 ELECTRIC COMPONENTS .

After installation:

- Check headlight adjustment, correct if necessary, see 63 10 004 ADJUSTING HEADLIGHTS .

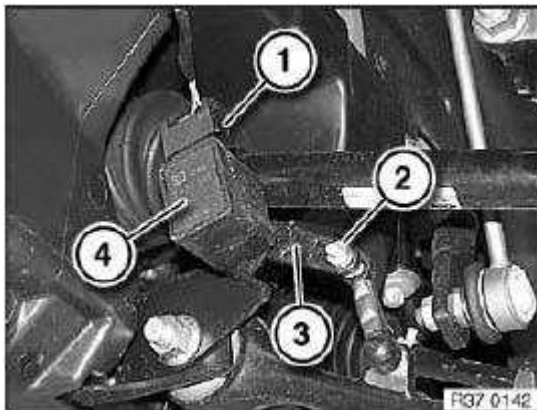


Fig. 1: Plug Connection, Nut And Lever
Courtesy of BMW OF NORTH AMERICA, INC.

37 14 512 REPLACING REAR RIDE-HEIGHT SENSOR (EARLY VERSION)

IMPORTANT: Read and comply with 61 35 ... NOTES ON ESD PROTECTION (ELECTRO STATIC DISCHARGE) .

Disconnect plug connection (1).

Release nut (3) and disconnect jointed rod.

Tightening torque: 37 14 7AZ , see **37 14 ELECTRIC COMPONENTS** .

Release screws (4) and remove ride-height sensor.

Installation:

Sensor lever (2) must point from ride-height sensor to right rear wheel.

Tightening torque: 37 14 6AZ , see **37 14 ELECTRIC COMPONENTS** .

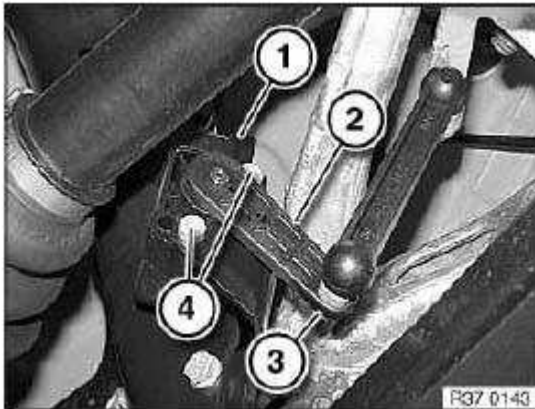


Fig. 2: Plug Connection, Nut, Screws And Sensor Lever
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Check headlight adjustment, correct if necessary, see **63 10 004 ADJUSTING HEADLIGHTS** .

37 14 512 REPLACING REAR RIDE-HEIGHT SENSOR

IMPORTANT: Read and comply with 61 35 ... NOTES ON ESD PROTECTION (ELECTRO STATIC DISCHARGE) .

Disconnect connector connection. Release nut (1) and disconnect jointed rod. Tightening torque, see 37 14 4AZ in **37 14 ELECTRIC COMPONENTS** . Release screws (2) and remove ride-height sensor. Tightening torque, see 37 14 3AZ in **37 14 ELECTRIC COMPONENTS** .

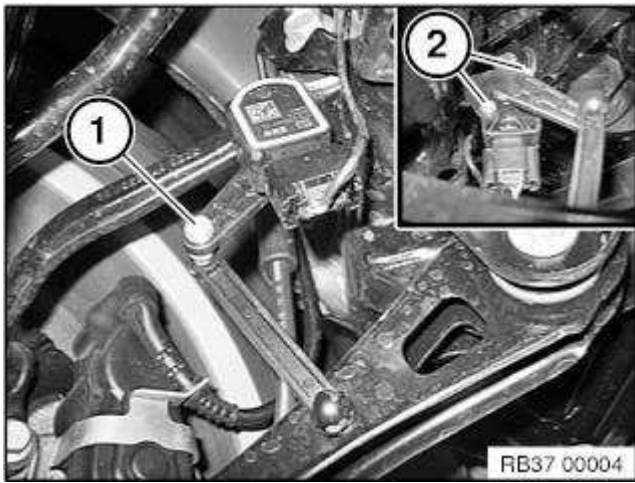


Fig. 3: Release Nut (1) And Disconnect Jointed Rod
Courtesy of BMW OF NORTH AMERICA, INC.

After installation: Check headlight setting, correct if necessary. Carry out ride-height adjustment (on vehicles with VDC).

SUSPENSION

Integrated Suspension Systems - Tightening Torques - X3

14 ELECTRICAL COMPONENTS

37 14 ELECTRIC COMPONENTS

ELECTRIC COMPONENTS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Wheel camber warning switch to console	E32, E34			9 Nm
2AZ Angled joint of jointed rod	E32, E34			5 Nm
3AZ Hydraulic switch to distributor	E24, E32			25 Nm
4AZ Hydraulic switch to hydraulic control unit	E24, E32			27 Nm
5AZ Solenoid valve to hydraulic control unit	E24, E32			55 Nm
6AZ Ride level sensor to holder	E39, E38, E46, E53, E52, E60, E61, E63, E64, E65, E66, E67, E83, E85, E86			5 Nm
7AZ Control rod / jointed rod to ride height sensor / bracket / control arm	E39, E46			9 Nm
	E53, E60, E61, E63, E64, E65, E66, E67, E83, E85, E86			8 Nm
	E38			5 Nm
	E52			10 Nm
8AZ Bracket ride level sensor to front axle carrier	E85, E86	M6		8 Nm
9AZ Control rod on transverse link (rear)	E38, E83			8 Nm
	E52			10 Nm

10AZ Control rod to swinging arm (rear)	E53, E60, E61, E63, E64, E65, E66			8 Nm
11AZ Bracket ride level sensor to rear axle carrier	E53, E60, E61, E63, E64, E65, E66, E83, E85, E86			8 Nm
12AZ Control lines for oscillating motor, rear, to valve block	E60, E61, E63, E64, E65, E66			35 Nm
13AZ Connecting nuts, hydraulic lines (pressure lines/control lines)	E60, E61, E63, E64, E65, E66			30 Nm
14AZ Line holder / pipe holder / holder	E60, E61, E63, E64, E65, E66			8 Nm
15AZ Control lines for oscillating motor, front, to valve block	E60, E61, E63, E64, E65, E66			35 Nm
16AZ Pressure line DYNAMIC DRIVE circuit to valve block	E60, E61, E63, E64, E65, E66			35 Nm
17AZ Valve block to holder	E60, E61, E63, E64, E65, E66			8 Nm
18AZ Control lines to oscillating motor	E60, E61, E63, E64, E65, E66			30 Nm
19AZ Return line to valve block	E60, E61, E63, E64, E65, E66			40 Nm
20AZ Holder, valve block, to body	E60, E61, E63, E64, E65, E66			8 Nm
20AZ Holder, valve block, to body	E64, E65, E66			8 Nm
21AZ Connecting nuts, hydraulic lines (return)	E60, E61, E63, E64, E65, E66			35 Nm
22AZ Bracket for jointed rod to front control arm	E85, E86	M6		8 Nm
23AZ Transversal acceleration sensor to body	E60, E61, E63, E64, E65, E66	M6		8 Nm
24AZ DYNAMIC DRIVE control unit to body	E60, E61, E63, E64	M8		2.5 Nm
	E65, E66	M6		4.5 Nm

25AZ Mounted acceleration sensor to bracket	E65, E66, E67	M6		8 Nm
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SUSPENSION

Rear Axle - Repair Instructions - X3

00 GENERAL

00 DANGER OF POISONING IF OIL IS INGESTED/ABSORBED THROUGH THE SKIN

Danger of poisoning!

Ingesting oil or absorbing through the skin may cause poisoning!

Possible symptoms are:

- Headaches
- Dizziness
- Stomach aches
- Vomiting
- Diarrhoea
- Cramps/fits
- Unconsciousness

Protective measures/rules of conduct:

- Pour oil only into appropriately marked containers
- Do not pour oil into drinking vessels (drinks bottles, glasses, cups or mugs)
- Observe country-specific safety regulations

First aid measures:

- Do not induce vomiting.

If the person affected is still conscious, he/she must rinse out their mouth with water, drink plenty of water and consult a doctor immediately.

If the person affected is unconscious, do not administer anything by mouth, place the person in the recovery position and seek immediate medical attention.

00 RISK OF INJURY IF OIL COMES INTO CONTACT WITH EYES AND SKIN

Danger of injury!

Contact with eyes or skin may result in injury!

Possible symptoms are:

- Impaired sight
- Irritation of the eyes
- Reddening of the skin
- Rough and cracked skin

Protective measures/rules of conduct:

- Wear protective goggles
- Wear oil-resistant protective gloves
- Observe country-specific safety regulations

First aid measures:

- Eye contact: Rinse eyes immediately with plenty of water for at least 15 minutes; if available, use an eye-rinsing bottle. If irritation of the eyes persists, consult a doctor.
- Skin contact: Wash off with soap and water immediately. If irritation persists, consult a doctor.

NOTE: Do not use solvents/thinners.

00 SAFETY INSTRUCTIONS FOR HANDLING OIL

**WARNING: Danger of poisoning if oil is ingested/absorbed through the skin!
Risk of injury if oil comes into contact with eyes and skin!**

Recycling:

Observe country-specific waste-disposal regulations.

Measures if oil is unintentionally released:

- Personal precautionary measures: Danger of slipping! Keep non-involved persons away from the work area. Wear personal protective clothing/equipment.
- Environmental protection measures: Prevent oil from draining into drain channels, sewerage systems, pits, cellars, water and the ground.
- Limiting spread: Use oil blocks to prevent the surface spread of oil.
- Cleaning procedure: Bind and dispose of escaped oil with nonflammable absorbents.

NOTE: Do not flush oil away with water or aqueous cleaning agents.

00 ... RAISING VEHICLE WITH TROLLEY JACK

IMPORTANT: Observe the following trolley-jack-related instructions:

1. Use only BMW-distributed/approved trolley jacks which have rubber plate contact points.
2. Trolley jacks must be regularly serviced and always checked for functional reliability before they are used!
3. Check the rubber plate on the trolley jack prior to each use, replacing if necessary.

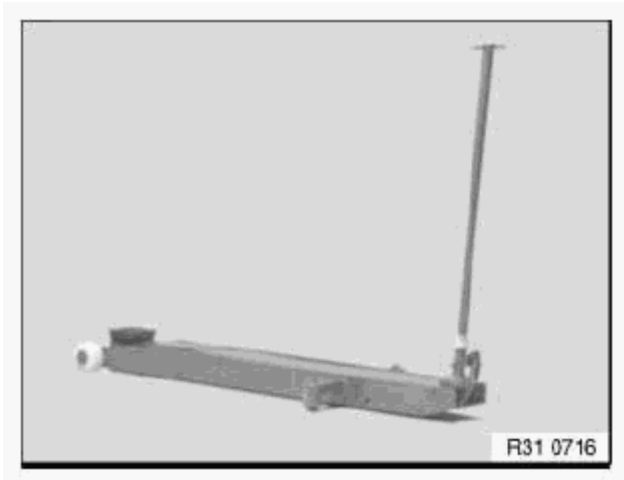
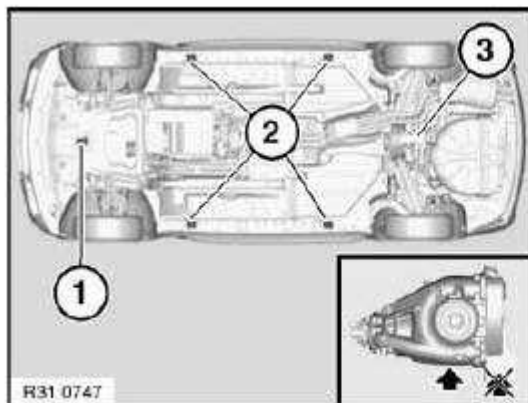


Fig. 1: Trolley Jack

Courtesy of BMW OF NORTH AMERICA, INC.

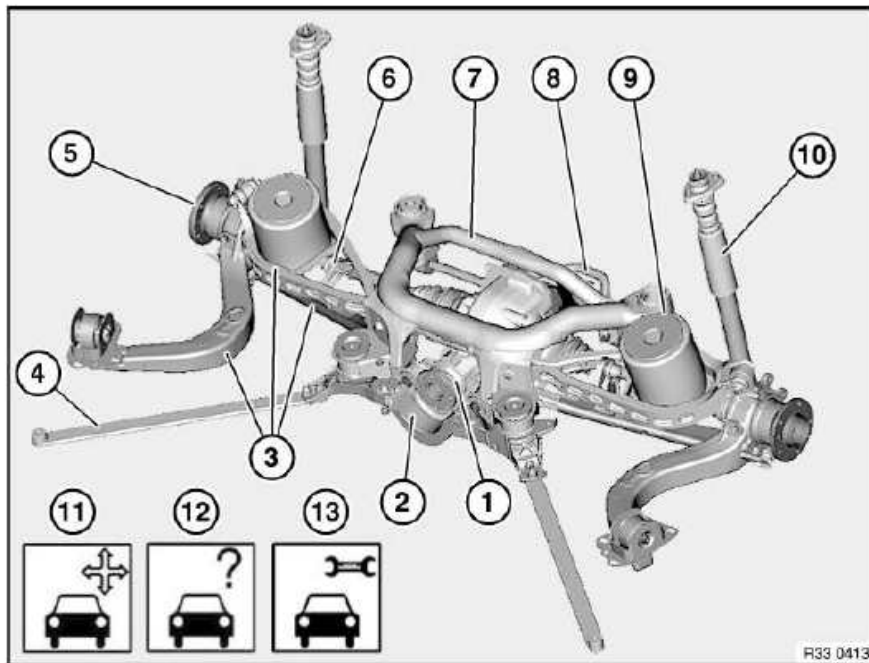
WARNING: The vehicle may be raised with a trolley jack only at the following jacking points!
Risk of damage: It is not permitted to raise the vehicle at the rear differential cover!



- 1 Car jacking point
- 2 Side car jacking points
- 3 Rear differential

Fig. 2: Vehicle Jacking Points

Courtesy of BMW OF NORTH AMERICA, INC.



[Safety precautions & general information](#)

- | | | | |
|---|--|----|--|
| 1 | Final drive / output shafts | 8 | Stabiliser |
| 2 | Tension strut | 9 | Coil spring |
| 3 | Arm | 10 | Shock absorber |
| 4 | Tension strut | 11 | Adjustment work |
| 5 | Wheel bearing / drive flange hub | 12 | Troubleshooting (shock absorber / rear axle) |
| 6 | Stabilizer link | 13 | Testing |
| 7 | Rear axle carrier | | |

Fig. 3: Rear Axle Layout Components

Courtesy of BMW OF NORTH AMERICA, INC.

33 00 ... INFORMATION ON REPLACING SHOCK ABSORBERS

Facts:

When a shock absorber is faulty on one side (leaking, noises, limit values exceeded on the shock tester), often both shock absorbers on the axle in question are replaced.

E32, E34, E38, E39: In the case of rear spring struts with ride-height control, there is always a slight oil spillage on the piston rod. These spring struts are permitted to be wet with oil over a maximum of half the shock absorber length on the outer tube, i.e. they are permitted to "sweat".

Consequence:

This is not necessary for technical reasons and causes the manufacturer not to recognize the unnecessarily removed shock absorbers as damaged parts. Unnecessarily high costs for the customer can be avoided by replacing the shock absorber on one side only.

Procedure:

Shock absorbers may be replaced on one side only until they have completed 50 000 km service.

Exception: On all M-GmbH models, when a limit value is exceeded on one side, it is still necessary always to replace both shock absorbers on the relevant axle.

33 00 ... NOTES ON REPAIRING THREADS

IMPORTANT: Install Helicoil thread inserts so that they are flush with the original thread.

NOTE: Damaged threads in the frame side member may be repaired with Helicoil thread inserts. Comply with the procedure described in the example, see 31 00 ... NOTES ON REPAIRING THREADS .



Fig. 4: Identifying Helicoil Thread

Courtesy of BMW OF NORTH AMERICA, INC.

33 00 ... REAR AXLE: WHEEL/CHASSIS ALIGNMENT CHECK MUST BE CARRIED OUT AFTER THE FOLLOWING WORK

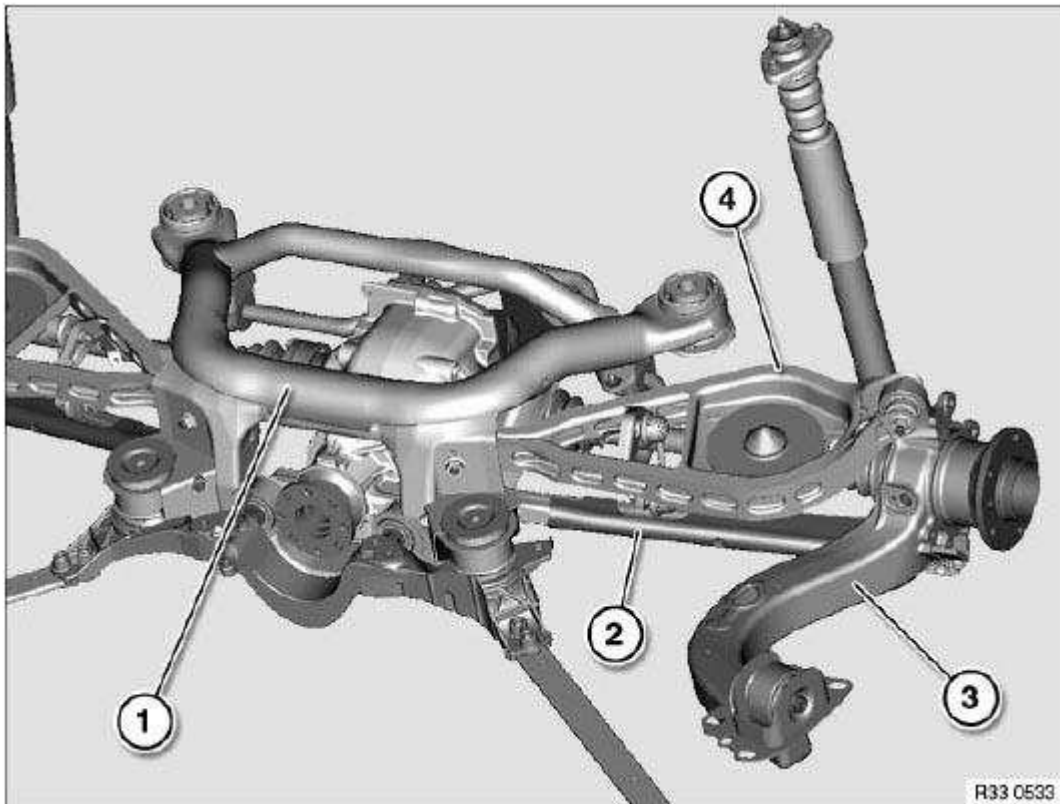


Fig. 5: Rear Axle Carrier, Lower Control Arm And Trailing Arm
Courtesy of BMW OF NORTH AMERICA, INC.

A wheel/chassis alignment check, see **32 00 ... CHASSIS/WHEEL ALIGNMENT CHECK PROCEDURE** must be carried out after the following work:

- Release of following screw/bolt connections:
 - Rear axle carrier to body
 - Bearing block to trailing arm / body
 - Upper control arm to rear axle carrier / trailing arm
 - Lower control arm to rear axle carrier / trailing arm
- Replacement of following parts:
 1. Rear axle carrier / rubber mount
 2. Lower control arm / rubber mount
 3. Trailing arm / rubber mount / bearing block / ball joint
 4. Upper control arm / rubber mount / ball joint

10 FINAL DRIVE

33 10 ... OVERVIEW OF REAR DIFFERENTIAL/OUTPUT SHAFTS

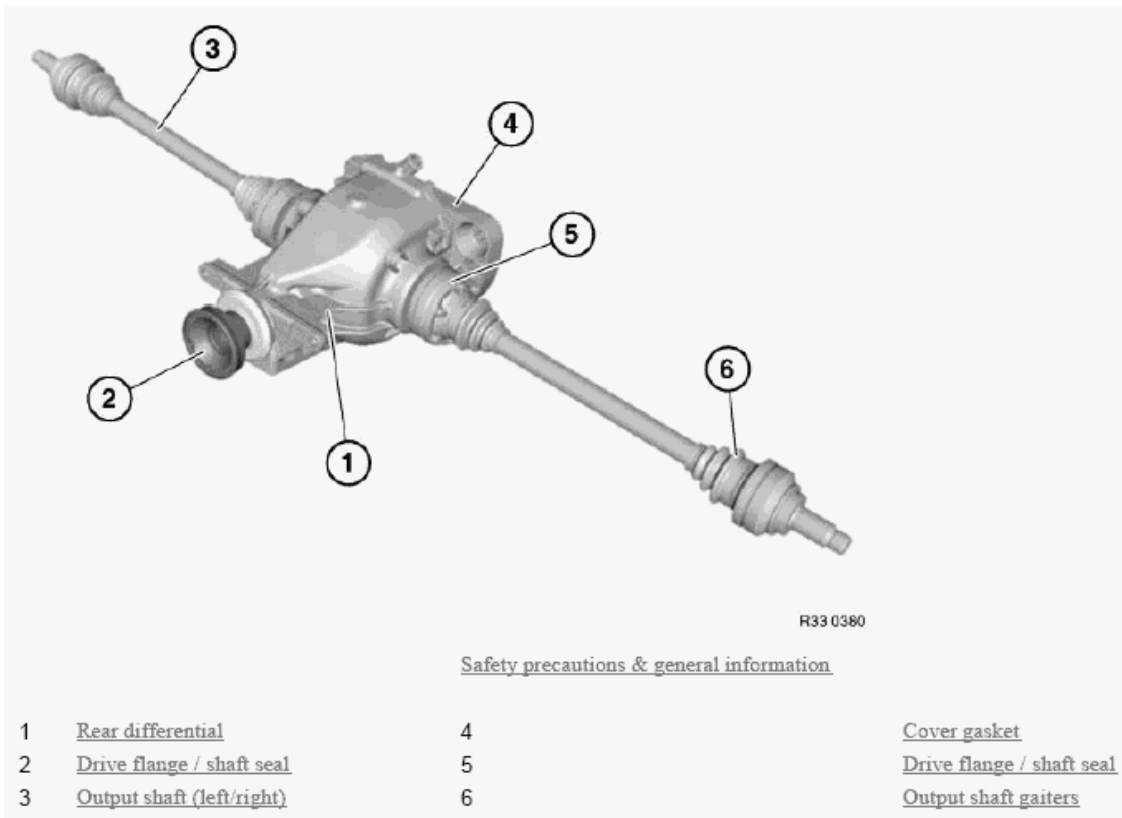


Fig. 6: Rear Differential/Output Shafts Components
 Courtesy of BMW OF NORTH AMERICA, INC.

33 10 ... REAR DIFFERENTIAL: ASSIGNMENT TO MODEL SERIES

REAR DIFFERENTIAL MODEL SERIES CHART

Model series	Engine	Rear differential	Remark
E83	M54 2.5i	168K	
	M54 3.0i, M47T2, M57TU, N46	188K	
E83 (FL)	N46, N52, M47T2, M57T2 (3.0d)	188L	
	M57T2 (3.0Sd)	215K	
K = Compact L = Light-running FL = Facelift from 09/2006			

33 10 010 REMOVING AND INSTALLING/REPLACING REAR DIFFERENTIAL

Special tools required:

- **33 4 420 SUPPORT**

IMPORTANT: Risk of damage
Refit spacer (1).

Use only approved rear differential oils!

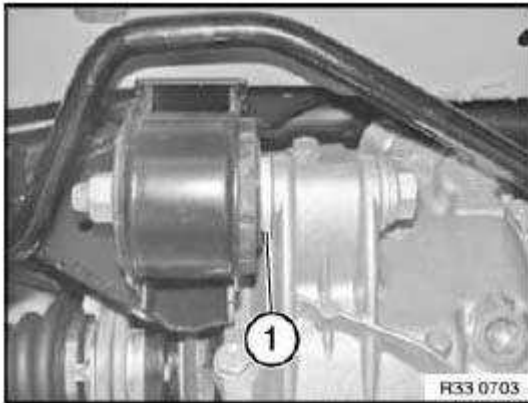


Fig. 7: Refit Spacer

Courtesy of BMW OF NORTH AMERICA, INC.

Necessary preliminary tasks:

- Lower exhaust system in rear area, see **18 00 020 REMOVING AND INSTALLING COMPLETE EXHAUST SYSTEM** .
- Remove output shaft from rear differential at both ends and tie back, see **33 21 001 Removing and installing / replacing left output shaft**.
- Remove propeller shaft from rear differential and tie back, see **26 11 000 REMOVING AND INSTALLING PROPELLER SHAFT (CARDAN UNIVERSAL JOINT) COMPLETELY** .

WARNING: Danger of injury!

Failure to comply with the following instructions may result in the vehicle slipping off the lifting platform and critically injuring other persons.

When supporting components, make sure that

- the vehicle can no longer be raised or lowered
- the vehicle does not lift off the locating plates on the lifting platform

Remove compression strut and insert bolts for rear axle carrier at front until contact is made, see **33 32 160 Removing and installing/replacing compression strut for rear axle carrier**.

Support rear differential with workshop jack and special tool 33 4 420 .

IMPORTANT: Observe gap between special tool 33 4 420 and dust plates (1).

To avoid grinding noises, make sure the dust plates (1) are not damaged (e.g. bent).

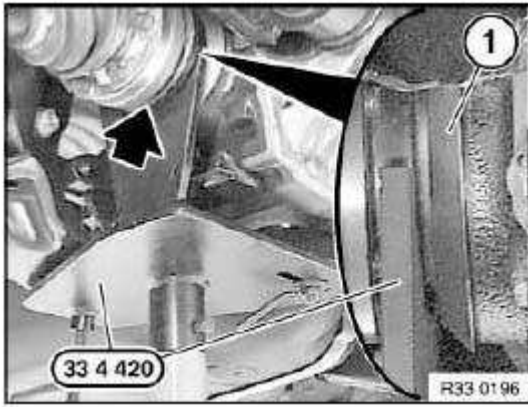


Fig. 8: Dust Plates With Special Tool (33 4 420)
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

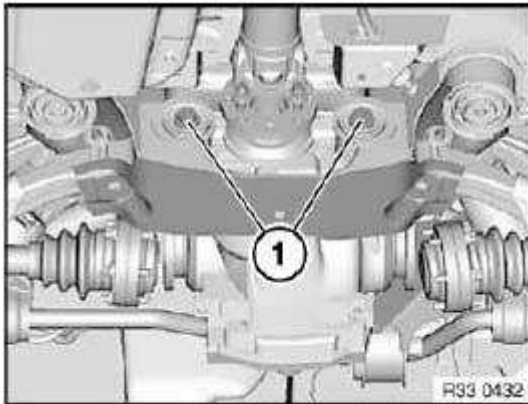


Fig. 9: Rear Differential Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten nut.

Unscrew bolt to center of car; if necessary, remove spacer.

Slowly lower workshop jack and tip rear differential out towards rear.

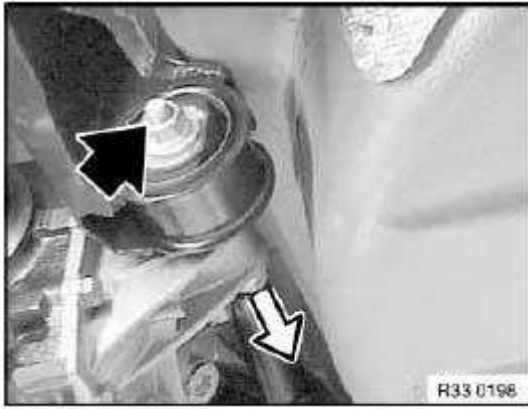


Fig. 10: Locating Rear Differential Nut
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Adhere to the following installation sequence in order to prevent distortion of the rear differential during installation and thereby avoid potential complaints about noise.

Installation sequence:

1. Install rear differential with workshop jack and special tool 33 4 420 .
2. Insert bolts (1) (do not tighten down)
3. Insert bolt (2); if necessary, fit spacer
4. Replace and screw on nut (3) (do not tighten down)
5. Lower workshop jack
6. Install compression strut, see **33 32 160 Removing and installing/replacing compression strut for rear axle carrier.**
7. Tighten down screws (1)

Tightening torque: 33 17 1AZ, see **33 17 FINAL DRIVE UNIT MOUNTINGS** .

8. Tighten nut (3)

Tightening torque: 33 17 1AZ, see **33 17 FINAL DRIVE UNIT MOUNTINGS** .

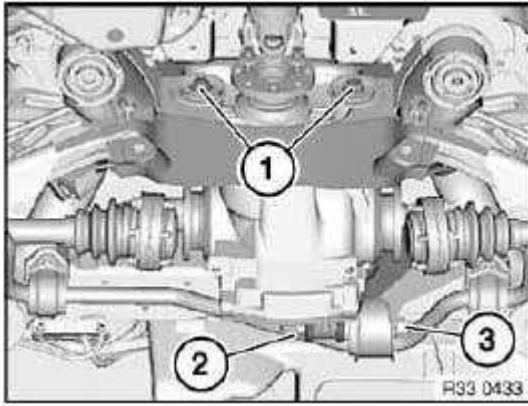


Fig. 11: Rear Differential Bolt And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Check rear differential oil level, correct if necessary, see **00 11 ... Checking/topping up oil level in rear differential.**

11 FINAL DRIVE WITH COVER

00 11 ... CHECKING/TOPPING UP OIL LEVEL IN REAR DIFFERENTIAL

IMPORTANT: Risk of damage!

To avoid serious damage to the rear differential, it is essential to use only approved gear oils in the differential.

Undo oil filler plug (1).

Check oil level.

If necessary, pour in rear differential oil up to lower edge of opening for oil filler plug (1).

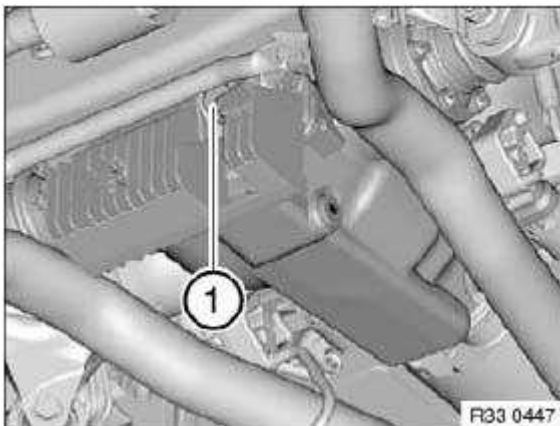


Fig. 12: Oil Filler Plug

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

- A. Oil filler plug with sealing ring:

Replace sealing ring (1).

Tightening torque: 33 11 3AZ, see **33 11 REAR DIFFERENTIAL CASE WITH COVER** .

- B. Oil filler plug with O-ring:

Replace oil filler plug (2).

Tightening torque: 33 11 9AZ, see **33 11 REAR DIFFERENTIAL CASE WITH COVER** .

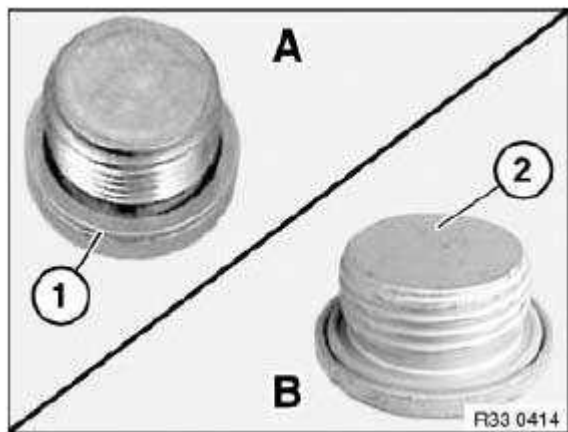


Fig. 13: Oil Filler Plug With Sealing Ring

Courtesy of BMW OF NORTH AMERICA, INC.

00 11 259 OIL CHANGE IN REAR DIFFERENTIAL INCL. USED OIL DISPOSAL

IMPORTANT: Risk of damage!

To avoid serious damage to the rear differential, it is essential to use only approved transmission oils in the differential.

NOTE:

The oil does not need to be changed in rear differentials carrying the "Life-Time-Oil" sticker.

Only change oil when rear differential is at normal operating temperature.

Recycling:

Catch and dispose of emerging differential oil.

Observe country-specific waste-disposal regulations

Oil drain plug present:

Place oil collecting apparatus underneath.

Remove oil drain plug (1).

Drain and dispose of differential oil.

Undo oil filler plug (2).

Add differential oil up to lower edge of opening for oil filler plug.

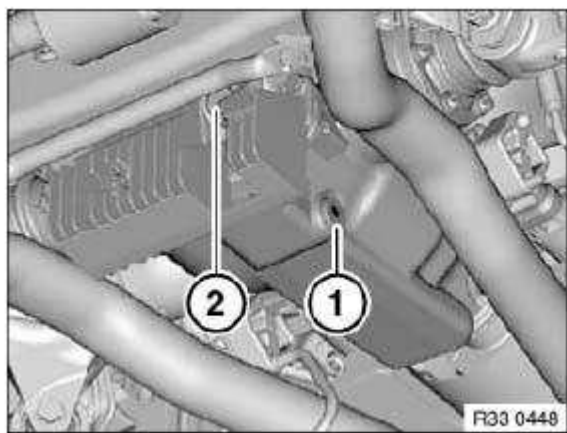


Fig. 14: Oil Filler Plug And Oil Drain Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

- A. Oil drain or oil filler plug with sealing ring:

Replace sealing ring (1).

Tightening torque: 33 11 3AZ, see **33 11 REAR DIFFERENTIAL CASE WITH COVER** .

- B. Oil drain or oil filler plug with O-ring:

Replace oil drain or oil filler plug (2).

Tightening torque: 33 11 9AZ, see **33 11 REAR DIFFERENTIAL CASE WITH COVER** .

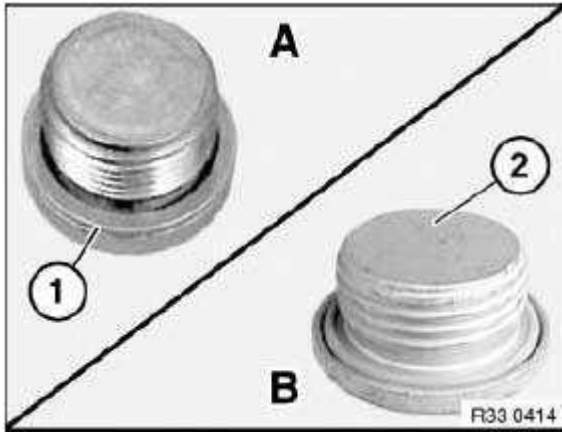


Fig. 15: Oil Filler Plug With Sealing Ring
 Courtesy of BMW OF NORTH AMERICA, INC.

No oil drain plug:

Undo oil filler plug (1).

Drain and dispose of differential oil.

Add differential oil up to lower edge of opening for oil filler plug (1).

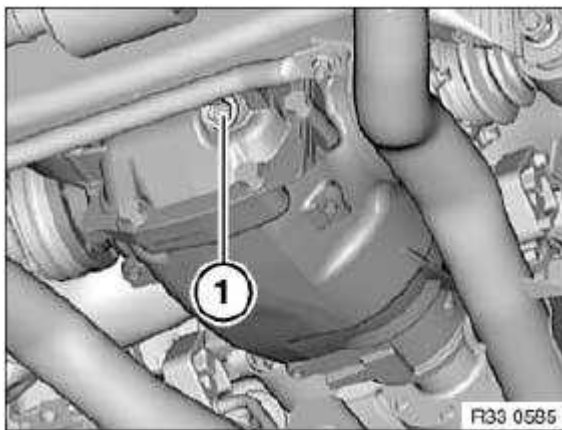


Fig. 16: Oil Filler Plug
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

A. Oil filler plug with sealing ring:

Replace sealing ring (1).

Tightening torque: 33 11 3AZ, see **33 11 REAR DIFFERENTIAL CASE WITH COVER** .

B. Oil filler plug with O-ring:

Replace oil filler plug (2).

Tightening torque: 33 11 9AZ, see 33 11 REAR DIFFERENTIAL CASE WITH COVER .

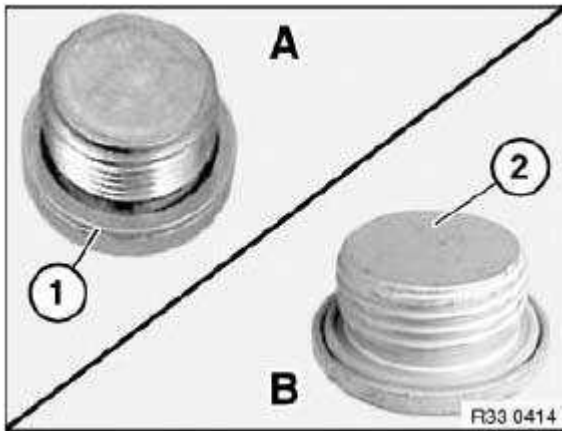


Fig. 17: Oil Filler Plug With Sealing Ring
Courtesy of BMW OF NORTH AMERICA, INC.

33 11 ... REPLACING REAR COVER GASKET ON REAR DIFFERENTIAL (168K)

IMPORTANT: To avoid leaks from the rear differential cover, do not use a paper gasket in cars with liquid gaskets!
To prevent the differential oil from foaming over, make sure that no remnants of the liquid gasket are pressed into the rear differential housing.

Release screw (1).

Tightening torque (M10x60): 33 11 1AZ, see 33 11 REAR DIFFERENTIAL CASE WITH COVER .

Unscrew screws (2).

Tightening torque (M10x25): 33 11 1AZ, see 33 11 REAR DIFFERENTIAL CASE WITH COVER .

Remove cover.

If necessary, remove remnants of liquid gasket with scraper.

Clean sealing face on cover and rear differential.

Installation:

If a paper gasket was fitted, a paper or liquid gasket can be used.

The liquid gasket can be found in Main Group 33 in the Electronic Parts Catalogue.

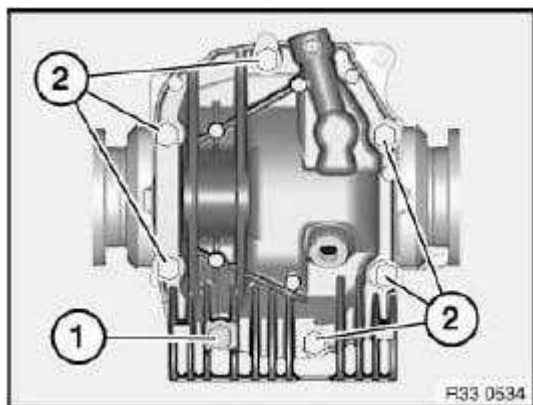


Fig. 18: Rear Differential Cover Screw (168K)
Courtesy of BMW OF NORTH AMERICA, INC.

33 11 ... REPLACING REAR COVER GASKET ON REAR DIFFERENTIAL (188K)

IMPORTANT: To avoid leaks from the rear differential cover, do not use a paper gasket in cars with liquid gaskets!
To prevent the differential oil from foaming over, make sure that no remnants of the liquid gasket are pressed into the rear differential housing.

Release screws (1).

Tightening torque (M10x75): 33 11 1AZ, see **33 11 REAR DIFFERENTIAL CASE WITH COVER** .

Unscrew screws (2).

Tightening torque (M10x25): 33 11 1AZ, see **33 11 REAR DIFFERENTIAL CASE WITH COVER** .

Remove cover.

If necessary, remove remnants of liquid gasket with scraper.

Clean sealing face on cover and rear differential.

Installation:

If a paper gasket was fitted, a paper or liquid gasket can be used.

The liquid gasket can be found in Main Group 33 in the Electronic Parts Catalogue.

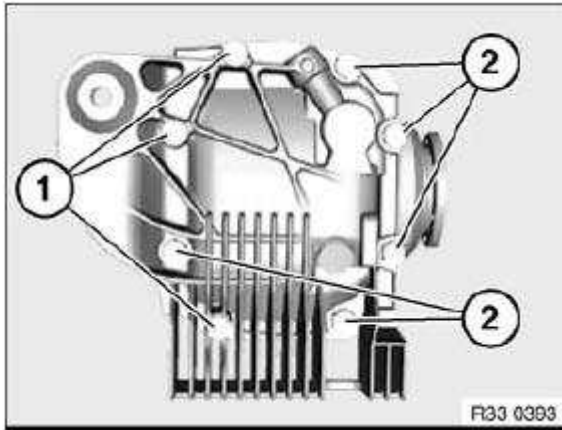


Fig. 19: Rear Differential Cover Screw (188K)
Courtesy of BMW OF NORTH AMERICA, INC.

33 11 ... REPLACING REAR COVER GASKET ON REAR DIFFERENTIAL (188L / 188LW)

IMPORTANT: To avoid leaks from the rear differential cover, do not use a paper gasket in cars with liquid gaskets!
To prevent the differential oil from foaming over, make sure that no remnants of the liquid gasket are pressed into the rear differential housing.

Release screws (1).

Tightening torque (M10x60): 33 11 1AZ, see **33 11 REAR DIFFERENTIAL CASE WITH COVER** .

Unscrew screws (2).

Tightening torque (M10x25): 33 11 1AZ, see **33 11 REAR DIFFERENTIAL CASE WITH COVER** .

Remove cover.

If necessary, remove remnants of liquid gasket with scraper.

Clean sealing face on cover and rear differential.

Installation:

If a paper gasket was fitted, a paper or liquid gasket can be used.

The liquid gasket can be found in Main Group 33 in the Electronic Parts Catalogue.

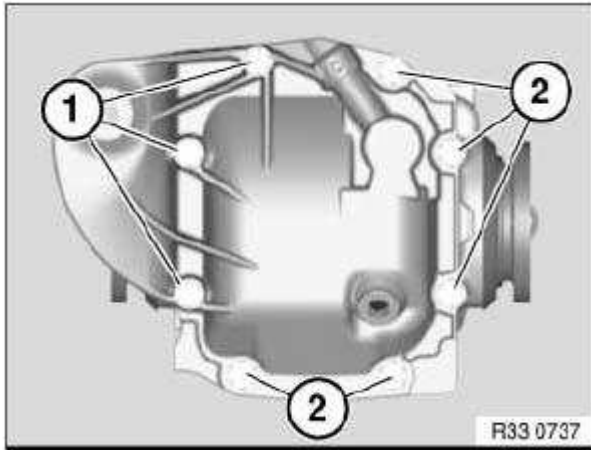


Fig. 20: Rear Differential Cover Screw (188L/188LW)
Courtesy of BMW OF NORTH AMERICA, INC.

33 11 ... REPLACING REAR COVER GASKET ON REAR DIFFERENTIAL (215K)

IMPORTANT: To avoid leaks from the rear differential cover, do not use a paper gasket in cars with liquid gaskets!
To prevent the differential oil from foaming over, make sure that no remnants of the liquid gasket are pressed into the rear differential housing.

Release screw (1).

Tightening torque (M10x75): 33 11 1AZ, see **33 11 REAR DIFFERENTIAL CASE WITH COVER** .

Unscrew screws (2).

Tightening torque (M10x25): 33 11 1AZ, see **33 11 REAR DIFFERENTIAL CASE WITH COVER** .

Remove cover.

If necessary, remove remnants of liquid gasket with scraper.

Clean sealing face on cover and rear differential.

Installation:

If a paper gasket was fitted, a paper or liquid gasket can be used.

The liquid gasket can be found in Main Group 33 in the Electronic Parts Catalogue.

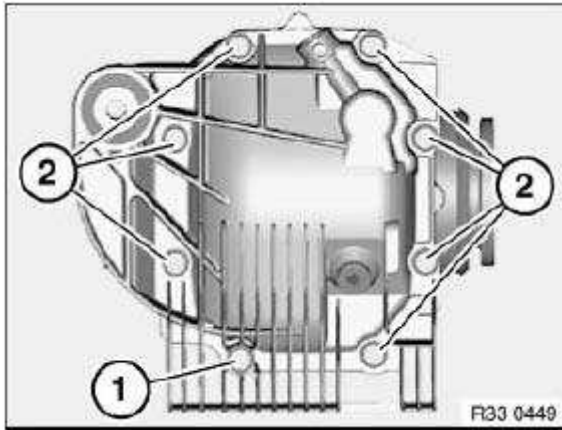


Fig. 21: Rear Differential Cover Screw (215K)
Courtesy of BMW OF NORTH AMERICA, INC.

33 11 021 REPLACING SHAFT SEAL FOR INPUT FLANGE ON FINAL DRIVE

Special tools required:

- **00 5 010 UNIVERSAL PULLER**
- **00 5 500 HANDLE FOR DRIFTS**
- **23 0 020 HOLDER**
- **23 1 300 FIXTURE**
- 23 1 302 **23 1 300 FIXTURE**
- 23 1 303 **23 1 300 FIXTURE**
- 31 2 101 **31 2 100 FIXTURE**
- 31 2 102 **31 2 100 FIXTURE**
- 31 2 103 **31 2 100 FIXTURE**
- 31 2 104 **31 2 100 FIXTURE**
- **33 1 150 FIXTURE**
- 33 1 341 **33 1 340 FIXTURE**
- **33 3 390 DRIFT**
- **33 3 440 DRIFT**
- **33 3 470 DRIFT**
- **33 3 480 DRIFT**
- **33 3 490 DRIFT**

IMPORTANT: Use only approved gear oils.

Failure to comply with this instruction will result in serious damage to the rear differential!

Necessary preliminary tasks:

- Remove propeller shaft from rear differential and tie back, see **26 11 000 REMOVING AND INSTALLING PROPELLER SHAFT (CARDAN UNIVERSAL JOINT) COMPLETELY** .

Removing drive flange:

Support rear axle carrier at front middle with workshop jack.

Release nuts and remove compression strut.

Installation:

Replace self-locking nuts.

Tightening torque: 33 33 3AZ, see **33 33 REAR AXLE SUSPENSION** .

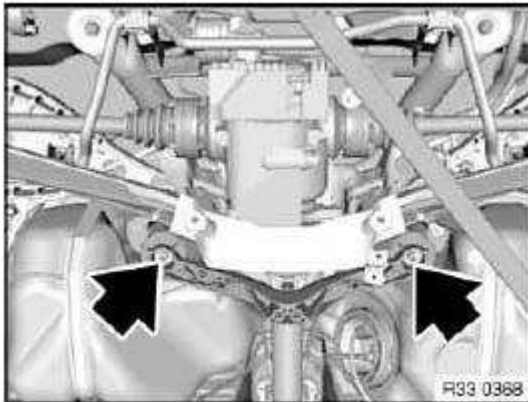


Fig. 22: Locating Compression Strut And Nut
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Before releasing collar nut, mark drive flange (3) and collar nut (2) to drive shaft (3) with center punch or colour marker pen.

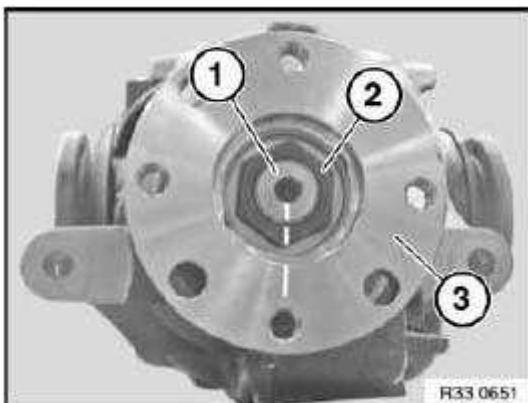


Fig. 23: Drive Flange, Collar Nut And Drive Shaft

Courtesy of BMW OF NORTH AMERICA, INC.

Brace drive flange with special tool 23 0 020 and release collar nut.

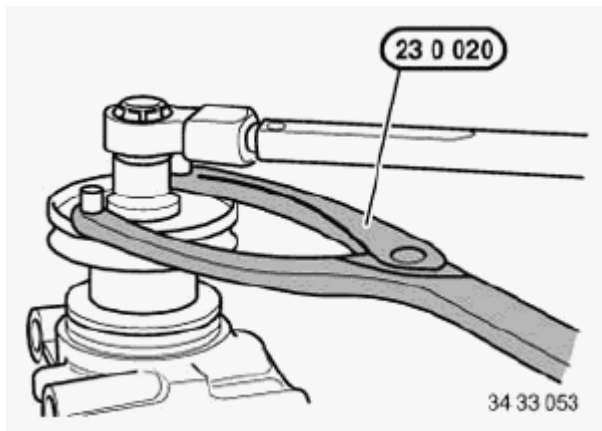


Fig. 24: Special Tool (23 0 020)

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Read and comply with document "Rear differential: Assignment to model series", see 33 10 ... Rear differential: Assignment to model series.

210 with lock, 215K:

Remove drive flange with special tools 31 2 101 , 31 2 102 , 31 2 103 / 31 2 104 .

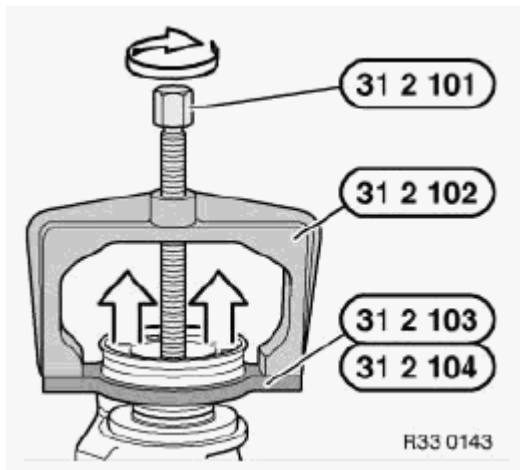


Fig. 25: Special Tool (31 2 101), (31 2 102) And (31 2 103)

Courtesy of BMW OF NORTH AMERICA, INC.

168K/L, 188K/L:

Remove drive flange with special tool 33 1 150 .

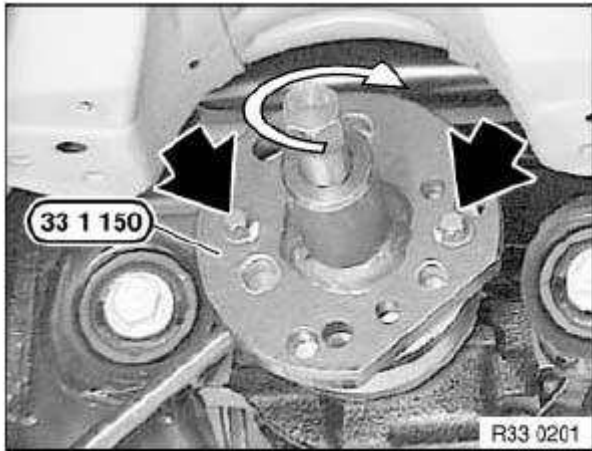


Fig. 26: Locating Special Tool (33 1 150)
Courtesy of BMW OF NORTH AMERICA, INC.

Replacing shaft seal:

Withdraw shaft seal with special tool 00 5 010 .

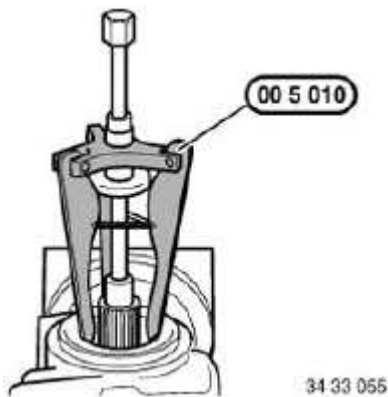


Fig. 27: Special Tool (00 5 010)
Courtesy of BMW OF NORTH AMERICA, INC.

Drive in new shaft seal with following special tools (depending on rear differential) as far as it will go.

- 168K/L: Use special tools 00 5 500 and 33 3 390
- 188K/L: Use special tools 00 5 500 and 33 3 470
- 210 with lock, 215K: Use special tools 00 5 500 and 33 3 440

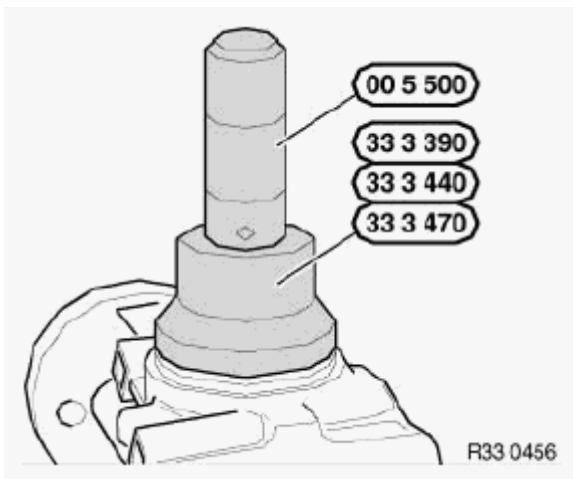


Fig. 28: Special Tool (00 5 500), (33 3 390) And (33 3 440)
 Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Clean end face (1) of drive flange and apply a thin coating of grease.

NOTE: Failure to comply with this instruction will result in the generation of noise in the rear differential.

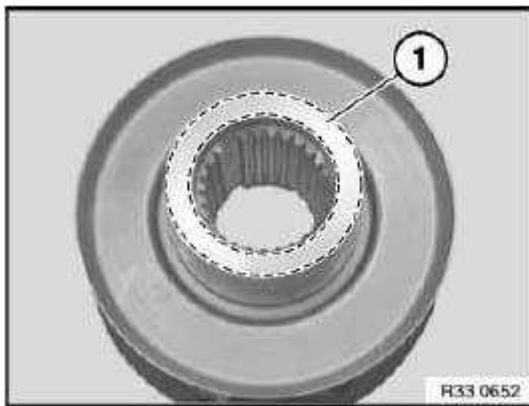


Fig. 29: End Face Of Drive Flange
 Courtesy of BMW OF NORTH AMERICA, INC.

Installing drive flange:

Coat sealing lips of shaft seal and sealing surface of drive flange with differential oil.

Attach drive flange as per marking.

Press on drive flange with special tools 23 1 300 , 33 1 341 and 23 1 303 , if necessary 23 1 302 until collar nut can be screwed on.

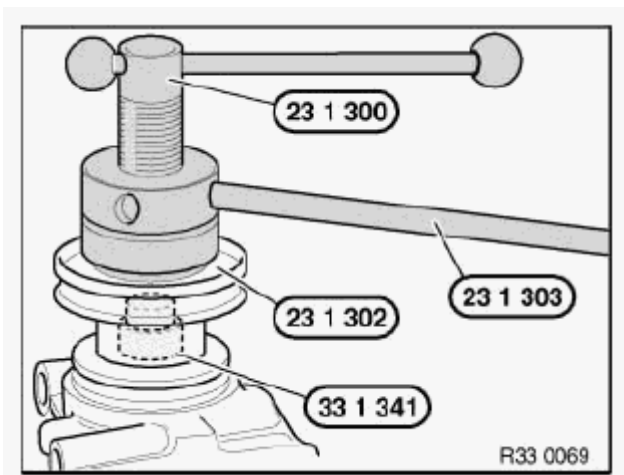


Fig. 30: Special Tool (23 1 303), (23 1 302) And (23 1 300)
 Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not under any circumstances tighten down collar nut beyond marker points in order to avoid damaging the clamping sleeve.

Tighten down collar nut (1) to point where marker points are aligned.

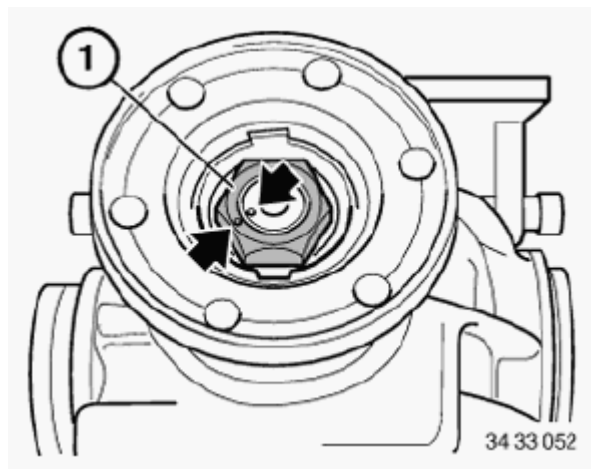


Fig. 31: Collar Nut
 Courtesy of BMW OF NORTH AMERICA, INC.

Drive in new retaining plate with following special tools (depending on rear differential) as far as it will go.

- 168K/L, 188K/L: Use special tools 00 5 500 and 33 3 480
- 210 with lock, 215K: Use special tools 00 5 500 and 33 3 490

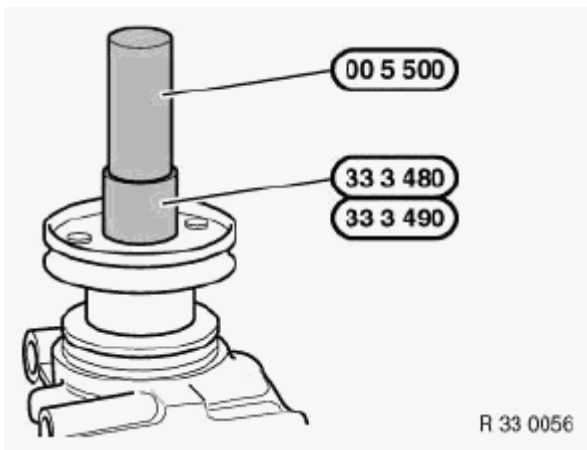


Fig. 32: Special Tool (00 5 500), (33 3 480) And (33 3 490)
 Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Differentials 168K up to 03/2003, 188K, 210 with lock only: Change rear differential oil, see **00 11 259 Oil change in rear differential incl. used oil disposal.**
- Differentials 168K from 03/2003, 168L to 188L only: Correct rear differential fluid level, see **00 11 ... Checking/topping up oil level in rear differential.**

33 11 080 REPLACING LEFT DRIVE FLANGE ON REAR DIFFERENTIAL

WARNING: Risk of burning on the exhaust system!

IMPORTANT: When replacing the drive flange, you must also replace the shaft seal! See 33 11 140 Replacing shaft seal for left drive flange.

Necessary preliminary tasks:

- Remove output shaft from rear differential and tie back, see **33 21 001 Removing and installing / replacing left output shaft.**

Drive out drive flange.

Installation:

Insert drive flange and rotate until spline on flange meshes with teeth on differential bevel gear.

Press drive flange in further until circlip locates with an audible click.

IMPORTANT: High installation forces indicate that the spline teeth on the drive flange/differential bevel gear are damaged/deformed!

Check spline teeth, replaced damaged parts.

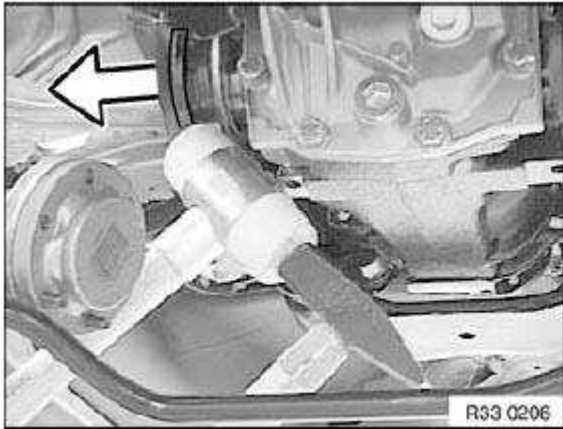


Fig. 33: Drive Flange

Courtesy of BMW OF NORTH AMERICA, INC.

Install retaining ring (1).

Installation:

Clean shaft seal race on drive flange thoroughly.

Coat drive flange at contact face of shaft seal with approved rear differential oil.

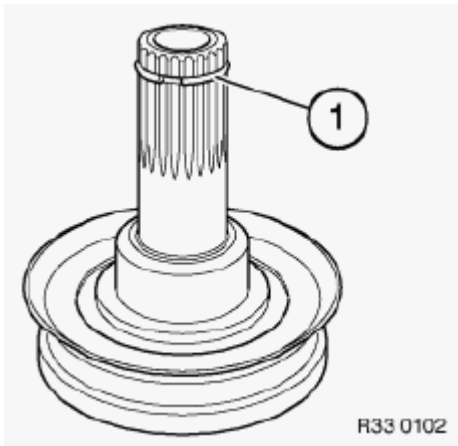


Fig. 34: Retaining Ring

Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

Replace shaft seal, see **33 11 140 Replacing shaft seal for left drive flange.**

After installation:

- Correct gearbox oil level/change differential oil, see 00 11 ... Checking/topping up oil level in rear differential.

33 11 085 REPLACING RIGHT DRIVE FLANGE ON REAR DIFFERENTIAL

The procedure is described in the document "Replacing left drive flange on rear differential", see 33 11 080 Replacing left drive flange on rear differential.

33 11 140 REPLACING SHAFT SEAL FOR LEFT DRIVE FLANGE

Special tools required:

- 00 5 010 UNIVERSAL PULLER
- 00 5 500 HANDLE FOR DRIFTS
- 32 1 060 DRIFT
- 33 1 308 33 1 300 RILLEX TAPERED ROLLER BEARING EXTRACTOR
- 33 3 400 DRIFT
- 33 4 240 DRIFT
- 33 4 250 DRIFT

Necessary preliminary tasks:

- Remove drive flange from rear differential, see 33 11 080 Replacing left drive flange on rear differential.
 - If necessary, press off dust cover

Withdraw shaft seal with special tools 00 5 010 and 32 1 060 / 33 1 308 .

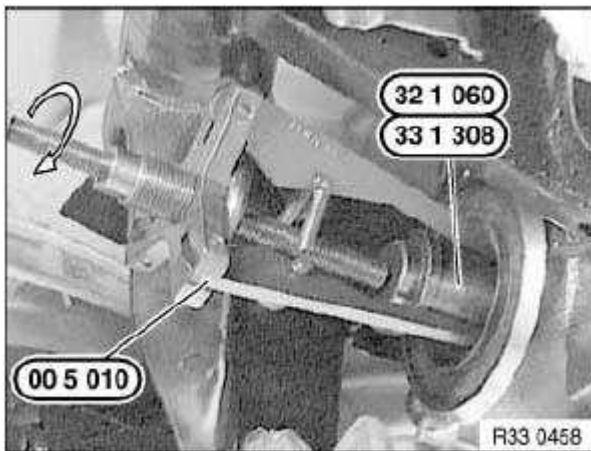


Fig. 35: Special Tool (32 1 060), (33 1 308) And (00 5 010)
Courtesy of BMW OF NORTH AMERICA, INC.

Coat housing plate flange and sealing lips of new shaft seal with approved rear differential oil.

Drive in new shaft seal as far as it will go with following special tools (depending on rear differential /outside diameter).

00 5 500 + 33 3 400 : 168K - 78x44x10

00 5 500 + 33 4 240 : 188K/L - 90x44x10

00 5 500 + 33 4 250 : 215L - 100x50x10

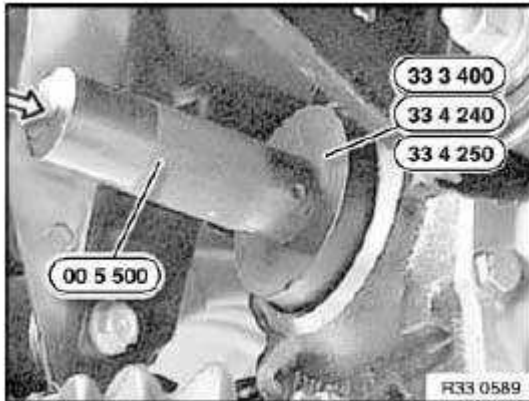


Fig. 36: Special Tool (33 3 400), (33 4 240) And (33 4 250)
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Check rear differential oil level, correct if necessary, see **00 11 ... Checking/topping up oil level in rear differential.**

33 11 145 REPLACING SHAFT SEAL FOR RIGHT DRIVE FLANGE

The procedure is described in the document "Replacing shaft seal for left drive flange", see **33 11 140 Replacing shaft seal for left drive flange.**

33 11 271 REPLACING REAR COVER GASKET ON REAR DIFFERENTIAL

IMPORTANT: In event of oil loss, always check rear differential for traces of wear and damage.

Necessary preliminary tasks:

- Drain and catch or draw off rear differential oil, see **00 11 259 Oil change in rear differential incl. used oil disposal.**
- Remove stabilizer from rear axle carrier, see **33 55 000 Removing and installing/replacing rear stabilizer.**
- Lower rear differential; if necessary, press to one side (do not remove output shafts), see **33 10 010**

Removing and installing/replacing rear differential.

NOTE: Read and comply with document "Rear differential: Assignment to model series".

Select rear differential:

- 168K
- 188K
- 188L
- 215K

After installation:

- Add rear differential oil.

33 11 271 REPLACING COVER GASKET ON REAR DIFFERENTIAL (235L)

IMPORTANT: In event of oil loss, always check rear differential for traces of wear and damage. To avoid leaks from the rear differential cover, do not use a paper gasket in cars with liquid sealing compounds! To prevent the differential oil from foaming over, make sure that no traces of the liquid gasket are pressed into the housing.

Necessary preliminary tasks:

- Drain and catch rear differential oil
- Remove rear axle final drive

Release screw (1). Tightening torque (M10x50) 33 11 1AZ, see **33 11 REAR DIFFERENTIAL CASE WITH COVER**. Unfasten screws (2). Tightening torque (M10x25) 33 11 1AZ, see **33 11 REAR DIFFERENTIAL CASE WITH COVER**. Remove cover. If necessary, remove remnants of liquid sealing compound with scraper. Clean sealing face on cover and rear differential.

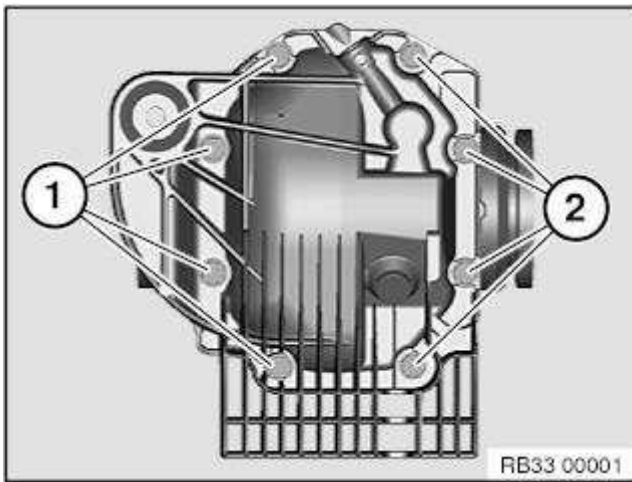


Fig. 37: Identifying Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Installation note: If a paper gasket was fitted, a paper gasket or liquid sealing compound can be used.

After installation: Add rear differential oil

17 FINAL DRIVE MOUNTING

33 17 004 REPLACING ALL RUBBER MOUNTS FOR DIFFERENTIAL MOUNTING AT FRONT

Special tools required:

- 33 3 314 **33 3 310 REMOVAL/INSTALLATION TOOL KIT**
- 33 3 315 **33 3 310 REMOVAL/INSTALLATION TOOL KIT**
- 33 3 361 **33 3 360 SET OF TOOLS**
- 33 3 362 **33 3 360 SET OF TOOLS**
- 33 4 173 **33 4 170 REMOVAL/INSTALLATION THRUST PIECES**

Necessary preliminary tasks:

- Remove rear differential, see **33 10 010 Removing and installing/replacing rear differential.**

Pull out rubber mount with special tools 33 3 314 , 33 3 315 , 33 3 361 , 33 3 362 and a standard nut (1) from rear axle carrier.

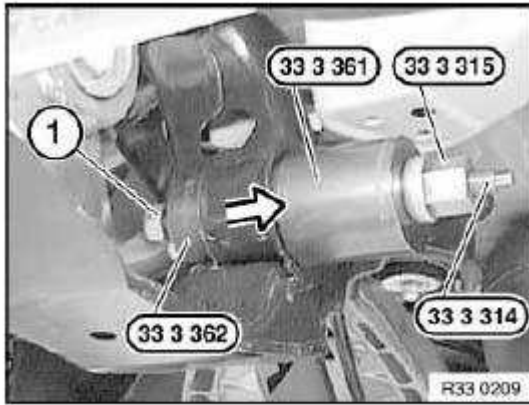


Fig. 38: Special Tool (33 3 361), (33 3 315) And (33 3 314)
 Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Observe installation position of rubber mount.
 Fig. A = Protrusion (A) in direction of travel, rear
 Fig. B = Openings (1) in transverse vehicle direction

Coat new rubber mount and bearing bush with Circo Light.

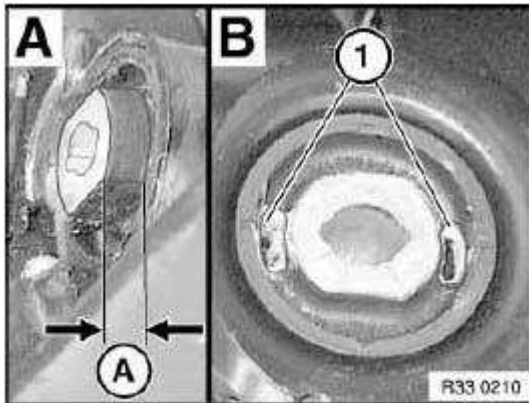


Fig. 39: Direction Of Travel And Transverse Vehicle Direction
 Courtesy of BMW OF NORTH AMERICA, INC.

Draw in rubber mount (1) with special tools 33 3 314 , 33 3 315 , 33 3 362 and 33 4 173 as far as it will go into rear axle carrier.

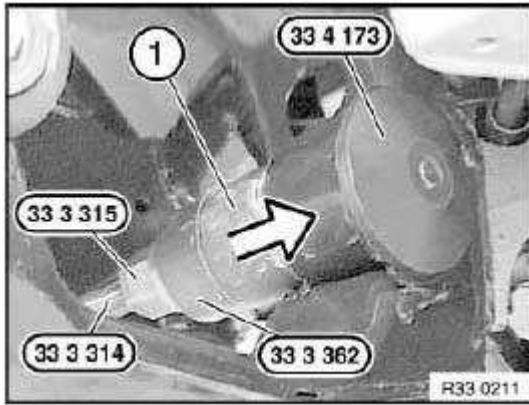


Fig. 40: Special Tool (33 4 173), (33 3 315) And (33 3 362)
 Courtesy of BMW OF NORTH AMERICA, INC.

33 17 005 REPLACING RUBBER MOUNT FOR REAR DIFFERENTIAL MOUNTING AT REAR

Necessary preliminary tasks:

- Remove rear differential, see **33 10 010 Removing and installing/replacing rear differential.**

IMPORTANT: Risk of damage!

When replacing rubber mount (B) with rubber mount (A), fit a spacer between rear differential and rubber mount.

Rubber mount (A) must not be replaced by rubber mount (B).

A = Remove rubber mount

B = Remove rubber mount (with hydraulic damping)

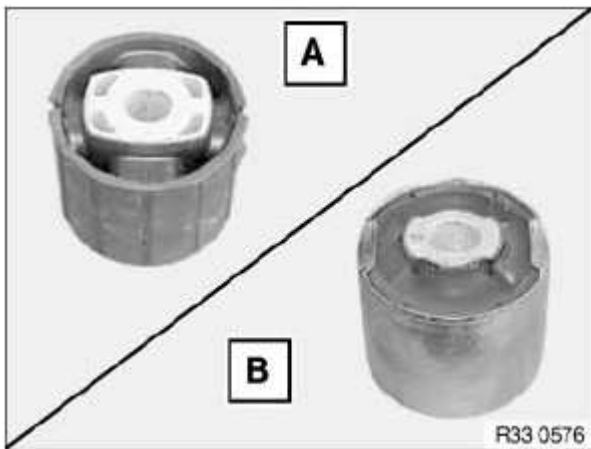


Fig. 41: Rubber Mount
 Courtesy of BMW OF NORTH AMERICA, INC.

21 OUTPUT SHAFTS

33 21 ... PRESSING OUTPUT SHAFT OUT OF DRIVE FLANGE AND DRAWING IN (OUTPUT SHAFT REMOVED FROM REAR DIFFERENTIAL)

Special tools required:

- 33 2 111 33 2 110 REMOVAL AND INSTALLATION TOOL
- 33 2 115 33 2 110 REMOVAL AND INSTALLATION TOOL
- 33 2 116 33 2 110 REMOVAL AND INSTALLATION TOOL
- 33 2 117 33 2 110 REMOVAL AND INSTALLATION TOOL
- 33 2 118 33 2 110 REMOVAL AND INSTALLATION TOOL
- 33 2 119 33 2 110 REMOVAL AND INSTALLATION TOOL
- 33 2 160 SPACER RING
- 33 2 201 33 2 200 FIXTURE
- 33 2 202 33 2 200 FIXTURE
- 33 2 203 33 2 200 FIXTURE
- 33 2 205 33 2 200 FIXTURE
- 33 2 206 33 2 200 FIXTURE
- 33 2 207 33 2 200 FIXTURE
- 33 5 070 EXTENSION PIECE (2)

WARNING: Risk of injury!

It is not permitted to use the impact screwdriver to press out and draw in the output shaft.

IMPORTANT: Risk of damage!

To avoid damaging the output shaft and adjoining parts, it is essential during the pressing-out process to repeatedly check and if necessary correct the position of the output shaft.

IMPORTANT: To avoid damaging the dust sleeve, use special tool 33 2 160 to press out and draw in the output shaft after removing the brake disk.

NOTE: Rounded inside edge of special tool 33 2 160 must point to drive flange.

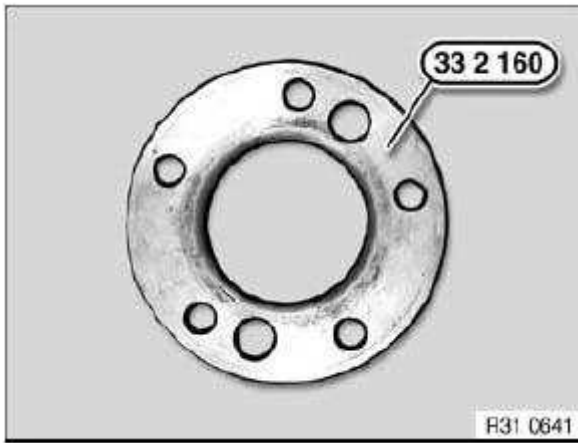


Fig. 42: Special Tool (33 2 160)

Courtesy of BMW OF NORTH AMERICA, INC.

Special tool 33 2 200:

Secure output shaft against falling out.

Screw on special tool 33 2 203 , 33 2 207 and 33 2 201 with all wheel studs to drive flange.

Press output shaft out of drive flange; in so doing, grip basic body 33 2 201 with special tools 33 2 202 and 33 5 070 .

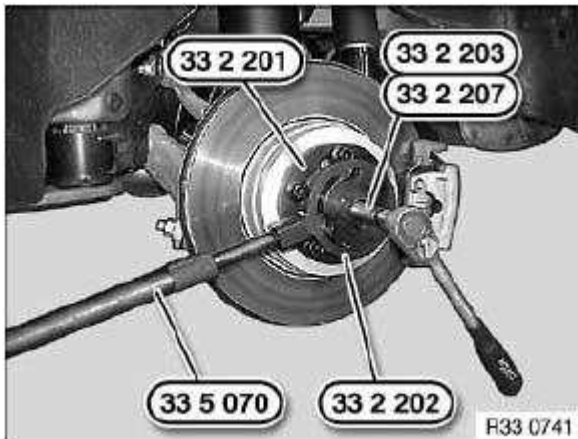


Fig. 43: Special Tool (33 2 201), (33 2 203) And (33 2 202)

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: No oil permitted on shaft journal thread!

Lightly oil spline teeth of output shaft.

Insert output shaft into drive flange.

Screw special tool 33 2 205 / 33 2 206 onto output shaft.

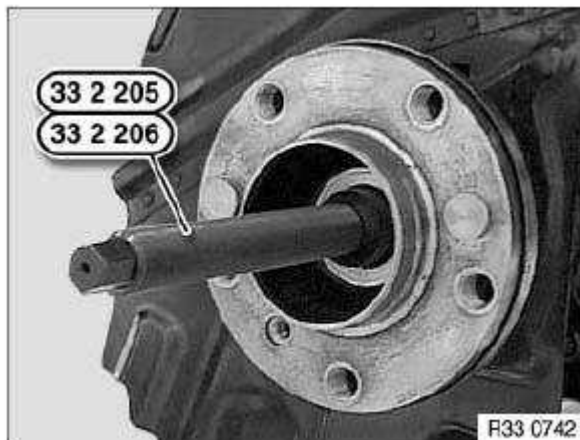


Fig. 44: Special Tool (33 2 205) And (33 2 206)
Courtesy of BMW OF NORTH AMERICA, INC.

Mount special tool 33 2 201 with three wheel studs to drive flange.

Draw in output shaft with special tool 33 2 205 up to stop; in so doing, grip basic body 33 2 201 with special tools 33 2 202 and 33 5 070 .

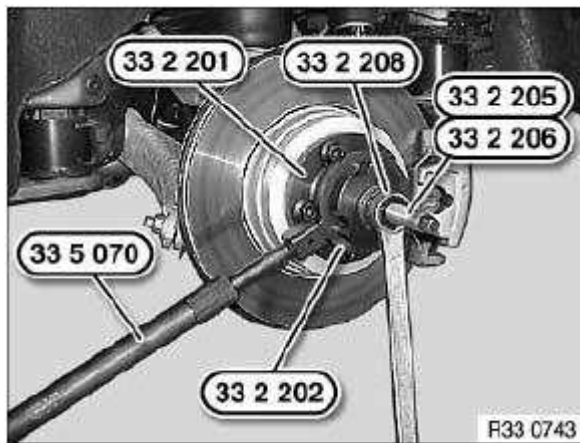


Fig. 45: Special Tool (33 2 201), (33 2 202) And (33 2 205)
Courtesy of BMW OF NORTH AMERICA, INC.

Special tool 33 2 100:

Secure output shaft against falling out.

Screw on special tool 33 2 111 , 33 2 117 and 33 2 116 with all wheel studs to drive flange.

Press output shaft out of drive flange; in so doing, grip basic body 33 2 116 with special tools 33 2 202 and 33 5 070 .

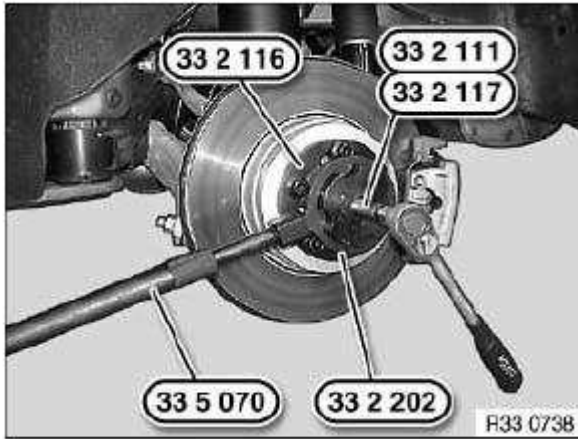


Fig. 46: Special Tool (33 2 116), (33 2 111) And (33 2 202)
 Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: No oil permitted on shaft journal thread!

Lightly oil spline teeth of output shaft.

Insert output shaft into drive flange.

Screw special tool 33 2 118 / 33 2 119 onto output shaft.

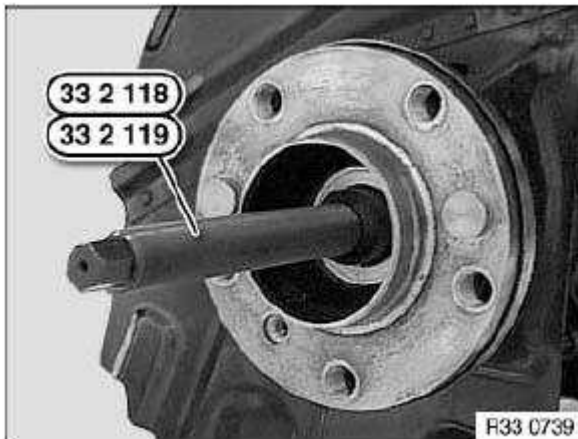


Fig. 47: Special Tool (33 2 118) And (33 2 119)
 Courtesy of BMW OF NORTH AMERICA, INC.

Mount special tool 33 2 116 with three wheel studs to drive flange.

Draw in output shaft with special tool 33 2 115 up to stop; in so doing, grip basic body 33 2 116 with special tools 33 2 202 and 33 5 070 .

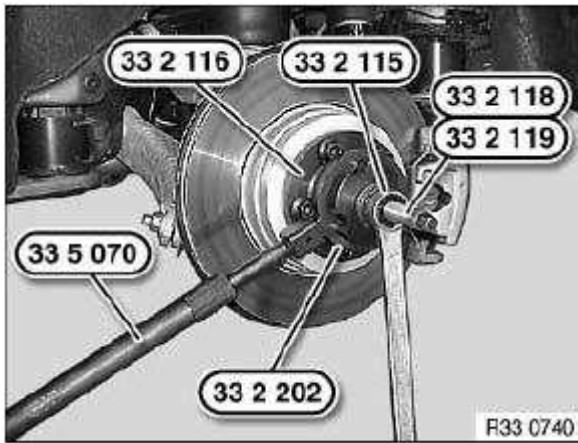


Fig. 48: Special Tool (33 2 116), (33 2 115) And (33 2 118)
 Courtesy of BMW OF NORTH AMERICA, INC.

33 21 ... RIBBED TEETH

IMPORTANT: Bolts with ribbed teeth must be replaced after they have been released!

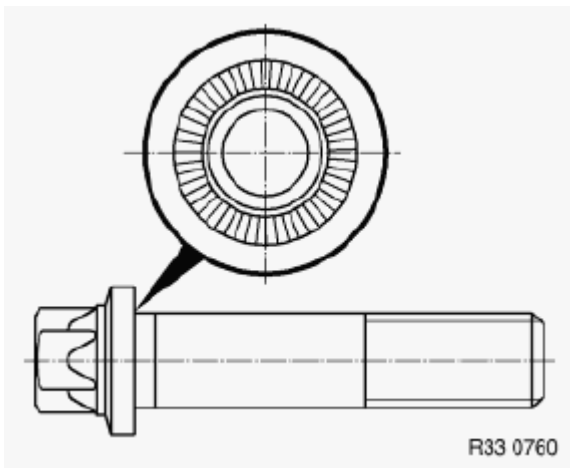


Fig. 49: Ribbed Teeth
 Courtesy of BMW OF NORTH AMERICA, INC.

33 21 001 REMOVING AND INSTALLING / REPLACING LEFT OUTPUT SHAFT

WARNING: Scalding hazard!
Only perform the following tasks after the vehicle has cooled down.

Necessary preliminary tasks:

- Remove entire exhaust system .

The subsequent procedure is described in the document "Removing and installing/replacing right output shaft.",

see **33 21 002 Removing and installing / replacing right output shaft.**

33 21 002 REMOVING AND INSTALLING / REPLACING RIGHT OUTPUT SHAFT

Apply handbrake.

Remove rear wheel, see **36 10 300 REMOVING OR INSTALLING FRONT OR REAR WHEEL .**

Unscrew collar nut.

Installation:

Replace collar nut, apply a light coating of oil to contact surface and tighten down.

Tightening torque: 33 41 3AZ, see **34 41 PARKING BRAKE .**

Secure collar nut by peening on flat areas of output shaft.

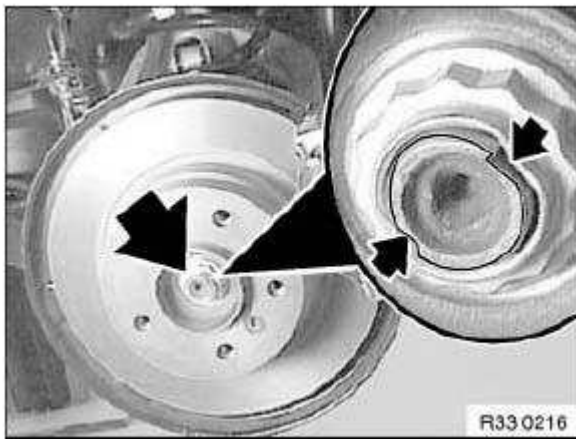


Fig. 50: Locating Right Output Shaft

Courtesy of BMW OF NORTH AMERICA, INC.

Remove stabilizer on rear axle carrier, see **33 55 000 Removing and installing/replacing rear stabilizer.**

Release bolts and remove with washers (1).

Press output shaft off drive flange using a suitable tool; if necessary, raise trailing arm with workshop jack approx. 20 mm.

Installation:

Before installing output shaft, make sure that drive flange is fully engaged in rear differential.

Replace bolts and washers (1).

Tightening torque: 33 21 1AZ, see **33 21 OUTPUT SHAFT** .

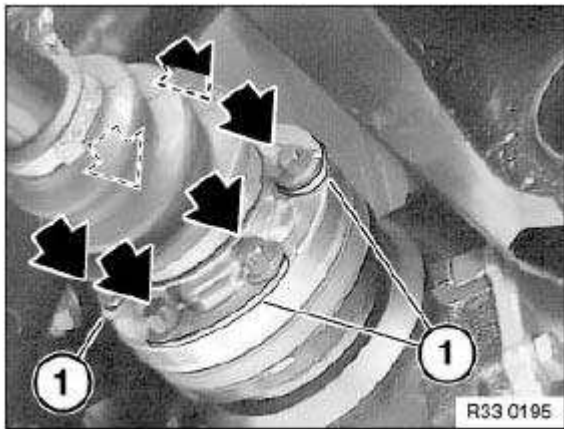


Fig. 51: Locating Bolt With Washer

Courtesy of BMW OF NORTH AMERICA, INC.

Press output shaft out of drive flange and remove towards center of vehicle, see **33 21 ... Pressing output shaft out of drive flange and drawing in (output shaft removed from rear differential)**.

After installation:

- Check that output shaft is correctly seated in rear differential.

33 21 035 REPLACING GAITER ON LEFT OUTPUT SHAFT

Special tools required:

- **21 2 120 DRIFT**
- **26 1 110 REMOVAL DISK**
- **33 2 100 CLAMPING FIXTURE**

Necessary preliminary tasks:

- Remove output shaft, see **33 21 001 Removing and installing / replacing left output shaft**.

Clean output shaft.

Press off sealing cap (1).

Installation:

Press on sealing cap with a thrust ring

Coat sealing faces of sealing cap with sealing compound.

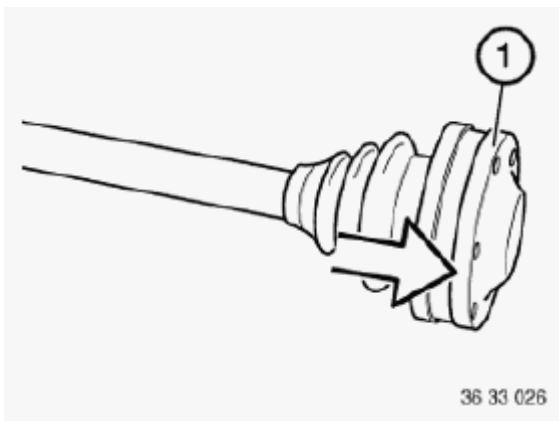


Fig. 52: Pressing Sealing Cap
 Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten hose clip (2).

Press cap (3) off together with gaiter.

Remove circlip (4).

Installation:

Turn new gaiter with cap (3) so that fastener of large hose clamp is between two bores of constant-velocity joint.

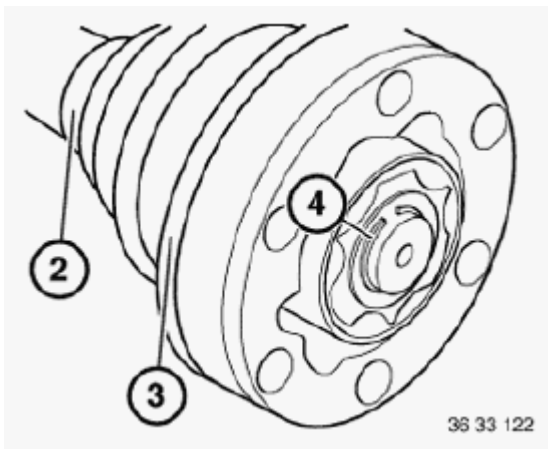


Fig. 53: Cap, Circlip And Hose Clip
 Courtesy of BMW OF NORTH AMERICA, INC.

Special tool 26 1 110 must be used in accordance with diameter of output shaft. Bearing inner race must rest on rib of special tool.

Hollow shaft only: Also use special tool 21 2 120 .

Press splined shaft out of constant-velocity joint.

Clean constant-velocity joint carefully and remove all traces of old grease.

Check constant-velocity joint for damage, replace if necessary.

Detach gaiter from splined shaft.

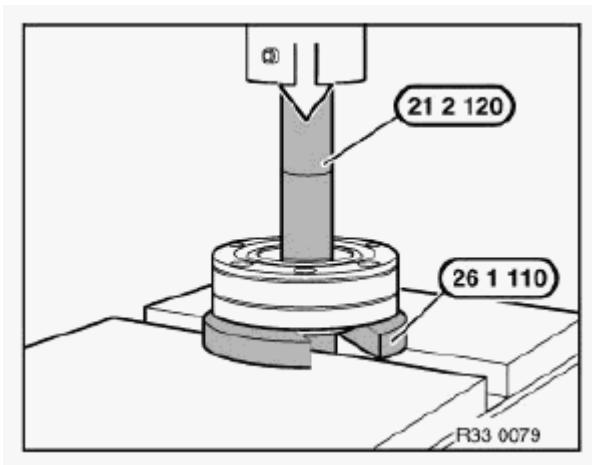


Fig. 54: Special Tool (21 2 120) And (26 1 110)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Pull gaiter onto cap (3).

Coat sealing surface of cap (3) with sealing compound and press with a thrust ring onto constant - velocity joint.

Fill constant-velocity joint with high-temperature grease.

Install new circlip.

Press constant-velocity joint and cap (3) over inner bearing race on splined shaft.

Mount special tool 33 2 100 with corresponding insert.

Push new gaiter onto splined shaft.

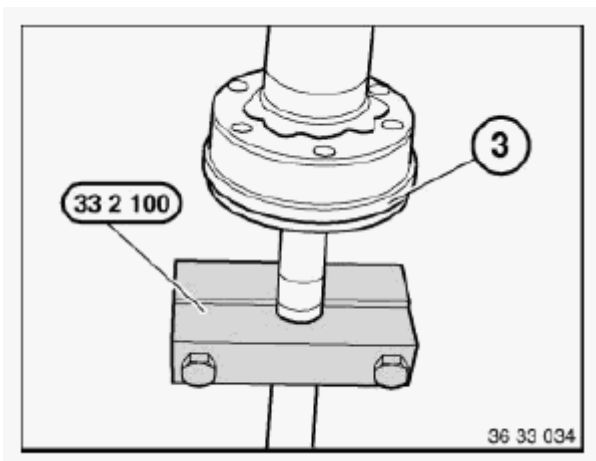


Fig. 55: Gaiter Onto Cap With Special Tool (33 2 100)
Courtesy of BMW OF NORTH AMERICA, INC.

Release hose clamps (5, 6).

Detach gaiter from splined shaft.

Clean joint carefully and remove all traces of old grease.

Installation:

Pull new gaiter on.

Thoroughly clean joint while assembled and remove old grease completely.

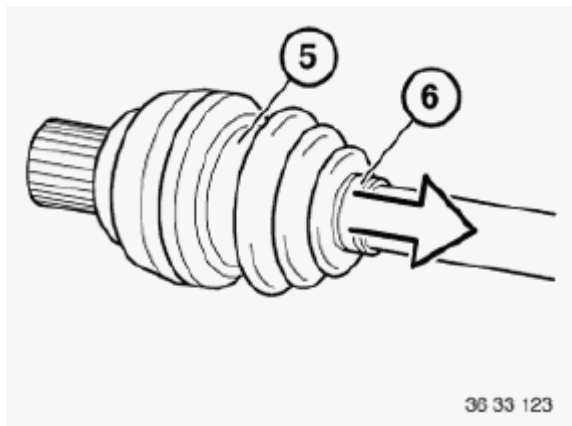


Fig. 56: Hose Clamps
Courtesy of BMW OF NORTH AMERICA, INC.

Disassembling/assembling constant-velocity joint:

NOTE: Mark positions of ball hub, ball cage and joint with respect to each other with electric inscriber.

Ensure all parts are clean prior to assembly.

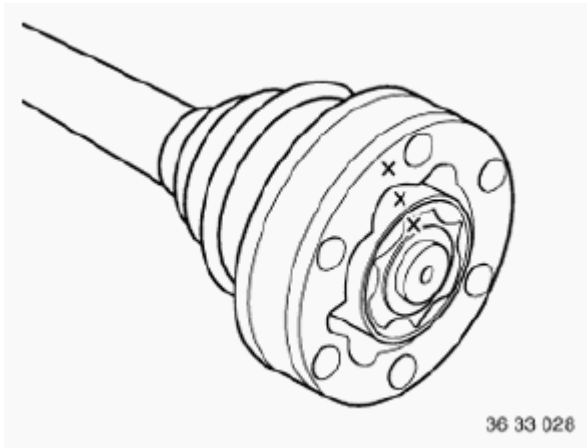


Fig. 57: Mark Positions Of Ball Hub

Courtesy of BMW OF NORTH AMERICA, INC.

33 21 035 REPLACING GAITER ON LEFT OUTPUT SHAFT (ALTERED SEALING COVER)

Special tools required:

- **21 2 120 DRIFT**
- **26 1 110 REMOVAL DISK**
- **33 2 100 CLAMPING FIXTURE**

Necessary preliminary tasks:

- Remove output shaft, see **33 21 001 Removing and installing / replacing left output shaft.**

Removing inner gaiter:

Clean output shaft and clamp with a cloth in vice.

Unfasten hose clip (1).

Using a suitable tool, force gaiter cap (2) off joint or sealing cover.

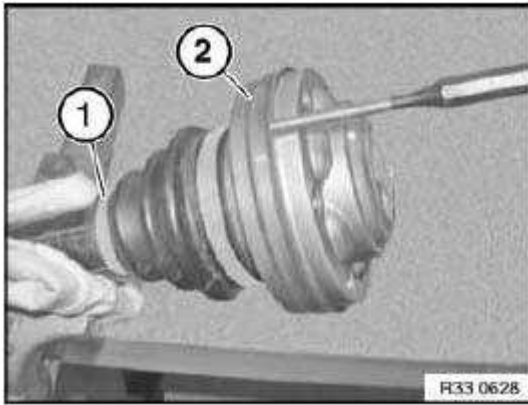


Fig. 58: Hose Clip And Gaiter Cap

Courtesy of BMW OF NORTH AMERICA, INC.

Push back gaiter with cap.

IMPORTANT: Risk of damage!
Make sure that joint does not fall apart.

Clamp joint (1) in vice.

Using a suitable tool, force sealing cover (2) off joint (1).

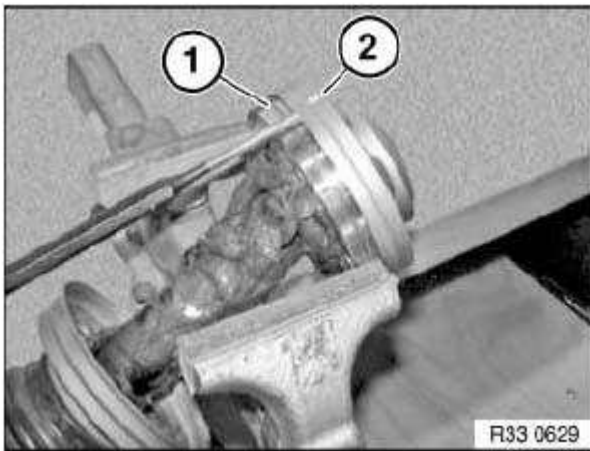


Fig. 59: Sealing Cover Off Joint

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Mark positions in relation to each other of ball hub, ball cage and joint at ends.

NOTE: If the joint falls apart, it can only be reassembled correctly with the aid of the markings.

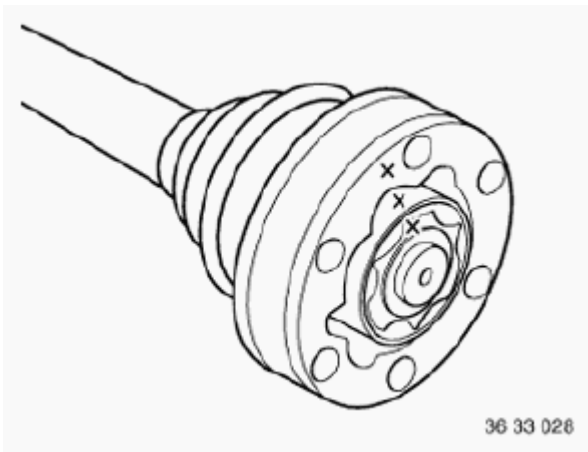


Fig. 60: Mark Positions Of Ball Hub
Courtesy of BMW OF NORTH AMERICA, INC.

Remove circlip (1).



Fig. 61: Circlip
Courtesy of BMW OF NORTH AMERICA, INC.

Grip output shaft.

Using special tool 26 1 110 and a suitable tool (for hollow shaft 21 2 120), press output shaft out of joint (1).

Clean joint (1) carefully.

NOTE: All traces off old grease must be removed.

Detach gaiter from output shaft.

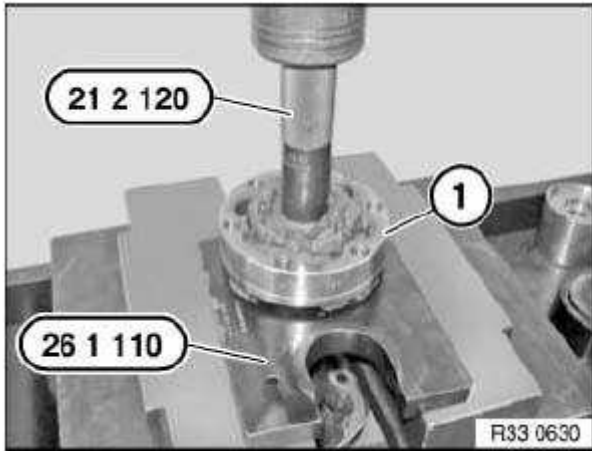


Fig. 62: Special Tool (21 2 120) And (26 1 110)
Courtesy of BMW OF NORTH AMERICA, INC.

Removing and installing outer gaiter:

Release hose clamps (1, 3) and detach gaiter (2) from output shaft.

Clean joint and output shaft carefully.

NOTE: All traces off old grease must be removed.

Check joint for damage; if necessary, replace output shaft .

Fill joint with propeller shaft grease.

Fit gaiter (2) on bellows and secure with hose clamps (1, 3).

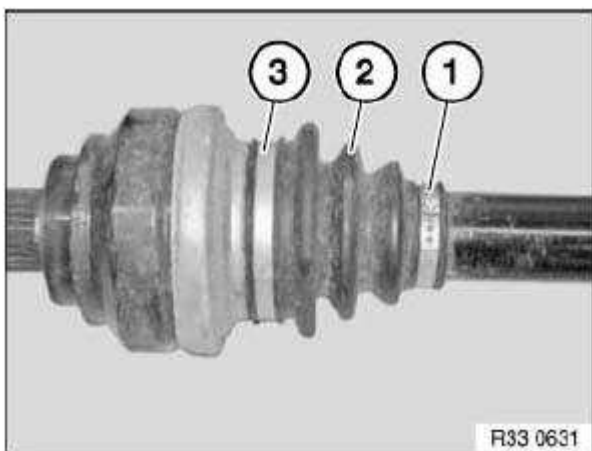


Fig. 63: Hose Clamps, Gaiter From Output Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Installing inner gaiter:

Push gaiter with cap onto output shaft (1).

Mount special tool 33 2 100 with corresponding shell inserts on output shaft (1).

Press joint (2) over bearing inner race onto output shaft.

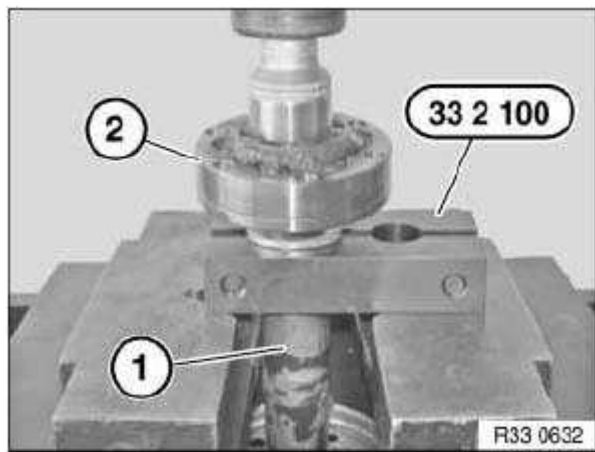


Fig. 64: Output Shaft With Special Tool (33 2 100)
Courtesy of BMW OF NORTH AMERICA, INC.

Install new circlip (1).



Fig. 65: Circlip
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Keep sealing faces of cap and joint (on both sides) clean and free from grease.

Fill joint at both ends with high-temperature grease.

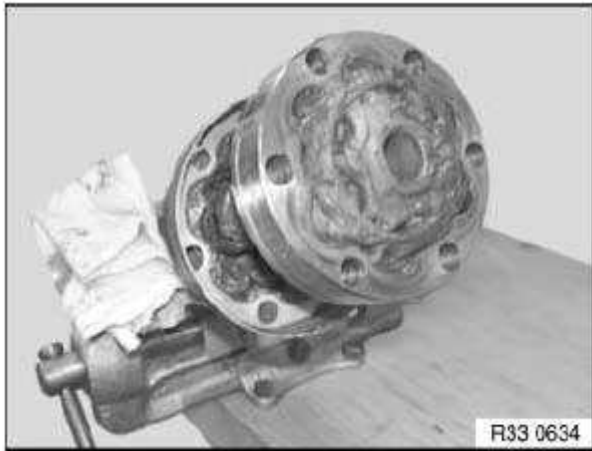


Fig. 66: Sealing Faces Of Cap And Joint
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage!

Do not install gaiter with cap and sealing cover on joint without shims.

Apply a thin coating of sealing compound to sealing faces of sealing cover and cap.

Install sealing cover (1) with two bolts, shims and nuts on joint.

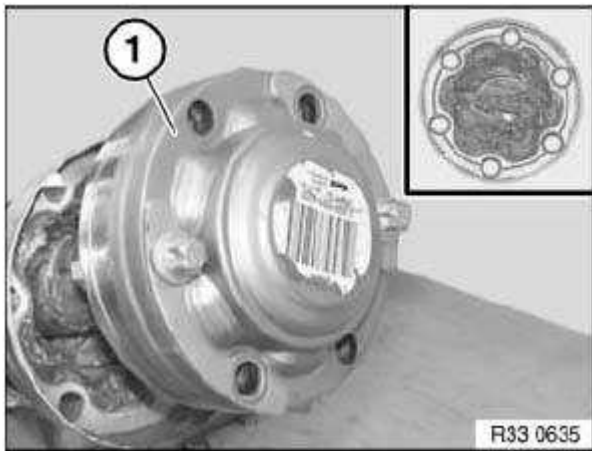


Fig. 67: Sealing Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Install cap (1) with two bolts, shims and nuts on joint.

Fit hose clamp (2).

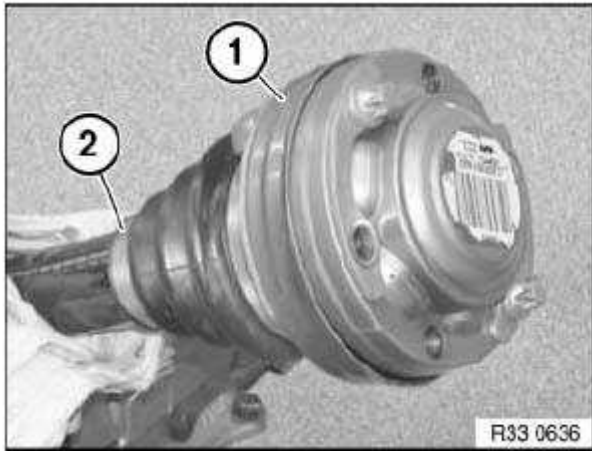


Fig. 68: Hose Clamp And Cap

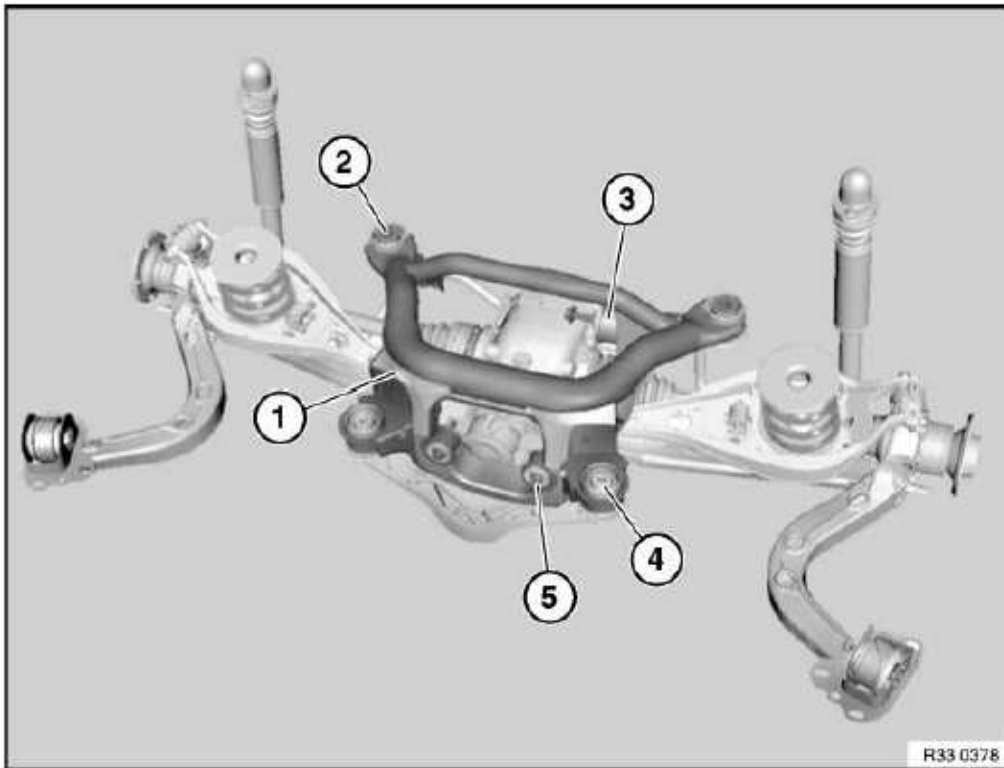
Courtesy of BMW OF NORTH AMERICA, INC.

33 21 036 REPLACING GAITER ON RIGHT OUTPUT SHAFT

Procedure is described in the document "Replacing gaiter on left output shaft", see **33 21 035 Replacing gaiter on left output shaft**.

31 REAR SUB-FRAME

33 31 ... OVERVIEW OF REAR AXLE CARRIER WITH RUBBER MOUNTS



- | | | | |
|---|--|---|---|
| 1 | Rear axle carrier | 4 | Rear axle carrier rubber mount. front |
| 2 | Rear axle carrier rubber mount. rear | 5 | Rear differential rubber mount. front |
| 3 | Rear differential rubber mount. rear | | |

Fig. 69: Rear Axle Carrier With Rubber Mounts Components
 Courtesy of BMW OF NORTH AMERICA, INC.

33 31 000 REMOVING AND INSTALLING COMPLETE REAR AXLE CARRIER

Special tools required:

- **33 4 420 SUPPORT**

Necessary preliminary tasks:

- Remove emergency wheel pan, see **51 71 495 REMOVING AND INSTALLING/REPLACING EMERGENCY WHEEL PAN** .
- Remove propeller shaft from rear differential and tie back, see **26 11 000 REMOVING AND INSTALLING PROPELLER SHAFT (CARDAN UNIVERSAL JOINT) COMPLETELY** .
- Disengage handbrake Bowden cables from handbrake lever and expose up to rear axle carrier, see **34 41 120 REMOVING AND INSTALLING/REPLACING BOTH HANDBRAKE BOWDEN CABLES** .
- Remove coil springs, see **33 53 000 Removing and installing / replacing rear left or right coil spring**.
- If necessary, disconnect plug connection from ride-height sensor
- Remove lip on both sides

- Disconnect plug connection for pulse generator on both sides
- Disconnect plug connection for right brake pad wear sensor.

IMPORTANT: Risk of damage!

Brake hose must not be exposed to tensile loads.

Release screw and remove bracket with brake hose.

Tightening torque: 34 32 3AZ, see **34 32 BRAKE LINES** .

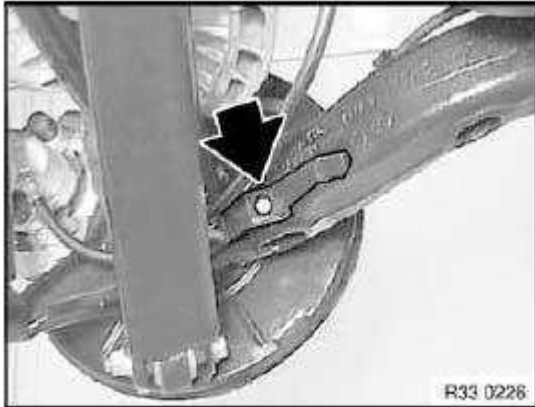


Fig. 70: Locating Bracket With Brake Hose

Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection for right brake pad wear sensor on brake caliper.

Remove brake caliper on both sides of trailing arm and tie back, see **34 21 745 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT REAR BRAKE CALIPER** .

Remove lower control arm on both sides from trailing arm **33 32 086 Removing and installing/replacing bottom left control arm.**

Slide brake caliper through between output shaft and lower control arm and tie up.

Remove bearing block for trailing arm from body **33 32 ... Replacing bearing block for front trailing arm.**

WARNING: Danger of injury!

Failure to comply with the following instructions may result in the vehicle slipping off the lifting platform and critically injuring other persons.

When supporting components, make sure that

- the vehicle can no longer be raised or lowered
- the vehicle does not lift off the locating plates on the lifting platform

Support rear differential with workshop jack and special tool 33 4 420 .

**IMPORTANT: Observe gap between special tool 33 4 420 and dust plates (1).
To avoid grinding noises, make sure the dust plates (1) are not damaged (e.g. bent).**

Remove tension strut, see 33 32 160 Removing and installing/replacing compression strut for rear axle carrier.

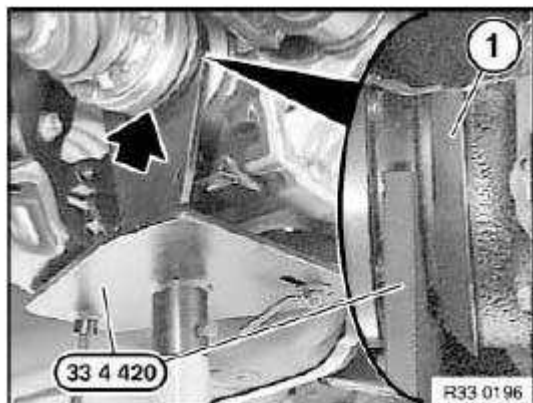


Fig. 71: Dust Plates With Special Tool (33 4 420)
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) and remove stop plate.

Lower rear axle carrier.

Installation:

Check threads for damage; if necessary, repair with Helicoil thread inserts, see 33 00 ... Notes on repairing threads.

Tightening torque: 33 33 3AZ, see 33 33 REAR AXLE SUSPENSION .

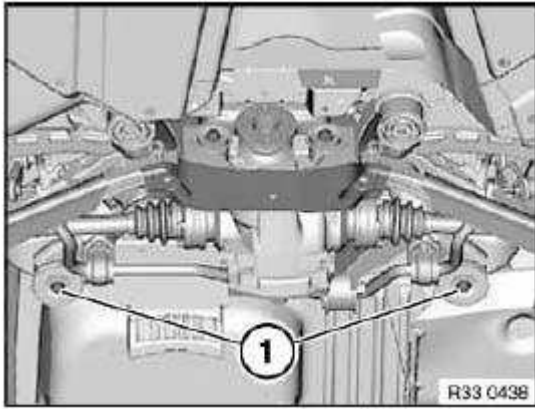


Fig. 72: Stop Plate And Screw

Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Adjust handbrake, see **34 10 014 ADJUSTING HANDBRAKE** .
- Perform **32 00 150 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH LOAD UP TO DESIGN POSITION**

33 31 011 REPLACING REAR AXLE CARRIER

Necessary preliminary tasks:

- Remove rear differential, see **33 10 010 Removing and installing/replacing rear differential**.
- Remove complete rear axle carrier, see **33 31 000 Removing and installing complete rear axle carrier**.

Disengage handbrake Bowden cables from expander lock and feed out of rear axle carrier, see **34 41 120 REMOVING AND INSTALLING/REPLACING BOTH HANDBRAKE BOWDEN CABLES** .

Remove stabilizer bar, see **33 55 000 Removing and installing/replacing rear stabilizer**.

Remove lower control arm from rear axle carrier, see **33 32 086 Removing and installing/replacing bottom left control arm**.

Remove upper control arm on both sides from rear axle carrier and remove with trailing arm and output shaft.

If necessary, remove height setting sensor and bracket, see **37 14 512 REPLACING REAR RIDE-HEIGHT SENSOR** .

If necessary, remove vibration damper.

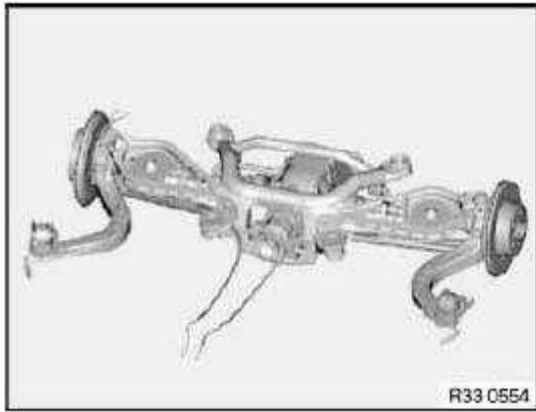


Fig. 73: Rear Axle Carrier

Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Adjust handbrake, see **34 10 014 ADJUSTING HANDBRAKE** .
- Perform **32 00 150 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH LOAD UP TO DESIGN POSITION**

33 31 503 LOWERING/RAISING REAR AXLE CARRIER

Special tools required:

- **33 4 420 SUPPORT**

NOTE: If the rear axle carrier is detached from the body, it is necessary after reinstallation to carry out a wheel/chassis alignment check.

Necessary preliminary tasks:

- Remove emergency wheel pan, see **51 71 495 REMOVING AND INSTALLING/REPLACING EMERGENCY WHEEL PAN** .
- Remove exhaust system up to catalytic converter, see **EXHAUST SYSTEM COMPLETE** .
- Remove tunnel thermal insulation
- Remove center mount from body and release screw ring, see **26 11 000 REMOVING AND INSTALLING PROPELLER SHAFT (CARDAN UNIVERSAL JOINT) COMPLETELY** .
- Unclip both handbrake Bowden cables in tunnel
- If necessary, disconnect plug connection from ride-height sensor

IMPORTANT: Risk of damage!

Brake hose must not be exposed to tensile loads.

Release screw and remove bracket with brake hose.

Tightening torque: 34 32 3AZ, see **34 32 BRAKE LINES** .

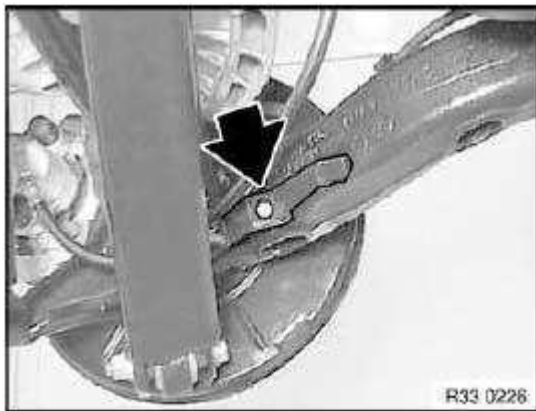


Fig. 74: Locating Bracket With Brake Hose
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Danger of injury!

Failure to comply with the following instructions may result in the vehicle slipping off the lifting platform and critically injuring other persons.

When supporting components, make sure that

- the vehicle can no longer be raised or lowered
- the vehicle does not lift off the locating plates on the lifting platform

Support rear differential with workshop jack and special tool 33 4 420 .

IMPORTANT: Observe gap between special tool 33 4 420 and dust plates (1).

To avoid grinding noises, make sure the dust plates (1) are not damaged (e.g. bent).

Remove tension strut, see **33 32 160 Removing and installing/replacing compression strut for rear axle carrier**.

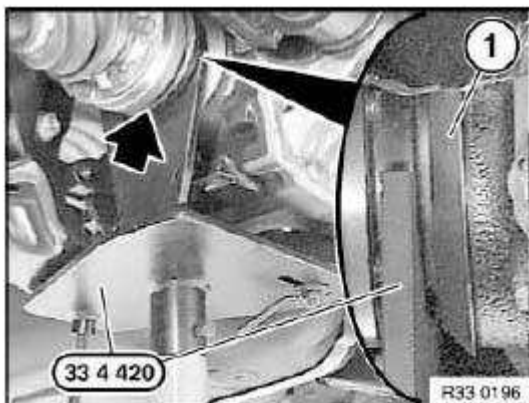


Fig. 75: Dust Plates With Special Tool (33 4 420)
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) and remove stop plate.

Lower rear axle carrier.

Installation:

Check threads for damage; if necessary, repair with Helicoil thread inserts, see **33 00 ... Notes on repairing threads.**

Check seating of coil springs with spring pads, correct if necessary.

Tightening torque: 33 33 3AZ, see **33 33 REAR AXLE SUSPENSION** .

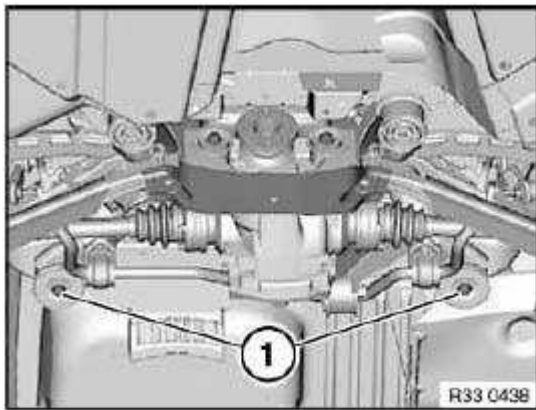


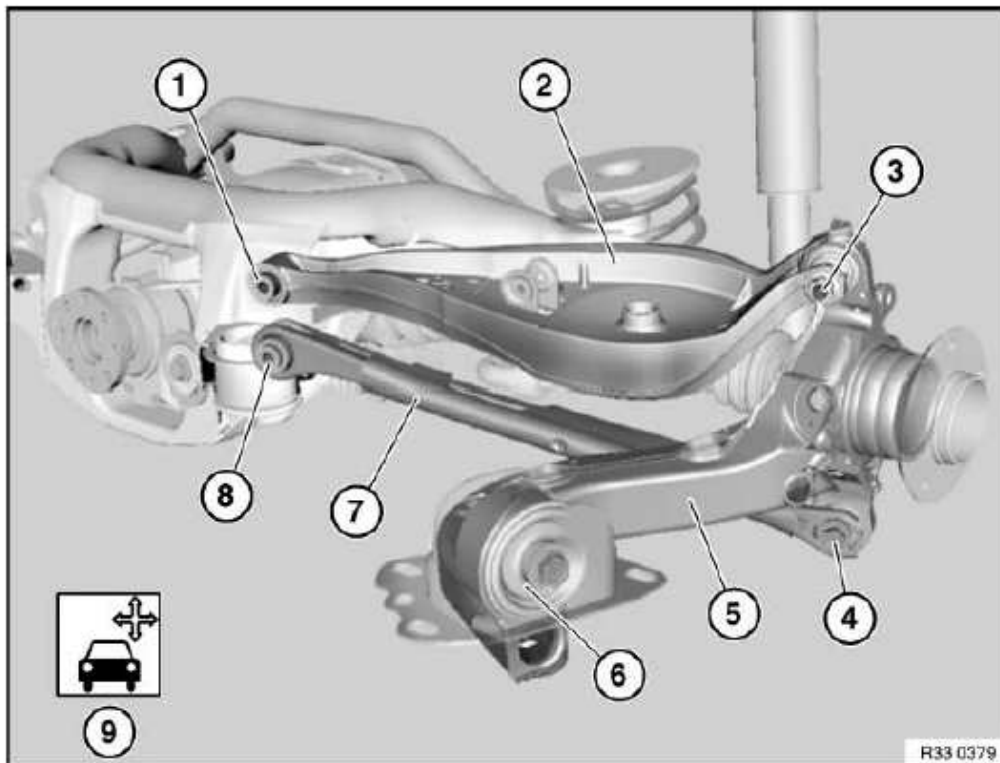
Fig. 76: Stop Plate And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Perform **32 00 150 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH LOAD UP TO DESIGN POSITION**

32 CONTROL ARMS AND STRUTS

33 32 .. OVERVIEW OF CONTROL ARMS WITH RUBBER MOUNTS



- | | | | |
|---|--|---|---|
| 1 | Rubber mount in control arm, top | 6 | Rubber mount in trailing arm at front |
| 2 | Control arm, top (left/right) | 7 | Control arm, bottom (left/right) |
| 3 | Ball joint in trailing arm | 8 | Rubber mount in control arm, bottom |
| 4 | Rubber mount in trailing arm | 9 | Adjustment work |
| 5 | Trailing arm (left/right) | | |

Fig. 77: Control Arms With Rubber Mounts Components
 Courtesy of BMW OF NORTH AMERICA, INC.

33 32 ... REPLACING BEARING BLOCK FOR FRONT TRAILING ARM

Special tools required:

- **33 3 280 SETTING GAUGE**

Necessary preliminary tasks:

- Remove rear wheel, see **36 10 300 REMOVING OR INSTALLING FRONT OR REAR WHEEL** .
- Disconnect plug connection for pulse generator; if necessary, expose lead up to trailing arm, see **34 52 535 REPLACING A REAR PULSE GENERATOR** .
- Only on right side: Disconnect plug connection for brake pad sensor; if necessary, expose lead up to trailing arm

IMPORTANT: Risk of damage!
Brake hose must not be exposed to tensile loads.

Release screw and remove bracket with brake hose.

Tightening torque: 34 32 3AZ, see **34 32 BRAKE LINES** .

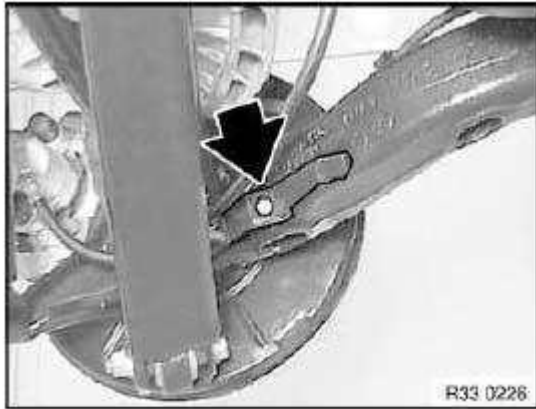


Fig. 78: Locating Bracket With Brake Hose
Courtesy of BMW OF NORTH AMERICA, INC.

Mark position of bearing block (1) to body (2) with colored mark (3); this simplifies subsequent toe-in adjustment.

Unfasten screws.

Tightening torque: 33 32 13AZ, see **33 32 CONTROL ARMS AND STRUTS** .

Lower workshop jack and pull trailing arm downwards.

Installation:

Check threads for damage; if necessary, repair with Helicoil thread inserts, see **33 00 ... Notes on repairing threads**.

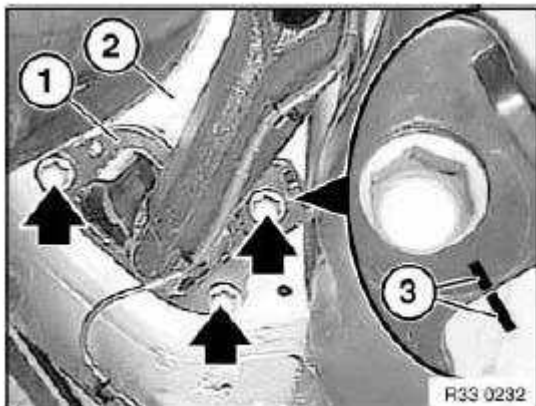


Fig. 79: Locating Mark Position Of Bearing Block To Body With Colored Mark

Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten nut.

Pull out screw.

Remove bearing block towards top.

Installation:

Replace self-locking nut.

Tightening torque: 33 32 12AZ, see **33 32 CONTROL ARMS AND STRUTS** .

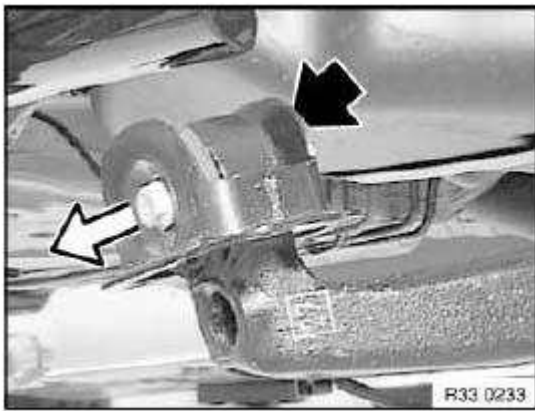


Fig. 80: Pulling Screw

Courtesy of BMW OF NORTH AMERICA, INC.

Installation with special tool:

Installation:

Secure special tool 33 3 280 to bearing pedestal with a screw and align to wheel center. Place bearing block in position and screw down.

Tightening torque: 33 32 12AZ, see **33 32 CONTROL ARMS AND STRUTS** .

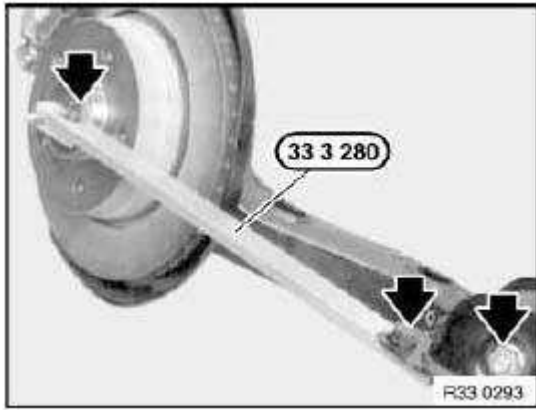


Fig. 81: Locating Special Tool (33 3 280)
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation without special tool:

Installation:

Place tube (1) (length = approx. 500 mm, dia. = 16 mm) flat on bearing block, secure with screw clamp and align tube center to wheel center. Screw bearing pedestal down in this position.

Tightening torque: 33 32 12AZ, see **33 32 CONTROL ARMS AND STRUTS** .

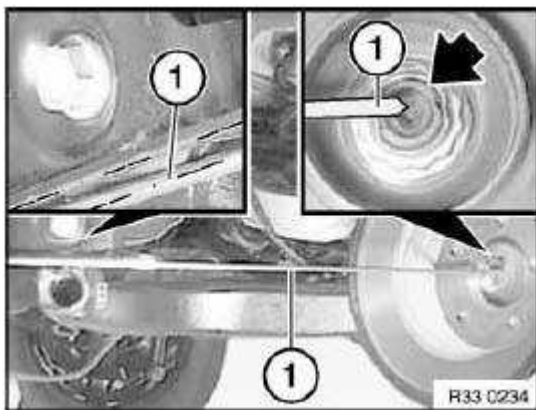


Fig. 82: Locating Tube
 Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Perform **32 00 150 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH LOAD UP TO DESIGN POSITION**

Special tools required:

- **31 5 220 SUPPORT**
- **33 2 160 SPACER RING**

Necessary preliminary tasks:

- Remove output shaft, see **33 21 001 Removing and installing / replacing left output shaft.**
- Remove brake disk, see **34 21 320 REMOVING AND INSTALLING/REPLACING BOTH BRAKE DISKS .**
- Disconnect handbrake Bowden cable from expander lock, see **34 41 120 REMOVING AND INSTALLING/REPLACING BOTH HANDBRAKE BOWDEN CABLES .**
- Remove pulse generator, see **34 52 535 REPLACING A REAR PULSE GENERATOR .**
- Only on right side: remove brake pad sensor

IMPORTANT: Risk of damage

Brake hose must not be exposed to tensile loads.

Release screw and remove bracket with brake hose.

Tightening torque: 34 32 3AZ, see **34 32 BRAKE LINES .**



Fig. 83: Locating Bracket With Brake Hose

Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Danger of injury!

Failure to comply with the following instructions may result in the vehicle slipping off the lifting platform and critically injuring other persons. When supporting components, make sure that

- the vehicle can no longer be raised or lowered
- the vehicle does not lift off the locating plates on the lifting platform

Secure special tools 31 5 220 and 33 2 160 with wheel studs to drive flange.

Support trailing arm with special tool 31 5 220 and workshop jack.

Remove bearing block from body, see **33 32 ... Replacing bearing block for front trailing arm.**

Remove lower control arm from trailing arm, see **33 32 071 Replacing one upper control arm.**

Remove upper control arm from trailing arm, see **33 32 071 Replacing one upper control arm.**

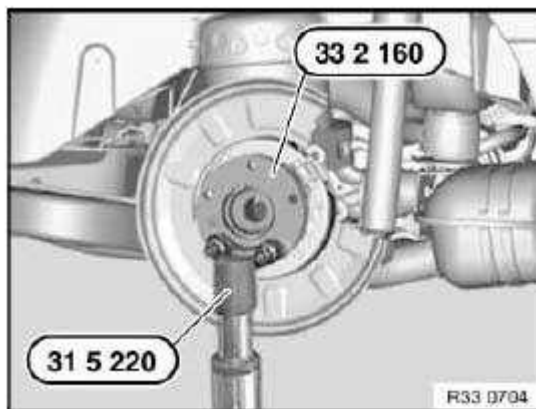


Fig. 84: Special Tool (33 2 160) And (31 5 220)
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Adjust handbrake, see **34 10 014 ADJUSTING HANDBRAKE .**
- Perform **32 00 150 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH LOAD UP TO DESIGN POSITION**

33 32 021 REPLACING LEFT OR RIGHT TRAILING ARM

Necessary preliminary tasks:

- Remove trailing arm, see **33 32 000 Removing and installing complete left or right trailing arm.**
- Remove brake carrier/brake guard plate, see **34 21 171 REMOVING AND INSTALLING/REPLACING A BRAKE CARRIER/BRAKE GUARD PLATE AT REAR .**

Installation:

Install new wheel bearing, see **33 41 153 Replacing left wheel bearing on rear axle shaft.**

Detach wheel bearing inner race from drive flange.

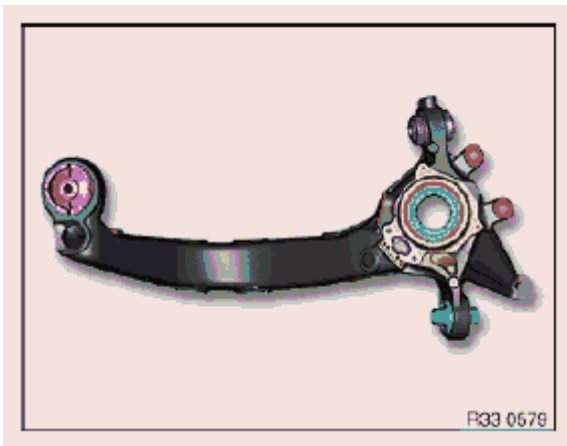


Fig. 85: Wheel Bearing Inner Race From Drive Flange
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Adjust handbrake, see **34 10 014 ADJUSTING HANDBRAKE** .
- Perform **32 00 150 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH LOAD UP TO DESIGN POSITION**

33 32 042 REPLACING A RUBBER MOUNT IN TRAILING ARM, FRONT

Special tools required:

- 33 3 144**33 3 140 SET OF TOOLS**
- 33 3 145**33 3 140 SET OF TOOLS**
- 33 3 222**33 3 220 SET OF TOOLS**
- 33 3 227**33 3 220 SET OF TOOLS**
- 33 3 228**33 3 220 SET OF TOOLS**

Necessary preliminary tasks:

- Remove bearing block, see **33 32 ... Replacing bearing block for front trailing arm.**

IMPORTANT: The arrow on special tool 33 3 228 must point in the pullout direction!

Pull out rubber mount with special tools 33 3 144 , 33 3 145 , 33 3 222 , 33 3 227 , 33 3 228 and nut (1).

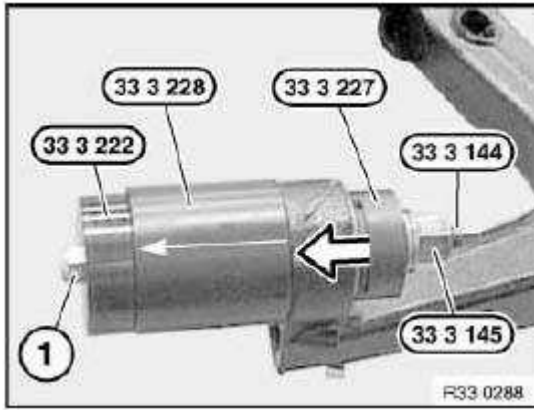


Fig. 86: Special Tool (33 3 228), (33 3 222) And (33 3 144)
Courtesy of BMW OF NORTH AMERICA, INC.

Mark trailing arm eye with a colored dot (K) as shown in illustration on left.

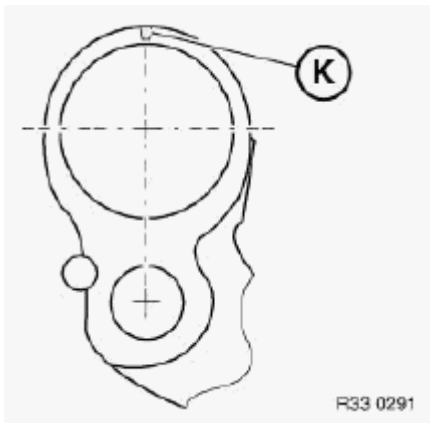


Fig. 87: Mark Trailing Arm Eye With Colored Dot
Courtesy of BMW OF NORTH AMERICA, INC.

Keep rubber mount and trailing arm eye clean and free from oil and grease.

IMPORTANT: Slot in rubber mount must match up with end of arrow on special tool 33 3 228 !

Insert rubber mount in special tool 33 3 228 and align.

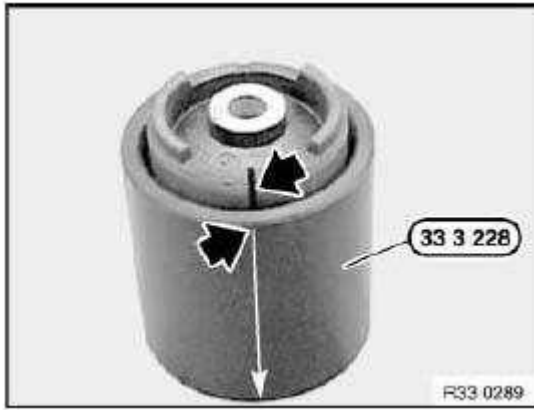


Fig. 88: Special Tool (33 3 228)
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Arrow on special tool 33 3 228 must point to colored dot (K)!

Draw in rubber mount with special tools 33 3 144 , 33 3 145 , 33 3 222 , 33 3 227 , 33 3 228 and nut (1) until special tool 33 3 228 becomes loose.

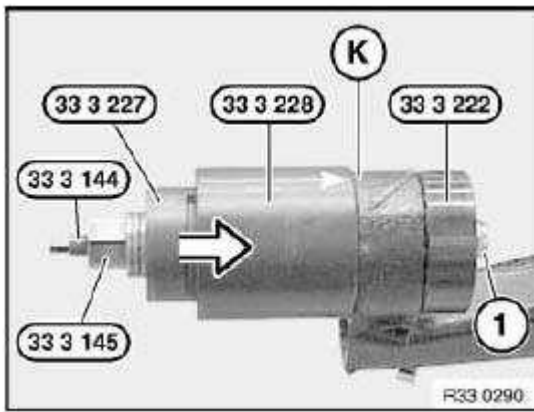


Fig. 89: Special Tool (33 3 227), (33 3 144) And (33 3 222)
Courtesy of BMW OF NORTH AMERICA, INC.

Draw in rubber mount to distance (A) = 2.5 mm.

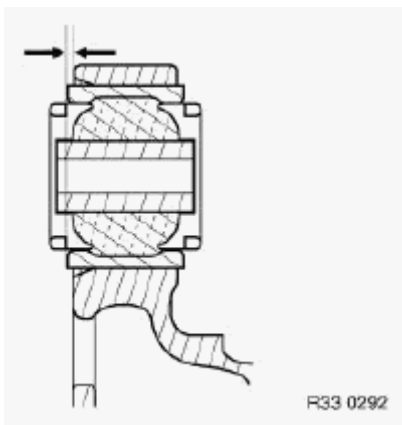


Fig. 90: Rubber Mount To Distance

Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Check that output shaft is correctly seated in rear differential.
- Perform **32 00 150 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH LOAD UP TO DESIGN POSITION**

33 32 044 REPLACING ONE RUBBER MOUNT/BALL JOINT IN TRAILING ARM FOR LOWER CONTROL ARM

Special tools required:

- 33 3 331 **33 3 330 REMOVAL AND INSTALLATION TOOL**
- 33 3 332**33 3 330 REMOVAL AND INSTALLATION TOOL**
- 33 3 333**33 3 330 REMOVAL AND INSTALLATION TOOL**
- 33 3 334**33 3 330 REMOVAL AND INSTALLATION TOOL**

NOTE: **S54: A ball joint is fitted instead of the rubber mount.**

Necessary preliminary tasks:

- Remove lower control arm from trailing arm, see **33 32 071 Replacing one upper control arm.**

Measure and note protrusion (A) of old rubber mount.

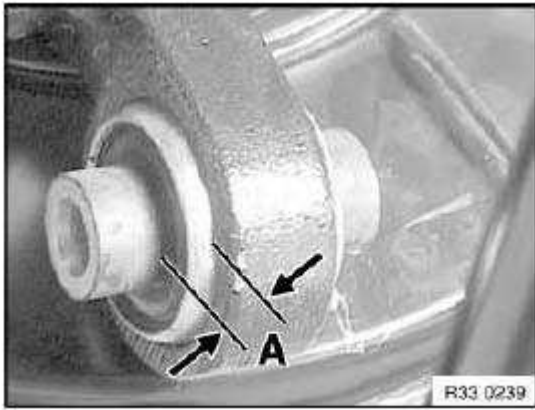


Fig. 91: Protrusion Of Rubber Mount
Courtesy of BMW OF NORTH AMERICA, INC.

Pull out rubber mount with special tools 33 3 331 , 33 3 332 , 33 3 333 and nut (1).

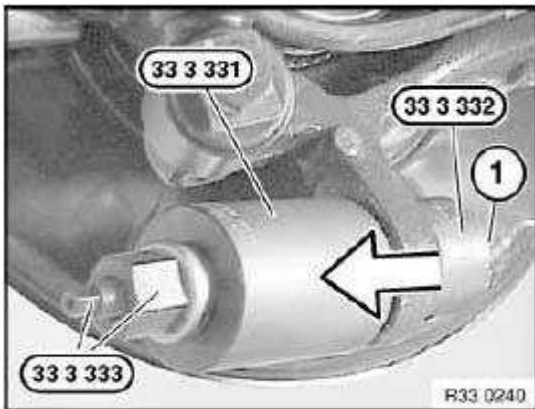


Fig. 92: Special Tool (33 3 331), (33 3 333) And (33 332)
Courtesy of BMW OF NORTH AMERICA, INC.

Draw in new rubber mount (1) with special tools 33 3 332 , 33 3 333 and 33 3 334 to previously determined protrusion (A).

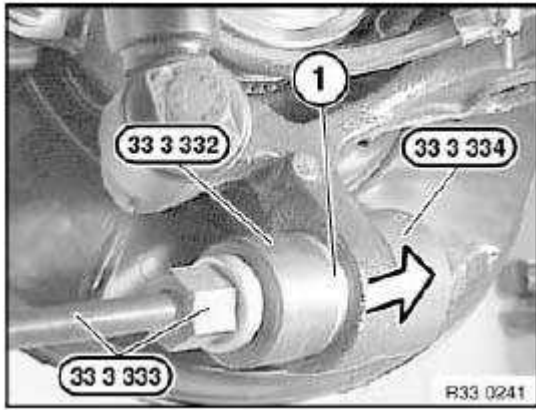


Fig. 93: Special Tool (33 3 332), (33 3 333) And (33 334)
 Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Check that output shaft is correctly seated in rear differential.
- Perform **32 00 150 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH LOAD UP TO DESIGN POSITION**

33 32 047 REPLACING A BALL JOINT IN TRAILING ARM FOR UPPER CONTROL ARM

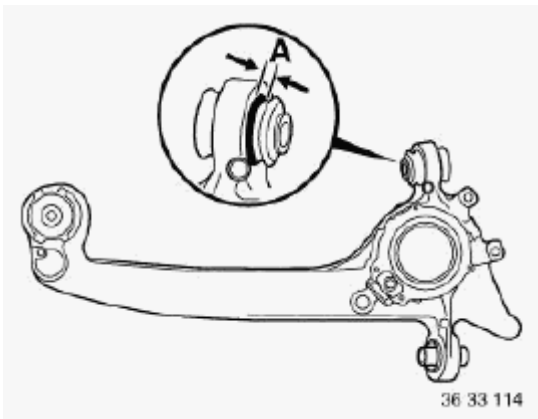
Special tools required:

- 33 3 331 **33 3 330 REMOVAL AND INSTALLATION TOOL**
- 33 3 332 **33 3 330 REMOVAL AND INSTALLATION TOOL**
- 33 3 333 **33 3 330 REMOVAL AND INSTALLATION TOOL**
- 33 3 334 **33 3 330 REMOVAL AND INSTALLATION TOOL**

Necessary preliminary tasks:

- Remove coil spring, see **33 53 000 Removing and installing / replacing rear left or right coil spring.**
- Remove upper control arm from trailing arm, see **33 32 071 Replacing one upper control arm.**

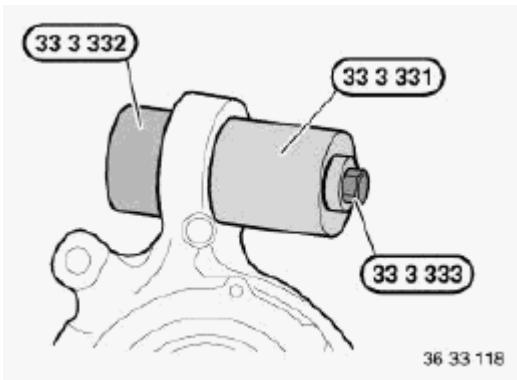
Measure and note down protrusion (A) of old ball joint.



36 33 114

Fig. 94: Down Protrusion Distance Of Ball Joint
 Courtesy of BMW OF NORTH AMERICA, INC.

Pull out ball joint with special tools 33 3 331 , 33 3 332 and 33 3 333 .

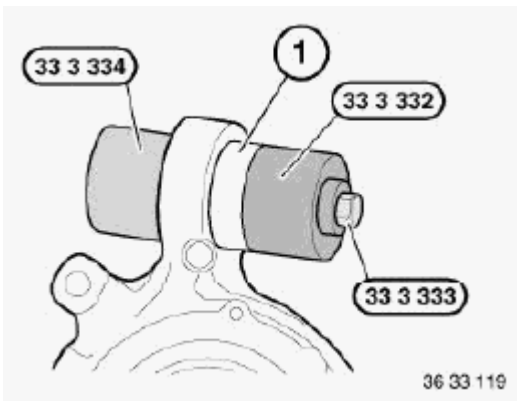


36 33 118

Fig. 95: Special Tool (33 3 332), (33 3 331) And (33 3 333)
 Courtesy of BMW OF NORTH AMERICA, INC.

Keep trailing arm eye and ball joint (1) clean and free from oil and grease.

Draw in new ball joint (1) with special tools 33 3 332 , 33 3 333 and 33 3 334 to previously determined protrusion (A).



36 33 119

Fig. 96: Special Tool (33 3 332), (33 3 334) And (33 3 333)

Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Perform **32 00 150 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH LOAD UP TO DESIGN POSITION**

33 32 071 REPLACING ONE UPPER CONTROL ARM

NOTE: If the upper control arm is detached from the rear axle carrier/trailing arm, it is necessary after reinstallation to carry out a wheel/chassis alignment check.

Necessary preliminary tasks:

- Remove coil spring, see **33 53 000 Removing and installing / replacing rear left or right coil spring.**
- Remove stabilizer link from upper control arm, see **33 55 040 Replacing stabilizer links for stabilizer.**
- If necessary, remove jointed rod of ride-height sensor from upper control arm
- Support rear differential and remove from rear axle carrier, see **33 10 010 Removing and installing/replacing rear differential.**

Unfasten nut.

Remove screw towards rear.

Installation:

Observe bolt insertion direction (F = direction of travel).

Replace self-locking nut.

Tightening torque: 33 32 24AZ, see **33 32 CONTROL ARMS AND STRUTS** .



Fig. 97: Locating Self-Locking Nut

Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten nut.

Remove bolt (1) towards rear.

Remove upper control arm (2) sideways.

Installation:

Note insertion direction of screw.

Replace self-locking nut.

Tighten bolt in normal position, see **32 00 ... MOVING VEHICLE INTO NORMAL POSITION** .

Tightening torque: 33 32 14AZ, see **33 32 CONTROL ARMS AND STRUTS** .

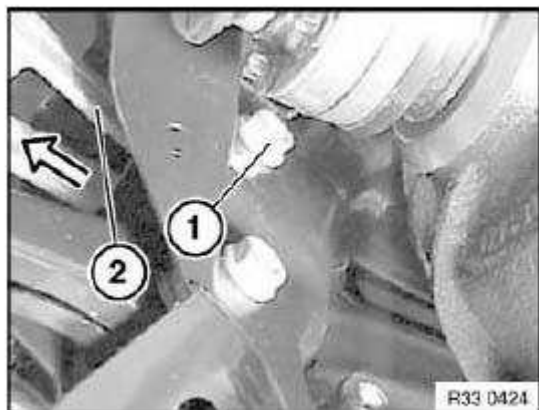


Fig. 98: Locating Upper Control Arm And Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Check that output shaft is correctly seated in rear differential.
- Perform **32 00 150 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH LOAD UP TO DESIGN POSITION**

33 32 086 REMOVING AND INSTALLING/REPLACING BOTTOM LEFT CONTROL ARM

NOTE: If the lower control arm is detached from the rear axle carrier/trailing arm, it is necessary after reinstallation to carry out a wheel/chassis alignment check.

Necessary preliminary tasks:

- Remove rear wheel, see **36 10 300 REMOVING OR INSTALLING FRONT OR REAR WHEEL** .
- Remove stabilizer from rear axle carrier, see **33 55 000 Removing and installing/replacing rear**

stabilizer.

- Support rear differential and remove from rear axle carrier, see **33 10 010 Removing and installing/replacing rear differential.**

IMPORTANT: To avoid damaging the output shaft, it will be necessary to support the trailing arm with the workshop jack.

Support trailing arm from underneath using a workshop jack.

Spread cover on lower control arm and pull off.

Installation:

Opening in cover points upwards.

Replace damaged cover.

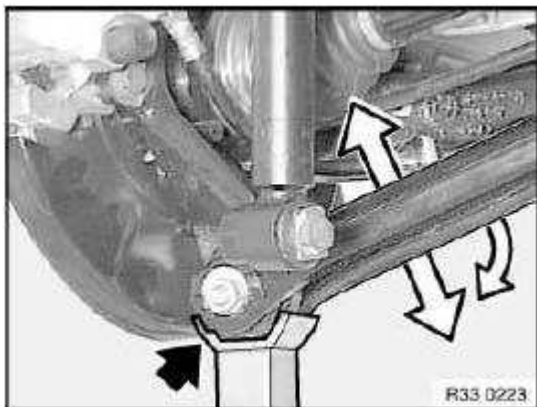


Fig. 99: Locating Lower Control Arm
Courtesy of BMW OF NORTH AMERICA, INC.

Mark position of eccentric screw (1) to lower control arm with center marks (2).

Replacement only: Carry over marking from old part to new part.

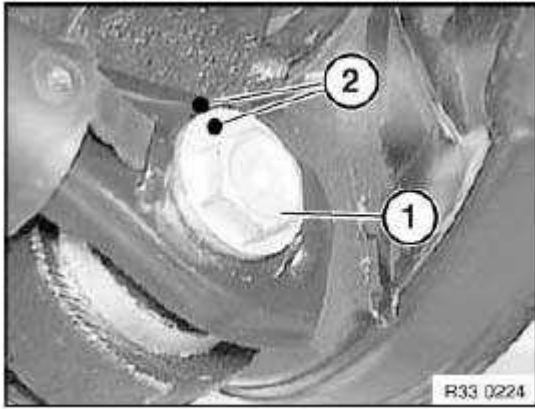


Fig. 100: Mark Position Of Eccentric Screw To Lower Control Arm With Centre Marks
Courtesy of BMW OF NORTH AMERICA, INC.

Release nut (1) and remove eccentric washer (2).

Remove eccentric screw towards front.

Installation:

Note insertion direction of eccentric screw.

Align eccentric screw by means of marking to lower control arm.

Reinstall eccentric washer.

Replace self-locking nut.

Tighten bolt in normal position, see **32 00 ... MOVING VEHICLE INTO NORMAL POSITION** .

Tightening torque: 33 32 25AZ, see **33 32 CONTROL ARMS AND STRUTS** .

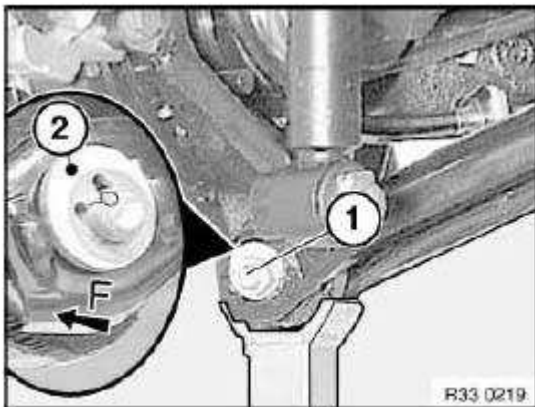


Fig. 101: Eccentric Washer And Nut

Courtesy of BMW OF NORTH AMERICA, INC.

Release screw and remove thread plate (1) downwards.

Press rear differential to side and remove bolt.

Remove lower control arm at side.

Installation:

Insert thread plate into opening in rear axle carrier.

Tighten bolt in normal position, see **32 00 ... MOVING VEHICLE INTO NORMAL POSITION** .

Tightening torque: 33 32 15AZ, see **33 32 CONTROL ARMS AND STRUTS** .

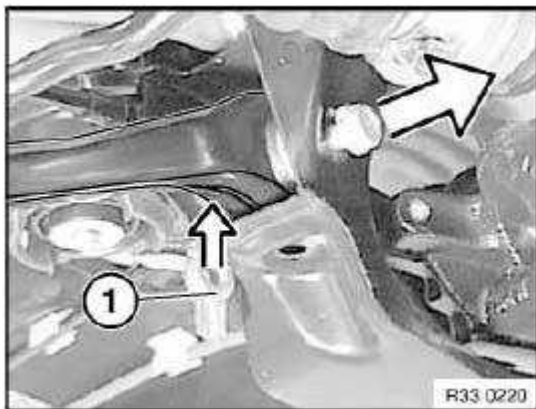


Fig. 102: Removing Thread Plate And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Weld seam of control arm must point upwards.



Fig. 103: Locating Weld Seam Of Control Arm
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Check that output shaft is correctly seated in rear differential.
- Perform **32 00 150 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH LOAD UP TO DESIGN POSITION**

33 32 087 REMOVING AND INSTALLING/REPLACING BOTTOM RIGHT CONTROL ARM

NOTE: If the lower control arm is detached from the rear axle carrier/trailing arm, it is necessary after reinstallation to carry out a wheel/chassis alignment check.

Necessary preliminary tasks:

- Remove rear wheel, see **36 10 300 REMOVING OR INSTALLING FRONT OR REAR WHEEL** .
- Remove output shaft from rear differential and tie back, see **33 21 001 Removing and installing / replacing left output shaft**.

NOTE: The subsequent procedure is described in the document "Removing and installing/replacing lower left control arm." See **33 32 086 Removing and installing/replacing bottom left control arm**.

After installation:

- Check that output shaft is correctly seated in rear differential.
- Perform **32 00 150 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH LOAD UP TO DESIGN POSITION**

33 32 160 REMOVING AND INSTALLING/REPLACING COMPRESSION STRUT FOR REAR AXLE CARRIER

IMPORTANT: Observe safety instructions for raising the vehicle, see **00 LIFTING VEHICLE WITH A LIFTING PLATFORM** .
Driving without the compression strut is not permitted!

Necessary preliminary tasks:

- Remove tension struts, see **33 32 160 Removing and installing/replacing compression strut for rear axle carrier**.
- Lower exhaust system in rear area, see **18 00 020 REMOVING AND INSTALLING COMPLETE EXHAUST SYSTEM (M54)** .

Release screws (1) and remove heat shield (2).

Tightening torque: 33 32 27AZ, see **33 32 CONTROL ARMS AND STRUTS** .

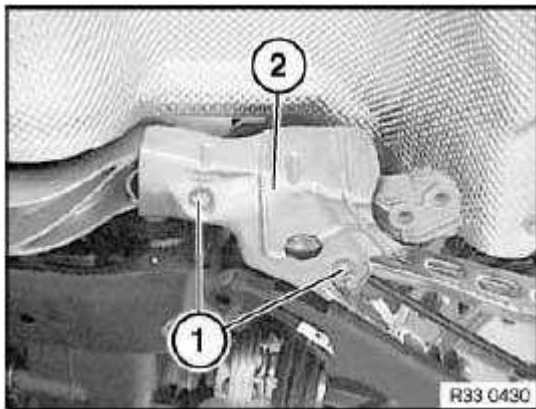


Fig. 104: Heat Shield And Screw

Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Danger of injury!

Failure to comply with the following instructions may result in the vehicle slipping off the lifting platform and critically injuring other persons. When supporting components, make sure that

- the vehicle can no longer be raised or lowered
- the vehicle does not lift off the locating plates on the lifting platform

Risk of damage!

Support rear axle carrier in area of dashed line with workshop jack.

Release screw (1), press tunnel thermal insulation downwards a little and release screw (2).

Release screws (4).

Tightening torque: 33 32 17AZ, see **33 32 CONTROL ARMS AND STRUTS** .

Release bolts (3) and remove compression strut (5).

Secure rear axle carrier by inserting bolts (3).

Installation:

Check threads for damage; if necessary, repair with Helicoil thread inserts, see **33 00 ... Notes on repairing threads**.

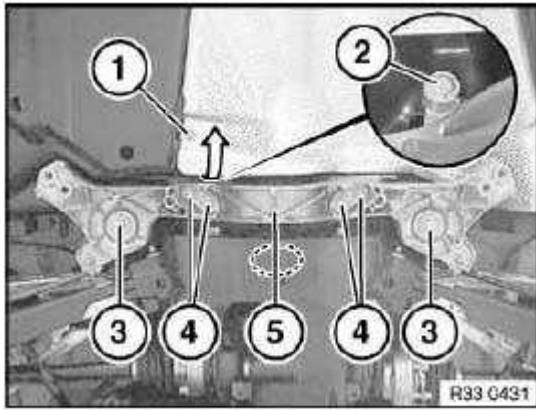


Fig. 105: Compression Strut, Bolt And Screw
 Courtesy of BMW OF NORTH AMERICA, INC.

Make sure handbrake Bowden cables are correctly positioned.

Tightening torque: 33 33 3AZ, see **33 33 REAR AXLE SUSPENSION** .

Replacement:

Convert both holders for handbrake Bowden cables.

33 32 170 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT TENSION STRUT

NOTE: **Build date from 07/2006:**
 Thread inserts in compression strut for securing tension strut have been omitted.

IMPORTANT: **Observe safety instructions for raising the vehicle, see 00 LIFTING VEHICLE WITH A LIFTING PLATFORM .**
Driving without tension struts is not permitted!

Release screws (1, 3).

Remove tension strut (2).

Installation:

When replacing compression strut: If necessary, replace threaded screws (3) with self-tapping screws.

Tightening torque: 33 32 26AZ, see **33 32 CONTROL ARMS AND STRUTS** .

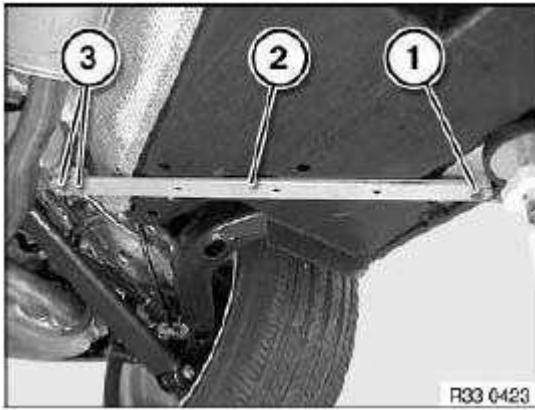


Fig. 106: Tension Strut And Screw
 Courtesy of BMW OF NORTH AMERICA, INC.

33 32 525 REPLACING ONE BALL JOINT IN THE SEMITRAILING ARM (SEMI-TRAILING ARM REMOVED)

Special tools required:

- **33 3 331 33 330 REMOVAL AND INSTALLATION TOOL**
- **33 3 332 33 330 REMOVAL AND INSTALLATION TOOL**
- **33 3 333 33 330 REMOVAL AND INSTALLATION TOOL**
- **33 3 334 33 330 REMOVAL AND INSTALLATION TOOL**

Measure and make a note of protrusion (A) of old ball joint.

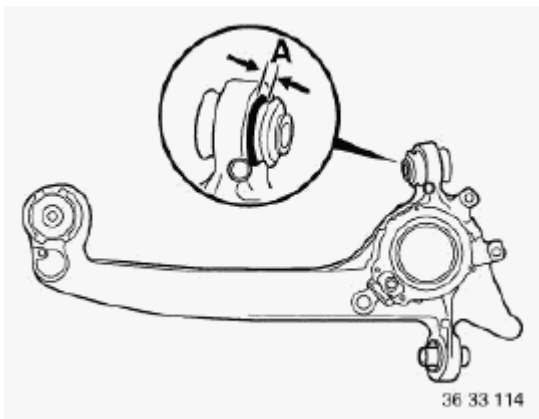


Fig. 107: Down Protrusion Distance Of Ball Joint
 Courtesy of BMW OF NORTH AMERICA, INC.

Pull out ball joint with special tools 33 3 331 , 33 3 332 and 33 3 333 .

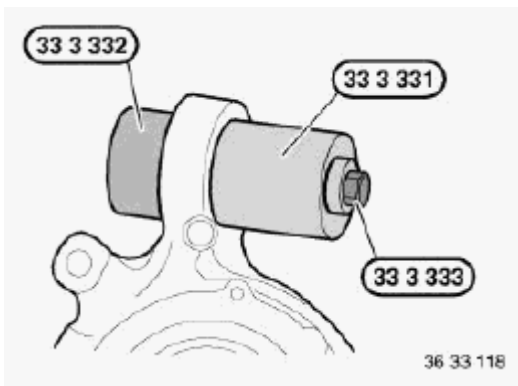


Fig. 108: Special Tool (33 3 332), (33 3 331) And (33 3 333)
Courtesy of BMW OF NORTH AMERICA, INC.

Keep trailing arm eye and ball joint (1) clean and free from oil and grease.

Draw in new ball joint (1) with special tools 33 3 332 , 33 3 333 and 33 3 334 to previously determined protrusion (A).

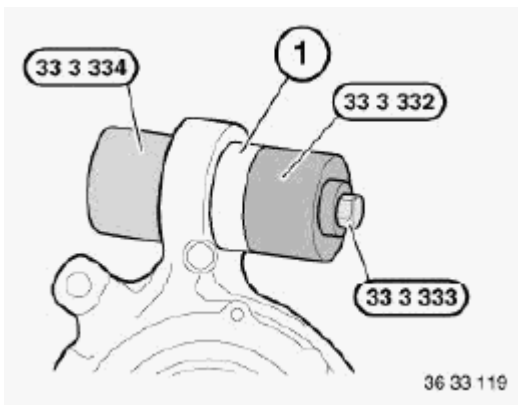


Fig. 109: Special Tool (33 3 332), (33 3 334) And (33 3 333)
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Perform **32 00 150 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH LOAD UP TO DESIGN POSITION**

33 32 671 REPLACING ONE RUBBER MOUNT IN THE UPPER CONTROL ARM (CONTROL ARM REMOVED)

Special tools required:

- 33 3 351 **33 3 350 SET OF TOOLS**
- 33 3 352 **33 3 350 SET OF TOOLS**

Press rubber mount with special tools 33 3 351 and 33 3 352 out of upper control arm.

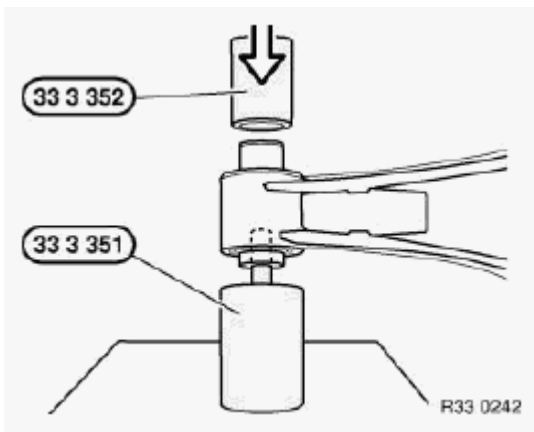


Fig. 110: Special Tool (33 3 352) And (33 3 351)
Courtesy of BMW OF NORTH AMERICA, INC.

Place new rubber mount at chamfered end of control arm bore. Here, longer collar (A = 17 mm) of rubber mount must point upwards.

Press in rubber mount with special tools 33 3 351 and 33 3 352 until flush.

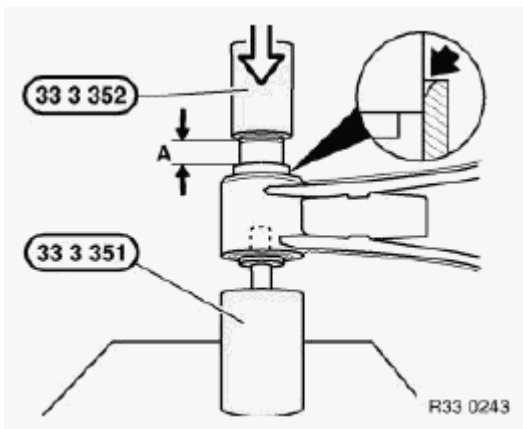


Fig. 111: Special Tool (33 3 352) And (33 3 351)
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Perform **32 00 150 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH LOAD UP TO DESIGN POSITION**

33 32 681 REPLACING ONE RUBBER MOUNT IN LOWER CONTROL ARM (CONTROL ARM REMOVED)

Special tools required:

- 33 3 351 **33 3 350 SET OF TOOLS**
- 33 3 352 **33 3 350 SET OF TOOLS**

- **33 3 353 33 3 350 SET OF TOOLS**
- **33 3 354 33 3 350 SET OF TOOLS**

Attach special tool 33 3 354 between both control arms.

Press rubber mount with special tools 33 3 351 and 33 3 352 out of lower control arm.

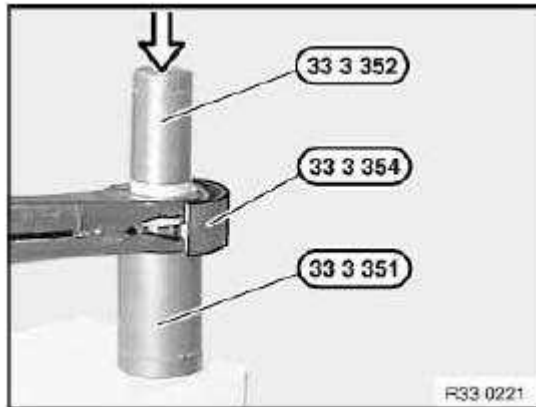


Fig. 112: Special Tool (33 3 352), (33 3 354) And (33 3 351)
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 33 3 354 between both control arms.

Press in new rubber mount (1) with special tools 33 3 351 and 33 3 353 .

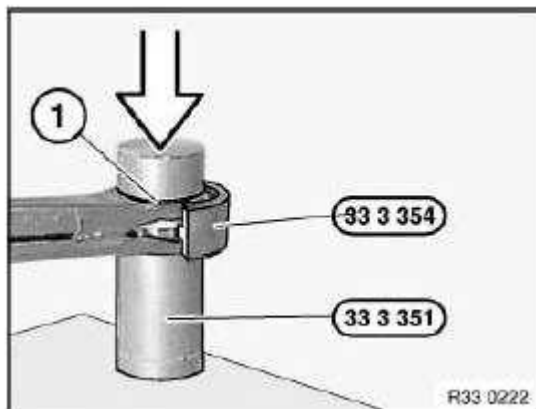


Fig. 113: Special Tool (33 3 354) And (33 3 351)
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Perform **32 00 150 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH LOAD UP TO DESIGN POSITION**

33 AXLE MOUNTING

33 33 101 REPLACING TWO RUBBER MOUNTS FOR REAR AXLE CARRIER

Special tools required:

- 33 3 314 33 3 310 REMOVAL/INSTALLATION TOOL KIT
- 33 3 315 33 3 310 REMOVAL/INSTALLATION TOOL KIT
- 33 3 371 33 3 370 SET OF TOOLS
- 33 3 372 33 3 370 SET OF TOOLS
- 33 3 373 33 3 370 SET OF TOOLS
- 33 4 140 UNIVERSAL SUPPORT
- 33 4 142 33 4 140 UNIVERSAL SUPPORT
- 33 4 145 33 4 140 UNIVERSAL SUPPORT
- 33 4 147 33 4 140 UNIVERSAL SUPPORT
- 33 4 155 33 4 150 REMOVAL AND INSTALLATION TOOL

WARNING: Danger of explosion!
Do not point air jet from hot air blower at fuel tank!

Necessary preliminary tasks:

- Lower rear axle carrier, see 33 31 503 Lowering/raising rear axle carrier.

Assemble special tool 33 4 140 with 33 4 142 and 33 4 147 .

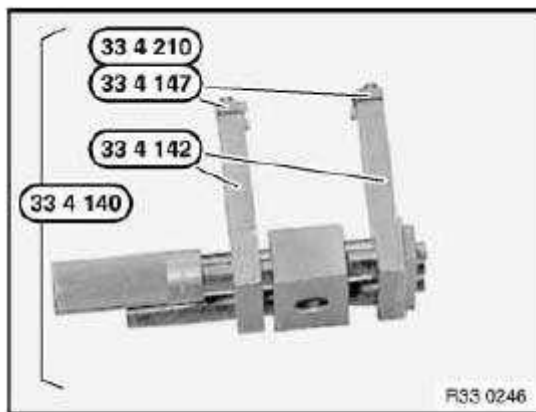


Fig. 114: Special Tool (33 4 210), (33 4 147) And (33 4 142)
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew feed handle (1). If necessary, mount extension piece (3) on special tool 33 4 145 with new screw (2).

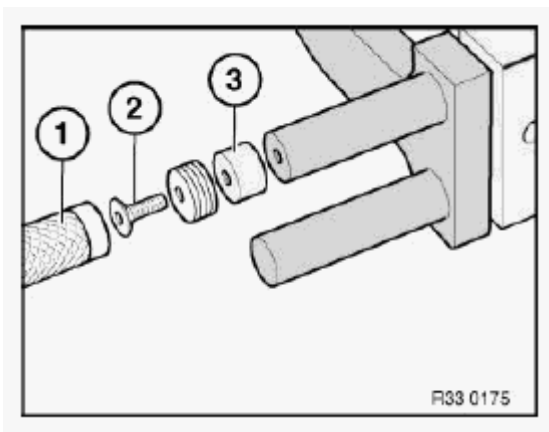


Fig. 115: Feed Handle, Mount Extension Piece And Screw
 Courtesy of BMW OF NORTH AMERICA, INC.

Position special tools 33 4 140 , 33 4 155 , 33 3 371 , 33 3 372 and nut (1) on openings of rubber mount.

NOTE: Ensure it is correctly supported on bushing of rear axle carrier.

Using a hot air blower, heat bearing bushing at max. 600°C outlet temperature for approx. 2 minutes.

Pull out rubber mount by turning special tool 33 4 155 .

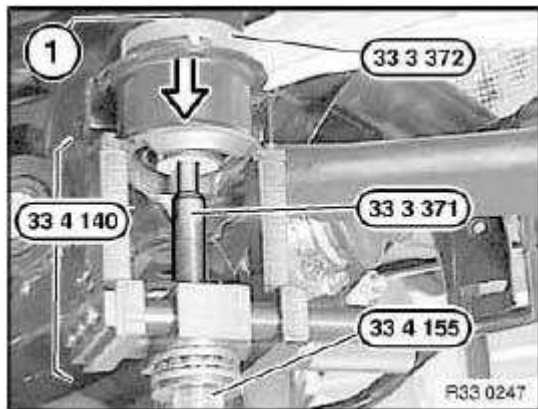


Fig. 116: Special Tool (33 4 140), (33 3 372) And (33 3 371)
 Courtesy of BMW OF NORTH AMERICA, INC.

Coat rubber mount with Circo Light anti-friction agent.

IMPORTANT: Front rubber mounts differ:

Rubber mount VR = front right with elongated hole (1)

Rubber mount VL = front left

When rubber mount is fitted, arrows (2) must point down longitudinal axis of vehicle.

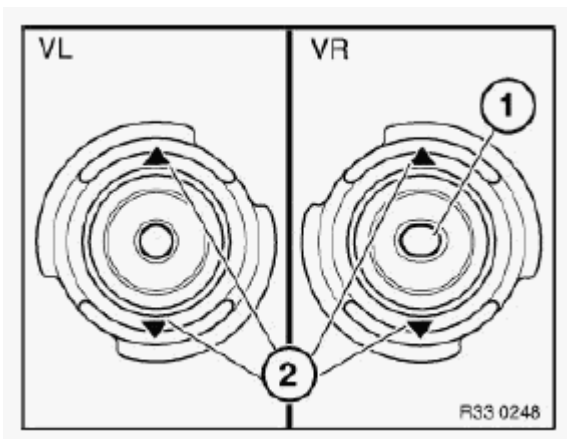


Fig. 117: Elongated Hole And Rubber Mount
 Courtesy of BMW OF NORTH AMERICA, INC.

Draw in rubber mount with special tools 33 3 314 , 33 3 315 , 33 3 372 and 33 3 373 as far as it will go.

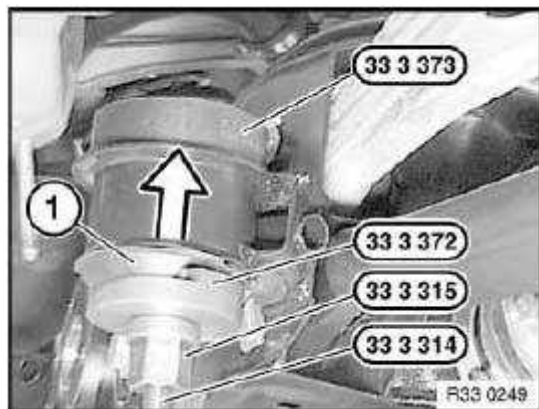


Fig. 118: Special Tool (33 3 373), (33 3 372) And (33 3 314)
 Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Check seating of coil spring with spring pads, correct if necessary
- Perform **32 00 150 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH LOAD UP TO DESIGN POSITION**

33 33 111 REPLACING ALL RUBBER MOUNTS FOR REAR AXLE SUPPORT

Special tools required:

- 33 0 001
- 33 0 002
- 33 0 011

- 33 0 012
- 33 0 051
- 33 0 052
- 33 0 140

IMPORTANT: Before removing rear axle support: In order to avoid damage to the vehicle hoists, perform weight compensation on vehicle. Load luggage compartment with sand bags.

Necessary preliminary tasks:

- Remove **rear axle support** .

Picture shows F01. Press-out and press-in directions pictured.

- Front rubber mount (1) is pulled out and in a downward direction.
- Rear rubber mount (2) is pulled out and in an upward direction.

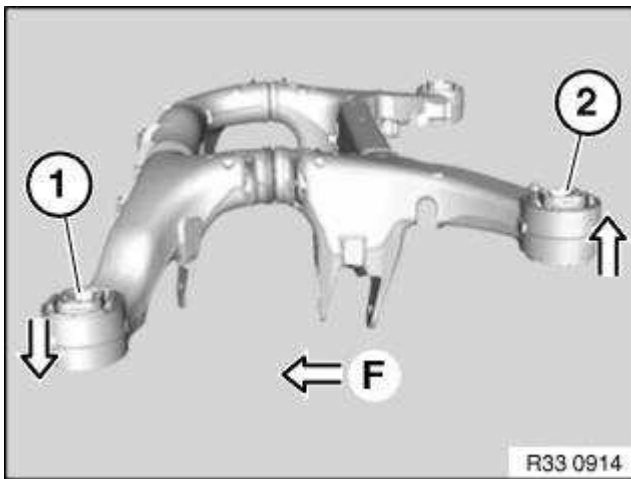


Fig. 119: Removing Front & Rear Rubber Mounts
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Removal and installation are described on the front rubber mount.

NOTE: Edges (2) break off when rubber mount (1) is pulled out in the direction of arrow.

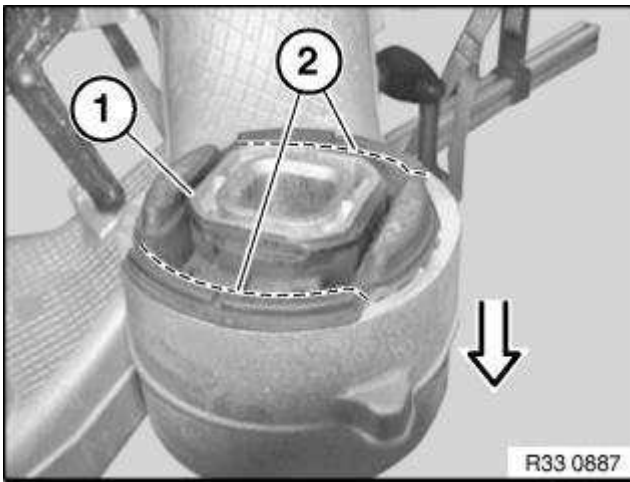


Fig. 120: Edges (2) Break Off When Rubber Mount (1) Is Pulled Out In Direction Of Arrow
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble special tool 33 4 140 in conjunction with 33 0 011 and 33 0 012.

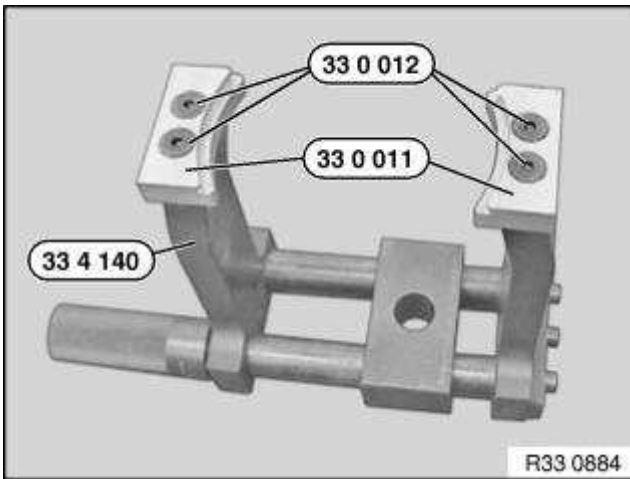


Fig. 121: Assemble Special Tool 33 4 140
Courtesy of BMW OF NORTH AMERICA, INC.

Withdraw rubber mount using special tools 33 4 140, 33 0 051, 33 0 052 and 33 0 001 from rear axle support bush.

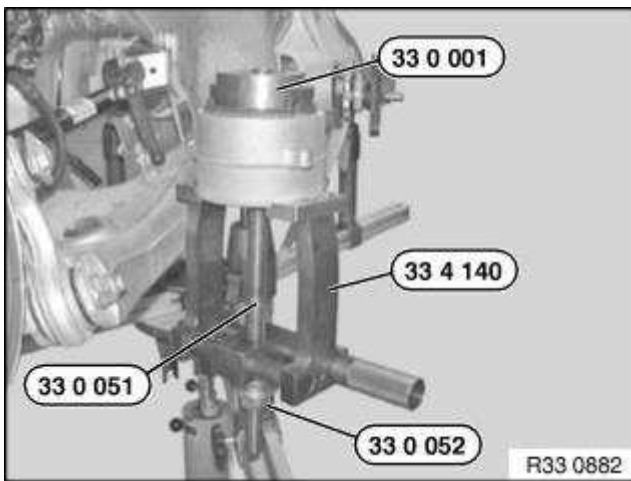


Fig. 122: Withdraw Rubber Mount From Rear Axle Support Bush
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Make sure special tool 33 0 001 is correctly positioned in relation to rubber mount. Make sure special tool 33 4 140 is correctly supported on rear axle support bush.

Applicable to front rubber mount: (View of rear axle support from above)

IMPORTANT: Arrow (1) must point on rubber mount (2) in direction of travel.

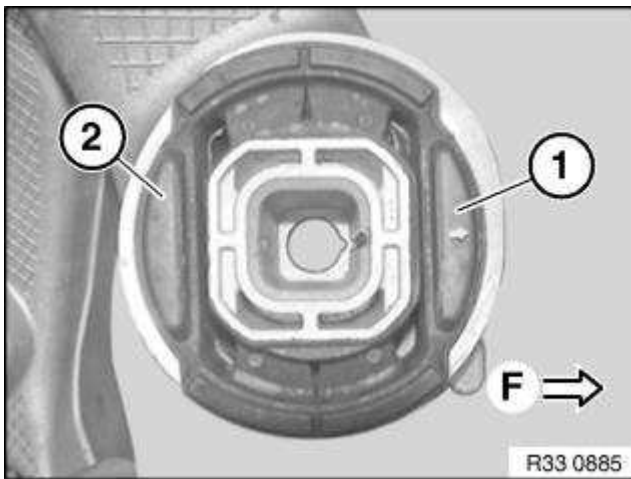


Fig. 123: Arrow (1) Must Point On Rubber Mount (2) In Direction Of Travel
 Courtesy of BMW OF NORTH AMERICA, INC.

Applicable to rear rubber mount: (View of rear axle support from below)

IMPORTANT: Notch (1) and arrow (2) on rubber mount (3) must point in direction of travel.

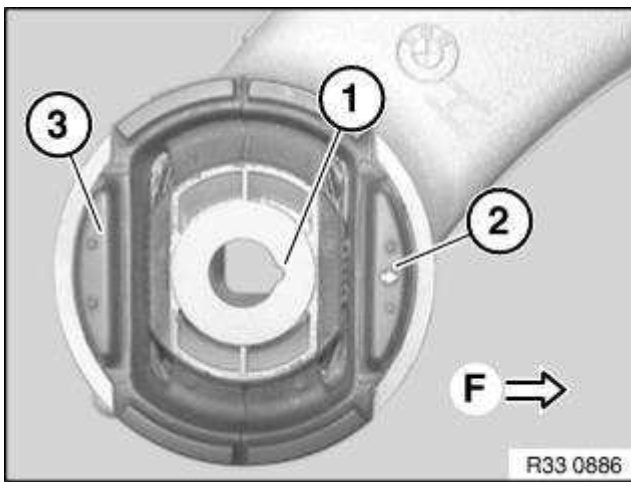


Fig. 124: Notch (1) And Arrow (2) On Rubber Mount (3) Must Point In Direction Of Travel
 Courtesy of BMW OF NORTH AMERICA, INC.

Draw in rubber mount (1) with special tools 33 0 002, 33 4 140, 33 0 052 and 33 0 051 as far as it will go into rear axle support bush.

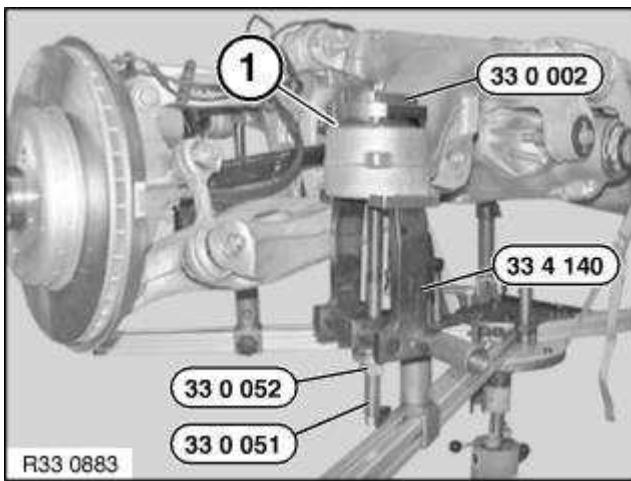


Fig. 125: Draw In Rubber Mount As Far As It Will Go Into Rear Axle Support Bush
 Courtesy of BMW OF NORTH AMERICA, INC.

After installation: For F01/F02/F07 only: Activate and fill air suspension system

33 33 515 REPLACING TWO FURTHER RUBBER MOUNTS FOR REAR AXLE CARRIER

The procedure is described in the document "Replacing two rubber mounts for rear axle carrier", See **33 33 101 Replacing two rubber mounts for rear axle carrier.**

41 WHEEL BEARINGS

33 41 005 REPLACING LEFT DRIVE FLANGE ON REAR AXLE SHAFT

Special tools required:

- 33 2 116 33 2 110 REMOVAL AND INSTALLATION TOOL
- 33 2 160 SPACER RING
- 33 2 201 33 2 200 FIXTURE
- 33 4 041 33 4 040 SET OF TOOLS
- 33 4 042 33 4 040 SET OF TOOLS
- 33 4 043 33 4 040 SET OF TOOLS
- 33 4 045 33 4 040 SET OF TOOLS
- 33 4 048 33 4 040 SET OF TOOLS
- 33 4 200 TOOL KIT / STRIKER FIXTURE

Necessary preliminary tasks:

- Remove output shaft, see 33 21 001 Removing and installing / replacing left output shaft.
- Remove brake disc
- Remove pulse generator, see 34 52 535 REPLACING A REAR PULSE GENERATOR .

Force drive flange with special tools 33 2 116 / 33 2 201 , 33 2 160 , 33 4 200 and 5 wheel studs out of wheel bearing.

NOTE: **Rounded inside edge of special tool 33 2 160 must point to drive flange.**

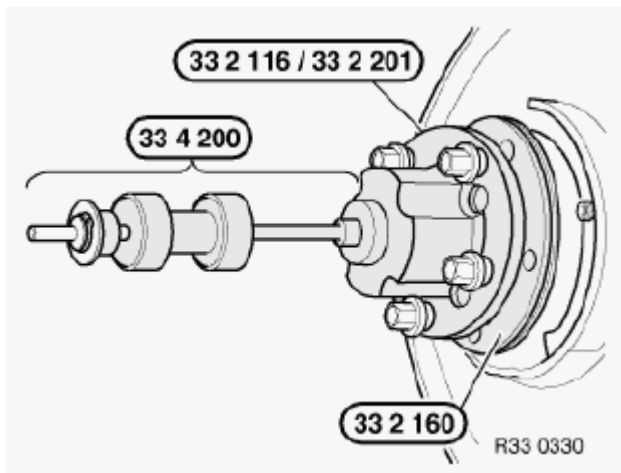


Fig. 126: Special Tool (33 2 116/33 2 201), (33 4 200) And (33 2 160)
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: The wheel bearing is destroyed when the drive flange is removed and cannot be reused!

Install new wheel bearing, see 33 41 153 Replacing left wheel bearing on rear axle shaft.

Installation:

Draw in drive flange with special tools 33 4 041 , 33 4 042 , 33 4 043 , 33 4 045 and 33 4 048 .

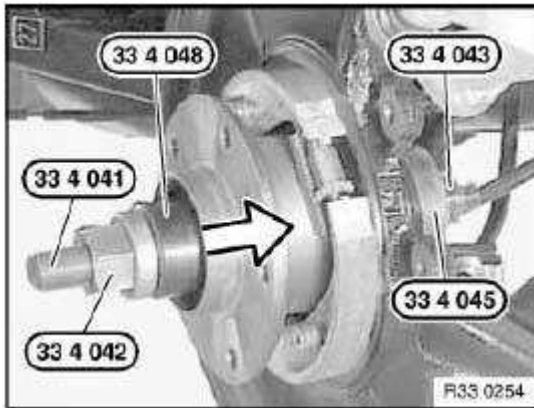


Fig. 127: Special Tool (33 4 048), (33 4 041) And (33 4 043)
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Adjust handbrake, see 34 10 014 ADJUSTING HANDBRAKE .

33 41 007 REPLACING RIGHT DRIVE FLANGE ON REAR AXLE SHAFT

NOTE: The procedure is described in the document "Replacing drive flange on rear axle shaft on left." See 33 41 005 Replacing left drive flange on rear axle shaft.

33 41 153 REPLACING LEFT WHEEL BEARING ON REAR AXLE SHAFT

Special tools required:

- 33 3 261 33 3 260 SET OF TOOLS
- 33 3 262 33 3 260 SET OF TOOLS
- 33 3 263 33 3 260 SET OF TOOLS
- 33 3 264 33 3 260 SET OF TOOLS
- 33 3 265 33 3 260 SET OF TOOLS

Necessary preliminary tasks:

- Remove drive flange for rear axle shaft, see 33 41 005 Replacing left drive flange on rear axle shaft.
- Detach wheel bearing inner race from drive flange

Press retaining ring (1) together using pliers and remove.

Installation:

Install retaining ring (1).

Check seating of retaining ring (1), correct if necessary.

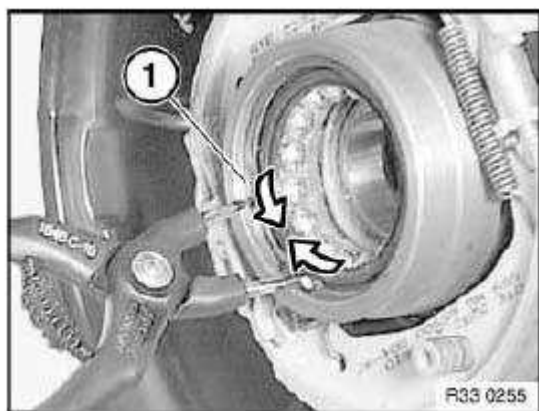


Fig. 128: Pressing Retaining Ring

Courtesy of BMW OF NORTH AMERICA, INC.

Pull out wheel bearing with special tools 33 3 261 , 33 3 262 and 33 3 263 .

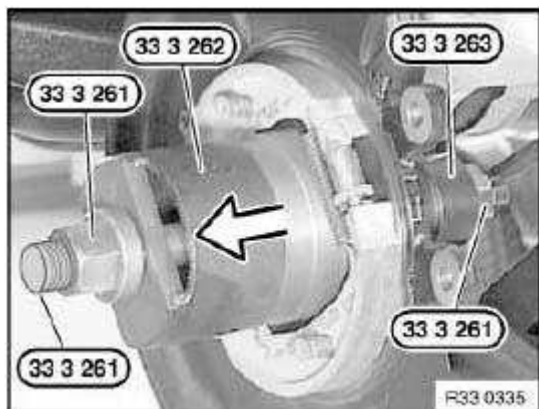


Fig. 129: Pulling Special Tool (33 3 261), (33 3 262) And (33 3 263)

Courtesy of BMW OF NORTH AMERICA, INC.

**IMPORTANT: Do not reuse old wheel bearing!
Note installation direction of wheel bearing.**

Installation:

Draw in wheel bearing (1) with special tools 33 3 261 , 33 3 264 and 33 3 265 .

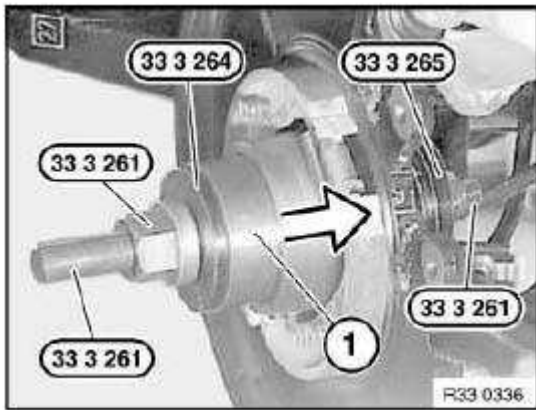


Fig. 130: Special Tool (33 3 261), (33 3 264) And (33 3 265)
 Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Adjust handbrake, see 34 10 014 ADJUSTING HANDBRAKE .

33 41 155 REPLACING RIGHT WHEEL BEARING ON REAR AXLE SHAFT

NOTE: Procedure is described in the document "Replacing wheel bearing on rear axle shaft on left", see 33 41 153 Replacing left wheel bearing on rear axle shaft.

52 SHOCK ABSORBER

33 52 000 REMOVING AND INSTALLING / REPLACING REAR LEFT OR RIGHT SHOCK ABSORBER

NOTE: Read and comply with Information on replacing shock absorbers, see 33 00 ... Information on replacing shock absorbers.

Necessary preliminary tasks:

- Remove rear wheel, see 36 10 300 REMOVING OR INSTALLING FRONT OR REAR WHEEL .
- Remove luggage compartment panel on left and/or right, see 51 47 151 REMOVING AND INSTALLING / REPLACING LEFT LUGGAGE COMPARTMENT WHEEL ARCH TRIM .

WARNING: Danger of injury!

Failure to comply with the following instructions may result in the vehicle slipping off the lifting platform and critically injuring other persons. When supporting components, make sure that

- the vehicle can no longer be raised or lowered
- the vehicle does not lift off the locating plates on the lifting platform

Support trailing arm with a workshop jack (1).

Release screw.

Installation:

Thrust washer (2) on rubber bearing must point to screw head.

Tighten bolt in normal position, see **32 00 ... MOVING VEHICLE INTO NORMAL POSITION** .

Tightening torque: 33 52 1AZ, see **33 52 SHOCK ABSORBERS** .

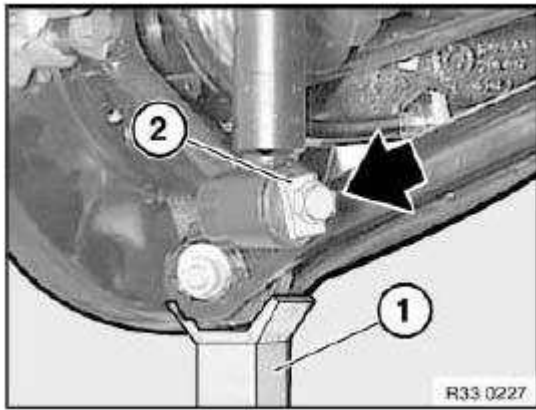


Fig. 131: Locating Support Trailing Arm With Workshop Jack
Courtesy of BMW OF NORTH AMERICA, INC.

Open and secure anti-drumming lining (1) in area of support bearing.

Unscrew nuts (2).

Remove shock absorber with support bearing towards bottom.

Installation:

Replace self-locking nuts.

Tightening torque: 33 52 3AZ, see **33 52 SHOCK ABSORBERS** .

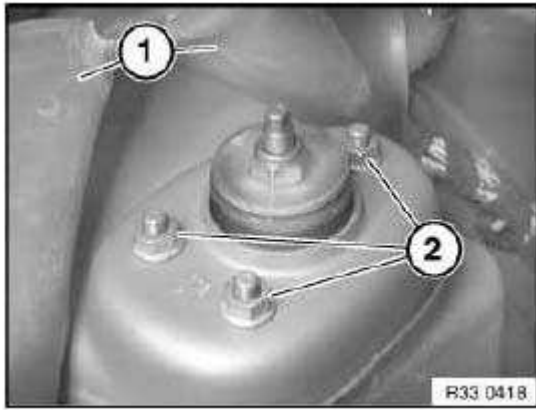


Fig. 132: Anti-Drumming Lining With Nut
 Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

Remove support bearing, see **33 52 161 Replacing rear left or right thrust bearing for spring strut / shock absorber**.

Remove or detach plate (1), auxiliary damper (2) and protective tube (3) from shock absorber (4).

Installation:

Check auxiliary damper (2) and protective tube (3) for damage, replace if necessary.

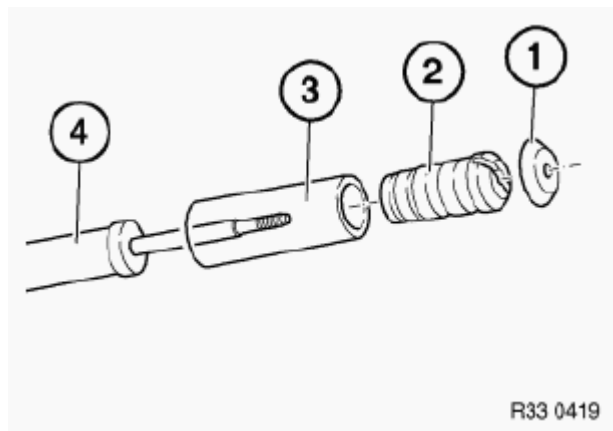


Fig. 133: Detach Plate, Auxiliary Damper And Protective Tube From Shock Absorber
 Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Check that output shaft is correctly seated in rear differential.

Necessary preliminary tasks:

- Remove rear shock absorber **33 52 000 Removing and installing / replacing rear left or right shock absorber**.

Unscrew nut (1).

Remove plate (2) and support bearing (3).

Installation:

Replace self-locking nut.

Tightening torque: 33 52 2AZ, see **33 52 SHOCK ABSORBERS** .

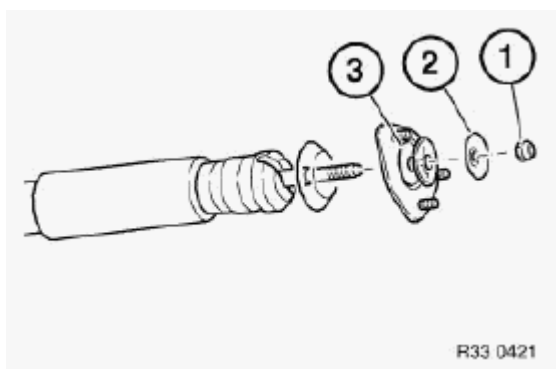


Fig. 134: Support Bearing, Plate And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

53 SPRINGS WITH SUSPENSION

33 53 ... MEASURING RIDE-LEVEL HEIGHT OF VEHICLE

Necessary preliminary tasks:

- Tighten bolt in normal position, see **32 00 ... MOVING VEHICLE INTO NORMAL POSITION** .

Determine actual ride height (A) - to do so, attach tape measure to rim flange (2) at bottom middle and measure to lower edge of wheel arch (1).

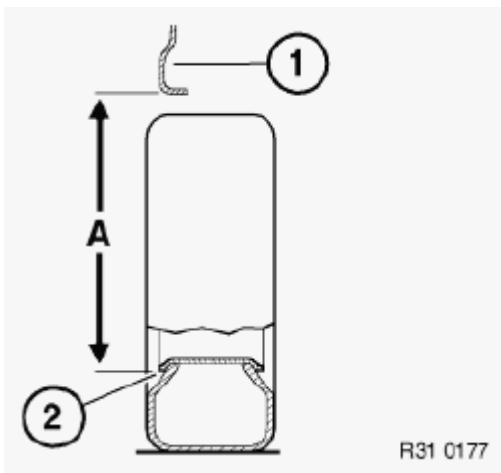


Fig. 135: Ride-Level Height Of Vehicle

Courtesy of BMW OF NORTH AMERICA, INC.

33 53 000 REMOVING AND INSTALLING / REPLACING REAR LEFT OR RIGHT COIL SPRING

IMPORTANT: Both coil springs on the relevant axle must be replaced only in the event of corrosion breakage!

Necessary preliminary tasks:

- Remove rear wheel, see **36 10 300 REMOVING OR INSTALLING FRONT OR REAR WHEEL** .
- Remove output shaft from rear differential and tie back, see **33 21 001 Removing and installing / replacing left output shaft**.
- Remove stabilizer link on both sides from stabilizer, see **33 55 040 Replacing stabilizer links for stabilizer**.
- If necessary, remove jointed rod from sensor lever of rideheight sensor, see **37 14 512 REPLACING REAR RIDE-HEIGHT SENSOR** .

IMPORTANT: Risk of damage!

Brake hose must not be exposed to tensile loads.

Release screw and remove bracket with brake hose.

Tightening torque: 34 32 3AZ, see **34 32 BRAKE LINES** .

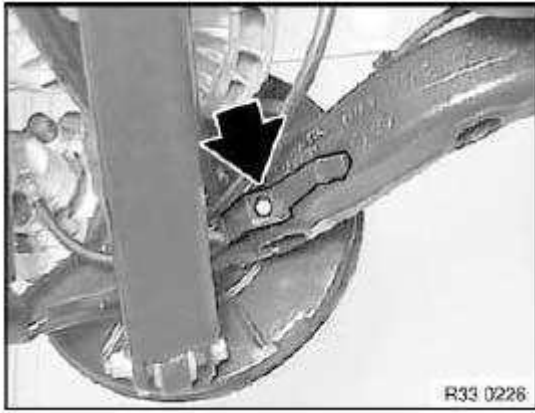


Fig. 136: Locating Bracket With Brake Hose

Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Danger of injury!

Failure to comply with the following instructions may result in the vehicle slipping off the lifting platform and critically injuring other persons.

When supporting components, make sure that

- the vehicle can no longer be raised or lowered
- the vehicle does not lift off the locating plates on the lifting platform

Release screw.

Lower workshop jack (1).

Installation:

Thrust washer (2) on rubber bearing must point to screw head.

Tighten bolt in normal position, see **32 00 ... MOVING VEHICLE INTO NORMAL POSITION** .

Tightening torque: 33 52 1AZ, see **33 52 SHOCK ABSORBERS** .

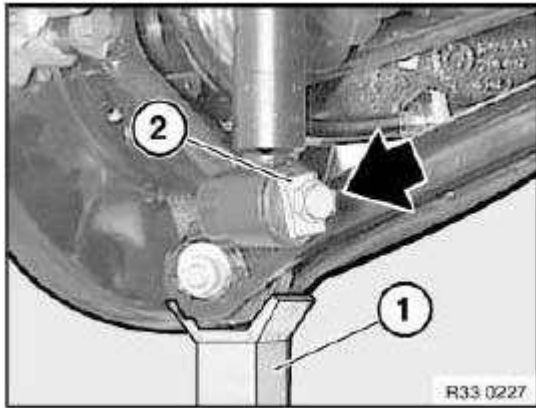


Fig. 137: Locating Support Trailing Arm With Workshop Jack
Courtesy of BMW OF NORTH AMERICA, INC.

Press trailing arm downwards.

Pull out barrel spring to the side.

Remove upper spring pad (1) from take-up locator/frame side member.

Installation:

Position coil spring with upper spring pad (1) on lower spring pad (2) mounted in control arm and align to take-up locator/frame side member.

Raise trailing arm using a workshop jack.

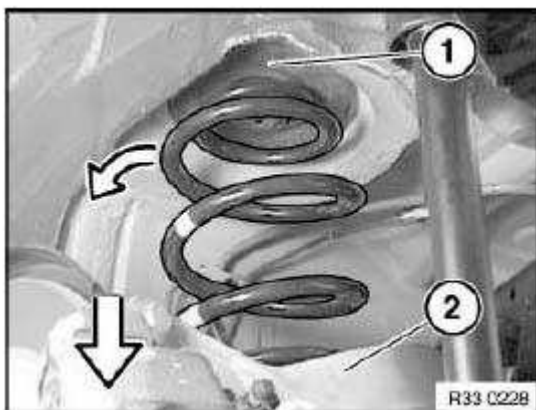


Fig. 138: Removing Upper Spring Pad From Take-Up Locator/Frame Side Member
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Spring pads must be positively seated in the take-up locator/frame side member or control arm to prevent the coil spring from springing out of the centering mount.

Installation:

Check spring mounts (1, 3) for damage, replace if necessary.

Attach spring mount at top (1) to coil spring (2).

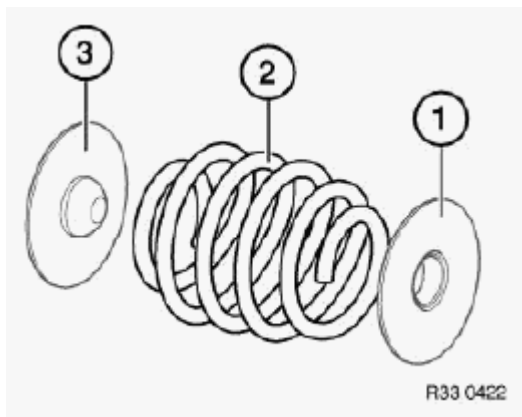


Fig. 139: Spring Mounts And Coil Spring
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Check headlight adjustment, correct if necessary, see **63 10 004 ADJUSTING HEADLIGHTS** .

55 STABILIZER BAR

33 55 000 REMOVING AND INSTALLING/REPLACING REAR STABILIZER

Necessary preliminary tasks:

- Remove emergency wheel pan, see **51 71 495 REMOVING AND INSTALLING/REPLACING EMERGENCY WHEEL PAN** .
- Remove stabilizer link on both sides from stabilizer, see **33 55 040 Replacing stabilizer links for stabilizer**.

Release screws (1).

Remove stabilizer (2) towards rear.

Installation:

Check rubber mount on both sides, replace if necessary, see **33 55 021 Replacing both rubber mounts for stabilizer mounting**.

Tightening torque: 33 55 3AZ, see **33 55 STABILIZER BAR** .

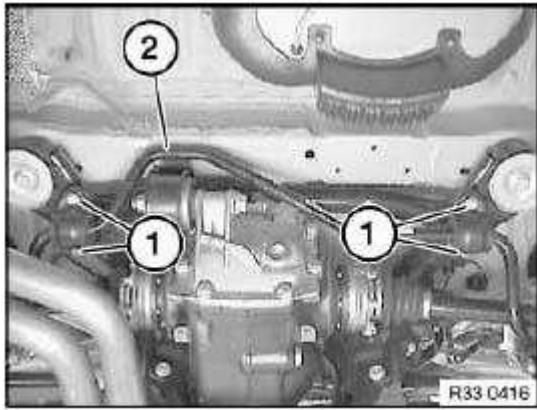


Fig. 140: Rear Stabilizer And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

Remove rubber mount on both sides from stabilizer, see **33 55 021 Replacing both rubber mounts for stabilizer mounting**.

33 55 021 REPLACING BOTH RUBBER MOUNTS FOR STABILIZER MOUNTING

Necessary preliminary tasks:

- Remove emergency wheel pan, see **51 71 495 REMOVING AND INSTALLING/REPLACING EMERGENCY WHEEL PAN** .

Release screws (1).

Tightening torque: 33 55 3AZ, see **33 55 STABILIZER BAR** .

Turn stabilizer in downwards direction.

Remove retaining bracket (2) and rubber mount (3).

Installation:

Keep retaining bracket (2), rubber mount (3) and stabilizer clean and free from oil and grease.

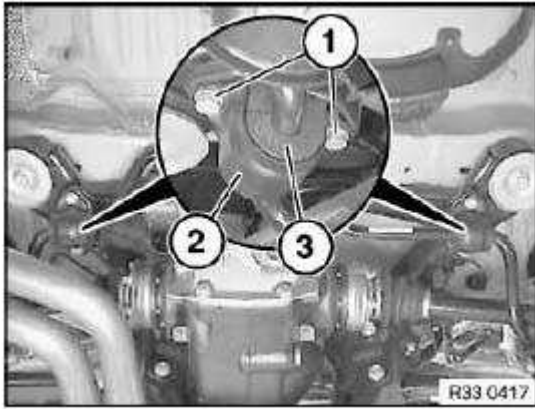


Fig. 141: Retaining Bracket, Rubber Mount And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

33 55 040 REPLACING STABILIZER LINKS FOR STABILIZER

Special tools required:

- **31 1 140 OPEN-END WRENCH WAF 16/18**

Release nuts (1, 2); grip with special tool 31 1 140 if necessary.

Remove stabilizer link (3).

Installation:

Replace self-locking nuts.

Tightening torque: 33 55 7AZ, see **33 55 STABILIZER BAR** .

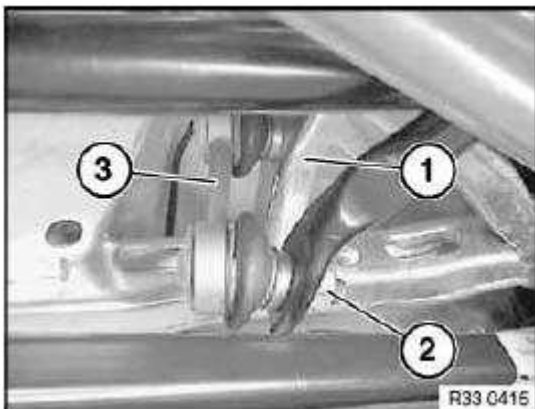


Fig. 142: Stabilizer Link And Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

90 TROUBLESHOOTING

33 90 ... REAR AXLE TROUBLESHOOTING

Observe troubleshooting for shock absorbers, see [33 90 ... Troubleshooting shock absorber.](#)

REAR AXLE TROUBLESHOOTING CHART

Fault	Cause	Remedy
Grinding noise (only when cornering)	Refer to <u>34 90 ... TROUBLESHOOTING BRAKE SYSTEM</u>	
	Wheel bearings faulty	Install new wheel bearings, see <u>33 41 153 Replacing left wheel bearing on rear axle shaft.</u>
Vibration (90 - 160 km/h)	Wheel imbalance	Balance wheels, see <u>36 10 508 STATIONARY WHEEL BALANCING</u>
	Radial/lateral rim runout	Check rims, replace if necessary, see <u>36 10 713 CHECKING ONE ROAD WHEEL ON BALANCING MACHINE FOR FACE AND RADIAL RUNOUT (WHEEL REMOVED)</u>
	Radial tire runout	Match or replace tires, see <u>36 10 209 CHECKING FRONT AND REAR WHEEL FOR FACE AND RADIAL RUNOUT</u>
	Imbalance in output shaft	Replace output shaft, see <u>33 21 001 Removing and installing / replacing left output shaft</u>
Drumming	Rubber mount of final drive suspension faulty	Replace rubber mount, see <u>33 17 004 Replacing all rubber mounts for differential mounting at front</u>
	Rubber mount of rear axle carrier faulty	Replace rubber mount, see <u>33 17 004 Replacing all rubber mounts for differential mounting at front</u>
Rattling noise	Refer to Observe troubleshooting for shock absorbers, see <u>33 90 ... Troubleshooting shock absorber..</u>	
	Stabilizer link loose or defective	Check screw connection, replace stabilizer link if necessary, see <u>33 55 040 Replacing stabilizer links for stabilizer</u>
	Rubber mount of rear axle carrier loose or faulty	Check seat Replace rubber mount if necessary, see <u>33 17 004 Replacing all rubber mounts for differential mounting at front</u>
Tail-end skid when braking with each side on different road surface	Rubber mount/ball joint of trailing arms faulty	Replace rubber mount/ball joint, see <u>33 32 042 Replacing a rubber mount in trailing arm, front</u>
Hesitation of rear wheels with hard braking	Rubber mount/ball joint of trailing arms faulty	Replace rubber mount/ball joint, see <u>33 32 042 Replacing a rubber mount in trailing arm, front</u>
	Observe troubleshooting for shock absorbers, see <u>33 90 ... Troubleshooting shock absorber.</u>	
	Rubber mount of	

Poor straight-running stability (steering wheel inclination)	rear axle carrier faulty	Replace rubber mount, see <u>33 17 004 Replacing all rubber mounts for differential mounting at front</u>
	Rubber mount of control arm faulty	Replace rubber mount, see <u>33 17 004 Replacing all rubber mounts for differential mounting at front</u>
	Rubber mount/ball joint of trailing arms faulty	Replace rubber mount/ball joint, see <u>33 32 042 Replacing a rubber mount in trailing arm, front</u>
	Rear axle alignment incorrectly adjusted	Carry out chassis/wheel alignment check, align rear axle if necessary, see <u>32 00 ... CHASSIS/WHEEL ALIGNMENT CHECK PROCEDURE</u>
	Steering wheel inclination: Refer to <u>32 90 ... TROUBLESHOOTING ON STEERING</u>	
Unsteady taking of curves due to self-steering or poor rear end track stability	Rubber mount of rear axle carrier faulty	Replace rubber mount, see <u>33 17 004 Replacing all rubber mounts for differential mounting at front</u>
	Rubber mount of final drive suspension faulty	Replace rubber mount, see <u>33 17 004 Replacing all rubber mounts for differential mounting at front</u>
	Observe troubleshooting for shock absorbers, see <u>33 90 ... Troubleshooting shock absorber.</u>	
Excessive tire wear	Front or rear axle alignment incorrectly adjusted	Carry out chassis/wheel alignment check, align rear axle if necessary, see <u>32 00 ... CHASSIS/WHEEL ALIGNMENT CHECK PROCEDURE</u>

33 90 ... TROUBLESHOOTING SHOCK ABSORBER

Read and comply with Information on replacing shock absorbers, see **33 00 ... Information on replacing shock absorbers.**

TRUBLESHOOTING SHOCK ABSORBER CHART

Fault	Cause	Remedy
Wheel knocking (bottoming)	Auxiliary spring faulty	Visually inspect auxiliary spring for cracking, replace auxiliary spring, see <u>33 52 000 Removing and installing / replacing rear left or right shock absorber</u>
	Shock absorber leaking (oil/gas)	Replace shock absorber, see <u>33 52 000 Removing and installing / replacing rear left or right shock absorber</u>
	Shock absorber mounting loose	Tighten shock absorber, see <u>33 52 000 Removing and installing / replacing rear left or right shock absorber</u>
	Support bearing loose	Secure support bearing, see <u>33 52 SHOCK ABSORBERS</u>
	Support bearing defective (cracked)	Visually inspect for cracking, replace support bearing, see <u>33 52 000 Removing and installing /</u>

		<u>replacing rear left or right shock absorber</u>
Rattling noise	Protective tube defective/failed	Visually inspect protective tube for cracking, replace protective tube
	Rubber mount/joint eye for lower shock absorber mounting defective	Replace rubber mount/joint eye
	Shock absorber leaking (oil/gas)	Replace shock absorber, see <u>33 52 000 Removing and installing / replacing rear left or right shock absorber</u>
	Worn down areas (flattened areas) on tire profile	Replace shock absorber, see <u>33 52 000 Removing and installing / replacing rear left or right shock absorber</u>
Long after-swinging of body after driving over rough road	Shock absorber leaking (insufficient shock absorber effect)	Replace shock absorber, see <u>33 52 000 Removing and installing / replacing rear left or right shock absorber</u>
Building-up of body in case of successive uneven surfaces	Shock absorber leaking (insufficient shock absorber effect)	Replace shock absorber, see <u>33 52 000 Removing and installing / replacing rear left or right shock absorber</u>
Wheels jumping even on normal road surfaces	Shock absorber leaking (insufficient shock absorber effect)	Replace shock absorber, see <u>33 52 000 Removing and installing / replacing rear left or right shock absorber</u>

2007 SUSPENSION

Rear Axle - Special Tools - X3

33 REAR AXLE

33 1 150 FIXTURE

Note: For detaching drive flanges.

Series: E30, E32, E34, E36, E38, E39, E46/16, E53, E60, E61, E63, E64, E65, E66, E67, E70, E81, E83, E85, E86, E87, E90, E91, E92, E93

Transmission: GS6-17BG, GS6-37BZ, GS6-37DZ, GS6-53BZ, GS6-53DZ, rear diff. type G, rear diff. type K, rear diff. type M, S5D 200G, S5D 250G, S5D 260Z, S5D 310Z, S5D 320Z

Storage location: B49, C20, C21, C49

Order number: 33 1 150

Fixture

Consisting of:

1 = 33 1 151 Spindle

2 = 33 1 152 Drift

3 = 33 1 153 Disk

4 = 33 1 154 Adapter plate

Note: Transmission: GS6-57DZ, GS6-53BZ (G-transmission) GS6-51DZ, GS6-51BZ (H-transmission)

5 = 33 1 155 Countersunk screws M10x30 (3 x)

Note: Transmission: GS6-57DZ, GS6-53BZ (G-transmission) GS6-51DZ, GS6-51BZ (H-transmission)

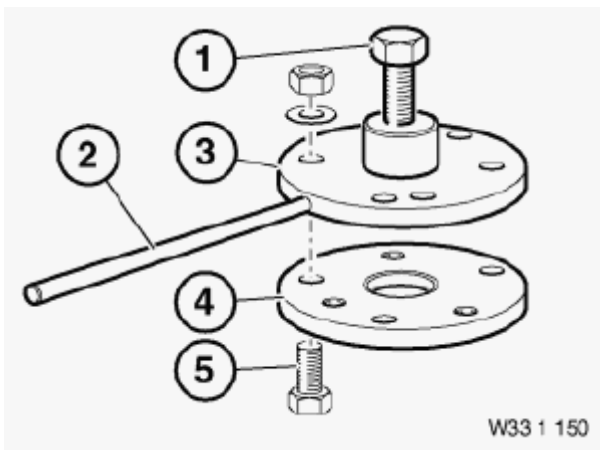


Fig. 1: Fixture (31 1 150)

Courtesy of BMW OF NORTH AMERICA, INC.

33 1 300 RILLEX TAPERED ROLLER BEARING EXTRACTOR

Note: For bevel pinion and differential case (final drive) / for mounting sprocket wheel on crankshaft (M70) / for removing bearing inner race from drive flange (E36, E46)

Transmission: Rear axle differential type G, K, M

Storage location: B6, C6

Order number: 33 1 300

Rillex tapered roller bearing extractor

Consisting of:

1 = 33 1 301 Connecting piece with spindle

1 = 33 1 311 Gripper

2 = 33 1 312 Thrust piece

Note: For removing bearing inner race from drive flange - Series: E36/5

In conjunction with: 00 7 500

5 = 33 1 305 Thrust piece (old)

6 = 33 1 306 Thrust piece

7 = 33 1 307 Thrust piece

8 = 33 1 308 Thrust piece

9 = 33 1 309 Thrust piece

Note: For final drive and for mounting sprocket wheel on crankshaft (M70)

In conjunction with: 00 8 500

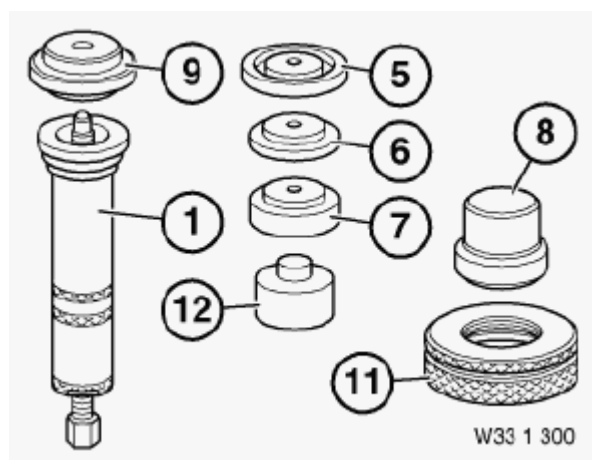


Fig. 2: Rillex Tapered Roller Bearing Extractor (33 1 300)
Courtesy of BMW OF NORTH AMERICA, INC.

33 1 340 FIXTURE

In conjunction with: 23 1 300

Note: For installing drive pinion in rear axle differential housing

Series: E23, E24, E28, E32, E34, E38, E39, E46, E52, E53, E60, E61, E63, E64, E65, E66, E67, E81, E83, E85, E86, E87, E90, E91, E92

Transmission: Rear diff. type G, rear diff. type K, rear diff. type M, S5D 260Z, S5D 310Z, S5D 320Z

Storage location: C22

Order number: 33 1 340

Fixture

Consisting of:

1 = 33 1 341 Reducer

2 = 33 1 342 Spacer bushing

Note: For transmissions S5D 260Z, S5D 310Z and S5D 320Z"

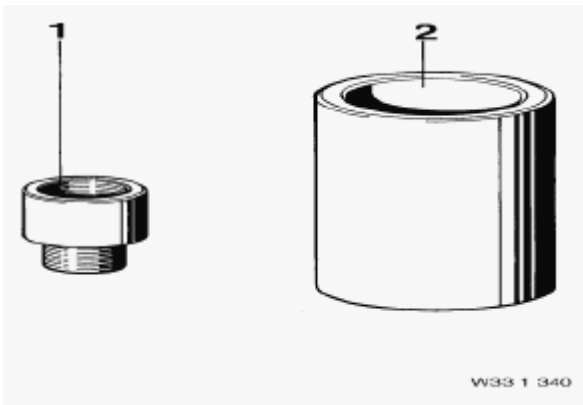


Fig. 3: Fixture (33 1 340)

Courtesy of BMW OF NORTH AMERICA, INC.

33 1 360 FIXTURE

In conjunction with: 33 1 356

Note: For removing and installing outer bearing races of tapered roller bearings

Series: E23, E24, E28, E30, E32, E34, E34tou, E46, E83

Transmission: Rear diff. type K, rear diff. type M

Storage location: A6, B6

Order number: 33 1 360

Fixture

Consisting of:

1 = 33 1 361 Extractor head

2 = 33 1 362 Spindle

3 = 33 1 363 Pressure nut in bearing

4 = 33 1 364 Nut

5 = 33 1 365 Draw-in disc

Note: For bearing shell (drive, outer)

6 = 33 1 366 Slip bush

Note: For bearing shell

7 = 33 1 367 Draw-in disc

Note: For bearing shell (drive, inner)

8 = 33 1 368 Draw-in disc

Note: For bearing shell (drive, left and right)

9 = 33 1 369 Thrust washer

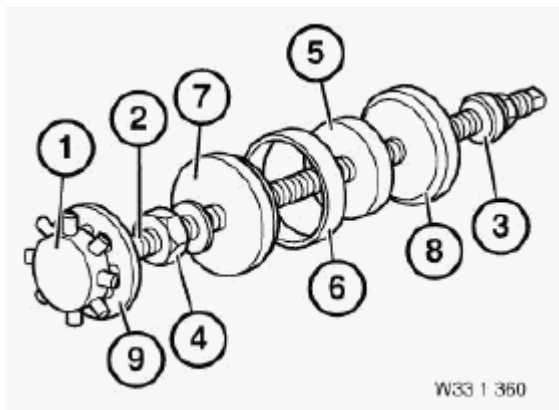


Fig. 4: Fixture (33 1 360)

Courtesy of BMW OF NORTH AMERICA, INC.

33 2 100 CLAMPING FIXTURE

Note: For gripping output shafts when press fitting constant-velocity joint

Series: E12, E21, E23, E24, E28, E30, E31, E32, E34, E36, E36/7, E38, E39, E46, E52, E53, E60, E61, E63, E64, E65, E66, E67, E81, E83, E85, E86, E87, E90, E91, E92, E93, RR1, RR2

Storage location: C23

SI number: 1 06 94 (801)

Order number: 33 2 100

Clamping fixture

Consisting of:

1 = 33 2 101 Frame

2 = 33 2 102 Insert shell (2 x)

Note: Diameter 30 mm - model series: E38 / model: 730i

3 = 33 2 103 Insert shell (2 x)

Note: Diameter 35 mm - model series: all, except E38

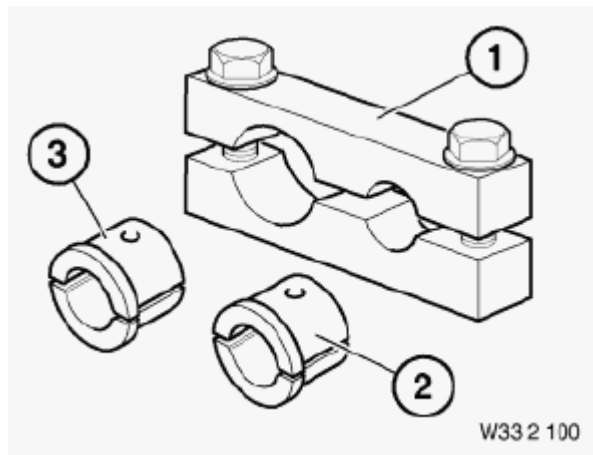


Fig. 5: Clamping Fixture (33 2 100)

Courtesy of BMW OF NORTH AMERICA, INC.

33 2 110 REMOVAL AND INSTALLATION TOOL

Minimum set: Mechanical tools

In conjunction with: 33 2 150 (E53)

Note: For removing and installing output shaft in drive flange as well as for removing front wheel bearing unit.

Series: E30, E31, E32, E34, E36, E38, E39, E46, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E81, E83, E85, E86, E87, E90, E91, E92, E93, RR1, RR2

Storage location: C13, C14, C38

Order number: 33 2 110

Removal and installation tool

Consisting of:

1 = 33 2 111 Pressure spindle

Note: For pressing out. Model series: E30, E31, E32, E36, E38, E39, E46, E53, E65, E66, E67, E83, E85

4 = 33 2 114 Spindle

Note: For installation / model series: E30

5 = 33 2 115 Nut with bearing

Note: Model series: E30, E31, E32, E36, E38, E39, E46, E52, E53, E60, E61, E65, E66, E67, E83, E85, RR1

6 = 33 2 116 Bridge

Note: New version 09/98 Model series: E30, E31, E32, E36, E38, E39, E46, E52, E53, E60, E61, E65, E66, E67, E83, E85, E90, RR1

7 = 33 2 117 Threaded piece

Note: Model series: E30, E31, E32, E36, E38, E39, E46, E53, E65, E66, E67, E83, E85

8 = 33 2 118 Spindle for installation

Note: Model series: E31, E52, E53, E60, E61, E65, E66, E67, E83

9 = 33 2 119 Spindle

Note: For installation / model series: E36, E46

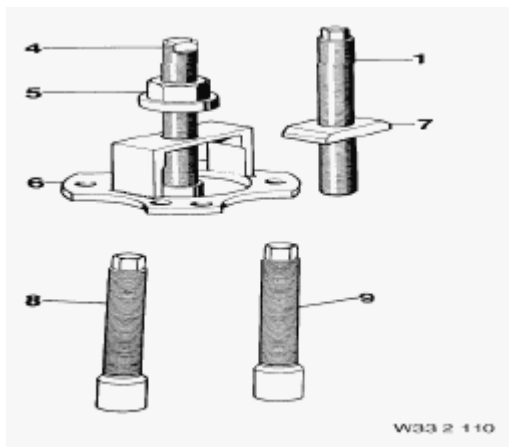


Fig. 6: Removal And Installation Tool (33 2 110)
Courtesy of BMW OF NORTH AMERICA, INC.

33 2 160 SPACER RING

Minimum set: Mechanical tools

In conjunction with: 33 2 110

Note: For removing and installing output shaft in drive flange, front and rear, as well as for removing front wheel bearing unit

Series: E46, E53, E60, E61, E63, E64, E65, E66, E67, E70, E81, E83, E85, E86, E87, E90, E91, E92, E93, RR1

Storage location: C39

SI number: 1 17 03 (012)

Order number: 33 2 160

Spacer ring

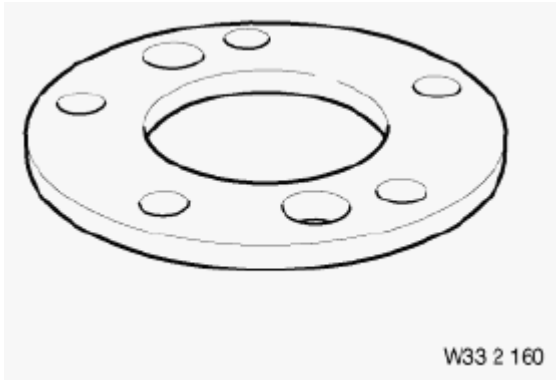


Fig. 7: Spacer Ring (33 2 160)

Courtesy of BMW OF NORTH AMERICA, INC.

33 2 200 FIXTURE

Minimum set: Mechanical tools

In conjunction with: 33 4 200, 33 5 070

Note: For removing and installing output shaft in drive flange as well as for removing front wheel bearing unit.

Series: E30, E31, E32, E34, E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, E46, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E83, E85, E86, E87, E90, E91, E92, E93, RR1, RR2

Order number: 33 2 200

Fixture

Consisting of:

1 = 33 2 201 Basic body

2 = 33 2 202 Counterholder

In conjunction with: 33 5 070

3 = 33 2 203 Spindle M20x1.5 / length 150 mm

Note: For pressing out. Model series: E30, E31, E32, E36, E38, E39, E46, E53, E65, E66, E67, E83, E85

4 = 33 2 204 Spindle M20x1.5 / length 180 mm

Note: For drawing in. Model series: E30

5 = 33 2 205 Spindle M20x1.5 / length 190 mm

Note: For drawing in. Connection: M27x1.5 Model series: E31, E52, E53, E60, E61, E65, E66, E67, E83

6 = 33 2 206 Spindle M20x1.5 / length 190 mm

Note: For drawing in. Connection: M24x1.5 Model series: E36, E46

7 = 33 2 207 Threaded piece

8 = 33 2 208 Nut with thrust bearing

Note: Model series: E30, E31, E32, E36, E38, E39, E46, E52, E53, E60, E61, E65, E66, E67, E83, E85, RR1

33 3 050 FIXTURE

Note: For removing and installing rubber mount in 20° semi-trailing arm

Series: E28, E30, E53, E83

Storage location: B6, C6

Order number: 33 3 050

Fixture

Consisting of:

1 = 33 3 051 Nut with bearing

Note: Model series: E28, E30

2 = 33 3 052 Spindle

Note: Model series: E28, E30

3 = 33 3 053 Sleeve

Note: Model series: E28, E30

4 = 33 3 054 Thrust piece

5 = 33 3 055 Thrust piece

Note: Model series: E28, E30 - Model: 518...735

6 = 33 3 056 Thrust piece

Note: Model series: E28, E30 - Model: 316...323i

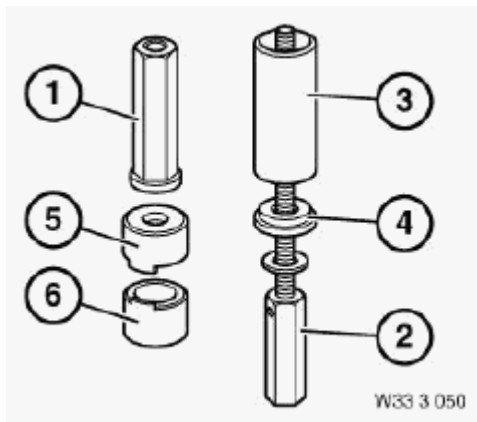


Fig. 8: Fixture (33 3 050)

Courtesy of BMW OF NORTH AMERICA, INC.

33 3 140 SET OF TOOLS

Minimum set: Mechanical tools

Note: For removing and installing rubber mounts in rear axle carrier (rear axle support)

Series: E32, E34, E46, E60, E61, E63, E64, E83, E85, E86, E87

Storage location: C13

SI number: 1 04 86 (566)

Order number: 33 3 140

Set of tools

Consisting of:

1 = 33 3 141 Removal and installation disc

Note: Model series: E32, E34, E46, E85

2 = 33 3 142 Sleeve

Note: Model series: E32, E34, E46, E85

3 = 33 3 143 Washer

Note: For bracing during installation Model series: E32, E34, E46, E85

4 = 33 3 144 Spindle with lock nut

Note: Model series: E32, E34, E46, E60, E61, E63, E64, E83, E85

5 = 33 3 145 Nut with bearing

Note: Model series: E32, E34, E46, E60, E61, E63, E64, E85

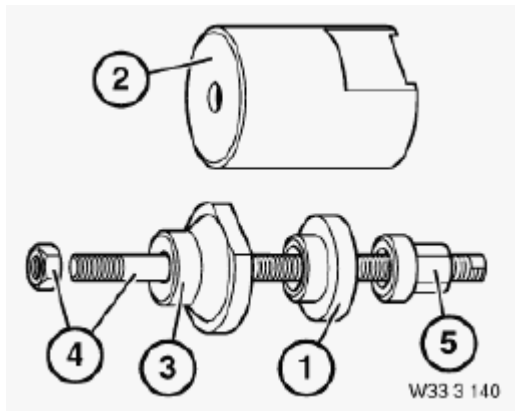


Fig. 9: Set Of Tools (33 3 140)

Courtesy of BMW OF NORTH AMERICA, INC.

33 3 220 SET OF TOOLS

Minimum set: Mechanical tools

In conjunction with: 00 8 550, 33 3 103, 33 3 104, 33 3 107

Note: For removing and installing rubber mount in rear axle carrier

Series: E31, E36, E46, E83, E85, E86

Storage location: A26, B40

SI number: 1 05 90(207)

Order number: 33 3 220

Set of tools

Consisting of:

1 = 33 3 221 Shaped disk

Note: For removing front rubber mounts from rear axle carrier / model series: E31

In conjunction with: 00 8 550 and 33 3 107

2 = 33 3 222 Upper shaped disk

Note: For installing front rubber mounts in rear axle carrier

In conjunction with: 33 3 103, 33 3 104

3 = 33 3 223 Lower shaped piece

Note: For installing front rubber mounts in rear axle carrier

In conjunction with: 33 3 103, 33 3 104

4 = 33 3 224 Shaped disk

Note: For removing rear rubber mounts from rear axle carrier / model series: E31

In conjunction with: 00 8 550 and 33 3 107

5 = 33 3 225 Upper shaped disk

Note: For installing rubber mounts in rear axle carrier Model series: E31

In conjunction with: 33 3 103, 33 3 104

6 = 33 3 226 Lower shaped piece

Note: For installing rubber mounts in rear axle carrier Model series: E31

In conjunction with: 33 3 103, 33 3 104

33 3 227 Thrust piece

Note: Model series: E36, E46

33 3 228 Slip bushing

Note: Model series: E36, E46

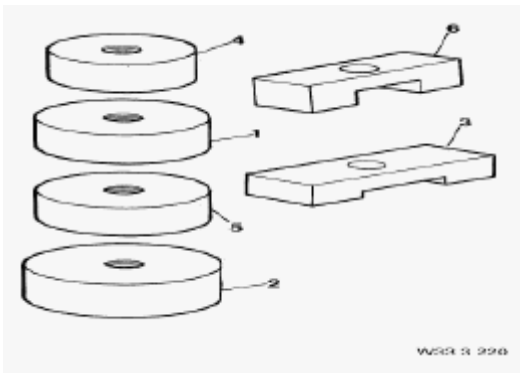


Fig. 10: Set Of Tools (33 3 220)

Courtesy of BMW OF NORTH AMERICA, INC.

33 3 260 SET OF TOOLS

Minimum set: Mechanical tools

Note: For removing and installing rear wheel bearings in wheel carrier and for fitting drive flange

Series: E31, E34, E38, E46/16, E52, E53, E60, E61, E67, E81, E83, E85, E86, E87, E90, E91, E92, E93, RR1

Storage location: B7, B8

SI number: 1 05 90 (207)

Order number: 33 3 260

Set of tools

Consisting of:

1 = 33 3 261 Spindle with 2 nuts

Note: Model series: E31, E34, E38, E46/16, E52, E53, E60, E61, E83, RR1

2 = 33 3 262 Spacer sleeve

Note: For removing wheel bearing from wheel carrier and installing drive flange Model series: E31, E34, E38, E46/16, E52, E53, E83

3 = 33 3 263 Adapter sleeve

Note: For removing wheel bearing from wheel carrier - Model series: E31, RR1

4 = 33 3 264 Adapter sleeve

Note: For installing wheel bearing in wheel carrier Model series: E31, E34, E38, E46/16, E52, E53, E83, RR1

5 = 33 3 265 Thrust washer

Note: For installing wheel bearing in wheel carrier - Model series: E31

6 = 33 3 266 Adapter sleeve

Note: For installing drive flange and removing wheel bearing Model series: E38, E52, E53, E60, E61, E83, RR1

7 = 33 3 267 Thrust washer

Note: For installing drive flange Model series: E31, E34, E38, E46/16, E52, E53

8 = 33 3 268 Support disk

Note: For installing wheel bearing Model series: E38, E52, E53, E60, E61, E83, RR1

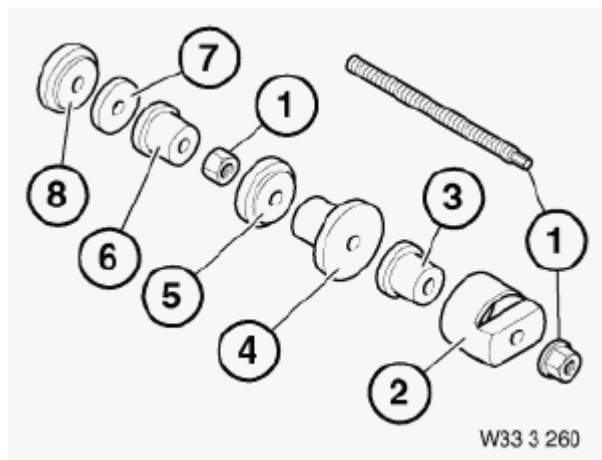


Fig. 11: Set Of Tools (33 3 260)

Courtesy of BMW OF NORTH AMERICA, INC.

33 3 270 SET OF SUPPORTS

In conjunction with: E36/5 = 33 3 303 E65 and E66 = 00 2 030, 00 2 040,

Note: For removing and installing rear axle

Series: E36/5, E60, E61, E63, E64, E65, E66, E67, E81, E83, E87, E90, E91, E92, E93

SI number: 1 01 94 (766)

Order number: 33 3 270

Set of supports

Consisting of:

1 = 33 3 271 Mounting

Note: For cross-beam

2 = 33 3 272 T-piece (2 x)

3 = 33 3 273 Base plate

Note: For hydraulic lifter

4 = 33 3 274 Hydraulic lifter

Note: Hydraulic mini-lifter Model series: E36/5, E60, E65, E66, E67

5 = 33 3 275 Pressure piece (rubber)

Note: For hydraulic lifter

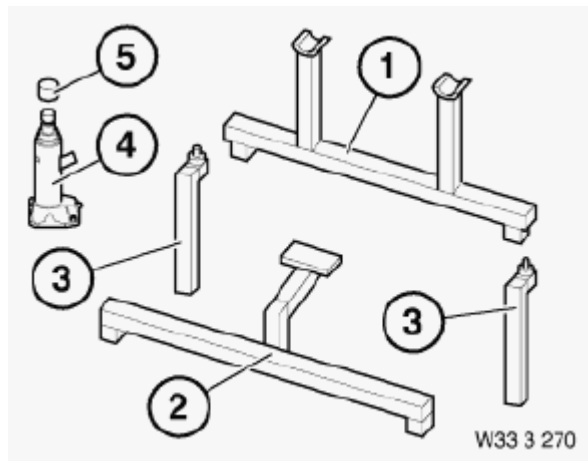


Fig. 12: Set Of Supports (33 3 270)

Courtesy of BMW OF NORTH AMERICA, INC.

33 3 280 SETTING GAUGE

Note: For aligning bearing block from frame side member to wheel center

Series: E36, E46, E67, E83, E85, E86

SI number: 1 19 99 (484)

Order number: 33 3 280

Setting gauge



Fig. 13: Setting Gauge (33 3 280)

Courtesy of BMW OF NORTH AMERICA, INC.

33 3 310 REMOVAL/INSTALLATION TOOL KIT

Minimum set: Mechanical tools

In conjunction with: 33 4 181 (E46)

Note: For removing and installing rubber mounts in rear axle suspension, front and rear

Series: E31, E36, E38, E46, E60, E61, E63, E64, E65, E66, E67, E81, E83, E85, E86, E87, E90, E91, E92, E93, R53, RR1

Storage location: A7

SI number: 1 05 90 (207)

Order number: 33 3 310

Removal/installation tool kit

Consisting of:

1 = 33 3 311 Locator sleeve

Note: For removing and installing rubber mount / model series: E31, E36

2 = 33 3 312 Thrust piece

Note: For removing rubber mount at rear differential cover / model series: E31, E36, E38, E60, E61, E63, E64, E65, E66, E67, RR1

3 = 33 3 313 Thrust piece

Note: For installing rubber mount on rear differential cover - model series: E31, E36, E38 For removing rubber mount at rear differential cover - model series: E46

4 = 33 3 314 Spindle

Note: For removing and installing rubber mount Model series: E31, E36, E38, E46, E60, E61, E63, E64, E65, E66, E67, E85, RR1

5 = 33 3 315 Nut with bearing

Note: Model series: E31, E36, E38, E46, E60, E61, E63, E64, E65, E66, E67, E85, RR1

6 = 33 3 316 Thrust piece

Note: For installing rear rubber mount in rear axle carrier / model series: E31

In conjunction with: 33 3 333 and 33 3 334

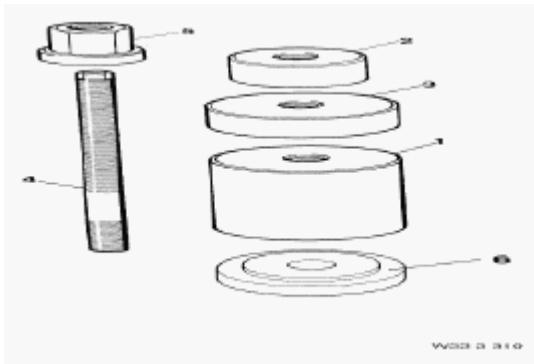


Fig. 14: Removal/Installation Tool Kit (33 3 310)
Courtesy of BMW OF NORTH AMERICA, INC.

33 3 330 REMOVAL AND INSTALLATION TOOL

Minimum set: Mechanical tools

Note: For removing and installing ball joint and rubber mount in semi-trailing arm

Series: E31, E36, E38, E39, E46, E52, E60, E61, E63, E64, E65, E66, E67, E70, E83, E85, E86, RR1

Storage location: A14

SI number: 1 10 90(288)

Order number: 33 3 330

Removal and installation tool

Consisting of:

1 = 33 3 331 Spacer sleeve

Note: For removing / model series: E36, E46

2 = 33 3 332 Extractor sleeve

Note: Model series: E36, E46

3 = 33 3 333 Spindle with forcing nut

4 = 33 3 334 Spacer sleeve

Note: For installing ball joint Model series: E31, E36, E38, E39, E46, E65, E66, E85

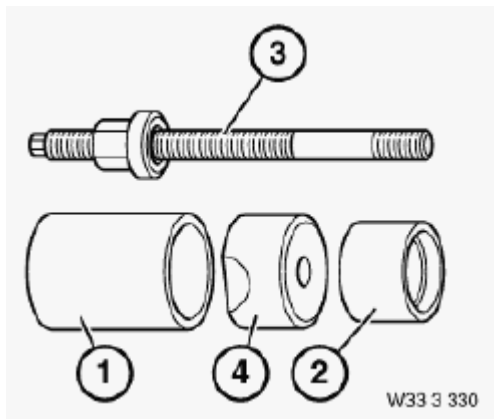


Fig. 15: Removal And Installation Tool (33 3 330)
Courtesy of BMW OF NORTH AMERICA, INC.

33 3 350 SET OF TOOLS

Minimum set: Mechanical tools

Note: For removing and installing rubber mount in top and bottom control arms

Series: E36, E46, E83, E85, E86

Storage location: A22

SI number: 1 10 90(288)

Order number: 33 3 350

Set of tools

Consisting of:

1 = 33 3 351 Sleeve with centering pin

Note: For pressing rubber mount in/out

2 = 33 3 352 Thrust sleeve

Note: For pressing out rubber mount in upper control arm

3 = 33 3 353 Shaped piece

Note: For pressing in rubber mount in lower control arm

33 3 354 Spacer

Note: For maintaining distance between both control arm halves when pressing rubber mount in/out

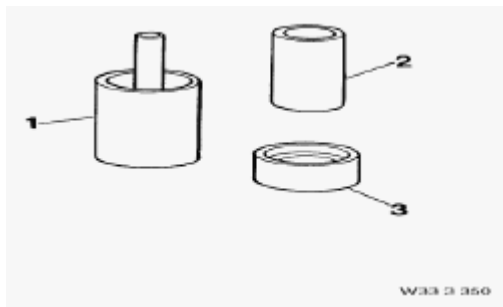


Fig. 16: Set Of Tools (33 3 350)

Courtesy of BMW OF NORTH AMERICA, INC.

33 3 360 SET OF TOOLS

Minimum set: Mechanical tools

In conjunction with: 33 3 311, 33 3 314

Note: For removing and installing rubber mount in bottom of rear axle carrier, threaded connection of rear axle differential

Series: E31, E36, E46, E83, E85, E86

Storage location: B32

SI number: 1 10 90(288)

Order number: 33 3 360

Set of tools

Consisting of:

1 = 33 3 361 Spacer sleeve

Note: For removing rubber mount in rear axle carrier at bottom / model series: E36, E46 For removing rubber mount in rear differential mounting at front left / model series: E46

In conjunction with: 33 3 333 (E36, E46), 33 3 314 and 33 3 315 (E46)

2 = 33 3 362 Shaped piece

Note: For removing and installing rubber mount in rear axle carrier at bottom, rear differential mounting and rear differential

In conjunction with: 33 3 311, 33 3 333 (installation) / 33 3 314, 33 3 315 and 33 4 173 (rear differential)

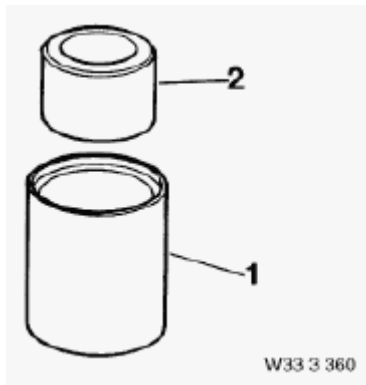


Fig. 17: Set Of Tools (33 3 360)

Courtesy of BMW OF NORTH AMERICA, INC.

33 3 370 SET OF TOOLS

Minimum set: Mechanical tools

In conjunction with: 33 3 314, 33 3 315, 33 4 140 and 33 4 155

Note: For removing and installing rubber mount in rear axle carrier

Series: E46, E83, E85, E86

Storage location: B37, C37

SI number: 1 02 98 (302)

Order number: 33 3 370

Set of tools

Consisting of:

1 = 33 3 371 Spindle

Note: Two-stage with M12 nut

2 = 33 3 372 Shaped disc

Note: For removing and installing rubber mount

3 = 33 3 373 Disc

Note: For gripping when installing rubber mount

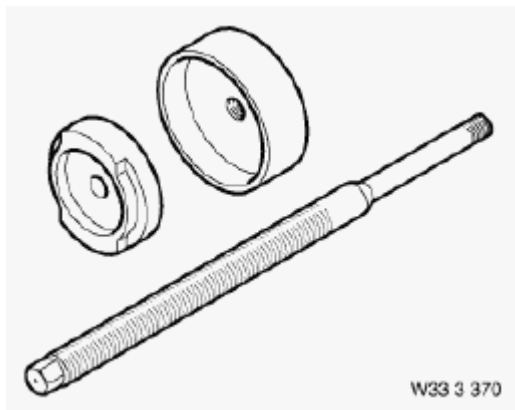


Fig. 18: Set Of Tools (33 3 370)

Courtesy of BMW OF NORTH AMERICA, INC.

33 3 390 DRIFT

Minimum set: Mechanical tools

In conjunction with: 00 5 500

Note: For driving rotary shaft seal onto drive flange of rear axle differential

Series: E30, E36, E46, E81, E83, E85, E86, E87, E90, E91

Storage location: A37

SI number: 1 02 98 (302)

Order number: 33 3 390

Drift

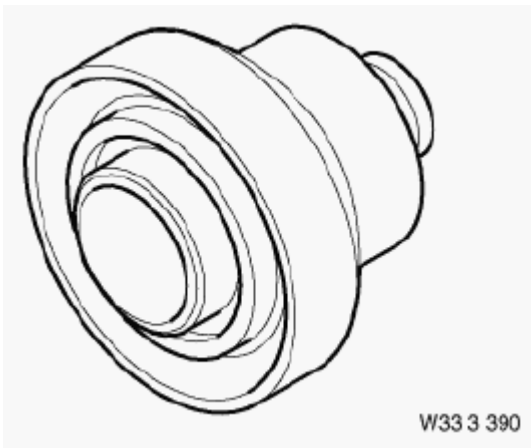


Fig. 19: Drift (33 3 390)

Courtesy of BMW OF NORTH AMERICA, INC.

33 3 400 DRIFT

Minimum set: Mechanical tools

In conjunction with: 00 5 500

Note: For driving rotary shaft seal onto output flange of rear axle differential

Series: E30, E36, E46, E83, E85, E87, E90, E91

Storage location: A37

SI number: 1 02 98(302)

Order number: 33 3 400

Drift

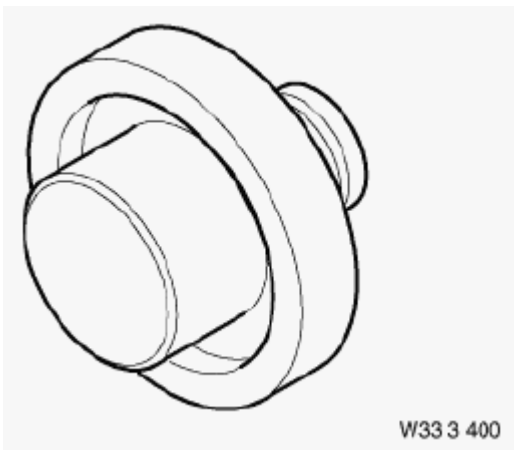


Fig. 20: Drift (33 3 400)

Courtesy of BMW OF NORTH AMERICA, INC.

33 3 420 DRIFT

Minimum set: Mechanical tools

In conjunction with: 00 5 500

Note: For fitting rotary shaft seals on output flanges

Series: E30, E32, E34, E36, E38, E46, E52, E83

Transmission: HAG 220kom, HAG type M

Storage location: A32

SI number: 1 05 94(789)

Order number: 33 3 420

Drift

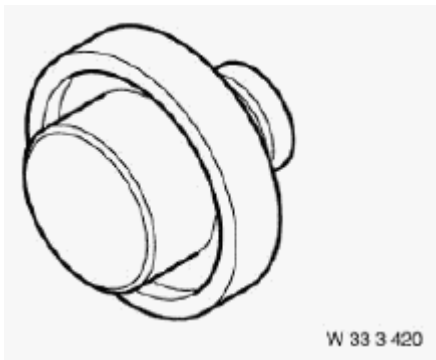


Fig. 21: Drift (33 3 420)

Courtesy of BMW OF NORTH AMERICA, INC.

33 3 440 DRIFT

Minimum set: Mechanical tools

In conjunction with: 00 5 500

Note: For fitting rotary shaft seal (with axial sealing lip) on input flange

Series: E30, E31, E32, E34, E36, E38, E39, E46, E52, E53, E60, E61, E63, E64, E65, E66, E67, E83, E85, E86, E87, E90, E91, E92, E93, RR1, RR2

Transmission: Rear diff. 220kom, rear diff. 225kom, rear diff. type G

Storage location: A31

SI number: 1 05 94 (789)

Order number: 33 3 440

Drift

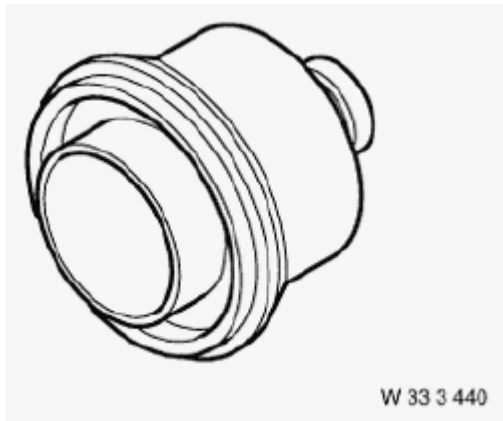


Fig. 22: Drift (33 3 440)

Courtesy of BMW OF NORTH AMERICA, INC.

33 3 450 DRIFT

Minimum set: Mechanical tools

In conjunction with: 00 5 500

Note: For fitting rotary shaft seals on output flanges

Series: E30, E31, E32, E34, E36, E38, E46, E52, E83

Transmission: HAG 220kom, HAG type G

Storage location: A32

SI number: 1 05 94(789)

Order number: 33 3 450

Drift

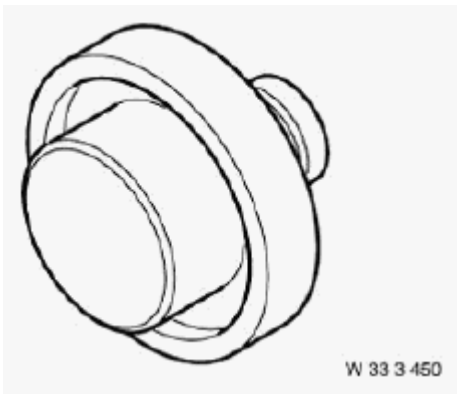


Fig. 23: Drift (33 3 450)

Courtesy of BMW OF NORTH AMERICA, INC.

33 3 470 DRIFT

Minimum set: Mechanical tools

In conjunction with: 00 5 500

Note: For fitting rotary shaft seal on input flange

Series: E30, E32, E34, E36, E38, E39, E46, E53, E60, E61, E63, E64, E65, E66, E81, E83, E85, E86, E87, E90, E91, E92, E93

Transmission: Rear diff. 188kom, rear diff. 225kom, rear diff. type M

Storage location: A32

SI number: 1 05 94 (789)

Order number: 33 3 470

Drift

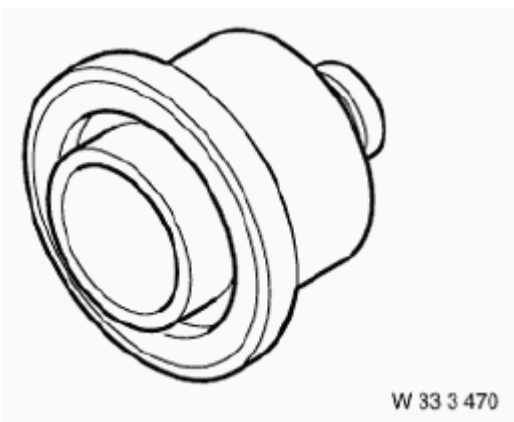


Fig. 24: Drift (33 3 470)

Courtesy of BMW OF NORTH AMERICA, INC.

33 3 480 DRIFT

Minimum set: Mechanical tools

In conjunction with: 00 5 500

Note: For driving in retaining plate on drive shaft (rear diff Types K and M) and for driving in locking ring in front axle differential drive flange (E34 AWD, E46)

Series: E30, E32, E34, E36, E38, E39, E46, E53, E60, E61, E63, E64, E65, E66, E81, E83, E85, E86, E87, E90, E91, E92, E93

Transmission: Rear diff. 225kom, rear diff. type K, rear diff. type M

Storage location: A31

SI number: 1 01 94 (766)

Order number: 33 3 480

Drift

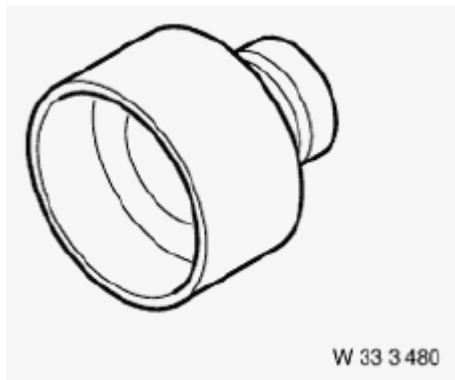


Fig. 25: Drift (33 3 480)

Courtesy of BMW OF NORTH AMERICA, INC.

33 3 490 DRIFT

In conjunction with: 00 5 500

Note: For driving in retaining plate on output shaft when replacing shaft seal and drive flange

Series: E31, E32, E34, E36, E36/7, E38, E39, E46, E52, E53, E60, E61, E63, E64, E65, E66, E67, E83, E85, E86, E90, E91, E92, E93, RR1, RR2

Transmission: Rear diff 225kom, rear diff type G

Storage location: A31

SI number: 1 05 94 (789)

Order number: 33 3 490

Drift

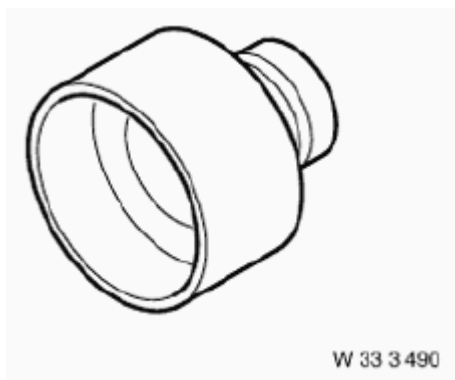


Fig. 26: Drift (33 3 490)

Courtesy of BMW OF NORTH AMERICA, INC.

33 4 030 SET OF TOOLS

Minimum set: Mechanical tools

Note: For removing and installing rear wheel bearings

Series: E23, E24, E28, E32, E34, E36, E46, E81, E83, E85, E86, E87, E90, E91, E92, E93

Storage location: C8

Order number: 33 4 030

Set of tools

Consisting of:

1 = 33 4 031 Bell

Note: For gripping when removing rear wheel bearing

2 = 33 4 032 Spindle

Note: Model series: E28

3 = 33 4 033 Thrust washer

Note: For removing rear wheel bearing / Model series: E28 / model: 518, 528i

4 = 33 4 034 Guide sleeve

Note: For installing rear wheel bearing / Model series: E28 / model: 518, 520i

5 = 33 4 035 Thrust washer

Note: For installing rear wheel bearing / Model series: E28 / model: 518, 520i

6 = 33 4 036 Guide sleeve

Note: For installing rear wheel bearing / Model series: E28 / model: 525i, 528i

7 = 33 4 037 Thrust washer

Note: For installing rear wheel bearing / Model series: E28 / model: 525i, 528i

8 = 33 4 038 Nut with bearing

Note: Model series: E28

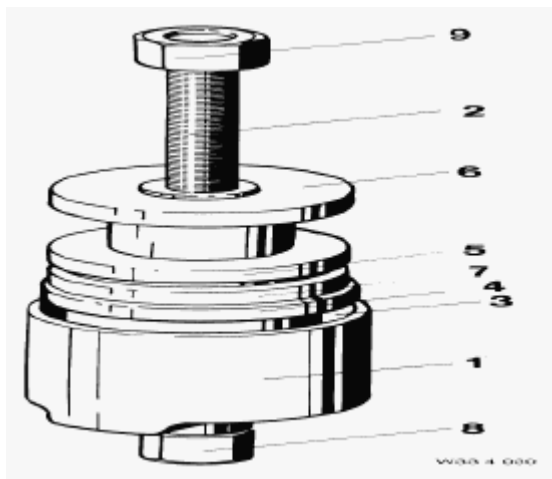


Fig. 27: Set Of Tools (33 4 030)

Courtesy of BMW OF NORTH AMERICA, INC.

33 4 040 SET OF TOOLS

Minimum set: Mechanical tools

Note: For removing and installing rear wheel bearings

Series: E30, E36, E46, E81, E83, E85, E86, E87, E90, E91, E92, E93

Storage location: C8

Order number: 33 4 040

Set of tools

Consisting of:

1 = 33 4 041 Spindle

Note: Model series: E30, E46

2 = 33 4 042 Nut with bearing

Note: Model series: E30, E46

3 = 33 4 043 Nut

Note: Model series: E30, E46

4 = 33 4 044 Bell

Note: For gripping when removing rear wheel bearing / Model series: E30

5 = 33 4 045 Pull-out disk

6 = 33 4 046 Guide sleeve

Note: For installing rear wheel bearing / Model series: E30

7 = 33 4 047 Thrust washer

Note: For installing rear wheel bearing

8 = 33 4 048 Draw-in sleeve for rear axle shaft

9 = 33 4 049 Guide sleeve

Note: For installing wheel bearing

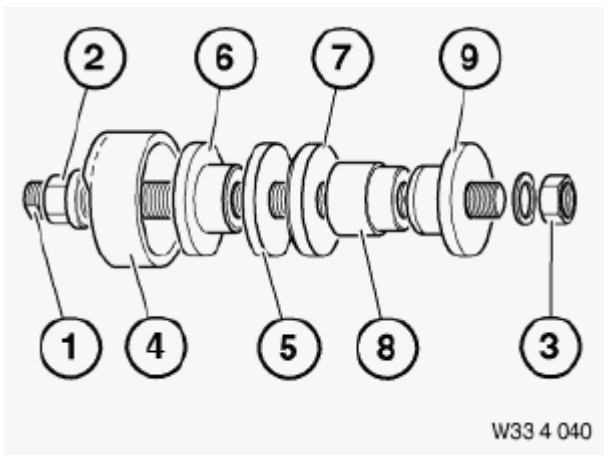


Fig. 28: Set Of Tools (33 4 040)

Courtesy of BMW OF NORTH AMERICA, INC.

33 4 140 UNIVERSAL SUPPORT

Minimum set: Mechanical tools

In conjunction with: 33 4 150

Note: For removing rubber mount in rear axle carrier

Series: E36, E38, E39, E39tou, E46, E52, E61, E65, E66, E67, E70, E81, E83, E85, E86, E87, E90, E91, E92, E93, R53, RR1, RR2

Storage location: A7

SI number: 1 02 99 (417)

Order number: 33 4 140

Universal support

Consisting of:

1 = 33 4 141 Threaded pipe

2 = 33 4 142 Support foot (2 x)

Note: Model series: E38, E39, E46

3 = 33 4 143 Sliding piece

4 = 33 4 144 Guide rod

5 = 33 4 145 Guide rod

Note: With threaded lug

6 = 33 4 146 Locating plate

Note: With screws

7 = 33 4 147 Thrust piece (2 x)

Note: With screws - Model series: E38, E39, E46

8 = 33 4 148 Support foot, long (2 x)

Note: Model series: E39/2, E65, E67, RR1

9 = 33 4 149 Thrust piece (2 x)

Note: With countersunk head screw - Model series: E39/2, E65, E67, E87

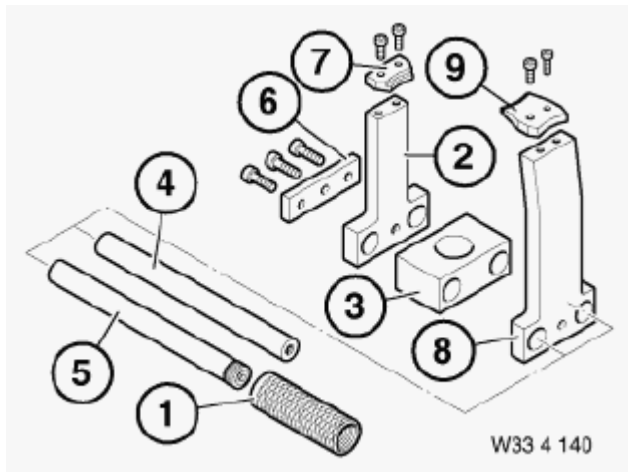


Fig. 29: Universal Support (33 4 140)

Courtesy of BMW OF NORTH AMERICA, INC.

33 4 150 REMOVAL AND INSTALLATION TOOL

Minimum set: Mechanical tools

In conjunction with: 33 4 140, 33 3 371

Note: For removing and installing rubber mount on rear axle carrier

Series: E38, E39, E39tou, E46, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E83, E85, E86, RR1, RR2

Storage location: B38, B8, C7, C8

SI number: 1 06 94 (801)

Order number: 33 4 150

Removal and installation tool

Consisting of:

1 = 33 4 151 Pressure plate

Note: For removal / model series: E38, E39, E46, E52

2 = 33 4 152 Pressure plate

Note: For installation Model series: E38, E39, E46, E52, RR1

3 = 33 4 153 Support plate

Note: For installation / model series: E38, E39, E46, E52

4 = 33 4 154 Spindle with lock nut

Note: Model series: E38, E39, E46, E52, E60, E61, E63, E64

5 = 33 4 155 Nut with bearing

In conjunction with: 33 3 371 (E46)

6 = 33 4 156 Spindle, long

Note: Model series: E39/2, E65, E66, E67, RR1

7 = 33 4 157 Pressure plate

Note: For installation - model series: E39/2, E65, E66, E67, RR1

8 = 33 4 158 Pressure plate

Note: For removal - model series: E53, E65, E66, E67, RR1

9 = 33 4 159 Support disk

Note: For installation - model series: E53, E65, E66, E67, RR1

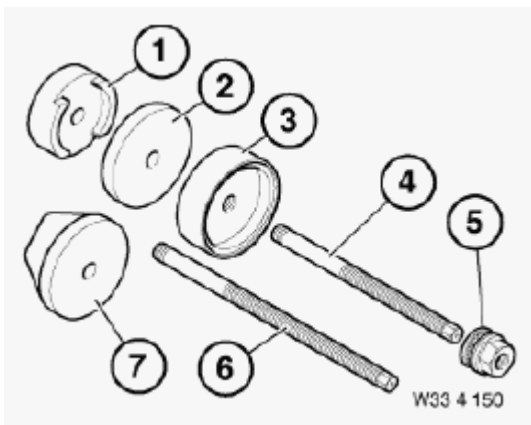


Fig. 30: Removal And Installation Tool (33 4 150)
Courtesy of BMW OF NORTH AMERICA, INC.

33 4 170 REMOVAL/INSTALLATION THRUST PIECES

Minimum set: Mechanical tools

In conjunction with: 33 3 314, 33 3 315, 33 3 362

Note: For removing and installing rubber mount at front and rear of rear axle differential, solid rubber mount

Series: E38, E39, E46, E83, E85, E86

Storage location: B34

SI number: 1 06 94(801)

Order number: 33 4 170

Removal/installation thrust pieces

Consisting of:

1 = 33 4 171 Support tube

Note: For removal

2 = 33 4 172 Thrust piece

Note: For installation

3 = 33 4 173 Support plate

Note: For installation

In conjunction with: 33 3 114, 33 3 315, 33 3 362 (E46)

4 = 33 4 174 Thrust piece

Note: For removal

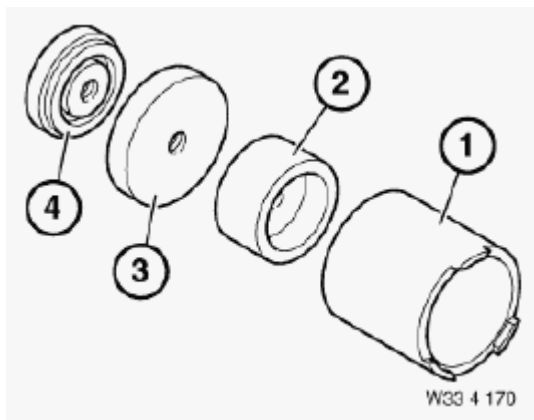


Fig. 31: Removal/Installation Thrust Pieces (33 4 170)
Courtesy of BMW OF NORTH AMERICA, INC.

33 4 180 REMOVAL/INSTALLATION TOOL

Minimum set: Mechanical tools

In conjunction with: 33 3 314, 33 3 315

Note: For removing and installing rubber mount in rear axle differential

Series: E39, E46, E60, E61, E63, E64, E83, E85, E86

Storage location: B34

SI number: 1 12 95 (992)

Order number: 33 4 180

Removal/installation tool

Consisting of:

1 = 33 4 181 Support tube

Note: For removing

2 = 33 4 182 Thrust piece

Note: For installing

3 = 33 4 183 Support plate

Note: For installing

4 = 33 4 184 Thrust piece

Note: For removing

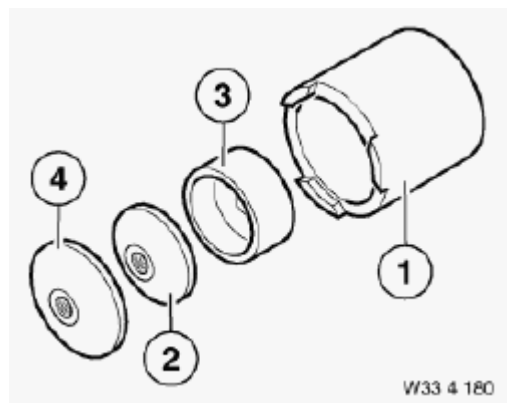


Fig. 32: Removal/Installation Tool (33 4 180)

Courtesy of BMW OF NORTH AMERICA, INC.

33 4 200 TOOL KIT / STRIKER FIXTURE

Minimum set: Mechanical tools

In conjunction with: 33 2 116

Note: For removing rear wheel flange when replacing wheel bearings

Series: E12, E21, E23, E24, E28, E30, E31, E32, E34, E36, E38, E39, E46, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E81, E83, E85, E86, E87, E90, E91, E92, E93, RR1

SI number: 1 06 94 (801)

Order number: 33 4 200

Tool kit / striker fixture

Consisting of:

1 = 33 4 201 Impact rod with handle

3 = 33 4 203 Impact piece

5 = 33 4 205 Adapter

Note: For removing wheel guide joint from E53, E83

In conjunction with: Impact tool 33 4 200

33 4 204 M20 nut and M20 flat nut

Note: Nuts 33 4 204 are integrated in 33 4 201 33 4 204 is only continued as a spare part number.

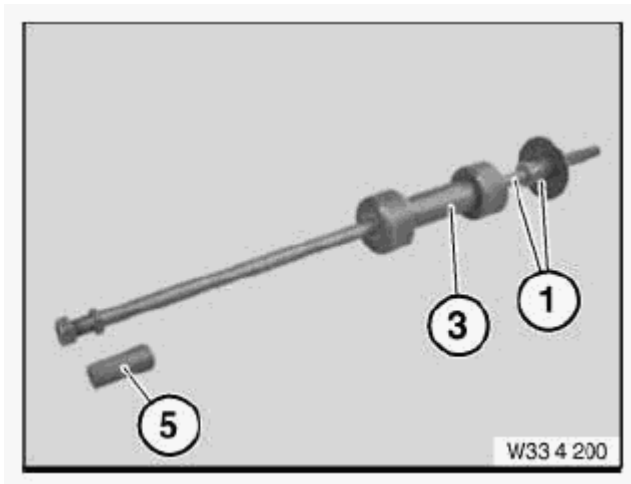


Fig. 33: Tool Kit / Striker Fixture (33 4 200)
Courtesy of BMW OF NORTH AMERICA, INC.

33 4 240 DRIFT

Minimum set: Mechanical tools

In conjunction with: 00 5 500

Note: For driving in radial seal on output flange in rear axle differential

Series: E30, E32, E34, E36, E38, E39, E46, E52, E53, E60, E61, E63, E64, E65, E66, E67, E83, E85, E86, E87, E90, E91, E92, E93

Storage location: A31

SI number: 1 10 95(976)

Order number: 33 4 240

Drift

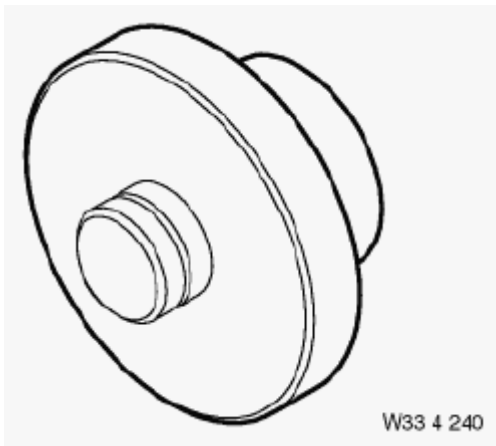


Fig. 34: Drift (33 4 240)

Courtesy of BMW OF NORTH AMERICA, INC.

33 4 250 DRIFT

Minimum set: Mechanical tools

In conjunction with: 00 5 500

Note: For driving radial seal into output flange.

Series: E31, E32, E34, E36, E38, E39, E46, E52, E53, E60, E61, E63, E64, E65, E66, E67, E83, E90, E91, E92, E93, RR1, RR2

Storage location: A31

SI number: 1 02 96 (035)

Order number: 33 4 250

Drift

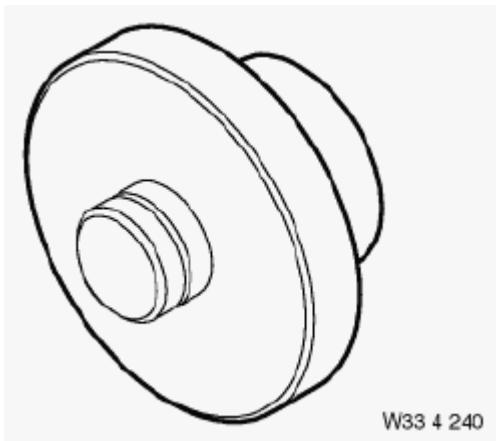


Fig. 35: Drift (33 4 240)

Courtesy of BMW OF NORTH AMERICA, INC.

33 4 260 SET OF TOOLS

In conjunction with: 33 3 260

Note: For removing and installing front wheel bearings in wheel carrier

Series: E53, E60, E61, E67, E83, E90, E91, E92, RR1

Storage location: C41

Order number: 33 4 260

Set of tools

Consisting of:

1 = 33 4 261 Bushing

Note: For extracting wheel bearing from wheel carrier

2 = 33 4 262 Disk

Note: For installing wheel bearing in wheel carrier

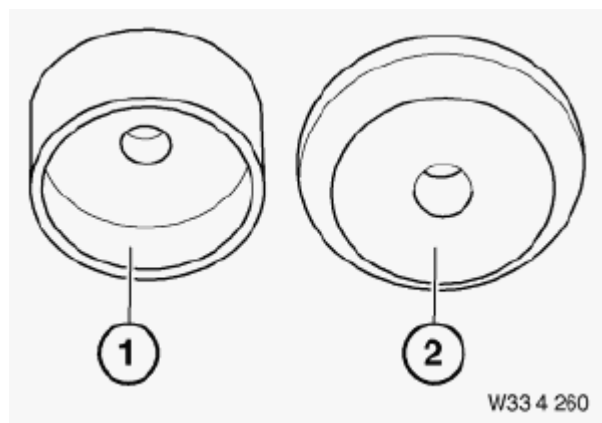


Fig. 36: Set Of Tools (33 4 260)

Courtesy of BMW OF NORTH AMERICA, INC.

33 4 320 DRIFT

Minimum set: Mechanical tools

In conjunction with: 00 5 500

Note: For driving radial seal onto output flange of rear differential. Rear differential:168K / L

Series: E30, E36, E46, E83, E85, E87, E90

Order number: 33 4 320

Drift

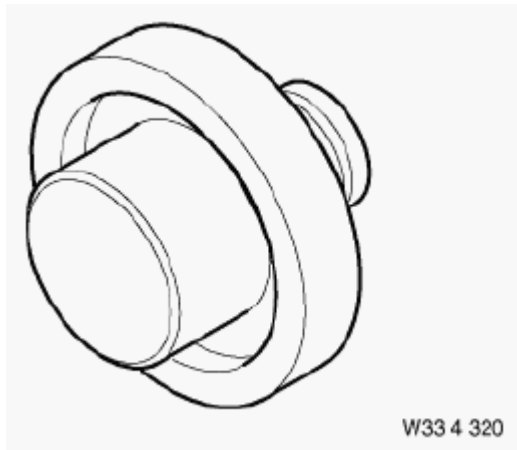


Fig. 37: Drift (33 4 320)

Courtesy of BMW OF NORTH AMERICA, INC.

33 4 330 DRIFT

Minimum set: Mechanical tools

In conjunction with: 00 5 500

Note: For driving in radial seal on output flange in rear axle differential. Rear differential: 188K / L

Series: E30, E32, E34, E36, E38, E39, E46, E52, E53, E60, E61, E63, E64, E65, E66, E67, E83, E85, E86, E87, E90, E91, E92, E93

Order number: 33 4 330

Drift

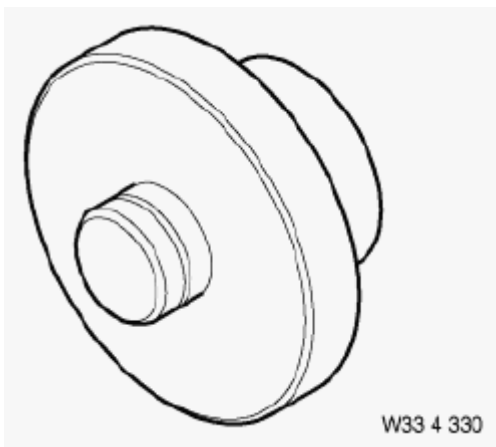


Fig. 38: Drift (33 4 330)

Courtesy of BMW OF NORTH AMERICA, INC.

33 4 400 PULLER FIXTURE

Note: For removing inner wheel bearing races on rear axle

Series: E12, E21, E23, E24, E28, E30, E30/C, E30tou, E31, E32, E32/3, E34, E34tou, E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E81, E83, E85, E86, E87, E90, E91, E92, E93, RR1

SI number: 1 05 99 (426)

Order number: 33 4 400

Puller fixture

Consisting of:

1 = 33 4 401 Basic body

2 = 33 4 402 Spindle

3 = 33 4 403 Wrench, large

4 = 33 4 404 Wrench, small

5 = 33 4 405 Clamping pliers (45...51 mm)

6 = 33 4 406 Clamping pliers (50...55 mm)

7 = 33 4 407 Clamping pliers (55...61 mm)

Note: Model series: E67

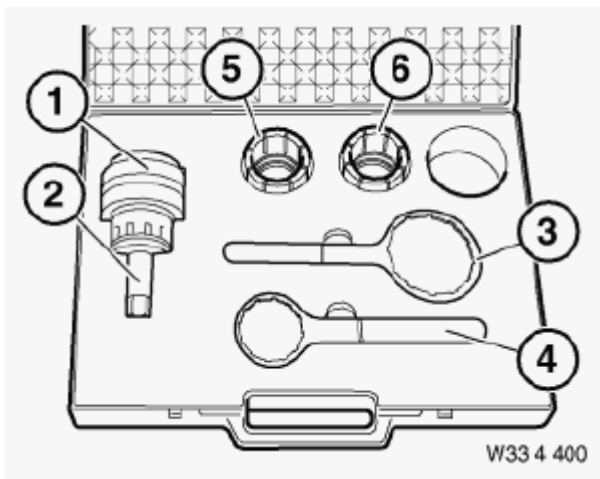


Fig. 39: Puller Fixture (33 4 400)

Courtesy of BMW OF NORTH AMERICA, INC.

33 4 420 SUPPORT

In conjunction with: 00 2 030

Note: For supporting rear differential during removal and installation.

Series: E31, E36, E38, E39, E46, E52, E53, E60, E61, E63, E64, E65, E66, E67, E81, E83, E85, E86, E87, E90, E91, E92, RR1, RR2

Order number: 33 4 420

Support

Consisting of:

1 = 33 4 421 Base plate

2 = 33 4 422 Adapter set

4 = 33 4 424 Spindle with pressure piece

5 = 33 4 425 Support angle

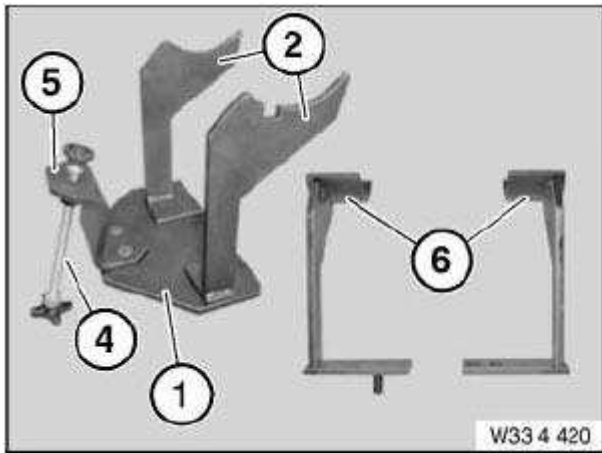


Fig. 40: Support (33 4 420)

Courtesy of BMW OF NORTH AMERICA, INC.

33 4 426 MOUNTING ADAPTER

Note: Locator for E85 Z4 M. SI 01 10 06 (264)

SI number: 01 10 06 264

Order number: 33 4 426

Mounting adapter

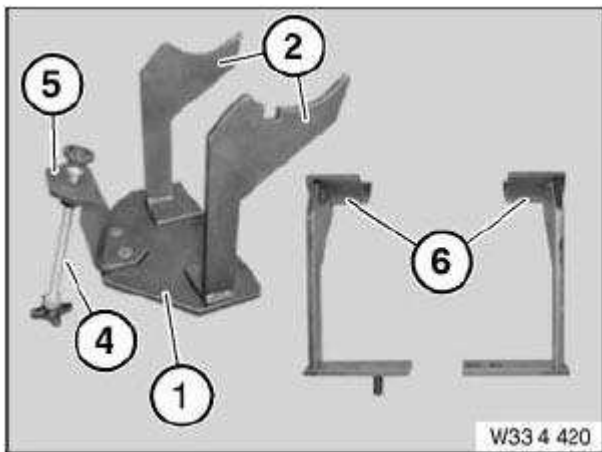


Fig. 41: Support (33 4 420)

Courtesy of BMW OF NORTH AMERICA, INC.

33 5 014 THRUST PIECE WITH SPLINED KEY

Order number: 33 5 014

Thrust piece with splined key

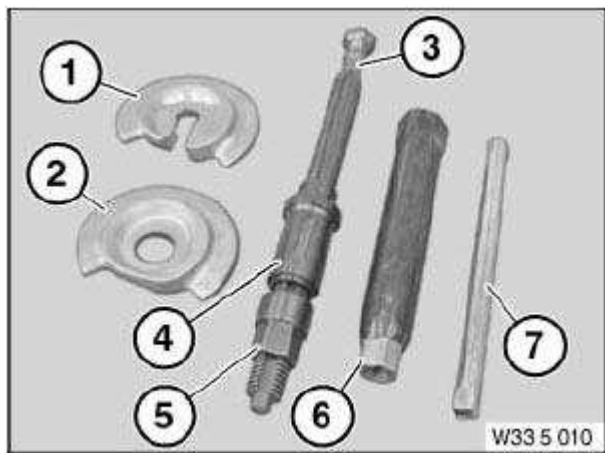


Fig. 42: Thrust Piece With Splined Key (33 5 014)
Courtesy of BMW OF NORTH AMERICA, INC.

33 5 070 EXTENSION PIECE (2)

Minimum set: Mechanical tools

In conjunction with: 33 5 040, 33 5 050, 33 5 060

Note: Pull-out extension for 33 5 040, 33 5 050, 33 5 060.

Series: E36, E38, E39, E46, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E81, E83, E85, E86, E87, E90, E91, E92, E93, RR1, RR2

SI number: 01 21 06 (300)

Order number: 33 5 070

Extension piece (2)

Consisting of:

1 = 33 5 071 Extension (1 x)



Fig. 43: Extension Piece (2) (33 5 070)
Courtesy of BMW OF NORTH AMERICA, INC.

33 5 080 DRIFT

Minimum set: Mechanical tools

Note: For driving in shaft seal on drive shaft.

Transmission: Diff. 215 Sp, diff. 220kom, diff. 225kom, diff. type G

SI number: 01 21 06 (300)

Order number: 33 5 080

Drift



Fig. 44: Drift (33 5 080)
Courtesy of BMW OF NORTH AMERICA, INC.

33 5 151 DISC

SI number: 01 22 06 (307)

Order number: 33 5 151

Disc

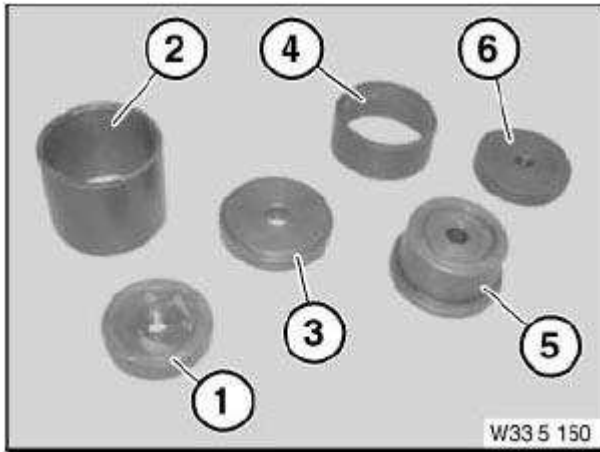


Fig. 45: Disc (33 5 151)

Courtesy of BMW OF NORTH AMERICA, INC.

33 5 152 HOLDING SLEEVE

SI number: 01 22 06 (307)

Order number: 33 5 152

Holding sleeve

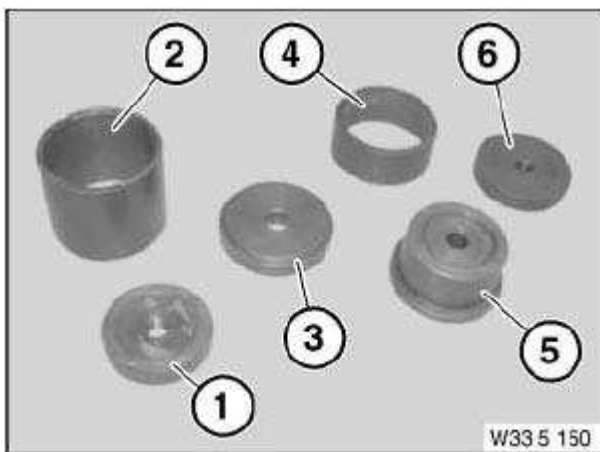


Fig. 46: Disc (33 5 151)

Courtesy of BMW OF NORTH AMERICA, INC.

33 5 153 DISC

SI number: 01 22 06 (307)

Order number: 33 5 153

Disc

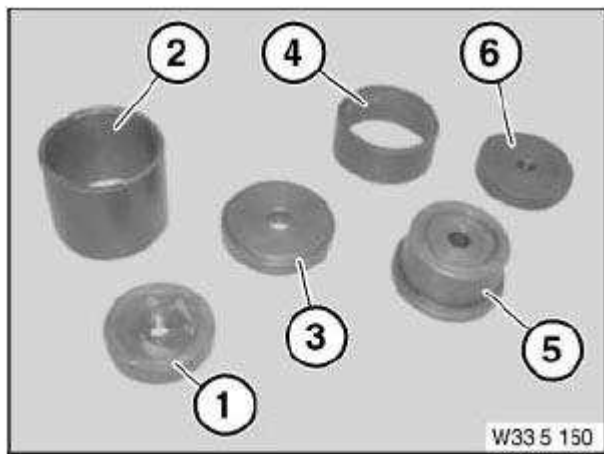


Fig. 47: Disc (33 5 151)

Courtesy of BMW OF NORTH AMERICA, INC.

33 5 154 HOLDING SLEEVE

SI number: 01 22 06 (307)

Order number: 33 5 154

Holding sleeve

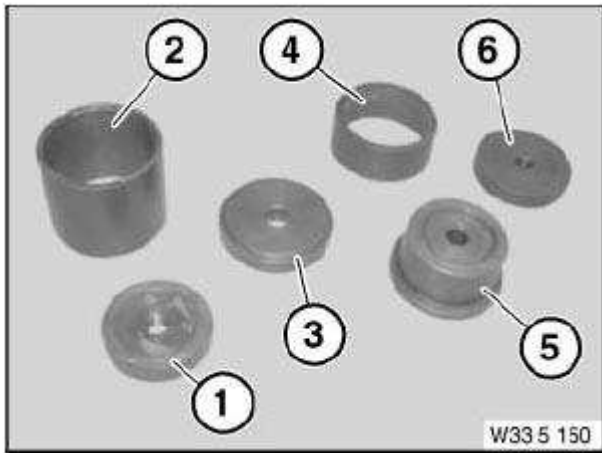


Fig. 48: Disc (33 5 151)

Courtesy of BMW OF NORTH AMERICA, INC.

33 5 155 DISC

SI number: 01 22 06 (307)

Order number: 33 5 155

Disc



Fig. 49: Disc (33 5 151)

Courtesy of BMW OF NORTH AMERICA, INC.

33 5 156 DISC

SI number: 01 22 06 (307)

Order number: 33 5 156

Disc



Fig. 50: Disc (33 5 151)

Courtesy of BMW OF NORTH AMERICA, INC.

SUSPENSION

Rear Axle - Technical Data - X3

00 GENERAL

33 10 FINAL DRIVE E39 / E46 / E83 / E85 188K

TECHNICAL DATA - FINAL DRIVE E39 / E46 / E83 / E85 188K

Use only approved rear differential oils.		
New oil filling volume	ltr.	1.0
Oil change volume	ltr.	1.0

33 10 FINAL DRIVE E46 / E83 / E85 168K

TECHNICAL DATA - FINAL DRIVE E46 / E83 / E85 168K

Use only approved rear differential oils.		
New oil filling volume	ltr.	0.9
Oil change volume	ltr.	0.9

33 00 GENERAL - TRACK WIDTH E83

TECHNICAL DATA - GENERAL - TRACK WIDTH E83

Track width for normal position and press-in depth (ET)		
- ET39	mm	1556
- ET46	mm	1542

33 00 REAR AXLE - RIDE HEIGHT E83

TECHNICAL DATA - REAR AXLE - RIDE HEIGHT E83

Ride height specification		in normal position (attach tape measure to rim flange at bottom middle and measure to lower edge of wheel arch)
Deviation from nominal value for all wheels together	Max. mm	10
Series		
17" rim	mm \pm 10	673
18" rim	mm \pm 10	685
19" rim	mm \pm 10	698
20" rim	mm \pm	- -

	10	
Sport suspension (not low slung)		
17" rim	mm ± 10	673
18" rim	mm ± 10	685
19" rim	mm ± 10	698
20" rim	mm ± 10	- -

10 FINAL DRIVE

33 10 FINAL DRIVE E39 / E46 / E83 / E85 188K

TECHNICAL DATA - FINAL DRIVE E39 / E46 / E83 / E85 188K

Use only approved rear differential oils.		
New oil filling volume	ltr.	1.0
Oil change volume	ltr.	1.0

33 10 FINAL DRIVE E46 / E83 / E85 168K

TECHNICAL DATA - FINAL DRIVE E46 / E83 / E85 168K

Use only approved rear differential oils.		
New oil filling volume	ltr.	0.9
Oil change volume	ltr.	0.9

11 FINAL DRIVE WITH COVER

33 10 FINAL DRIVE E39 / E46 / E83 / E85 188K

TECHNICAL DATA - FINAL DRIVE E39 / E46 / E83 / E85 188K

Use only approved rear differential oils.		
New oil filling volume	ltr.	1.0
Oil change volume	ltr.	1.0

33 10 FINAL DRIVE E46 / E83 / E85 168K

TECHNICAL DATA - FINAL DRIVE E46 / E83 / E85 168K

Use only approved rear differential oils.		
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New oil filling volume	ltr.	0.9
Oil change volume	ltr.	0.9

41 WHEEL BEARINGS

31 21 WHEEL BEARINGS AND STEERING KNUCKLE ALL

TECHNICAL DATA - WHEEL BEARINGS AND STEERING KNUCKLE ALL

Bearing units lubricated for entire service life and cannot be disassembled		
max. axial runout of wheel hub at wheel bearing flange	max. mm	< 0.03

33 41 WHEEL BEARINGS

TECHNICAL DATA - WHEEL BEARINGS

Double-row, angular ball bearing lubricated for service life and not to be disassembled		
Max. axial wheel bearing play	max. mm	0.06 ... 0.08

2007 SUSPENSION

Rear Axle - Tightening Torques - X3

11 FINAL DRIVE WITH COVER

33 11 REAR DIFFERENTIAL CASE WITH COVER

REAR DIFFERENTIAL CASE WITH COVER - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Case Covers Transmission allocation	E36, E38, E39, E46, E53, E60, E61, E65, E66, E83, E85, E86	M10 8.8	168N 168K 188 188N 188K 210 210N 215	45 Nm
	E46, E83, E85	M10 10.9	168K	55 Nm
	E38, E39, E46, E53, E60, E61, E65, E66, E83, E85	M10 10.9	188K	55 Nm
	E46, E53, E60, E61, E63, E64, E65, E66, E67, E83	M10	215K	90 Nm
	E38, E39, E52	M10 x 25 10.9	220K	90 Nm
	E38, E39, E52	M10 x 75 10.9	220K	110 Nm
	E38, E39, E52	M10 x 67 10.9	220K	130 Nm
	E65, E66, E67	M10	230K	90 Nm
	E85	M10 10.9	168L	55 Nm
	E60, E61, E63, E64	M10 10.9	188L 188LW	55 Nm
	E65, E66, E83, E85, E86	M10 10.9	188L	55 Nm
	E60, E63, E64	M10 10.9	215 with lock	60 Nm
2AZ Side bearing cap (insert into through bore-holes only new coated screws or screws with Loctite 270)	E12, E21, E23, E24, E28, E30, E31, E32, E34, E36, E38	M8	Type M, G	22 Nm
	E12, E21, E28, E30, E34, E36, E38, E39	M8	Type K	

			Jointing torque	10 Nm
			Torque angle	40 °
3AZ Oil fill and drain plug with sealing ring	E30, E31, E32, E34, E36, E38, E39, E46, E52, E53, E60, E63, E83, E85, E86		Replace sealing ring	65 Nm
4AZ Drive flange, right	E34 / 525ix	M10		59 Nm
5AZ Drive flange, left (always replace screws)	E34 / 525ix	M14 x 1.5	Jointing torque	90 Nm
			Torque angle	100 + 4°
6AZ Oil cooler connection to rear differential	E31			35 Nm
7AZ Union nuts pipe oil cooler	E31			17 Nm
8AZ Vibration damper on bracket	E38, E39, E46			77 Nm
9AZ Oil filler and oil drain plugs with O-ring on cover / housing	E30, E31, E32, E34, E36, E38, E39, E46, E52, E53, E60, E61, E63, E64, E65, E66, E67, E83, E85, E86		Replace oil filler and oil drain plugs	60 Nm

17 FINAL DRIVE MOUNTING

33 17 FINAL DRIVE UNIT MOUNTINGS

FINAL DRIVE UNIT MOUNTINGS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Final drive to rear axle carrier	E21			90 Nm
	E12, E24/until 5.82			80 Nm
	E23, E24 / from 5.82, E28 / from 5.82, E30, E32, E34, E36 / Z3 / Compact			110 Nm
	E36, E46	Front		95 Nm
	E46/S54, E85/ S54, E86 / S54	Front	Observe repair instruction.	200 Nm
	E38, E39, E52	Front		150 Nm
	E53, E60, E61, E63, E64, E65, E66, E67, E83, E85 / except S54, E86 / except S54	Front	Observe repair instruction.	100 Nm
	E31, E36	Rear		77 Nm
	E38	Rear		102 Nm
	E38	Rear	tighten also via screw head	75 Nm
	E39	Rear	tighten also via screw head	105 Nm
	E46 / except S54	Rear		174 Nm

	E46/S54, E85/ S54, E86 / S54	Rear	Observe repair instruction.	
			Jointing torque	20 Nm
			Torque angle	90 °
	E52	Rear	tighten also via screw head	102 Nm
	E53, E60 / except S85, E61, E63 / except S85, E64, E65, E66, E67, E83, E85 / except S54, E86 / except S54	Rear	Observe repair instruction.	165 Nm
	E60/S85, E63/ S85	Rear	Observe repair instruction.	220 Nm
2AZ Final drive to stabilizer link and stabilizer link to body	E21, E30			90 Nm
3AZ Final drive to rubber mount	E12, E23, E24, E28			87 Nm
	E32, E34			77 Nm
4AZ Differential cover with rubber mount to body	E30, E36 / Z3 / Compact			77 Nm
5AZ Final drive cover to case cover	E32	M12 8.8		81 Nm
	E32, E34	M12 10.9		102 Nm
	E12, E24			48 Nm
6AZ Rubber mount to body				
	E23	M8 8.8	Thread free from oil and grease Secure with Loctite No. 270	24 Nm
	E23	M8 10.9	Thread free from oil and grease Secure with Loctite No. 270	37 Nm
	E23, E32	M10 8.8	Thread free from oil and grease Secure with Loctite No. 270	52 Nm
7AZ Final drive cover to final drive	E31	M14 x 1.5		186 Nm
8AZ Final drive cover to rear axle support	E31			127 Nm
9AZ Vibration damper	E65 / M57TU / M57T2	M12		100 Nm

21 OUTPUT SHAFTS

33 21 OUTPUT SHAFT

OUTPUT SHAFT - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Output shaft to rear axle differential and drive flange				
Hexagon socket screw	E30, E32, E34	M10x50 10.9	Replace screws	60 Nm
Torx screw without ribbed teeth	E30, E31, E32, E34, E36, E38	M10x50 10.9 (black)	Replace screws	60 Nm
Torx screw with ribbed teeth	E36, E39, E46	M8x40 (black)	Replace screws	64 Nm
	E36, E39, E46, E60, E83, E85	M8x40 (silver)	Replace screws	52 Nm
	E36 / M54 / Z3 3.0i, E46	M10x23 10.9 (silver)	Replace screws	85 Nm
	E30, E36, E38, E39, E46, E52, E53, E60, E61, E63, E64, E65, E66, E83, E85, E86	M10 (silver)	Replace screws	80 Nm
	E36 / Z3 2.8i, E36 / S50 / S52 / S54, E46 / S54, E85 / S54, E86 / S54	M10x46 10.9 (black)	Replace screws	100 Nm
	E31, E38, E39, E60, E63, E64	M12x50 10.9 (black)	Replace screws	135 Nm

31 REAR SUB-FRAME

33 31 REAR AXLE CARRIER

REAR AXLE CARRIER - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Vibration damper to rear axle carrier	E36 / E38 / E46 / E83	M12		77 Nm
	E65 / E66 / E67	M12		100 Nm

32 CONTROL ARMS AND STRUT

33 32 CONTROL ARMS AND STRUTS

CONTROL ARMS AND STRUTS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1 AZ Trailing arm to rear axle carrier	E34 (M5)		Replace screw tighten with special tool 33 3 060 and torque wrench Hazet 6291-2CT	55 Nm
	E30, E32, E34, E36		tighten in normal position	67 Nm
	E30, E32, E34, E36	10.9		77 Nm
2AZ Trailing arm to console	E31	M14 x 1.5		127 Nm
3AZ Trailing arm to wheel carrier	E31	M18 x 1.5		278 Nm
4AZ Traction strut to wheel carrier	E31		Tapered spigot and bore must be free of grease	80 Nm
	E38, E52			
	E39		Tapered spigot and bore must be free of grease	55 Nm
	E53			56 Nm
	E60, E61, E63, E64, E65, E66, E67	M10	Replace nut	65 Nm
	E60, E63, E64, E65, E66	M12	Replace nut	100 Nm
5AZ Control arm to rear axle support	E31		tighten in normal position	95 Nm
	E38		tighten in normal position	60 Nm
	E39		tighten in normal position With torque wrench Hazet 6290-CT	60 Nm
	E52		tighten in normal position	60 Nm
	E53		tighten in normal position with special tool 32 3 150 and torque wrench Hazet 6291 -ICT	59 Nm
	E60, E61, E63, E64, E65, E66, E67		Replace nut tighten in normal position	65 Nm
6AZ Support arm to rear axle support	E31	M14 x 1.5		127 Nm
7AZ Support arm to wheel carrier	E31			150 Nm
8AZ Upper control arm to wheel carrier	E31	M14 x 1.5		127 Nm
	E38, E52			160 Nm
	E39			142 Nm

	E53		Replace nut	165 Nm
	E60, E61, E63, E64, E65, E66		Replace nut	175 Nm
	E67		Replace nut	110 Nm
9AZ Interconnecting link to trailing arm	E31	M16 x 1.5	Tapered spigot and bore both free of grease	120 Nm
10AZ Integral arm to upper control arm	E31	M14 x 1.5		127 Nm
11 AZ Upper/lower control arms to trailing arm	E36, E46	M12 x 1.5	Replace nut tighten in normal position	110 Nm
12AZ Trailing arm to console	E36, E46			110 Nm
	E83, E85, E86	M12 x 1.5 10.9		100 Nm
13AZ Trailing arm console to body	E36, E46, E83, E85, E86			77 Nm
14AZ Upper control arm to rear axle carrier	E31	M12 x 1.5	tighten in normal position	77 Nm
	E36	M12 10.9	tighten in normal position Always replace antifatigue bolts with combination bolts and washers, see	77 Nm
	E38, E39, E52		tighten in normal position	110 Nm
	E52		tighten in normal position	110 Nm
	E46, E83, E85, E86		tighten in normal position	77 Nm
	E53, E60, E61, E63, E64		Replace nut tighten in normal position	100 Nm
	E65, E66, E67		Replace nut tighten in normal position	
			Jointing torque	100 Nm
			Torque angle	90 °
15AZ Lower control arm to rear axle carrier	E36	M12 10.9	tighten in normal position Always replace antifatigue bolts with combination bolts and washers, see	77 Nm
	E46, E83, E85, E86		tighten in normal position	77 Nm
16AZ Support bracket on body	E21 / E30			28 Nm
17AZ Compression strut on body	E46, E83	M8 8.8		21 Nm
	E30, E32, E34, E36, E85, E86	M8 10.9		30 Nm
	E60, E61, E63, E64	M10 10.9		48 Nm

	E65, E66, E67	M10 10.9		38 Nm
18AZ Auxiliary control arm to trailing arm and rear axle carrier	E32, E34	M14 x 1.5	tighten in normal position	127 Nm
19AZ Additional strut on rear axle carrier	E32, E34	M12 x 1.5		110 Nm
20AZ Swinging arm to rear axle support	E38	Front	tighten in normal position	60 Nm
	E39	Front	tighten in normal position	58 Nm
	E52	Front	tighten in normal position	105 Nm
	E53, E60, E61, E63, E64, E65, E66, E67	Front	Replace nut tighten in normal position	100 Nm
	E38	Rear	tighten in normal position	130 Nm
	E39	Rear M12	tighten in normal position	115 Nm
	E39 / Touring, M5	Rear M14	tighten in normal position	174 Nm
	E52	Rear M14	tighten in normal position	160 Nm
	E53, E60, E61, E63, E64, E65, E66, E67	Rear M14	Replace nut tighten in normal position	165 Nm
21AZ Integral link on front wheel carrier	E38, E39, E52, E53		tighten in normal position	105 Nm
	E60, E61, E63, E64, E65, E66, E67		tighten in normal position	100 Nm
22AZ Screw connection, swinging arm, integral link, wheel carrier	E38		tighten in normal position	236 Nm
	E39, E52		Replace nut tighten in normal position	256 Nm
	E53		Replace nut tighten in normal position	250 Nm
	E60, E61, E63, E64, E65, E66, E67		Replace nut tighten in normal position	240 Nm
23AZ V-strut to tension strut / body	E46 / M3 / M3 CSL		Replace screws	
			Jointing torque	59 Nm
			Torque angle	90 °
24AZ Upper control arm to trailing arm	E85, E86	M12 x 1.5 8.8	Replace nut	100 Nm
	E83	M12 x 1.5	Replace nut	106 Nm

25AZ Lower control arm to trailing arm	E85, E86	M12 x 1.5 10.9	Replace nut tighten in normal position	77 Nm
	E83	M12 x 1.5 10.9	Replace nut tighten in normal position	100 Nm
26AZ Tension strut to compression strut / body	E83	M10		60 Nm
27AZ Heat shield to compression strut	E83	M6		5 Nm
28AZ Heat shield to compression strut	E65, E66, E67	M8		19 Nm

33 AXLE MOUNTING

33 33 REAR AXLE SUSPENSION

REAR AXLE SUSPENSION - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Rubber mount to rear axle carrier	E21, E23			95 Nm
	E21, E24, E28			40 Nm
2AZ Stud to body	E36			120 Nm
	E36 / Z3 / Compact			127 Nm
	E46, E85, E86			90 Nm
3AZ Rear axle carrier with rubber mounts to body	E36, E46, E83, E85, E86	M12 x 1.5		77 Nm
	E36	M14 x 1.5		140 Nm
	E38			127 Nm
	E39, E52, E53			163 Nm
	E60, E61, E63, E64, E65, E66, E67			165 Nm
4AZ Rear rubber mount to body	E32, E34	M10	Thread free from oil and grease Secure with Loctite No. 270	45 Nm
5AZ Rear axle carrier to rear rubber mount	E32, E34	M12		77 Nm
6AZ Fixing, rubber mount/rear axle carrier, front	E67			8 Nm

41 WHEEL BEARINGS

33 41 WHEEL BEARINGS

WHEEL BEARINGS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Rear axle shaft to drive flange	E12, E21, E23, E24	Collar nut yellow chromated	Replace collar nut	435 Nm
	E28	Collar nut waxed white M22	Replace collar nut	190 Nm
	E23, E24, E28, E32, E34	Collar nut waxed white M27	Replace collar nut	250 Nm
2AZ Bearing unit on wheel carrier	E39		Replace screws	
			Jointing torque	30 Nm
			Torque angle	90 °
	E60		Replace screws	
			Jointing torque	30 Nm
			Torque angle	110 °
	E53, E61, E63, E64, E65, E66			100 Nm
3AZ Drive flange to axle shaft	E53, E60, E61, E63, E64, E65, E66, E67	M27	Replacing collar nut and lightly oil contact face	420 Nm
	E31, E36, E38, E39, E46, E52, E83, E85, E86	M27	Replacing collar nut and lightly oil contact face	300 Nm
	E36, E46, E85, E86	M24	Replacing collar nut and lightly oil contact face	250 Nm
	E30, E36	M22	Replacing collar nut and lightly oil contact face	200 Nm

52 SHOCK ABSORBER

33 52 SHOCK ABSORBERS

SHOCK ABSORBERS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Shock absorber to trailing arm/wheel carrier/swinging arm/support arm/control arm (tighten in normal position)	E12, E23, E24, E28, E32, E34, E38, E52			127 Nm
	E21			54 Nm
	E30, E36/7, E36/5			77 Nm
	E31			115 Nm
	E36, E46, E83, E85, E86	M12		100 Nm

	E39, E53	M14	Replace nut	127 Nm
	E60, E61, E63, E64, E65, E66	M14	Replace screw	165 Nm
	E67	M16	Replace screw	250 Nm
2AZ Shock absorber piston rod on thrust bearing	E21, E30			15 Nm
	E23, E24, E28, E34			25 Nm
	E36, E46, E83	M10	Replace nut	14 Nm
	E38, E39, E52	M10	Replace nut	23 Nm
	E38, E39	M14	Replace nut	27 Nm
	E53, E60, E63, E64, E65, E66, E67	M12	Replace nut	27 Nm
	E61	M12	Replace nut	28 Nm
	E85, E86	M10 x 1	Replace nut	13 Nm
3AZ Support on body/rear axle carrier	E36, E38	M8	Replace nut	24 Nm
	E39	Nut and bolt yellow chrome-plated	Replace nut	24 Nm
	E39	Nut and bolt silver-grey	Replace nut	28 Nm
	E46, E52, E60, E63, E64, E65, E66, E67	M8	Replace nuts	28 Nm
	E53	M10	Replace nuts	56 Nm
	E83, E85 / S54, E86 / S54	M8	Replace nuts	24 Nm
	E85 / except S54, E86 / except S54	M8	Replace nuts	27 Nm

55 STABILIZER BAR

33 55 STABILIZER BAR

STABILIZER BAR - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Stabilizer to trailing arm	E30, E31, E36 / Z3 / Compact	M8	tighten in normal position	22 Nm
	E31	M10	tighten in normal position	42 Nm
2AZ Stabilizer link on anti-roll bar/swinging arm	E38			42 Nm

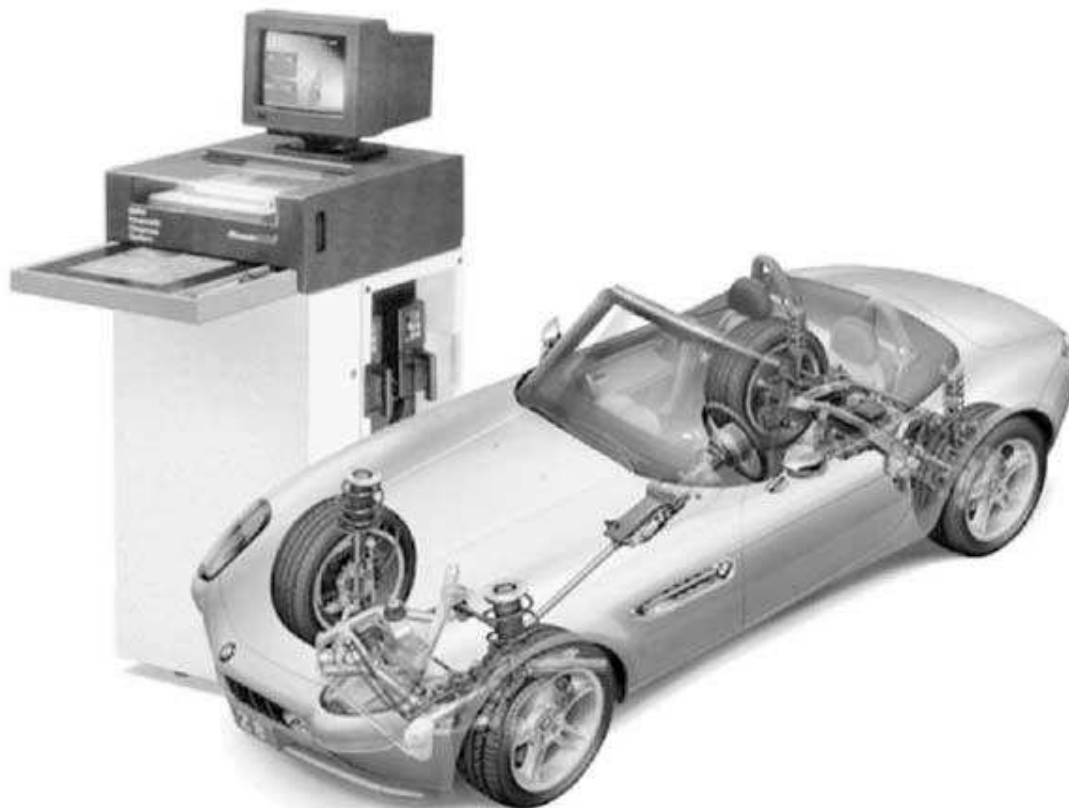
	E39, E52			65 Nm
	E53			100 Nm
	E60, E61, E63, E64	M10		65 Nm
	E65, E66, E67	M10		58 Nm
	E60, E61, E63, E64, E65, E66, E67	M12		100 Nm
3AZ Retaining bracket, stabilizer bar to rear axle support	E46, E52, E85			22 Nm
	E53			19 Nm
	E60, E61, E63, E64	M8		28 Nm
	E65, E66, E67	M10		60 Nm
	E83	M8		21 Nm
4AZ Stabilizer link to bracket	E46, E85, E86	M8	Replace nut	22 Nm
5AZ Bracket stabilizer link to upper control arm	E46, E85, E86	M8	Replace nuts	22 Nm
6AZ Vibration damper to right stabilizer retaining bracket	E61	M12		100 Nm
7AZ Stabilizer link to stabilizer bar / upper control arm	E83	M10	Replace nuts	65 Nm

SUSPENSION

Wheel And Tires - SI Techniques - All Models

KINEMATIC DIAGNOSIS SYSTEM AND ENVIRONMENT

BMW KDS (Beissbarth)



G03179502

Fig. 1: Identifying Kinematic Diagnosis System And Environment
Courtesy of BMW OF NORTH AMERICA, INC.

1. FOREWORD

1.1 Objectives

Wheel alignment has become an increasingly complex subject. The aim of this BMW Service Technology bulletin, therefore, is to achieve several objectives:

- Creation of guidelines for working with the BMW Kinematic Diagnosis System (KDS).
- Familiarization with wheel alignment technology for current vehicles and clarifying any questions which

arise in this connection.

- Transparency and clarification of different terms.
- Clarification of the causes of errors in the past, such that they can be avoided after reading this document.
- Creation of conditions for dealing safely with the BMW KDS.

1.2 Further development of the BMW Kinematic Diagnosis System

- The BMW Kinematic Diagnosis System is an integrated part of automotive system concepts. It ensures that work is carried out in a particularly rational manner which is appropriate for BMW requirements, such that you can also be certain of being prepared for future technological developments. As far as precision and performance in wheel alignment and tuning is concerned, BMW, together with leading manufacturers, has made the best of what is technically feasible: the BMW Kinematic Diagnosis System.
- The BMW Kinematic Diagnosis System manufactured by Beissbarth is more than just the further development of conventional wheel alignment equipment. It sets new standards in precision, performance, speed and handling. It is a guarantor for the perfection which BMW service customers rely on.
- Ride comfort, road safety and tyre wear depend to a large extent on the perfect interplay of the vehicle's kinematic functions. BMW is constantly launching new generations of chassis which are even better than their predecessors. This is why there are fewer kinematics system adjusting points and narrower tolerances when measuring and tuning the chassis.
- With the use of the multi-link rear suspension and the E36, the electronic wheel alignment devices are no longer suitable for BMW wheel alignment purposes. This applies to both the measuring procedure and measuring precision. The generation of equipment which was approved with the E36 series still fulfils all the requirements placed on a modern wheel alignment device, including the use of the latest computer technology.
- Only BMW Kinematic Diagnosis Systems manufactured by Beissarh and Bosch may be used for wheel alignment.

1.3 Technical Data



G03179503

Fig. 2: Technical Data Display

Courtesy of BMW OF NORTH AMERICA, INC.

BMW KINEMATIC DIAGNOSIS SYSTEM - TECHNICAL DATA SPECIFICATIONS

1)	Display	- 17" graphic screen with high-resolution graphics (640x480 pixels with 256 colours)
2)	On-screen text	- In the appropriate national language
3)	Wheel dimensions	- 12"...20"
4)	Vehicle memory locations	- Unlimited
5)	Rotating plates	- Load bearing capacity 1000 kg, angle of rotation +/- 360°, 450 x 450 x 50 mm (L x W x H), sliding range +/- 50 mm, weight 18 kg
6)	Sliding plates	- Loadbearing capacity 1000 kg, angle of rotation +/- 10°, 450x450 x 50mm (L x W x H)
7)	Electrical connection	- 100...115 V/220...240V 50/60 Hz, 0.5 kW (other connections on request)

1.4 Scope Of Delivery

1 - PC display device with graphic screen, graphical tablet, small or large equipment cabinet including automatic charging station, DIN A4 dot matrix printer

4 - Measuring sensors with CCD camera technology and infrared data transmission with built-in power supply

1 - Cable set (comprising 4 cables)

1 - Brake clamping device

1 - Steering lock device

2 - Electronic precision rotating plates with integrated sensor without access ramps

2 - Sliding plates without access ramps

4 - BMW quick-clamping units, comprising a P8-68 locating bell and P267 01 quick-acting clamp including coated holding claws

1 - Operating instructions for BMW KDS (8 languages)

1 BMW software and the BMW vehicle set-point data with setting screens as well as text for the measurement preparations

1.5 Accessories Required

2 Locating rods for positioning the vehicle

1 Set of sand bags for the prescribed loading

1.6 Accessories recommended

4 - Quick-clamping units

2 - Sets of access ramps

1 - Remote control display

1 - Trolley (for ballast bags, rotating and sliding plates and 4 quick-acting clamps)

2. MEASURING OPTIONS USING THE BMW KINEMATIC DIAGNOSIS SYSTEM

2.1 Front Axle

- Toe-in (single and total toe-in in relation to the geometrical drive axis)
- Camber (with steering wheel pointing straight ahead)
- Wheel displacement (in relation to the left-hand front wheel)
- Castor, kingpin inclination and toe-differential angle

2.2 Rear Axle

- Toe-in (single and total toe-in in relation to the longitudinal centre plane of the vehicle -> previously called symmetrical axis)
- Geometrical drive axis
- Camber

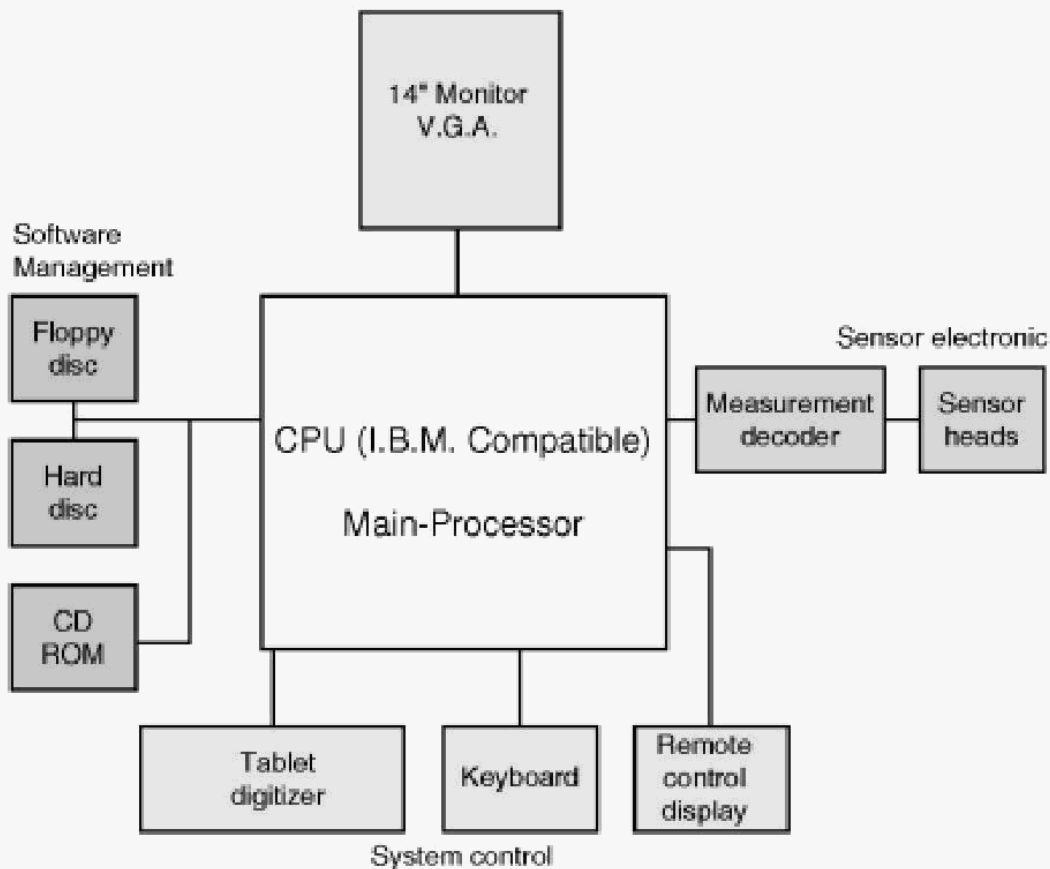
2.3 Other Measuring Options

- Rear Wheel Displacement
- Wheelbase Difference
- Lateral Displacement On Right
- Lateral Displacement On Left
- Track Difference
- Axial Displacement

3. SYSTEM DESCRIPTION

3.1 BMW Kinematic Diagnosis System 1, Based On The Beissbarth ML4000

microline 4000 system concept



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Fig. 3: BMW Kinematic Diagnosis System Concept Chart
Courtesy of BMW OF NORTH AMERICA, INC.

The KDS 1 is available in two different designs at no extra charge:

1. Mobile Workstation



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Fig. 4: Identifying Mobile Workstation
Courtesy of BMW OF NORTH AMERICA, INC.

2. Mobile Compact Cabinet



G03179506

Fig. 5: Identifying Mobile Compact Cabinet
Courtesy of BMW OF NORTH AMERICA, INC.

The larger workstation offers a small storage area for accessories, whilst the compact cabinet is mobile and ideal for restricted working areas. Both variants can be supplied as a cableless measuring system (infrared). From the point of view of measuring technology, there is only a difference in the handling and equipping of the system. For both designs, the four measuring sensors are stored in integrated inserts with rechargeable battery charging points. When automatically charged over night, the measuring sensor batteries provide enough power for 10 hours of continuous use.

3.2 Computer

The KDS 1 system comprises tested and reliable industrial components. The computer is an IBM-compatible, 32-bit Intel processor with CD ROM drive to the industry standard.

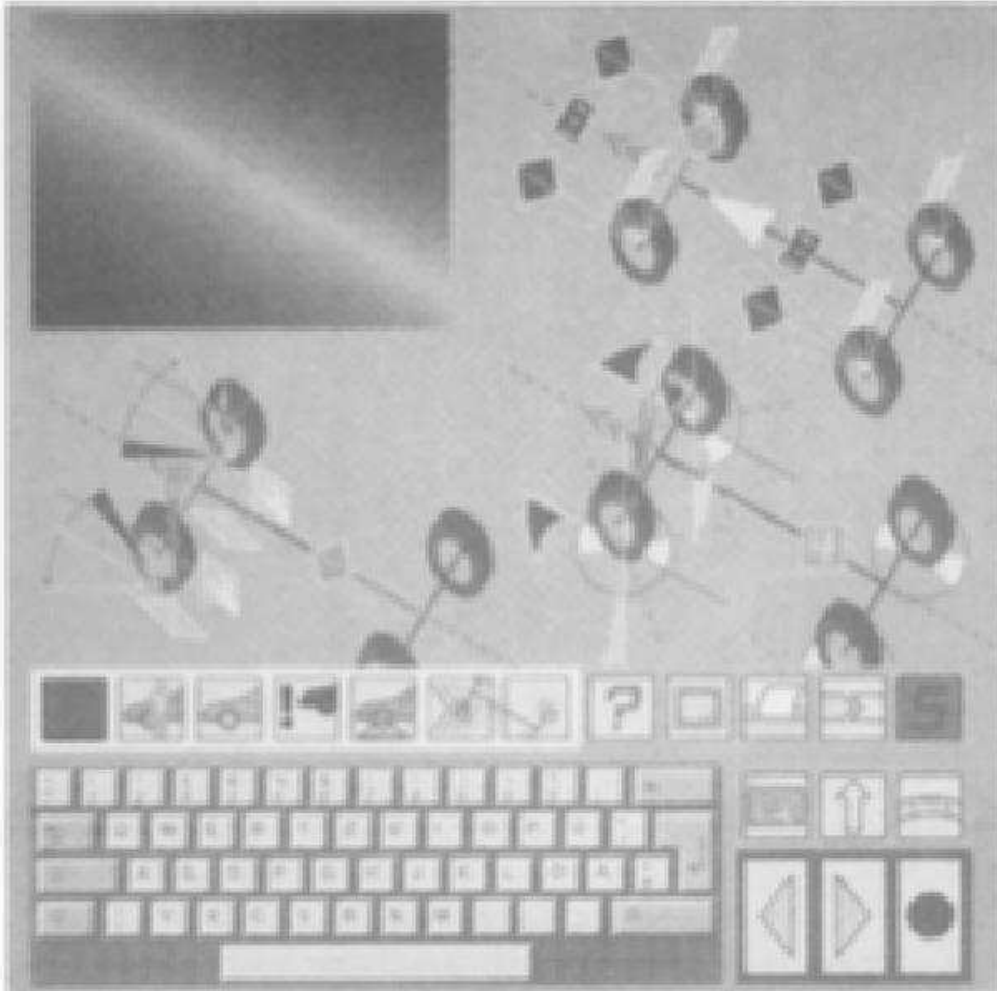


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Fig. 6: Identifying System Comprises Tested And Reliable Industrial Components
Courtesy of BMW OF NORTH AMERICA, INC.

3.3 Graphical Tablet

All functions are shown in graphical form on a "pictogram" panel. The panel is protected by a plexiglass cover. It can easily be replaced if more extensive design modifications are necessary. The operator interface has no membrane and is thus protected against damage. The main functions are activated by clicking the icon with the digital pen.



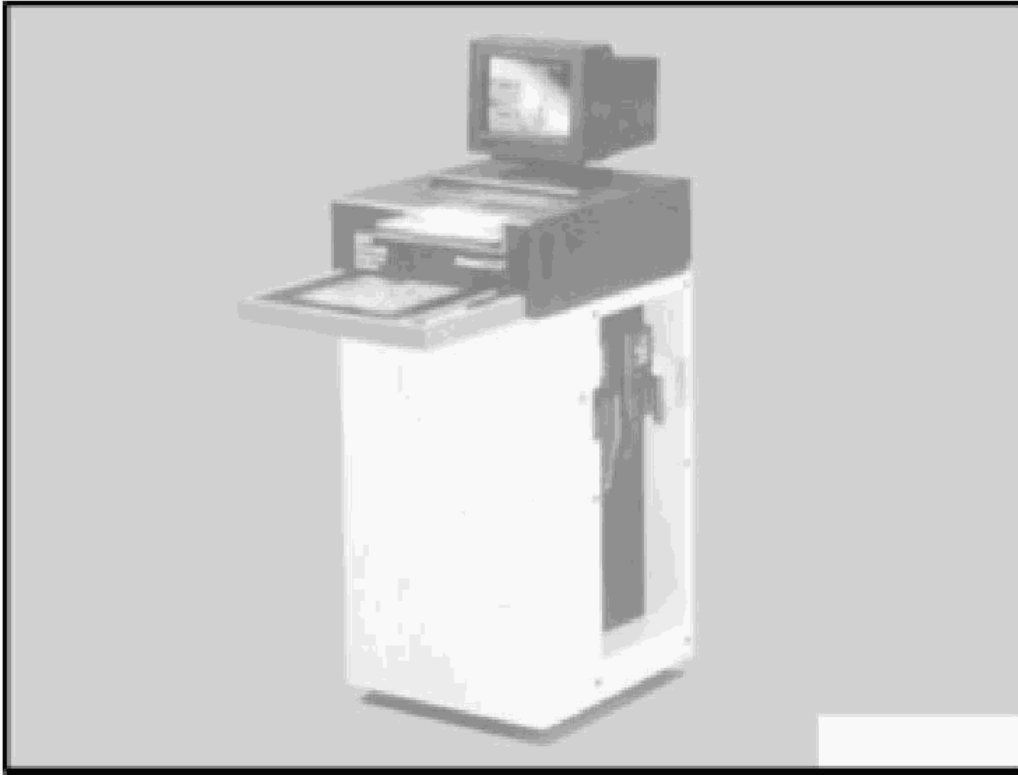
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Fig. 7: Identifying Graphical Tablet

Courtesy of BMW OF NORTH AMERICA, INC.

3.4 Equipment Cabinet

The PC with graphic monitor and removable operating panel, supports for the measuring sensors, the remote control and the A4 printer are integrated into the workstation. The charging station is located in the cabinet and can also be connected to the measuring sensors and the remote control using the plug-in cables (operating while simultaneously charging the batteries).



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Fig. 8: Identifying Equipment Cabinet
Courtesy of BMW OF NORTH AMERICA, INC.

3.5 Remote Display

A cableless remote display can be supplied on request. The remote control keys are only active during measuring and adjustment (not for customer data input, or if selecting a vehicle or editing the setpoint data etc.). The following displays are supported by the remote control:

- Measured value with setpoint/actual comparison and tolerance bar
- Steering graphics for steering routines
- Live overview of the track/camber values with a setpoint/actual comparison
- Rim run-out compensation



G03179510

Fig. 9: Identifying Remote Display
Courtesy of BMW OF NORTH AMERICA, INC.

3.6 Measuring Sensors With CCD Camera

The measuring sensors are each equipped for automatic measurement with two CCD cameras and their own processor for the cableless infrared transmission of data with integrated batteries. Benefits:

- No temperature deviation
- Very high measuring resolution (the track
- Single track range of more than +/- 9 degrees for the constant display of toe-in when changing the tie-rod ends
- Exact system accuracy, i.e. when carrying out measurements at the vehicle following rim run-out compensation, the toe-in and camber measurements are accurate to 2 angular minutes



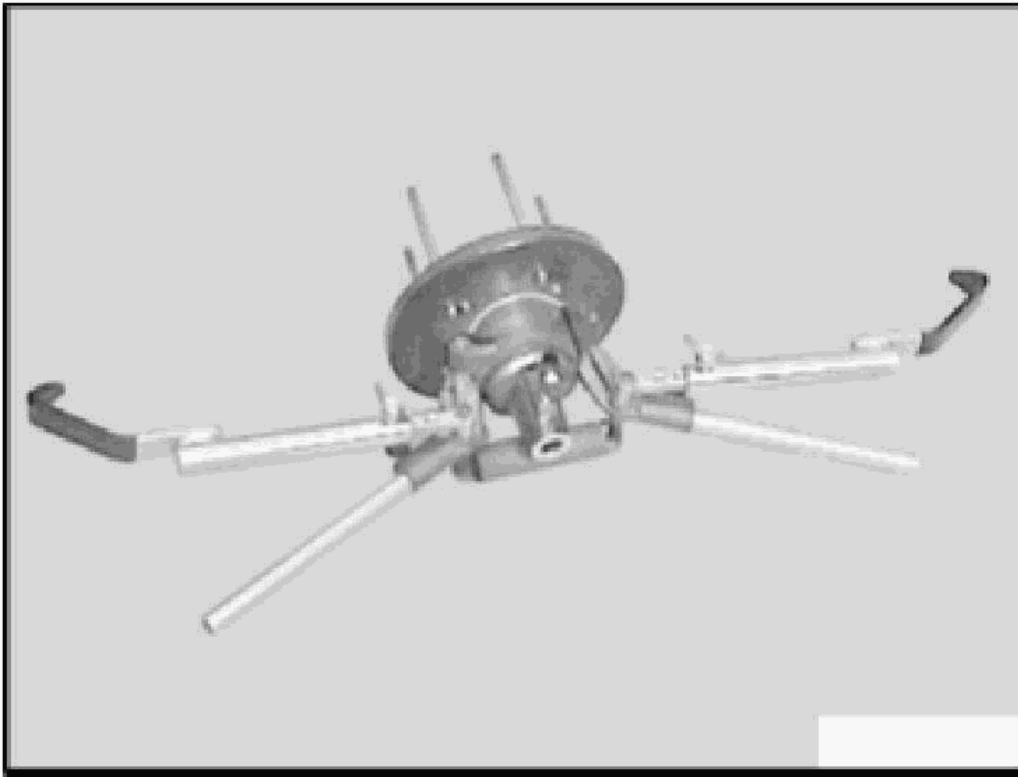
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Fig. 10: Measuring Sensors With CCD Camera
Courtesy of BMW OF NORTH AMERICA, INC.

3.7 BMW Quick-Acting Clamp

BMW quick-acting clamp for holding the measuring sensors precisely in position and measuring without rim run-out compensation.

NOTE: Any existing quick-acting clamps, e.g. from older F1600s or ML-3000s, must not be used on the BMW KDS.

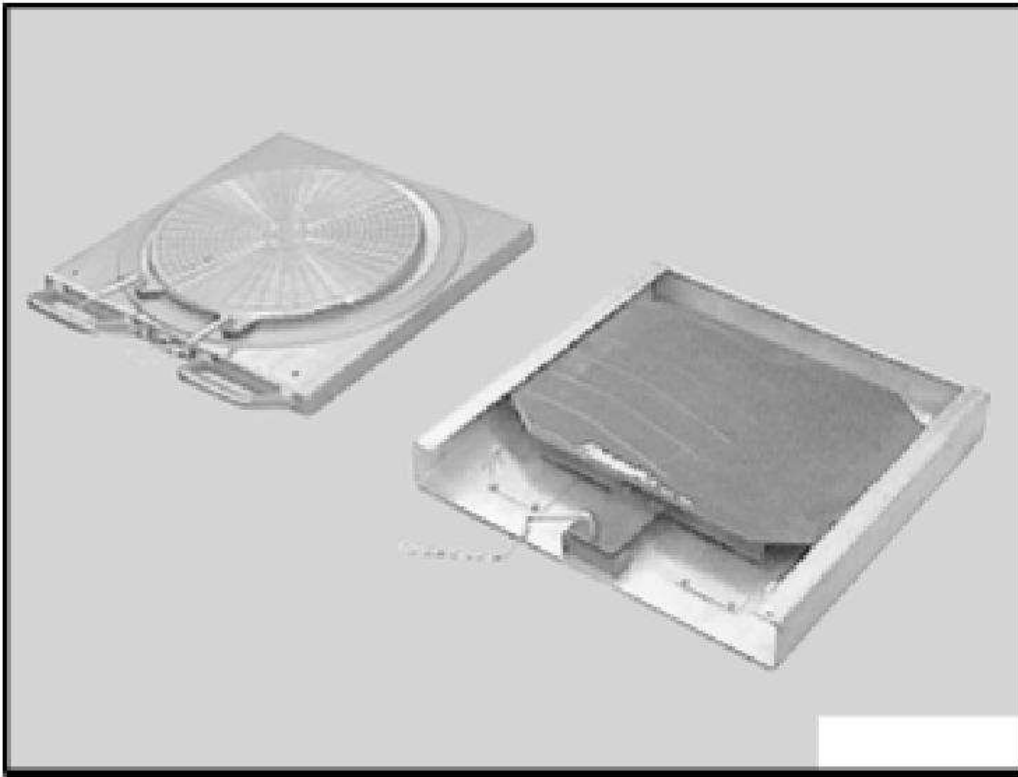


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Fig. 11: Measuring BMW Quick-Acting Clamp For Holding
Courtesy of BMW OF NORTH AMERICA, INC.

3.8 Rotating/Sliding Plates

- Electronic precision rotating plates for the front wheels with integrated sensor (360 degree measuring range)
- Stable sliding plates for the rear wheels with a swivelling/rotating top plate
- Accessories: Cover hood for aluminum rotating plates

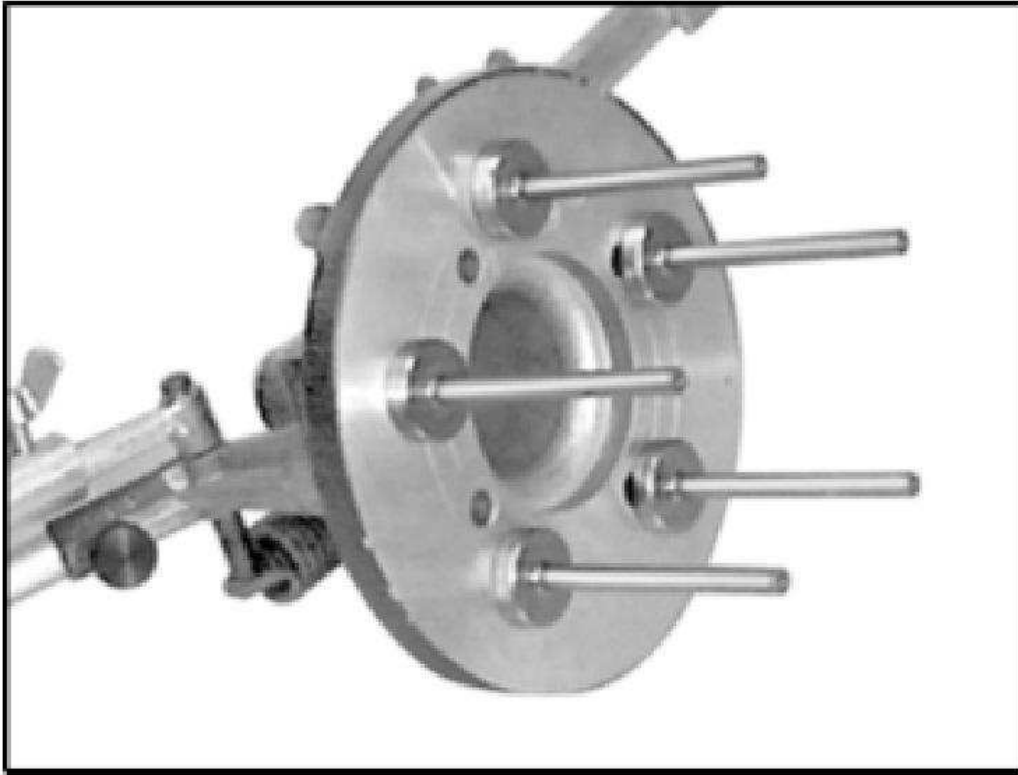


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Fig. 12: Identifying Rotating/Sliding Plates
Courtesy of BMW OF NORTH AMERICA, INC.

3.9 Sensor Pins

- A new BMW light alloy wheel (styling no. 18) has been available as optional equipment from April 1993. When measurements are being made on vehicles with these wheels, new sensor pins are required for the quick-acting clamps of the recommended wheel alignment equipment.
- The new sensor pins are included in the scope of supply for new deliveries of KDS 1 (order number: BS 90 19 11).



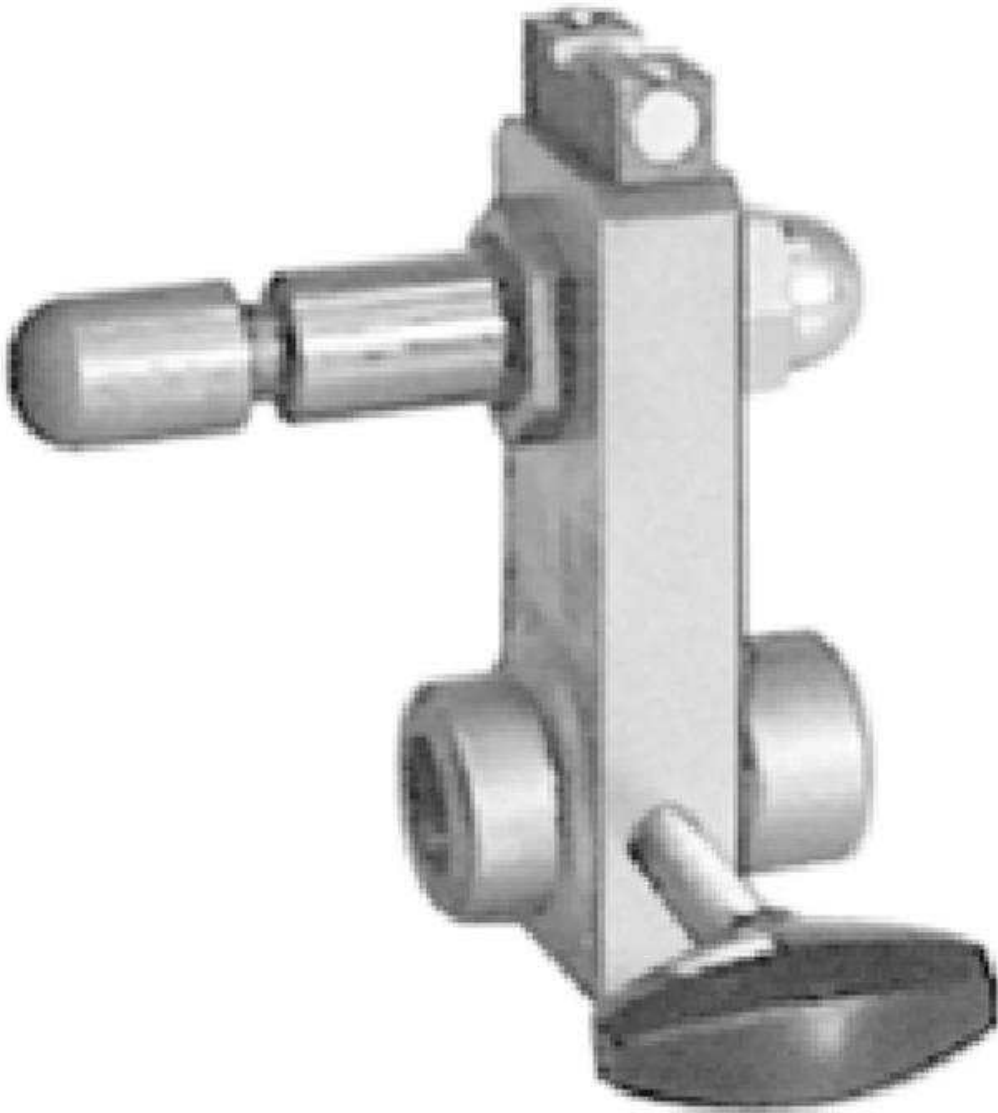
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Fig. 13: Identifying Sensor Pins

Courtesy of BMW OF NORTH AMERICA, INC.

3.10 Spoiler Adapter

- In the case of vehicles with very low spoilers, the sensor beam may be broken by the spoiler between the measuring sensors. This primarily occurs in front of the front axle.
- The spoiler adapter is used here as a connecting element between the measuring equipment clamp and the measuring sensor. Thanks to the adapter, the sensors are placed 50 mm lower, thus allowing the sensor beam to move freely below the spoiler.

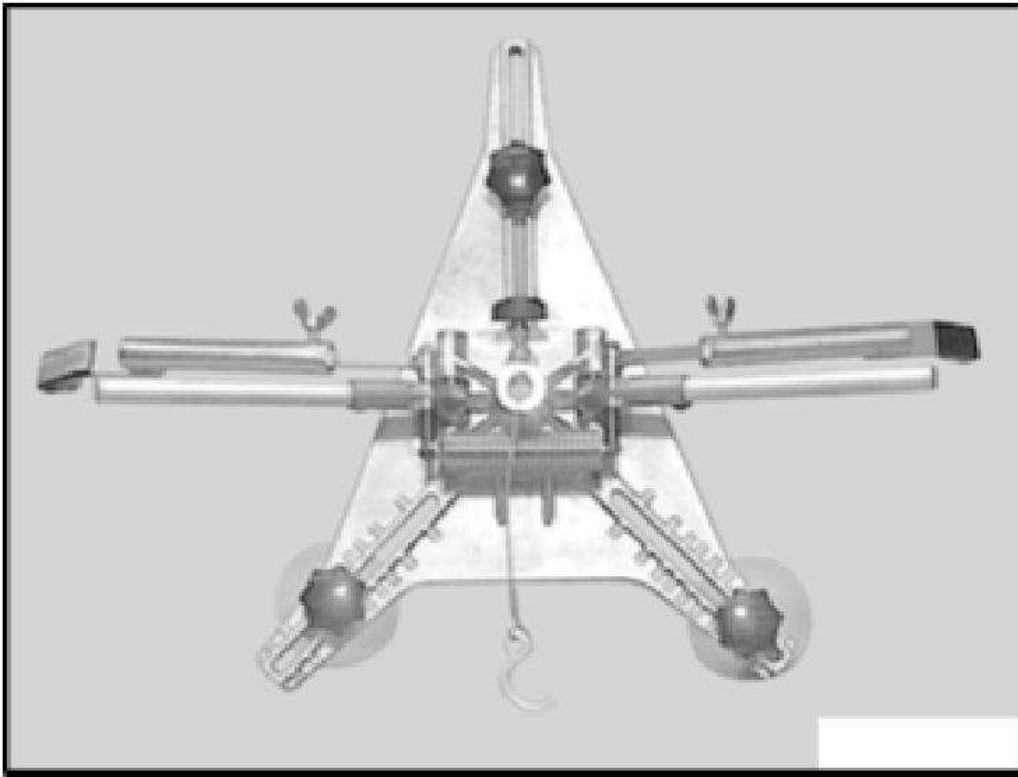


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Fig. 14: Identifying Spoiler Adapter
Courtesy of BMW OF NORTH AMERICA, INC.

3.11 Quick-Clamping Units

- Quick-clamping units for wheel alignment on non-BMW vehicles with rim run-out compensation.
- Rims without sensors boreholes (rims for BMW vehicles from other manufacturers)



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Fig. 15: Identifying Quick-Clamping Units For Wheel Alignment Non-BMW
Courtesy of BMW OF NORTH AMERICA, INC.

3.12 Retainers

- The most varied clamping options for the measuring equipment are possible thanks to the versatile retainers and the rubber-coated thrust pieces, even on exotic light-alloy rims.

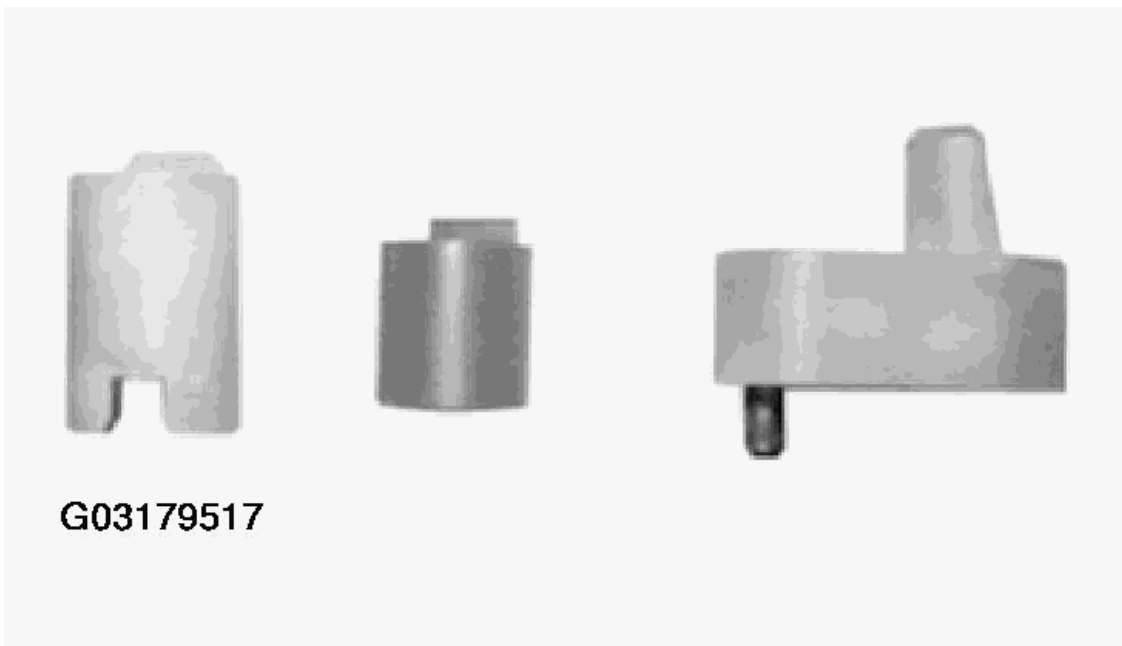


Fig. 16: Identifying Retainers

Courtesy of BMW OF NORTH AMERICA, INC.

4. WORKSTATION

4.1 Environment

All lifting platforms currently recommended by BMW (see Workshop Equipment Planning documentation, Issue 11) for wheel alignment meet the requirements for the BMW KDS.

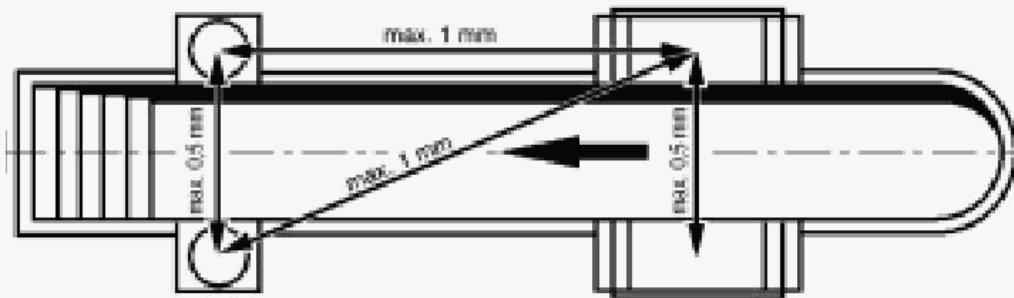
No particular requirements have to be met in respect of the location at which the BMW KDS is used. The measuring device can be installed over working pits or on lifting platforms.

Requirements:

- Wheel alignment pits
- Pillar-type lifts with set-down device
- 2 plunger-type lifting platforms with set-down device
- Repair stands with set-down device
- One measuring area (approx. 4.5 m x 7.0 m).
- The rotating plates must be pinned to the platform

The support surfaces for the rotating and sliding plates may only display the following maximum height difference:

- from left to right +/- 0.5 mm
- from front to back +/- 1.0 mm
- diagonally +/- 1.0 mm.



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Fig. 17: Cutaway View Of For Rotating And Sliding Plates
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: A difference in the height of the rotary plates of +/- 2 mm from left to right results in a measuring error of 4.8° in the camber.
 As a comparison: The camber tolerance on the E36 is +/- 10'. The tyre tread difference or varying tyre pressure cause measuring errors of the same magnitude.

4.2 Preconditions For Alignment

When carrying out the wheel alignment, the front and rear wheels must be centred on the rotating and sliding plates in order that all wheel suspensions remain free of tension during the steering routine and adjustment work. As a result, the rotating and sliding plates for the relevant wheel bases and track widths of the vehicle to be aligned must be moved.

4.3 Measuring Tolerance

All measuring tolerances are system tolerances. This means that the sum of all individual tolerances gives the value shown in the example. Example of camber: Quick-acting clamp + measuring sensor + computer = 1' at a measuring range of +/- 3° (all BMW vehicles are within this measuring range).

4.4 Levelling The Measuring Station

The manufacturers of the BMW KDS (Beissbarth/Bosch) are able to measure the measuring area to the required accuracy using levelling devices. Any "normal" water level is not suitable for this. Lifting platforms must be levelled under load so that the uneven deflection in the travel rails is taken into account.

IMPORTANT: Adjustment work for the lifting platform concerned must be executed by a specialist (manufacturer's after-sales service).

5. CHASSIS-RELATED TERMS

5.1 Toe-Differential Angle

Description:

- The toe-differential angle (a) is the angular position of the internal wheel on the curve in relation to the external wheel on the curve when driving round bends. The steering is designed such that the angular position of the wheels in relation to each other changes as the steering angle increases.
- In ideal cases, the wheel axes meet at point D in any steering position (except for straight ahead).

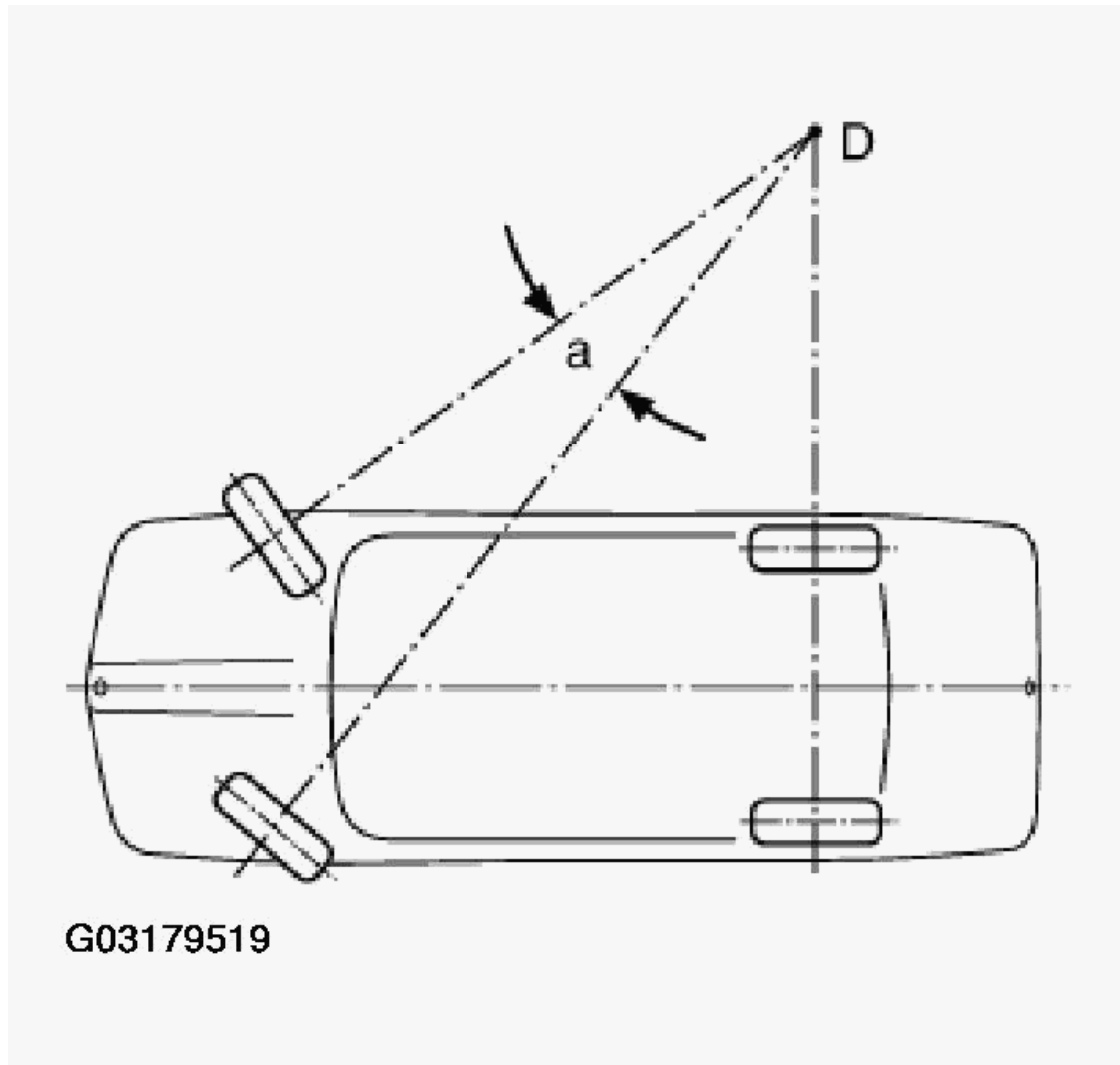
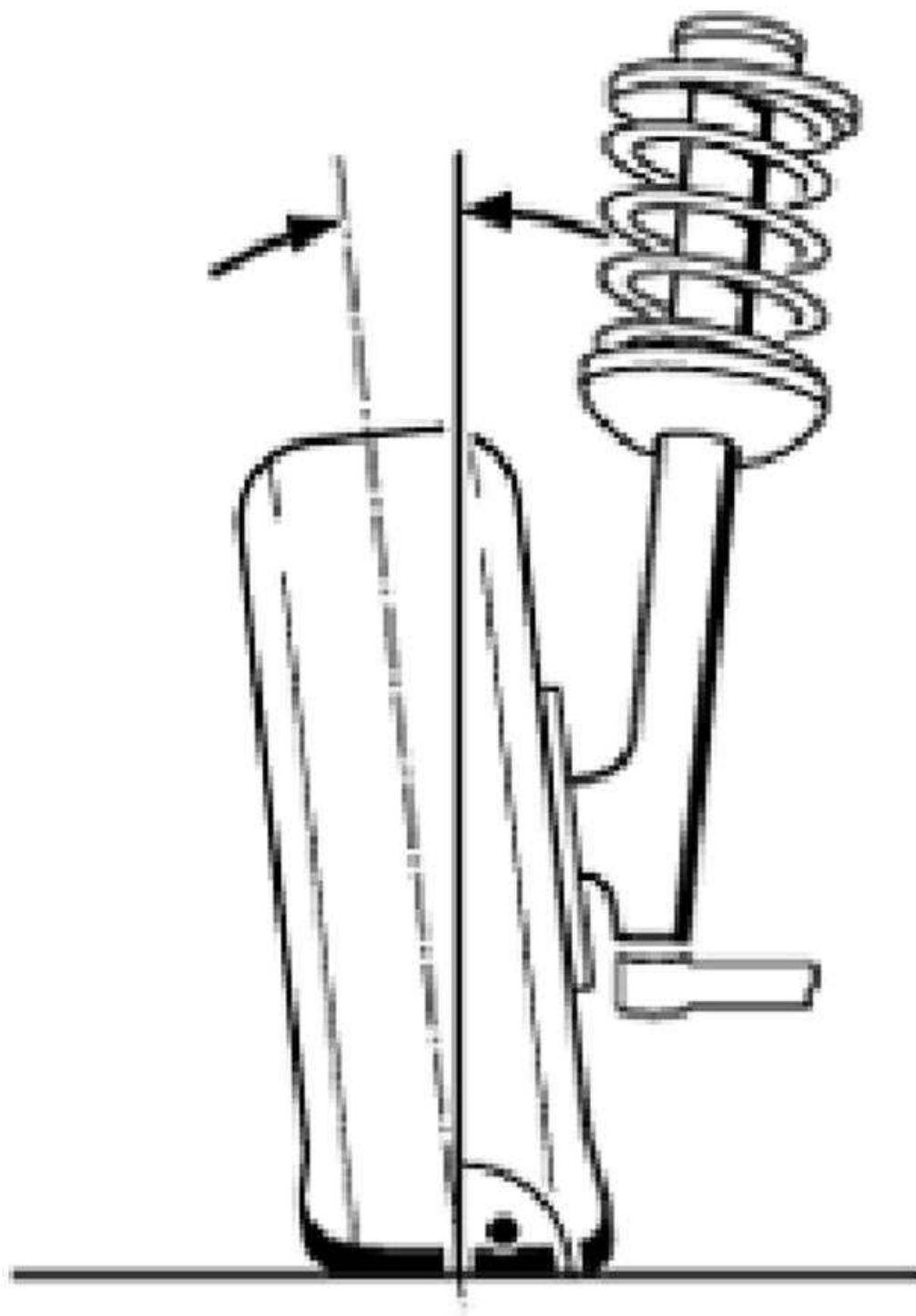


Fig. 18: Identifying Toe-Differential Angle
Courtesy of BMW OF NORTH AMERICA, INC.

5.2 Camber

- The camber is the angle of inclination of the wheel in relation to the vertical.



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Fig. 19: Identifying Camber Angle

Courtesy of BMW OF NORTH AMERICA, INC.

5.3 Toe-In

- The toe-in is the reduction in the distance between the front of the wheels and the rear. The toe-in prevents the wheels from moving apart whilst driving (wobbling and grinding).

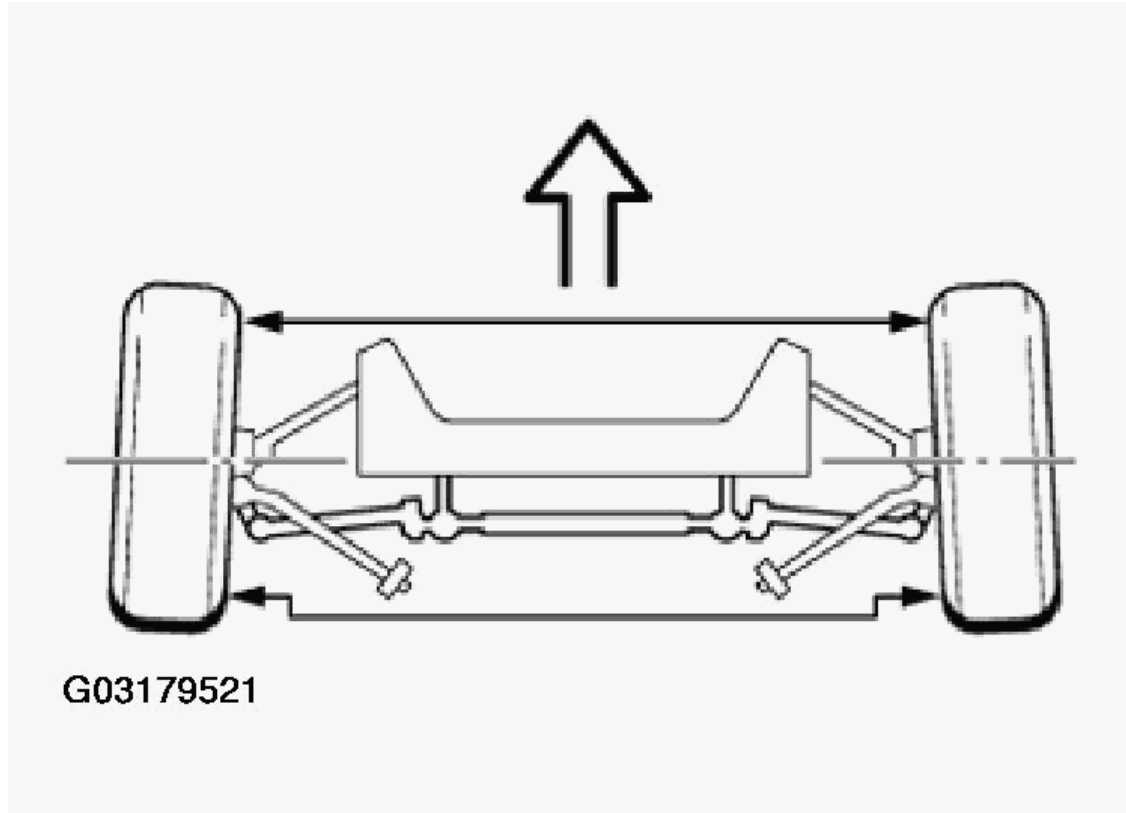
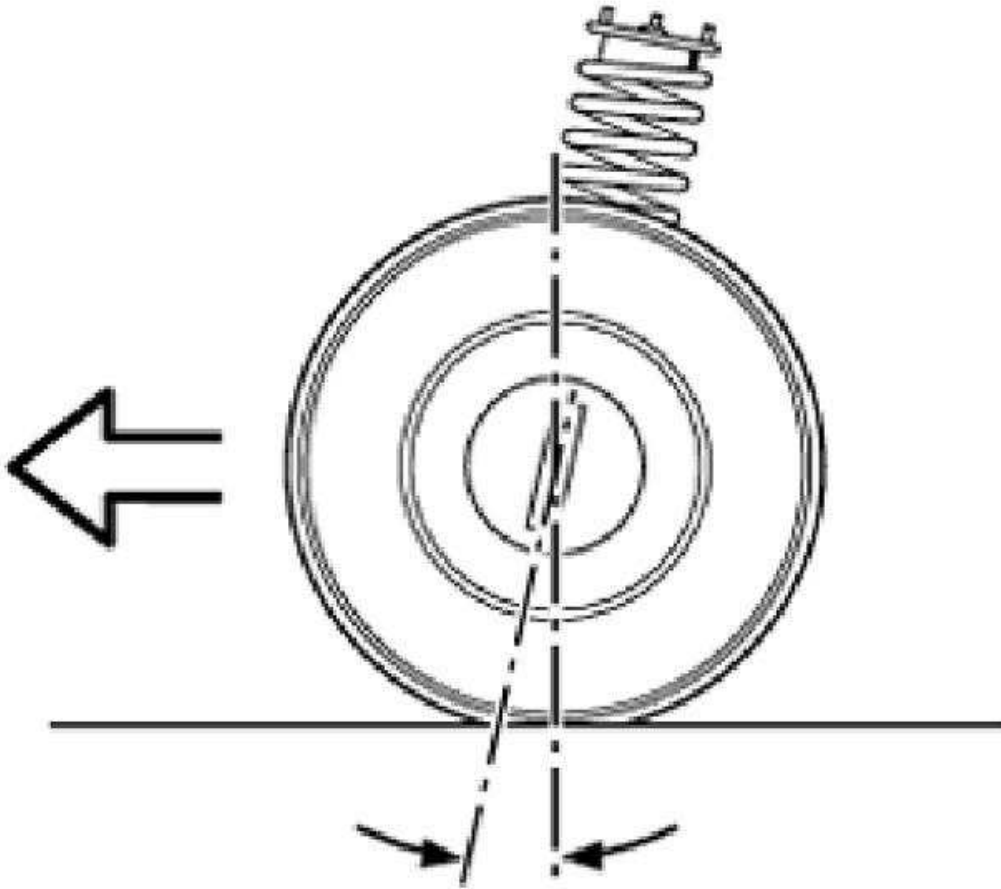


Fig. 20: Identifying Toe-In Angle

Courtesy of BMW OF NORTH AMERICA, INC.

5.4 Caster

- The castor is the kingpin angle seen from the side in the opposite direction of travel. The line through the centre of the spring strut mount and control arm ball joint corresponds to the kingpin.



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Fig. 21: Identifying Castor Angle

Courtesy of BMW OF NORTH AMERICA, INC.

5.5 Geometrical Drive Axis/Symmetrical Axis

- (1) The geometrical drive axis is the line bisecting the angle of the overall rear wheel toe. The measurements of the front wheels relate to this axis.
- (2) The symmetrical axis represents the centre line through the front and rear axes.

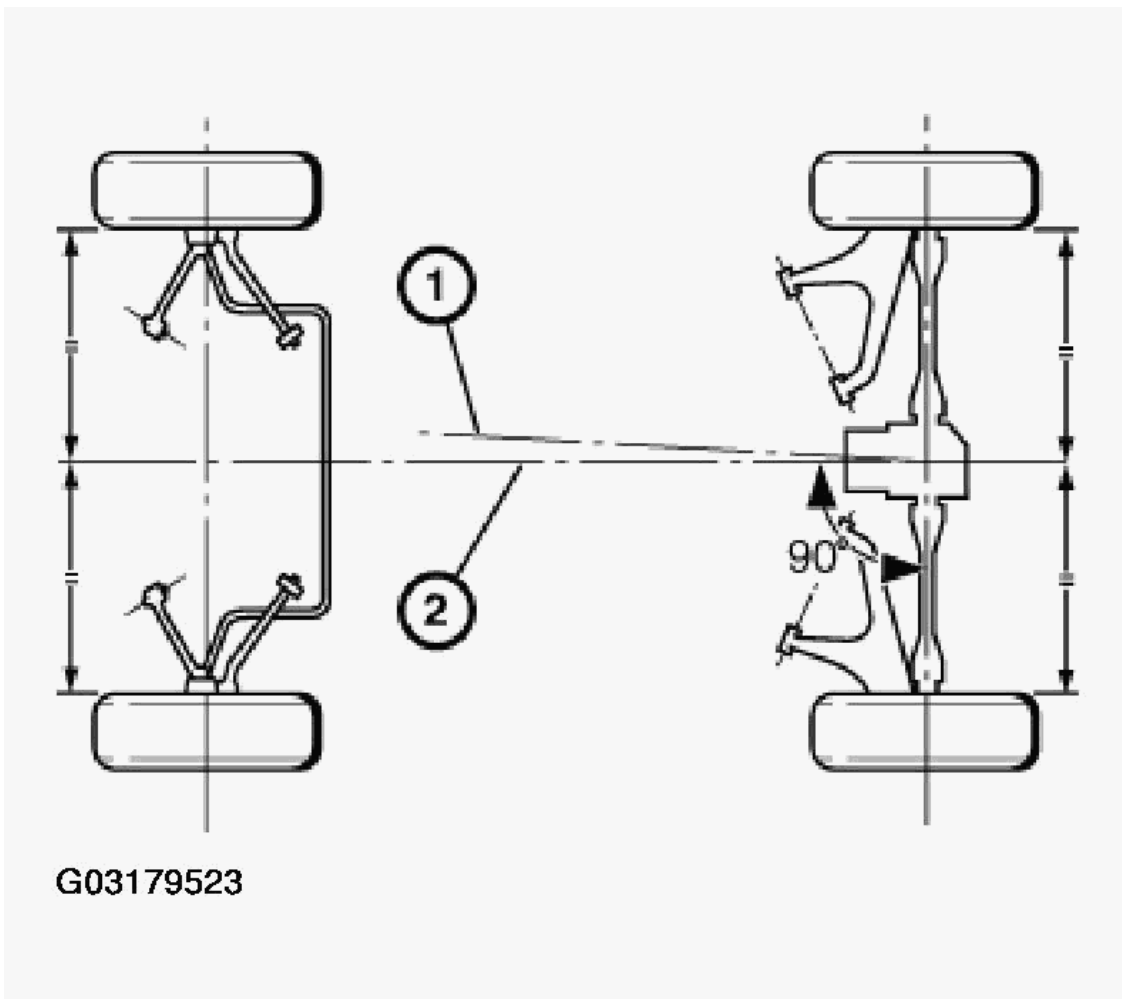


Fig. 22: Identifying Geometrical Drive Axis Angle
Courtesy of BMW OF NORTH AMERICA, INC.

5.6 Wheel Displacement Angle

- The wheel displacement angle is the angular deviation of the connecting line of the wheel contact points in relation to a line running at 90° to the geometrical drive axis. The wheel displacement angle is positive if the right-hand wheel is displaced to the front, and is negative if it is displaced to the rear.

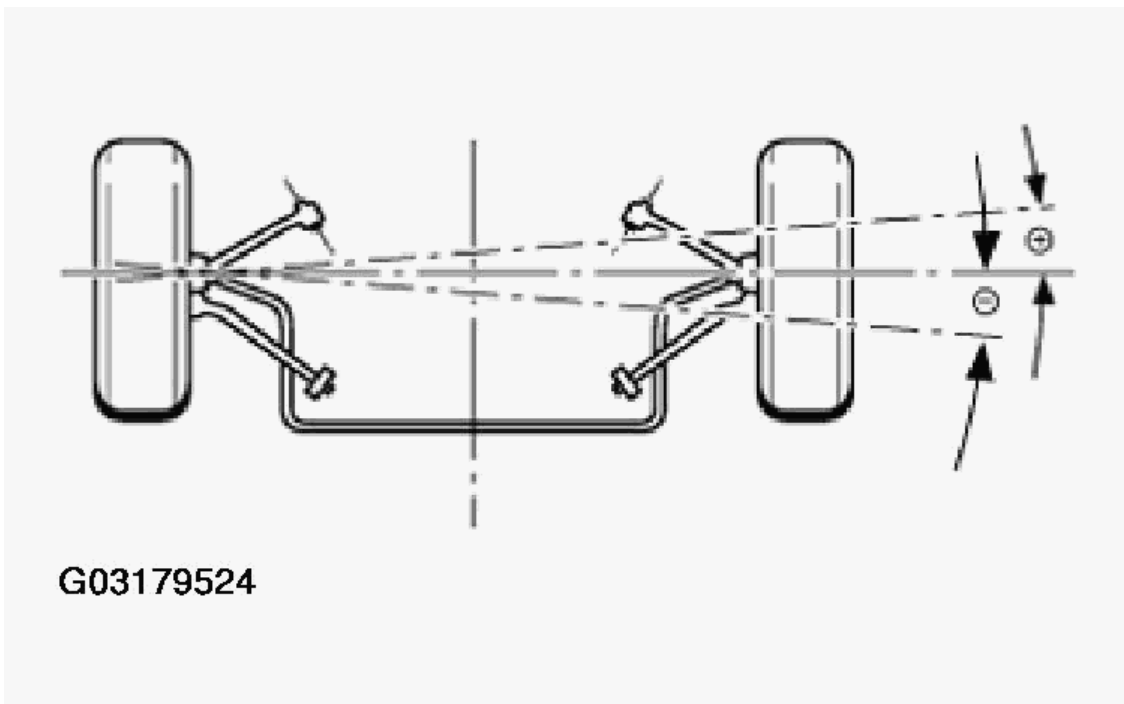
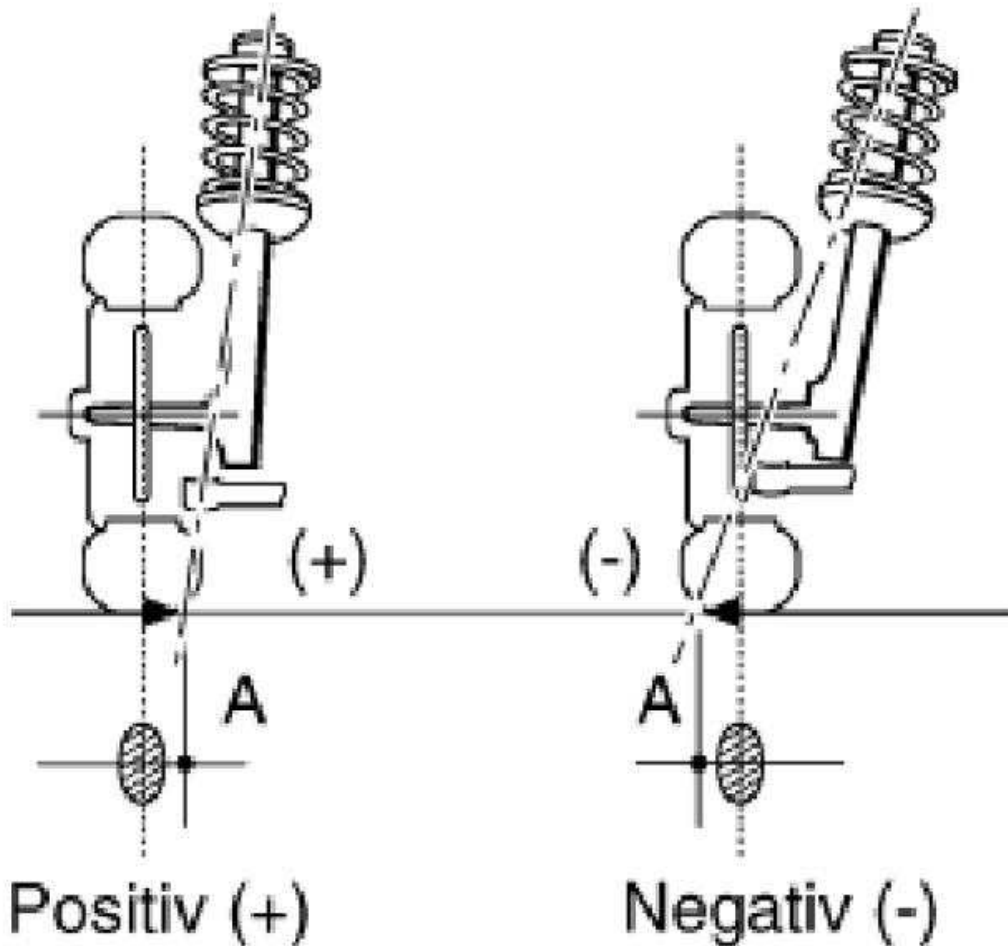


Fig. 23: Identifying Wheel Displacement Angle
Courtesy of BMW OF NORTH AMERICA, INC.

5.7 Kingpin Offset

- The kingpin offset is the distance from the centre of the wheel contact point to the contact point of the kingpin extrapolation.



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Fig. 24: Identifying Kingpin Offset Angle
 Courtesy of BMW OF NORTH AMERICA, INC.

6. WHEEL SUSPENSION

Those parts which connect the wheel to the mostly load-bearing floor elements of the bodywork and guide it in the required direction belong to the wheel suspension. They are connected by axles or other comparable structures and guided by the arms. The wheel suspension plays a decisive role in the handling characteristics of a vehicle. Two main groups have to be distinguished: 1. Rigid axle suspension and 2. Independent wheel suspension.

6.1 Rigid Axle Suspension

RIGID AXLE SUSPENSION SPECIFICATIONS

Description	Advantages	Disadvantages
The rigid axle suspension has a rigid connection between both wheels or wheel pairs. Any change in one wheel is more or less transferred to the other. It is now only fitted as a rear axle, if at all. However it is frequently used for lorries or busses.	In the event of deflection taking place, there are no changes to the camber or wheel toe. This means: less tyre wear and good track stability.	Non-driven rear axles may also acquire negative camber as well as increasing tyre lateral guidance, thus increasing tyre wear.

6.2 Independent Wheel Suspension

INDEPENDENT WHEEL SUSPENSION DESCRIPTION

Description	Advantages	Disadvantages
State-of-the-art individual wheel suspension is available on BMW vehicles on the front and rear axles. This development has its cause in mass inertia, as a reduction in the non-suspended mass improves wheel and ground contact, and the wheel stays better on the road. Control arms and trailing arms, which have to absorb high longitudinal and lateral forces to some extent, are required for guiding independently suspended wheels.	Wheels suspended independently from each other have no mutual influence on each other.	Depending on the type, changes may occur in the camber, wheel toe, track width, castor and wheelbase.

7. WHEEL ALIGNMENT PROCEDURE

7.1 Measuring Options

An overview of all measuring options and values (VA = front axle, HA = rear axle) is shown below.

MEASURING OPTIONS SPECIFICATIONS

Measuring options	Measuring accuracy	In measuring range	Total measuring range
Total wheel toe (VA + HA)	+/- 2'	+/-2°	+/-18°
Single wheel toe (VA + HA)	+/-2'	+/-2°	+/-9°
Camber (VA + HA)	+/-1'	+/-3°	+/-10°
Wheel displacement (VA)	+/-2'	+/-2°	+/-9°
Geometrical drive axis	+/-2'	+/-2°	+/-9°

Castor	+/-4'	+/-18°	+/-22°
Kingpin inclination	+/-4'	+/-18°	+/-22°
Toe-differential angle	+/-4'	+/-20°	+/-20°
Maximum steering angle (VA)	+/-4'	+/-60°	+/-300°
Maximum steering angle (HA)	+/-4'	+/-9°	+/-9°
Castor correction range	+/-4'	+/-7°	+/-10°

NOTE: The measuring accuracy details only apply when using the precision rotating and sliding plates as well as the BMW quick-acting clamps.

7.2 Preparatory Work

Before commencing the measurement, preparatory work must be carried out at the measuring area and on the vehicle (see BMW KDS operating instructions). Preparatory work includes:

- Easy-running rotating and sliding plates
- Aligning the rotating and sliding plates in relation to the track width and wheelbase
- Centering the vehicle on the plates
- Applying the parking brake
- Removing the lock pins on the plates to prevent tension in the chassis under loading
- Checking the rim and tyre size, tread depth, tyre pressure, steering wheel play, wheel bearings and condition of suspension and shock absorbers
- Fastening the measuring equipment to the wheels
- Loading the vehicle according to BMW KDS specifications
- Rock the vehicle firmly with the brakes released to ensure a stable centre position
- Lock the service brake using the brake clamping device

7.3 Initial/Final Measurement

This measurement can be carried out as a program-guided measurement in the same way as any subsequent adjusting work and the final measurement. The sequence of the chassis measuring points to be called up is specified and controlled by the system software. The individual steps comprise:

- Driving straight ahead to correctly record the wheel toe and camber values for the rear axle
- Steering routine for recording the castor, kingpin inclination and toe-differential angle
- Recording the wheel toe and camber of the front axle (adjust the steering centre point in advance)
- Steering routine for measuring the maximum steering angle on the left/right
- Checking the overview of measured values with the setpoint and actual comparison of all measured values

7.4 Printing Out The Data

- Carry out all work in the same way as with the program-guided measurement.
- Before measuring the wheel toe and camber values for the rear axle, the steering must be in the "straight ahead" position to ensure that it is perfectly aligned in relation to the longitudinal centre plane of the vehicle.
- Before measuring the single wheel toe values on the front axle, the centre of steering must be established to ensure the correct position of the steering wheel.

8.2 System Settings

The following settings must only be entered or set once: language, display format, date/time, advertising text, remote control with display, rotating plate selection and printer settings. They remain stored.

9. BMW KINEMATIC DIAGNOSIS SYSTEM COMPARISON (BOSCH - BEISSBARTH)

BMW KINEMATIC DIAGNOSIS SYSTEM SPECIFICATIONS

Bosch		Beissbarth
Measured value recording	Infrared	CCD camera
Data transmission	Cable	Infrared / cable
Measuring sensor power supply	Cable	Battery/ cable
Remote control	Infrared	Infrared
Remote control with measured value display	Cable	Infrared
Setpoint data memory	Floppy disk	Hard disk
Measured value memory	Always the last vehicle measured	Unlimited vehicle memory
Operating system	--	MS-DOS
Languages	English and one language on request	EN, DE, NI, SV, IT, FR, SP (further languages can be called up)
Update	3.5" floppy disk	3.5" floppy disk using TIS/DIS
Monitor	20"	17"
Computer	--	Pentium
Disk drives	2 x floppy disk	1 x floppy, 1 x CD ROM

10. CONTROL MODIFICATION (MENU)

10.1 Remote Control With Display

The following steps show how the remote control with display is activated:

1. Call up the "Service" menu in special functions ("S" key)
2. Call up the "Remote control" sub-menu in the "Service" menu.
3. Select the "Remote control with display" item in the "Remote control" sub-menu - this configuration is retained.

IMPORTANT: In the case of equipment without remote control, this must be configured to "No remote control".

10.2 Brief Operating Instructions

1. Activate the remote control with the "ON" button (it may also be switched on during alignment). The title page will appear on the LCD.
2. Select "Straight ahead" of the "Initial measurement", "Adjustment work" or "Final measurement" at the measuring equipment cabinet. The steering graphics for "Straight ahead" will appear on the LCD.
3. Use the "Forward arrow" to change to the next measurement image. Display blocks will appear on the LCD with the designation of the measured value and tolerance bar with the measured value. If the measured value is within the tolerance range, it is shown in dark figures against a light background. If the measured value is outside the tolerance range, it will be shown in inverse video (light figures against a dark background).
4. By pressing the "F" key shortly, you can move alternately between the designation of the measured value and the setpoint value with the tolerance inside the display blocks.
5. You can scroll through the measured values using the "Forward arrow", "Backward arrow" and "Cancel" (red dot) keys. The function of these keys is identical to that of the keys on the graphics panel.
6. Even with "Free alignment", it is possible to scroll through the measured values in the same way as with "Program-guided alignment".
7. During measurement, the report print-out can be initiated using the "Printer" key. The remote control keys are only active during measurement and adjustment (not during customer data input, vehicle selection etc.).

10.3 Display Support

- Measured values with a setpoint/actual comparison and tolerance bar (setpoint figures can be displayed with the "F" key).
- Steering graphics for steering routines.
- Overview of measured values with current setpoint/actual comparison
- Rim run-out compensation.
- With all other functions (e.g. customer input), the title illustration appears on the LCD display.

If the data transmission from the remote control to the computer is interrupted, the remote control icon in the bottom right-hand corner of the screen changes colour from green to red and the illustration on the LCD display is shown inversely - black turns to white, white to black. This change does not take place in the title illustration. Once the line-of-sight connection has been re-established, the remote control continues to operate from the point of interruption in the program. A continuous visual connection during alignment is therefore not necessary.

- The "Hour glass" icon in the LCD display means: "Please wait".
- The "Battery" icon in the top right-hand corner of the LCD display means that the battery reserve has been reached.
- To switch off the remote control: press the "F" key for 5 seconds, then return it to its charging unit or

connect it to a charge cable. The title illustration will again appear as a charging check.

- If, during the measurement, the remote control has been placed back in the charging unit, it must be switched on again using the "ON" button.

11. UPDATING THE SOFTWARE/SETPOINT DATA

Floppy disks will no longer be sent to BMW partners who have acquired a "BMW KDS (Beissbarth/Bosch)". For cost-related reasons, you can create these disks yourself on the "DIS-tester" or on the "TIS/EPC server". The data for this is regularly updated on the TIS CD.

11.1 Requirements

- BMW KDS (Beissbarth/Bosch)
- TIS CD program status (Beissbarth): from CD 12/95
- EPC program status: from 12/95
- TIS CD program status (Bosch): from CD 08/97
- DIS program status: from V6.0
- 3.5" diskettes, 1.44 MB (Beissbarth 5 diskettes/Bosch 1 diskette)

11.2 Procedure (Beissbarth)

1. Go to the "Administration" screen
2. Select the KDS button
3. Select Beissbarth
4. Insert "Diskette 1" on request and confirm with "OK" (program diskette 1 of 2 is created, label it)
5. Insert "Diskette 2" on request and confirm with "OK" (program diskette 2 of 2 is created, label it)
6. Insert "Diskette 3" on request and confirm with "OK" (setpoint data diskette 1 of 3 is created, label it)
7. Insert "Diskette 4" on request and confirm with "OK" (setpoint data diskette 2 of 3 is created, label it)
8. Insert "Diskette 5" on request and confirm with "OK" (setpoint data diskette 3 of 3 is created, label it)
9. Perform update and/or setpoint data on the KDS in the usual manner with the diskettes which have just been created.

11.3 Procedure (Bosch)

1. Go to the "Administration" screen
2. Select the KDS button
3. Select Bosch
4. Label "Diskette 3.1", insert it into the drive on request and confirm with "OK" (2x) --> Setpoint data is copied to the diskettes.
5. Insert setpoint data diskette 3.1 into the 3.1 floppy disk drive, insert operating system diskette 3.0 into the 3.0 drive.
6. Switch on the machine in the usual manner.

IMPORTANT: When creating the KDS diskettes, all data on the diskettes used is overwritten.

NOTE: In the event of an error, a corresponding message is shown and the program is cancelled completely. The procedure must be run from the beginning again and all data on the diskette will be deleted. A new diskette may have to be used.

12. CREATING, COPYING AND EDITING SETPOINT DATA

12.1 Copying

- Press the "C" button and select the vehicle to be copied.
- Select the "**Edit setpoint data**" menu item from the special functions. Create a new vehicle in the usual manner. The setpoint values for the last vehicle selected will appear in the data input screen. Enter the data and save the data record.

12.2 Creating

- Press the "C" button and select the "**Edit setpoint data**" menu item from the special functions. Create a new vehicle in the usual manner. An empty data input screen will appear. Enter the data and save the data record.

12.3 Editing

- Factory-programmed setpoint data can neither be deleted nor modified. If this data does need to be modified, a new vehicle with modified setpoint data must be created. New vehicles created by the user are identified by a "+" in the selection menu. These vehicles can be deleted by the user using the "-" key or modified using the "<>" key. These keys only appear if vehicles have been entered by the user.

13. SPECIAL FUNCTIONS

13.1 Customer-Specific Printer Report Header

The sub-item "**Customer-specific text**" must be called up in the "**Special functions**" menu. An input screen will appear on the monitor. This input screen must be filled out with the name and address and stored with the "S" screen key. The text entered is inserted into the report header.

13.2 Adjusting Options

- Call up the "**Service**" menu in the special functions ("S" key).
- Select the "**Wheel toe adjustment**" item or the "**Camber adjustment**" item from the "**Adjustment**" sub-menu. The toe and camber adjustment program will guide the user step by step through the adjustment using text and images. The measuring deviation for each measuring sensor will be shown on the screen when the adjustment has been completed.
- You can store the adjustment values in the measuring sensor using the "**Store**" key or you can quit the program with the "**Red dot key**" without saving them (check). The adjustment values can be printed out.

13.3 Rotating Plate Test

- Call up the "**Service**" menu in the special functions ("**S**" key).
- Call up the "**Rotating plate**" item in the "**Service**" menu. Turn the left-hand and right-hand rotating plate and check the display on the screen. Important: The measuring range is +/- 306 degrees.

13.4 Viewing And Deleting Customer Entries From Database

- Call up the menu item "**Delete**" in the "**Database**" menu in the special functions. The data input screen will appear. Fill in the search fields with the data to be deleted.
- Use the "-" button to delete this data record. A new data record can then be highlighted and deleted with the digital pen.
- You can scroll through the entire database with the "**Arrow up**" and "**Arrow down**" keys.

14. MODIFICATIONS WITHIN PROGRAM

Further modifications were carried out within the program which only slightly change the program sequence but which optimise the alignment in respect of comfort and speed. This is described below:

- Optimisation of the rim run-out compensation in respect of speed.
- Optimisation of the steering routines: Highlighted values within the gate can still be corrected. The message "**Rotating plates not connected**" no longer causes the steering routine to be cancelled. Further measurements can be carried out after the rotating plates have been connected.
- Standardisation of screen colours with the colours on the tablet.
- Addition of texts in several foreign languages.
- Elimination of program-related and cosmetic faults.
- Electronic water level.
- Omission of kingpin inclination measurement.

15. FAULTS

15.1 Tyre Faults

TYRE FAULTS SPECIFICATIONS

Fault	Effect
1) Wheel toe, camber, toe-differential angle and castor not correct	1) Severe tyre squeaking even at relatively low speeds
2) Excessive toe-in and excessive positive camber	2) Tyres are worn down on one outside edge in the longitudinal direction
3) Excessive negative camber	3) Tyre wear on inside edge
4) Worn front-axle suspension on front-wheel-drive vehicles	4) Increased noise / Vehicle pulls on one side when accelerating
5) Incorrect wheel alignment	5) Wheels scrubbing / Tyre surface shows feathering in the tread

6) Play in the suspension due to mechanical parts (suspension, steering)	6) Washout / Wobbling of front wheels
7) Tyre pressure too low	7) Outside tyre surface wear

15.2 Front Axle Faults

FRONT AXLE FAULTS SPECIFICATIONS

Fault	Cause	Remedy
1. Toe deviation	<ul style="list-style-type: none"> a. Vehicle not in normal position b. Tie rod(s) bent c. Tie rod ball joints worn d. Rubber mount in control arm defective 	<ul style="list-style-type: none"> a. Correct height level b. Replace tie rod(s) c. Replace tie rod(s) d. Replace control arm
2. Camber deviation: The camber is fixed during the design stage and cannot be adjusted.	<ul style="list-style-type: none"> a. Rubber mount in control arm defective b. Control arm deformed c. Spring strut deformed d. Traction strut worn e. Spring deflection too great f. Front axle carrier deformed g. Spring strut mount deformed h. Distortion in the floor assembly (engine bracket) 	<ul style="list-style-type: none"> a. Replace control arm b. Replace control arm c. Replace spring strut d. Replace control arm e. Replace coil spring, height level f. Replace front axle carrier g. Repair forward structure h. Repair body
3. Castor deviation: The castor is fixed during the design stage and cannot be adjusted.	<ul style="list-style-type: none"> a. Rubber mount for tension / traction strut defective b. Tension / traction strut deformed c. Control arm deformed d. Spring strut deformed e. Wheelhouse deformed (spring strut mount) f. Distortion in the floor assembly (engine bracket) 	<ul style="list-style-type: none"> a. Replace rubber mount b. Replace tension / traction strut c. Replace control arm d. Replace spring strut e. Repair forward structure f. Repair body
4. Toe-differential angle deviation	<p>Requirement: camber and castor are correct</p> <ul style="list-style-type: none"> a. Tie rods unevenly adjusted 	<ul style="list-style-type: none"> a. Set wheel toe on left and right to identical values
5. Wheel displacement deviation	<p>Requirement: Front wheels have same single toe in relation to the</p>	<ul style="list-style-type: none"> a. Replace front axle carrier

	<p>geometrical axis</p> <p>a. Front axle carrier deformed</p> <p>b. Engine bracket deformed</p> <p>c. Control arm deformed</p> <p>d. Tension / traction strut deformed</p>	<p>b. Repair body</p> <p>c. Replace control arm</p> <p>d. Replace tension / traction strut</p>
--	--	--

15.3 Rear Axle Faults

REAR AXLE FAULTS SPECIFICATIONS

Fault	Cause	Remedy
1. Camber deviation	<p>a. Vehicle not in normal position: spring deflection too great</p> <p>b. Rubber mount on rear axle</p> <p>c. Rear axle carrier deformed</p> <p>d. Control arm deformed</p> <p>e. Traction strut deformed</p> <p>f. Distortion in the floor assembly</p> <p>g. Swinging arm deformed</p>	<p>a. Correct height level</p> <p>b. Replace rubber mount</p> <p>c. Check rear axle carrier and replace, if necessary</p> <p>d. Check control arm and replace, if necessary</p> <p>e. Check traction strut and replace, if necessary</p> <p>f. Repair body</p> <p>g. Replace swinging arm</p>
2. Rear wheel position is not correct	<p>a. Rear axle carrier has been shifted laterally</p> <p>b. Distortion in the floor assembly</p>	<p>a. Check the rubber mounts on the rear axle carrier and replace, if necessary</p> <p>b. Repair body</p>
3. Toe deviation	<p>a. Vehicle not in normal position, i.e. spring deflection too great</p> <p>b. Rubber mount in rear axle carrier defective</p> <p>c. Control arm deformed</p> <p>d. Rubber mount and swinging arm defective</p> <p>e. Rear axle carrier deformed</p> <p>f. Traction strut deformed</p>	<p>a. Correct height level</p> <p>b. Replace rubber mount</p> <p>c. Replace control arm</p> <p>d. Replace swinging arm</p> <p>e. Check rear axle carrier and replace, if necessary</p> <p>f. Check traction strut and replace, if necessary</p>
4. Deviation from the geometrical drive axis	<p>Requirement: Total wheel toe is correct</p> <p>a. Distortion in the floor assembly</p>	<p>a. Repair body</p>

Further details on the "Kinematic Diagnosis System" can be found in the operating instructions for the BMW KDS (Beissbarth/Bosch).

Functional and system descriptions are not subject to change. Parts availability and immediate ordering availability cannot be derived from this information. The specialist departments will be providing further details at the relevant time.

RUNFLAT INDICATOR

All models



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Fig. 26: Identifying Runflat Indicator
Courtesy of BMW OF NORTH AMERICA, INC.

INTRODUCTION

The Run Flat Indicator (RPA) monitors the tyre pressure throughout the journey.

The entire vehicle weight is carried by the air pressure in the tyres. If the pressure in one of the tyres should drop, the tyre will gradually "cave in". The resulting flexing means that the defective tyre will quickly receive additional damage. The tyre could burst.

Some 80 % of all flat tyres are caused by small holes (e.g. caused by nails). The holes result in a gradual loss of pressure in the affected tyre. Many "tyre blowouts" can be traced back to preliminary damage caused by a gradual loss of pressure.

A gradual loss of pressure in one tyre may remain unnoticed for a long time. The lack of pressure only makes itself clearly felt when driving when the tyre is almost completely empty.

As tyre pressure drops, the radius of the wheel and with it the tyre's rolling circumference will also decrease. The upshot is that the wheel speed of the affected tyre is increased.

The RPA records the wheel speeds using the wheel-speed sensors of the Dynamic Stability Control (DSC). The RPA compares the speeds of the individual wheels and computes an average speed. In this way the RPA is able to detect a loss of tyre pressure.

The RPA detects a drop in pressure below about 30 % +/- 10 % of the initial value. The RPA indicator and warning light indicates a drop in tyre pressure. The RPA will indicate this after just a short distance, as a rule after a few minutes, from a certain minimum speed (e.g. 25 km/h) up to the permissible top speed.

IMPORTANT: Responsibility resides with the driver at all times.

Check tyre pressures regularly, at least twice a month and before embarking on lengthy journeys.

During initialisation, the set tyre pressure is taken as the initial value for the current set of tyres.

If all 4 tyres lose pressure at the same rate, the wheel speeds will also change at the same rate. The RPA is unable to detect a uniform drop in pressure in all tyres (e.g. due to diffusion = natural loss of air from all 4 tyres)

IMPORTANT: Correct function of the Run Flat Indicator is not guaranteed when the emergency wheel is fitted.

As the emergency wheel has a much smaller diameter, the correct operation of the RPA can no longer be guaranteed.

BRIEF DESCRIPTION OF COMPONENTS

The SMG system comprises the following key components:

4 Wheel Speed Sensors The wheel-speed sensors of the Dynamic Stability Control (DSC) measure the wheel speeds of the individual wheels.

RPA button (E46, E53, E83, E85) The RPA button is only needed for initializing the PRA.

(RPA initialisation means "teaching the system the tyre pressures".

CID: Central Information Display Vehicles that are equipped with CID are initialized using the CID.

On-board computer button and rocker switch on turn-signal/main-beam switch (E87, E90, E91) Initialisation is performed on the LCD display, using the BC button and the rocker switch on the turn-signal/main-beam switch. The on-board computer functions are selected with the rocker switch.

The RPA software is in the following control units, depending on model series:

- **RPA Control Unit** (E46 all-wheel drive)

The E46 All-wheel drive has a separate RPA control unit.

The 4 wheel-speed sensors measure the wheel speeds. The DSC control unit sends the signals through 4 direct wires to the RPA control unit.

Alternatively

- **DSC control unit with additional software for Run Flat Indicator** (E46, E53, E60, E61, E63, E64, E83, E85, E87, E90, E91)

With DSC Mk60 and DSC 8, the RPA is integrated into the DSC control unit through additional software.

Alternatively

- **CIM: Chassis integration module** (E65, E66)

The CIM controls:

- Servotronic
- Steering column adjustment
- Run Flat Indicator (RPA)

The following control units are involved in the functions of the Run Flat Indicator:

- **CAS: Car Access System** E60, E61, E63, E64, E65, E66, E87, E90, E91

The CAS control unit provides input signals relating to terminal status (e.g. terminal 15 ON).

- **GM: Basic Module** E46, E53, E83, E85

The general module provides input signals relating to terminal status (e.g. terminal 15 ON).

- **JBE: Junction Box Electronics** E87, E90, E91

The JBE is the data interface (= gateway) between the K-CAN and the PT-CAN. (K-CAN stands for "Body Controller Area Network"; PT-CAN stands for "Powertrain Controller Area Network") The junction box consists of the junction-box electronics and the electrical distribution centre.

- **KGM: Body-Gateway Module** E60, E61, E63, E64 from 09/2005

The body-gateway module replaces the safety and gateway module (SGM). The KGM forms the data interface (= gateway) between the K-CAN and the PT-CAN.

- **M-ASK/CCC: Multi-Audio System Controller/Car Communication Computer** The M-ASK/CCC will emit an acoustic warning through the loudspeakers if tyre pressure drops. (On vehicles without M-ASK or CCC, the instrument cluster will emit the warning.)
- **SGM: Safety and gateway module** E60, E61, E63, E64 up to 09/2005 E65, E66 from 03/2004

The SGM is the data interface (= gateway) between the K-CAN, bytflight and the PT-CAN.

- **SZL: Steering Column Switch Cluster** E87, E90, E91

The signals from the on-board computer button and from the rocker switch are recorded and processed in the SZL. The data are transmitted to the instrument cluster through a direct wire (on-board computer).

- **ZGM: Central Gateway Module** E65, E66 until 03/2004

The ZGM forms the data interface (= gateway) between the K-CAN and the PT-CAN.

- **KOMBI and CID: Instrument Cluster and Central Information Display** A fault in the RPA or drop in tyre pressure will be indicated by the RPA indicator and warning light in instrument cluster. At the same time, the symbol will light up in the LC display.

Faults registered by the RPA are indicated as follows by the RPA indicator and warning light (for variations, please refer to national version):

- The RPA indicator and warning light lights up:
 - **Red (with acoustic signal):** Drop in tyre pressure more than approx. 30 % +/- 10 %. Driving safety is no longer guaranteed.
 - **Yellow:** RPA failed

Information about the Check-Control message can be called up in the CID (CID is fitted depending on the vehicle's equipment).

RPA Indicator And Warning Lights And Central Information Display

Installation Location

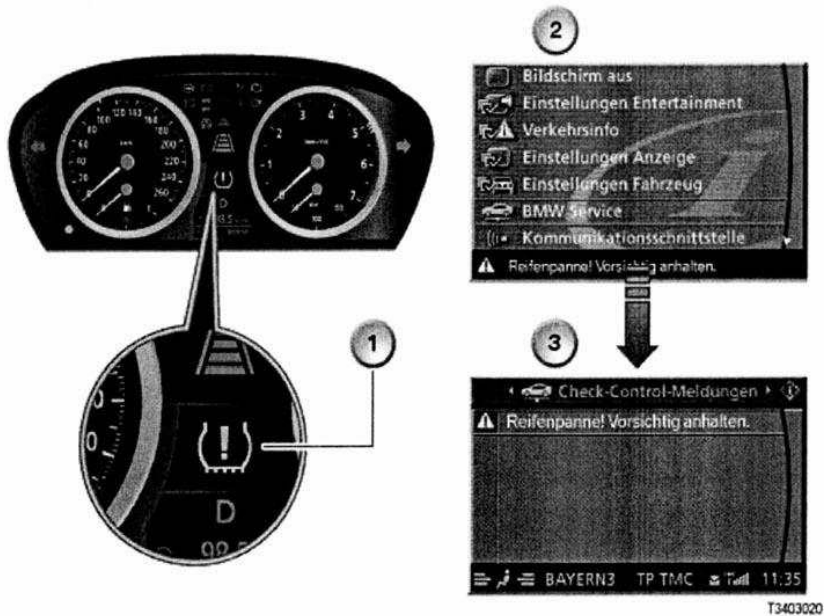
The Run Flat Indicator (RPA) has the following displays in the instrument cluster:

- RPA Indicator And Warning Light
- Symbol In LC Display



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Fig. 27: Identifying Runflat Indicator (E83 Shown)
Courtesy of BMW OF NORTH AMERICA, INC.



Item	Description	Item	Description
1	Symbol for check control message (yellow or red) on E60	2	"BMW Service" menu in the Central Information Display (CID)
3	Check control message in the Central Information Display (CID)		

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Fig. 28: Identifying RPA Warning In Central Information Display
 Courtesy of BMW OF NORTH AMERICA, INC.

How It Works RPA fault is displayed as follows:

- Via the RPA indicator and warning light The RPA indicator and warning light lights up:
 - **Red (with acoustic signal):** Drop in tyre pressure more than approx. 30 % +/- 10 %. Driving safety is no longer guaranteed.
 - **Yellow:** The RPA has developed a fault.
- Indicator or symbol in LC display (yellow or red).
- Check control message in Central Information Display (CID) with additional information text.

If the RPA should fail, the following Check-Control messages are possible (for example):

RPA FAILURE MESSAGES & EXPLANATIONS

Check Control Message In CID Status Bar	Further Information
Flat tyre!	Flat tyre Stop the vehicle carefully.

	<p>Please refer to the Owner's Handbook for how to change a wheel.</p> <p>Tyres with emergency-running characteristics (RSC): The journey can be continued for a limited distance at speeds up to max. 80 km/h, please refer to the Owner's Handbook.</p> <p>Have the tyres checked by the nearest BMW Service</p>
Run Flat Indicator failure!	<p>Run Flat Indicator</p> <p>Run Flat Indicator failed Flat tyres cannot be detected.</p> <p>Have the problem checked by BMW Service as soon as possible.</p>

SYSTEM FUNCTIONS

The Run Flat Indicator (RPA) comprises the following functions:

- Self-test
- Initialisation
- Detects drop in tyre pressure
- Visual and acoustic warning

Self-Test

The RPA performs a self-test when terminal 15 is switched ON. A fault in the RPA is indicated by the RPA indicator and warning light and by a symbol in the LCD display.

Initialisation

Initialisation is started manually (e.g. by pressing the RPA button). Then (after the journey has started), initialisation will run as a fully automatic calibration sequence. In other words, the circumference of individual tyres are recorded and evaluated.

To allow a drop in tyre pressure to be detected, the system considers different speed ranges and driving situations. Taking account of the driving situation means that the system has to be primed for each speed range individually.

From 09/2004 (starting with E87), these speed ranges and driving situations have been combined into 3 calibration ranges. This means greater clarity for output via the BMW diagnosis systems Group Tester One (GT1) and DISplus.

The initialisation phase lasts approx. 5 to 15 minutes for the individual speed ranges. The end of the initialisation phase is not indicated.

Detects Drop In Tyre Pressure

The RPA records the wheel speeds using the wheel-speed sensors from the DSC. The RPA compares the speeds of the individual wheels and computes an average speed. In this way the RPA is able to detect a loss of tyre pressure. (In the event of a tyre losing pressure, the tyre rolling circumference of the affected tyre is also reduced.)

Visual And Acoustic Warning

A drop in pressure in one tyre of approx. 30 % +/- 10 % from the initial value is indicated by the RPA indicator and warning light. In addition, an acoustic signal sounds.

Signal output: Depending on the model concerned, either via the instrument cluster or the multi-audio system controller (M-ASK)/Car Communication Computer (CCC).

NOTE: ***DSC malfunction***
The sensors used by the RPA are all monitored by the DSC. If DSC detect a fault, the RPA will also register a malfunction.

SPECIAL CONDITIONS FOR SYSTEM FUNCTION

The following operating conditions may cause a delay in the warning being given in the event of a drop in tyre pressure:

- Heavy braking
- Rapid acceleration
- High rate of lateral acceleration
- Cornering (in a tight corner)
- Vehicle speed dropping below a minimum speed (the RPA only responds when a certain minimum speed has been reached)
- Large difference in slip (between axles or between wheel on one side of vehicle)
- Initialisation not being completed in current speed range (see "Controls")
- Winter conditions

The following operating conditions may cause a delay in the warning being given in the event of a drop in tyre pressure:

- Driving with snow chains fitted

Driving with snow chains may impair the correct function of the RPA.

The system will work as normal again after the snow chains have been removed and the vehicle is driven for a few minutes. (Repeat initialisation not necessary.)

NOTE: **Do not perform initialisation when snow chains are fitted.**
Initialisation and snow chains will cause incorrect adaptation values.

- Trailer towing

Initialisation should be performed when a trailer with a weight greater than approx. 300 kg is being towed.

Repeat the initialisation process after detaching or unloading the trailer.

- Old/new tyres

NOTE: Only fit tyres with the same tread depth!

Avoid fitting tyres with greatly different tread depth (from approx. 2 millimetres) on one axle. The different diameters mean that the correct operation of the RPA is no longer guaranteed.

In the following cases, the system will **not emit a warning despite a drop in tyre pressure being detected** :

- The same amount of pressure is lost in 2 or more tyres.
- Drops in tyre pressures caused by diffusion and affecting all 4 tyres equally
- If a tyre is damaged with a sudden loss of all pressure (tyre blowout, warning is given too late)

OPERATION

The Run Flat Indicator (RPA) is initialized using the following control elements:

- RPA button
- On-board computer button on turn-signal/main-beam switch
- With iDrive in the Central Information Display (CID) with the controller

IMPORTANT: Always perform initialisation immediately after correcting the tyre pressure, especially if a tyre is changed or the wheels are interchanged. Only check tyre pressures when the tyres are cold.

Set the tyres to the correct pressure before performing initialisation. During initialisation, the set tyre pressure is taken as the initial value for the current set of wheels.

Correct the tyre pressures when the tyres are cold to prevent the data recorded from being affected by temperature.

IMPORTANT: Responsibility resides with the driver at all times.

Check tyre pressures regularly, at least twice a month and before embarking on lengthy journeys. During initialisation, the set tyre pressure is taken as the initial value for the current set of tyres.

Initialise the RPA in the following situations:

- If tyre pressure is changed
 - (tyre pressure is corrected or reset)
- If the position of the tyres is changed (change of axles, wheels), even if the tyre pressure is not changed
- If a tyre is changed or the wheels are interchanged
 - (e.g. old tyres for new tyres, summer tyres for winter tyres, etc.)

Start initialisation as follows:

- Terminal 15 ON
 - (engine OFF or ON, do not pull away)
- Vehicles **with** RPA button
 - Press and hold the RPA button until the RPA indicator and warning light lights up yellow for a few seconds
- Vehicles **with** BC button (on-board computer function)
 - In the on-board computer function select "RPA" and "INIT" (LCD display) with the rocker switch on the turn-signal/main-beam switch. Press the BC button to confirm.
 - Press and hold the BC button for approx. 5 seconds, until a box with a tick appears behind the "INIT" display.
- Vehicles with Central Information Display

Initialisation is performed via the Central Information Display (CID) and controller.

- Select "RPA" in the "Settings" menu and confirm.
- Select "Set" and confirm.
- Drive off

The end of the initialisation phase is not indicated.

Preconditions For Activation

The Run Flat Indicator (RPA) is automatically activated when terminal 15 is switched ON. The RPA cannot be switched off manually.

NOTES FOR SERVICE STAFF

Service staff should note the following points:

General information:

General information for Service staff on the Run Flat Indicator The following general information on the Run Flat Indicator (RPA) is given for Service staff:

- Wheel-Speed Sensor Failure
- Read Off Status Of Initialisation Phase

Wheel-Speed Sensor Failure If no signal is received from one of the wheel-speed sensors, the RPA will switch to "inactive" mode after approx. 2 minutes. The RPA indicator and warning light lights up yellow. The fault is indicated with a check control message. A fault is recorded in the fault memory of the RPA control unit.

If the RPA is integrated into the DSC, a fault will be recorded in the DSC control unit. If the signal returns after a signal failure, the RPA will be active again after driving for approx. 30 minutes. The fault will remain stored in the fault memory.

Read off status of initialisation phase The status of the initialisation phase can be displayed in the service functions for the control unit concerned (e.g. DSC control unit).

Diagnosis:

Encoding/Programming The Run Flat Indicator

- **Encoding** At the factory, the Run Flat Indicator (RPA) software is adapted to the model series concerned (encoding data). The RPA is encoded with the encoding data. Here, different parameters specific to the various vehicle models are written into the control unit.
- **Programming** The RPA is automatically programmed with the software for the Dynamic Stability Control (DSC).

US NATIONAL VERSION

A flat tyre is indicated as follows:

- E53, E83, E85

Yellow RPA indicator and warning light **without** acoustic signal

- E60, E61, E63, E64, E65, E66, E90, E91

Yellow RPA indicator and warning light **with** acoustic signal

An RPA failure is indicated as follows:

- Yellow RPA indicator and warning light **without** acoustic signal

Subject to alteration due to misprints, errors and technical modifications.

TYRES WITH EMERGENCY RUNNING CHARACTERISTICS AND TYRE

PRESSURE WARNING SYSTEMS

All models

GENERAL INFORMATION

Warning Systems

BMW AG offers two different systems to warn the driver of a drop in tyre pressure.

WARNING SYSTEMS SPECIFICATIONS

System	Description	Measuring principle
RDC	Tyre pressure control	Tyre pressure/temperature
RDW	Tyre pressure warning	Comparison of wheel speeds

Emergency Running Systems

In addition to the warning systems, two emergency running systems are also employed to prevent a depressurised tyre from caving in:

Components of emergency running system with self-supporting tyres:

EMERGENCY RUNNING SYSTEM COMPONENTS (WITH SELF-SUPPORTING TYRES)

RDW (standard equipment)	Tyre pressure warning
RDC (available as option from 03/2000)	Tyre pressure control
SST	Self Supporting Tyre
EH2 disc wheel	Disc wheel with Extended Hump 2

Components of emergency running system with integrated support ring:

EMERGENCY RUNNING SYSTEM COMPONENTS (WITH INTEGRATED SUPPORT RING)

Support ring	NOTE: In the future, only for heavy safety vehicles (E38/3)
RDC (optional)	Tyre pressure control
H2 disc wheel	Standard disc wheel with Hump 2

TYRE PRESSURE CONTROL (RDC)

RDC System Description

RDC permanently monitors the tyre pressure and the temperature in the tyres, both while the vehicle is being driven and when it is stationary. Data is transmitted via data telegram by the wheel electronic units to the antennas installed in the wheel housing and on to the RDC control unit. There, the data received is compared with the stored limit values.

After correcting the air pressure with the engine off and the ignition on, press the Set button and hold (approx. 6 seconds) until the words "Set tyre pressure" appear in the instrument cluster (instrument cluster high) or the yellow LED lights up (basic instrument cluster).

If the limit values are exceeded, the driver will be warned via the instrument cluster in two stages, as follows:

RDC WARNING SYSTEM (LOSS OF TIRE PRESSURE)

Loss of tyre pressure	Warning
Drop in tyre pressure of 0.2 to 0.4 bar	Yellow LED on basic instrument cluster, or Text: "Check tyre pressure" on instrument cluster high Gong: no
Drop in tyre pressure of more than 0.4 bar	Red LED on basic instrument cluster, or Text: "Tyre failure" on instrument cluster high Gong: yes

Advantages of RDC

ADVANTAGES OF RDC

1) Safety	<ul style="list-style-type: none"> ○ early warning in the event of rapid loss of pressure ○ warning of loss of tyre pressure through normal diffusion
2) Comfort	<ul style="list-style-type: none"> ○ unchanging ride comfort ○ instruction to check tyre pressure as necessary
3) Service life, economy	<ul style="list-style-type: none"> ○ minimisation of tyre wear ○ minimisation of fuel consumption
4) New developments	<ul style="list-style-type: none"> ○ allow tyres with emergency running characteristics to be fitted ○ no spare wheel if tyres with emergency running characteristics are fitted (saves weight)

RDC System Layout

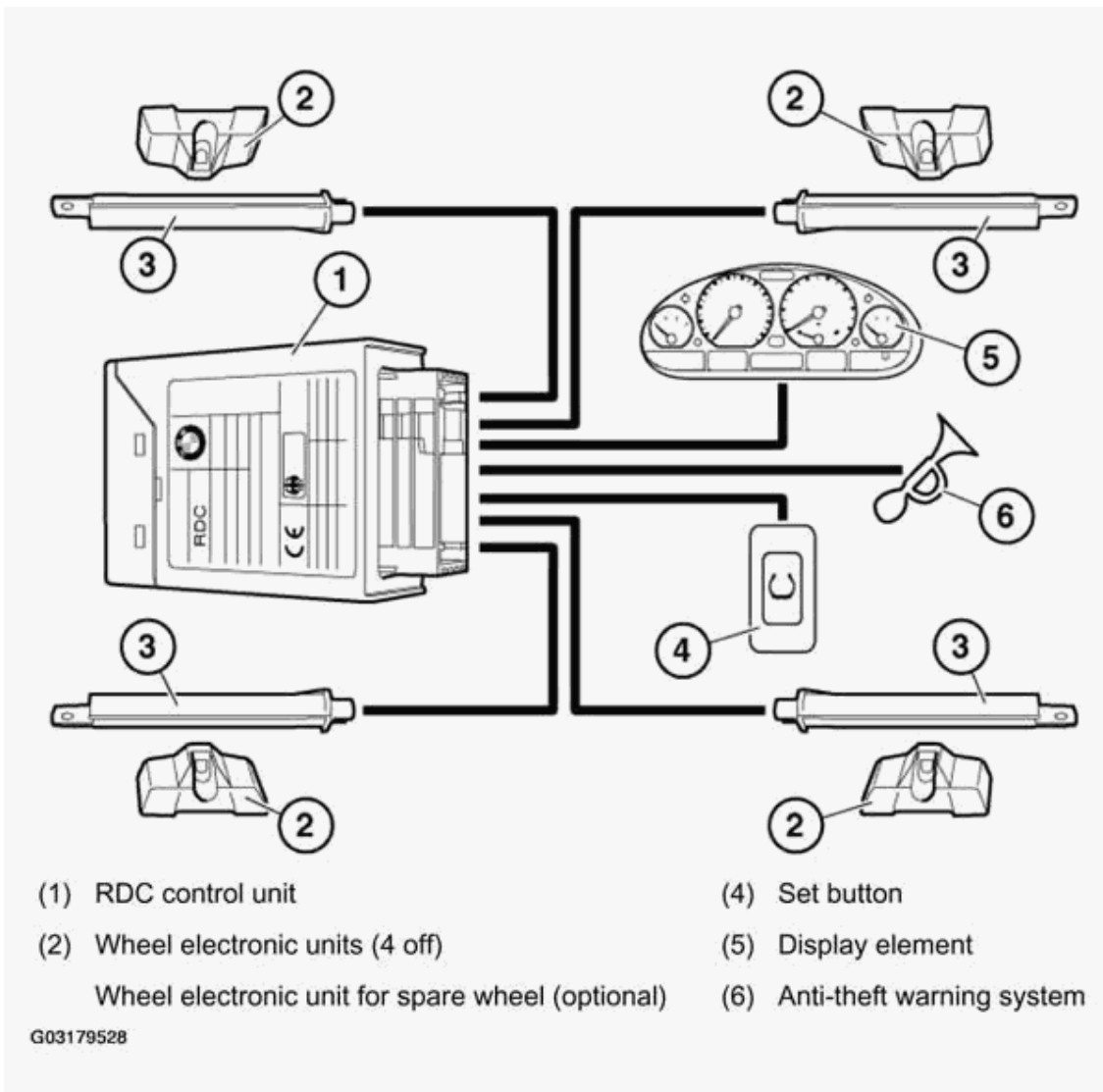


Fig. 29: RDC System Layout

Courtesy of BMW OF NORTH AMERICA, INC.

Component Description

RDC Control Unit

Fully diagnosis-compatible

Task:

Evaluates the following telegrams from the wheel electronic units:

- Tyre Pressure
- Tyre Air Temperature
- Identification Number Of Wheel Electronic Unit

- Remaining Service Life Of Wheel Electronic Unit Battery

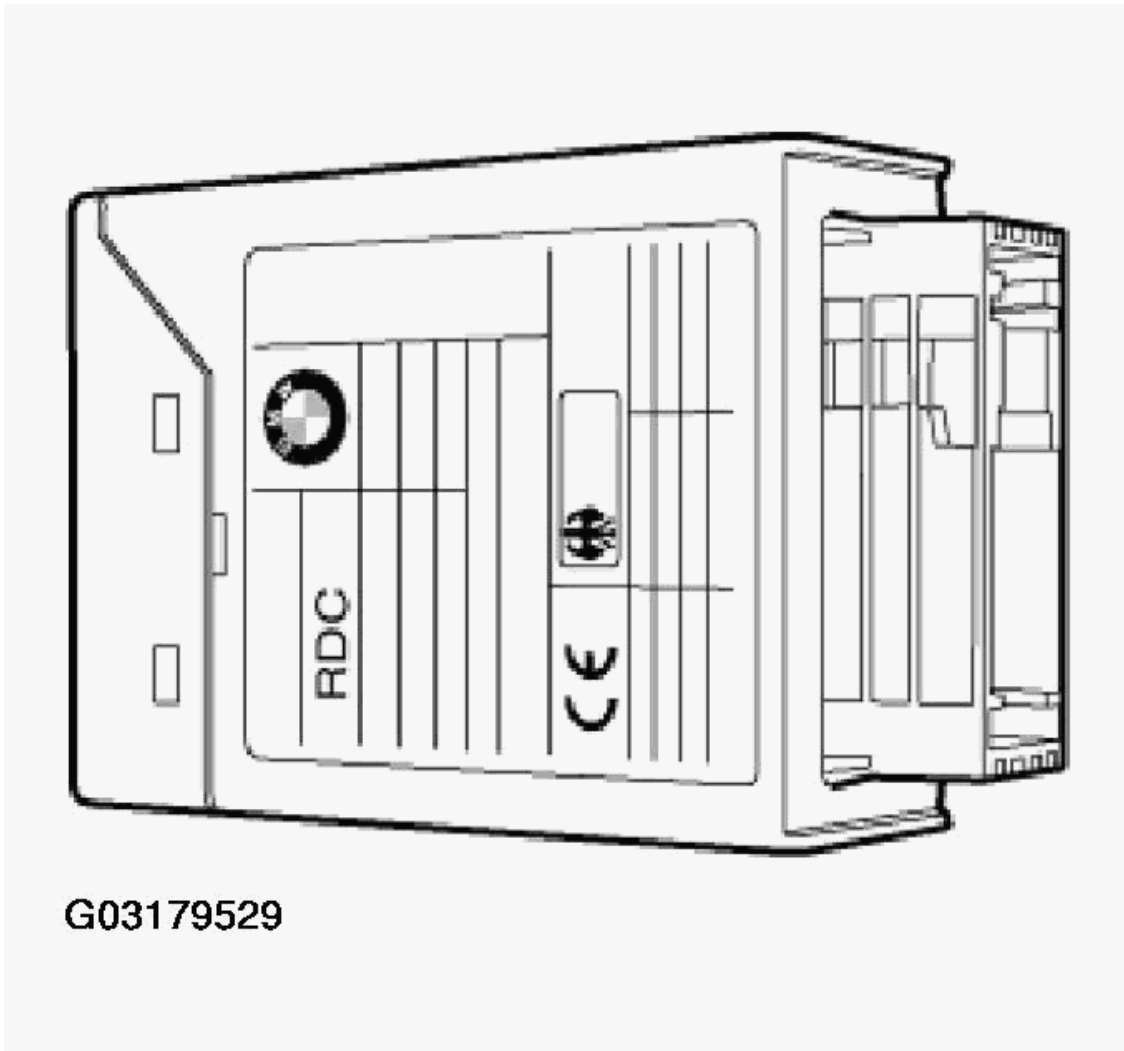


Fig. 30: Identifying RDC Control Unit
Courtesy of BMW OF NORTH AMERICA, INC.

If required, information or a warning is transmitted.

Wheel Electronic Unit With Valve

Components:

- Pressure Sensor
- Temperature Sensor
- Transmitter
 - Frequencies According To Country
- Power Supply

- Service Life: Approx. 7 Years
- Not Exchangeable

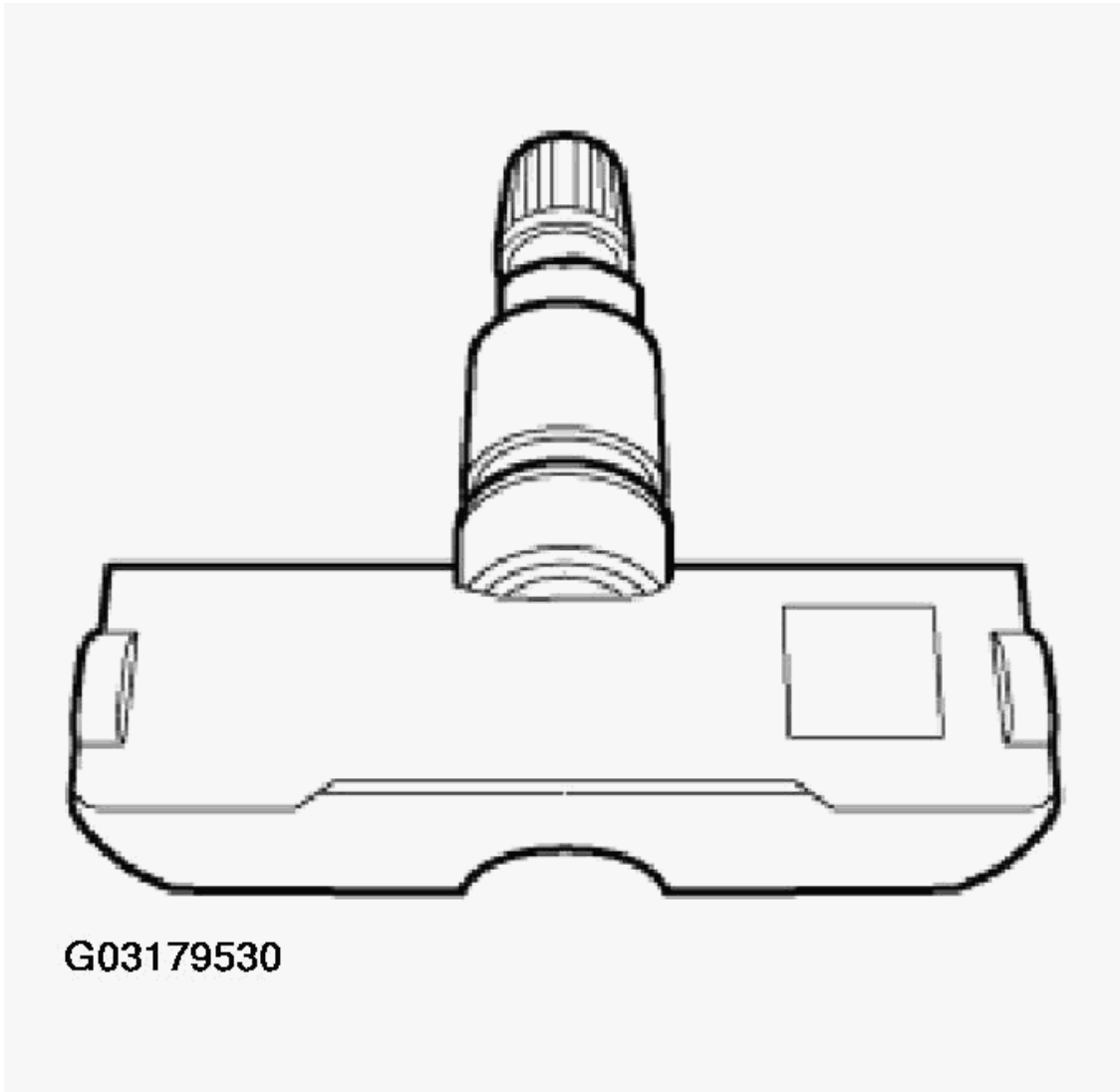


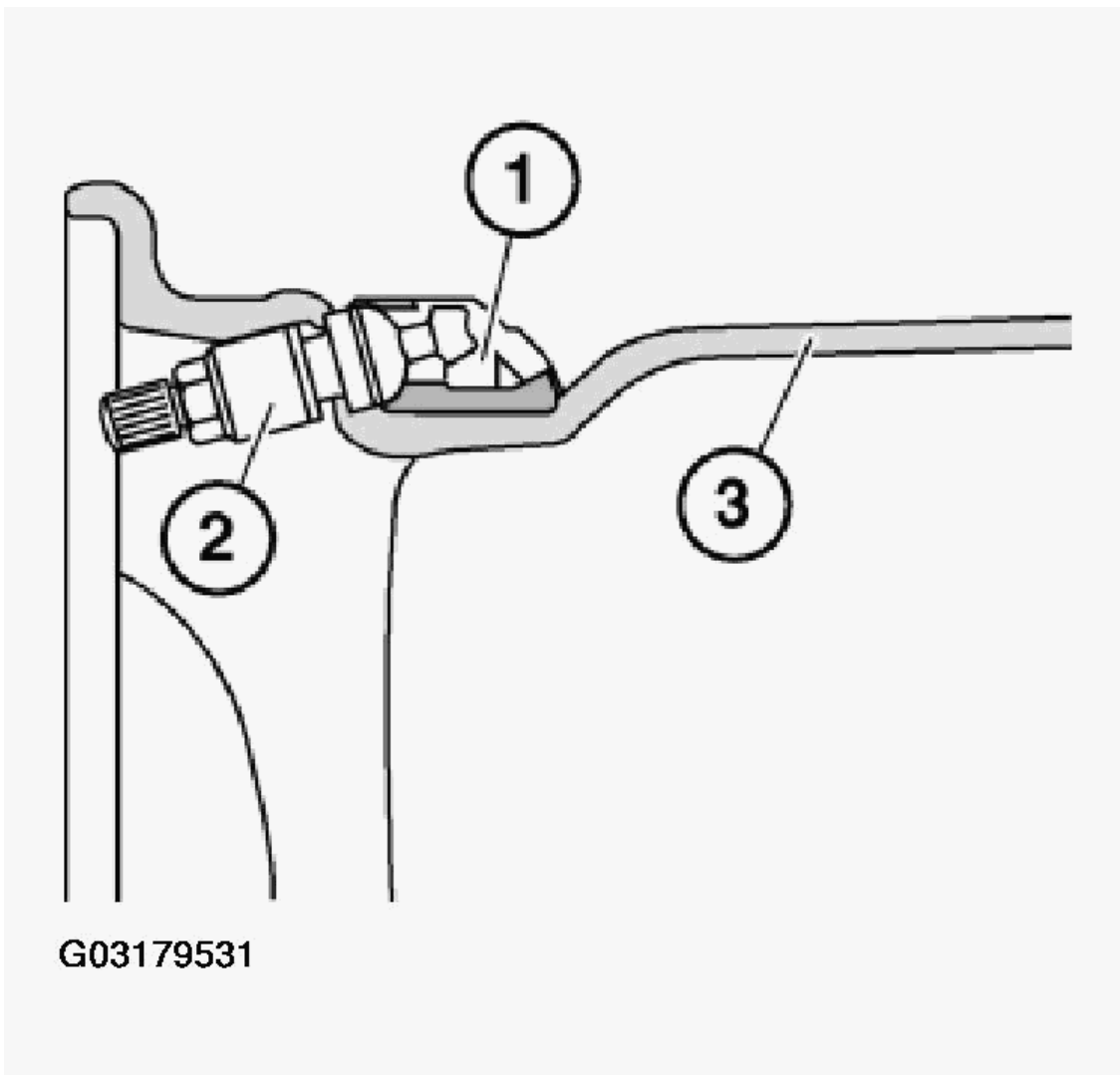
Fig. 31: Identifying Wheel Electronic Unit With Valve
Courtesy of BMW OF NORTH AMERICA, INC.

Installation Location Of Wheel Electronic Unit In Disc Wheel

The wheel electronic unit (1) is screwed to the valve (2) on the disc wheel (3)

Identifying feature: Metal Tyre Valves

NOTE: Different valves have to be used to allow for the different disc wheel sizes. The valves are colour-coded. The correct coding can be taken from the spare parts catalogue.



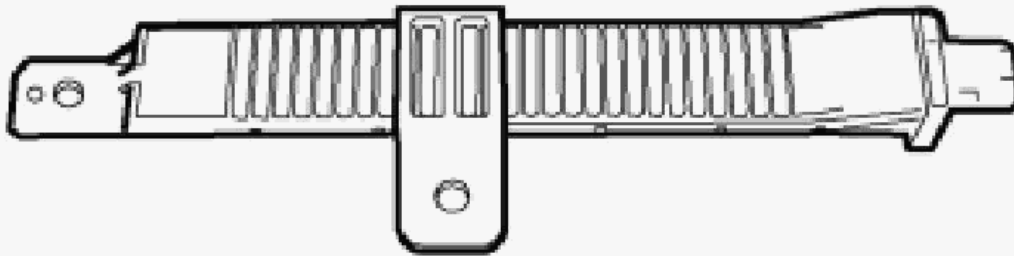
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Fig. 32: Identifying Installed Position Of Wheel Electronic Unit In Disc Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

Antenna

There is an antenna in each wheel housing.

Task: Receives telegrams and forwards these to the RDC control unit.



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Fig. 33: Identifying RDC Antenna

Courtesy of BMW OF NORTH AMERICA, INC.

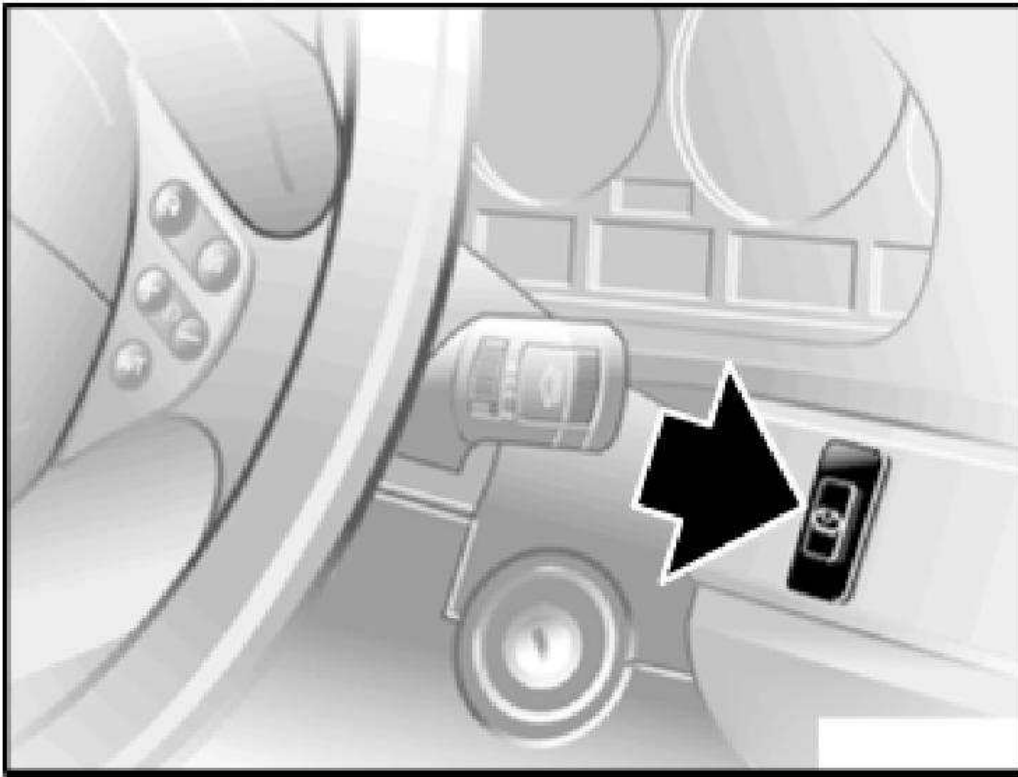
Component Description

Set Button

Installed in the instrument panel to the right of the steering wheel. (E46: in the centre console)

Symbol: tyre cross-section

Task: initialisation after resetting cold tyre pressure or after changing tyre or wheel location.



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Fig. 34: Identifying RDC Set Button
Courtesy of BMW OF NORTH AMERICA, INC.

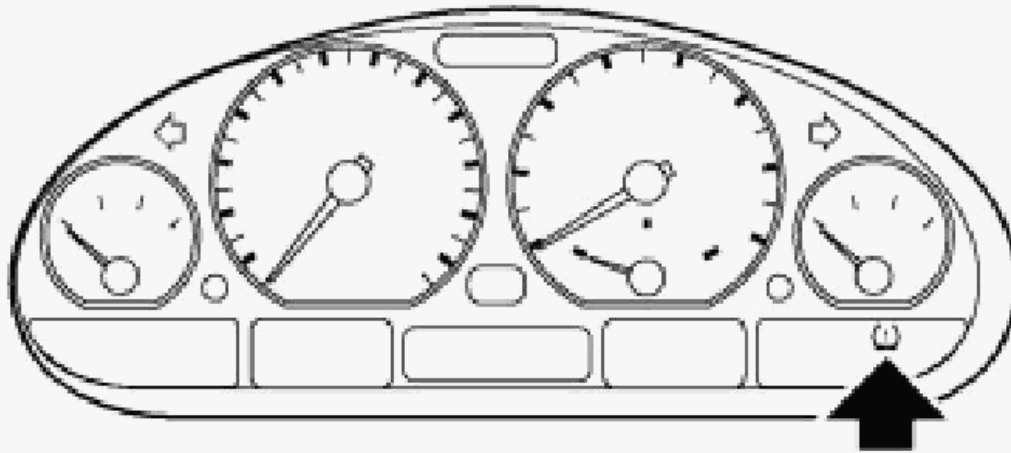
Display Element In Instrument Cluster

Indicator lamp lights up yellow:

- drop in tyre pressure of 0.2 to 0.4 bar

Indicator lamp lights up red:

- drop in tyre pressure of greater than 0.4 bar



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Fig. 35: Identifying RDC Indicator In Instrument Cluster Display
 Courtesy of BMW OF NORTH AMERICA, INC.

TYRE PRESSURE WARNING RDW

RDW System Description

RDW measures the wheel speeds on all four wheels, using the wheel speed sensors of the ABS/ASC or ABS/DSC system. It compares the wheel speeds of the diagonally opposite wheels and of the average speed.

In the event of a drop in tyre pressure, the dynamic diameter of a wheel will change, leading to a changed wheel speed.

A drop in tyre pressure of 30 +/- 10 % can be detected on all wheels from about 15 km/h (10 mph) up to the vehicle's top speed.

If this value is exceeded, the driver will be warned via the instrument cluster as follows:

RDW SYSTEM DESCRIPTION

Loss of tyre pressure	Warning
Loss of tyre pressure of 30 +/- 10 %	Red LED Text: "Tyre failure" Gong: yes The vehicle is not to be driven faster than 80 km/h (50 mph).

NOTE: A cautious driving style with moderate forward and transverse acceleration will help to prolong the service life of the defective tyre.

Advantages of RDW

With two exceptions, the advantages of RDC also apply to RDW.

Exceptions:

- no warning of loss of tyre pressure through normal diffusion
- tyre pressure still have to be checked regularly, every 14 days

RDW System Layout

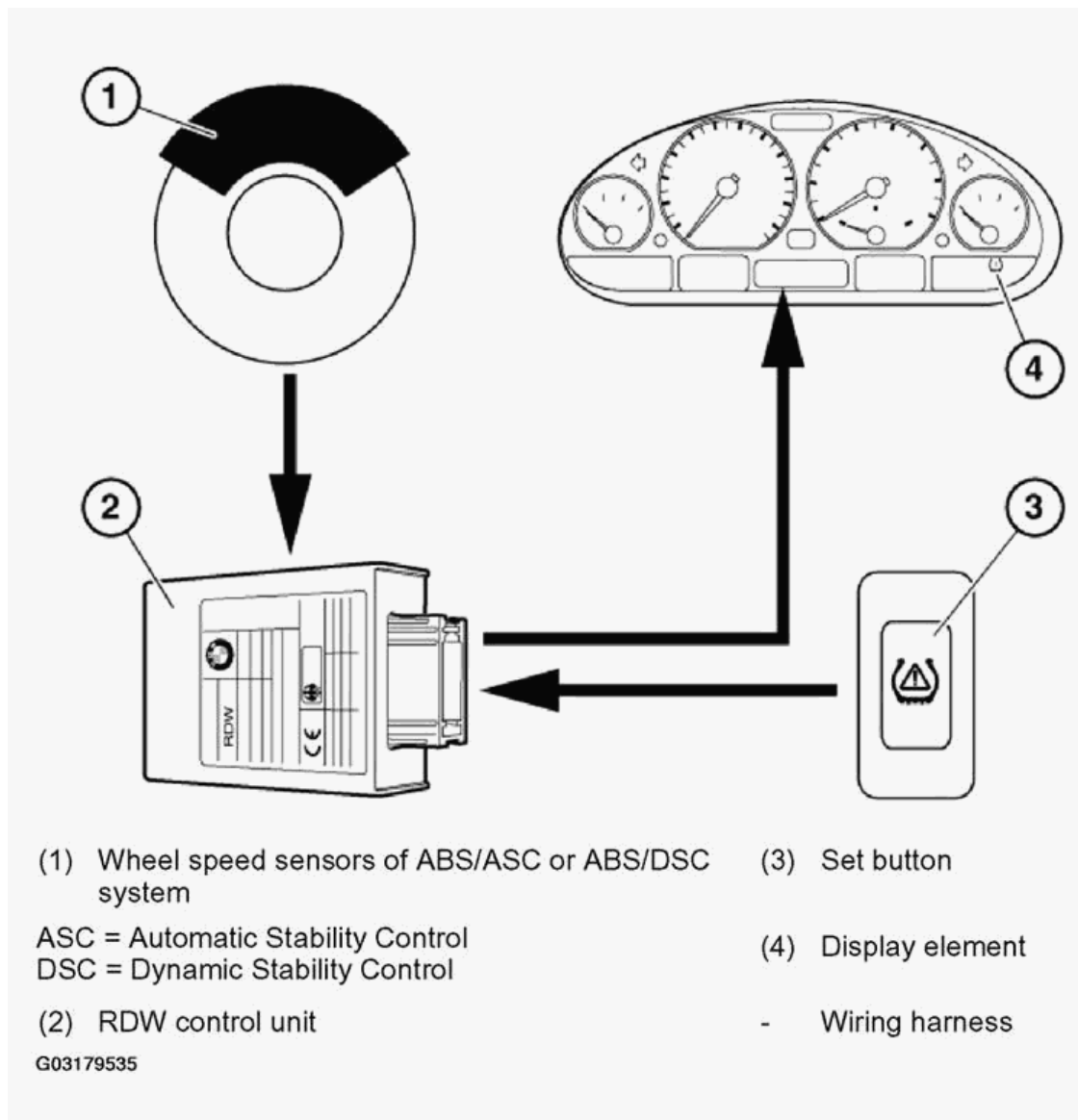


Fig. 36: RDW System Layout

Courtesy of BMW OF NORTH AMERICA, INC.

Component Description

RDW Control Unit

Fully diagnosis-compatible

Task:

- evaluates wheel speeds.
- a warning is transmitted as required.

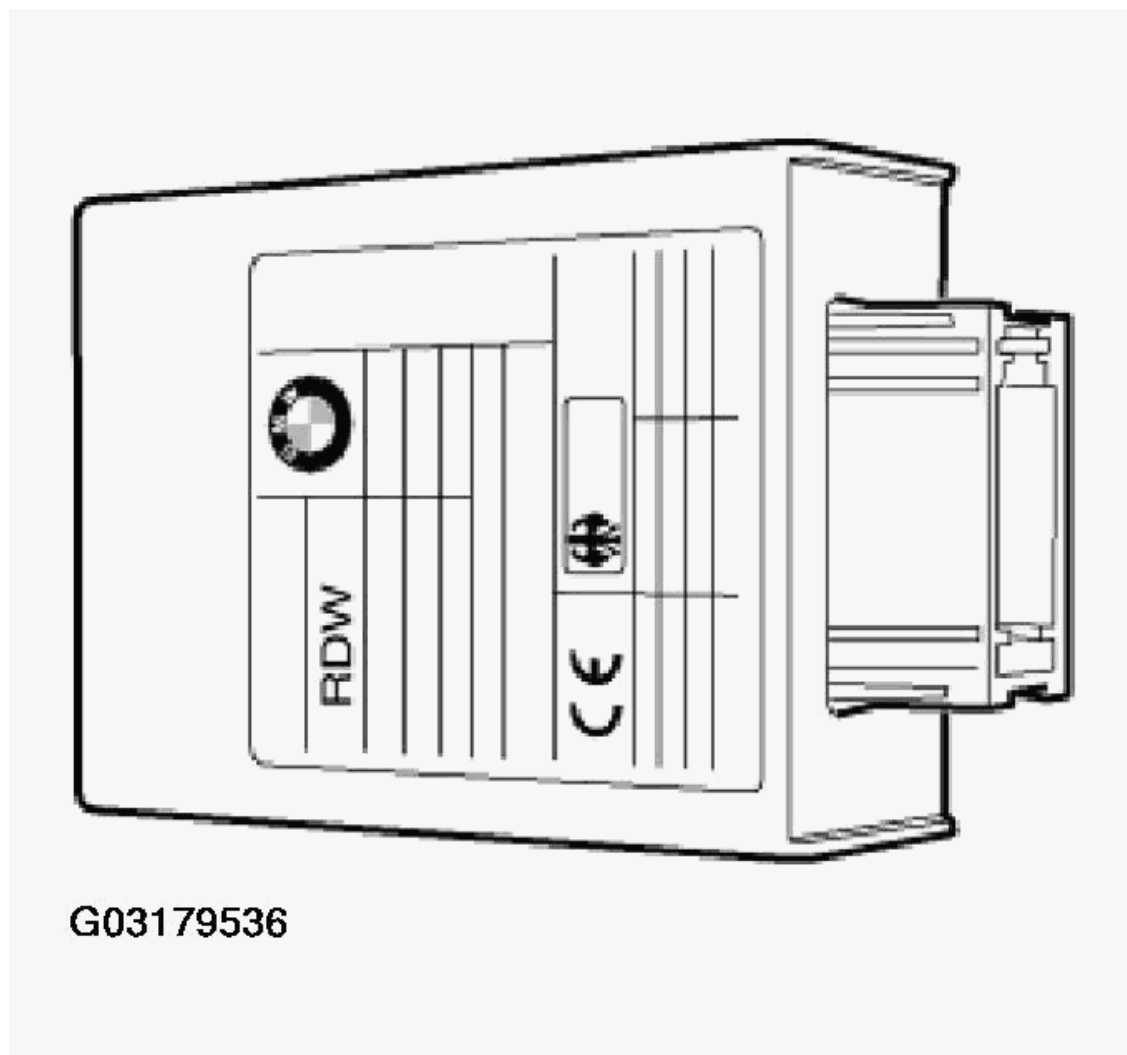


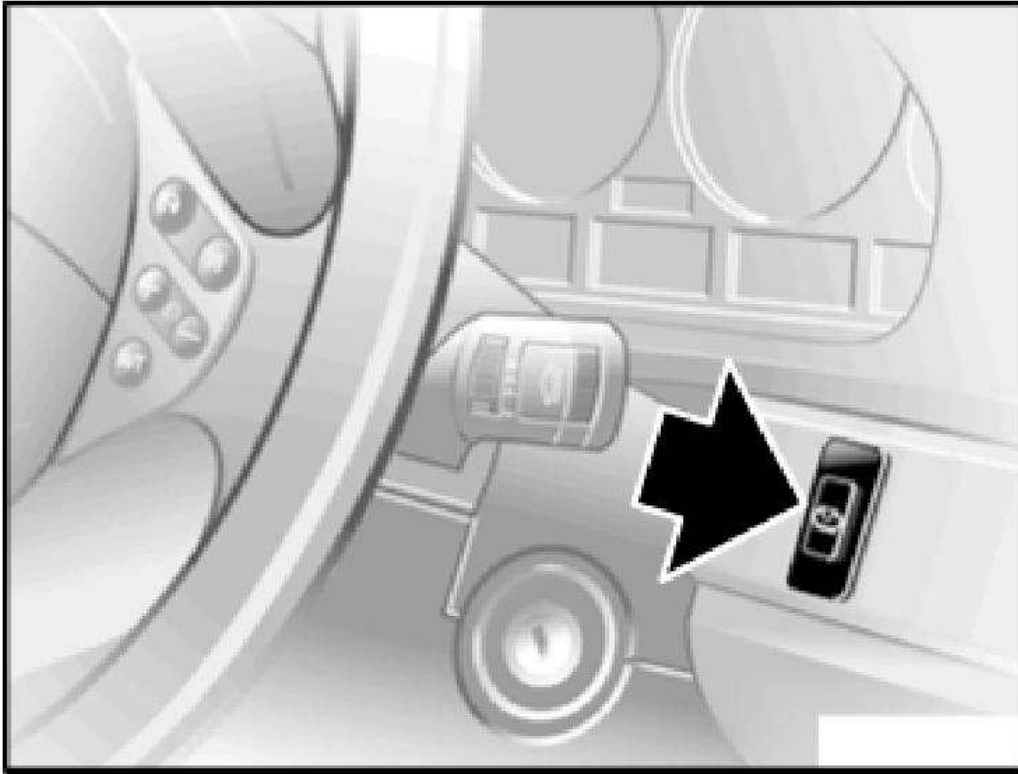
Fig. 37: Identifying RDW Control Unit

Courtesy of BMW OF NORTH AMERICA, INC.

Set Button

Installed in the dashboard to the right of the steering wheel. Symbol: tyre cross-section with warning triangle.

Task: initialisation after resetting cold tyre pressure or after changing tyre or wheel location.



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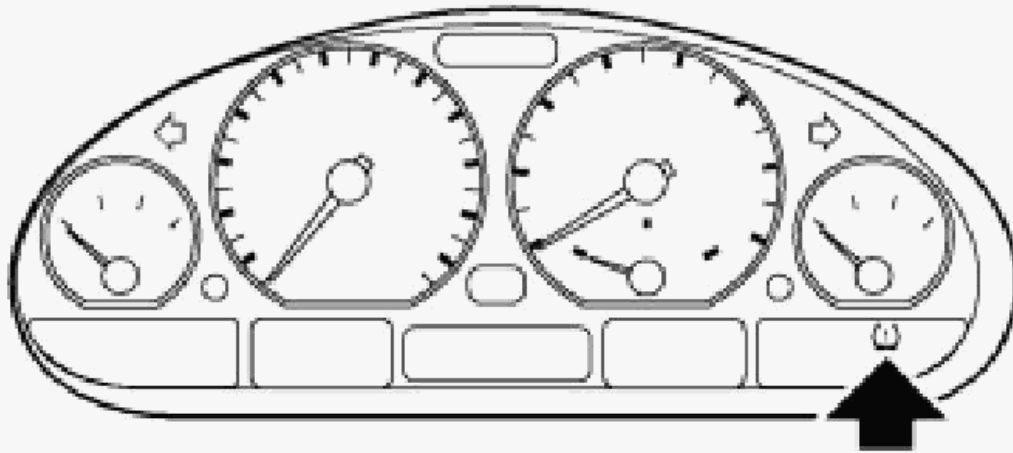
Fig. 38: Identifying Set Button

Courtesy of BMW OF NORTH AMERICA, INC.

Display Element In Instrument Cluster

Indicator lamp lights up red:

- drop in tyre pressure 30 +/- 10 %



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Fig. 39: Identifying RDW Indicator Lamp
 Courtesy of BMW OF NORTH AMERICA, INC.

EMERGENCY RUNNING SYSTEMS

Introduction

Tyres with emergency running characteristics can still be used for a certain distance even if they suffer a complete loss of pressure. There are two different systems which meet these requirements:

- emergency running system with self-supporting tyres
- emergency running system with integrated support ring

Emergency Running Systems Setup

Emergency Running System With Self-Supporting Tyres

The side walls of the self-supporting tyre are reinforced. In conjunction with a special disc wheel, the tyre can still be used for a certain distance even if it suffers a complete loss of pressure.

Mobility is retained for the following distances up to a speed of 80 km/h (50 mph) and with a cautious, suitably adapted driving style:

EMERGENCY RUNNING SYSTEM DESCRIPTION

Unloaded vehicle	max. 500 km (300 miles)
Unloaded roadster	less than 250 km (150 miles)

Self-supporting tyres demand permanent monitoring of the tyre pressure to ensure that the driver is given adequate warning if pressure is lost during a journey. For this reason, these tyres are only available in conjunction with the warning system RDW and from 03/2000 also with RDC.

To prevent the self-supporting tyres from becoming detached from the disc wheel in the event of a complete loss of tyre pressure, they must be fitted to newly developed wheels with modified disc wheel humps, but with unchanged tyre seating (= standard disc wheel).

However, the new wheels can also be used for standard tyres of the same size.

Comparison Standard Tyres/Self-Supporting Tyres

Standard Tyres, Unpressurised

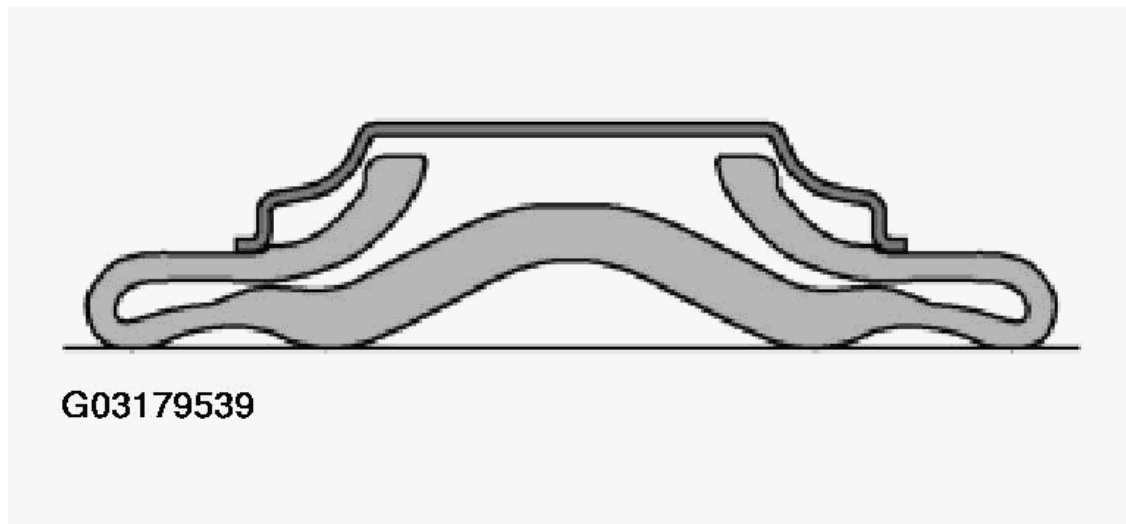
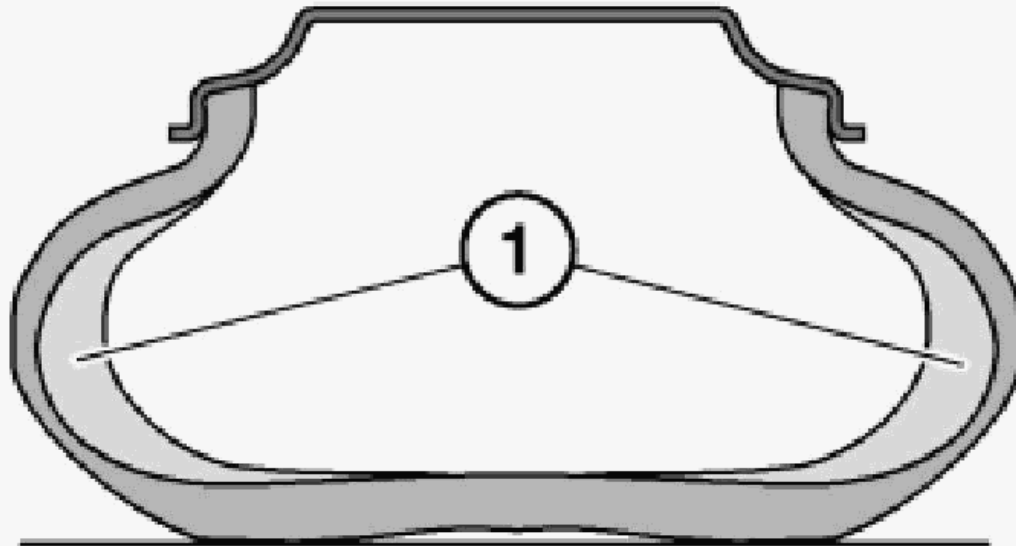


Fig. 40: Identifying Unpressurised, Standard Tyres
Courtesy of BMW OF NORTH AMERICA, INC.

Self-supporting tyres, unpressurised

Envulcanised reinforcement (1) made of a temperature-resistant rubber compound.



G03179540

Fig. 41: Identifying Unpressurised, Self-Supporting Tyres
Courtesy of BMW OF NORTH AMERICA, INC.

Disc Wheels

H2 Disc Wheel (Standard Disc Wheel) For Emergency Running System With Integrated Support Ring

(1) Hump 2 of standard disc wheel

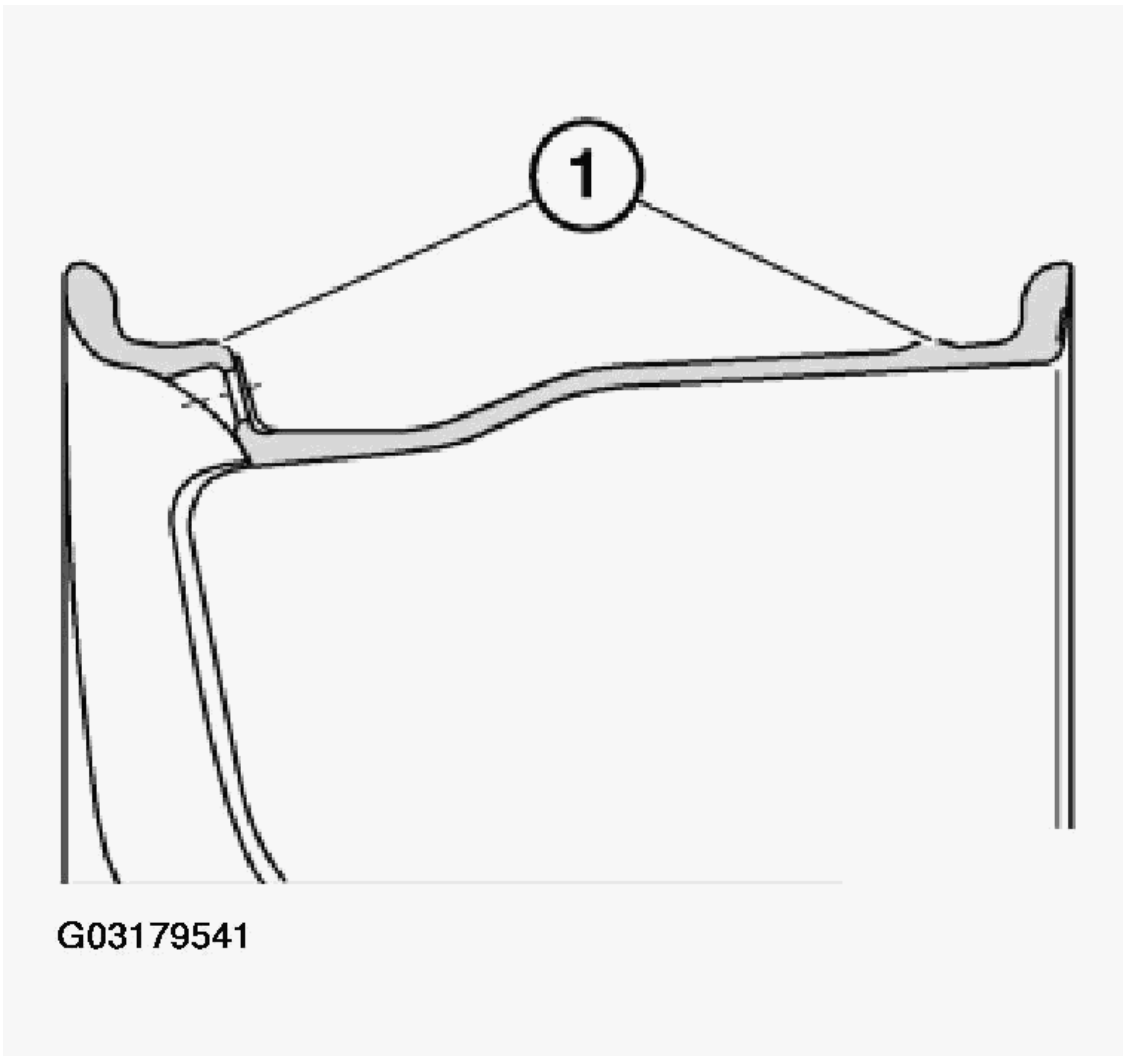
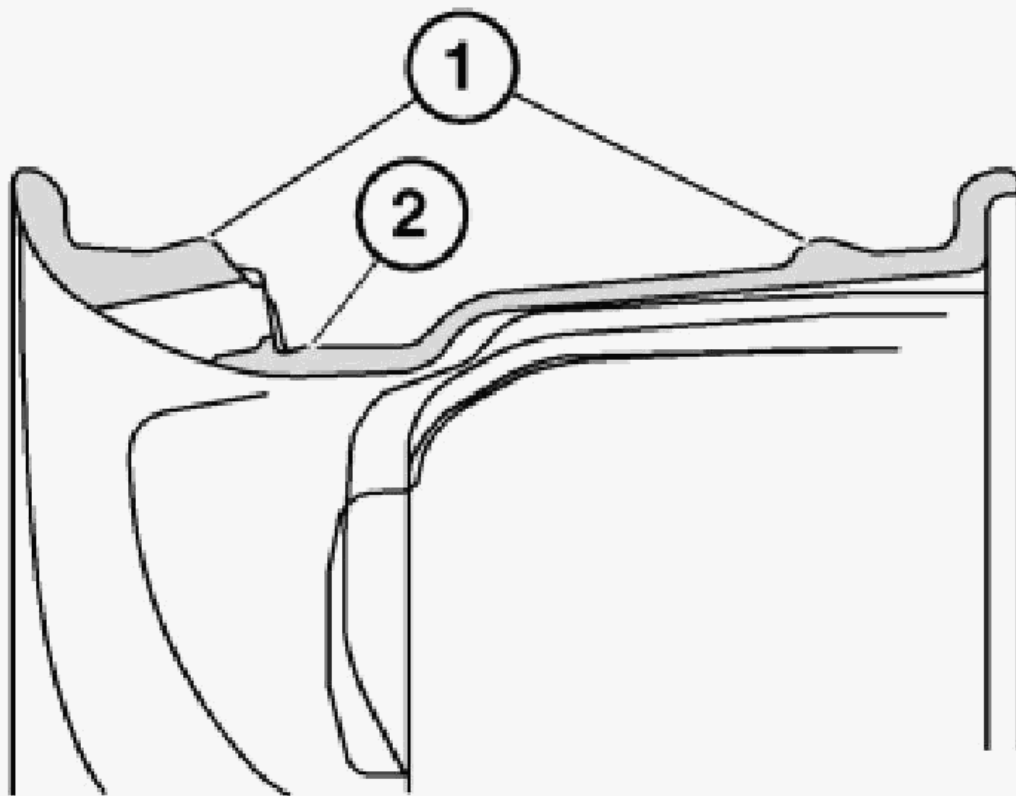


Fig. 42: Identifying H2 Disc Wheel

Courtesy of BMW OF NORTH AMERICA, INC.

EH2 Disc Wheel For Emergency Running System With Self-Supporting Tyre



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Fig. 43: Identifying EH2 Disc Wheel

Courtesy of BMW OF NORTH AMERICA, INC.

1. Extended Hump 2 of disc wheel
2. Drop centre relocated a few millimetres to the centre (precentring on outside)

NOTE: The new EH2 disc wheels (extended Hump 2 inner and outer) will be used more frequently on BMW vehicles in the future as they can also help to delay standard tyres from being lost in the event of a drop in tyre pressure.
Example: from current 1.1 bar to 0.6 bar (X5 or Landrover disc wheel)

Emergency Running System With Integrated Support Ring

(In the future, primarily on heavy safety vehicles)

The support ring is made of a high-strength resilient plastic and is fitted on the disc wheel inside the tyre. The support ring can only be removed using special tools which have been specially approved by BMW. It can only

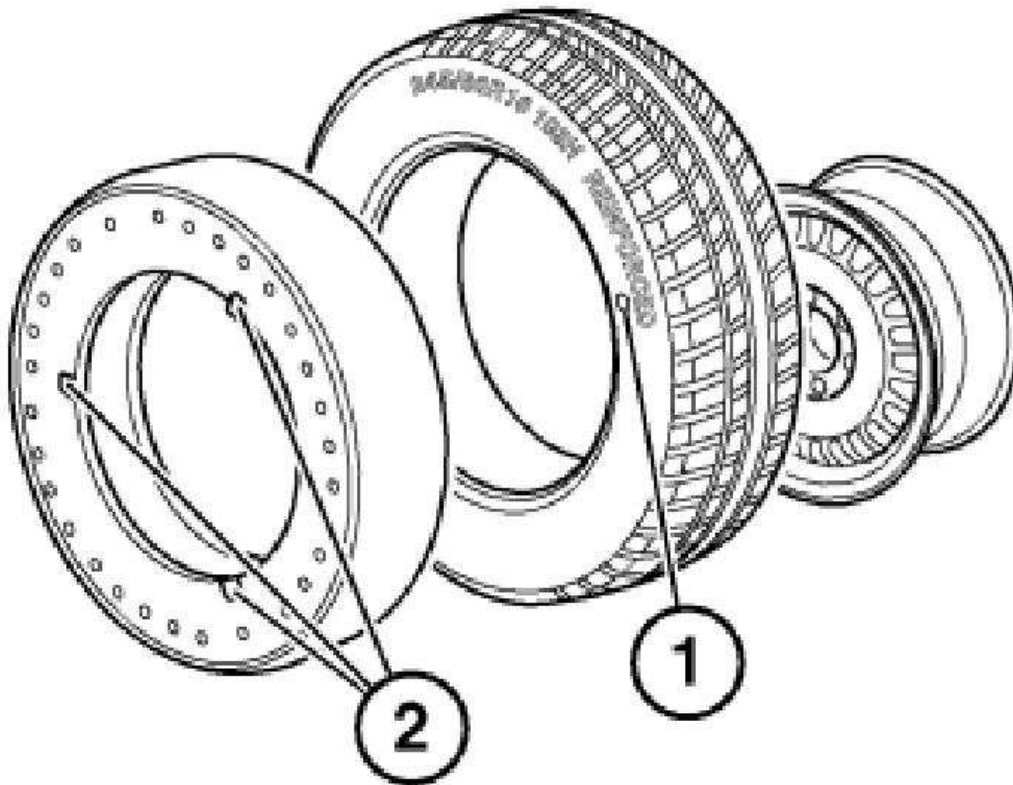
be removed after destroying the tyre.

Emergency running systems with integrated support ring are used in particular on heavy safety vehicles. They allow the vehicle to be driven away from a potential danger without dropping speed even if the tyres have suffered a complete loss of pressure (flight situation).

It is possible as an option to have the tyre pressure monitored by an RDC system. The RDC is installed by pressing the components into the support ring before it is fitted.

Wheel Structure With Integrated Support Ring

Emergency Running System With Integrated Support Ring



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Fig. 44: Identifying Support Ring And Tyre
Courtesy of BMW OF NORTH AMERICA, INC.

1. Tyre

2. Support ring

Installation Location Of RDC Wheel Electronic Unit

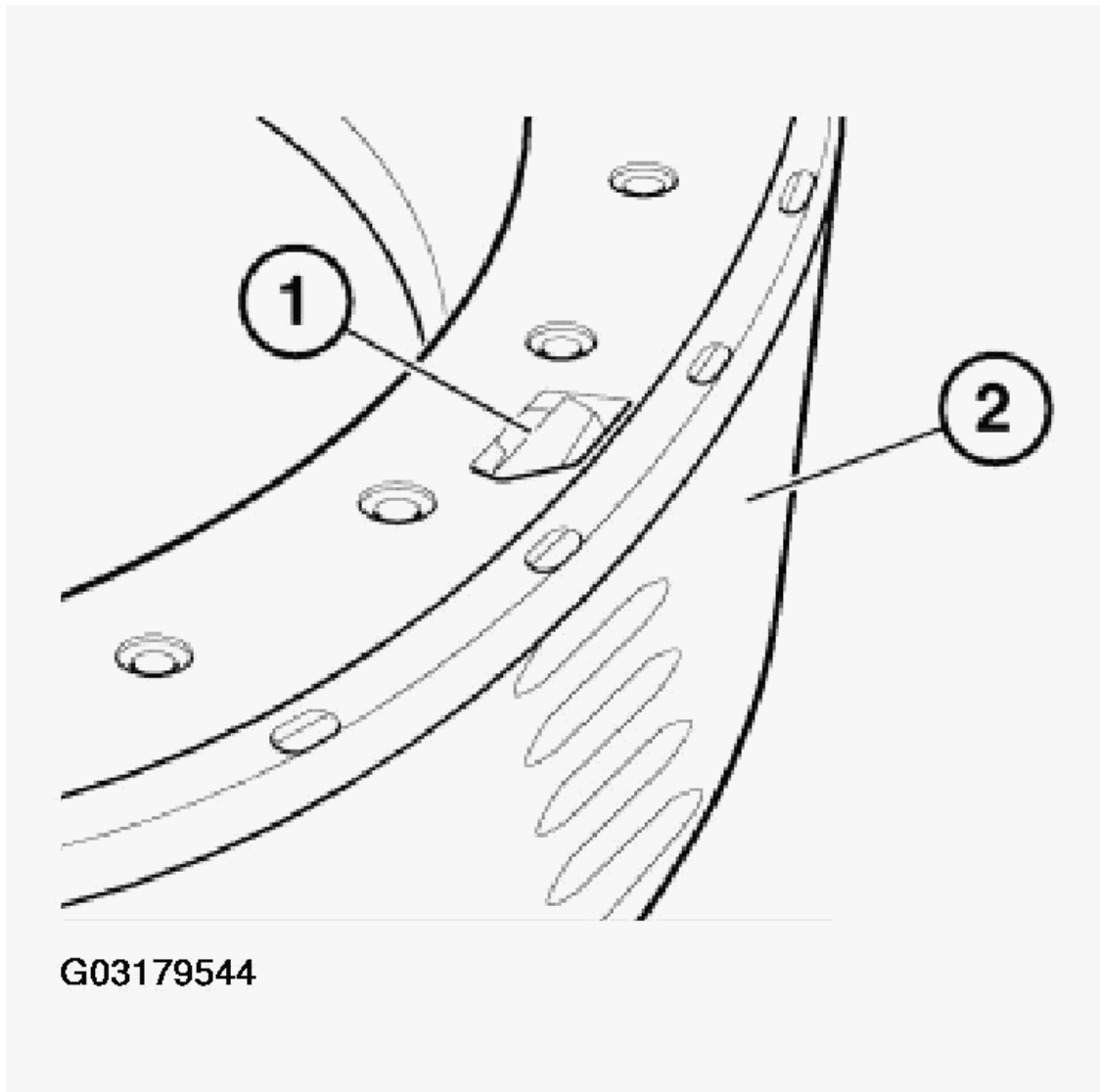


Fig. 45: Identifying Wheel Electronic Unit And Support Ring
Courtesy of BMW OF NORTH AMERICA, INC.

1. Wheel electronic unit
2. Support ring

For further information on the subject of "Tyre pressure warning systems and tyres with emergency running characteristics", please refer to the vehicle Owner's Handbook.

A Parts Information bulletin will be published with information on how to order parts.

Functional and system descriptions are not subject to change. Parts availability and immediate ordering

availability cannot be derived from this information. The specialised departments will inform the markets with further details at the appropriate time.

STORING WHEELS AND TYRES

All Models

WHEELS/TYRES - GENERAL NOTES

The service of storing a customer's wheels is one which is now almost taken for granted. For this reason, we have published this BMW Technical Service bulletin to provide a uniform storage concept, which will prevent damage being caused due to incorrect storage.

The tyre's rubber will age under the influence of sunlight, heat, humidity, movements in the air and ozone, and will thus lose some of its stability and elasticity. For this reason, tyres should never be stored in the open-air. If open-air storage cannot be avoided, the wheels/tyres must be stored in a clean and dry condition and covered with waterproof material. It is essential that wheels/tyres are protected against rain, snow and sunlight, but due to the risk of corrosion they must not be stored in tyre sacks. For more information on protective covers for wheels and tyres, see SI 36 01 88 (864).

Wheels/tyres with tyre pressure control (RDC) must not be cleaned with high-pressure cleaning equipment. For general information on RDC, **TYRES WITH EMERGENCY RUNNING CHARACTERISTICS AND TYRE PRESSURE WARNING SYSTEMS**.

Storage Requirements

The following requirements apply in general to storage in enclosed rooms:

STORING WHEELS AND TYRES SPECIFICATIONS

cool	15...25 °C / sources of heat screened, or 1 m minimum distance from source of heat
dry	Prevent water and condensation Avoid contact with mineral lubrication products
dark	Protect from direct sunlight and high-UV artificial light
moderate ventilation	Avoid a supply of oxygen and ozone

In short, the storage room should be cool and dry. It is not necessary to heat the room during the winter. In the summer, the doors and windows should be kept closed to ensure that no air can circulate. In addition, the windows can also be coated with sun protection paint.

The storage room should not contain any working electric machinery, welding equipment, distribution boxes etc. as electrical sparks generate ozone which can have a serious impact on the surface of the tyre (ozone cracks).

Tyres should not be allowed to come into contact with oil, petrol, or other mineral lubricants as these dissolve rubber, making the tyre porous.

Preparing Wheels/Tyres

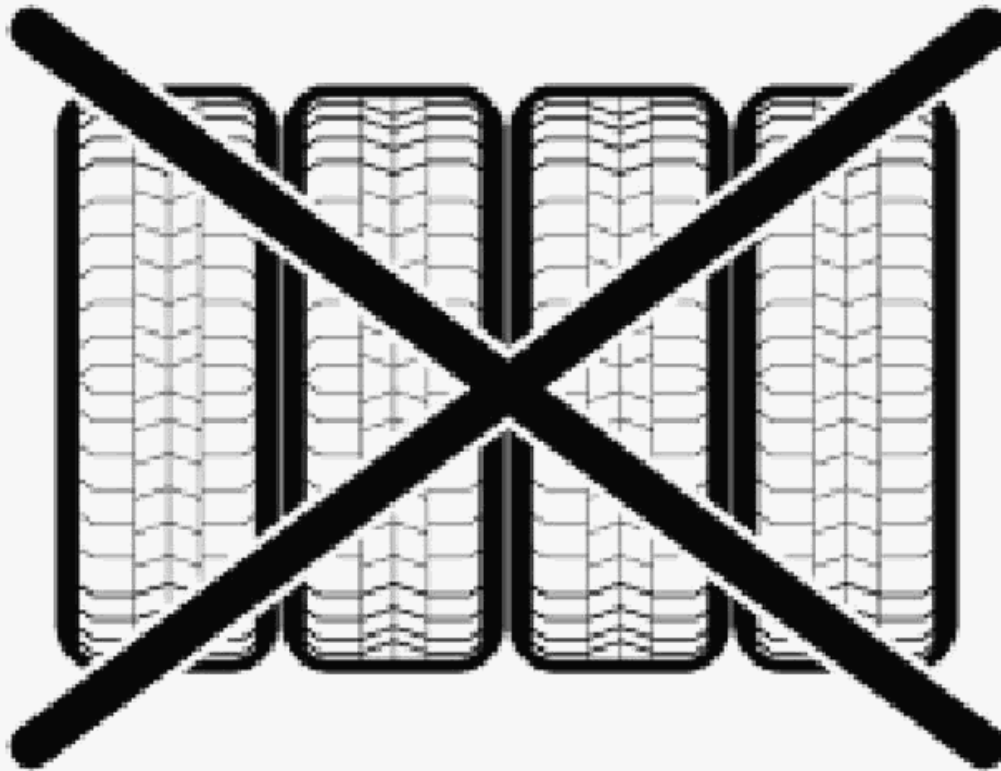
1. Before removing a wheel, mark its position on the vehicle.
2. Whenever possible, keep the tyre on its wheel (complete wheels).
3. Correct the inflation pressure and recheck every 2 months.
4. Ensure that tyres are stored at a sufficient distance above the ground. Wheels/tyres should never be stored on the ground.
5. Complete the storage forms. These should contain the following data:
 - Type and size of tyre
 - Condition and tread depth
 - Customer's address
 - Date and signature of customer

Wheel/Tyre Storage Requirements

A. Tyre fitted to wheel

Do not store upright, ...

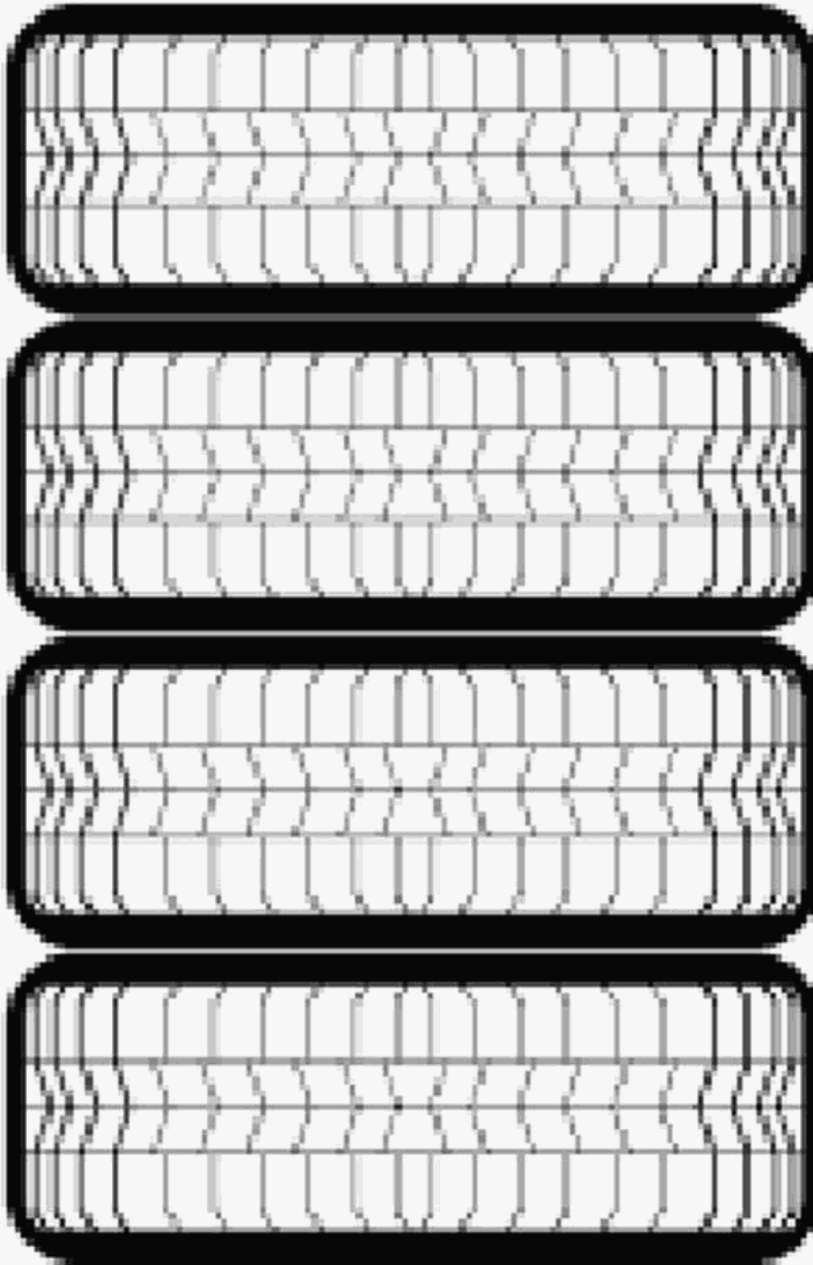
NOTE: If storing the wheels upright cannot be avoided, the inflation pressure must be increased to 3.5 bar.



G03179545

Fig. 46: Use Care When Storing Wheel/Tyre Storage In Upright Position (Tyre Fitted To Wheel)
Courtesy of BMW OF NORTH AMERICA, INC.

... but rather hang ...

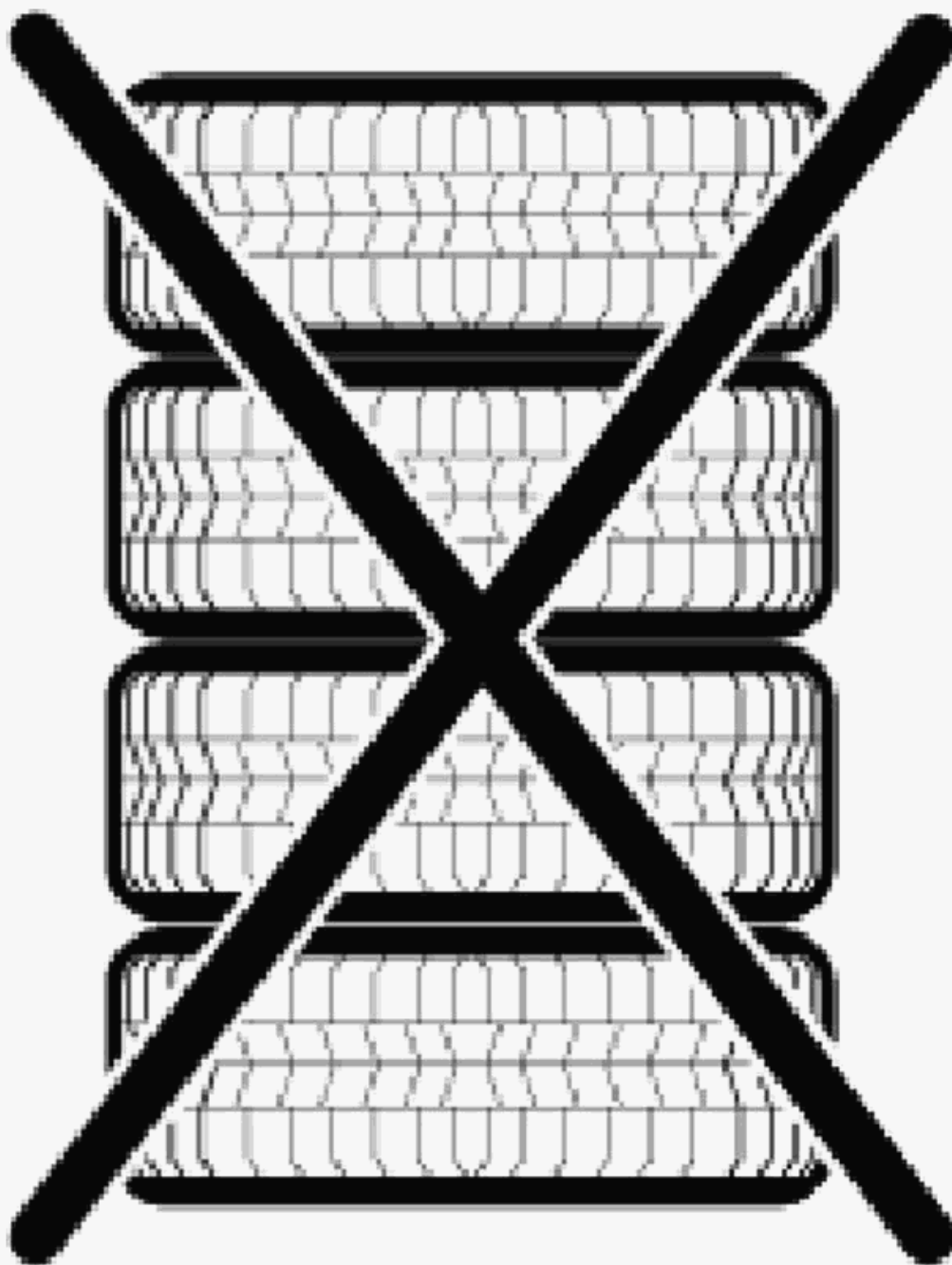


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Fig. 48: Storing Tyres In Stacked Position (Tyre Fitted To Wheel)
Courtesy of BMW OF NORTH AMERICA, INC.

B. Tyres Not Fitted

Do not stack, ...



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Fig. 49: DO NOT Store Wheel/Tyre In Staked Position (Tyres Not Fitted)
Courtesy of BMW OF NORTH AMERICA, INC.

... do not hang, ...

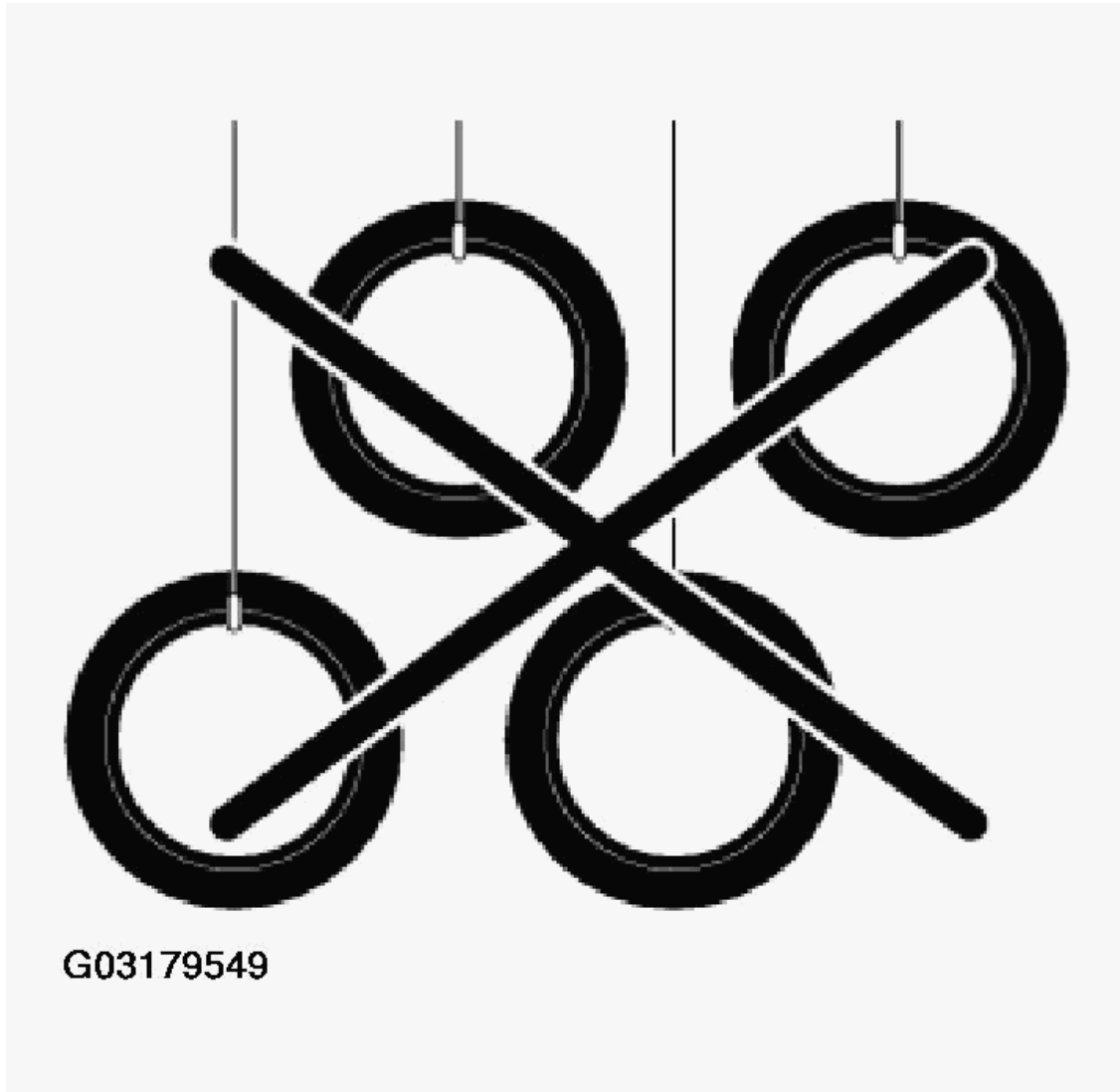
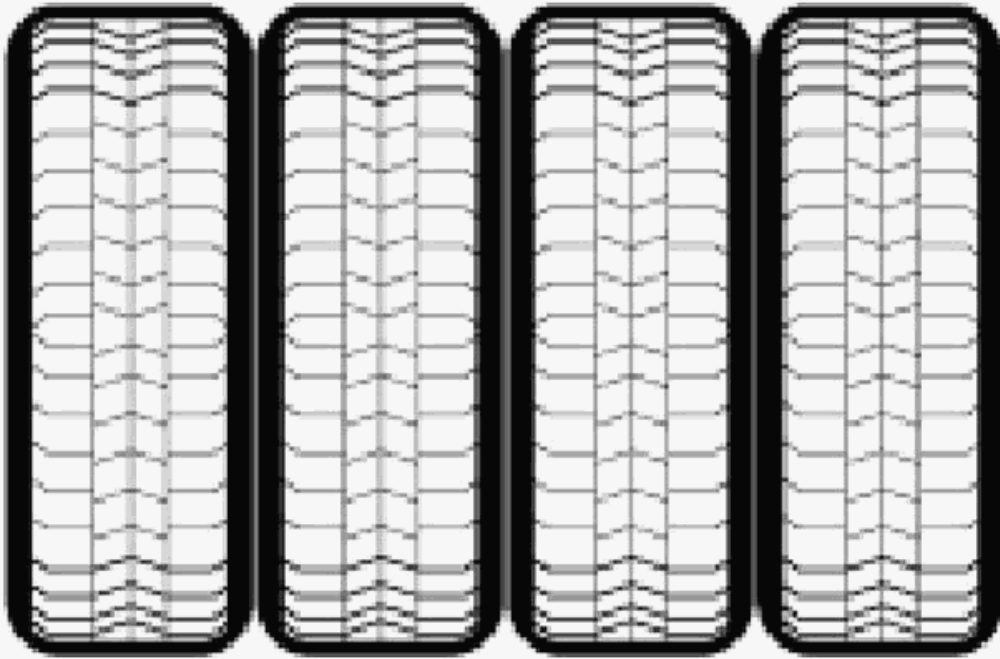


Fig. 50: DO NOT Store Wheel/Tyre In Hanging Position (Tyres Not Fitted)
Courtesy of BMW OF NORTH AMERICA, INC.

... but rather store them upright and turn them every 4 weeks.

NOTE: **Never store tyres on the ground.**
 Use commercially available shelves.



G03179550

Fig. 51: Preferred: Store Tyres In Staked Position (Tyres Not Fitted)
Courtesy of BMW OF NORTH AMERICA, INC.

SUSPENSION

Wheel and Tires - Special Tools - X3

36 WHEELS AND TIRES

36 1 010 SPRING LIFTER

Note: For lifting retaining spring when removing and installing balance weight

Series: E12, E21, E23, E24, E28, E30, E31, E32, E34, E36, E38, E39, E46, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E83, E85, E86, E87, E90, E91, E92, E93

Storage location: A28

SI number: 1 01 96(034)

Order number: 36 1 010

Spring lifter

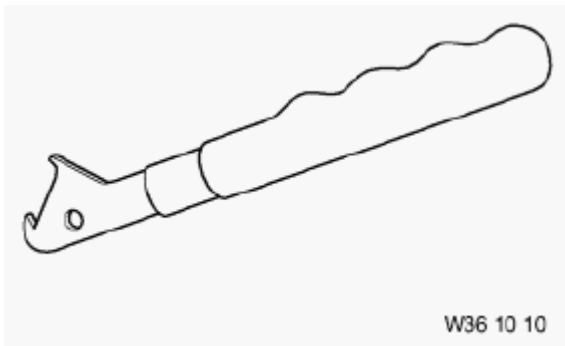


Fig. 1: Spring Lifter (36 1 010)

Courtesy of BMW OF NORTH AMERICA, INC.

36 1 020 TYRE PLIERS

Note: For compressing sides of tires when removing and installing retaining spring

Series: E12, E21, E23, E24, E28, E30, E31, E32, E34, E36, E38, E39, E46, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E83, E85, E86, E87, E90, E91, E92, E93

SI number: 1 01 96(034)

Order number: 36 1 020

Tyre pliers

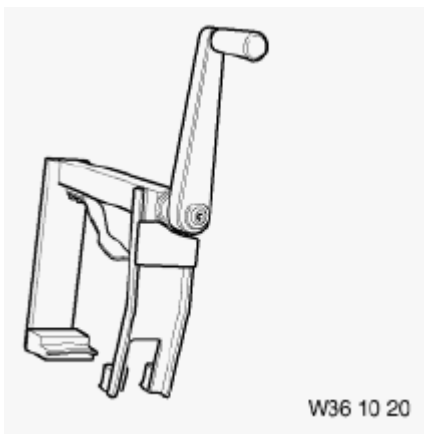


Fig. 2: Tyre Pliers (36 1 020)

Courtesy of BMW OF NORTH AMERICA, INC.

36 1 030 TESTER

Note: For measuring vertical and lateral runout of wheels

Series: E12, E21, E23, E24, E28, E30, E30/C, E30tou, E31, E32, E32/3, E34, E34tou, E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53, R56, RR1, RR2

SI number: 1 11 00 (594)

Order number: 36 1 030

Tester

Consisting of:

1 = 36 1 031 Pedestal

2 = 36 1 032 Post with clamp

3 = 36 1 033 Holder with clamp

4 = 36 1 034 Clamp

5 = 36 1 035 Measuring roller

6 = 36 1 036 Dial gauge

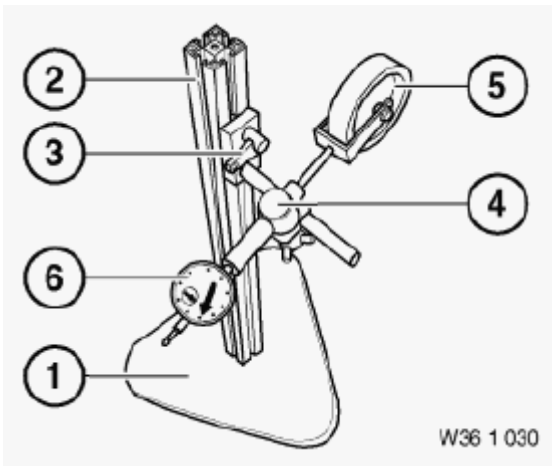


Fig. 3: Tester (36 1 030)

Courtesy of BMW OF NORTH AMERICA, INC.

36 1 040 SCRAPER

Note: For removing stick-on weights from aluminum rims

Series: All models

Storage location: Single

SI number: 1 13 00(596)

Order number: 36 1 040

Scraper

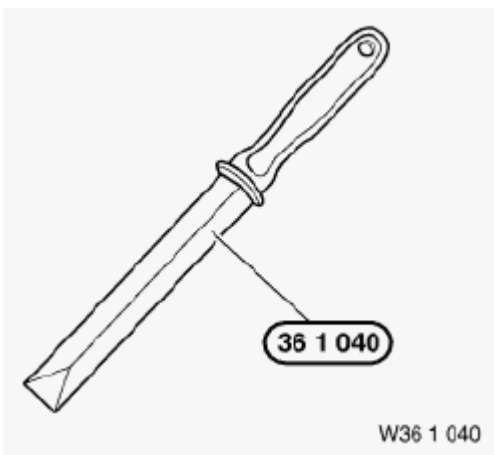


Fig. 4: Scraper (36 1 040)

Courtesy of BMW OF NORTH AMERICA, INC.

36 1 120 LEVER

Note: For prying off Styling 90 wheel cover

Series: E60, E61, E63, E64, E65, E66, E67, E83, E86, E87, E90, E92

SI number: 1 14 01(766)

Order number: 36 1 120

Lever

Consisting of:

1 = 36 1 121 Lever, individual

2 = 36 1 122 Support

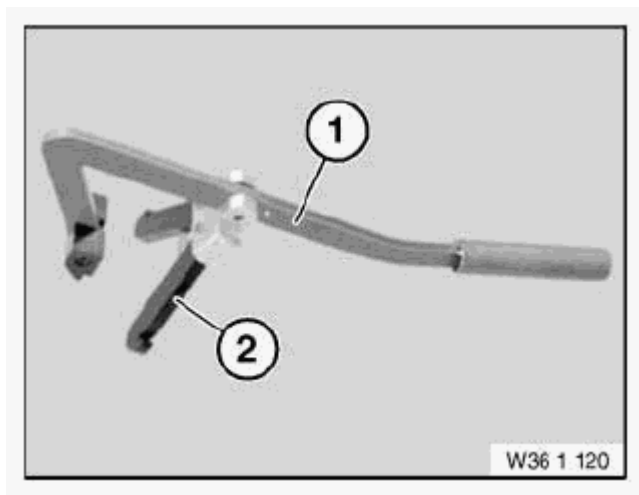


Fig. 5: Lever (36 1 120)

Courtesy of BMW OF NORTH AMERICA, INC.

36 1 250 WHEEL HUB GRINDER

Note: For cleaning wheel hubs

Series: E12, E21, E23, E24, E28, E30, E30/C, E30tou, E31, E32, E32/3, E34, E34tou, E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E83, E85, E86, E87, E90, E92, R50, R52, R53, RR1, RR2

SI number: 1 15 03 (005)

Order number: 36 1 250

Wheel hub grinder

Consisting of:

1 = 36 1 251 Basic body

Note: Basic body with mounting screws (slotted pan-head screw)

2 = 36 1 252 Grinding wheel

3 = 36 1 253 Slotted pan-head screw (3 x)

Note: For securing grinding wheel on basic body

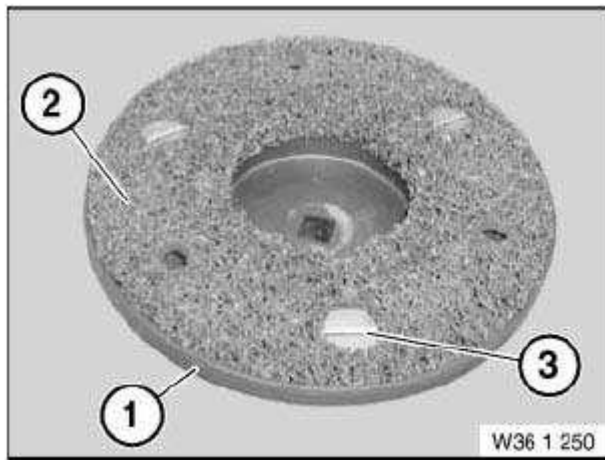


Fig. 6: Wheel Hub Grinder (36 1 250)

Courtesy of BMW OF NORTH AMERICA, INC.

36 1 300 SET OF WHEEL STUD ADAPTERS

Minimum set: Mechanical tools

Note: For loosening and tightening wheel studs (antitheft)

Series: E12, E21, E23, E24, E28, E30, E31, E32, E34, E36, E38, E39, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53

SI number: 1 27 04 (167)

Order number: 36 1 300

Set of wheel stud adapters

Consisting of:

36 1 301 Code 11

36 1 302 Code 12

36 1 303 Code 13

36 1 304 Code 14

36 1 306 Code 16

36 1 307 Code 17

36 1 308 Code 18

36 1 309 Code 19

36 1 311 Code 20

36 1 305 Code 15

36 1 323 Code 30

Note: With centering bore

36 1 324 Code 31

Note: With centering bore

36 1 325 Code 32

Note: With centering bore

36 1 326 Code 33

Note: With centering bore

36 1 327 Code 34

Note: With centering bore

36 1 328 Code 35

Note: With centering bore

36 1 329 Code 36

Note: With centering bore

36 1 331 Code 37

Note: With centering bore

36 1 332 Code 38

Note: With centering bore

36 1 333 Code 40

Note: With centering bore



Fig. 7: Set Of Wheel Stud Adapters (36 1 300)
Courtesy of BMW OF NORTH AMERICA, INC.

36 1 335 SUPPLEMENTARY SET FOR WHEEL BOLT ADAPTER KIT 36 1 300

Note: Consisting of: 36 1 323 Code 30 36 1 324 Code 31 36 1 325 Code 32 36 1 326 Code 33 36 1 327 Code 34
36 1 328 Code 35 36 1 329 Code 36 36 1 331 Code 37 36 1 332 Code 38 36 1 333 Code 40 36 1 336
Connection diagram sticker

SI number: 1 27 04 (167)

Order number: 36 1 335

Supplementary set for wheel bolt adapter kit 36 1 300



Fig. 8: Set Of Wheel Stud Adapters (36 1 300)
Courtesy of BMW OF NORTH AMERICA, INC.

36 1 336 CONNECTION DIAGRAM STICKER

Order number: 36 1 336

Connection diagram sticker



Fig. 9: Set Of Wheel Stud Adapters (36 1 300)
Courtesy of BMW OF NORTH AMERICA, INC.

36 1 339 CASE WITH INLAY

Note: incl. connection diagram sticker

Order number: 36 1 339

Case with inlay



Fig. 10: Set Of Wheel Stud Adapters (36 1 300)
Courtesy of BMW OF NORTH AMERICA, INC.

36 2 010 SET OF BMW WHEEL BOLT ADAPTERS

Minimum set: Mechanical tools

Note: For releasing / tightening wheel bolts with security code. Adapter kit comprising 20 adapters for BMW vehicles.

SI number: 01 13 06 (275)

Order number: 36 2 010

Set of BMW wheel bolt adapters



Fig. 11: Set Of BMW Wheel Bolt Adapters (36 2 010)
Courtesy of BMW OF NORTH AMERICA, INC.

SUSPENSION

Wheel and Tires - Technical Data - X3

10 WHEELS

36 10 WHEELS ONE-PART ALLOY WHEELS

TECHNICAL DATA - WHEELS ONE-PART ALLOY WHEELS

Max. radial runout of tire Rim with tire	max. mm	1.1
Max. axial runout or tire Rim with tire	max. mm	1.3
Max. radial runout out rim	max. mm	0.3
Max. axial runout of rim	max. mm	0.3
Max. imbalance for each side (before balancing)	max. g	90 for clamp weights 120 for stick-on weights
Permissible residual imbalance for each side (after balancing)	max. g	4
Elimination of imbalance: Up to 60 g with one weight or more than 60 g with two weights		

36 10 WHEELS STEEL AND ALUMINIUM STRIP WHEELS

TECHNICAL DATA - WHEELS STEEL AND ALUMINIUM STRIP WHEELS

Max. radial runout of tire Rim with tire	max. mm	1.6
Max. axial runout or tire Rim with tire	max. mm	1.8
Max. radial runout out rim	max. mm	0.8
Max. axial runout of rim	max. mm	0.8
Max. imbalance for each side (before balancing)	max. g	90 for clamp weights 120 for stick-on weights
Permissible residual imbalance for each side (after balancing)	max. g	4
Elimination of imbalance: Up to 60 g with one weight or more than 60 g with two weights		

36 10 WHEELS TWO-PART ALLOY WHEELS

TECHNICAL DATA - WHEELS TWO-PART ALLOY WHEELS

Max. radial runout of tire Rim with tire	max. mm	1.3
---	---------	-----

Max. axial runout or tire Rim with tire	max. mm	1.5
Max. radial runout out rim	max. mm	0.5
Max. axial runout of rim	max. mm	0.5
Max. imbalance for each side (before balancing)	max. g	90 for clamp weights 120 for stick-on weights
Permissible residual imbalance for each side (after balancing)	max. g	4
Elimination of imbalance: Up to 60 g with one weight or more than 60 g with two weights		

SUSPENSION

Wheel and Tires - Tightening Torques - X3

10 WHEELS

36 10 WHEELS

WHEELS TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Wheel bolt	E30 / E31 / E32 / E34 / E36 / E38 / E39 / E46 / E52 / E60 / E61 / E63 / E64 / E85 / E86	M12		120 ± 10 Nm
	E53 / E65 / E66 / E67 / E83	M14		140 ± 10 Nm

11 DISC WHEELS (RIMS)

36 11 WHEEL RIMS

WHEEL RIMS TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Wheel cover on disc wheel Bolts coated with blue Loctite No. 243	E31 / E32 / E34			9 Nm
2AZ Valve on disc wheel (RDC)	E38 / E39 / E46 / E53 / E65 / E66			3.5 Nm
3AZ Wheel electronics (RDC) on valve	E38 / E39 / E46 / E53 / E65 / E66			3.5 Nm

36 11 WHEEL RIMS

WHEEL RIMS TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Valve on disc wheel (RDC)	E83 / E90 / E91 / E92 / E93			3.5 Nm
2AZ Wheel electronics (RDC) on valve	E83 / E90 / E91 / E92 / E93			3.5 Nm

SUSPENSION

Wheels & Tires - Repair Instructions - X3

10 WHEELS

36 10 209 CHECKING FRONT AND REAR WHEEL FOR FACE AND RADIAL RUNOUT

Special tools required:

- 36 1 030 TESTER .

Necessary preliminary tasks:

- Check wheel bearings

Lift vehicle.

Check wheel with special tool 36 1 030 (measuring fixture) for lateral runout and radial runout, see 36 10 WHEELS ONE-PART ALLOY WHEELS ;36 10 WHEELS STEEL AND ALUMINUM STRIP WHEELS ;36 10 WHEELS TWO-PART ALLOY WHEELS .

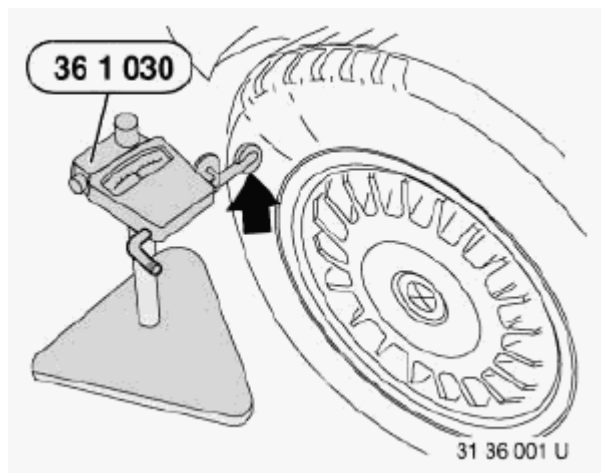


Fig. 1: Lateral Runout With Special Tool (36 1 030)
Courtesy of BMW OF NORTH AMERICA, INC.

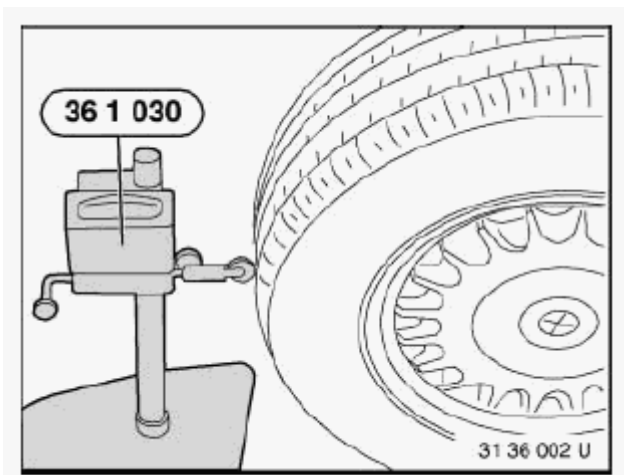


Fig. 2: Checking Radial Runout With Special Tool (36 1 030)
Courtesy of BMW OF NORTH AMERICA, INC.

If applicable, remove balance weights.

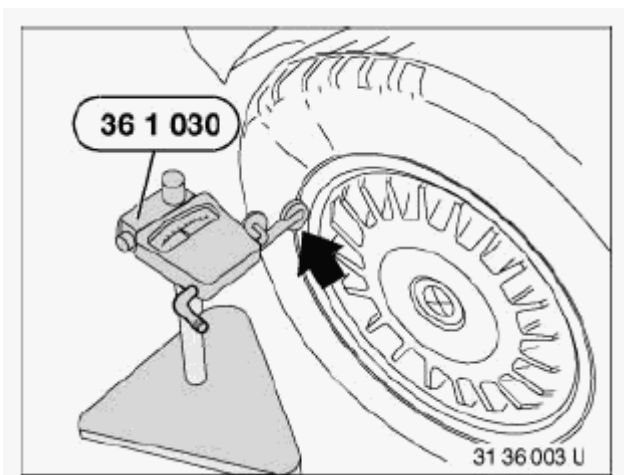


Fig. 3: Lateral Runout Of Rim With Special Tool (36 1 030)
Courtesy of BMW OF NORTH AMERICA, INC.

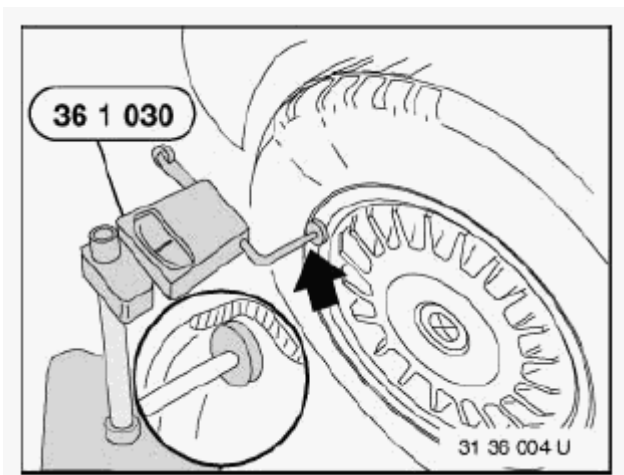


Fig. 4: Radial Runout With Special Tool (36 1 030)
Courtesy of BMW OF NORTH AMERICA, INC.

36 10 300 REMOVING OR INSTALLING FRONT OR REAR WHEEL

Special tools required:

See, **36 WHEELS AND TYRES**

- 36 1 120
- 36 1 250
- 36 1 300

IMPORTANT: Observe safety instructions on 00 LIFTING VEHICLE WITH A LIFTING PLATFORM .

Follow instructions on initializing Run Flat Indicator (RPA), see 36 11 500 Initializing Run Flat Indicator (RPA).

After completing installation, check again that all wheel bolts are tightened to specified torque.

Tightening torque: 36 10 1AZ, see 36 10 WHEELS .

Observe the following procedure to prevent shift errors and imbalance:

- Loosen wheel bolts.
- Wheel positioned with valve facing down.
- If several wheels are removed simultaneously, mark the installation locations of the wheels on the tires (e.g. with chalk).
- Mark out wheel to wheel hub.
- Mark out lockable wheel bolt in relation to wheel.
- Release wheel bolts, remove wheel.

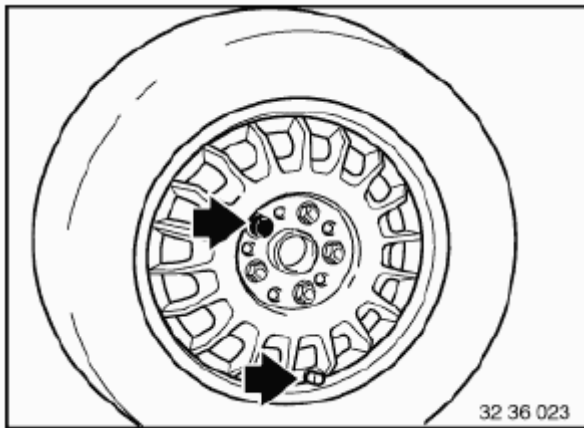


Fig. 5: Valve And Nut

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Contact surfaces between:

- brake disk and disk wheel,
- brake disk and wheel hub,

must be free from grease.

Remove dirt, grease residues and corrosion from contact

face (1) with a drill and special tool 36 1 250.

IMPORTANT: Do not operate special tool 36 1 250 with an impact screwdriver!

NOTE: Degrease contact face with universal cleaner.

NOTE: If there are grease residues in the area of the wheel stud bore, the brake disk must be removed and cleaned, see 34 11 220 REMOVING AND INSTALLING/REPLACING BOTH FRONT BRAKE DISCS .

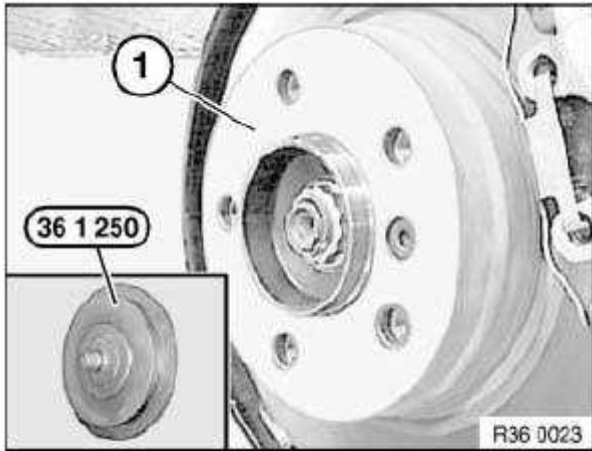


Fig. 6: Contact Face With Special Tool (36 1 250)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove dirt, grease residues and corrosion from contact face (1) with a drill and special tool 36 1 250.

IMPORTANT: Do not operate special tool 36 1 250 with an impact screwdriver!

NOTE: Degrease contact face with universal cleaner.

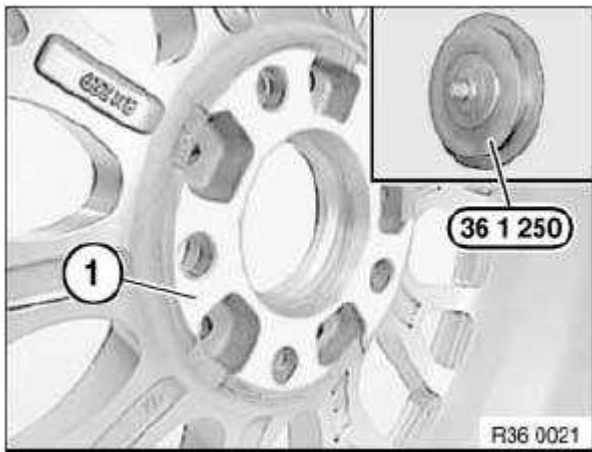


Fig. 7: Brake Disc With Special Tool (36 1 250)
Courtesy of BMW OF NORTH AMERICA, INC.

Check brake disk retaining bolt (1) for secure seating.

IMPORTANT: Mounting bolt (1) must not under any circumstances protrude over contact surface (2) between brake disk and disk wheel.

Tightening torque brake disk retaining bolt:

Front axle 34 11 1AZ, see **34 11 FRONT BRAKE**

Rear axle 34 21 1AZ, see **34 21 REAR BRAKE**

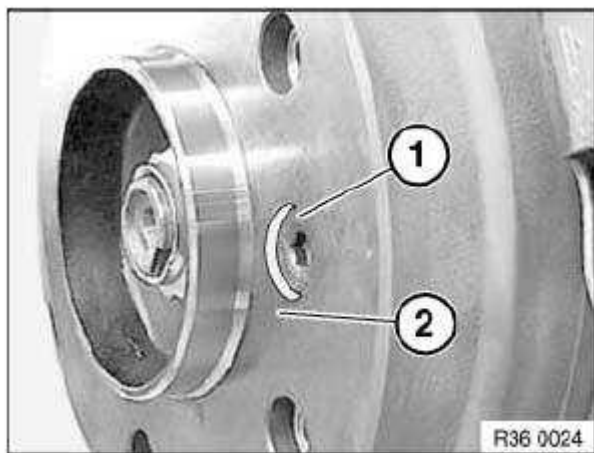


Fig. 8: Brake Disk Retaining Bolt And With Contact Surface
Courtesy of BMW OF NORTH AMERICA, INC.

Apply a thin coat of grease to wheel centering (1) in disk wheel.

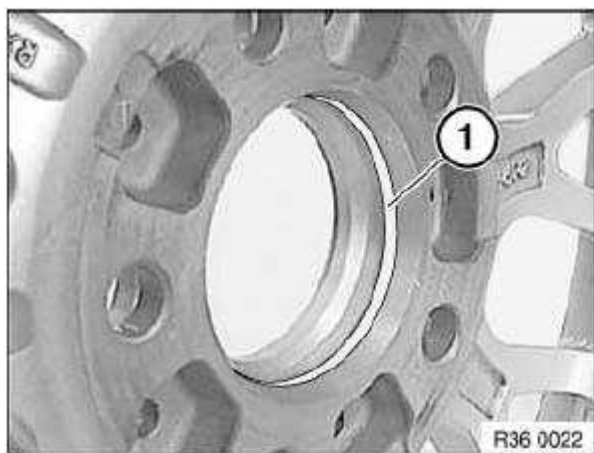


Fig. 9: Wheel Centering In Disk Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

Wheel studs with taper:

- a. Wheel bolt - galvanized
- b. Wheel bolt - black chrome plated
- c. Wheel bolt - black chrome plated and lockable
- d. Lockable wheel stud with adapter, black chrome-plated

NOTE: To release and tighten down lockable wheel stud, use a matching adapter from special tool 36 1 300.

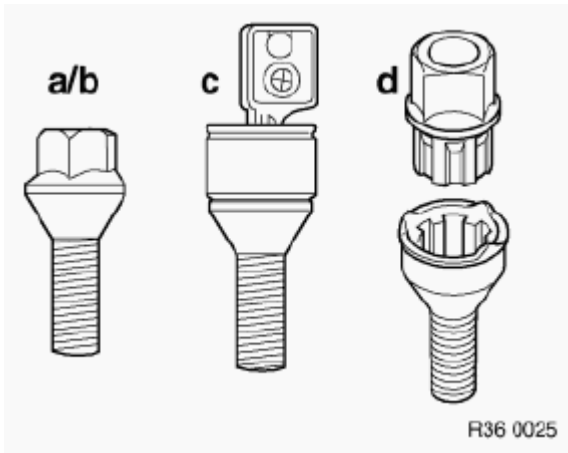


Fig. 10: Wheel Stud With Adapter

Courtesy of BMW OF NORTH AMERICA, INC.

Clean wheel bolts and check threads for damage, replace, if necessary.

Replace rusty wheel bolts.

IMPORTANT: Do not apply oil to new wheel bolts.

Before inserting, wipe threads and tapers of used wheel bolts with an oil cloth.

**IMPORTANT: You may use an impact or power screwdriver to insert the wheel bolts and join the wheel until a tightening torque of 20 Nm is obtained.
Do not under any circumstances use an impact or power screwdriver to tighten down the wheel bolts (in diagonal sequence); this must be done by hand.**

Tighten down wheel bolts with a calibrated torque wrench to prescribed tightening torque.

Tightening torque 36 10 1AZ, see **36 10 WHEELS** .

IMPORTANT: Disk wheel must rest uniformly against brake disk.

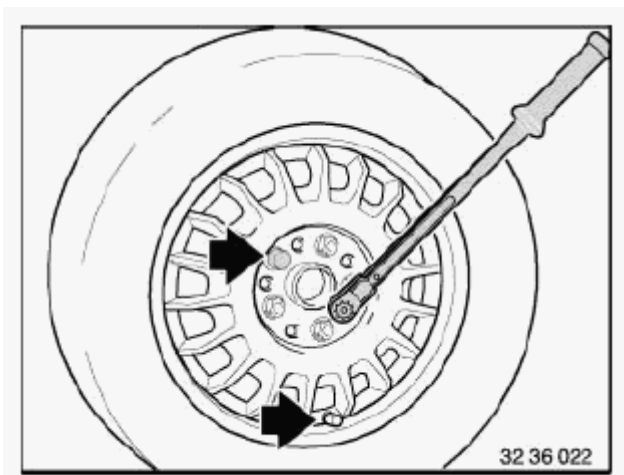


Fig. 11: Down Wheel Bolts With Calibrated Torque Wrench
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: For wheels with Styling 90 wheel cover.
The wheel cover can be removed for cleaning and removal of foreign objects.

Fit special tool 36 1 120 (3) as shown on rim (1) (near valve).

Engage removal fork of special tool 36 1 120 (3) in wheel cover (2).

Pull off wheel cover (2) with handle of special tool 36 1 120 (3).



Fig. 12: Rim With Wheel Cover
Courtesy of BMW OF NORTH AMERICA, INC.

36 10 508 STATIONARY WHEEL BALANCING

Special tools required:

See **36 WHEELS AND TYRES** .

- 36 1 010
- 36 1 020

Necessary preliminary tasks:

- Remove the wheel, see **36 10 300 Removing or installing front or rear wheel.**

IMPORTANT: Use only BMW-approved balance weights.

Remove any fitted balancing weights, stones in tread pattern and larger contaminants.

Check tire pressure, check tire for condition, damage, flat spots (out-of-round caused by e.g. stopping the car with hot tires); if necessary, check wheel and tire for radial and lateral runout, see **36 10 209 Checking front and rear wheel for face and radial runout**

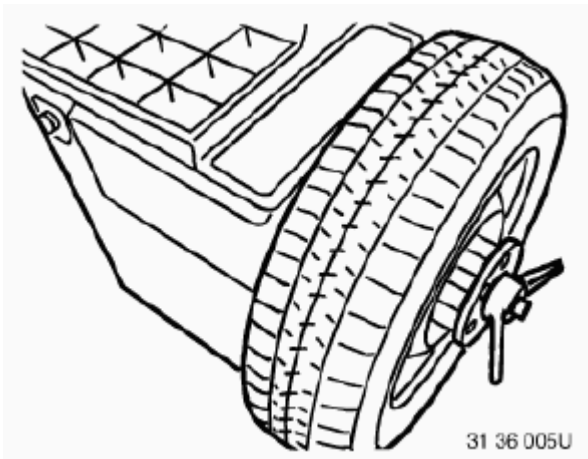


Fig. 13: Checking Wheel And Tyre For Radial And Lateral Runout
 Courtesy of BMW OF NORTH AMERICA, INC.

Use BMW-approved centering elements of relevant balancing machine manufacturers.

1. Basic flange
2. Wheel centering element
3. Type flange
4. Clamping nut

Also refer to section on **WORKSHOP EQUIPMENT** .

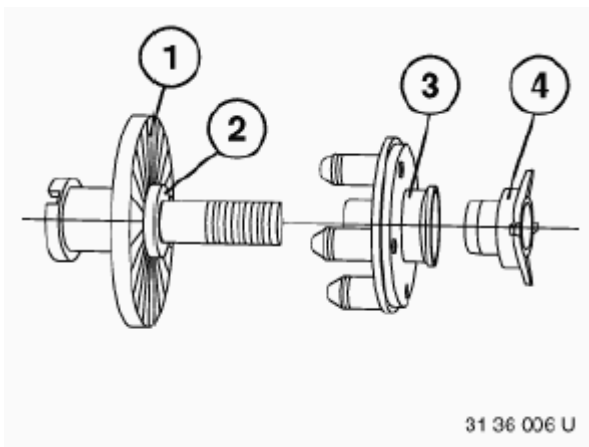


Fig. 14: Basic Flange, Wheel Centering Element And Clamping Nut
 Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: To avoid retooling errors, it will be necessary to fit the wheel on the balancing machine in the same way (e.g. valve facing down) as it is then fitted on the car. Balance wheel in accordance with operating instructions of relevant balancing machine.

On light-alloy rims with distinctive J-shape rim flange, proceed as follows:

1. Gently force off tire side wall with special tool 36 1 020 at appropriate point from rim flange.
2. Install retaining clip (1).
3. Remove special tool 36 1 020.

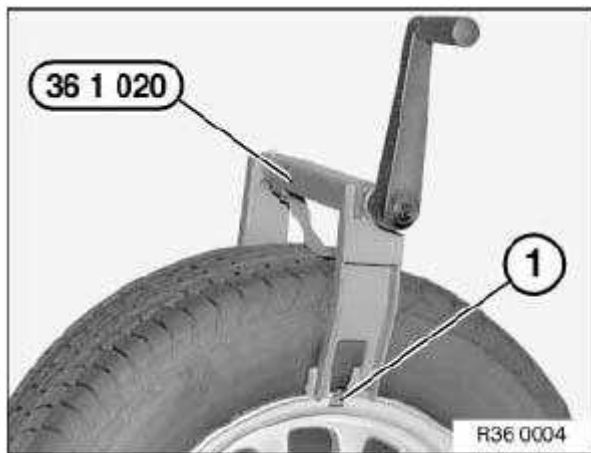


Fig. 15: Retaining Clip Special Tool (36 1 020)
 Courtesy of BMW OF NORTH AMERICA, INC.

Raise retaining clip with special tool 36 1 010. Slide balance weight underneath and allow it to snap into place.

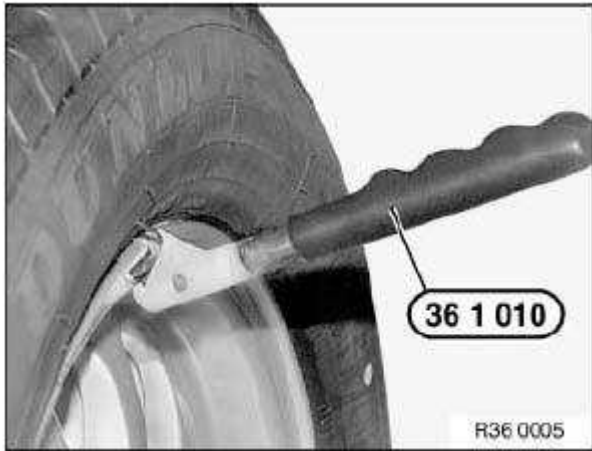


Fig. 16: Special Tool (36 1 010)
Courtesy of BMW OF NORTH AMERICA, INC.

Arrangement of balance weights for light-alloy rims with distinctive J-shape rim flanges.

1. Spring retainer
2. Balance weight

Adhesive weights must be used on all other light-alloy rims. **36 10 WHEELS ONE-PART ALLOY WHEELS** .

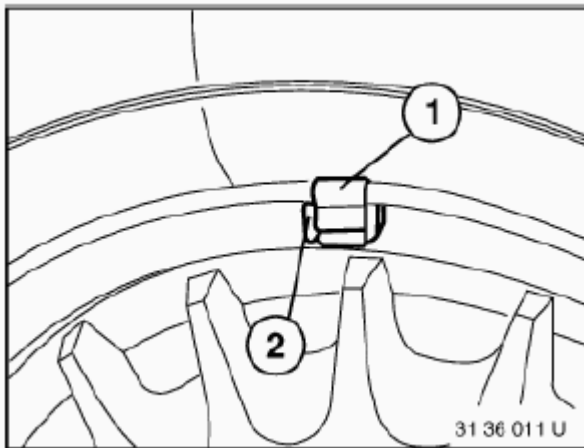


Fig. 17: Spring Retainer And Balance Weight
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: When using adhesive weights, proceed as follows:

1. Carefully remove any adhesive weights. Do not damage rim when doing so.
2. Select suitable location for fitting.

3. Clean adhesive area thoroughly.

IMPORTANT: On the E87 with 16" tires, do not use stick-on weights; use only clamp-on weights instead.

36 10 713 CHECKING ONE ROAD WHEEL ON BALANCING MACHINE FOR FACE AND RADIAL RUNOUT (WHEEL REMOVED)

Special tools required:

See 36 WHEELS AND TYRES .

- 36 1 030
- 36 1 031
- 36 1 032
- 36 1 033
- 36 1 034
- 36 1 035
- 36 1 036

Necessary preliminary tasks:

- Remove wheel, see 36 10 300 Removing or installing front or rear wheel.

Mount wheel in balancing machine.

To avoid retooling errors, fit the wheel on the balancing machine in the same way as it is also fitted on the car (valve position facing down).

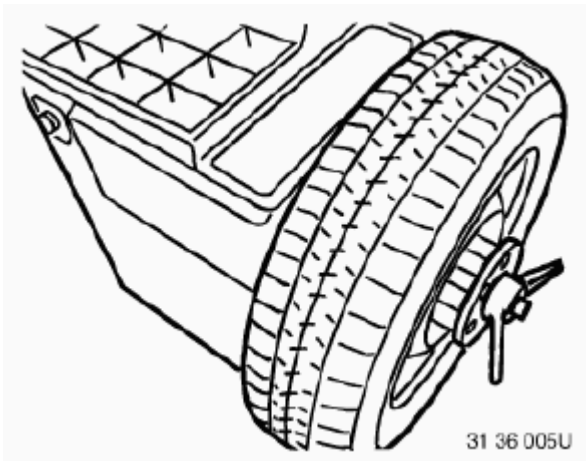


Fig. 18: Wheel And Tyre For Radial And Lateral Runout
Courtesy of BMW OF NORTH AMERICA, INC.

Use suitable wheel centering element supplied with corresponding balancing machine.

1. Basic flange
2. Wheel centering element
3. Type flange
4. Clamping nut

Also refer to section on **WORKSHOP EQUIPMENT** .

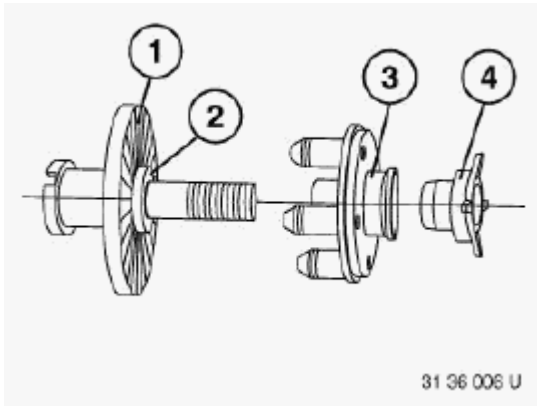


Fig. 19: Basic Flange, Wheel Centering Element And Clamping Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Use special tool 36 1 030 for testing.

Special tool 36 1 030 consists of:

1. Stand 36 1 031
2. Post with clamp 36 1 032
3. Holder with clamp 36 1 033
4. Clamp 36 1 034
5. Measuring roller 36 1 035
6. Dial gauge 36 1 036

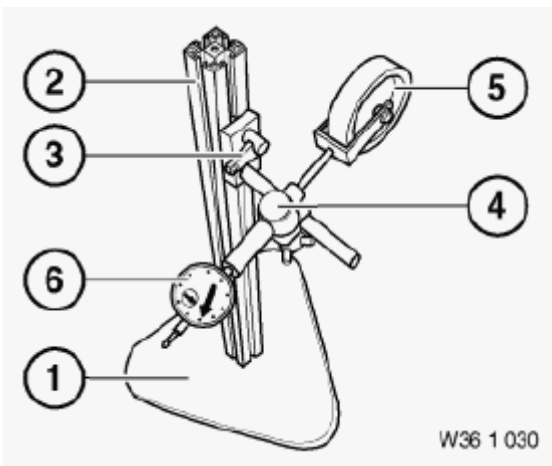


Fig. 20: Special Tool (36 1 031), (36 1 032) And (36 1 036)
 Courtesy of BMW OF NORTH AMERICA, INC.

Position special tool 36 1 030 on tire tread.

Turn wheel by hand and measure max radial tire runout, see **36 10 WHEELS ONE-PART ALLOY WHEELS ;36 10 WHEELS STEEL AND ALUMINUM STRIP WHEELS ;36 10 WHEELS TWO-PART ALLOY WHEELS** .

NOTE: Measuring device must be vertical to tire tread.

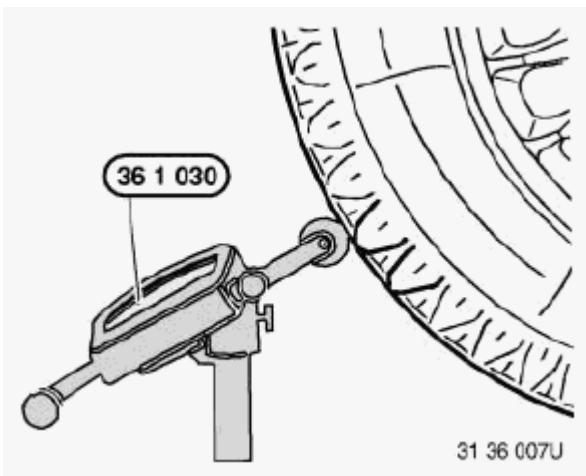


Fig. 21: Special Tool (36 1 030)
 Courtesy of BMW OF NORTH AMERICA, INC.

Position special tool 36 1 030 on tire side wall.

Turn wheel by hand and measure max lateral tire runout, see **36 10 WHEELS ONE-PART ALLOY WHEELS ;36 10 WHEELS STEEL AND ALUMINUM STRIP WHEELS ;36 10 WHEELS TWO-PART ALLOY WHEELS** .

NOTE: Measuring device must be vertical to tire side wall.
Never measure on printed text on tire!
If necessary, check disk wheel (rim) for radial and face runout, see 36 10 WHEELS ONE-PART ALLOY WHEELS ;36 10 WHEELS STEEL AND ALUMINUM STRIP WHEELS ;36 10 WHEELS TWO-PART ALLOY WHEELS .

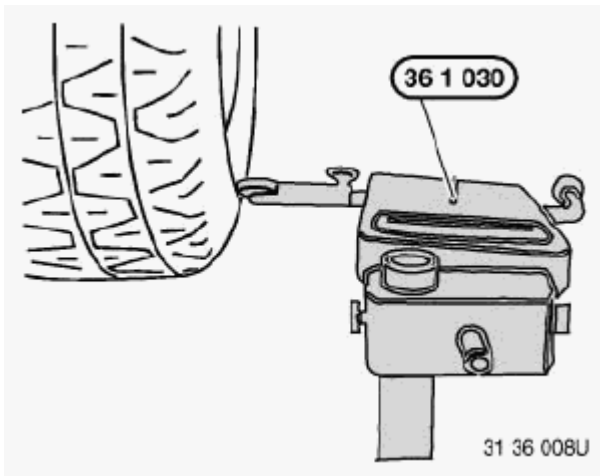


Fig. 22: Special Tool (36 1 030)

Courtesy of BMW OF NORTH AMERICA, INC.

36 10 715 CHECKING RIM FOR FACE AND RADIAL RUNOUT

Necessary preliminary tasks:

- Remove wheel, see 36 10 300 Removing or installing front or rear wheel.
- Check front and rear wheel for face and radial runout, see 36 10 WHEELS ONE-PART ALLOY WHEELS ;36 10 WHEELS STEEL AND ALUMINUM STRIP WHEELS ;36 10 WHEELS TWO-PART ALLOY WHEELS .
- Pull tire off rim
- Remove fitted balance weights
- Remove dirt from rim well and rim flange

IMPORTANT: Disk wheels must not be repaired!

Mount disk wheel in balancing machine.

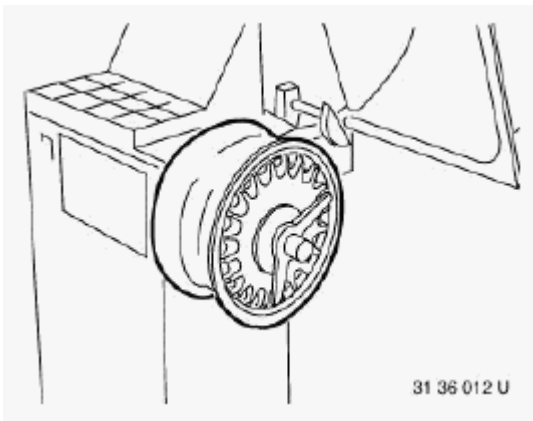


Fig. 23: Mount Disk Wheel In Balancing Machine
Courtesy of BMW OF NORTH AMERICA, INC.

Use suitable wheel centering element supplied with corresponding balancing machine.

1. Basic flange
2. Wheel centering element
3. Type flange
4. Clamping nut

Also refer to section on **WORKSHOP EQUIPMENT** .

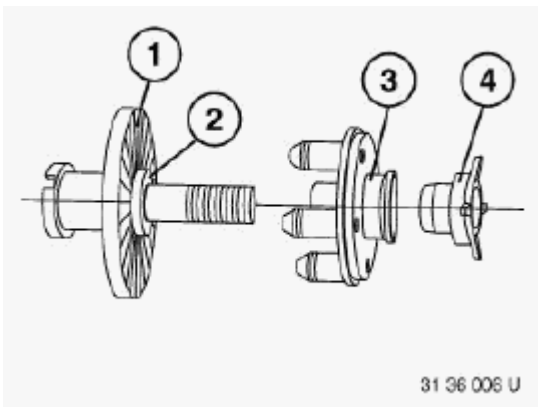


Fig. 24: Basic Flange, Wheel Centering Element And Clamping Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Place dial gauge sensor on rim shoulder.

Turn wheel by hand and measure max radial runout, see **36 10 WHEELS ONE-PART ALLOY WHEELS ;36 10 WHEELS STEEL AND ALUMINUM STRIP WHEELS ;36 10 WHEELS TWO-PART ALLOY WHEELS** .

Carry out measurement on both rim shoulder sides.

NOTE: Dial gauge must be vertical to rim shoulder.

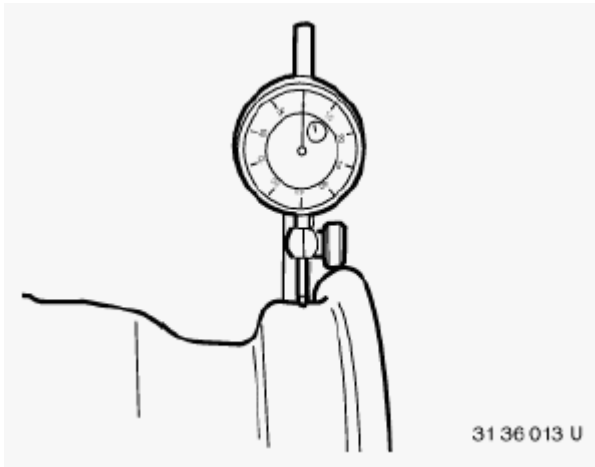


Fig. 25: Checking Radial Runout With Dial Gauge
Courtesy of BMW OF NORTH AMERICA, INC.

Position sensor on rim flange.

Turn wheel by hand and measure max lateral runout, see **36 10 WHEELS ONE-PART ALLOY WHEELS ;36 10 WHEELS STEEL AND ALUMINUM STRIP WHEELS ;36 10 WHEELS TWO-PART ALLOY WHEELS** .

Carry out measurement on both rim flanges.

NOTE: Dial gauge must be vertical to rim flange.

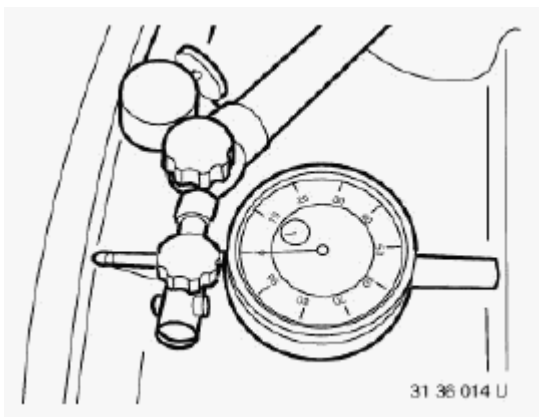


Fig. 26: Checking Lateral Runout With Dial Gauge
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Avoid transformation errors during subsequent installation tasks.

11 DISC WHEELS (RIMS)

36 11 105 REMOVING AND INSTALLING RDC (TIRE PRESSURE CONTROL) CONTROL UNIT

IMPORTANT: Read and comply with notes on PROTECTION AGAINST ELECTROSTATIC DAMAGE (ESD PROTECTION) .

Necessary preliminary tasks:

- Remove right luggage compartment trim panel. See **51 47 161 REMOVING AND INSTALLING/REPLACING RIGHT LUGGAGE COMPARTMENT WHEEL ARCH TRIM** .

Press sound-insulating material (1) to one side slightly. Release screw (2) and carefully swing out control unit holder a little.

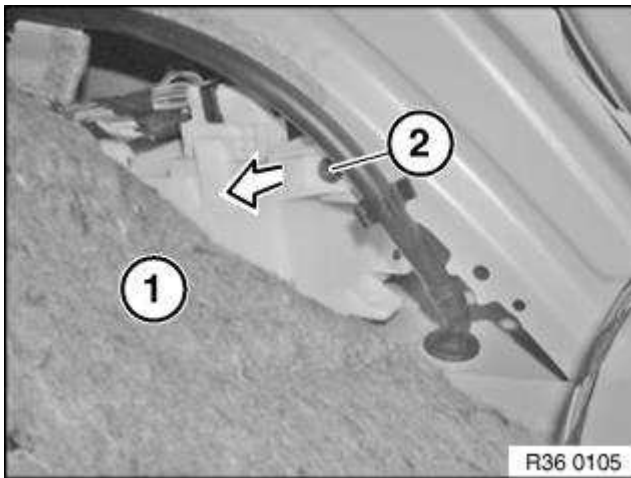


Fig. 27: Press Sound-Insulating Material (1) To One Side Slightly
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1). Press lug (2) in direction of arrow and pull out control unit (3) towards top.

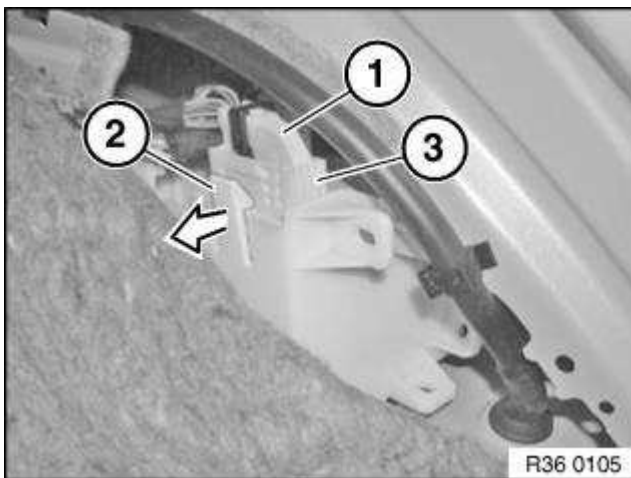


Fig. 28: Disconnect Plug Connection (1)
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

- Carry out **PROGRAMMING/CODING**

36 11 115 REMOVING AND INSTALLING/REPLACING RDC RECEIVING AERIAL

Necessary preliminary tasks:

- Remove rear **UNDERBODY PROTECTION** .

Disconnect plug connection (1).

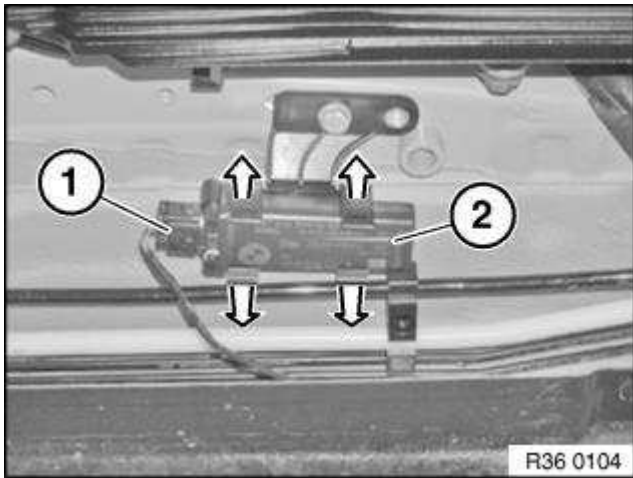


Fig. 29: Removing Receiving Aerial

Courtesy of BMW OF NORTH AMERICA, INC.

Gently press retaining tabs apart in direction of arrow and remove receiving aerial (2).

36 11 121 REMOVING AND INSTALLING/REPLACING AN RDC TRIGGER TRANSMITTER (FRONT)

Necessary preliminary tasks:

- Remove front wheel arch trim. See **51 71 040 REMOVING AND INSTALLING/REPLACING FRONT LEFT OR RIGHT WHEEL ARCH COVER** .

Press through studs (1) of expander rivets towards rear. Remove trigger transmitter (2).

Installation:

If necessary, replace plastic nuts.

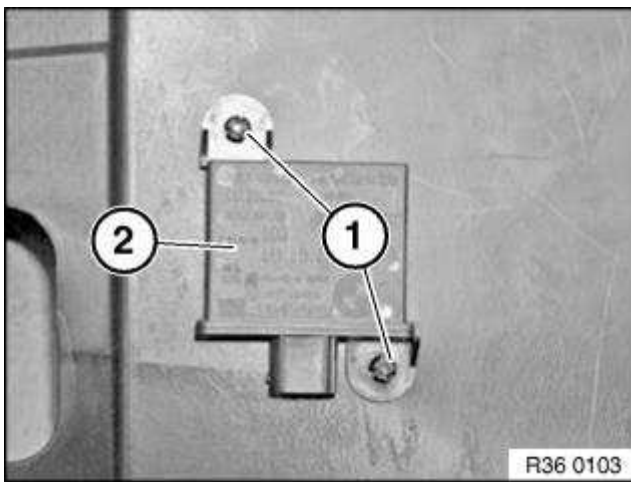


Fig. 30: Press Through Studs (1) Of Expander Rivets Towards Rear
Courtesy of BMW OF NORTH AMERICA, INC.

36 11 533 REMOVING AND INSTALLING/RENEWING/TIRE PRESSURE CONTROL WHEEL ELECTRONICS (2ND GENERATION)

IMPORTANT: Before removing or refitting, check which generation of wheel modules is fitted. If the electronic wheel module has been removed, the complete valve must be replaced.

NOTE: There are two different electronic wheel modules. The SP303 electronic wheel module must be used with RDC-01 and RDC-02 from model year 03/06. The Gen3 electronic wheel module must be used with RDC-LC from model year 09/09. If a tire sealant has been used, replace the electronic wheel module. When a tire has been removed, do not clean the rim with installed electronic wheel module with high-pressure cleaner. Do not treat electronic wheel module with solvents, cleaning agents etc. If dirty, wipe with a clean cloth only. Before the installation of new wheel electronics with valve, thoroughly clean the valve bore of the wheel rim. Do not clean electronic wheel module with compressed air.

- Remove tire

Labelling of Gen3 electronic wheel module for RDC-LC

1. Data Matrixcode
2. BMW part number
3. FCC ID = radio authorization
4. Electronic wheel module ID
5. Transmission frequency
6. Pressure sensor
7. Width across flats of union nut

8. Tightening torque
9. Production date of electronic wheel module

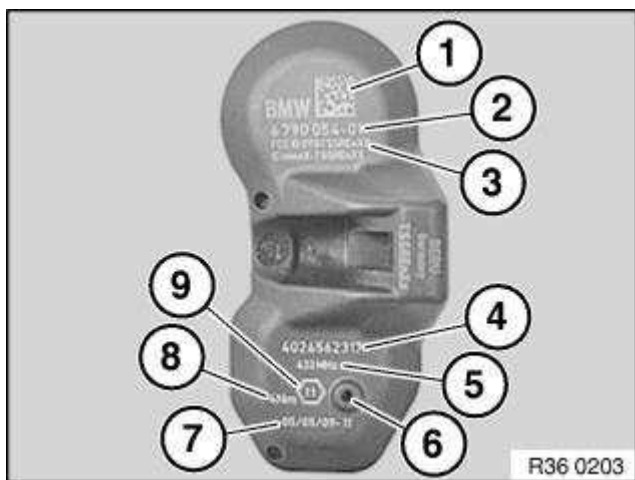


Fig. 31: Labelling Of Gen3 Electronic Wheel Module For RDC-LC
 Courtesy of BMW OF NORTH AMERICA, INC.

Labelling of electronic wheel modules SP303 RDC-01 and RDC-02

1. Transmission frequency of electronic wheel module
2. Large Torx socket screw
3. BMW part number
4. Tightening torque of Torx screw and union nut
5. Width across flats of union nut
6. Serial number of electronic wheel module
7. Production date of electronic wheel module

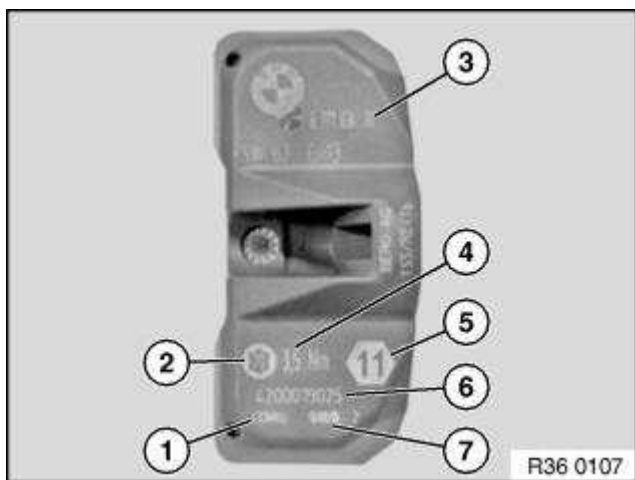


Fig. 32: Labelling Of Electronic Wheel Modules SP303 RDC-01 And RDC-02
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The following illustrations only show removal and refitting of the 3rd generation wheel module. The instructions also apply without alteration to the wheel module SP303.

Removing electronic wheel module Release union nut (1).

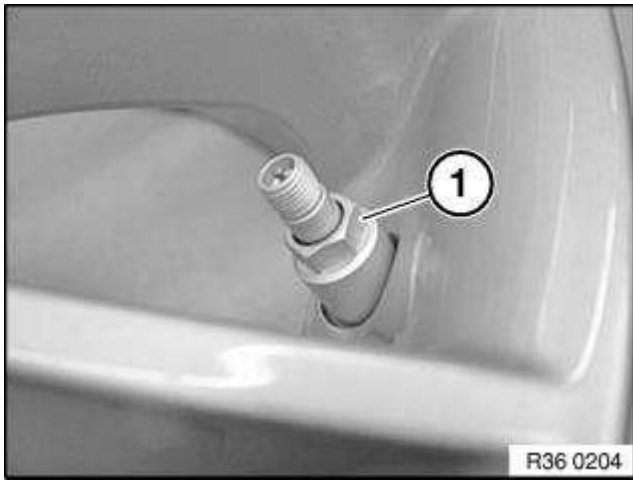


Fig. 33: Release Union Nut (1)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove wheel module and valve (1) from valve hole.

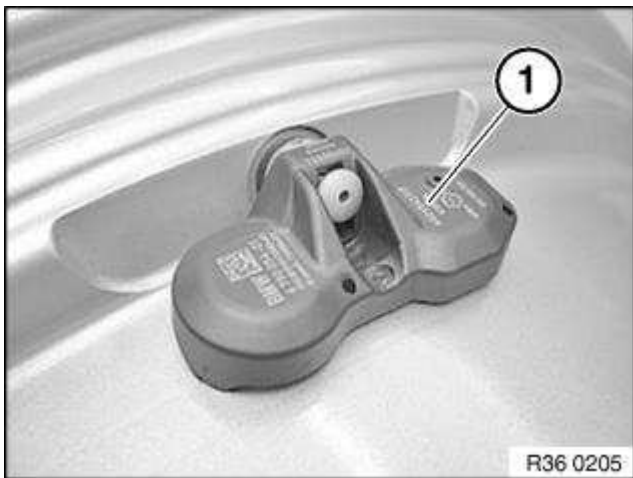


Fig. 34: Remove Wheel Module And Valve (1) From Valve Hole
Courtesy of BMW OF NORTH AMERICA, INC.

Using suitable pliers (2), unscrew valve (1) from the thread of the square-head bolt (3), while holding the wheel module (4) firm. Completely unscrew valve (1). Remove square-head bolt from wheel module holder.
Installation: Replace valve.

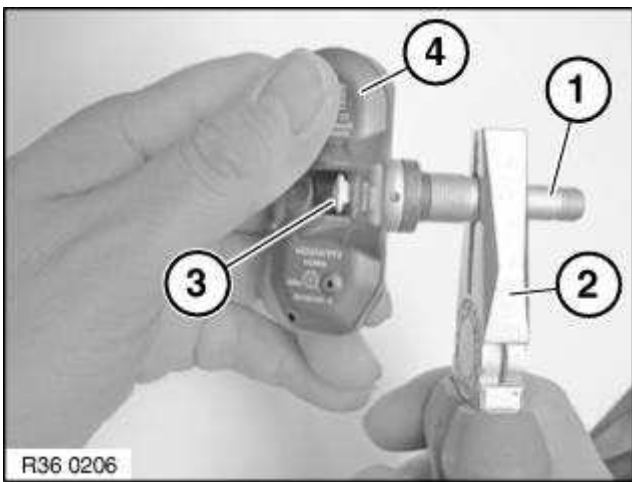


Fig. 35: Using Suitable Pliers (2), Unscrew Valve (1) From The Thread Of The Square-Head Bolt (3)
 Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Before the installation of new wheel electronics with valve, thoroughly clean the valve bore of the wheel rim! Also make sure that the valve bore is free of burrs

Installing electronic wheel module: Insert new square-head bolt (1) in wheel module (2). Screw single-use valve insert (3) three turns onto square-head bolt (1).

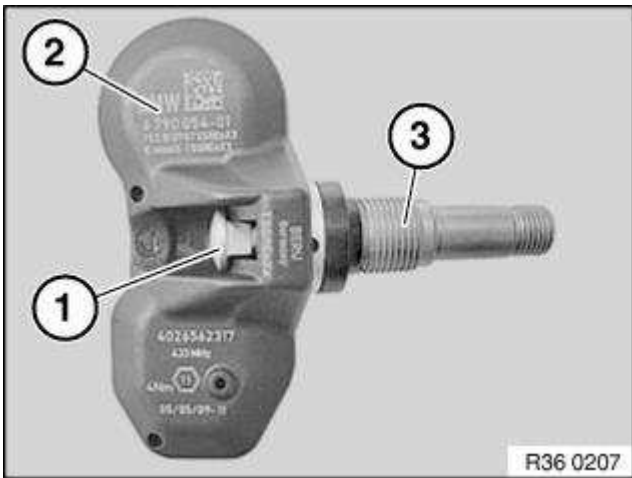


Fig. 36: Installing Electronic Wheel Module Insert New Square-Head Bolt (1) In Wheel Module (2)
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Make sure the square head screw (1) fits exactly in the holder for the electronic wheel module!

Insert valve insert with electronic wheel module into cleaned valve bore. Both outer feet on the underside of the wheel module must be resting against the rim wall.

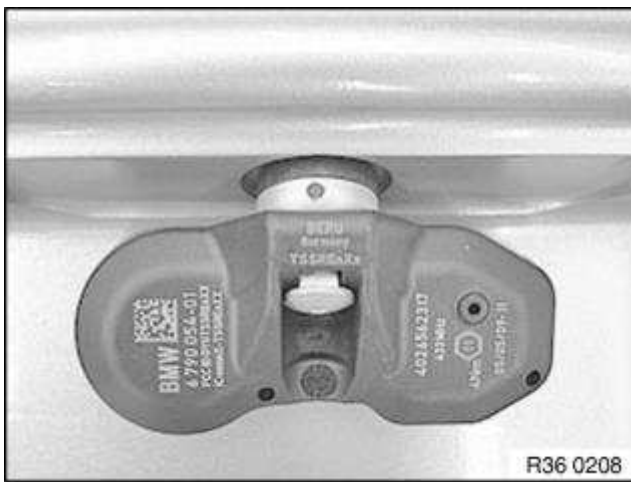


Fig. 37: Make Sure The Square Head Screw (1) Fits Exactly In The Holder For The Electronic Wheel Module

Courtesy of BMW OF NORTH AMERICA, INC.

Screw on sleeve nut (1) by hand as far as it will go. Tighten sleeve nut until the inner strip-off ring breaks. Breakage is perceptible audibly and tangibly (momentary drop in torque resistance). Then fully tighten sleeve nut (1). Tightening torque, see 36 11 1AZ in **36 11 WHEEL RIMS** .

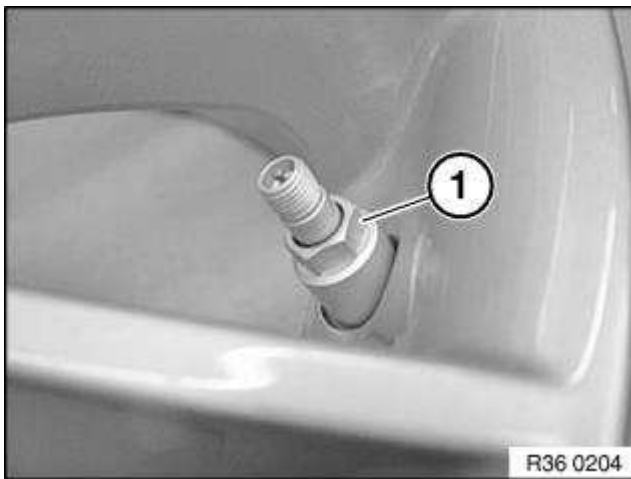


Fig. 38: Screw On Sleeve Nut (1) By Hand As Far As It Will Go

Courtesy of BMW OF NORTH AMERICA, INC.

Important! Fixing must not under any circumstances be retightened! The square-head bolt should be located precisely in the wheel module holder. After tightening, the electronic wheel module must fit snugly on the rim!

36 11 500 INITIALIZING RUN FLAT INDICATOR (RPA)

NOTE: **Checking the tire pressure is based on monitoring the speeds of the wheels in relation to each other. A tire puncture is detected and signalled by way of a deviation in specific speed ratios.**
The four tires mounted on the vehicle are monitored while the vehicle is

moving.

Initialization must be carried out in each case immediately after tire pressures have been corrected, after tires/wheels have been replaced and after repairs to the air spring system.

IMPORTANT: The Run Flat Indicator does not function when the vehicle is driven with the compact spare wheel.

36 11 503 RDC RESETTING

NOTE: RDC monitors the tire inflation pressure in the four wheels. Each tire incorporates an electronic wheel circuit, which constantly monitors the tire inflation pressure. The system signals when the inflation pressure drops in one or more tires. Resetting must be carried out in each case immediately after tire pressures have been corrected, after tires/wheels have been replaced and after repairs to the air spring system.

36 11 533 REMOVING AND INSTALLING / REPLACING RDC WHEEL ELECTRONICS

Special tools required:

- 00 2 190

NOTE: If a tire sealant has been used, replace the wheel electronics. When a tire has been removed, do not clean the rim with installed wheel electronics with high-pressure cleaning equipment. Do not treat wheel electronics with solvents, cleaning agents etc. If dirty, wipe with a clean cloth only. Do not clean wheel electronics with compressed air.

IMPORTANT: If the wheel electronics have been removed, the complete valve must be replaced.

Necessary preliminary tasks:

- Remove tire, see **36 12 001 Replacing a tire.**

Labelling of wheel electronics

1. Transmitting frequency of wheel electronics
2. Large Torx socket
3. BMW part number
4. Tightening torque of Torx screw and union nut
5. Width across flats of union nut

- 6. Serial number of wheel electronics
- 7. Date of manufacture of wheel electronics

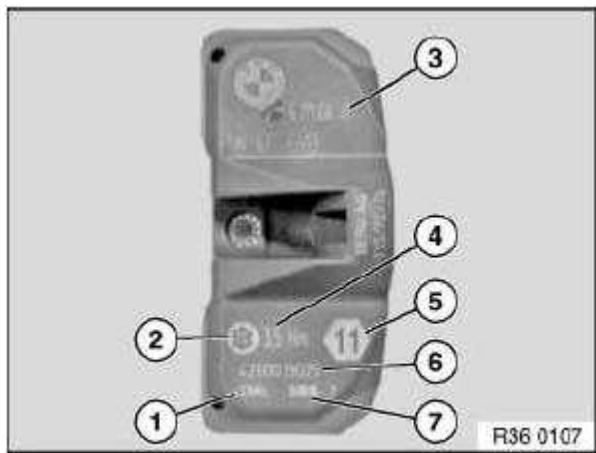


Fig. 39: Torx Socket Crew And Wheel Electronics
 Courtesy of BMW OF NORTH AMERICA, INC.

Removing wheel electronics

Release Torx socket crew (1) and remove wheel electronics (2).

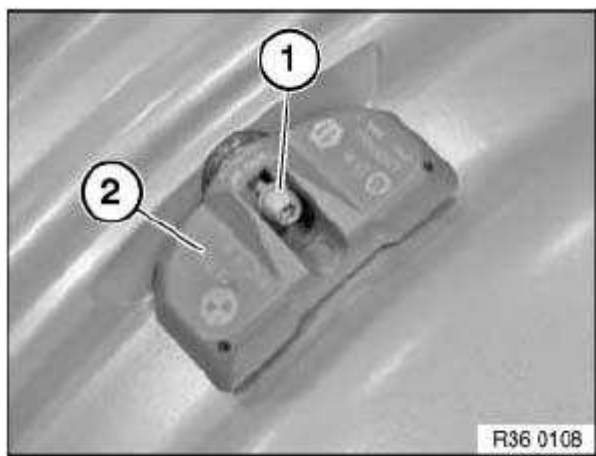


Fig. 40: Torx Socket Crew And Wheel Electronics
 Courtesy of BMW OF NORTH AMERICA, INC.

Release union nut with special tool 00 2 190; if necessary, grip valve insert (1) at cylindrical section of ball head.

Remove valve insert from rim.

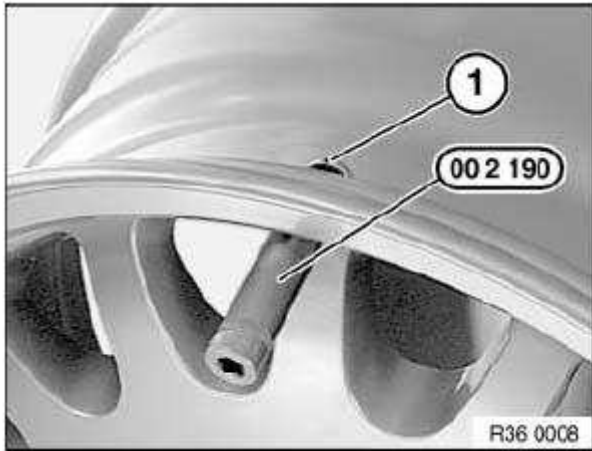


Fig. 41: Union Nut With Special Tool (00 2 190)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove washer (1).

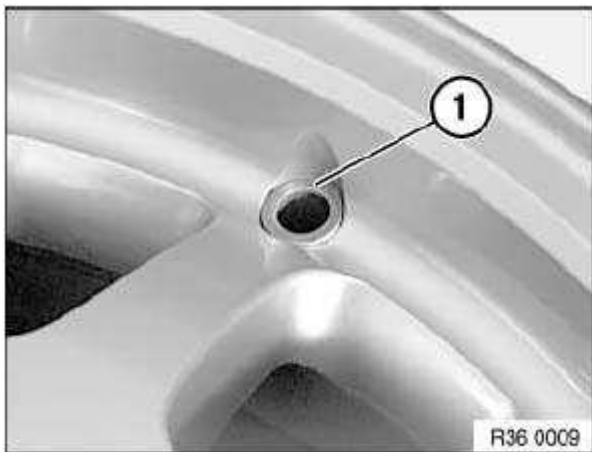


Fig. 42: Washer
Courtesy of BMW OF NORTH AMERICA, INC.

Installing wheel electronics

Insert new Torx socket screw (1) in wheel electronics (2) and secure firmly.

Twist new valve insert (3) by hand approx. 3 turns onto screw (1).

NOTE: Do not tighten screw; wheel electronics and valve insert must be loosely joined together.

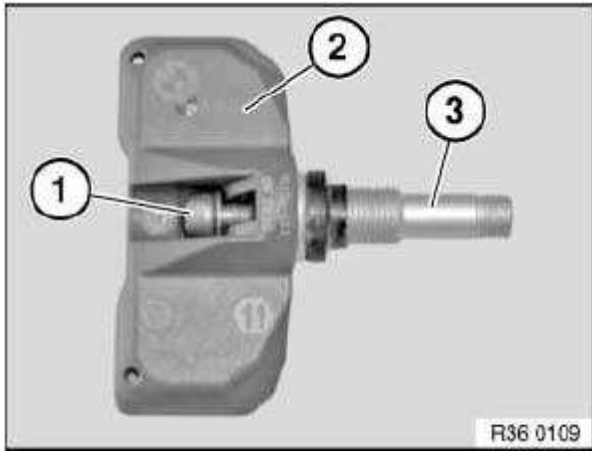


Fig. 43: Torx Socket Screw, Wheel Electronics And Valve
Courtesy of BMW OF NORTH AMERICA, INC.

Insert valve insert with wheel electronics into cleaned valve bore.

Here the radial bore (1) for gripping on the circumference of the valve insert ball head must point outwards.

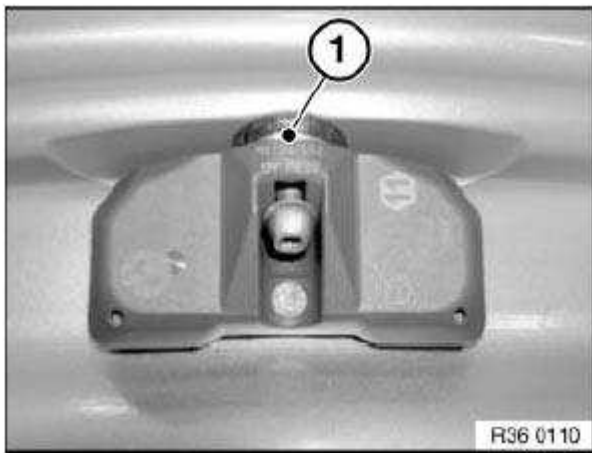


Fig. 44: Radial Bore
Courtesy of BMW OF NORTH AMERICA, INC.

Insert the brace (1) supplied with the valve into the valve insert bore.

Fit new washer and screw on new union nut (2) by hand as far as it will go.

Tighten down union nut (2) while using brace (1) to prevent valve insert from turning.

Installation:

Tightening torque: 36 11 1AZ, see **36 11 WHEEL RIMS** .

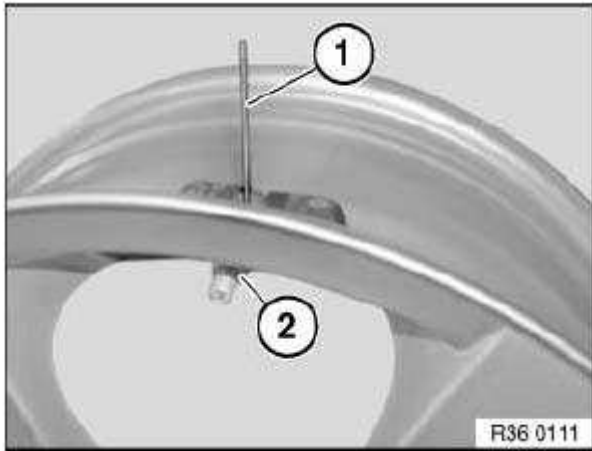


Fig. 45: Brace And Union Nut

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: The screw connection must be tightened to the specified torque in one go!
Do not under any circumstances retighten the screw connection!
Remove brace, otherwise it may damage the tire.

Press wheel electronics gently into well base and tighten Torx socket screw (1).

Installation:

Tightening torque: 36 11 2AZ, see 36 11 WHEEL RIMS .

IMPORTANT: The screw connection must be tightened to the specified torque in one go!
Do not under any circumstances retighten the screw connection!

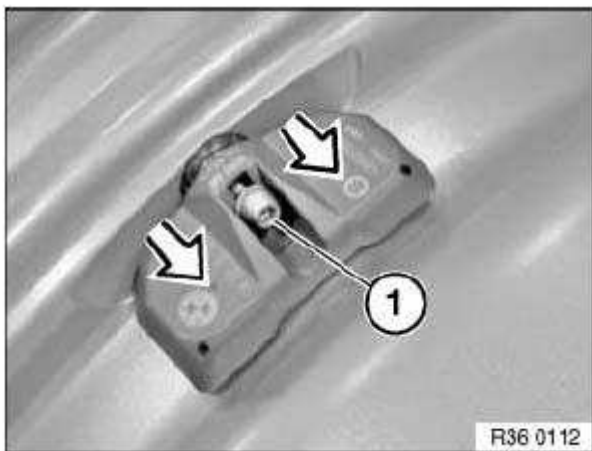


Fig. 46: Torx Socket Screw

Courtesy of BMW OF NORTH AMERICA, INC.

12 TIRES

36 12 001 REPLACING A TIRE

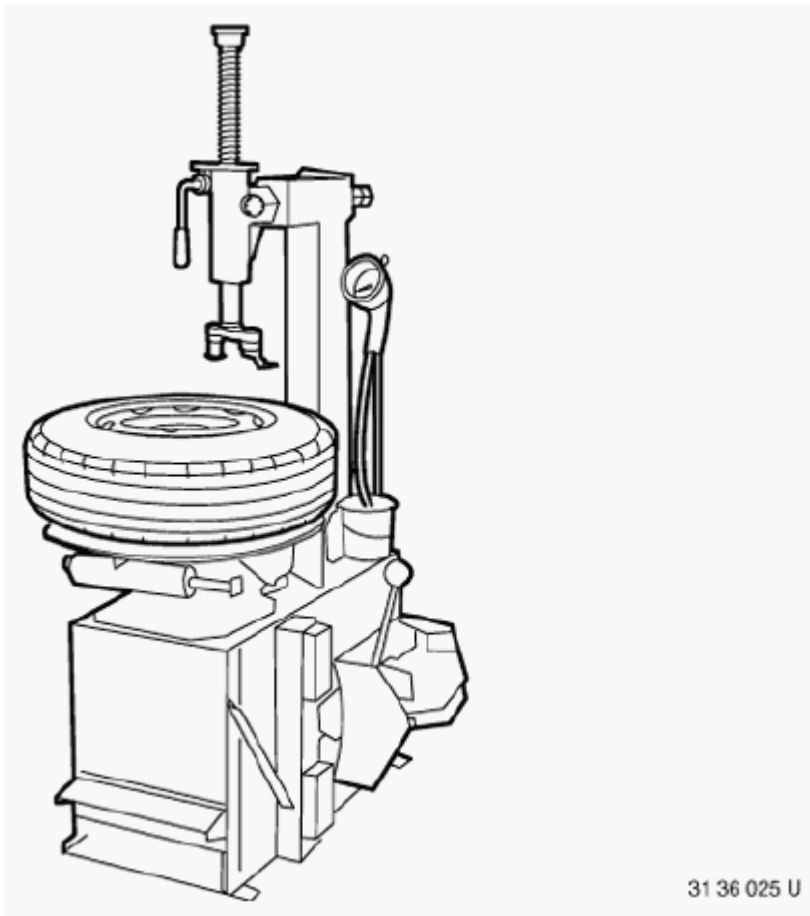


Fig. 47: Changing Tyre Machine
Courtesy of BMW OF NORTH AMERICA, INC.

Refer to the operating manual of the relevant fitting equipment manufacturer for details on how to fit the tire correctly. However, it is essential to make sure that the equipment is in proper working condition and there is no damage to the disc wheel or the tire.

NOTE: Comply with approved tires, tire sizes and optional extra.
Follow instructions on initializing run flat indicator:

- Run flat indicator (RPA)

NOTE: Pay attention to different tire markings:

- Item (1) Marking denoting BMW-approved tires. Ensure that only BMW-approved tires are fitted.
- Item (2) RSC is the abbreviation for R unflat S ystem C omponent (runflat

tires).

- **Item (3) Outside.** The tire must be fitted so that the wording **Outside** is always situated on the outside of the rim.

IMPORTANT: Many tires are directional!

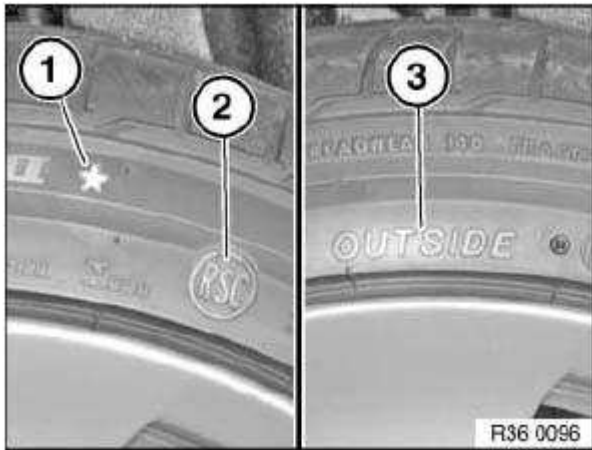


Fig. 48: Tyre Point

Courtesy of BMW OF NORTH AMERICA, INC.

The arrow on the tire must point in the direction of travel for each wheel!

Models with M Mobility system

If the tire was filled with the M-Mobility system after a puncture, it will be necessary before removal to drill an approx. 25 mm dia. hole in the side wall of the tire. Allow sealing compound to flow out through this bore and dispose of compound in compliance with environmental regulations. Clean disc wheel after removing tire.

Tyre removal with a fitting machine:

Unscrew valve insert, discharge air, force off tire bead from rim flange with pressing-off horn of device on outside and inside.

If tire beads are stuck, first release the tire with the pressing - off horn at several points of the wheel before actually pressing off, apply tire mounting paste between tire and rim flange and press off the tires completely.

Pull off balance weights on rim and clean rim to remove large pieces of dirt.

Clamp wheel on mounting machine.

Narrow rim shoulder always faces upwards.

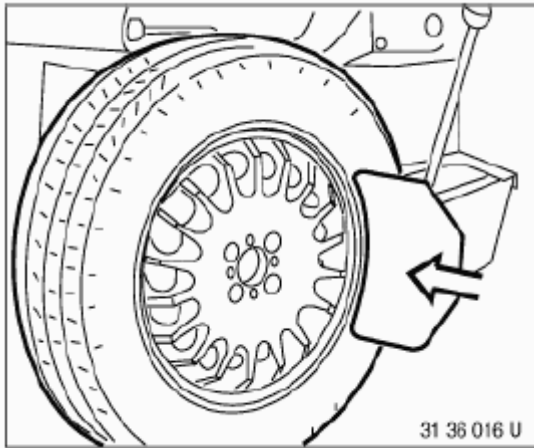


Fig. 49: Removing Wheel Rim

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Vehicles with RDC:

To prevent the pressing-off horn from damaging the RDC wheel electronics, do not rest the pressing-off horn on both rim sides in the area of the valve.

Swing or fold mounting pillar into position and let it engage.

Adjust mounting head, pressing it on the rim edge fully, and turn down the lever for the clamp; normally the distance of the mounting head will set in automatically.

The valve should be approx. 15 cm to the right of the assembly head (so as to prevent the tire iron from damaging the wheel electronics).

Raise tire bead with tire iron over mounting finger.

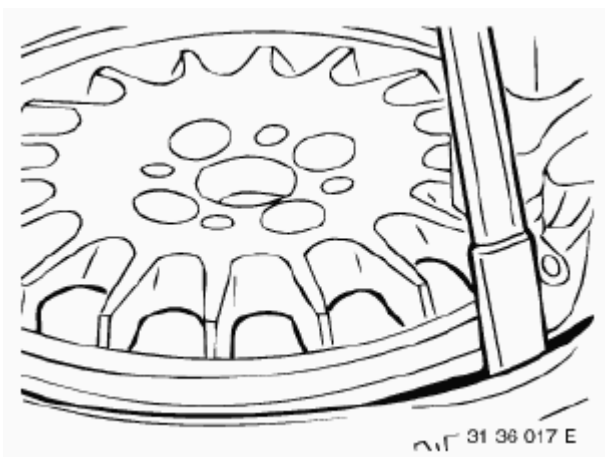


Fig. 50: Raising Tyre Bead With Tyre Iron Mounting Finger

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: On aluminium rims, it is best to use a tire iron coated (either fully or partially) with shrink-on plastic tubing to prevent damage.

Let fitting machine run back a short distance (counterclockwise); tire bead will slip fully onto mounting finger.

Then let fitting machine run forward in stages (clockwise).

In so doing, always check whether the lower bead is fully resting in the well and allow the tire time to move.

If the bead clamps, stop the machine and let it run back slightly.

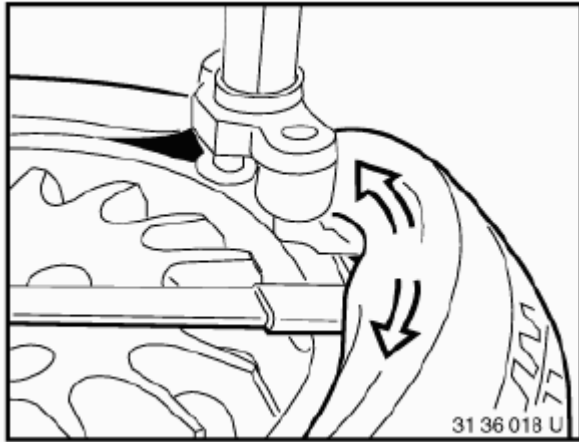


Fig. 51: Removing Tyre Bead

Courtesy of BMW OF NORTH AMERICA, INC.

If the upper bead is pulled off the rim, also lift the bottom bead over the mounting finger with the tire iron.

Let machine run back a short distance again and then forward (clockwise) briefly until there is complete separation of the tire from the rim.

IMPORTANT: Vehicles with RDC:

Tyre bead must not press onto wheel electronics.

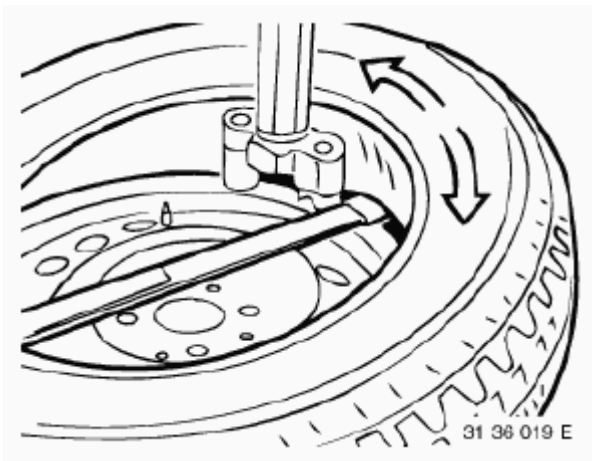


Fig. 52: Removing Tyre Rim

Courtesy of BMW OF NORTH AMERICA, INC.

Release lock and tilt back or swing away mounting pillar.

Unclamp and clean rim.

Replace valve.

Coat rim flange and tire beads with mounting paste.

IMPORTANT: Vehicles with RDC:

When the wheel electronics are installed, the rim must not be cleaned with high-pressure cleaning equipment.

Visually inspect wheel electronics for external damage and check for tight fit; do not retighten screw and union nut. If one of the valve parts is loose, replace the entire valve.

Keep wheel electronics free of tire mounting paste.

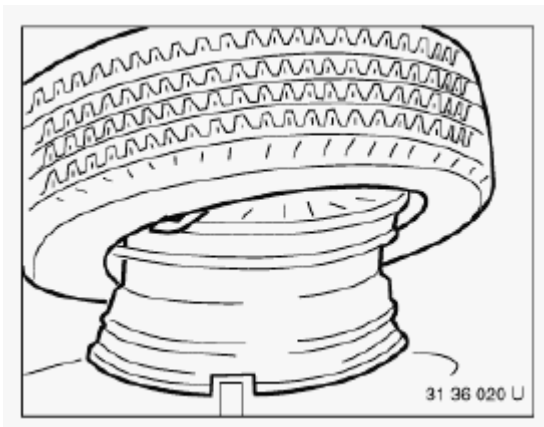


Fig. 53: Releasing Lock And Tilt Back

Courtesy of BMW OF NORTH AMERICA, INC.

Clamp rim on fitting machine, valve must be located at 180° to mounting head.

Slide on tire with lower bead partially over rim flange.

Swing or tilt mounting pillar into position and lock.

Check adjustment of mounting finger, readjusting if necessary, and clamp.

Press tire under mounting finger by hand.

Tyre bead should seat in rollers next to mounting finger.

Let fitting machine run forward (clockwise) a short distance.

Lower tire bead will drop into well.

IMPORTANT: Vehicles with RDC:

Fit lower tire bead so that no pressure forces are exerted on wheel electronics.

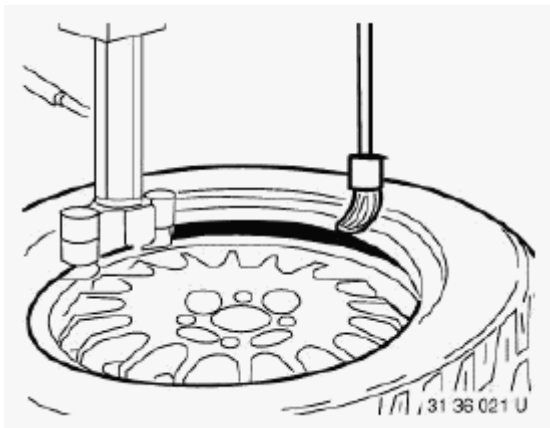


Fig. 54: Tyre Under Mounting Finger

Courtesy of BMW OF NORTH AMERICA, INC.

Turn wheel again into fitting position so that valve is at 180° to mounting head.

Press upper tire bead under mounting finger. Tyre bead should seat in rollers next to mounting finger.

IMPORTANT: Do not pinch or damage bead.

Operate fitting machine forwards (clockwise) little by little; while doing so, make sure the lower tire bead remains in the well.

IMPORTANT: Vehicles with RDC:

Fit upper tire bead so that no pressure forces are exerted on wheel electronics.

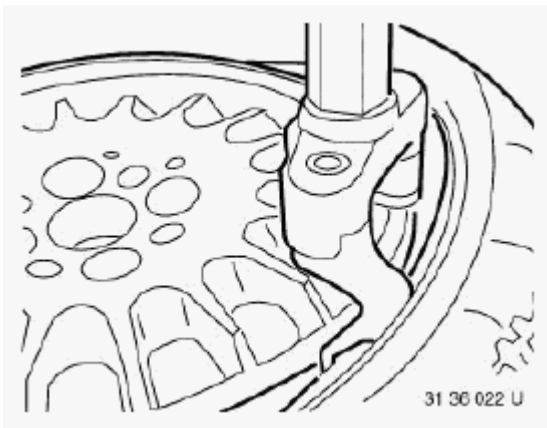


Fig. 55: Pressing Upper Tyre Bead Under Mounting Finger
Courtesy of BMW OF NORTH AMERICA, INC.

After mounting, first release clamps and then inflate tire (without valve).

Increase pressure up to 3.3 bar (330 kPa) in steps (jumping pressure).

If the tire bead does not slip on all round at the rim edge, do not increase pressure further but rather drain off air.

Press off tire bead again, coat rim flange again with tire mounting paste, and pump up again to 3.3 bar. When the beads are resting properly on the rim shoulders, increase inflation pressure to max. 4.0 bar to "settle" the tire.

Screw in valve insert and correct tire pressure.

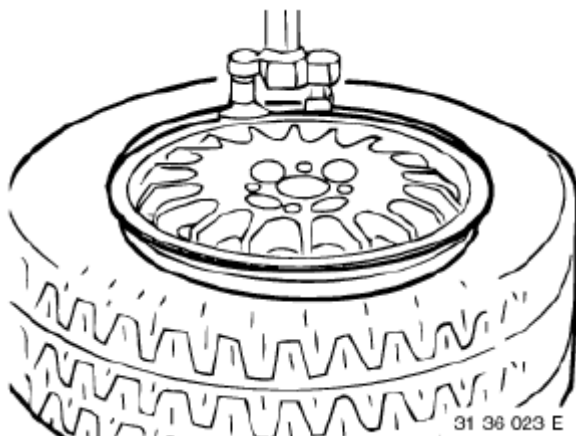


Fig. 56: Releasing Clamping Claws
Courtesy of BMW OF NORTH AMERICA, INC.

36 12 005 REPLACING A RUNFLAT TIRE

Follow the fitting machine manufacturer's operating instructions.

It is absolutely essential to ensure that the equipment is in proper working condition and that there is no damage to the disc wheel and tire.

After completion of work, balance wheels, see 36 10 508 Stationary wheel balancing.

IMPORTANT: Only fitting machines which are approved for fitting runflat tires may be used!
Please refer to the operating instructions of the respective fitting machine for details of the exact fitting procedure.
Use only BMW-approved plastic-covered tire irons.
Use only BMW-approved tire mounting paste.

NOTE: Pay attention to different tire markings:

- Item (1) Marking denoting BMW-approved tires. Ensure that only BMW-approved tires are fitted.
- Item (2) RSC is the abbreviation for R unflat S ystem C omponent (runflat tires).
- Item (3) Outside. The tire must be fitted so that the wording Outside is always situated on the outside of the rim.

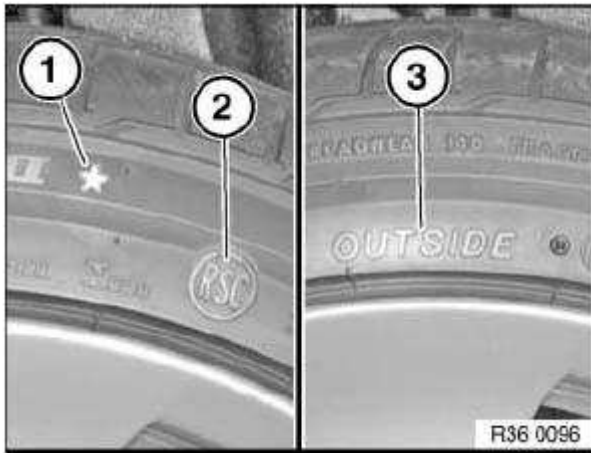


Fig. 57: Identifying Tyre Point

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Many tires are directional!
The arrow on the tire must point in the direction of travel for each wheel!

After completing fitting, first release clamping claws.

Inflate with air (without valve insert).

Increase pressure up to 3.3 bar in stages (jumping pressure).

If the tire bead does not slip fully past the rim edge all round, do not under any circumstance increase the pressure.

Release air and force off tire bead again.

Coat rim flange with tire mounting paste again.

Inflate tire again up to 3.3 bar.

When tire beads are resting perfectly on rim shoulders, increase inflation pressure to max. 4.0 bar to "settle" tire.

Screw in valve insert and correct tire pressure.

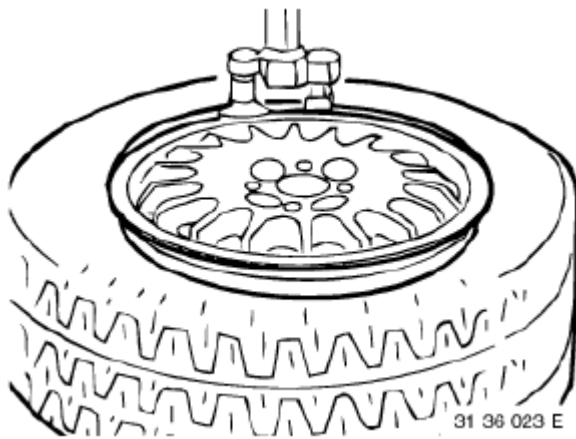


Fig. 58: Releasing Clamping Claws
Courtesy of BMW OF NORTH AMERICA, INC.

Follow instructions on initializing Run Flat Indicator (RPA), see **36 11 500 Initializing Run Flat Indicator (RPA)**.

**IMPORTANT: Advise the customer to avoid heavy acceleration in the initial period.
The mounting paste can cause the tire to turn on the rim and give rise to imbalance.**

13 MOUNTING

36 13 SUBSEQUENT INSTALLATION OF WHEEL-BOLT LOCK

Loosen wheel bolts.

Raise car so that wheel can be turned freely.

Release wheel studs to such an extent that the wheel can move freely on the wheel hub.

Turn wheel so that valve is face down.

Remove top wheel stud and insert wheel stud lock.

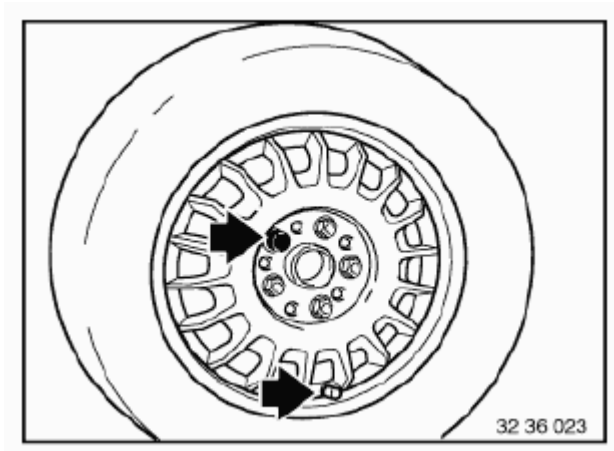


Fig. 59: Valve And Nut

Courtesy of BMW OF NORTH AMERICA, INC.

Possible play in wheel center and wheel weight could cause imbalance.

This imbalance is reduced to a minimum by installing the somewhat heavier wheel-bolt lock in the top wheel-bolt position.

In this position - wheel stud lock at top, valve at bottom - tighten wheel studs hand-tight in diagonal sequence.

Lower car and tighten wheel bolts crosswise.

Tightening torque: 36 10 1AZ, see **36 10 WHEELS** .

If this sequence of fitting the wheel stud lock is followed by a customer complaint about wheel imbalance, it will be necessary to finish-balance the wheels.

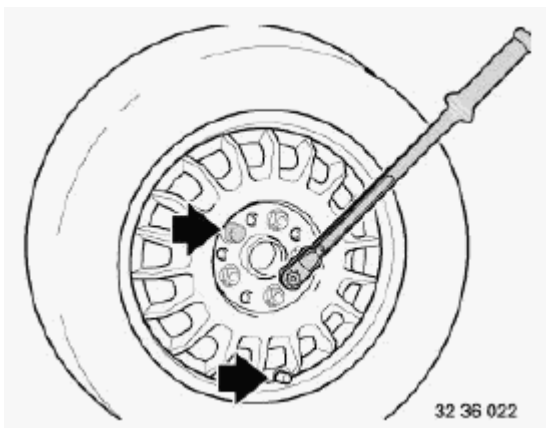


Fig. 60: Tightening Down Wheel Bolts With Calibrated Torque Wrench

Courtesy of BMW OF NORTH AMERICA, INC.

SUSPENSION

Wheels And Tires - Operating Fluids

1.0 TIRE MOUNTING PASTE

Use only a lubricant specifically designed for this purpose (former BMW Part No. 81 22 9 407 288).

Wurth Tire Mounting Paste Part No. 892800

Silicone sprays are not acceptable, as they are extremely slippery and don't dry. If applied to the tire bead, it is likely that the tire moves on the rim, causing an imbalance.

2.0 WHEEL CLEANERS

Liquids for cleaning the alloy wheels must be strong enough to lift brake dust, road dirt, etc. off the painted wheel surface with minimum manual agitation, yet not attack the wheel material. The following cleaner has been thoroughly tested for optimum cleaning action and long-term compatibility with the wheel's surfaces:

Wheel Cleaner Spray BMW Part No. 82 14 1 467 045

3.0 WHEEL HUB COVERS

Covers may be affixed to the alloy rim by using Loctite 638 (former BMW Part No. 07 58 9 056 030). Covers may only be used once.

WHEEL HUB COVERS SPECIFICATION

Loctite 638	-	Wurth Part No. 8936010
	-	Loctite Part No. 21447

The cooling-turbine wheel covers of the M5 (E34) produced from March 1990 to October 1990 may be secured to the wheel by applying Loctite 242 to the attaching screw threads. First clean screw threads with Loctite Cleaning Solvent 755.

4.0 ANTI-CORROSION PASTE

Apply small amounts of Plastilube paste evenly around the centering cone of the alloy wheel rim and onto the contact areas of the brake hub.

Plastilube BMW Part No. 81 22 9 407 103.

2007 SYSTEM WIRING DIAGRAMS

BMW - X3

AIR CONDITIONING

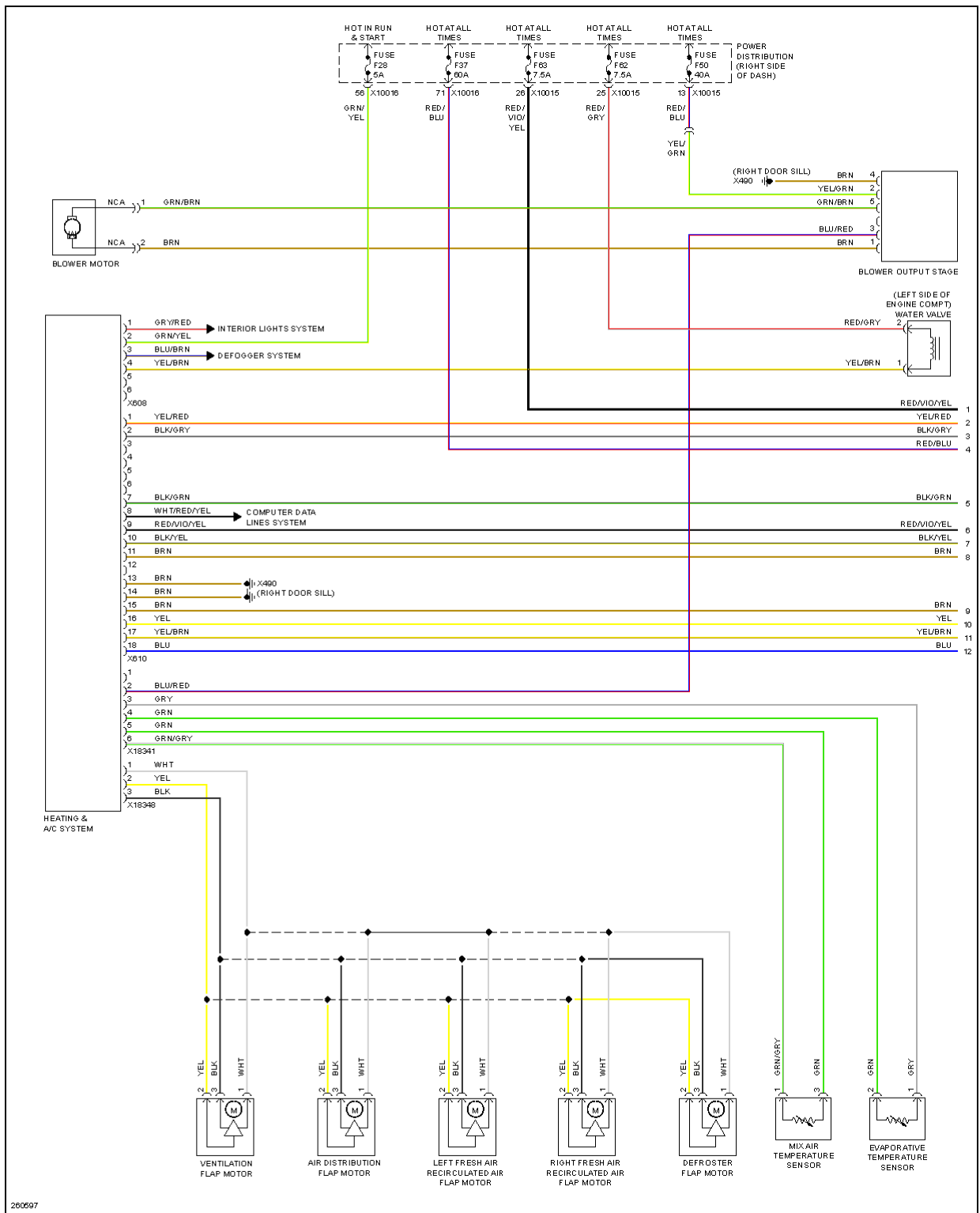


Fig. 1: Automatic A/C Circuit (1 of 2)

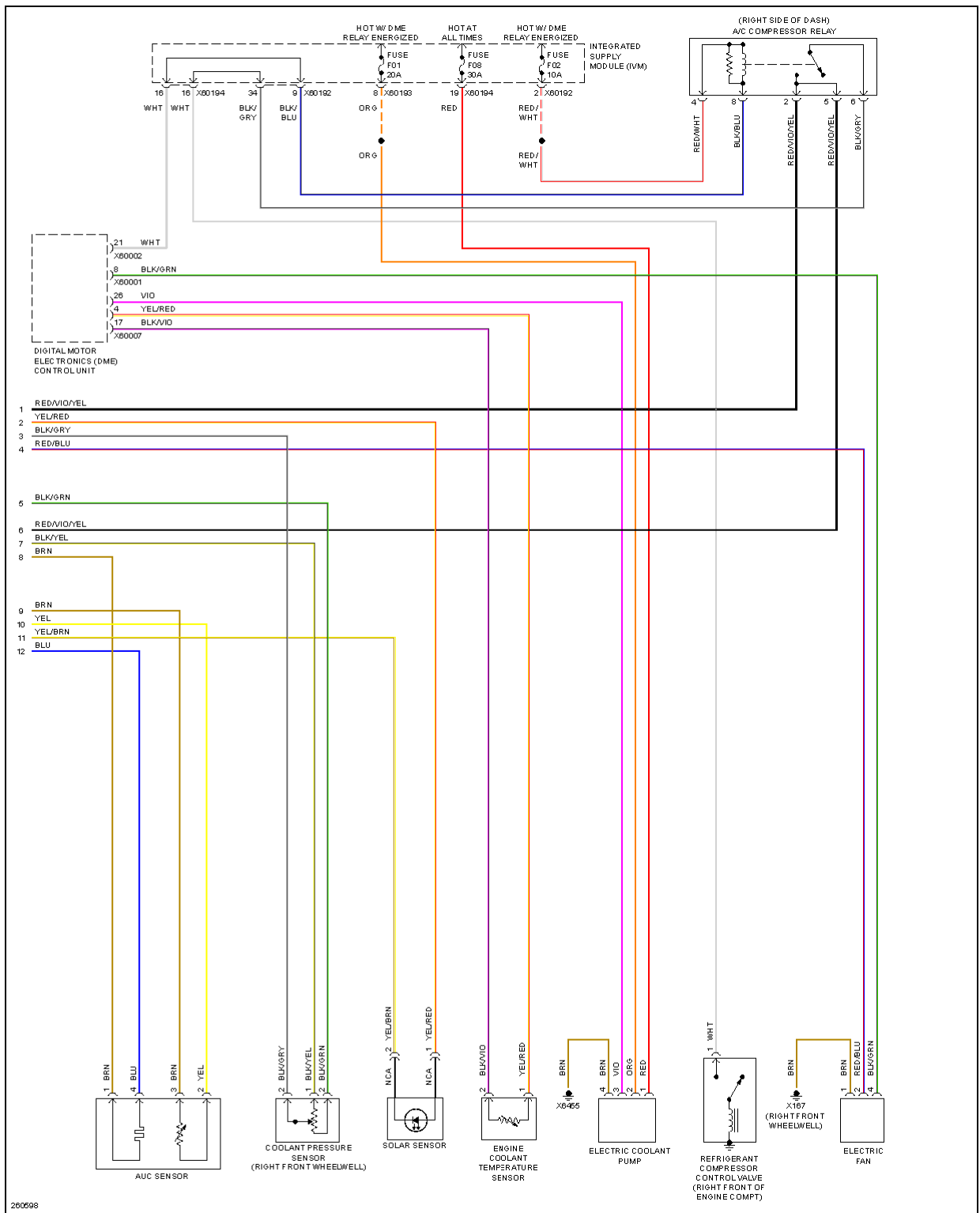


Fig. 2: Automatic A/C Circuit (2 of 2)

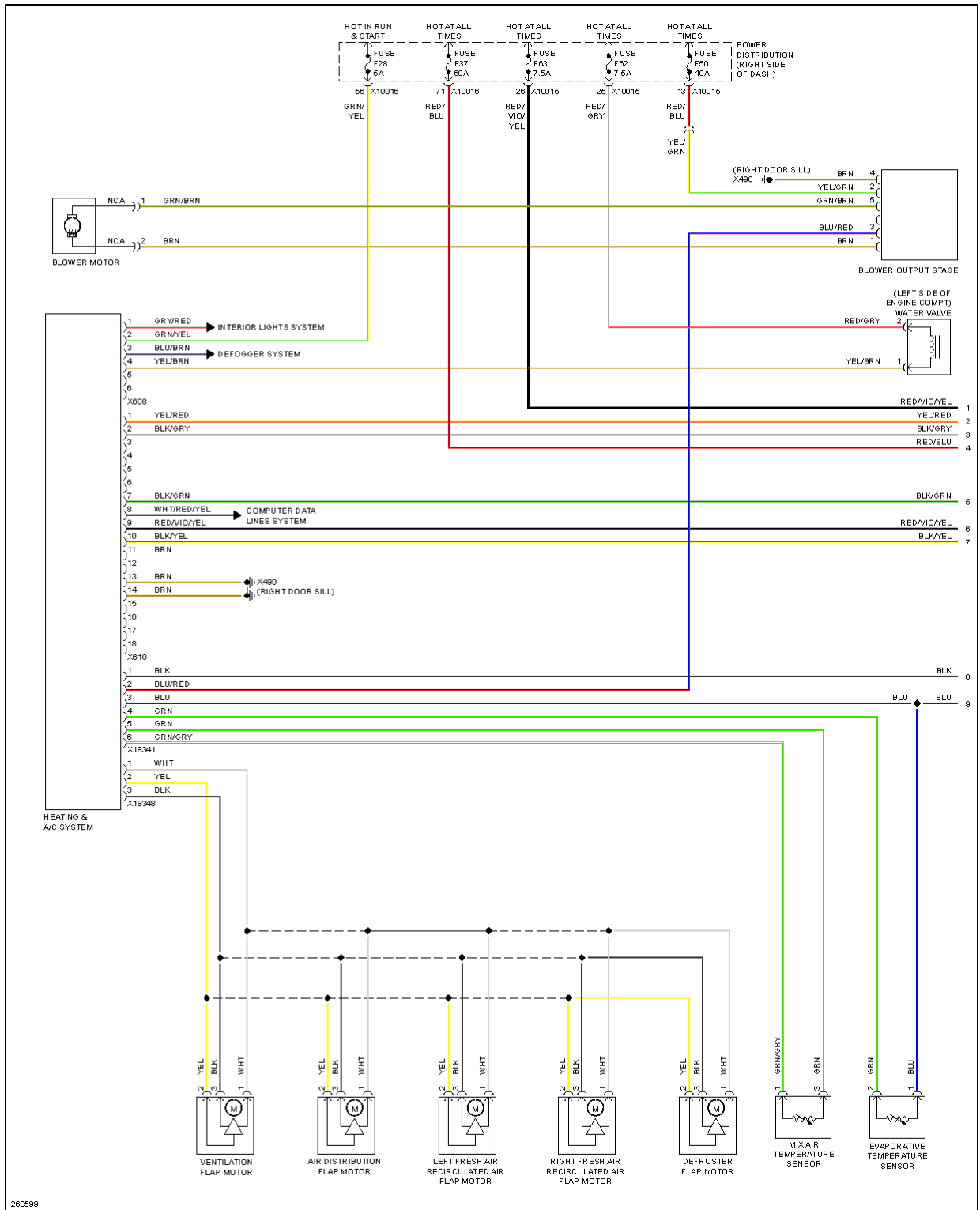
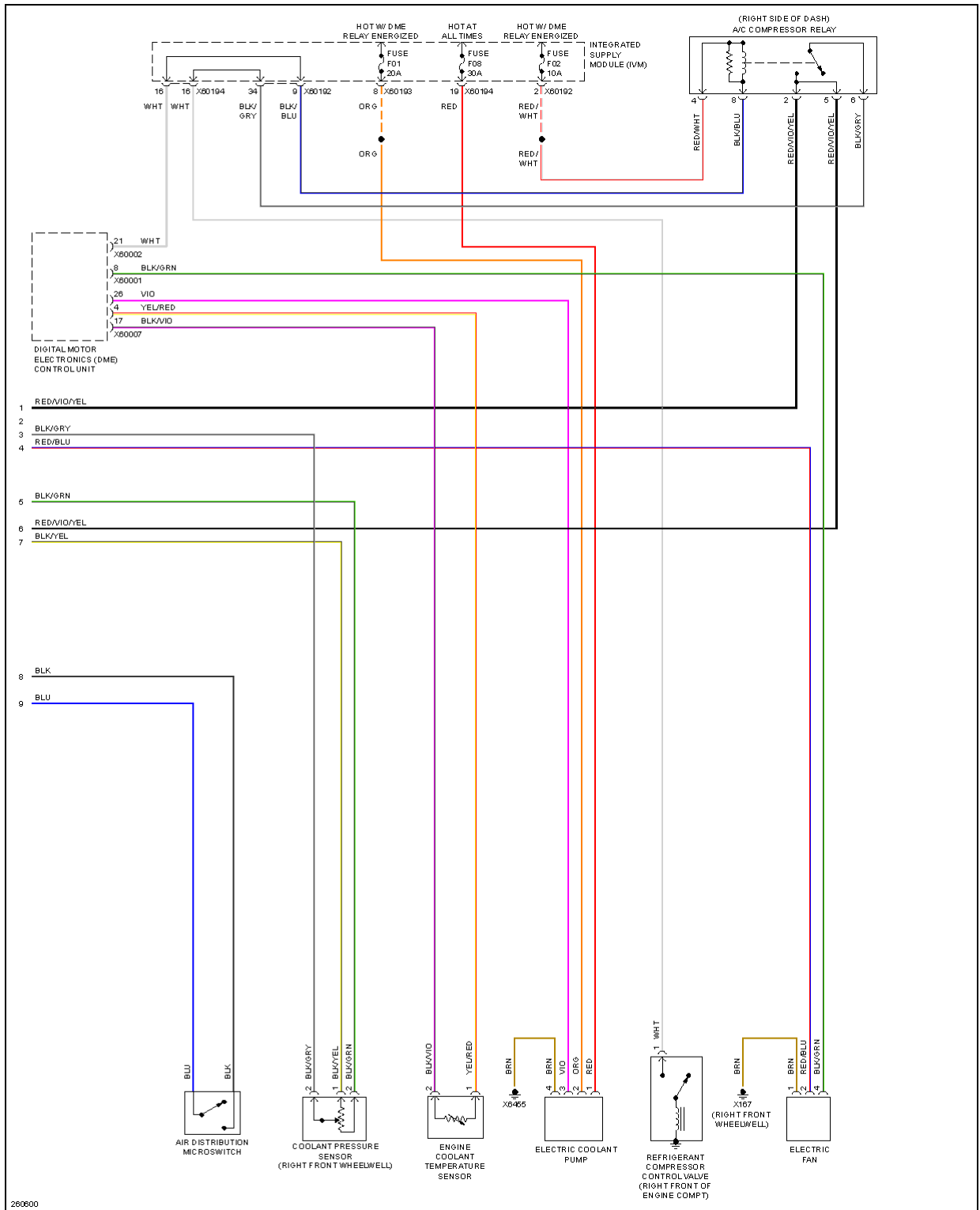


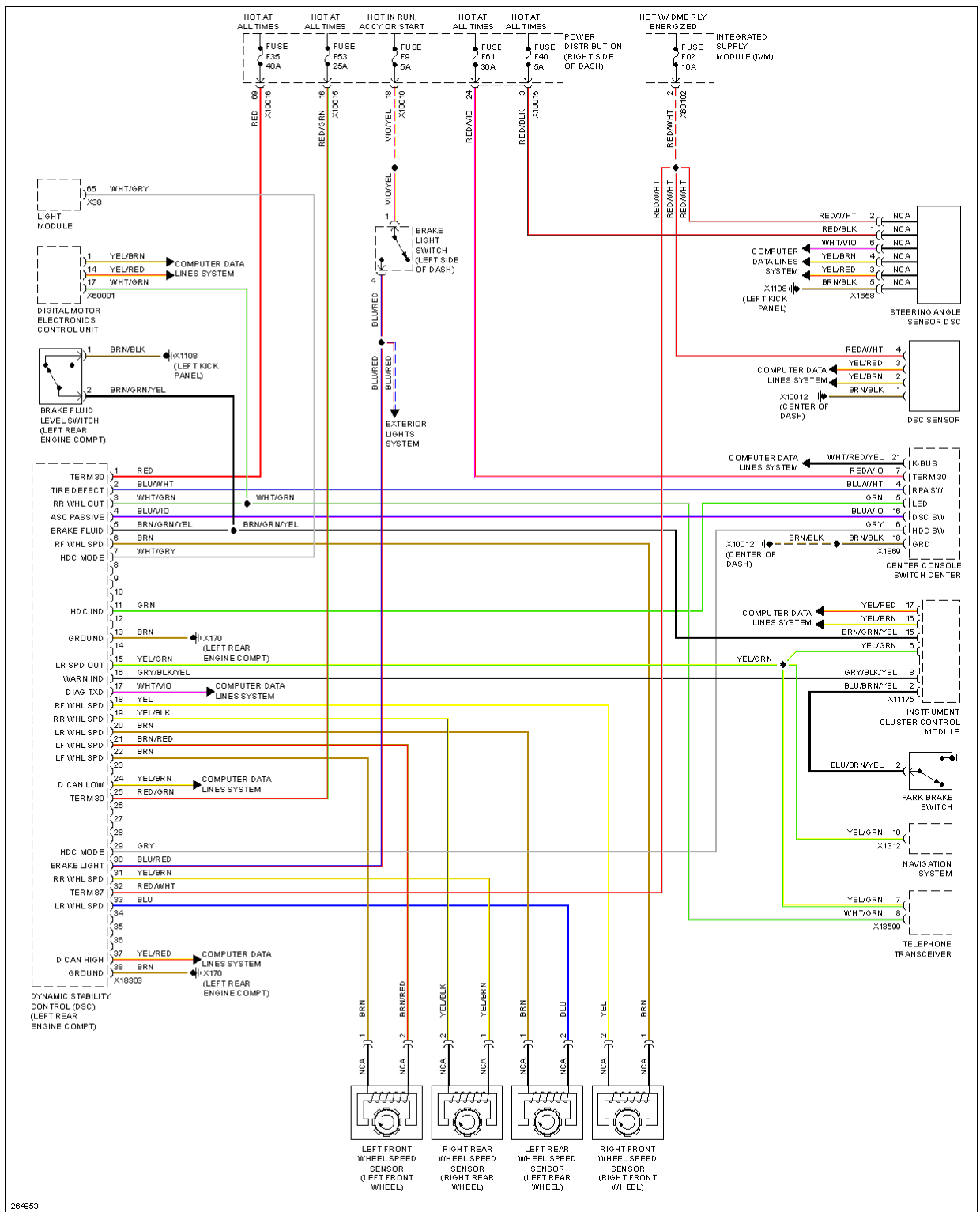
Fig. 3: Manual A/C Circuit (1 of 2)



260800

Fig. 4: Manual A/C Circuit (2 of 2)

ANTI-LOCK BRAKES



264253

Fig. 5: Anti-lock Brakes Circuit

ANTI-THEFT

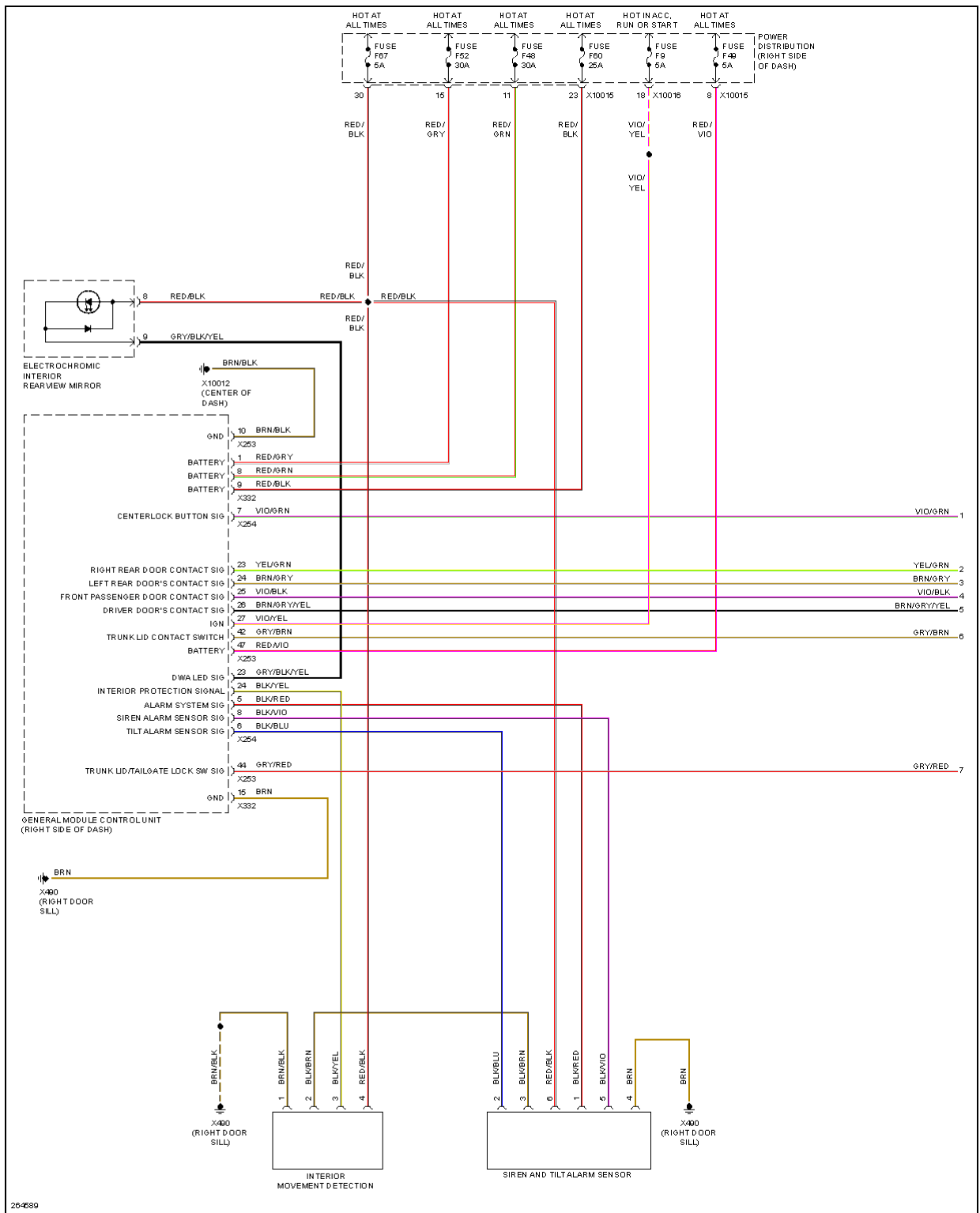


Fig. 6: Anti-theft Circuit (1 of 2)

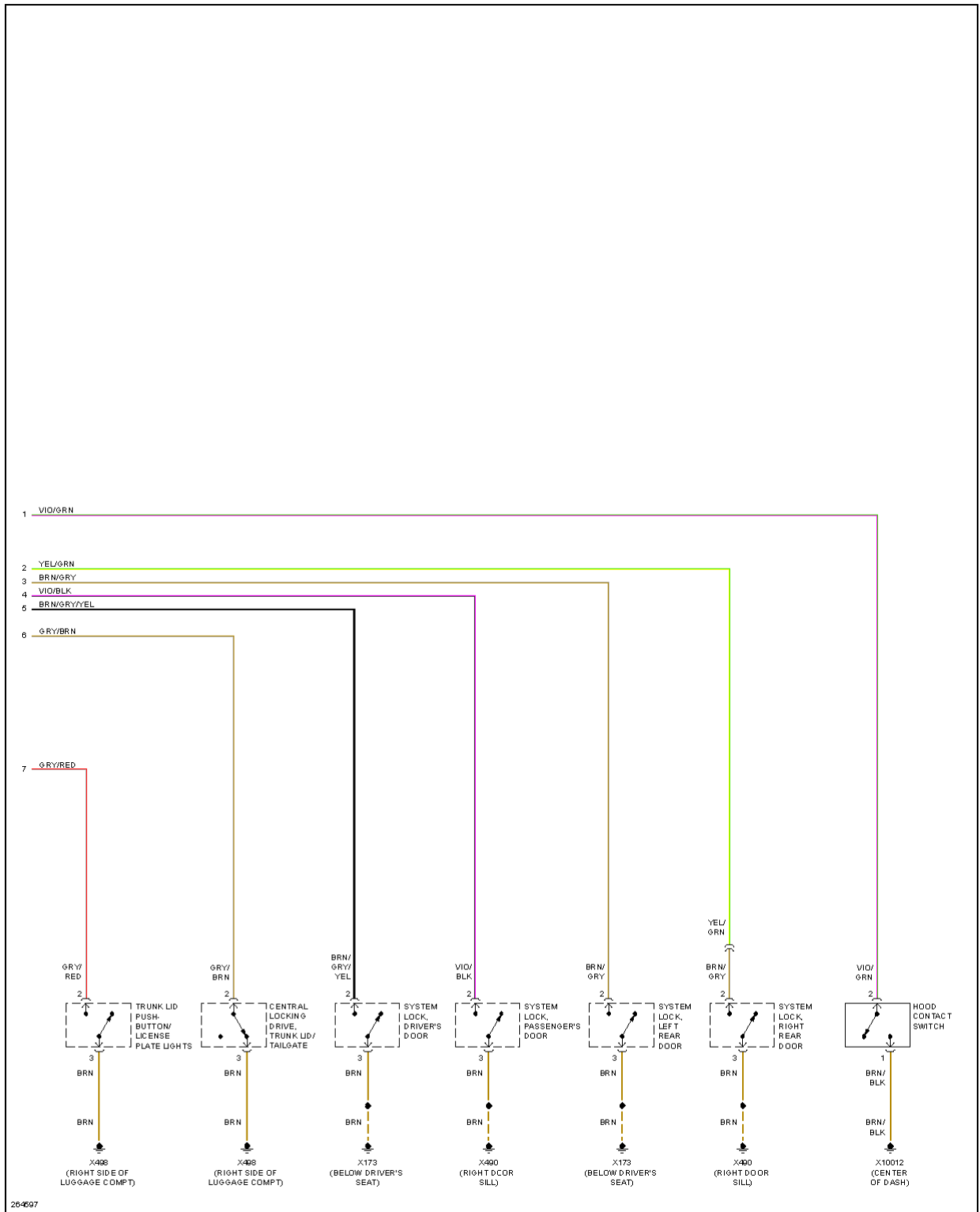
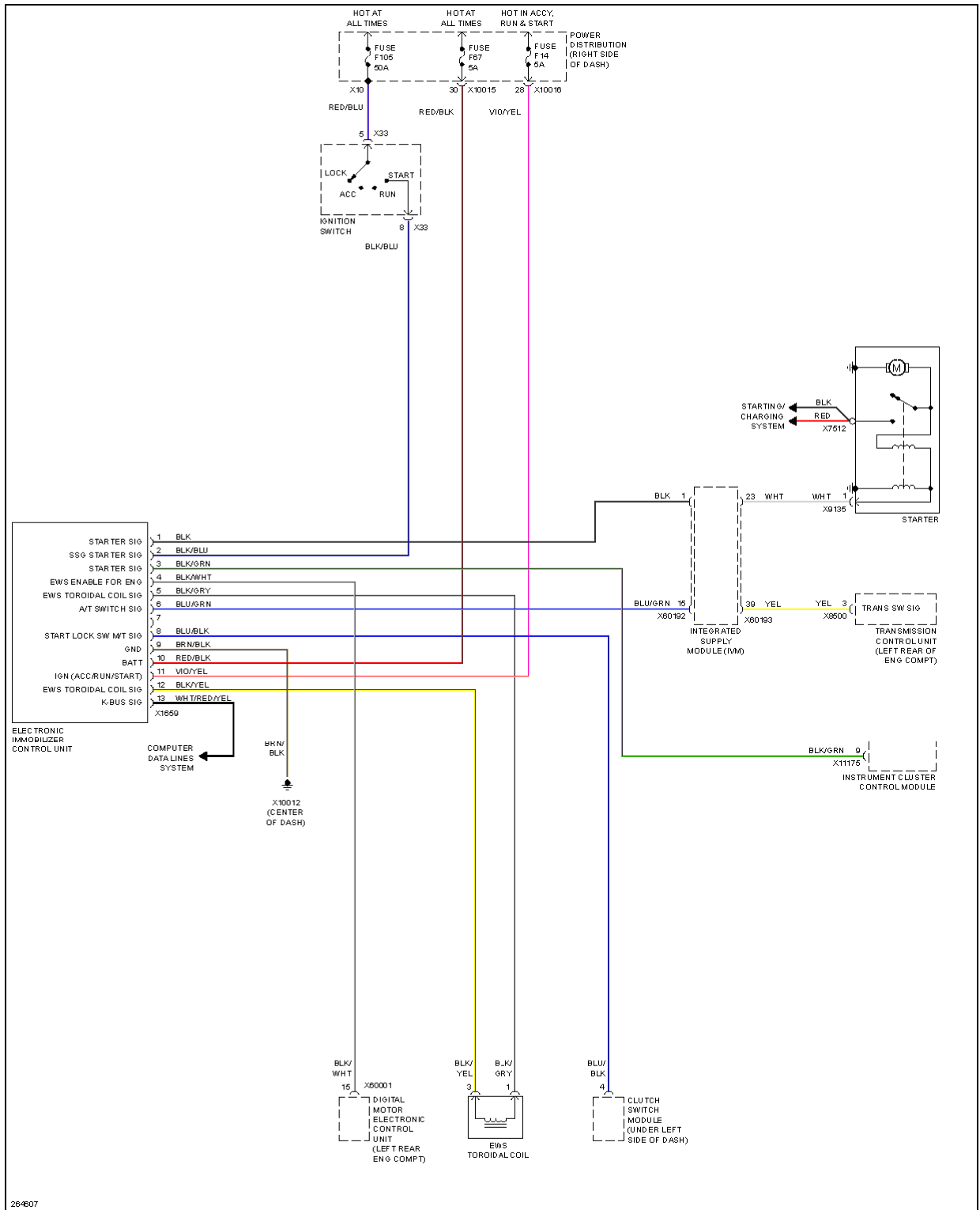


Fig. 7: Anti-theft Circuit (2 of 2)



284807

Fig. 8: Immobilizer Circuit

BODY CONTROL MODULES

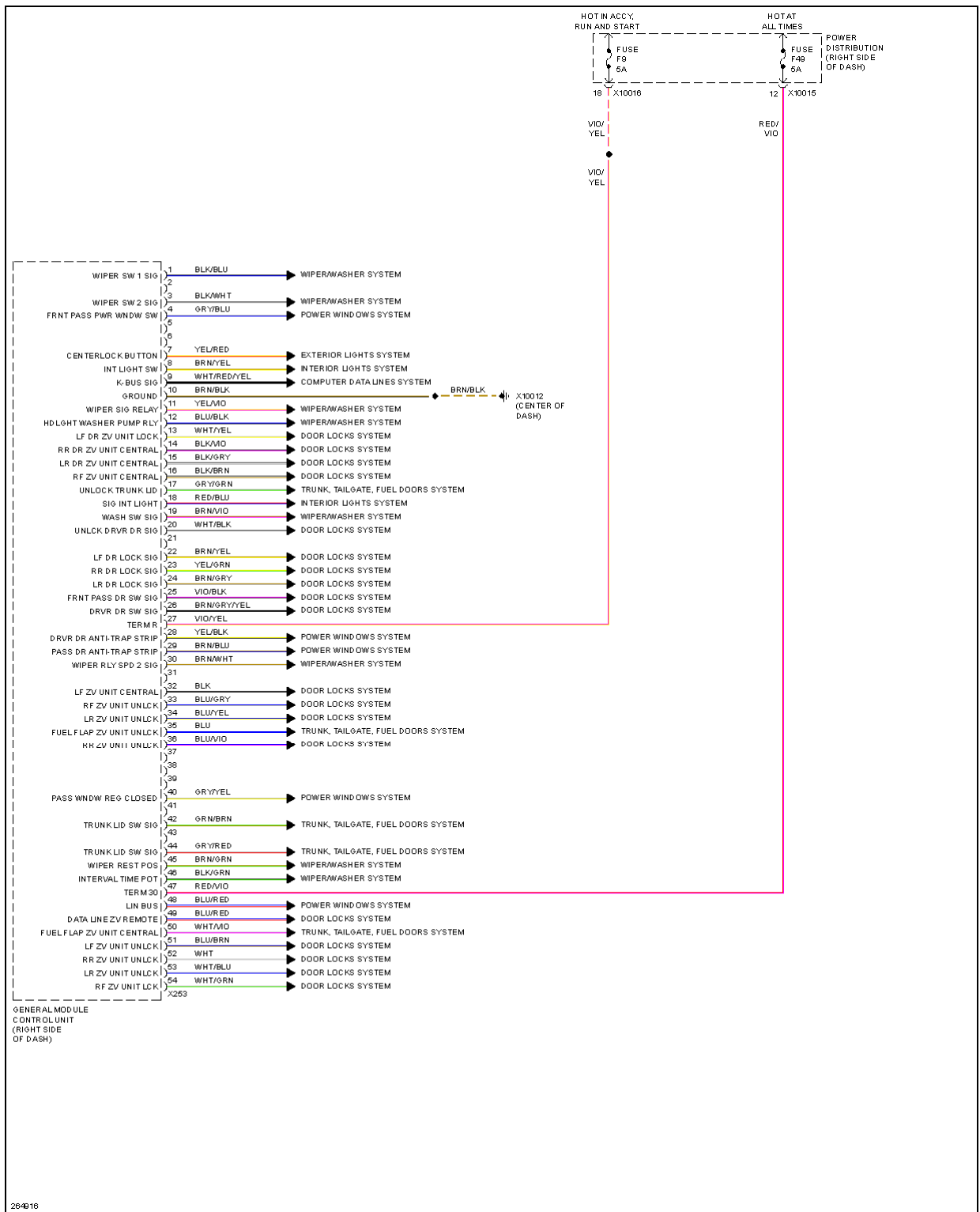
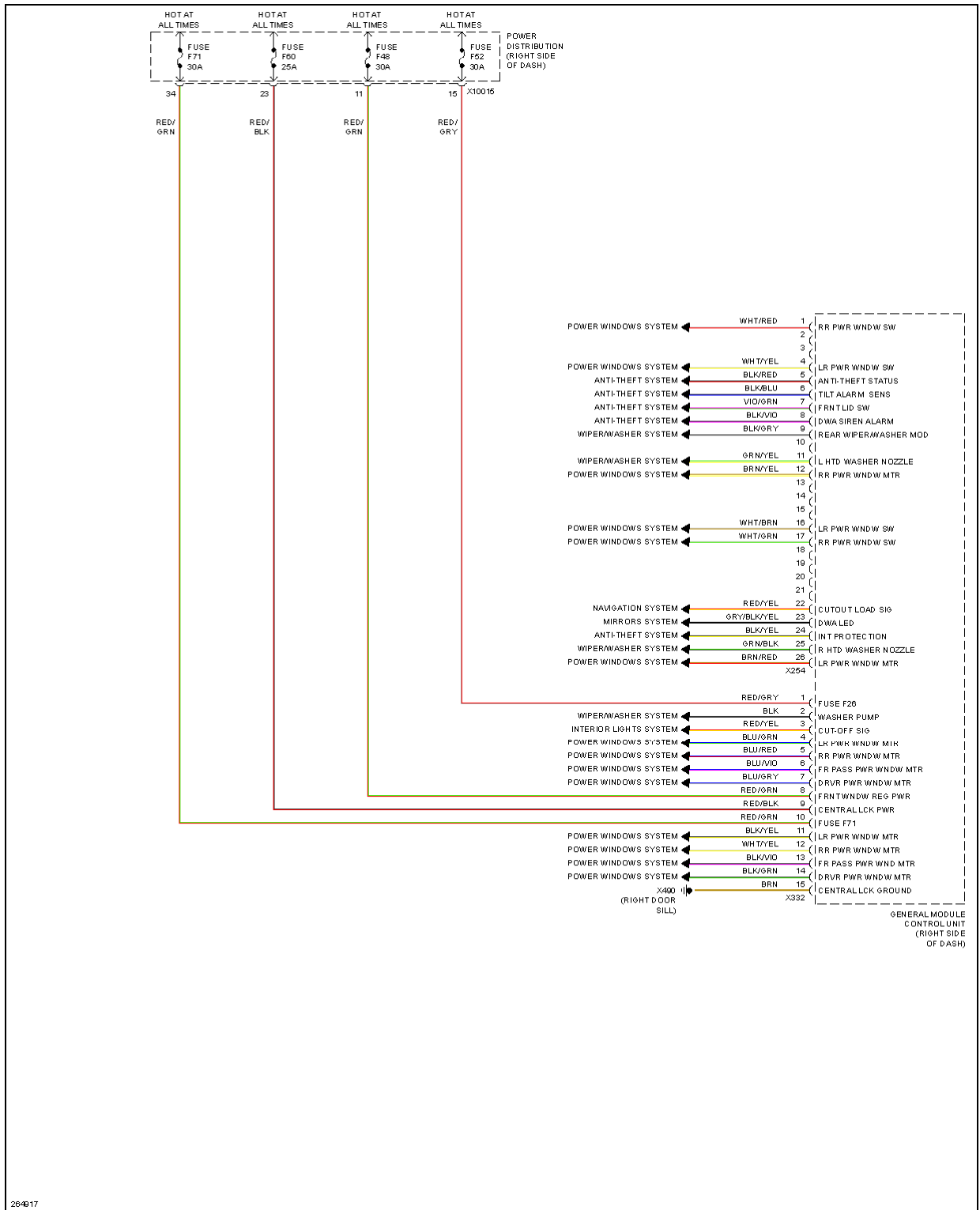


Fig. 9: Body Control Modules Circuit (1 of 2)



264017

Fig. 10: Body Control Modules Circuit (2 of 2)

COMPUTER DATA LINES

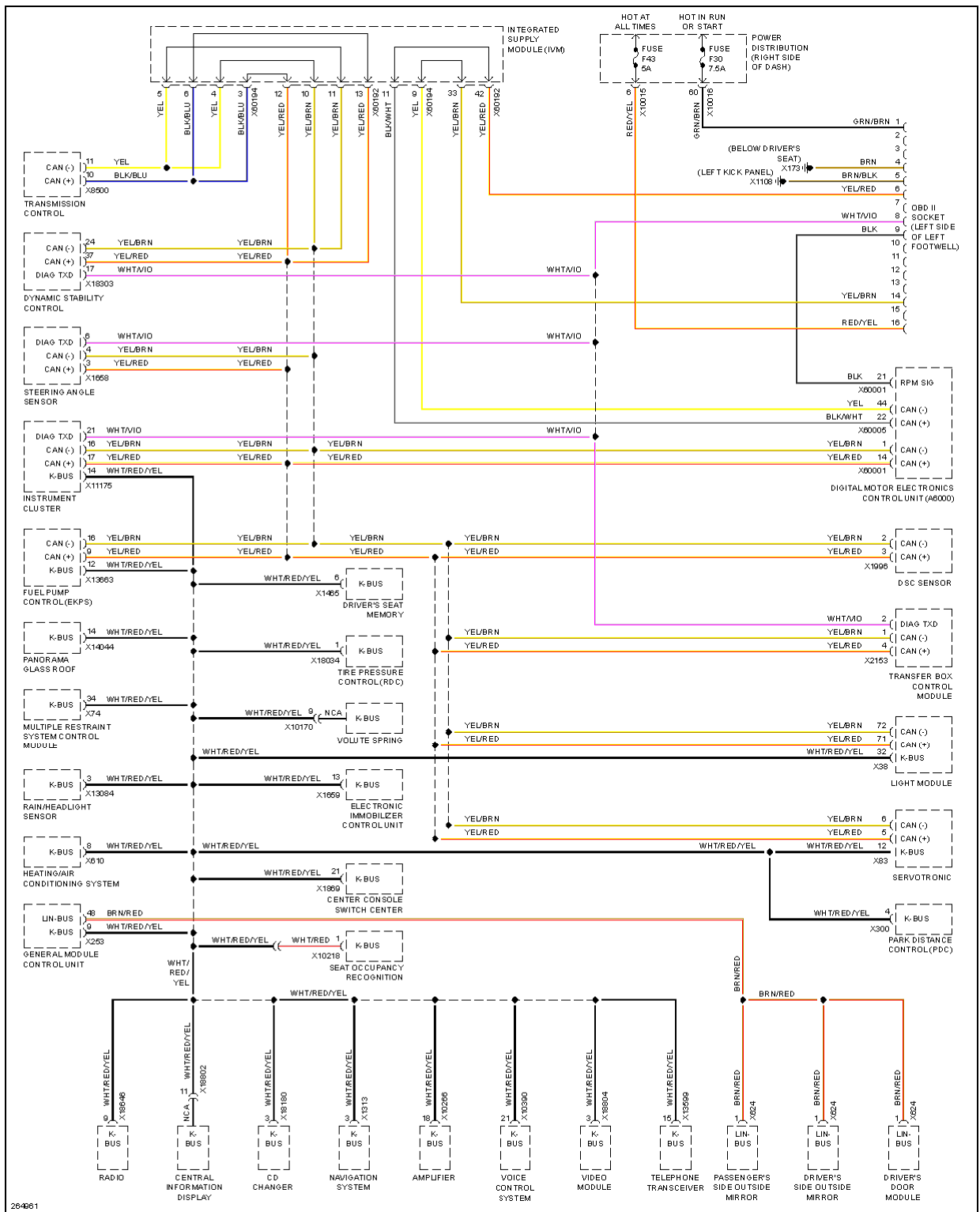


Fig. 11: Computer Data Lines Circuit

COOLING FAN

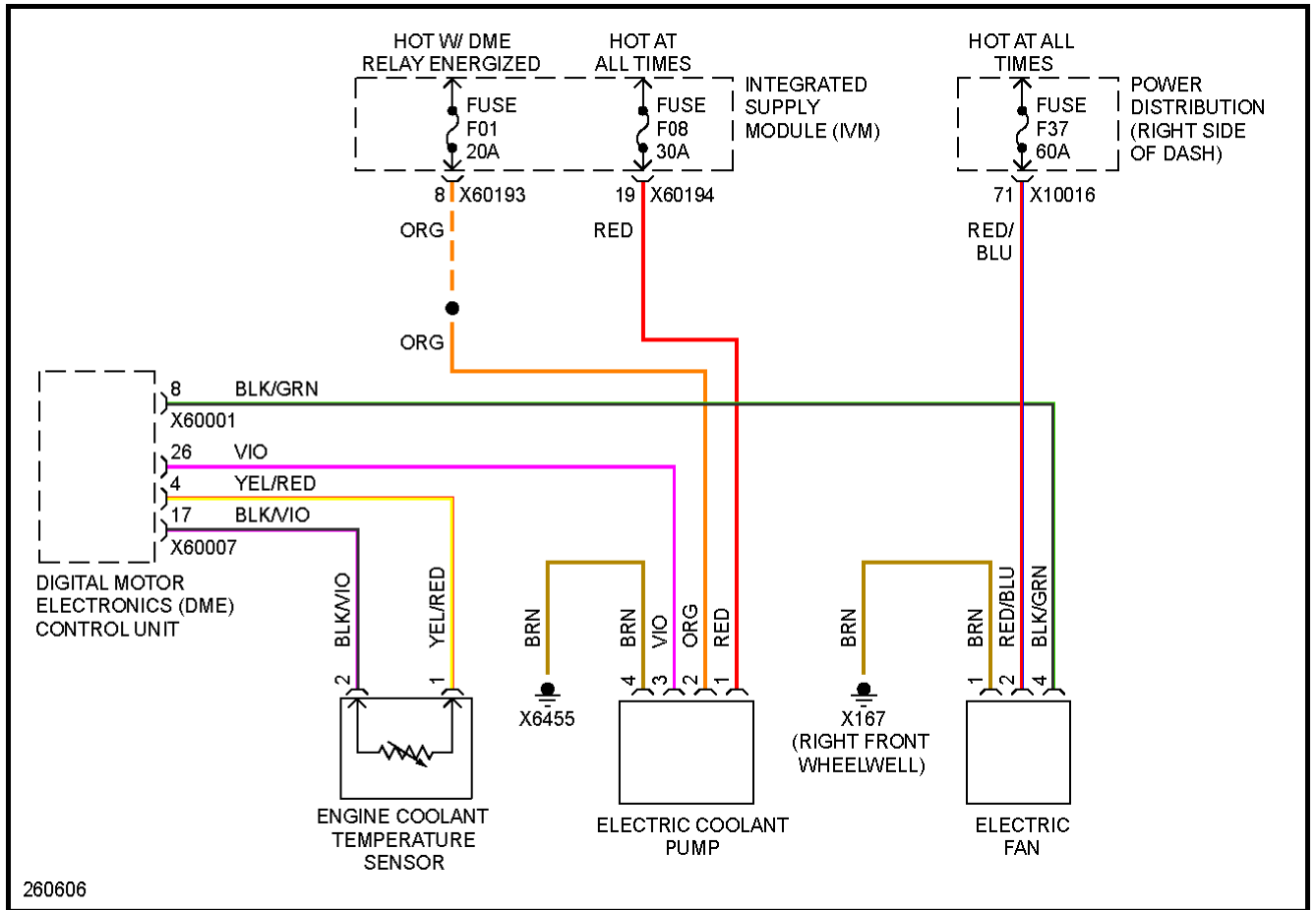


Fig. 12: Cooling Fan Circuit

CRUISE CONTROL

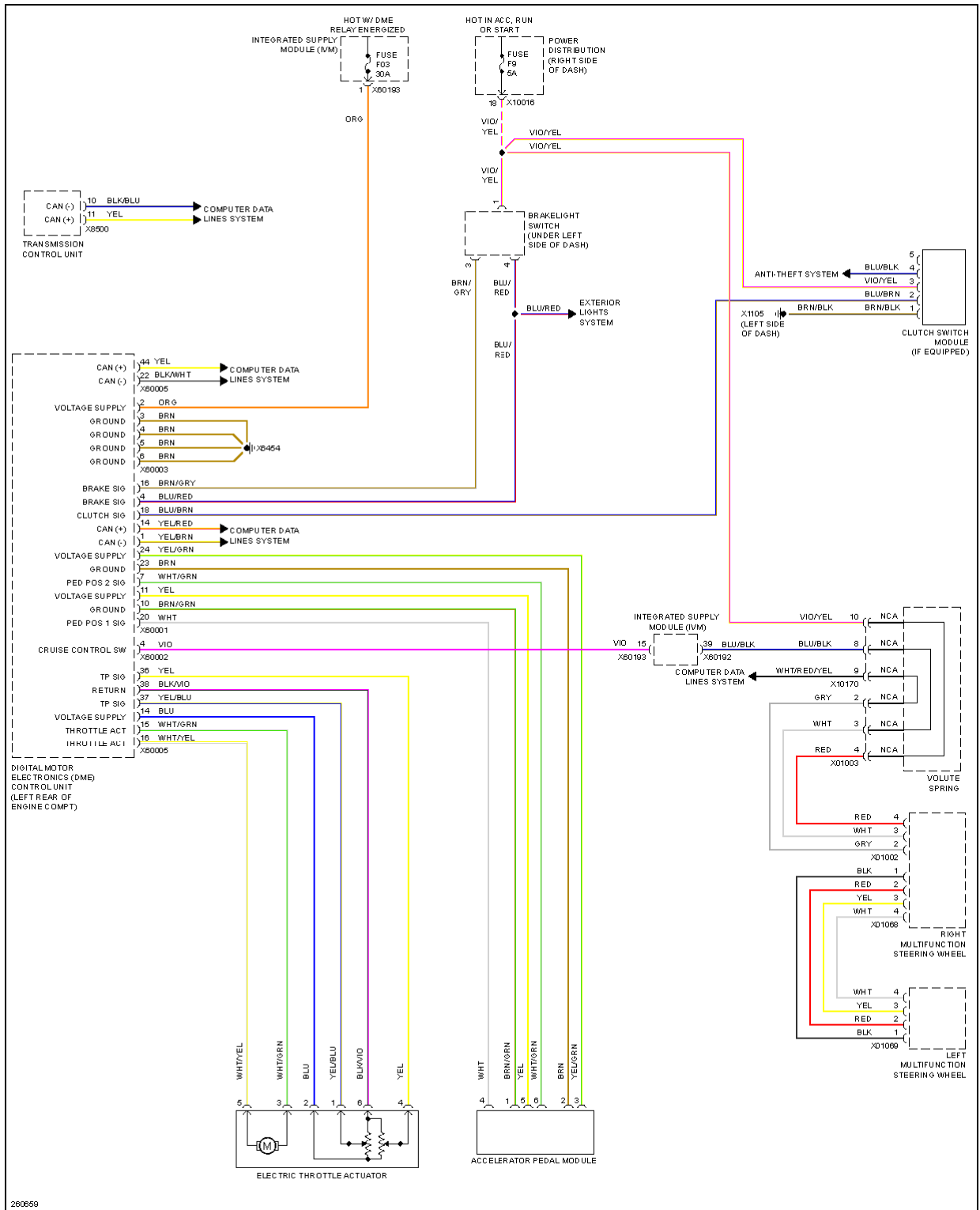
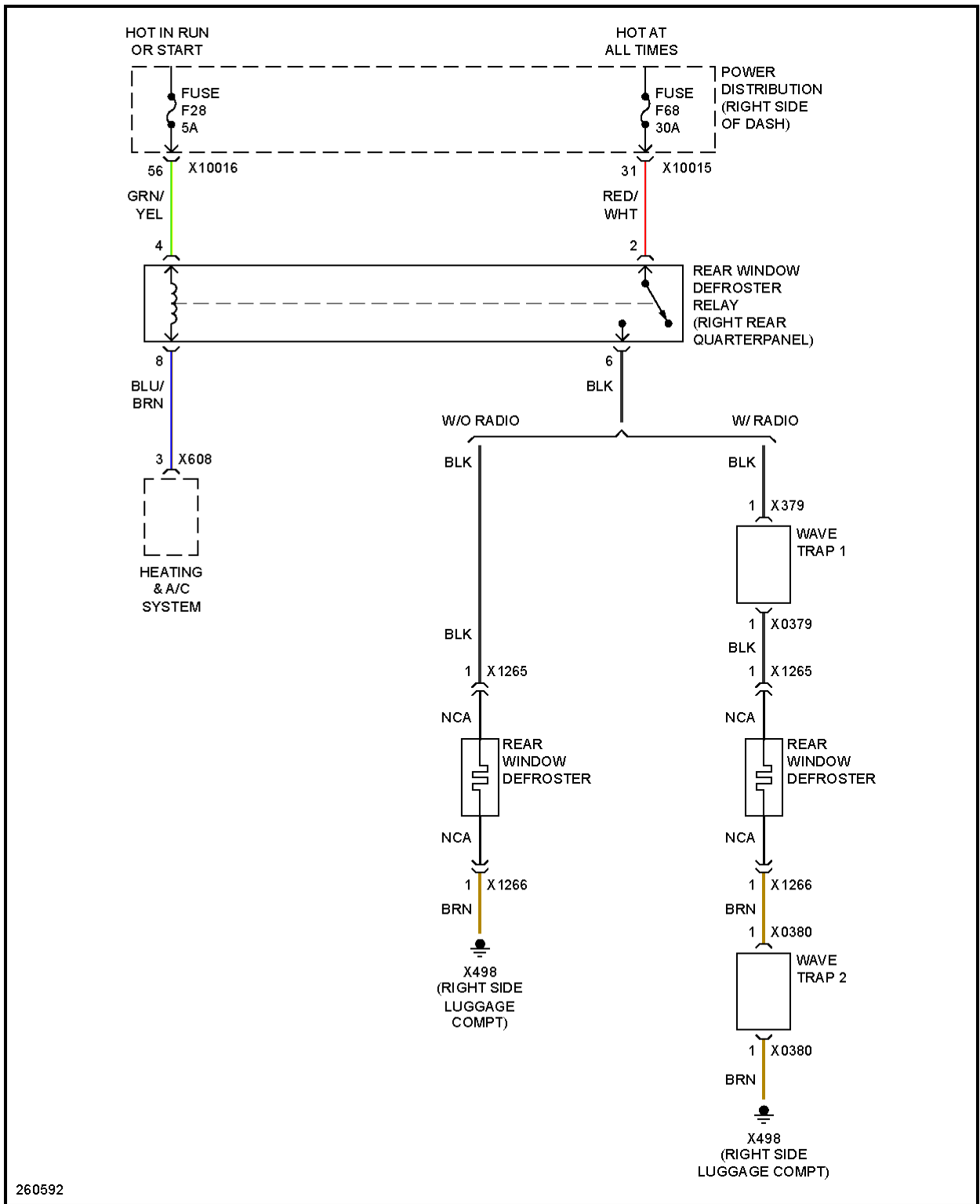


Fig. 13: Cruise Control Circuit

DEFOGGERS



260592

Fig. 14: Defoggers Circuit

ENGINE PERFORMANCE

3.0L

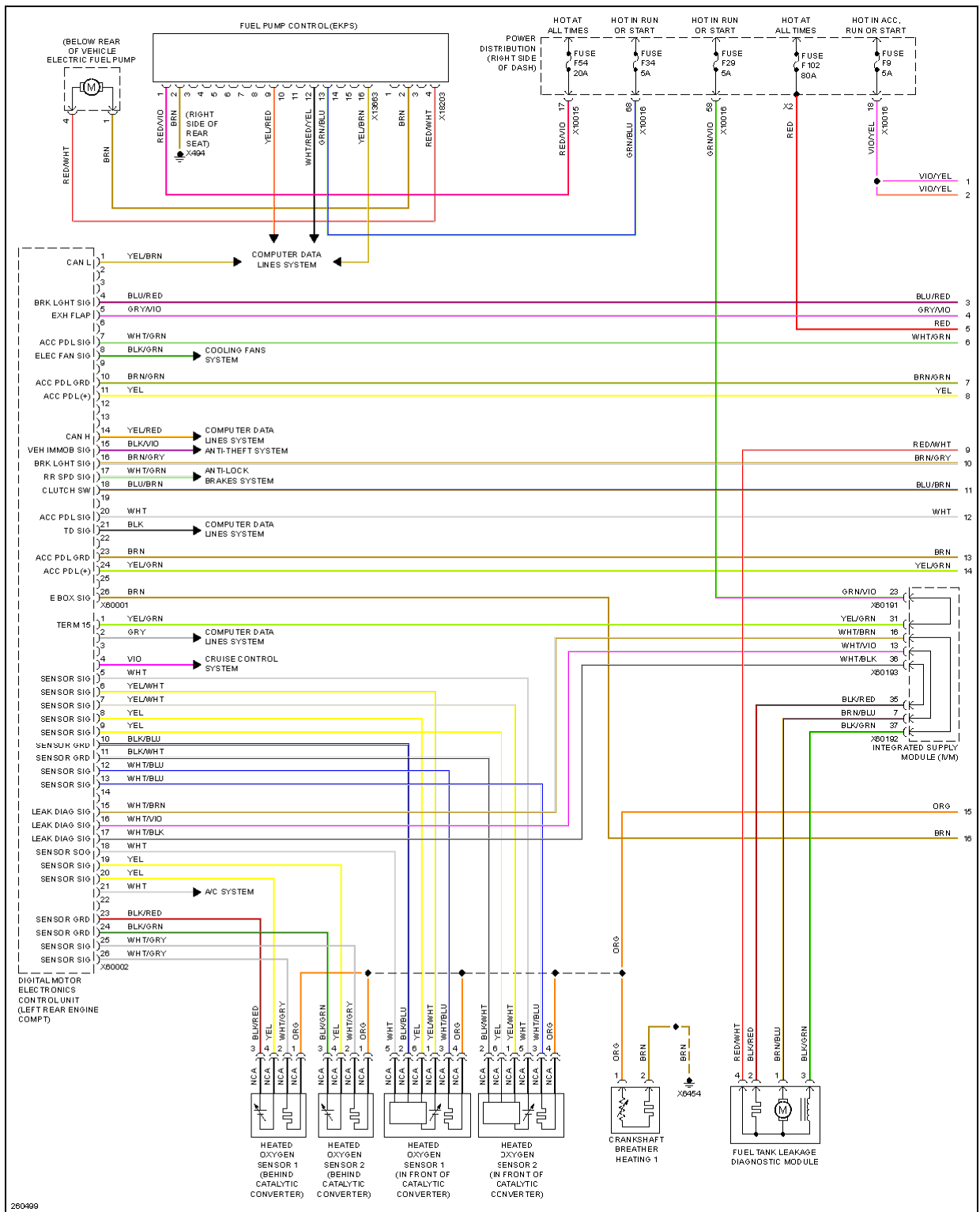


Fig. 15: 3.0L, Engine Performance Circuit (1 of 4)

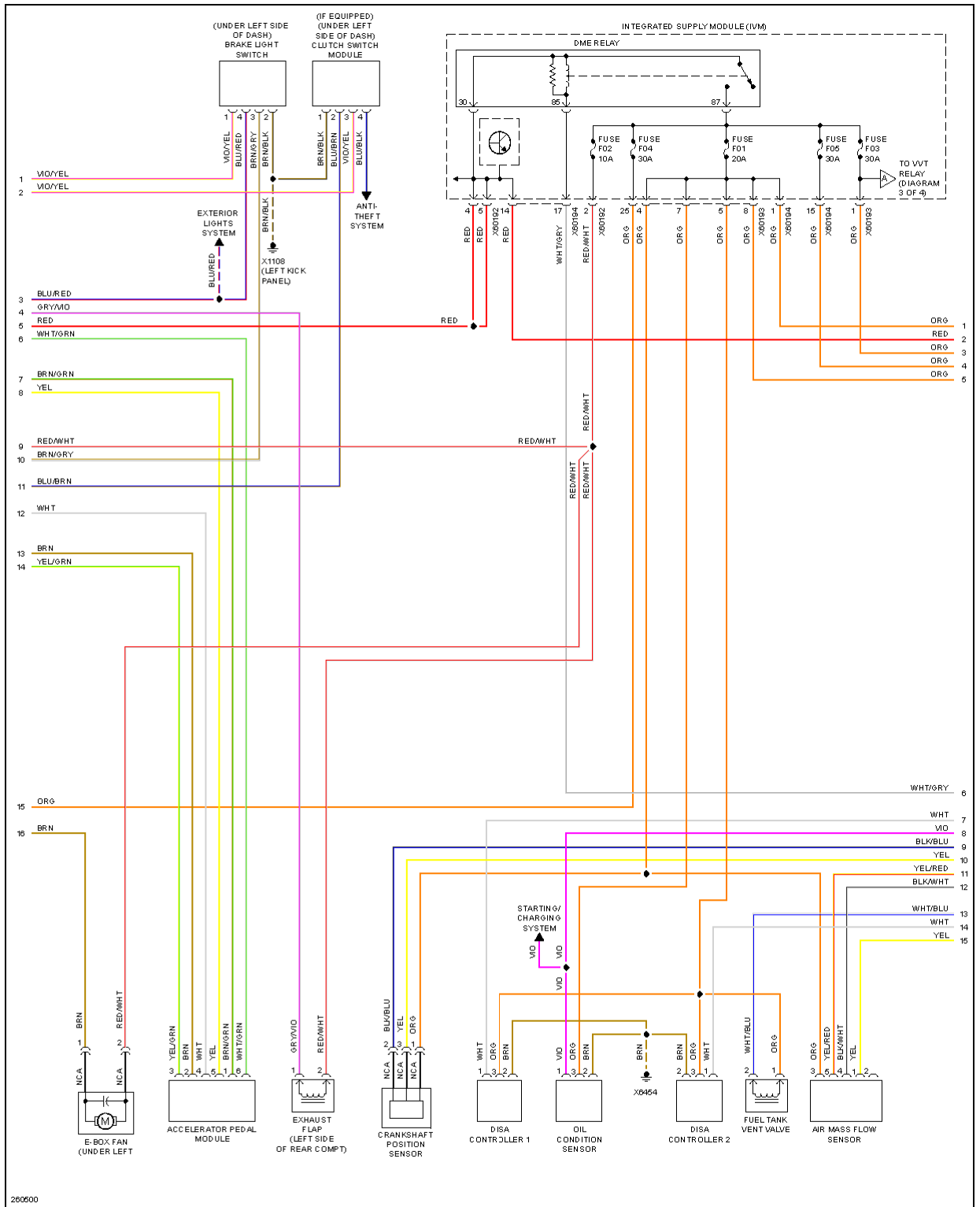


Fig. 16: 3.0L, Engine Performance Circuit (2 of 4)

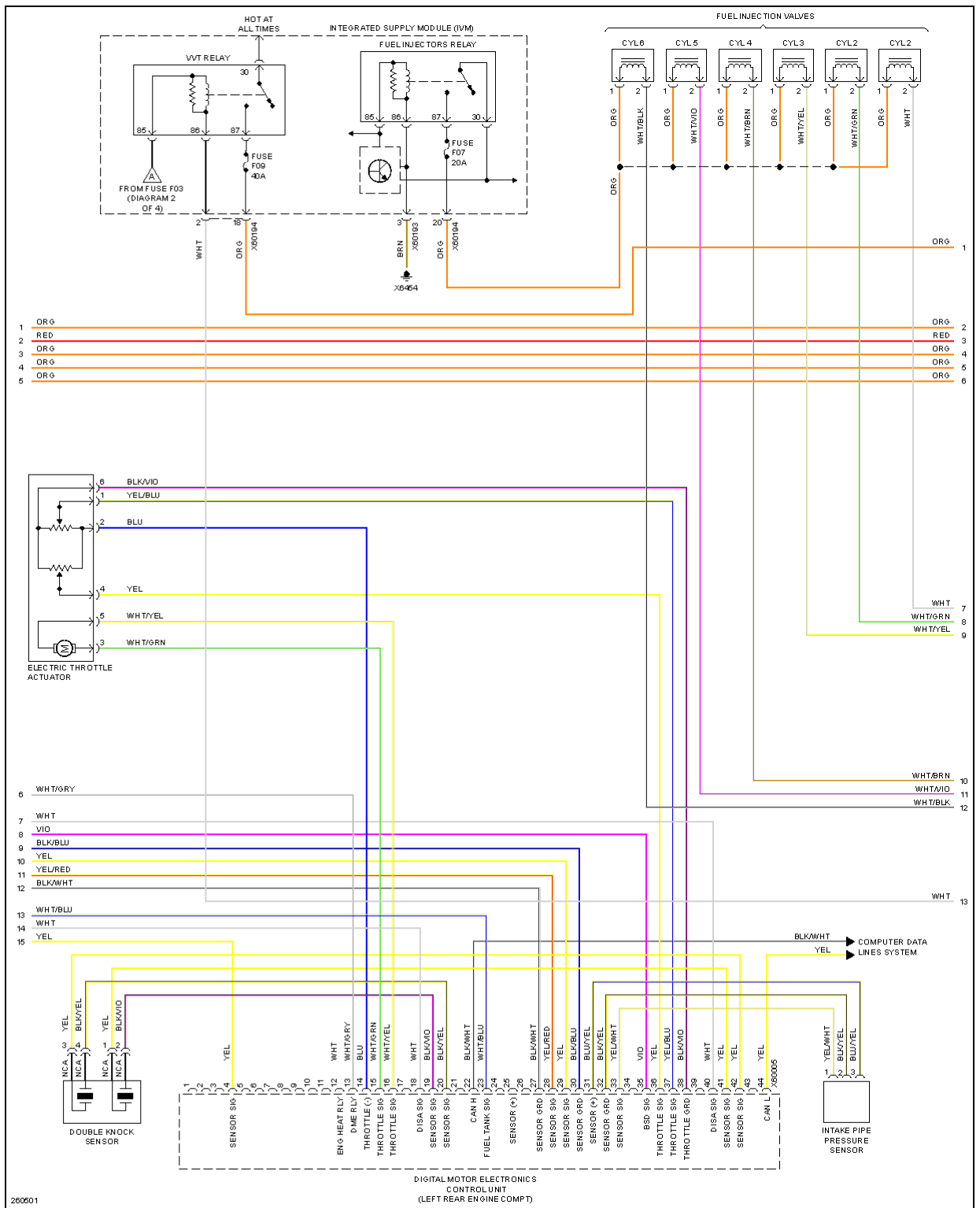


Fig. 17: 3.0L, Engine Performance Circuit (3 of 4)

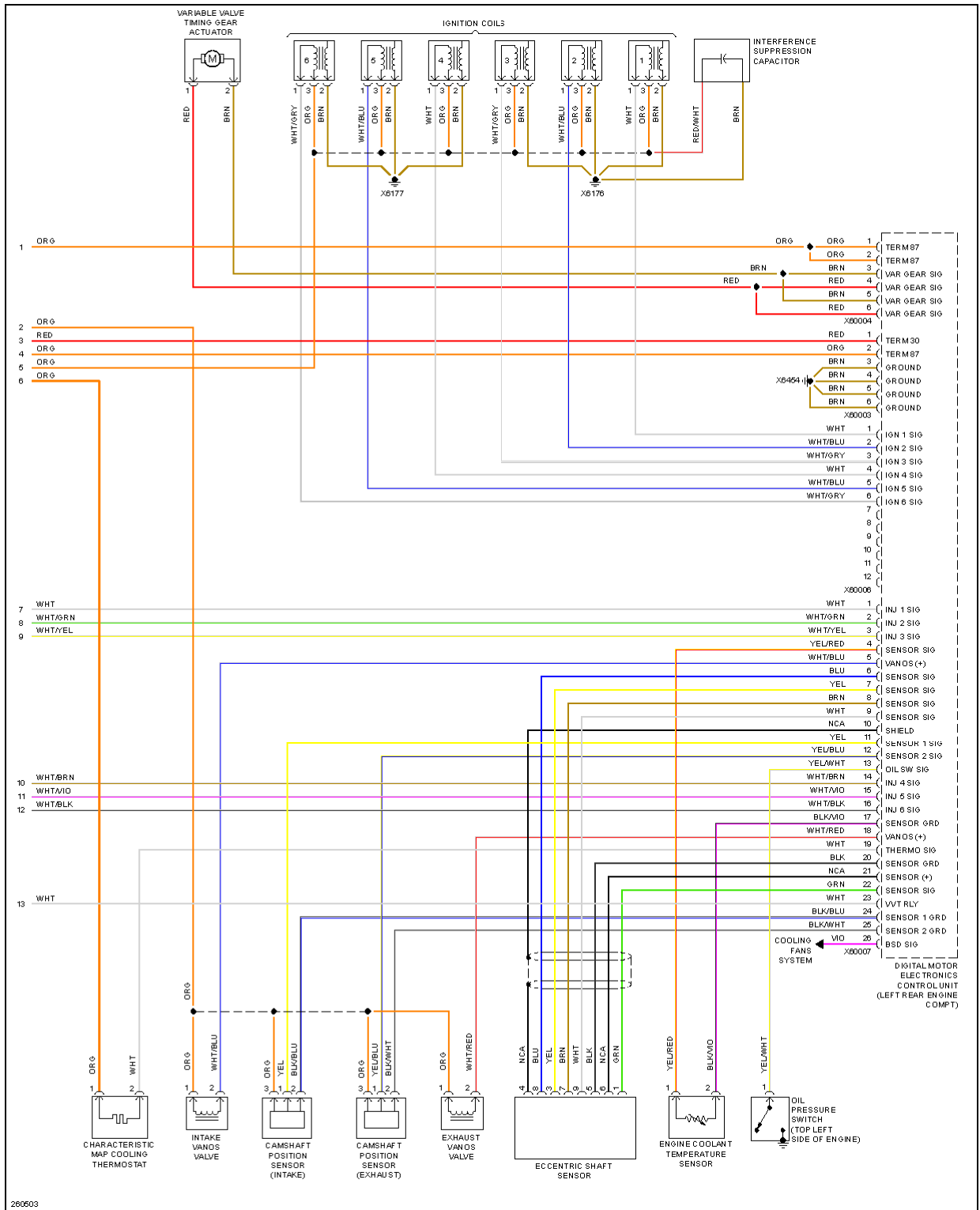
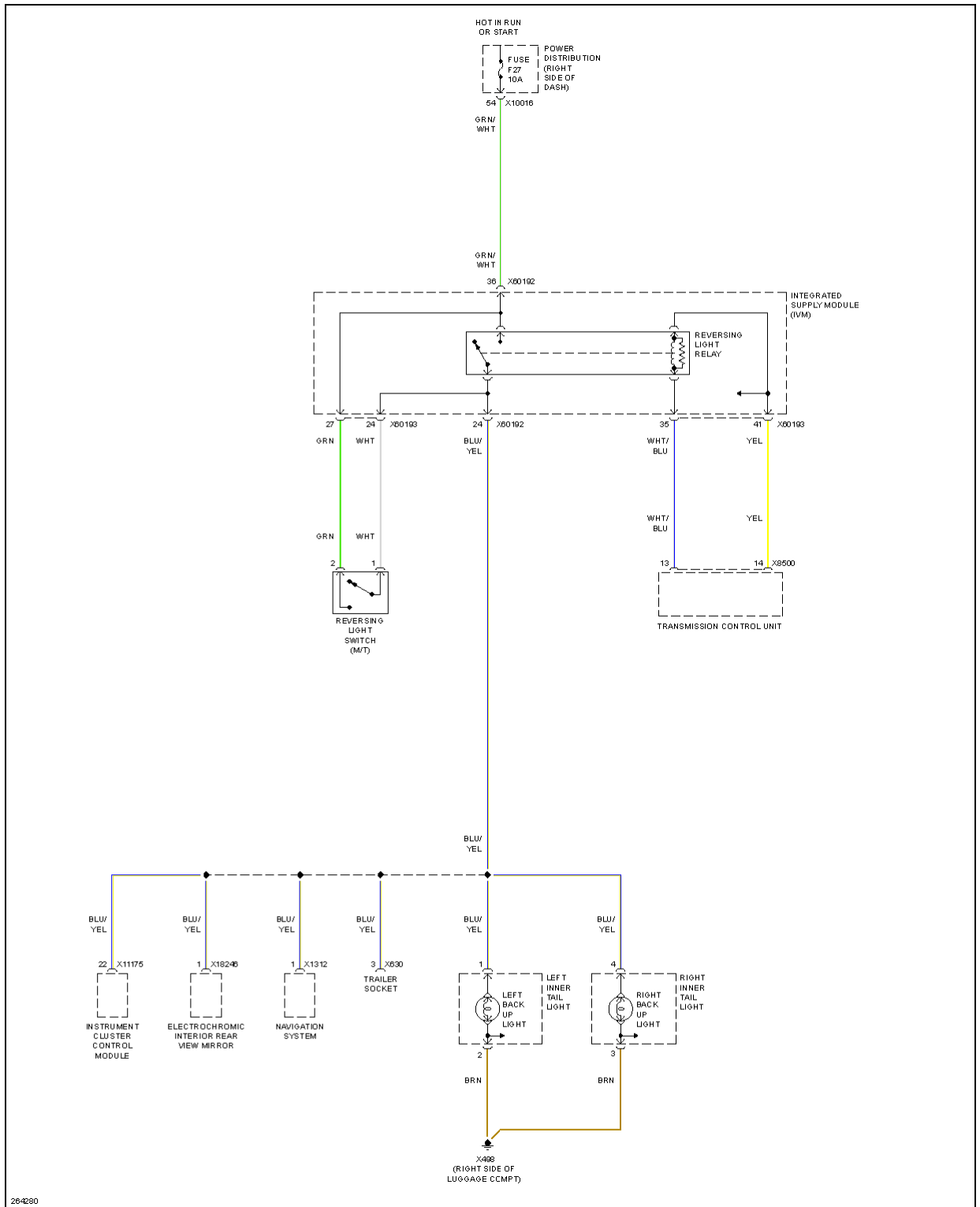


Fig. 18: 3.0L, Engine Performance Circuit (4 of 4)

EXTERIOR LIGHTS



264280

Fig. 19: Back-up Lamps Circuit

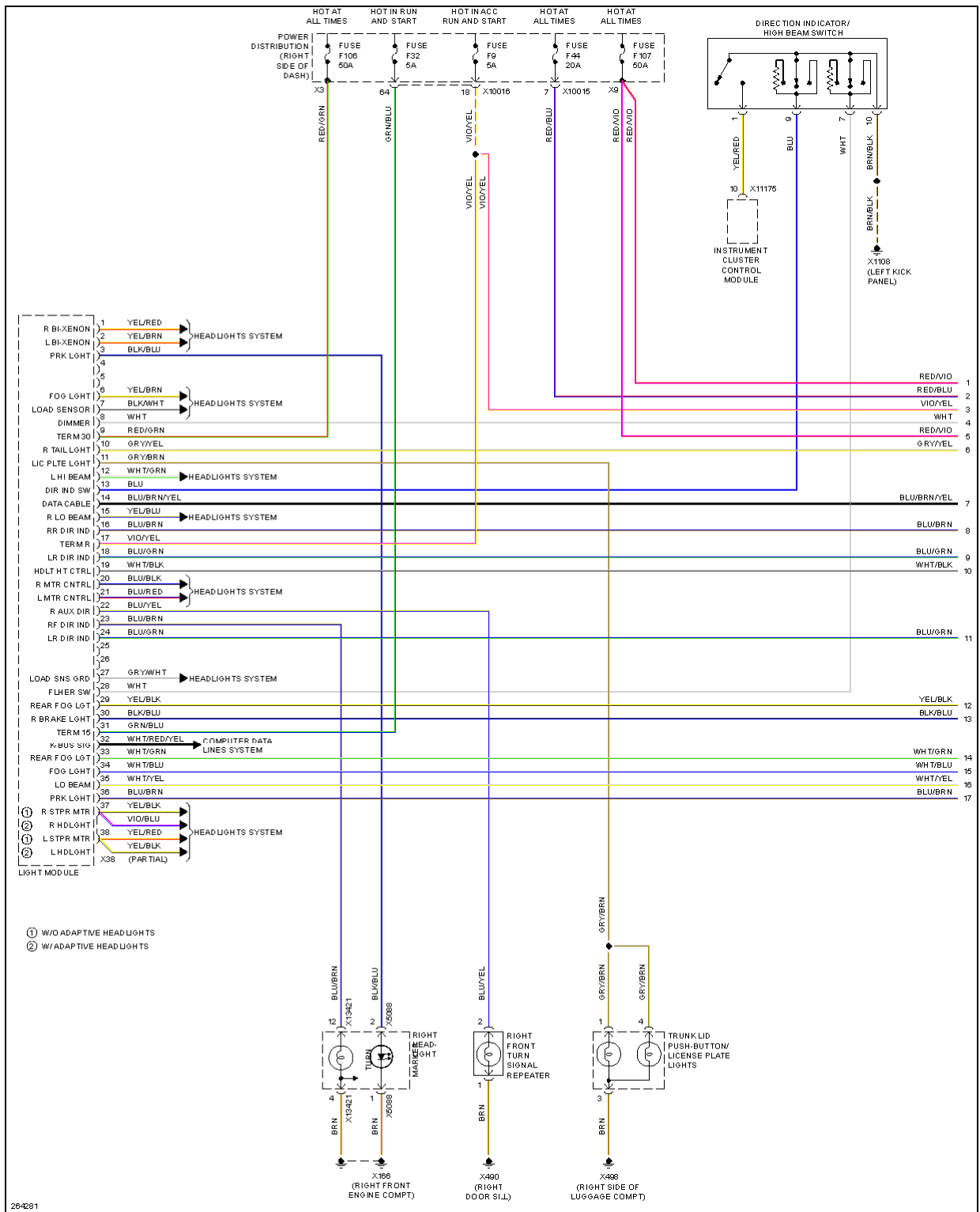


Fig. 20: Exterior Lamps Circuit (1 of 3)

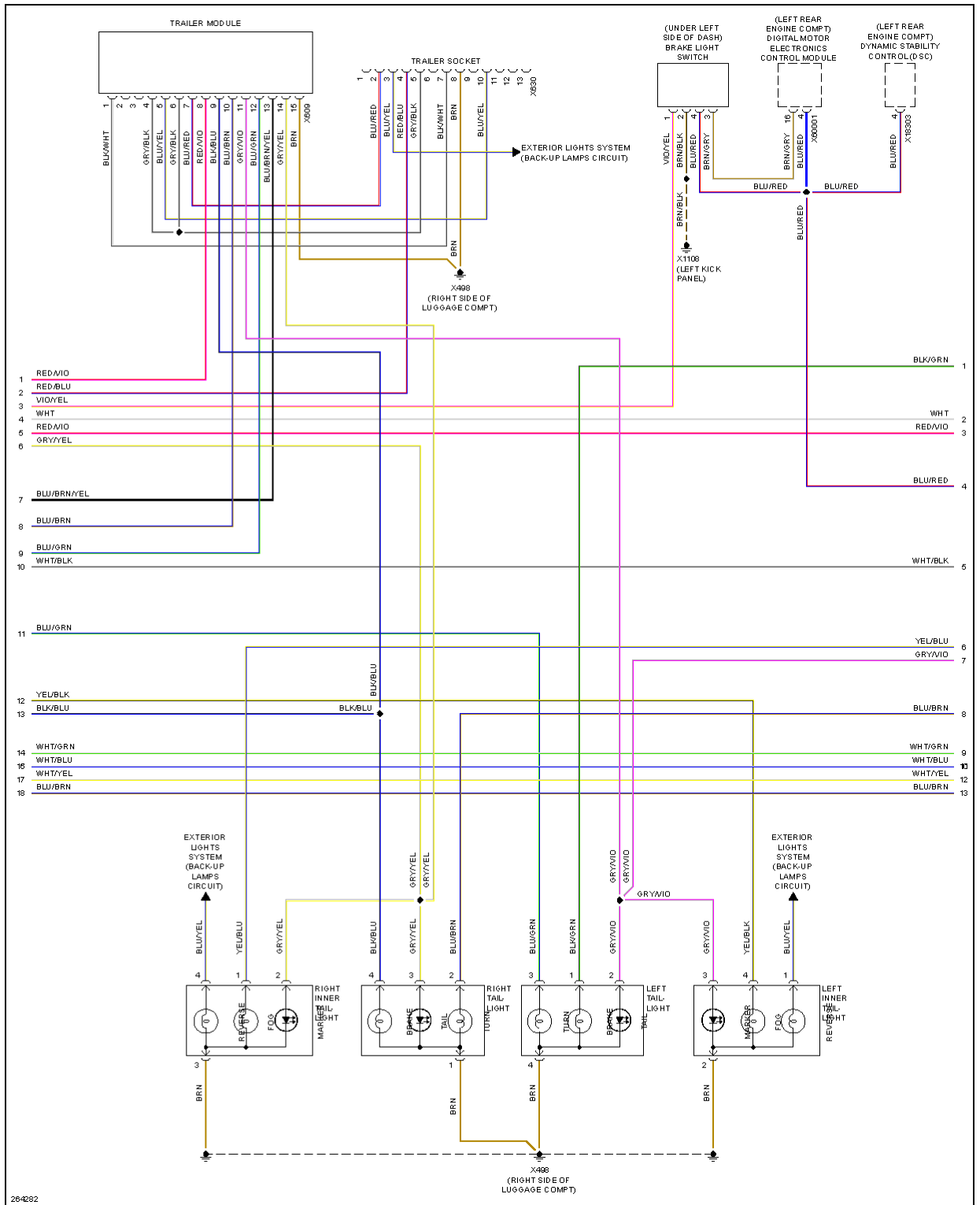


Fig. 21: Exterior Lamps Circuit (2 of 3)

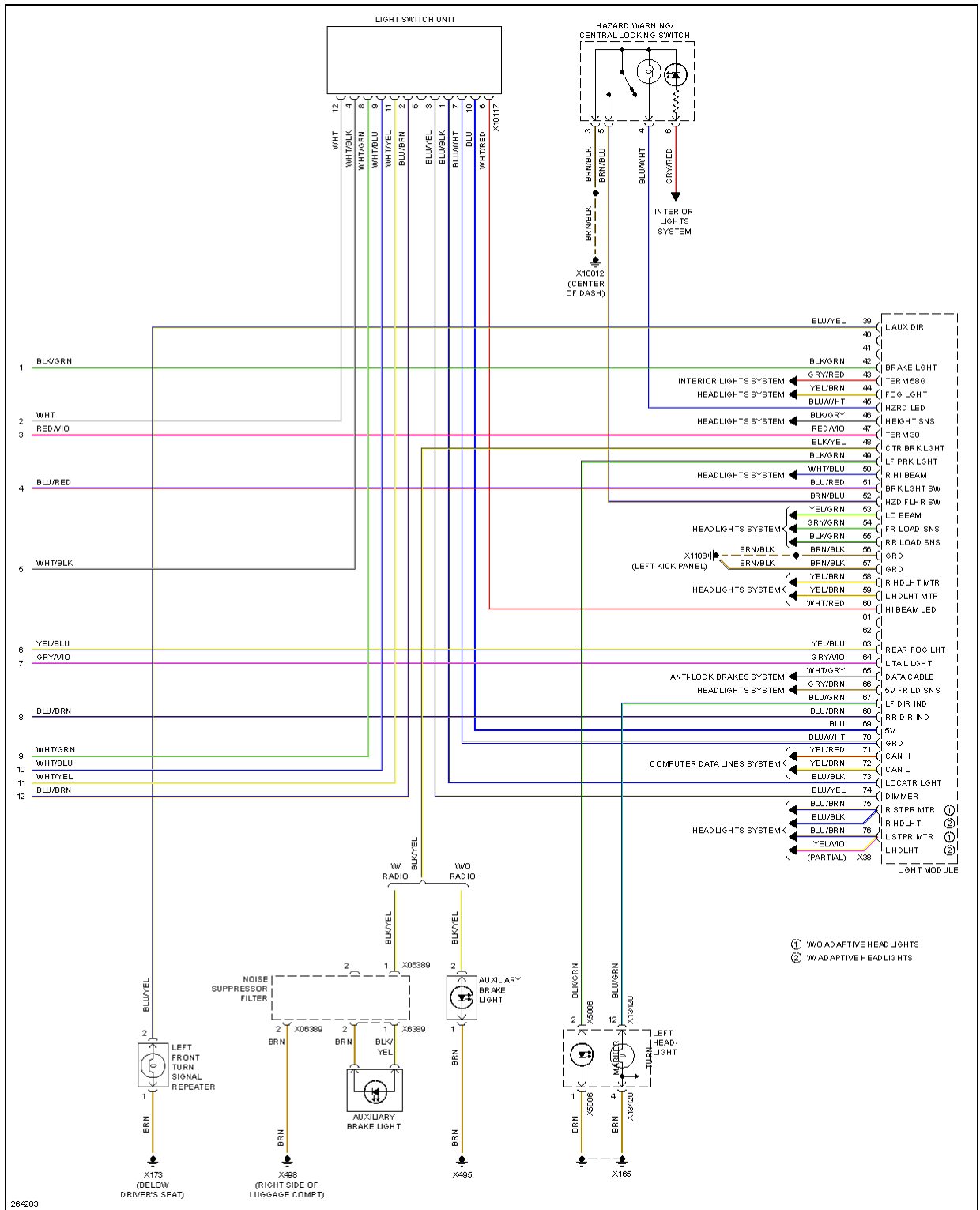
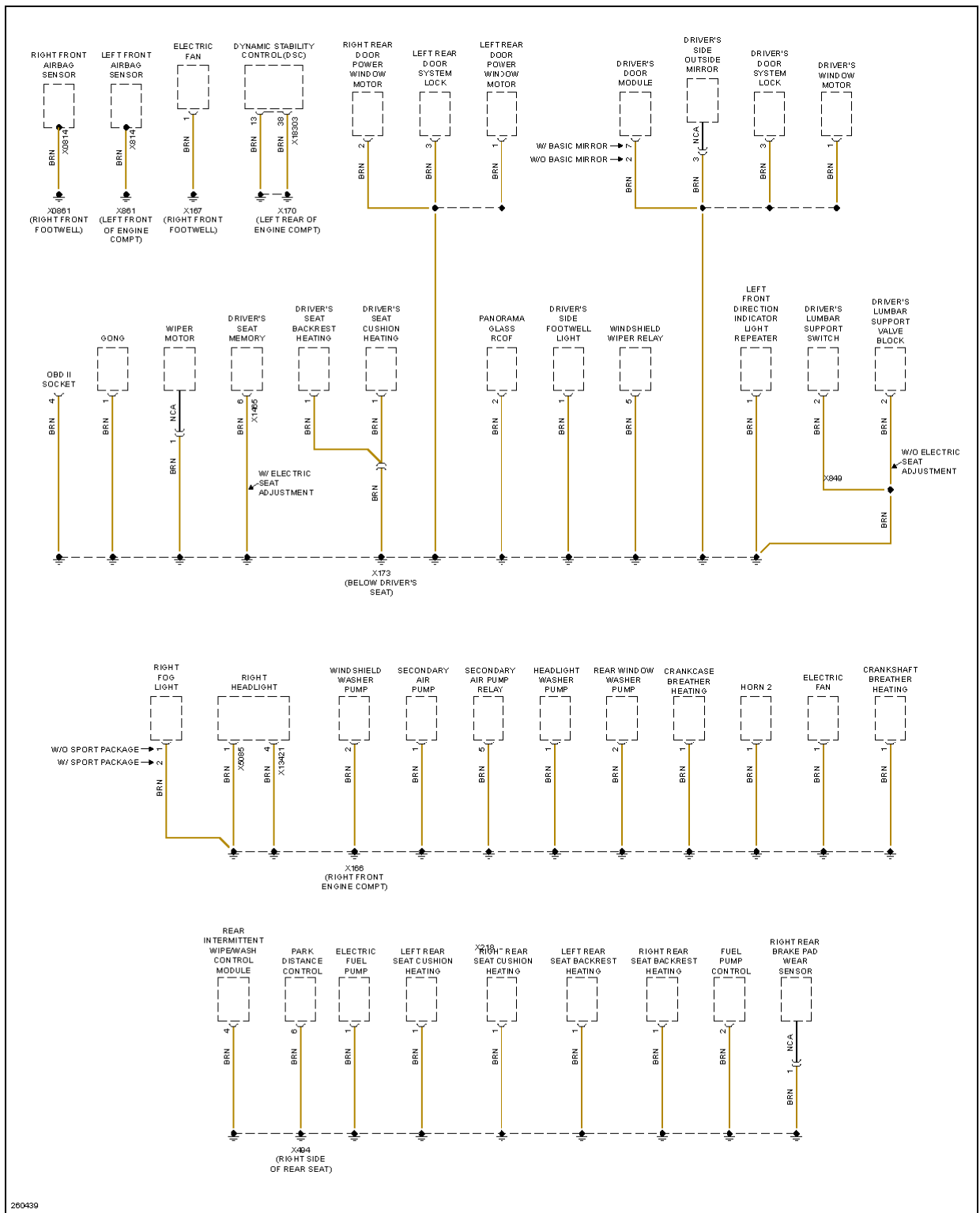


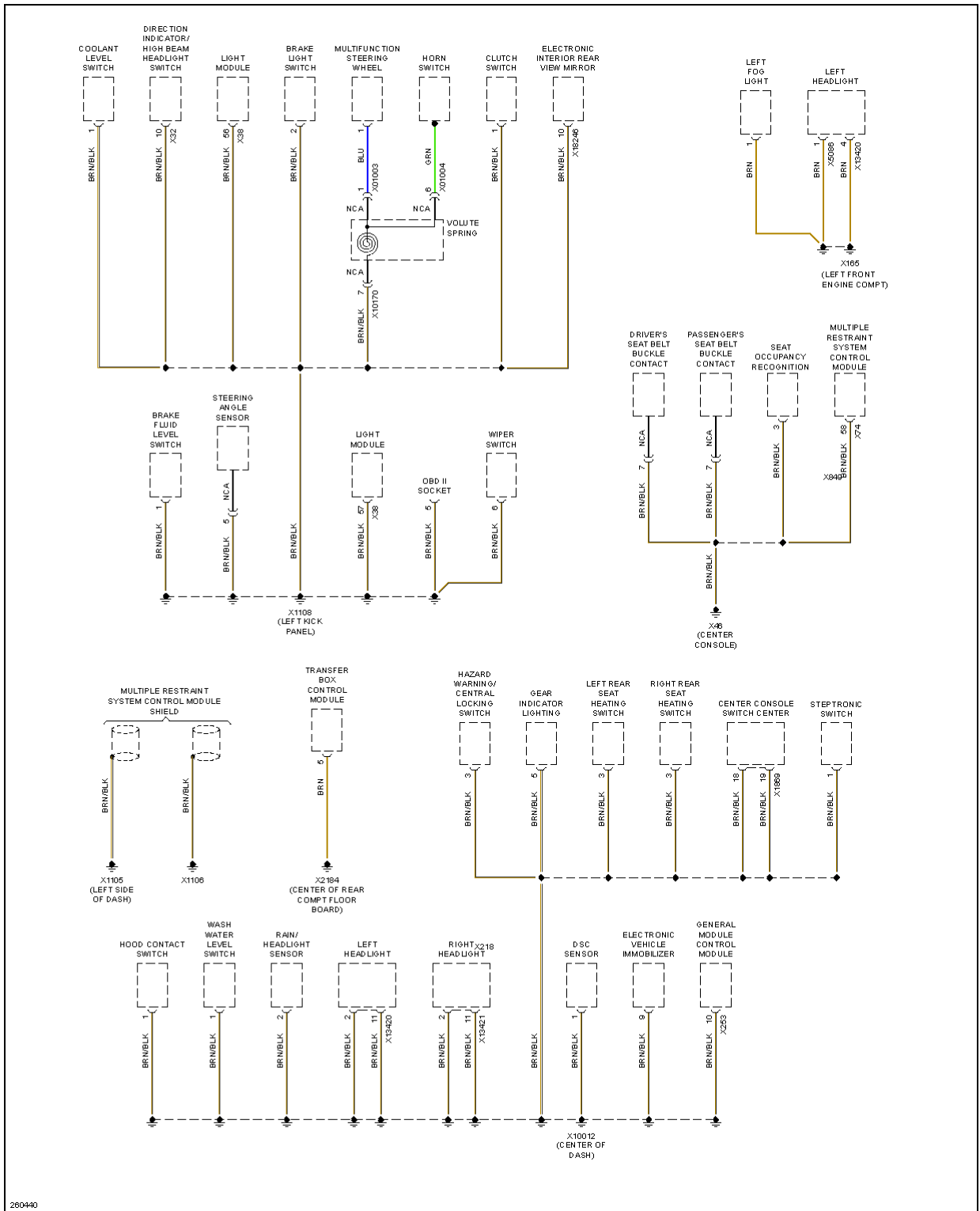
Fig. 22: Exterior Lamps Circuit (3 of 3)

GROUND DISTRIBUTION



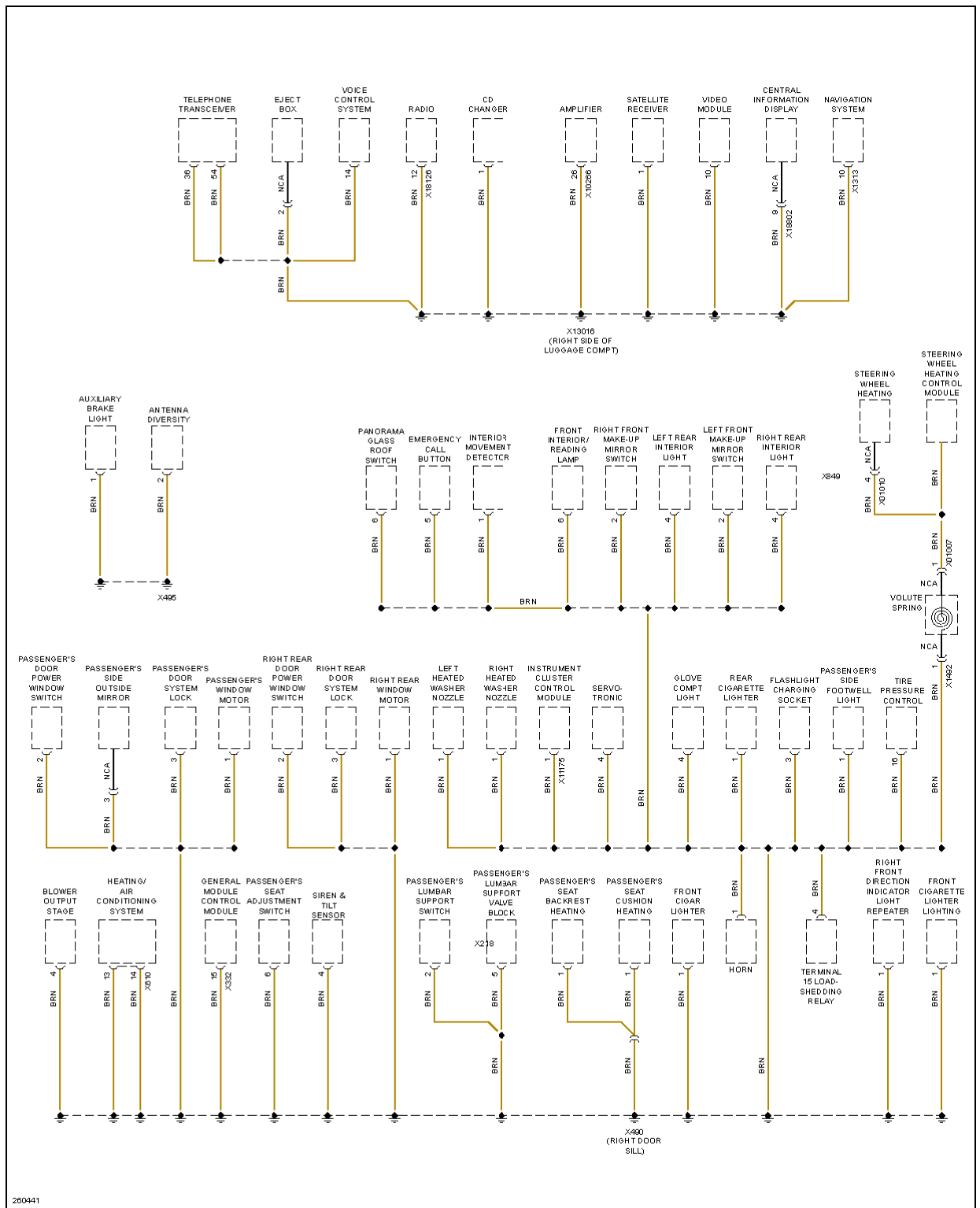
260439

Fig. 23: Ground Distribution Circuit (1 of 4)



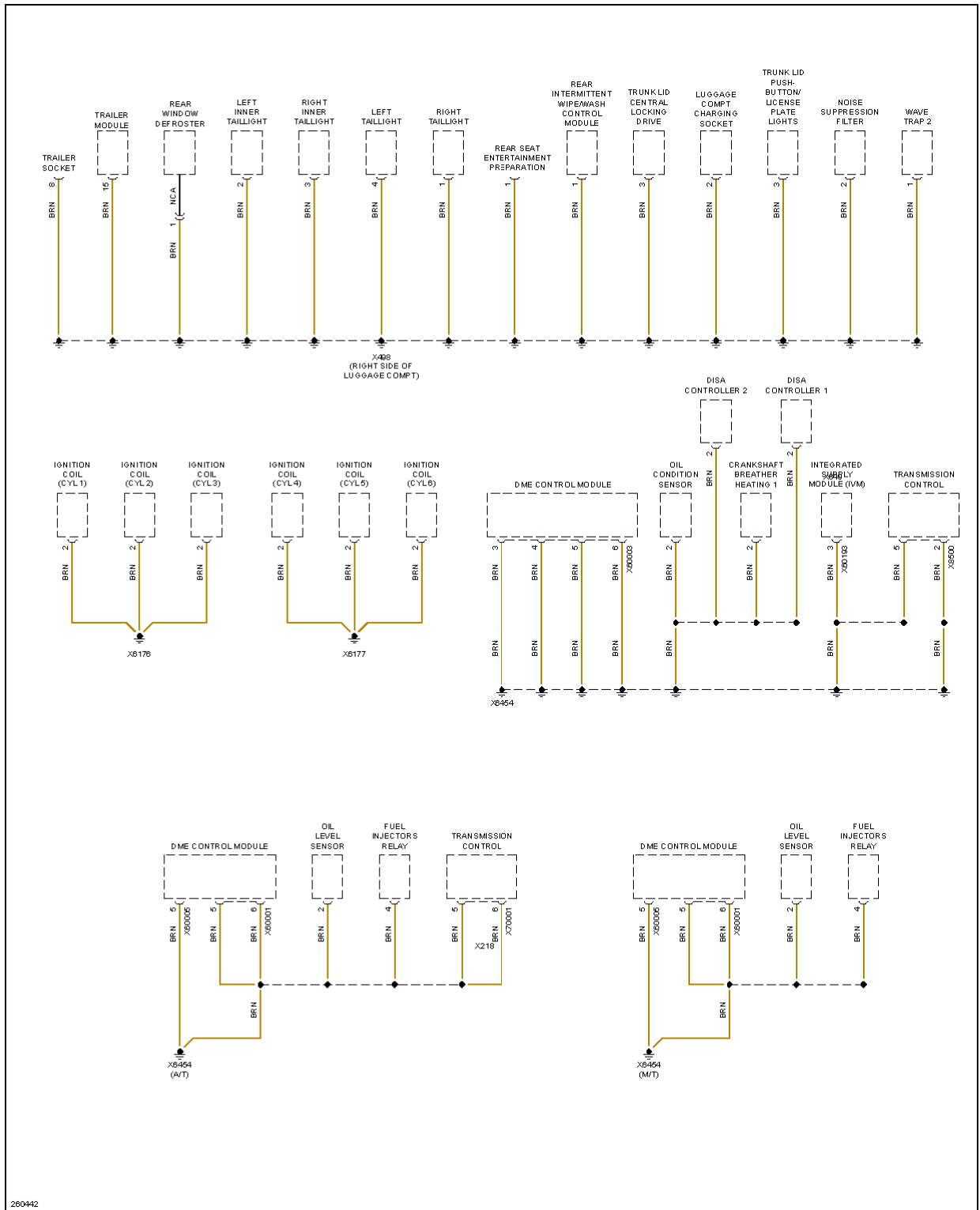
260440

Fig. 24: Ground Distribution Circuit (2 of 4)



280441

Fig. 25: Ground Distribution Circuit (3 of 4)



260442

Fig. 26: Ground Distribution Circuit (4 of 4)

HEADLIGHTS

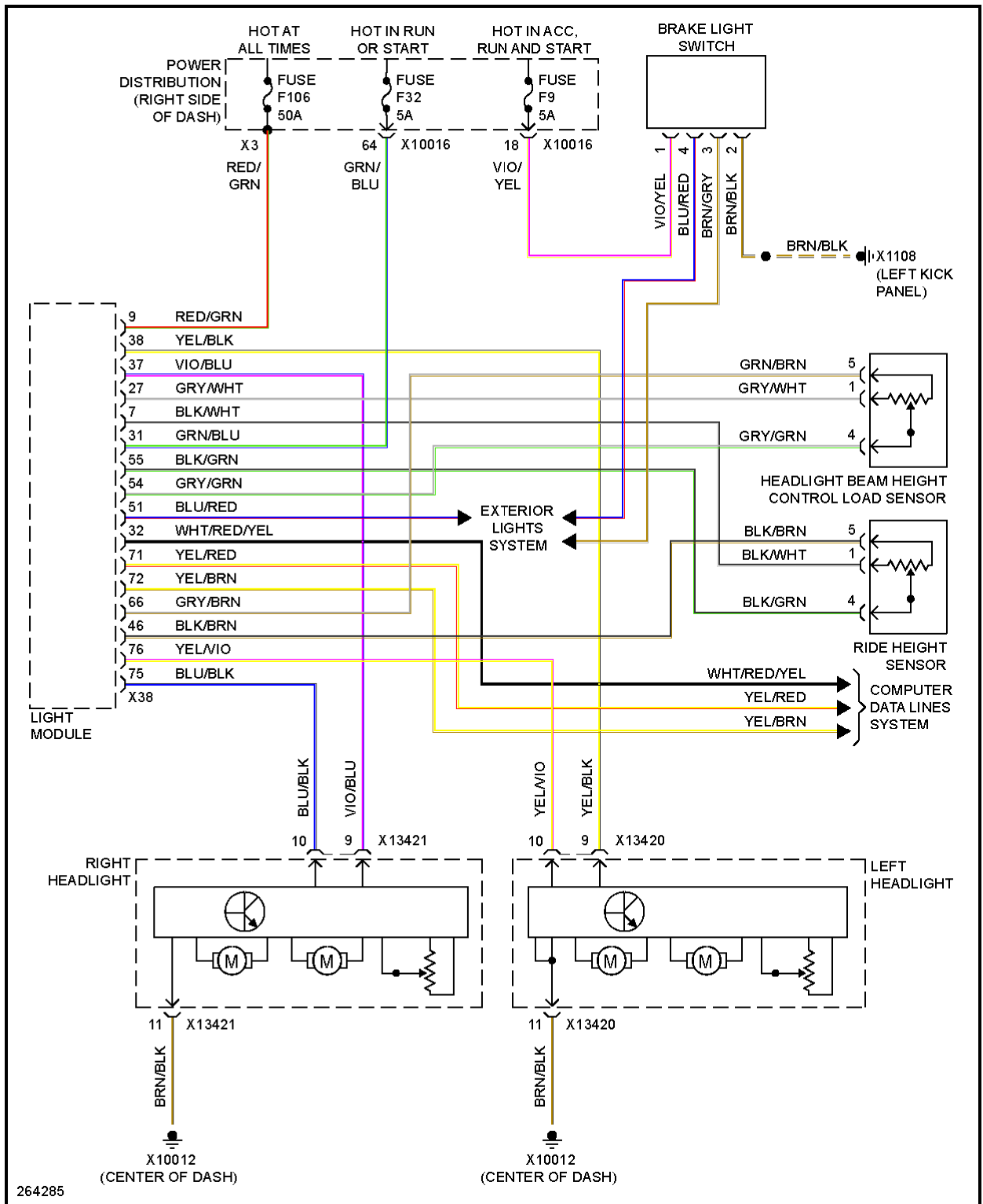
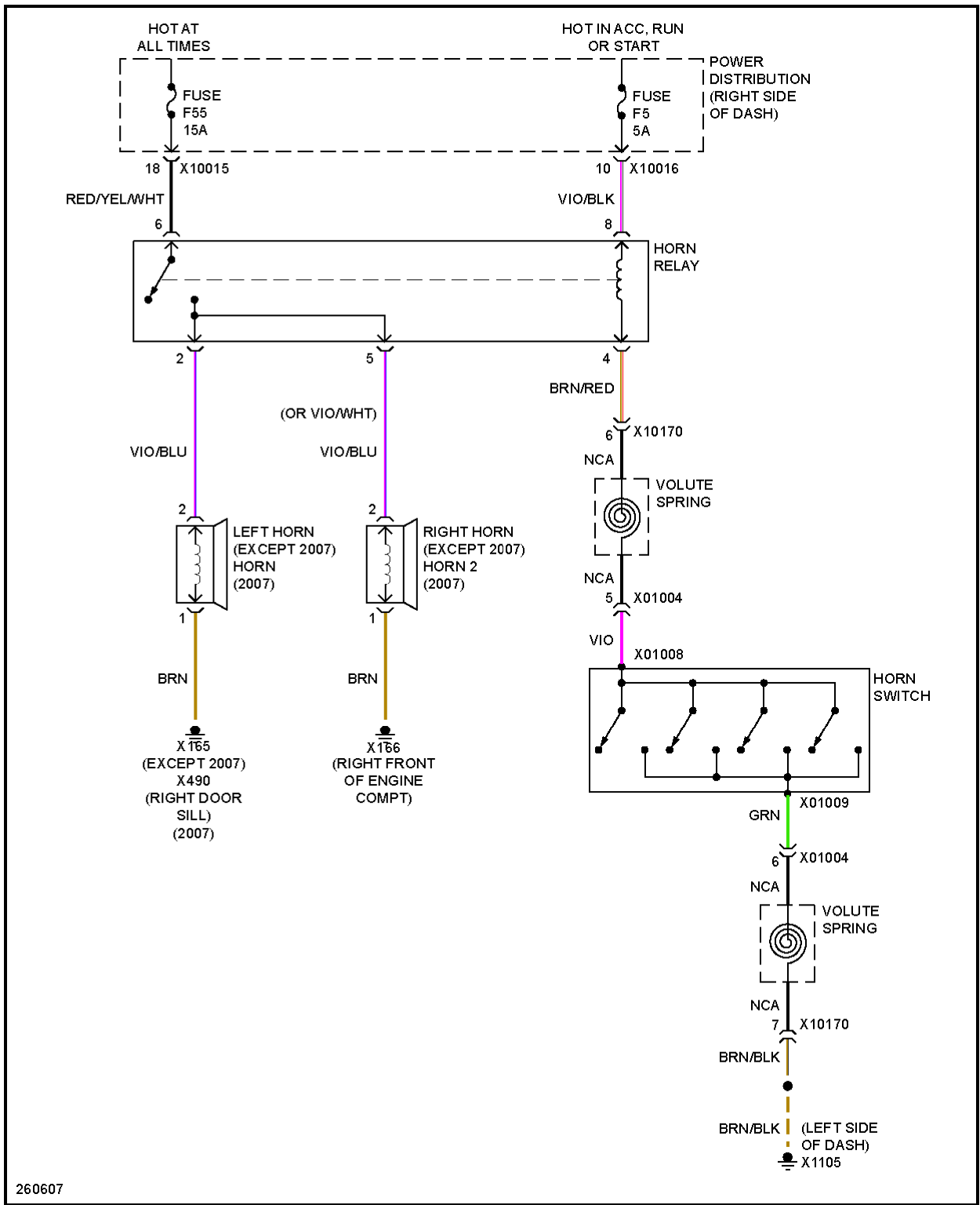


Fig. 27: Adaptive Front Lighting Circuit

HORN



260607

Fig. 30: Horn Circuit

INSTRUMENT CLUSTER

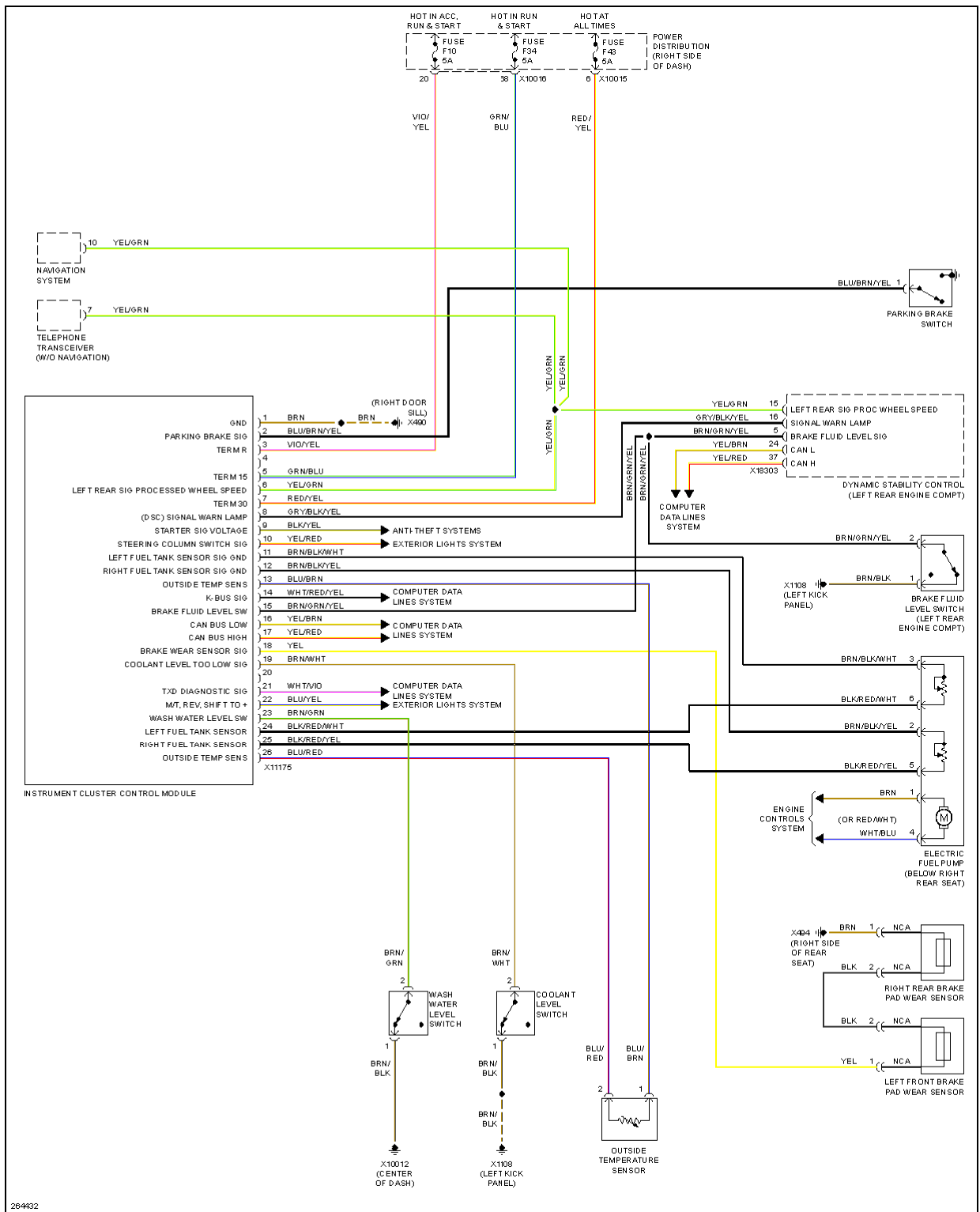


Fig. 31: Instrument Cluster Circuit

INTERIOR LIGHTS

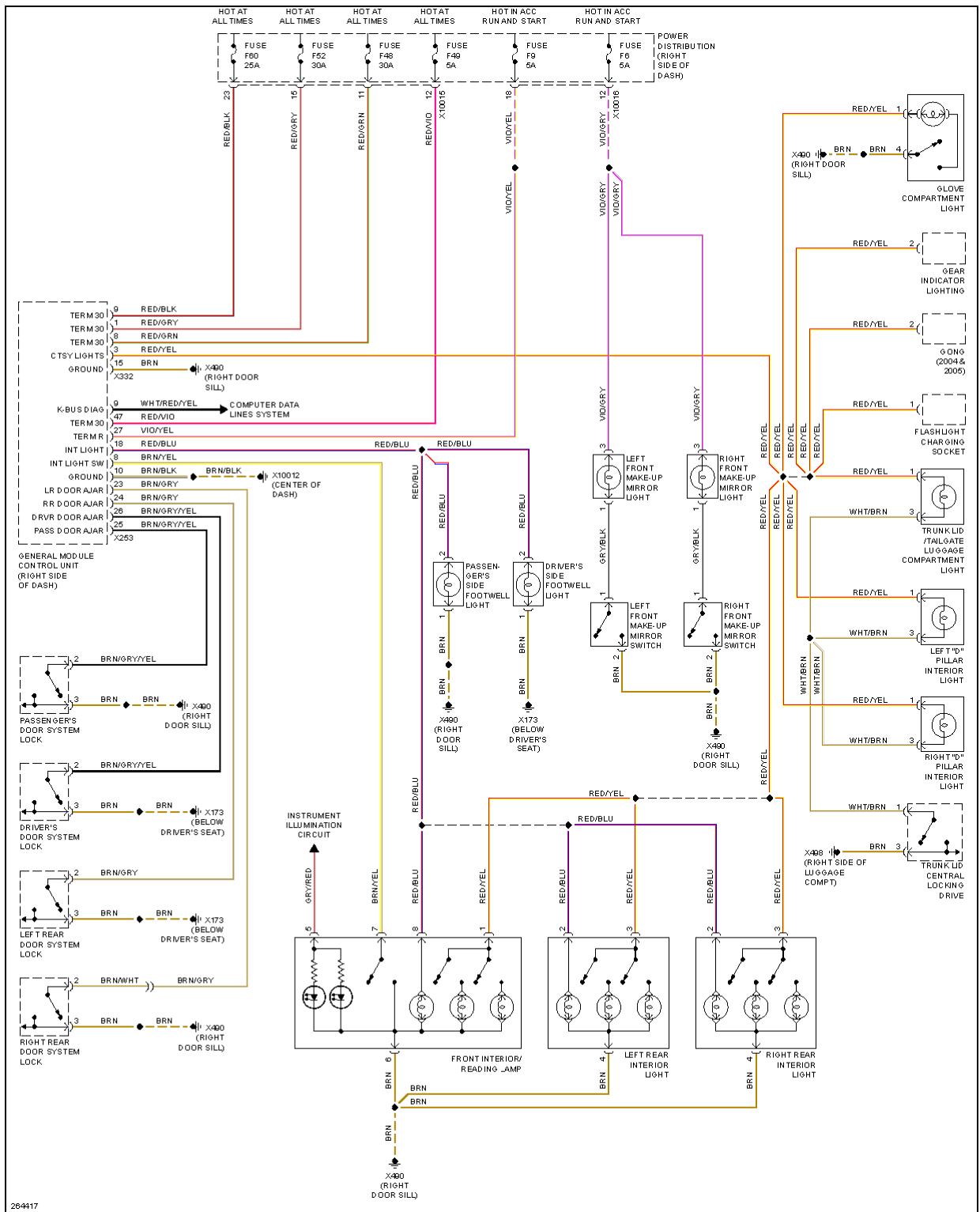


Fig. 32: Courtesy Lamps Circuit

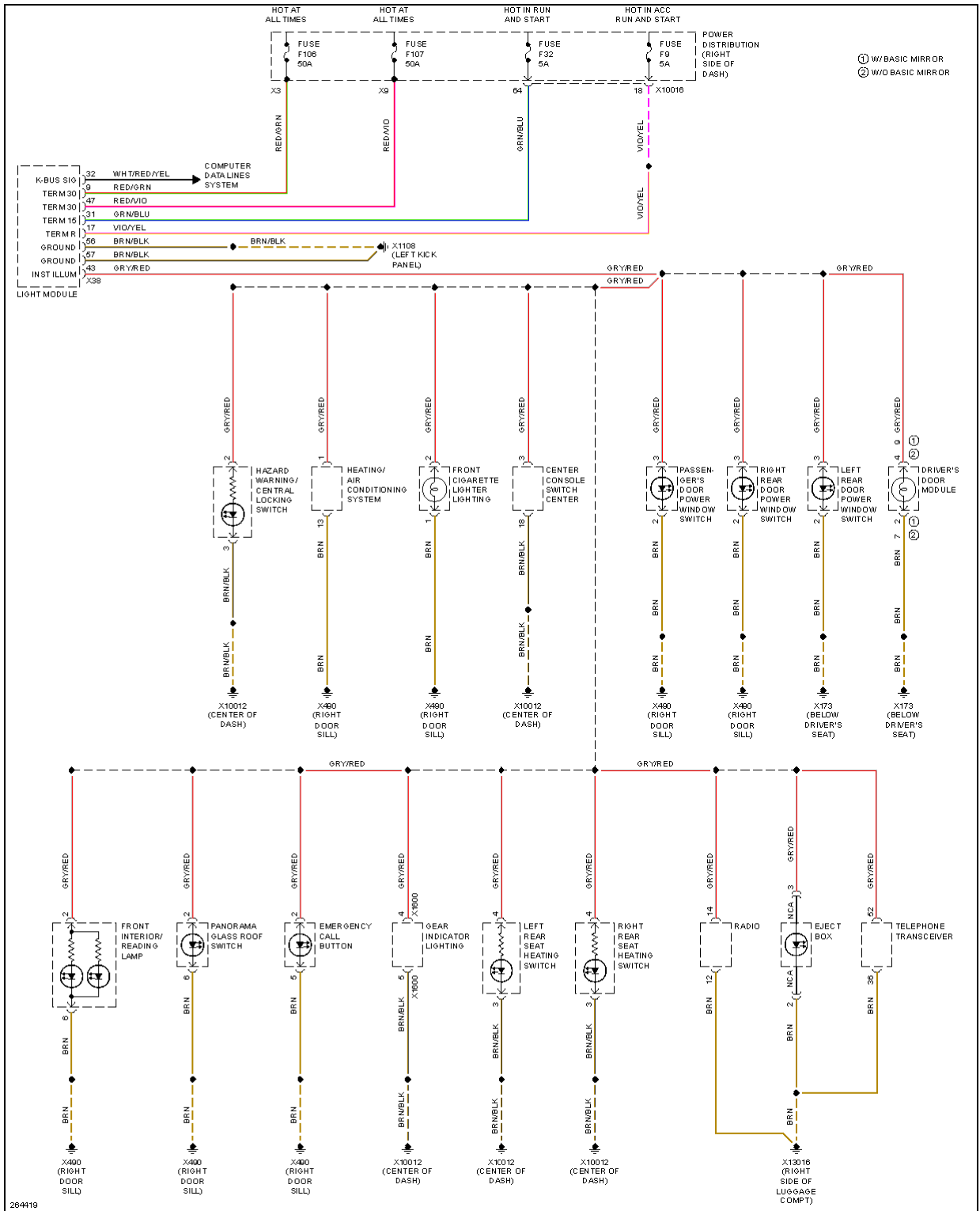


Fig. 33: Instrument Illumination Circuit

MEMORY SYSTEMS

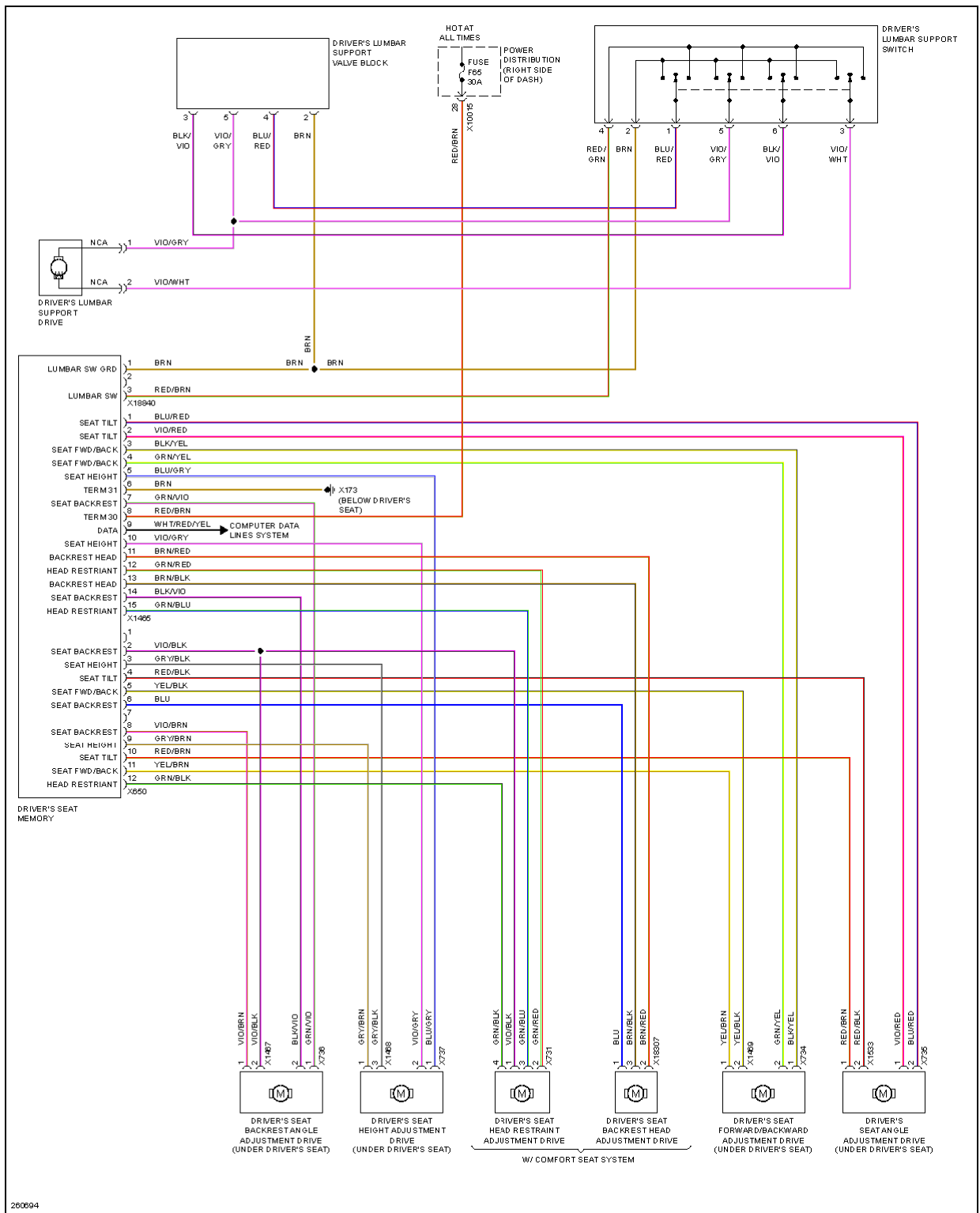
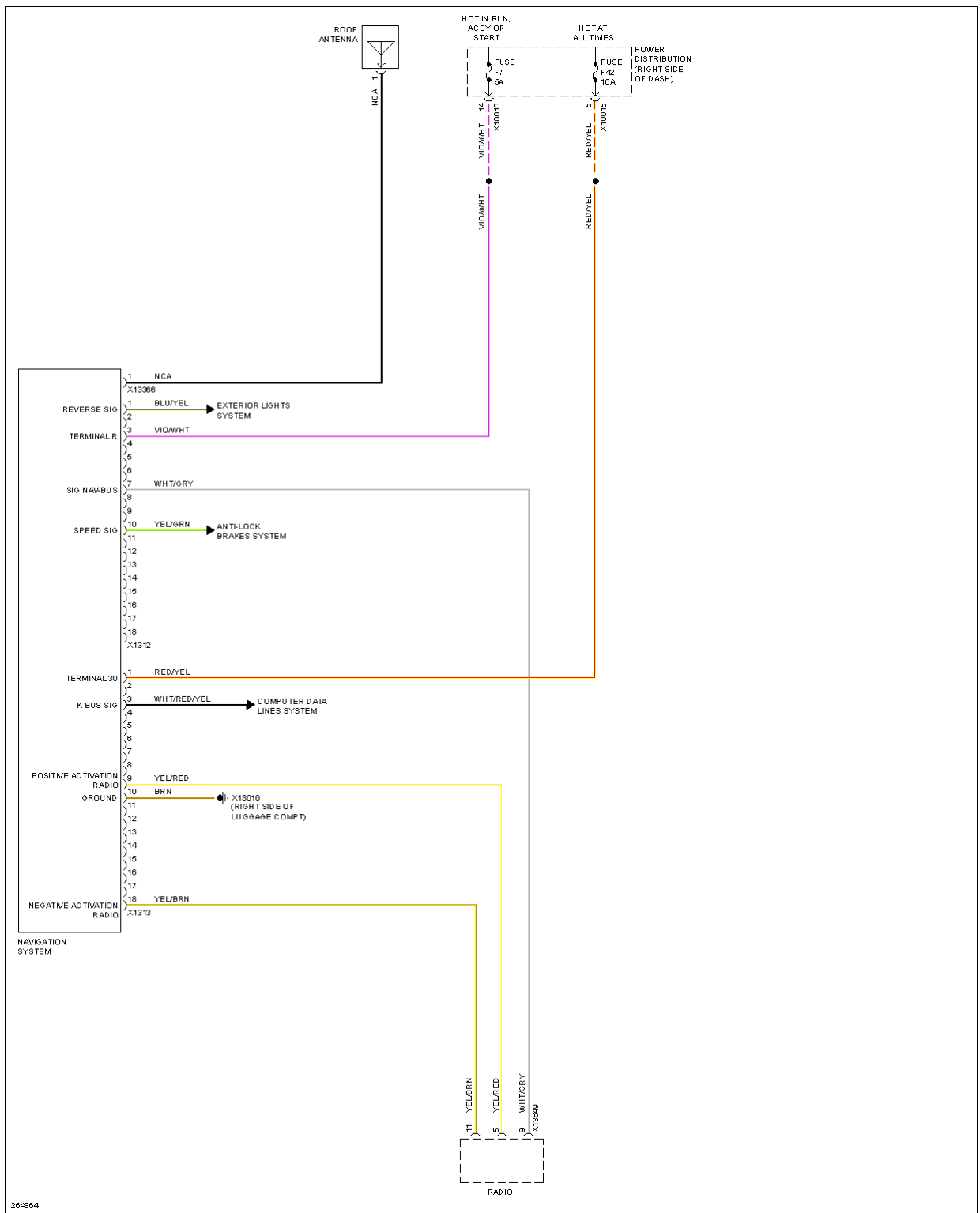


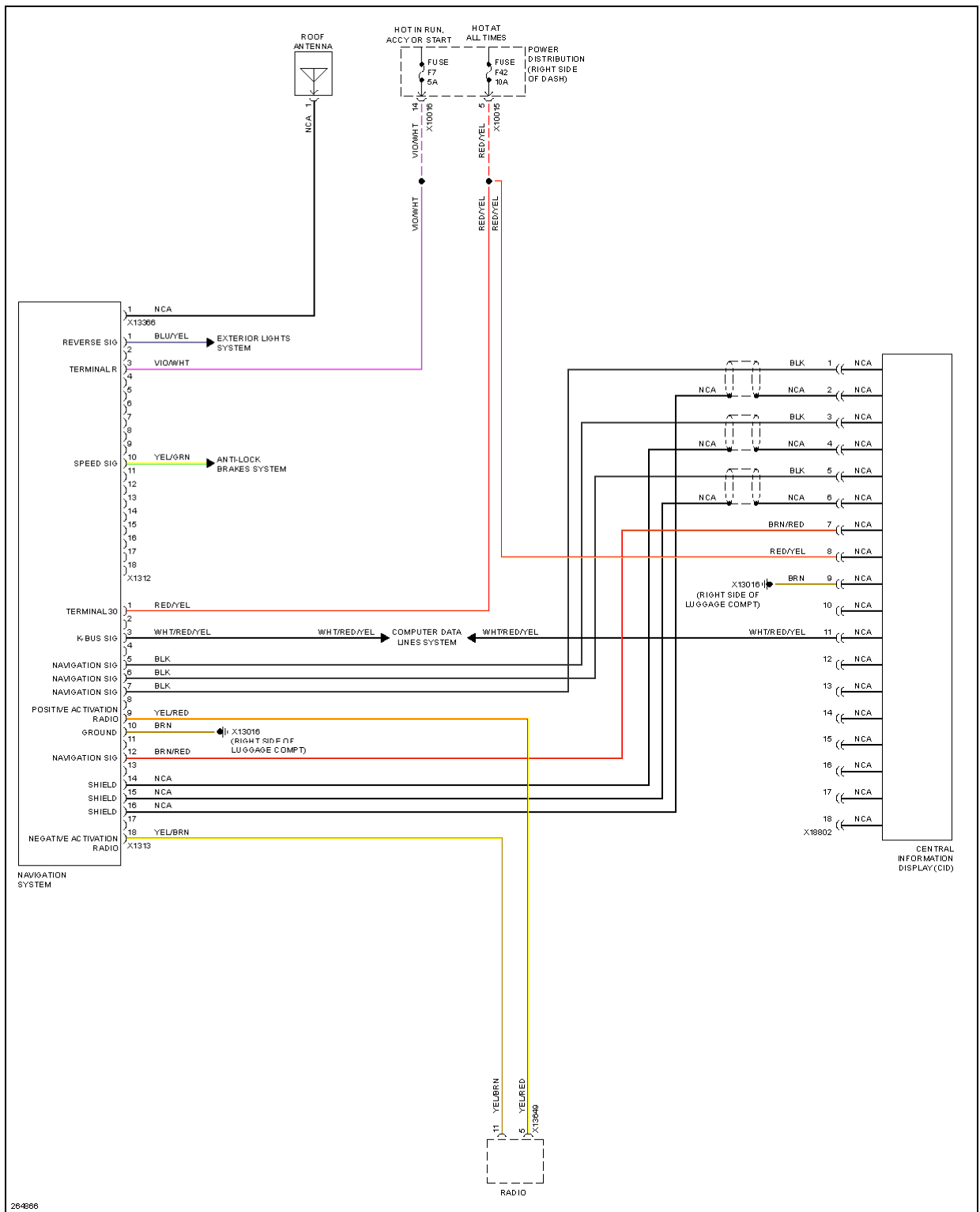
Fig. 34: Memory Systems Circuit

NAVIGATION



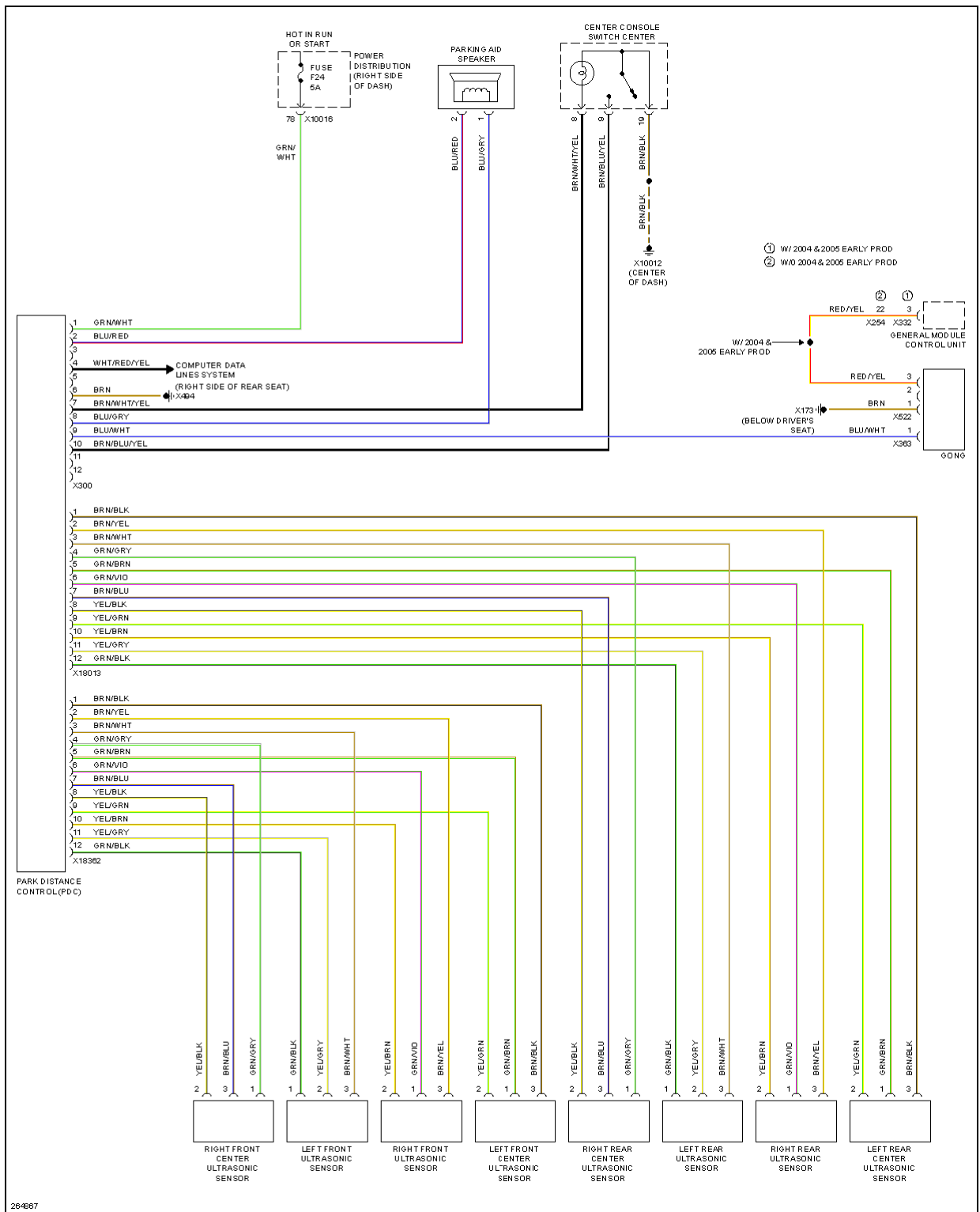
264864

Fig. 35: Navigation Circuit, W/ Multi-Information Radio



264886

Fig. 37: Navigation Circuit, W/O Video Module



264867

Fig. 38: Parking Assistant Circuit

POWER DISTRIBUTION

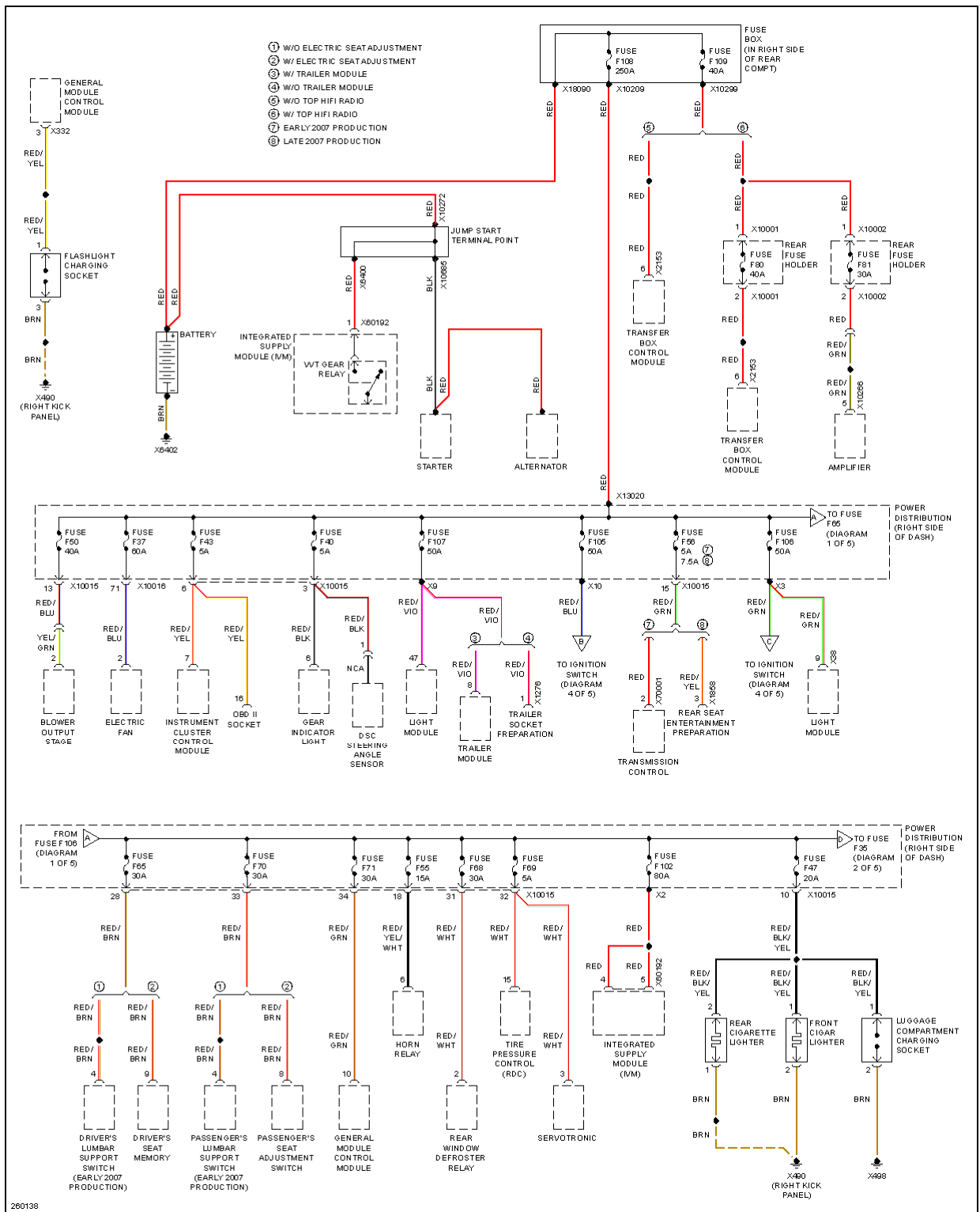
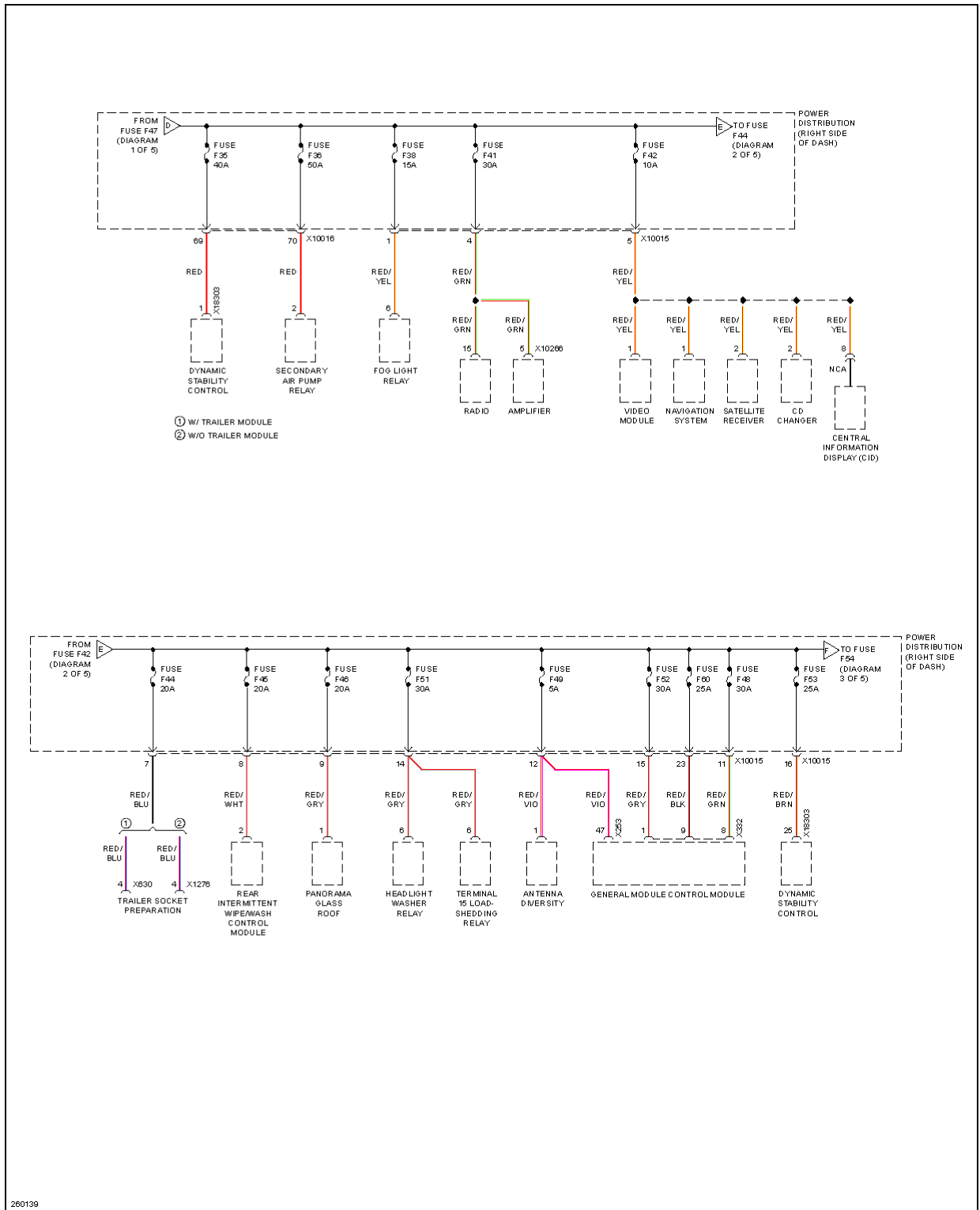


Fig. 39: Power Distribution Circuit (1 of 5)



280139

Fig. 40: Power Distribution Circuit (2 of 5)

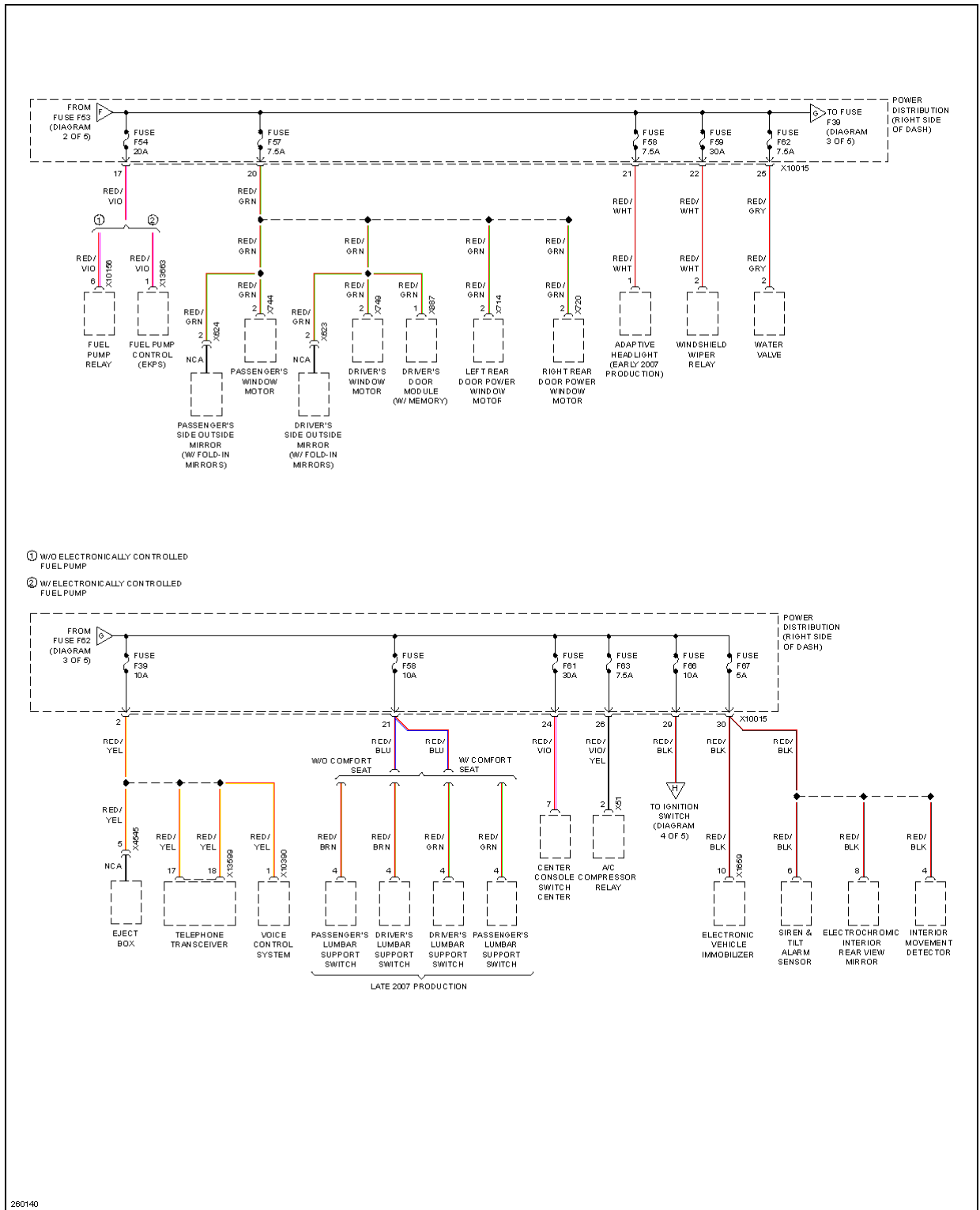
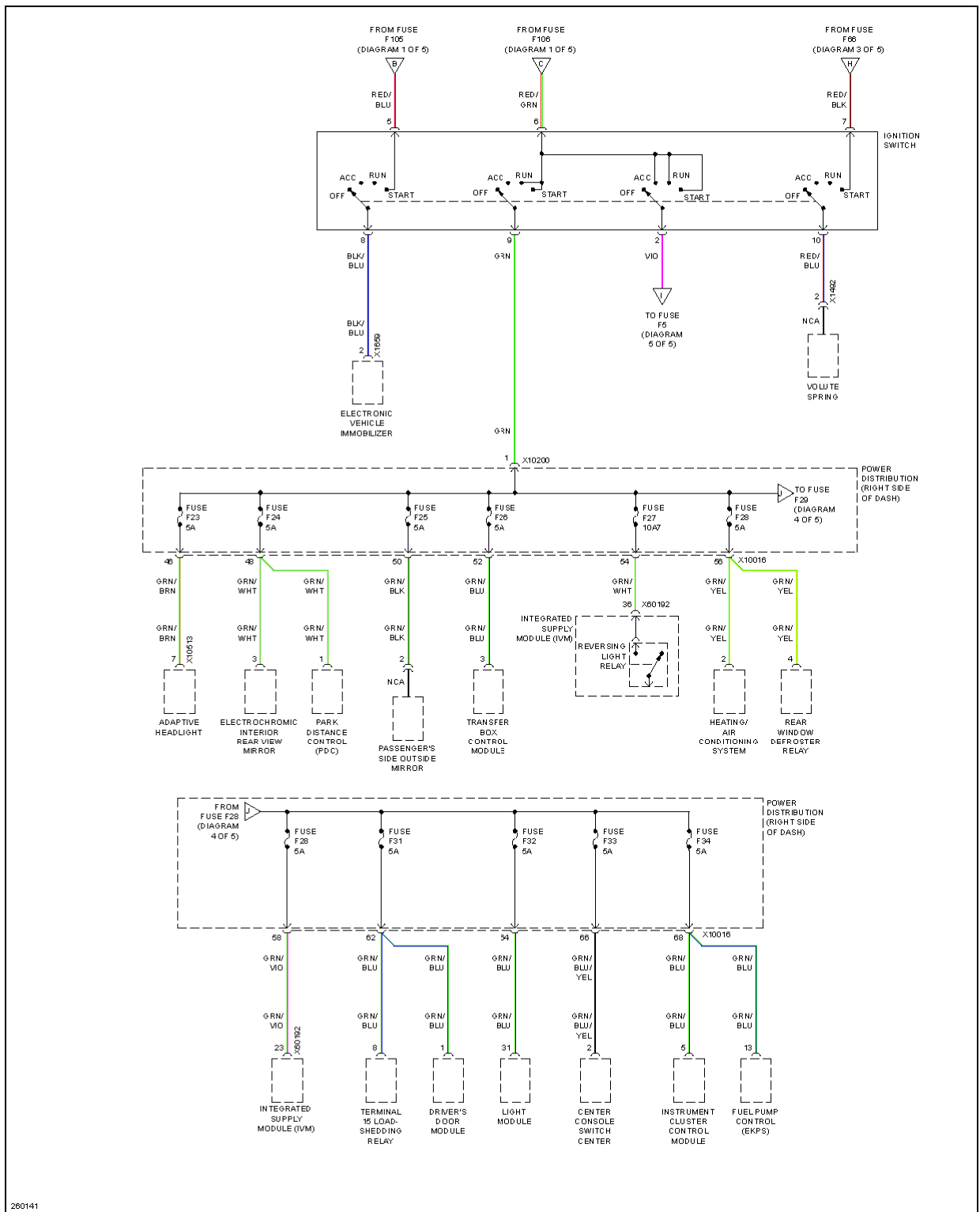
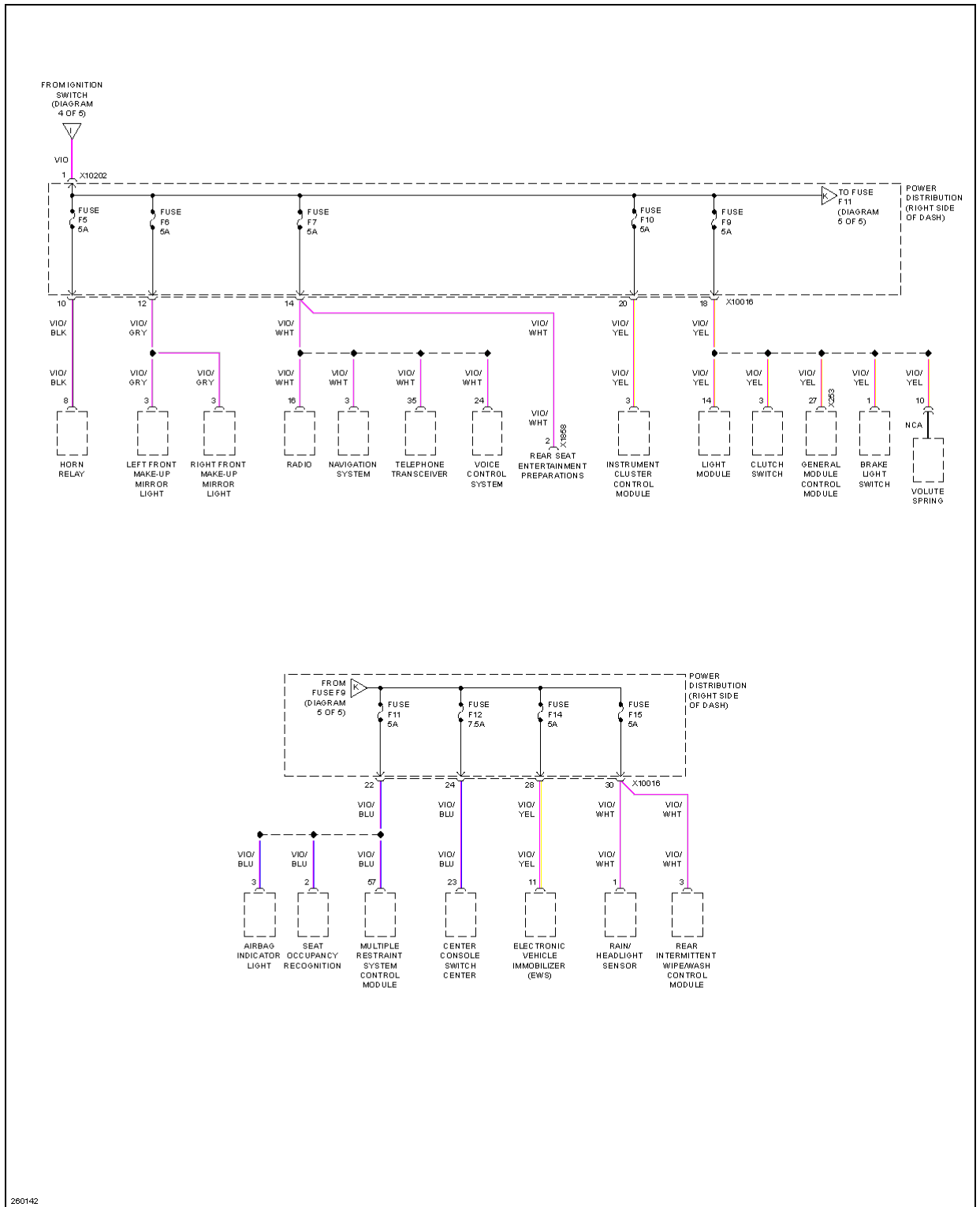


Fig. 41: Power Distribution Circuit (3 of 5)



280141

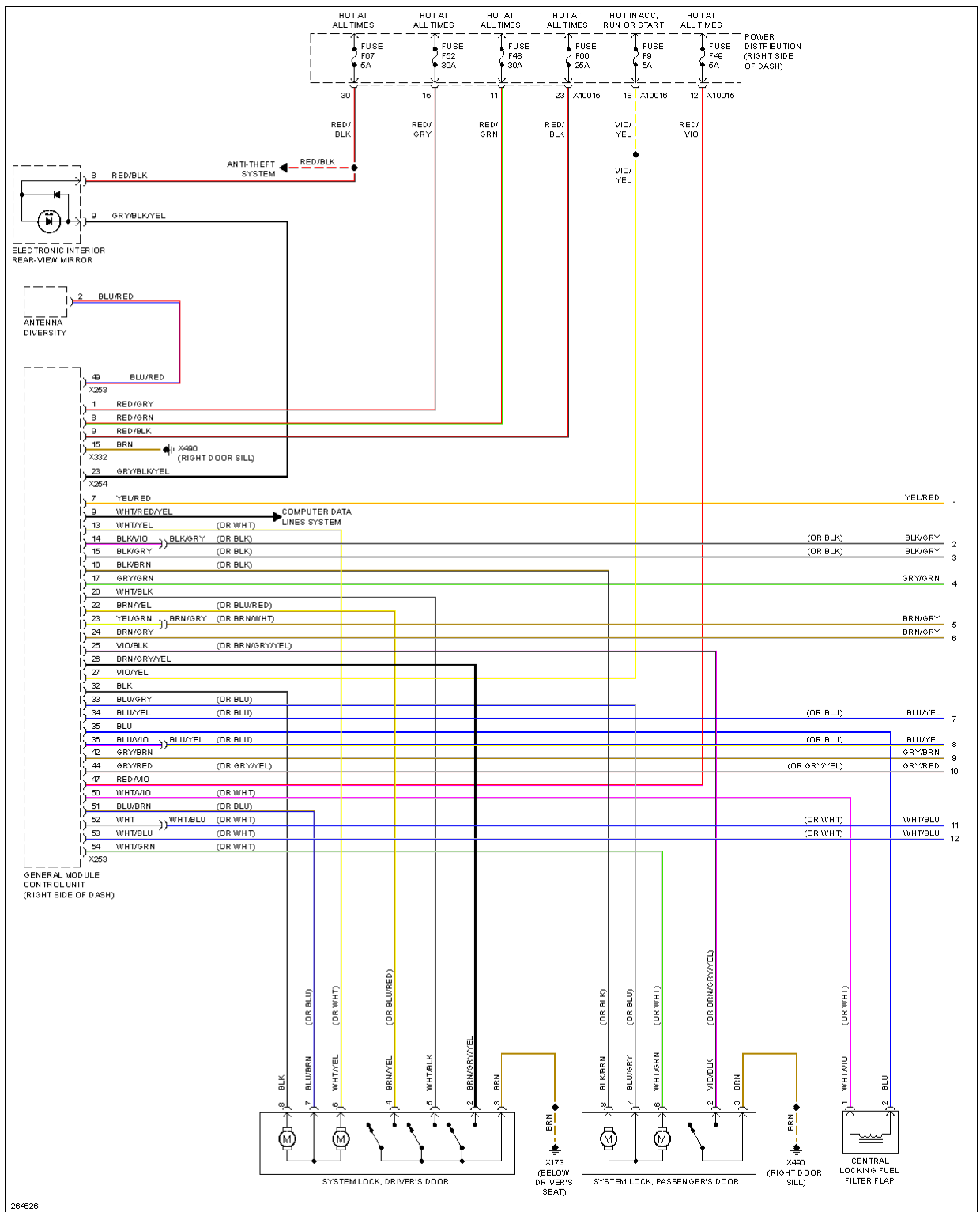
Fig. 42: Power Distribution Circuit (4 of 5)



280142

Fig. 43: Power Distribution Circuit (5 of 5)

POWER DOOR LOCKS



264826

Fig. 44: Power Door Locks Circuit (1 of 2)

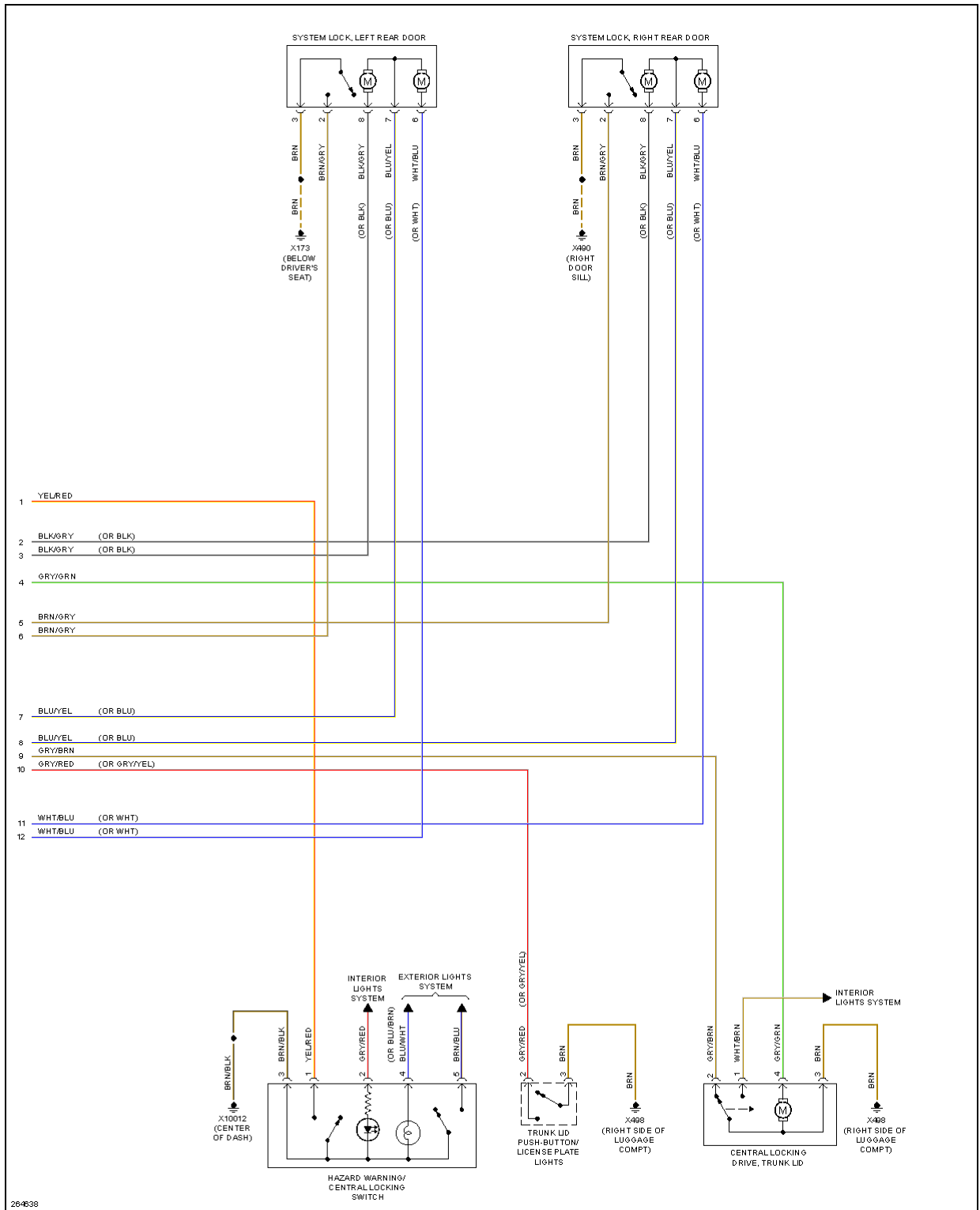


Fig. 45: Power Door Locks Circuit (2 of 2)

POWER MIRRORS

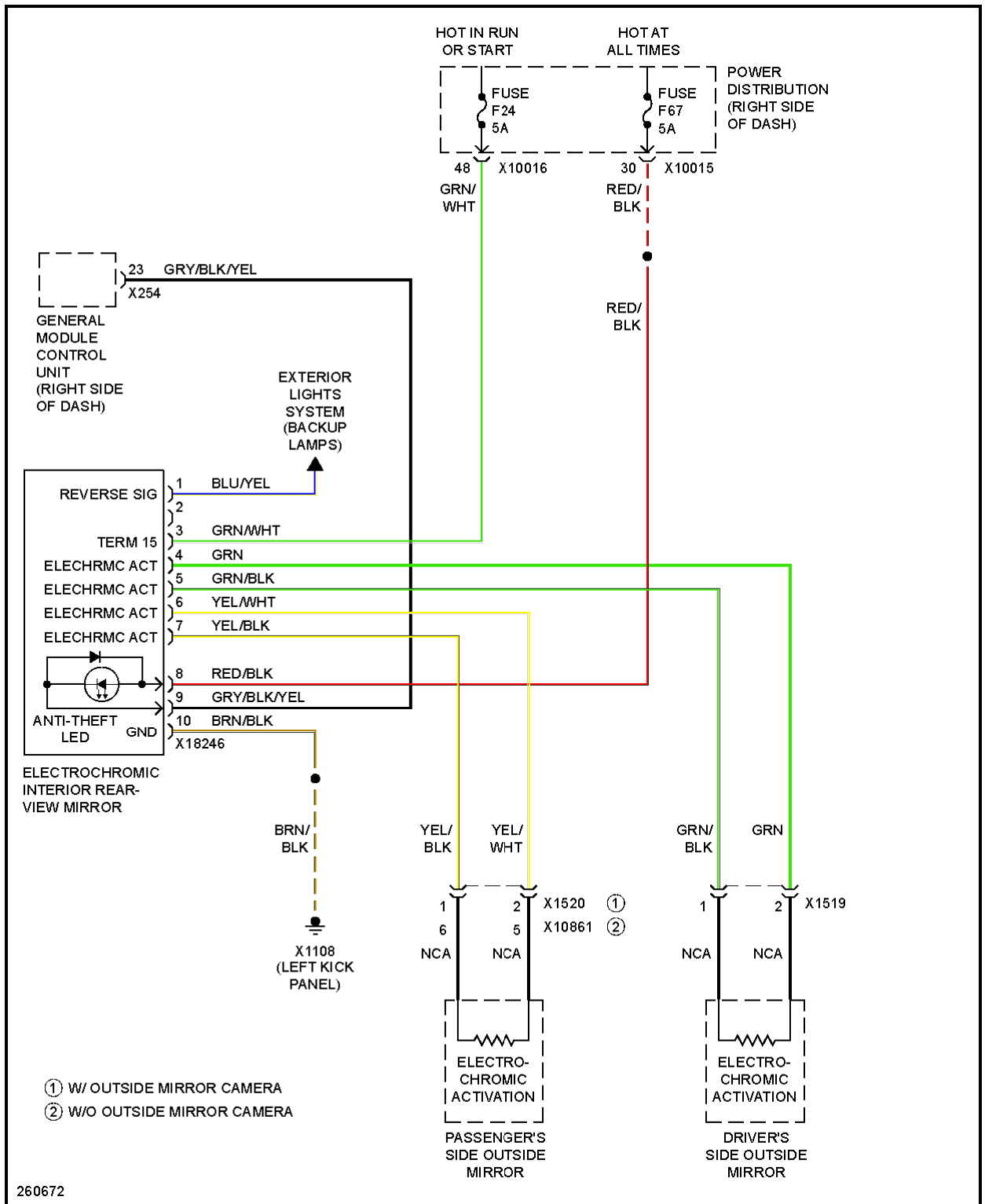


Fig. 46: Electrochromic Mirror Circuit

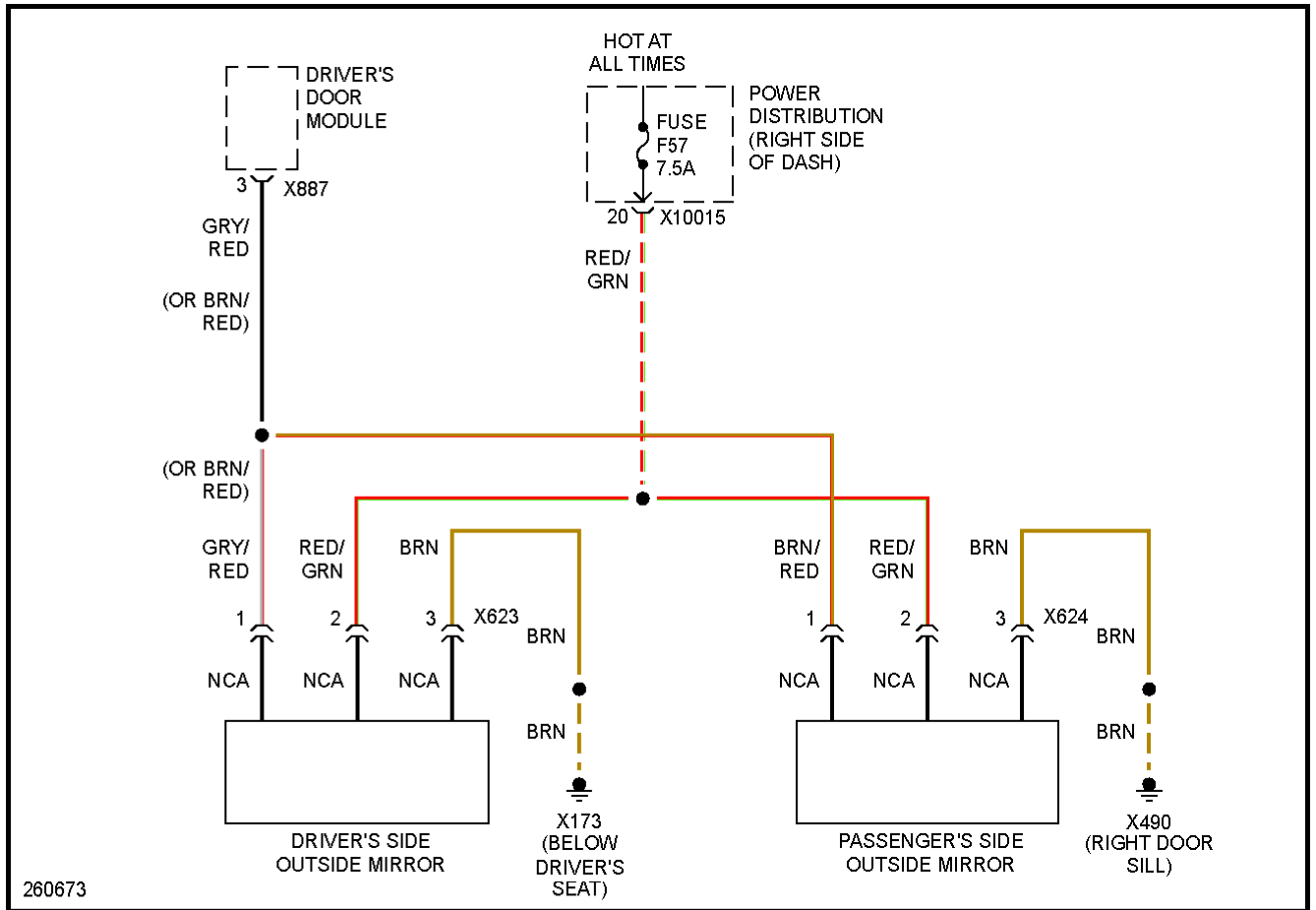
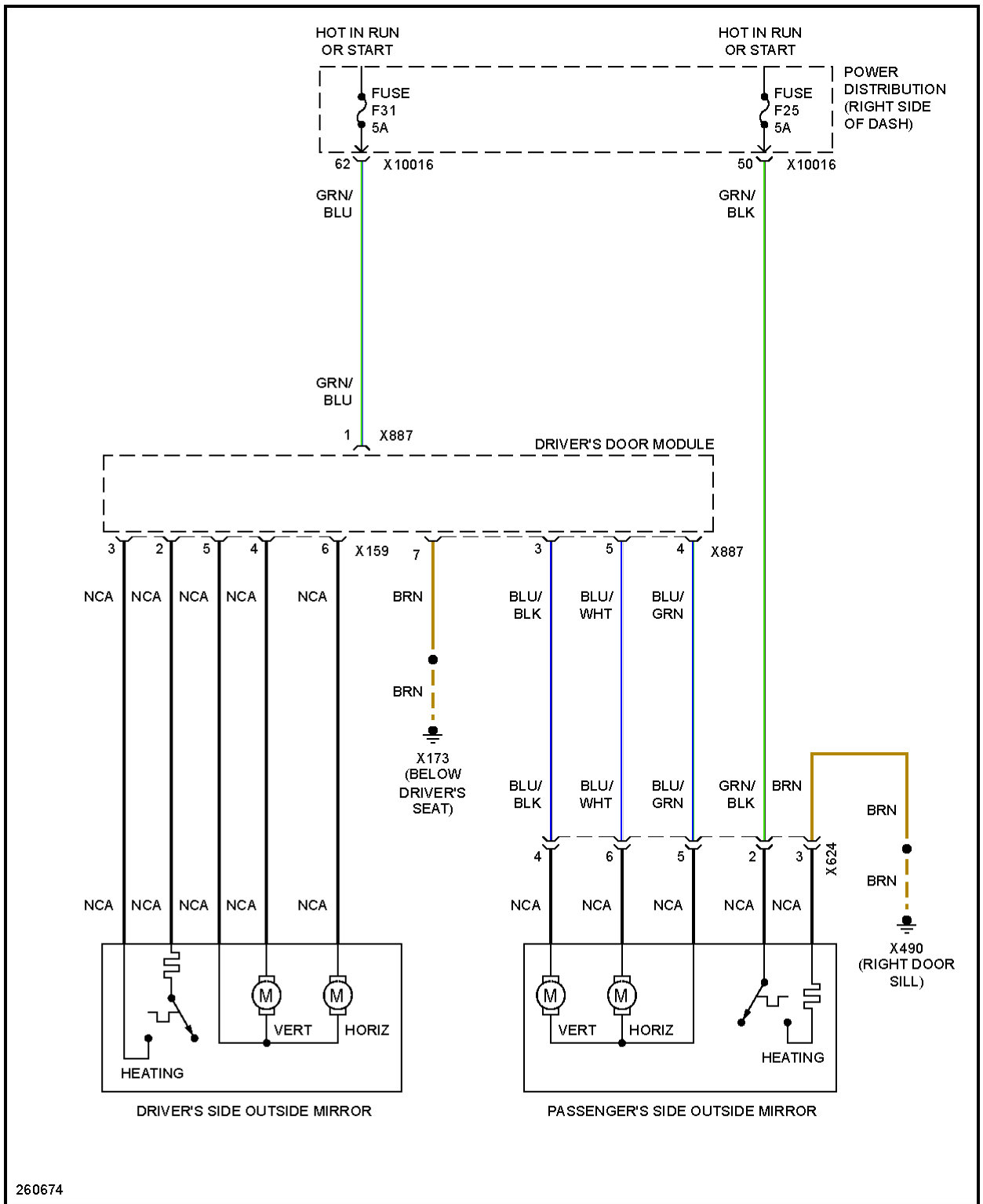


Fig. 47: Power Mirrors Circuit, W/ Fold-Back Mirrors



260674

Fig. 48: Power Mirrors Circuit, W/O Fold-Back Mirrors

POWER SEATS

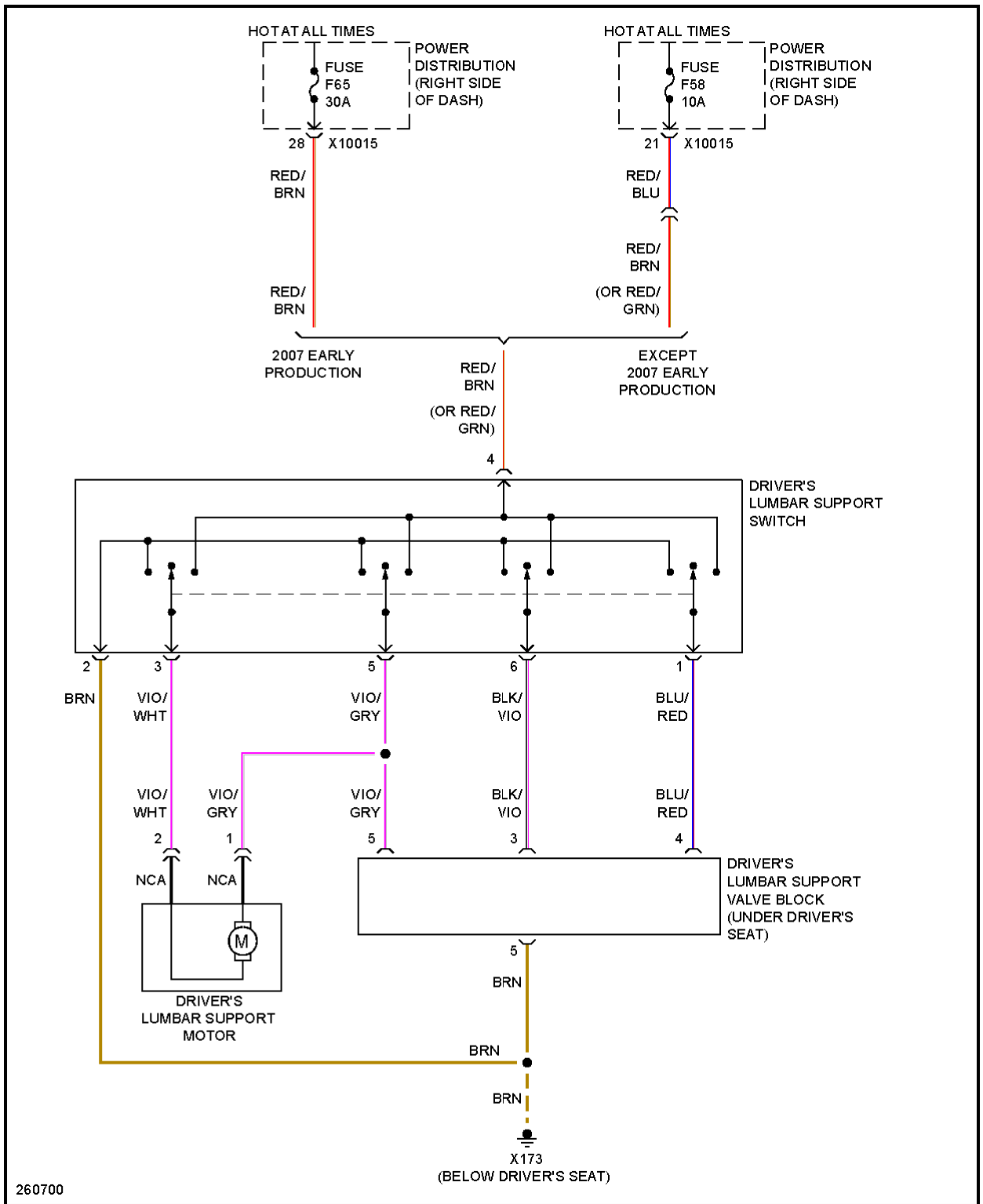
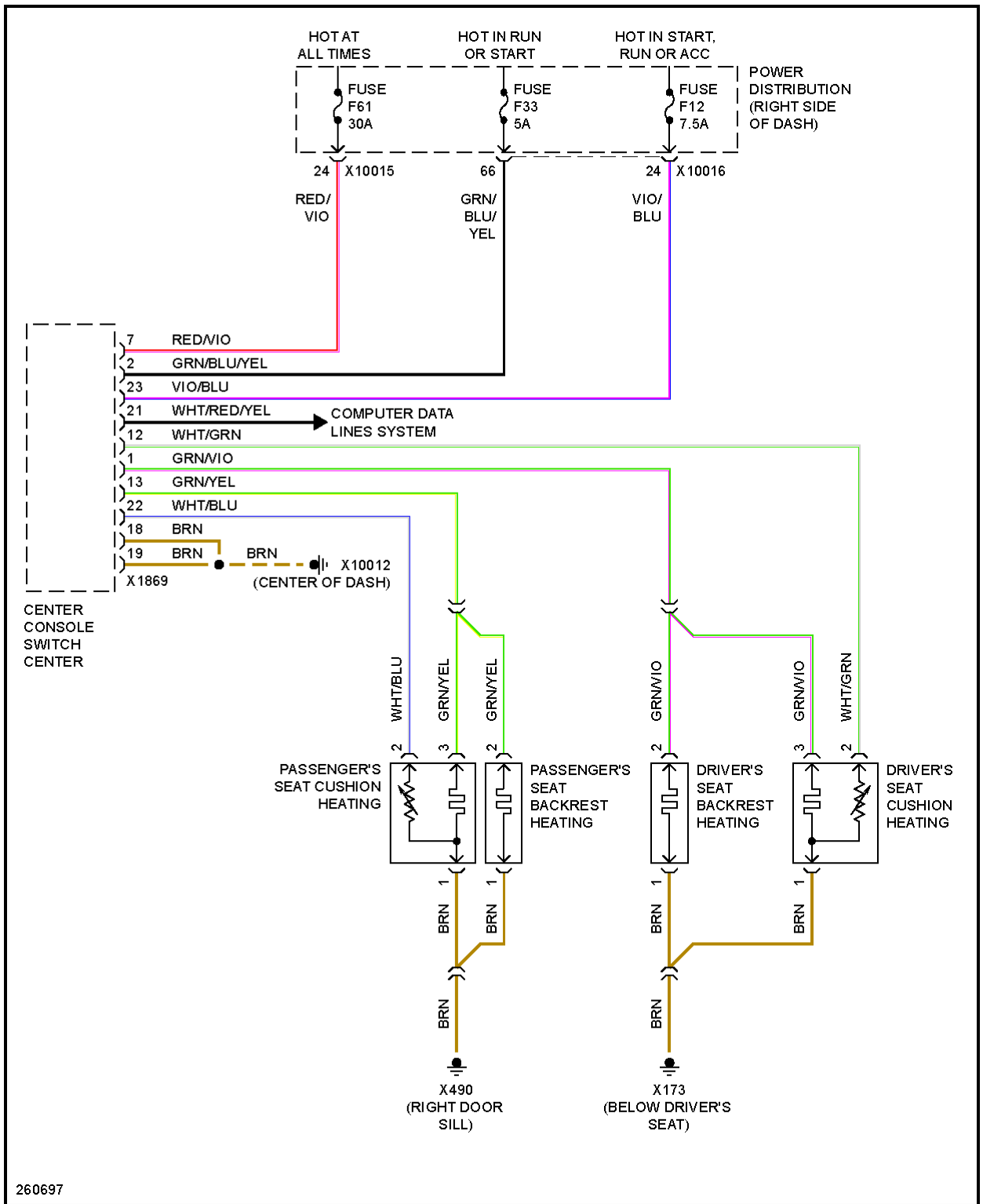
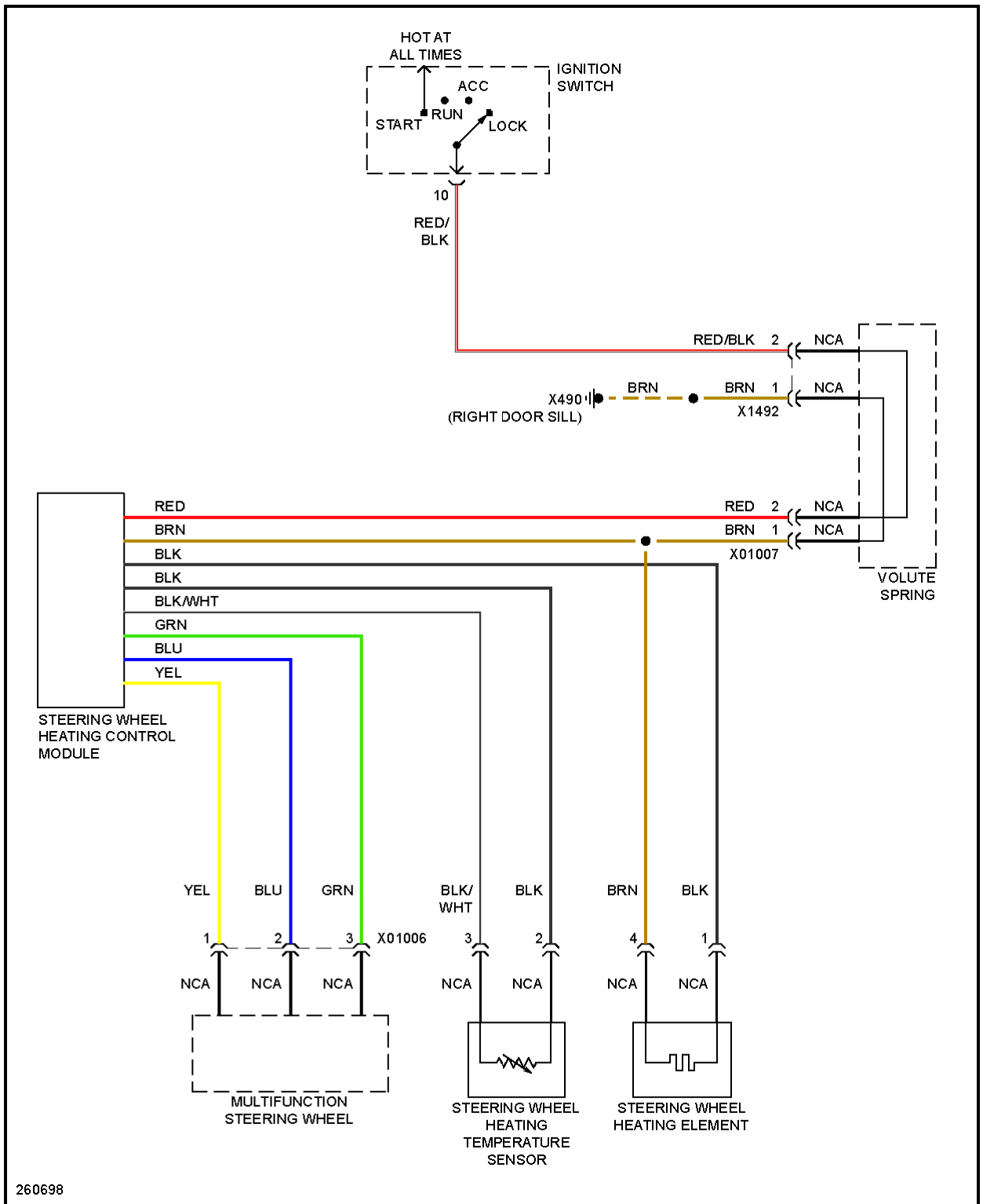


Fig. 49: Driver's Lumbar Circuit



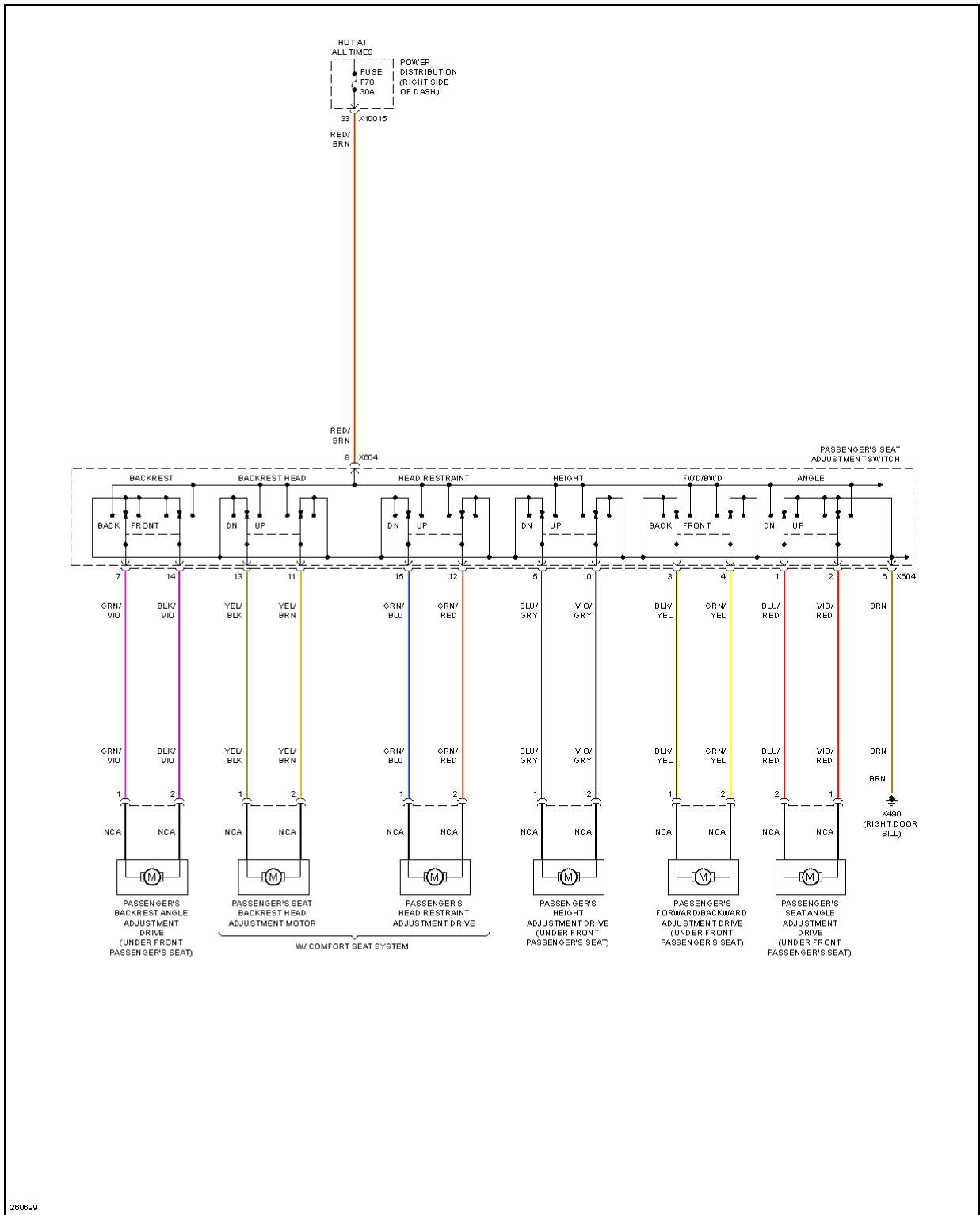
260697

Fig. 50: Heated Seats Circuit



260698

Fig. 51: Heated Steering Wheel Circuit



260899

Fig. 52: Passenger Power Seat Circuit

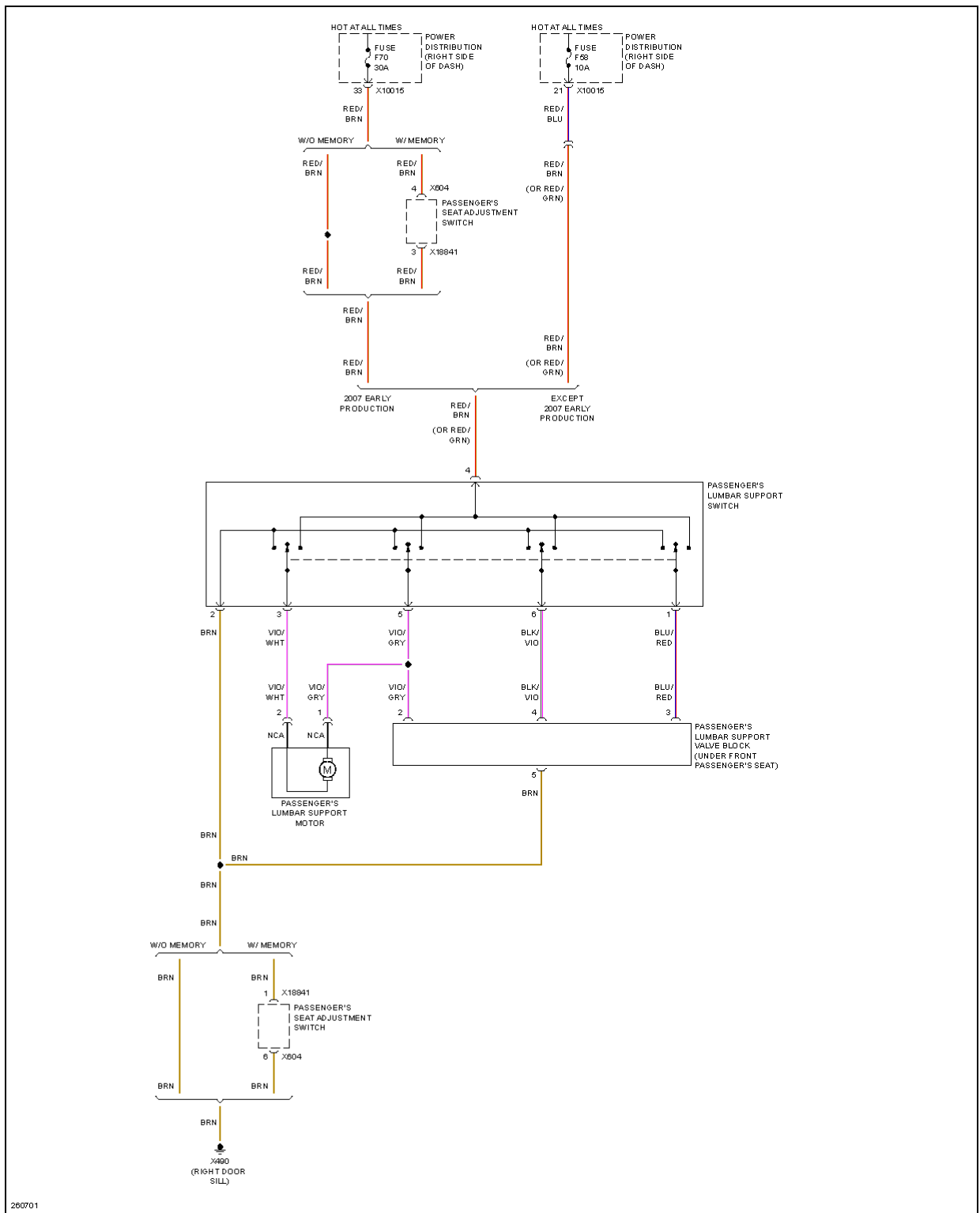


Fig. 53: Passenger's Lumbar Circuit

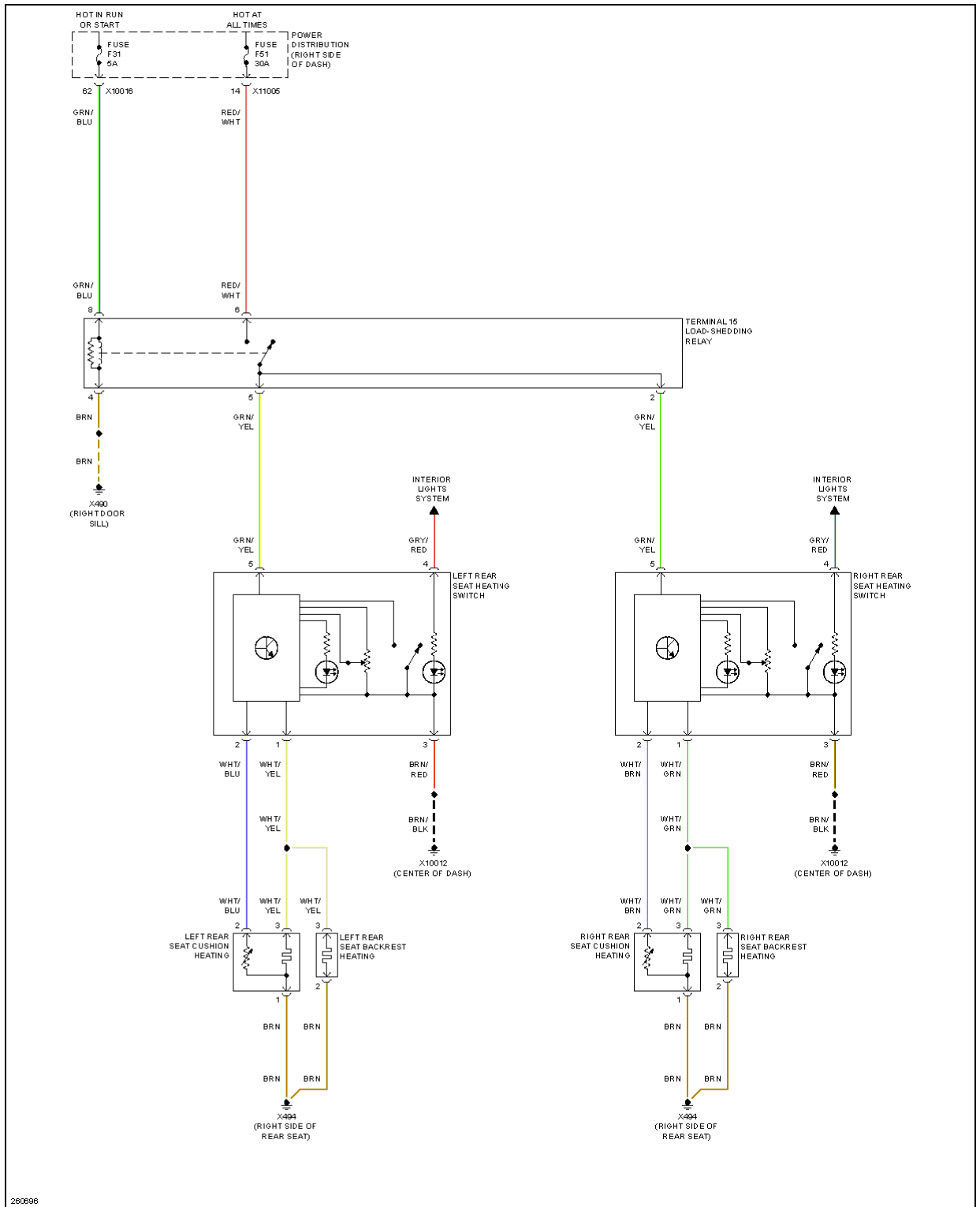


Fig. 54: Rear Heated Seats Circuit

POWER TOP/SUNROOF

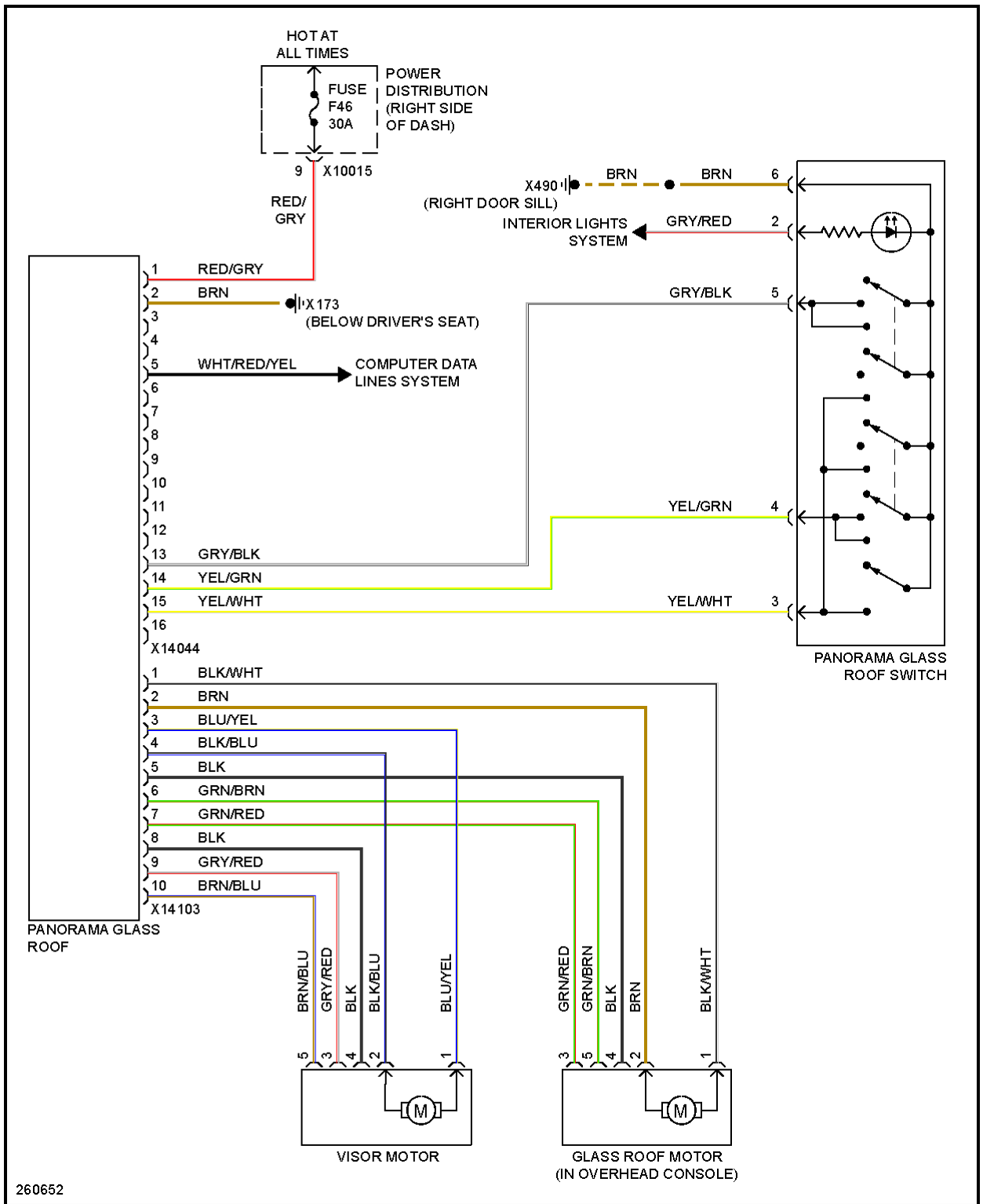


Fig. 55: Power Top/Sunroof Circuit

POWER WINDOWS

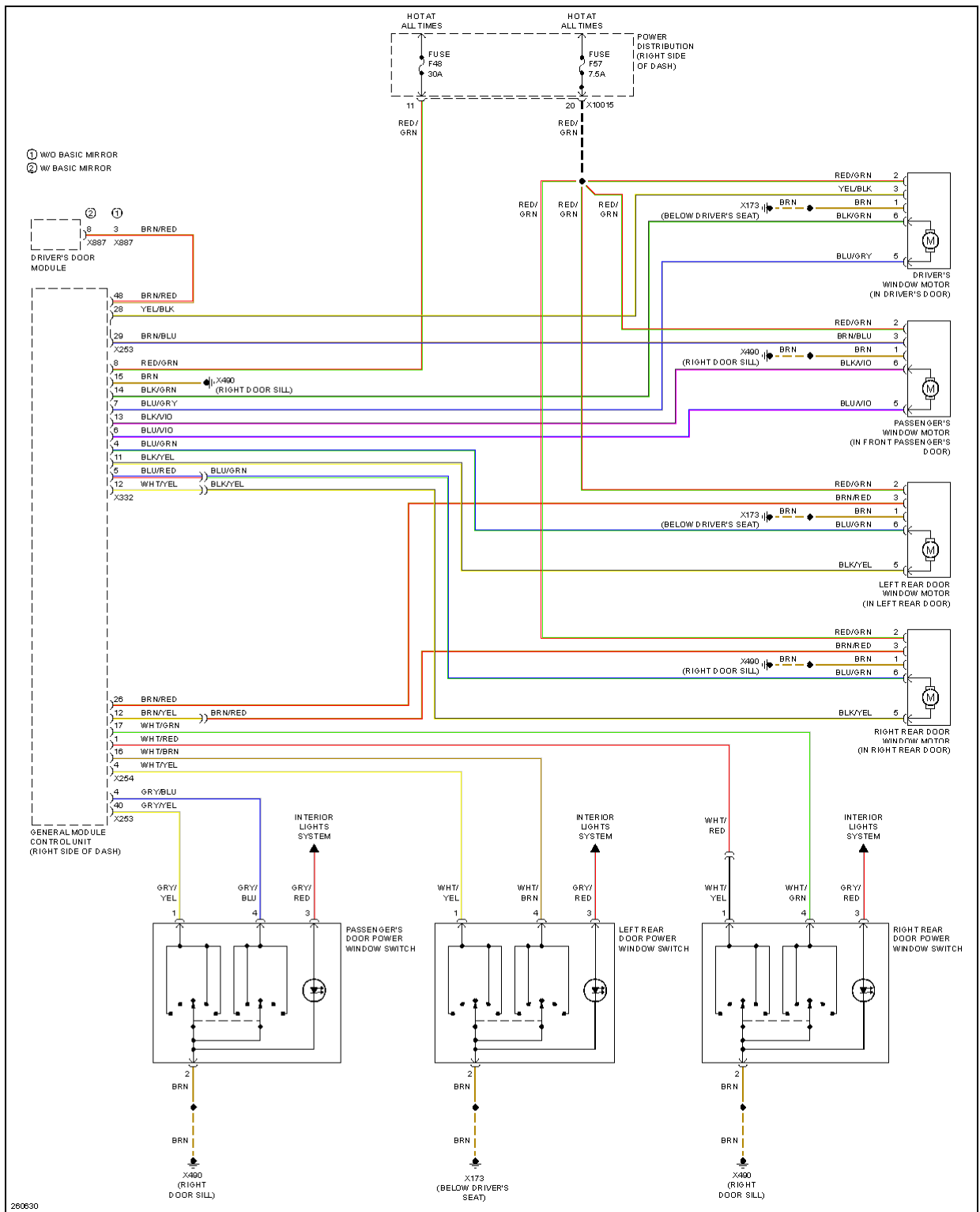


Fig. 56: Power Windows Circuit

RADIO

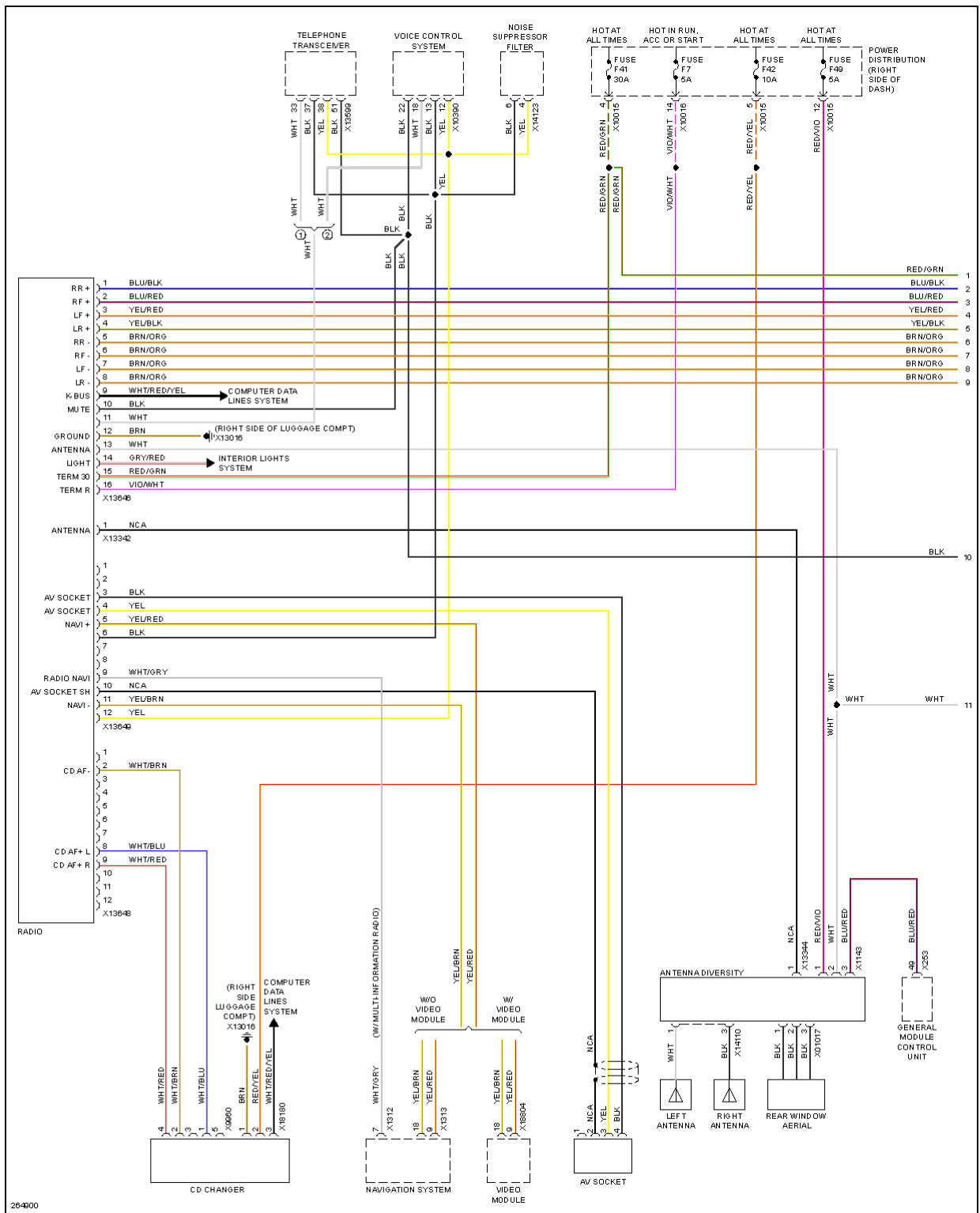


Fig. 58: Premium Radio Circuit, HIFI Radio (1 of 2)

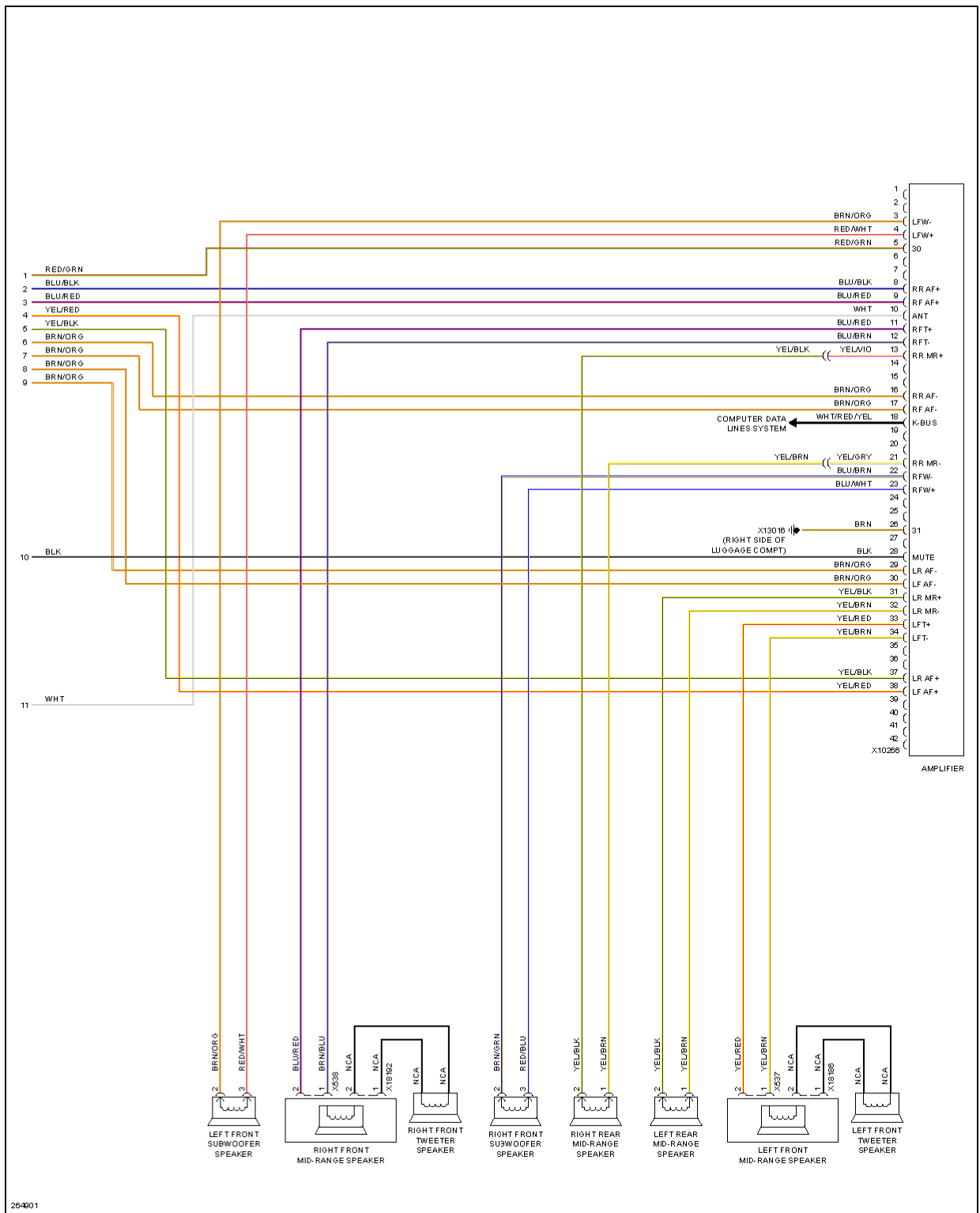


Fig. 59: Premium Radio Circuit, HIFI Radio (2 of 2)

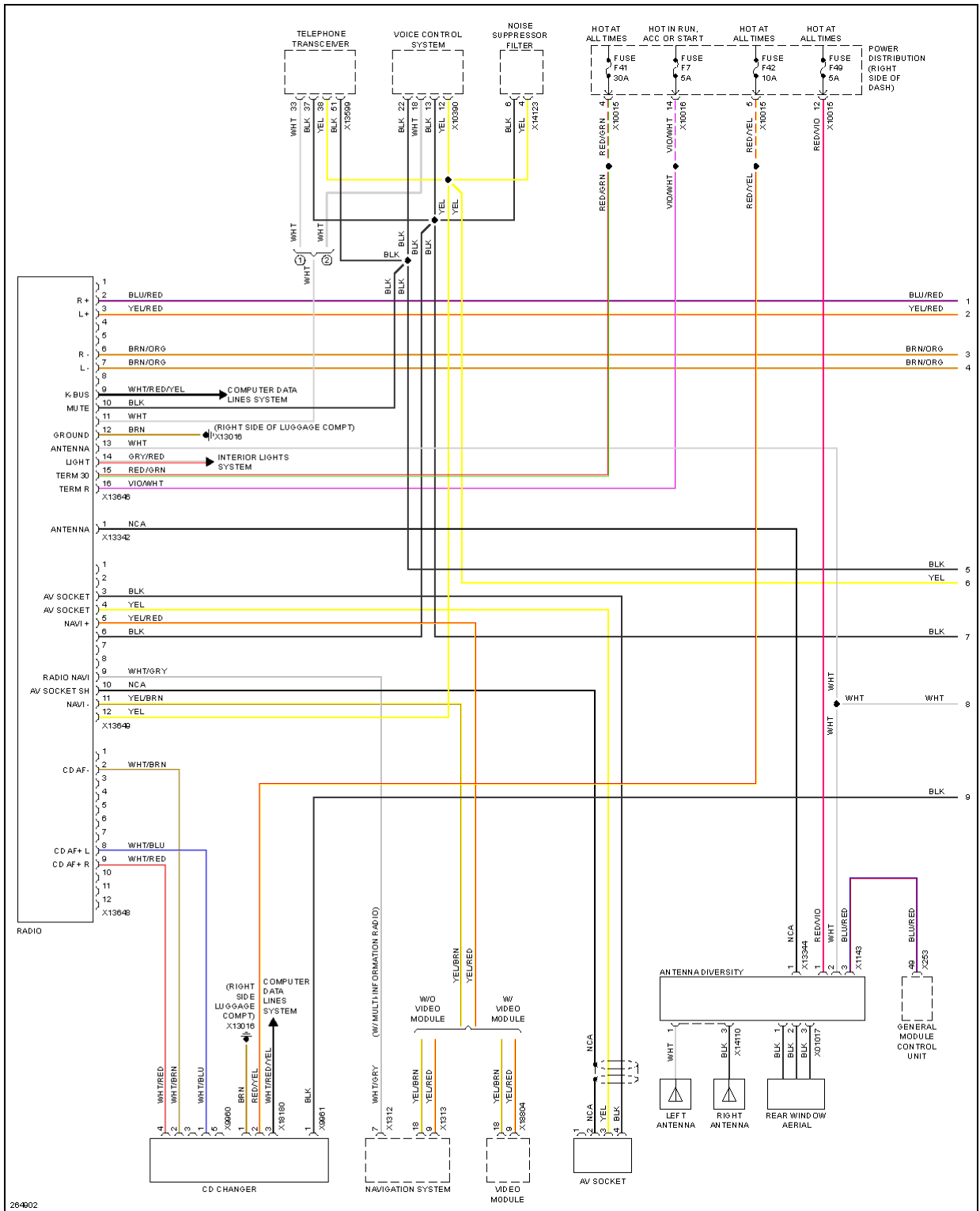
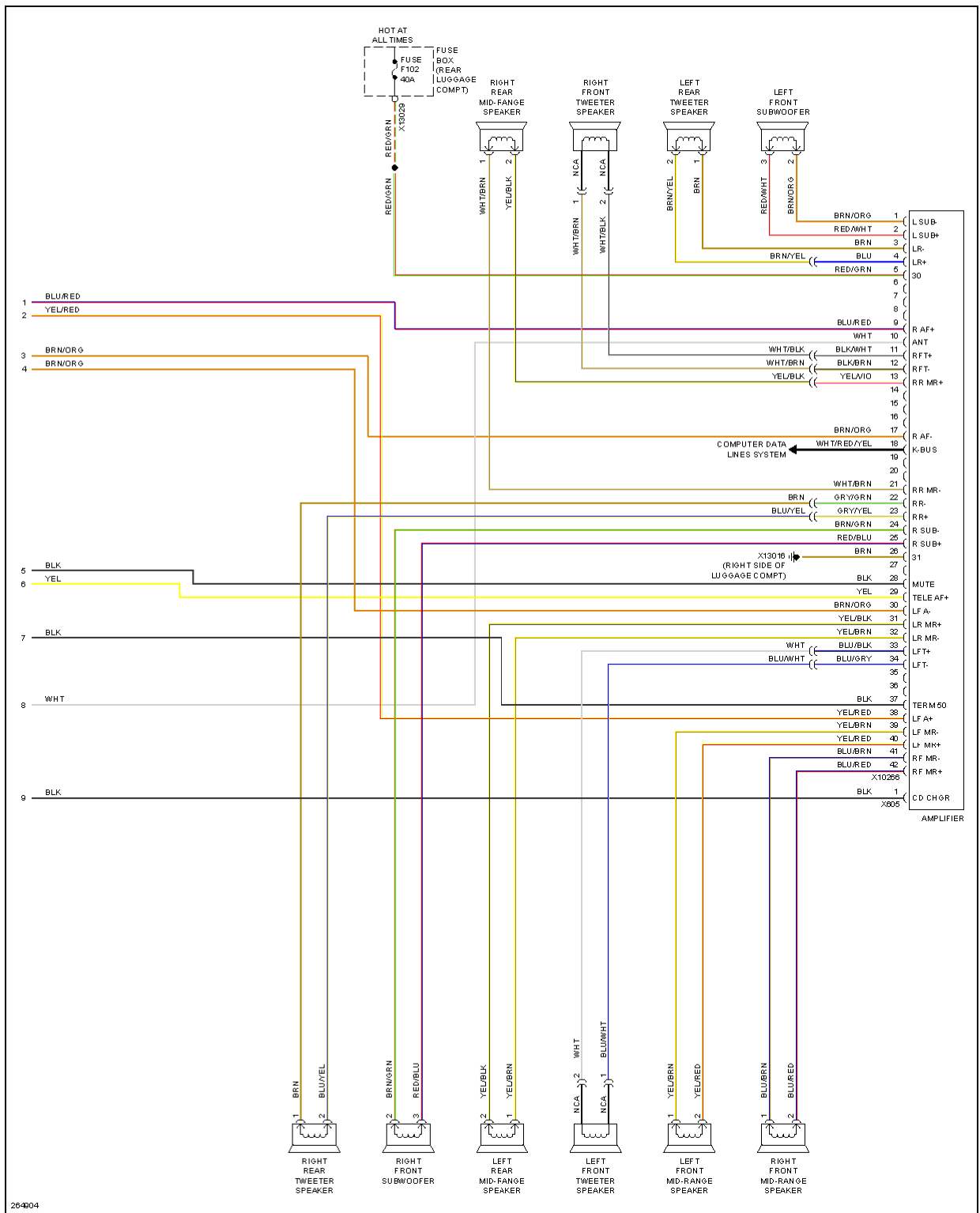


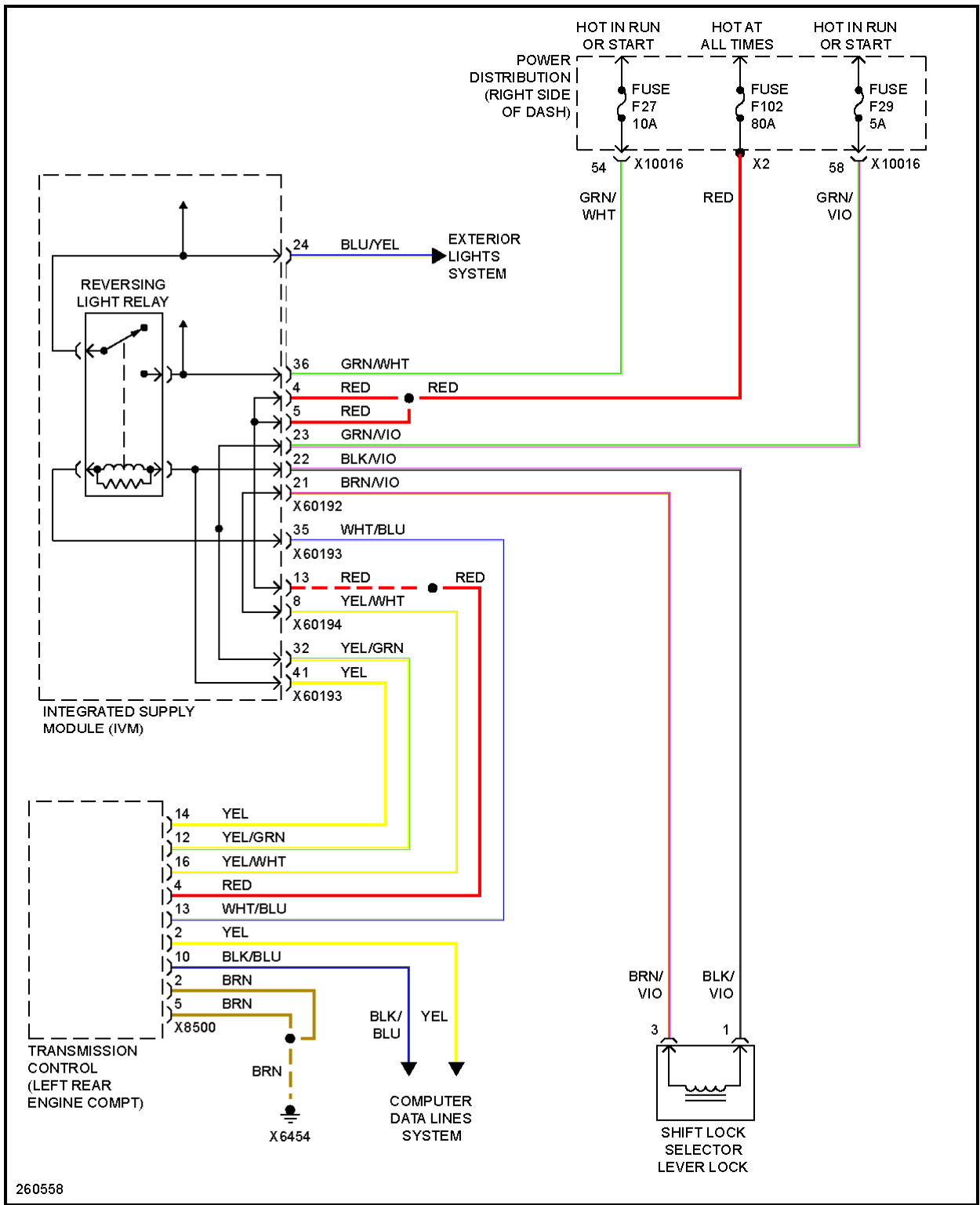
Fig. 60: Premium Radio Circuit, Top HIFI Radio (1 of 2)



264004

Fig. 61: Premium Radio Circuit, Top HIFI Radio (2 of 2)

SHIFT INTERLOCK



260558

Fig. 62: Shift Interlock Circuit

STARTING/CHARGING

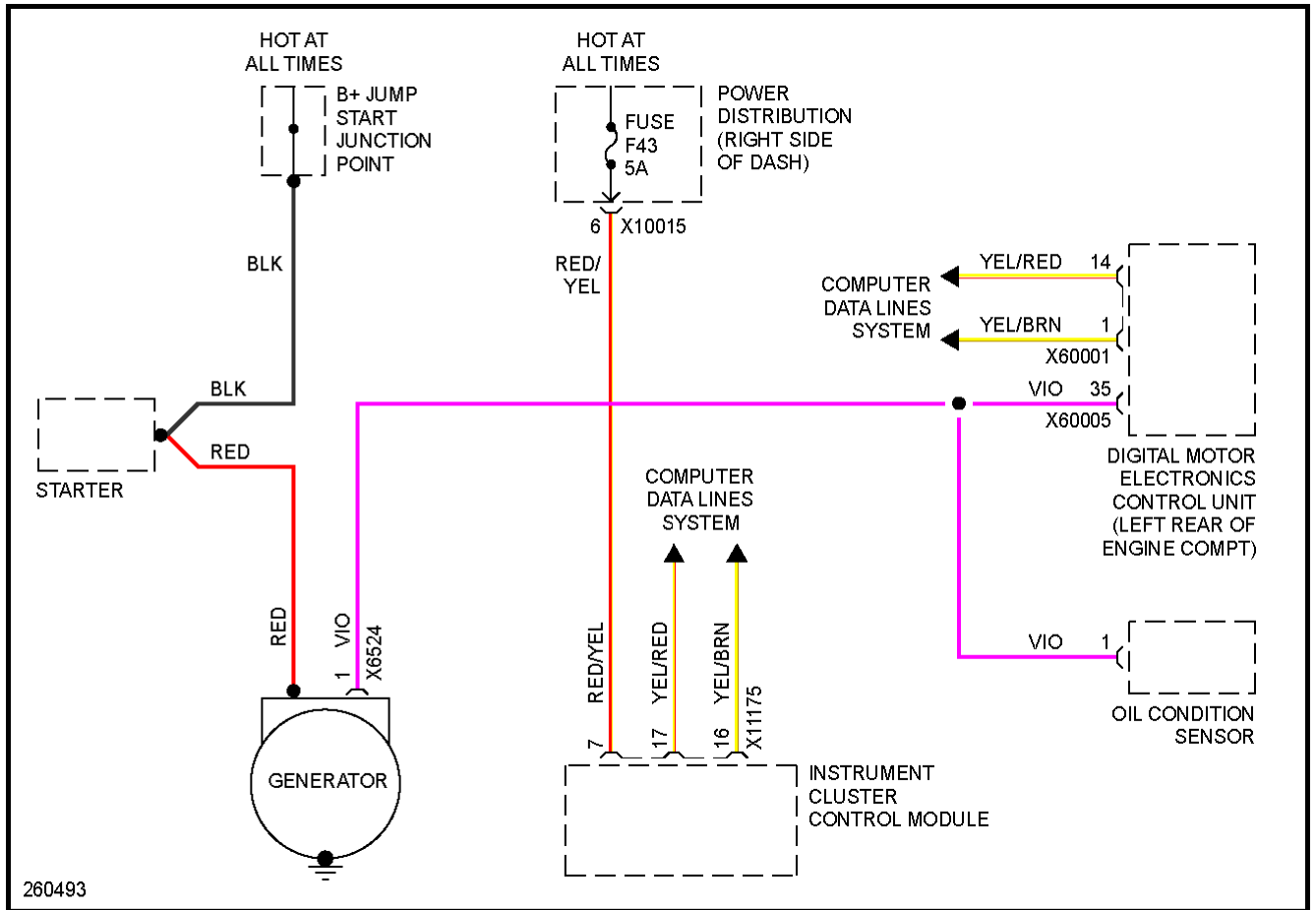
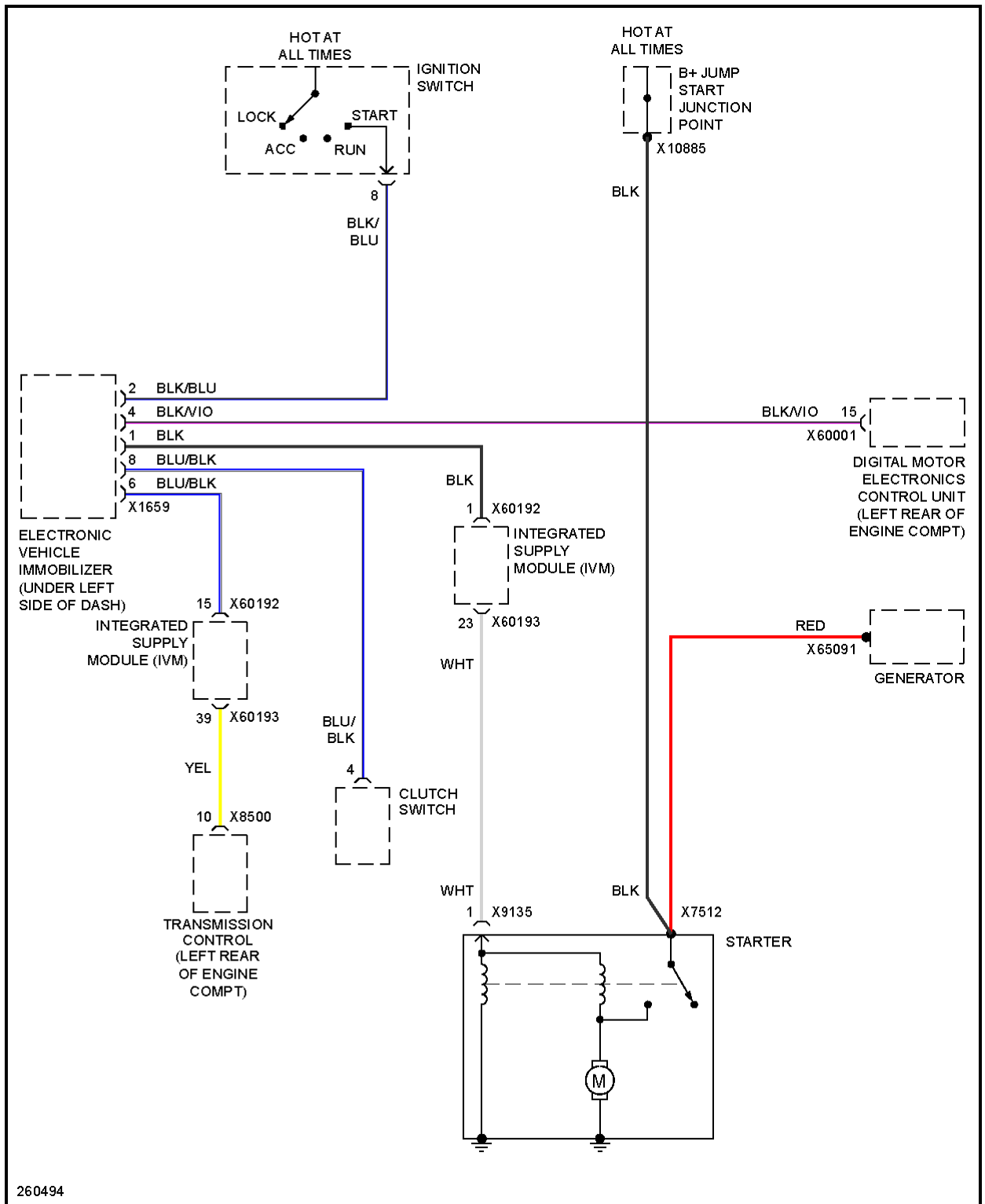


Fig. 63: Charging Circuit



260494

Fig. 64: Starting Circuit

SUPPLEMENTAL RESTRAINTS

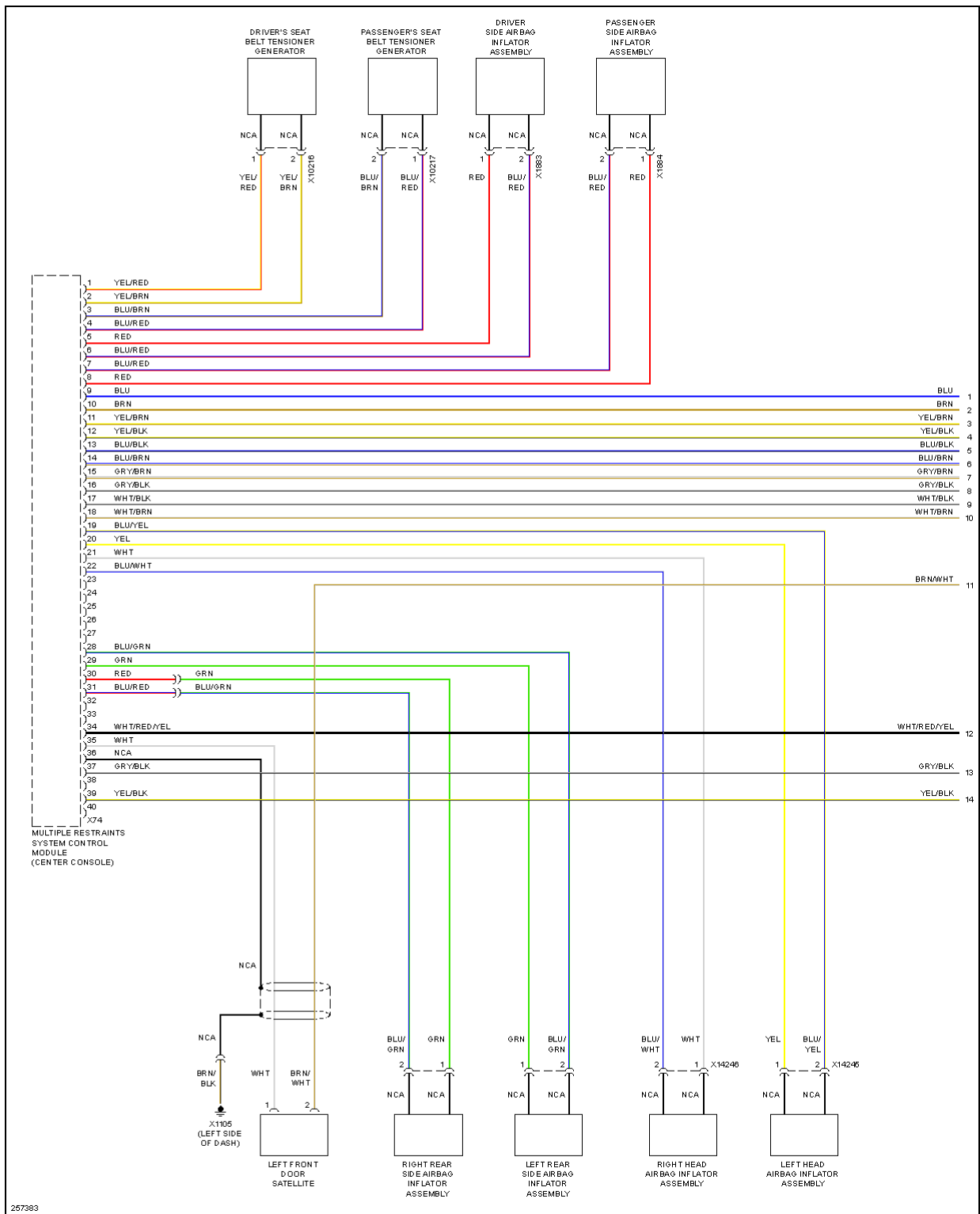
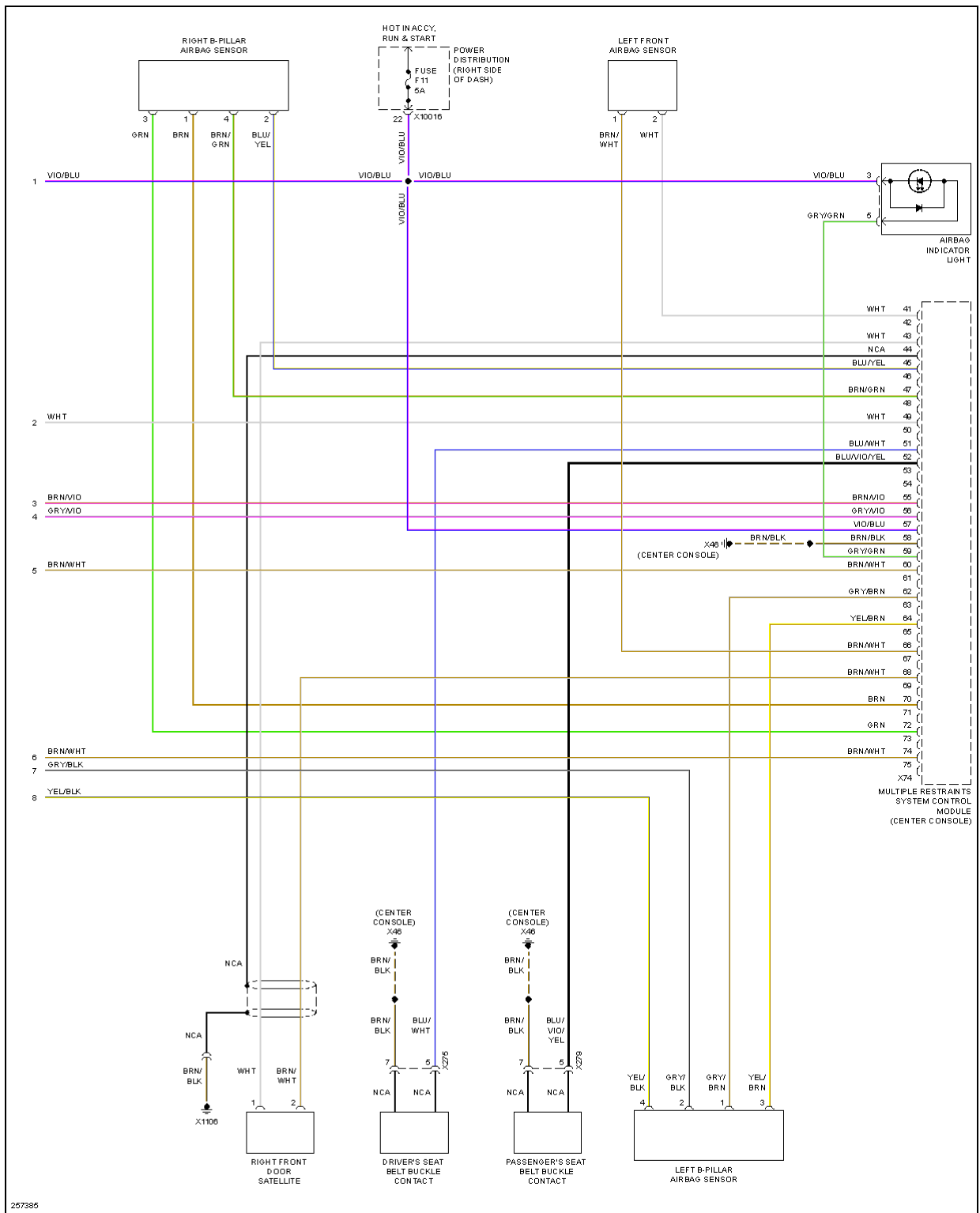


Fig. 65: Supplemental Restraints Circuit (1 of 3)



257385

Fig. 67: Supplemental Restraints Circuit (3 of 3)

TRANSMISSION

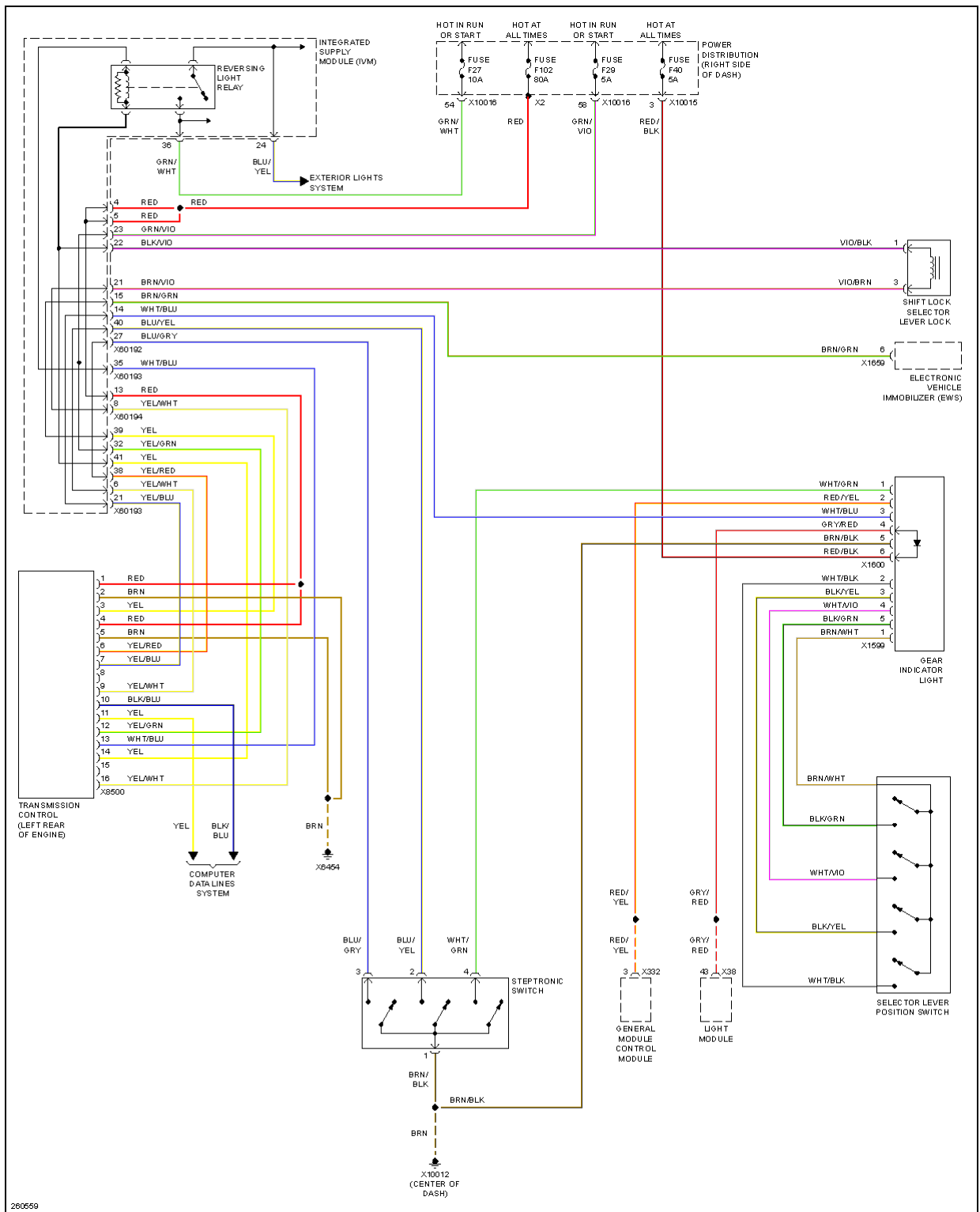


Fig. 68: A/T Circuit

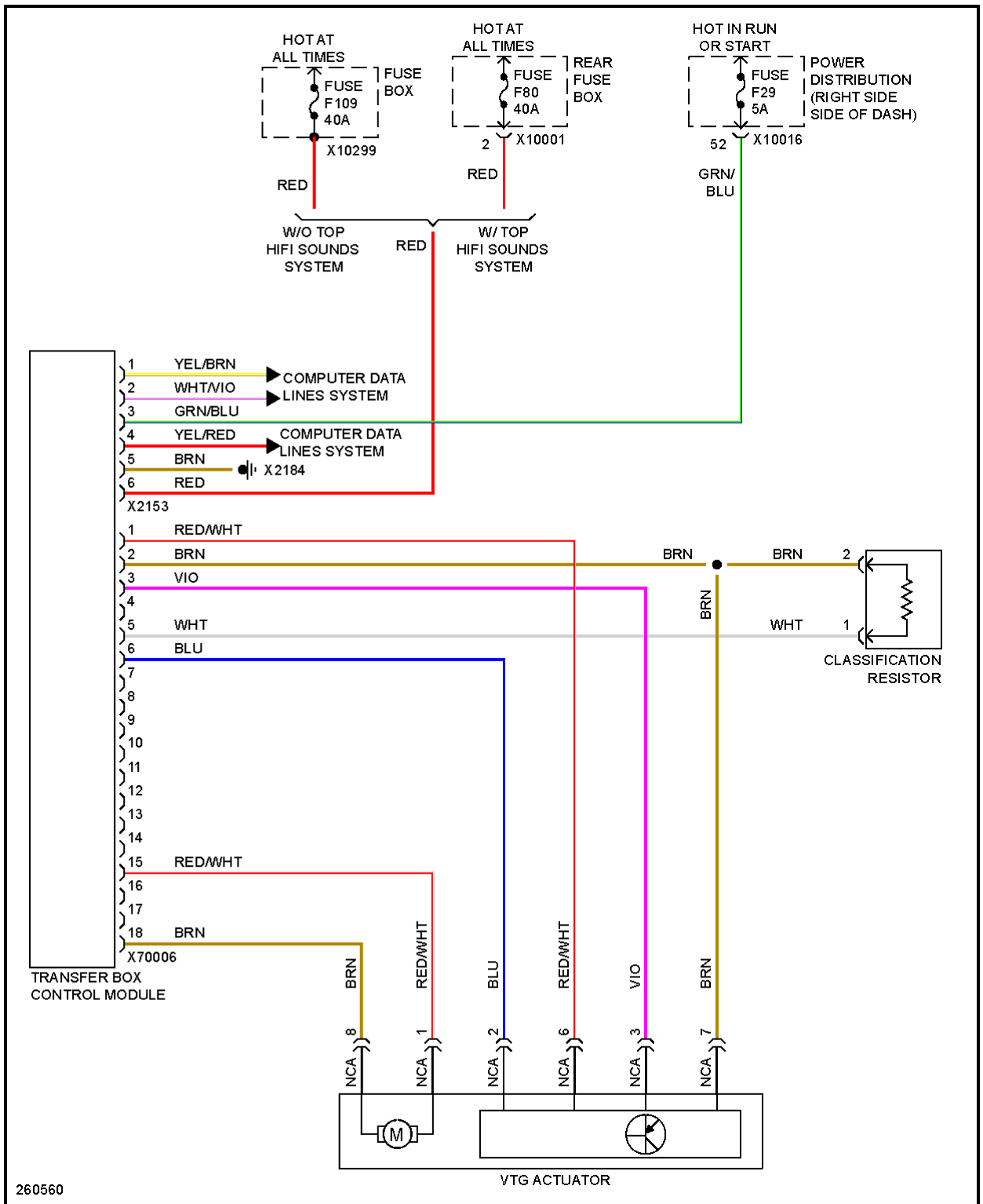


Fig. 69: Transfer Case Circuit

TRUNK, TAILGATE, FUEL DOOR

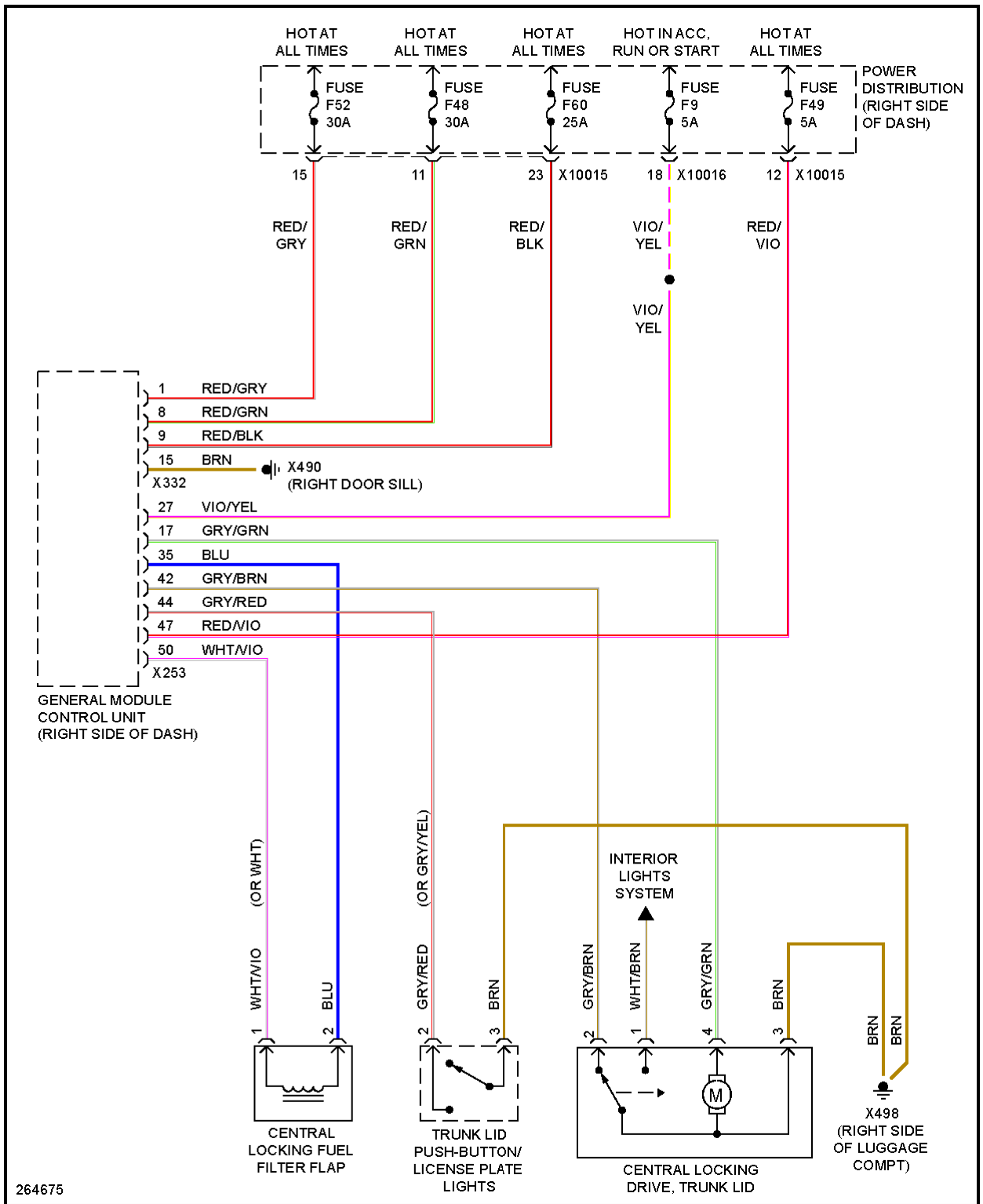
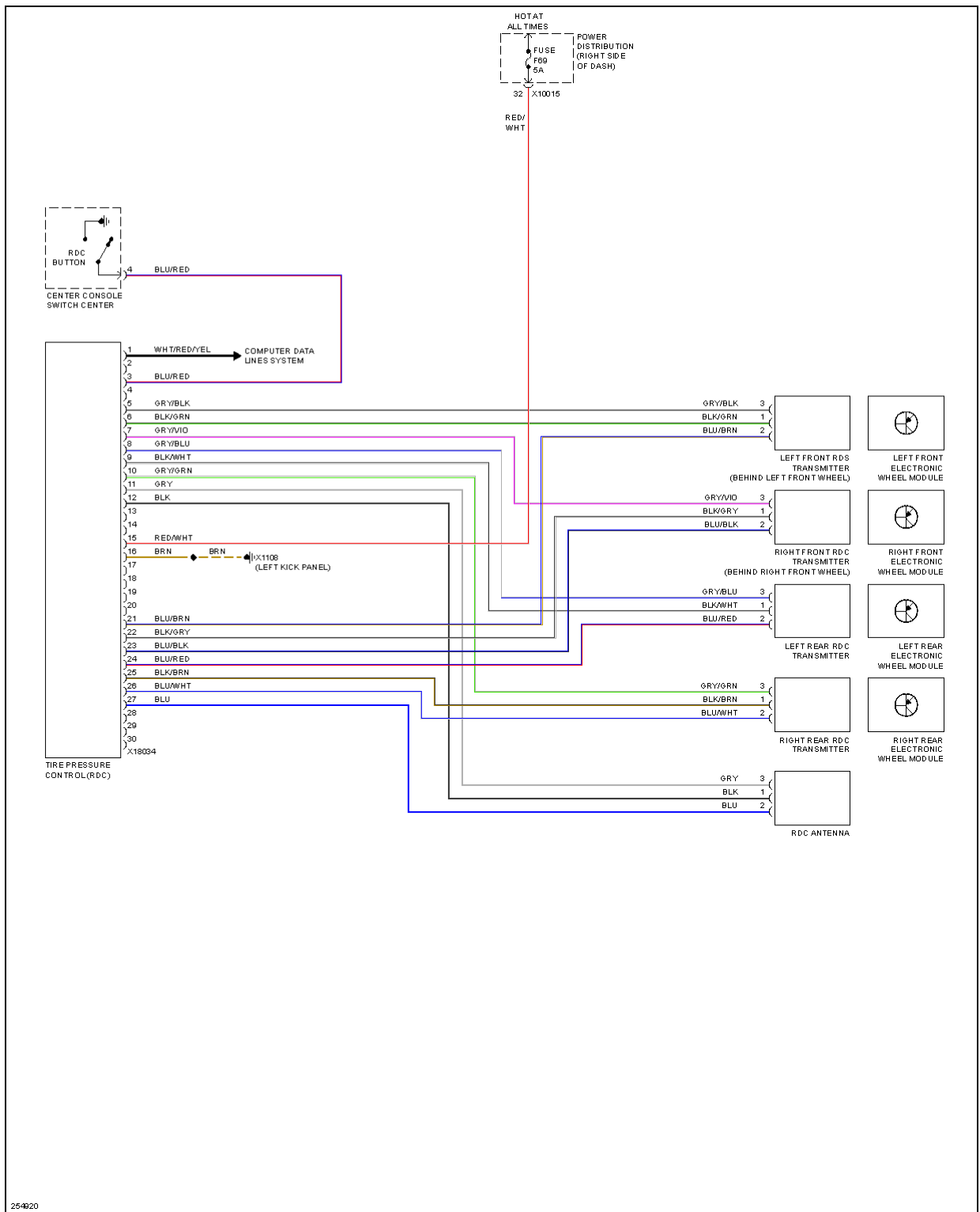


Fig. 70: Trunk & Fuel Door Release Circuit

WARNING SYSTEMS



254020

Fig. 71: Warning Systems Circuit

WIPER/WASHER

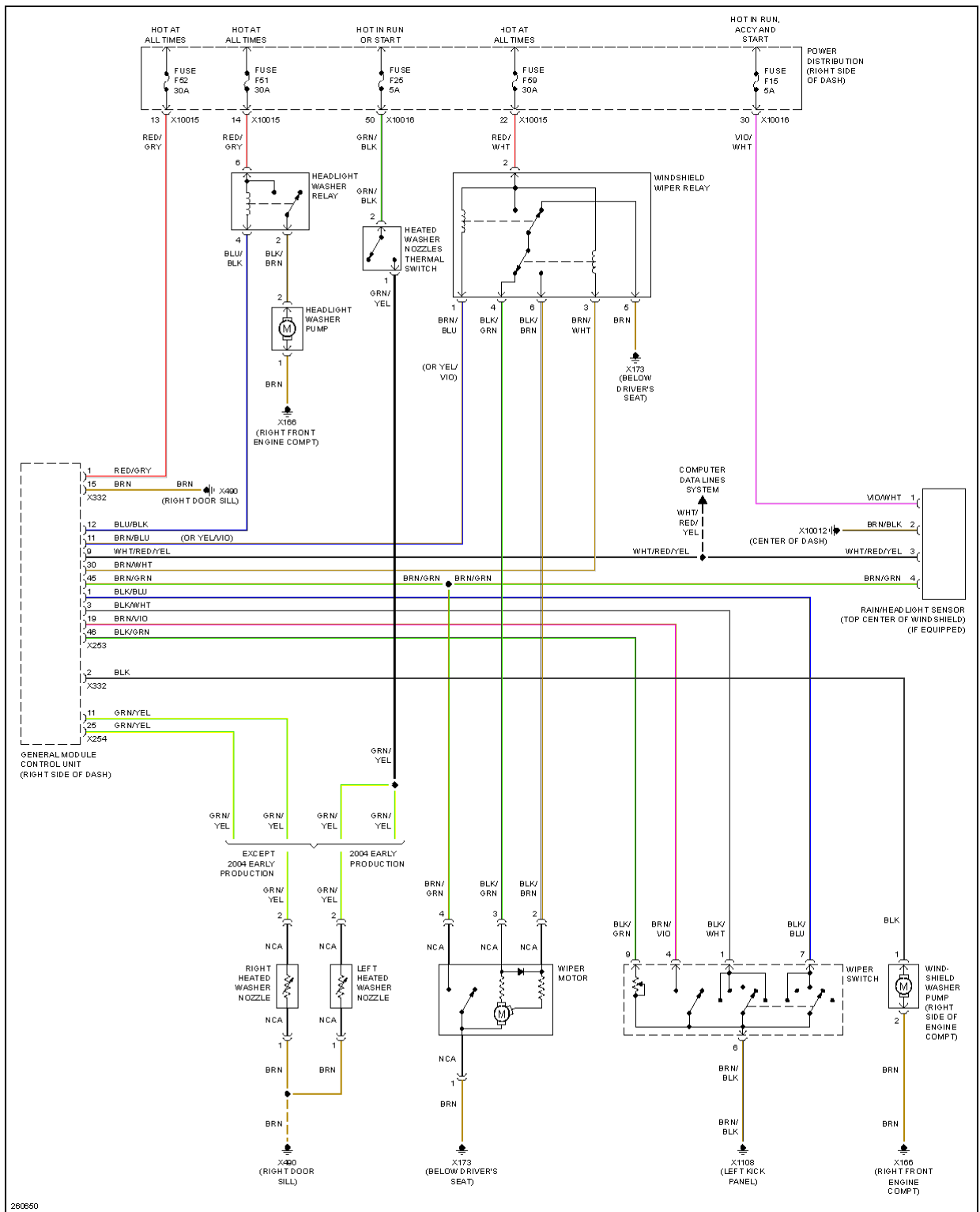


Fig. 72: Front Wiper/Washer Circuit

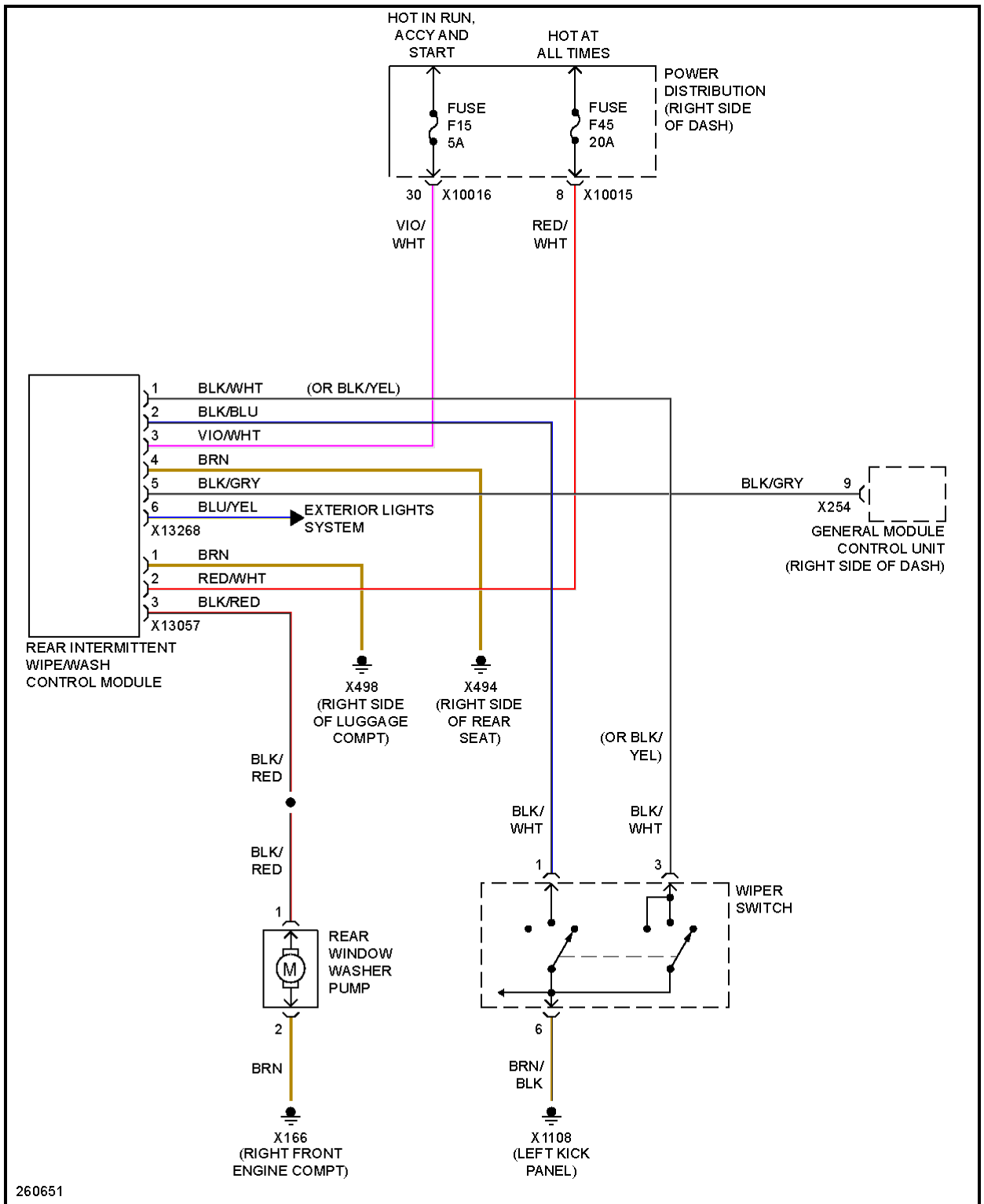


Fig. 73: Rear Wiper/Washer Circuit

TRANSMISSION

Automatic Transmission - Operating Fluids

1.0 GENERAL INFORMATION ON AUTOMATIC TRANSMISSION FLUIDS

Automatic Transmission Fluid was developed especially for automatic transmissions. It requires additives which are carefully matched with each other, a high viscosity index and a solidification point below -40°F/-40°C.

Friction behavior of Automatic Transmission Fluid in plate-type clutches under very different operating conditions is extremely important. Other important factors are:

- Wear protection
- Oil film shear resistance
- Adhesive property
- Oxidation resistance
- Corrosion inhibition
- Sludge prevention
- Temperature-dependent viscosity changes
- Compatibility with sealing materials.

2.0 OIL ADDITIVES

Automatic transmissions are designed so that oil additives are not necessary. BMW disapproves the use of any oil additives and cannot accept the liability for any consequential damage which results from using oil additives.

3.0 APPROVED AUTOMATIC TRANSMISSION FLUIDS FOR INITIAL FILLINGS AND CORRECTING FLUID LEVELS

3.1 GM TRANSMISSIONS

USE OF ANY OTHER OIL WILL CAUSE A NON WARRANTABLE TRANSMISSION FAILURE

***Transmission identification plate can be utilized to determine proper transmission fitted in vehicle**

A4S 270R (THM-R1W)

E36

318i/is/iC/ti from 1996 to 1999 production

323i/is/iC from 1998 to 1999 production

328i/is/iC from 1996 to 1998 production

Z3 1.9 from 1996 to 1999 production

Z3 2.3/2.8 from 1997 to 2000 production

All reputable brand name Automatic Transmission Fluids of the Dexron® III formulation.

E39

528i/iT from 1997-1999 production

All reputable brand name Automatic Transmission Fluids of the Dexron® III formulation.

A4S 310R (THM-R1)

E34

525i from 1990 to 1995 production

All reputable brand name Automatic Transmission Fluids of the Dexron® III formulation.

E36

318i/is/iC/ti from 1992 to 1995 production

325i/is/iC from 1992 to 1995 production

All reputable brand name Automatic Transmission Fluids of the Dexron® III formulation.

A5S 360R (GM5)

E46

323i/Ci/Cic from 6/98 to 3/00 production

323iT from 1//00 to 3/01 to production

328i/Ci/Cic from 6/98 to 3/01 production

The transmission oil pan will be labeled with either Texaco ETL - 7045 or Dexron® III, please fill or top off with the proper fluid only. Do not mix Texaco ETL - 7045 and Dexron® III fluids.

A5S 390R (GM 5)

E46

330xi from 6/00 production to present

325xiT from 9/00 production to present

E53

X5 3.0 from 8/03 production to present

E83

X3 2.5, 3.0 from 8/03 production to present

The transmission oil pan will be labeled with either Texaco ETL - 7045 or Dexron® III, please fill or top off with the proper fluid only. Do not mix Texaco ETL - 7045 and Dexron® III fluids.

E85

Z4 3.0 from 9/02 production to present

Z4 2.5 from 9/02 production to present

No subsequent transmission fluid changes are necessary. Never mix any other oil with this transmission fluid when doing repairs or topping up.

ESSO LT 71141, BMW Part No. 83 22 9 407 807.

GA6L45R (GM6)

DEXRON-VI Automatic Transmission Fluid

E83

X3 LCI from 9/06 production to present

E82, E88

128i, 135is from 12/07 production to present

E90

328Xi from 9/06 production to present

E91

328Xi from 9/06 production to present

The fluid can be sourced locally until a BMW PN is available.

3.2 ZF TRANSMISSIONS

USE OF ANY OTHER OIL WILL CAUSE A NON WARRANTABLE TRANSMISSION FAILURE

***Transmission identification plate can be utilized to determine proper transmission fitted in vehicle**

ZF 3HP22, 4HP22, 4HP24

Utilizes Castrol TQ or Texaco Havoline Automatic Transmission Fluids of the Dexron® III formulation. Never mix any other oil with this transmission fluid when doing repairs or topping up.

A5S 310Z (5HP18)

E36

M3 from 1995 to 1999 production

Utilizes a lifetime filling of synthetic transmission fluid, ESSO LT 71141, no subsequent transmission fluid changes are necessary. Never mix any other oil with this transmission fluid when doing repairs or topping up.

ESSO LT 71141, BMW Part No. 83 22 9 407 807.

E34

530i/iT from 1993 through 1995 production

Utilizes Castrol TQ or Texaco Havoline Automatic Transmission Fluids of the Dexron® III formulation. Never mix any other oil with this transmission fluid when doing repairs or topping up.

A5S325Z (5HP19)

E46

323i/Ci/Cic from 3/00 to 8/00 production

325iT from 4/01 production to present

330i/Ci/Cic from 6/00 production to present

325i/Ci/Cic from 9/00 production to present

No subsequent transmission fluid changes are necessary. Never mix any other oil with this transmission fluid when doing repairs or topping up.

ESSO LT 71141, BMW Part No. 83 22 9 407 807.

E39

525i/iT from 3/01 production to present

530i from 3/01 production to present

No subsequent transmission fluid changes are necessary. Never mix any other oil with this transmission fluid when doing repairs or topping up.

ESSO LT 71141, BMW Part No. 83 22 9 407 807.

A5S 440Z (5HP24)

E31

840Ci from 9/96 to the present

No subsequent transmission fluid changes are necessary. Never mix any other oil with this transmission fluid when doing repairs or topping up.

ESSO LT 71141, BMW Part No. 83 22 9 407 807.

E38

740i/iL from 1/97 production to present

No subsequent transmission fluid changes are necessary. Never mix any other oil with this transmission fluid when doing repairs or topping up.

ESSO LT 71141, BMW Part No. 83 22 9 407 807.

E39

540i/iT from 1/97 production to present

No subsequent transmission fluid changes are necessary. Never mix any other oil with this transmission fluid when doing repairs or topping up.

ESSO LT 711 41, BMW Part No. 83 22 9 407 807.

E53

X5 4.4i from 9/99 production to present

X5 4.6i from 9/01 production to present

No subsequent transmission fluid changes are necessary. Never mix any other oil with this transmission fluid when doing repairs or topping up.

ESSO LT 711 41, BMW Part No. 83 22 9 407 807.

A5S 560Z (5HP30)

E31

840Ci equipped with M60 engine

Utilizes a lifetime fill of transmission fluid, no subsequent oil changes are necessary on this transmission. If transmission fluid is required for repair purposes, use only the oil approved for this transmission. It is not permitted to mix this oil with other grades of transmission fluid.

Shell LA 2634, BMW Part No. 83 22 9 407 765.

E31

840Ci equipped with M62 engine

850Ci equipped with M73 Engine

Utilizes lifetime fill of transmission fluid, no subsequent transmission fluid changes are necessary.

Never mix any other oil with this transmission fluid when doing repairs or topping up.

ESSO LT 711 41, BMW Part No. 83 22 9 407 807.

E32

740i/iL from 1993 through 1994 production

Utilizes a lifetime fill of transmission fluid, no subsequent oil changes are necessary on this transmission. If transmission fluid is required for repair purposes, use only the oil approved for this transmission. It is not permitted to mix this oil with other grades of transmission fluid.

Shell LA 2634, BMW Part No. 83 22 9 407 765.

E34

540i/iT from 1993 through 1995 production

Utilizes a lifetime fill of transmission fluid, no subsequent oil changes are necessary on this transmission. If transmission fluid is required for repair purposes, use only the oil approved for this transmission. It is not permitted to mix this oil with other grades of transmission fluid.

Shell LA 2634, BMW Part No. 83 22 9 407 765.

Effective with model year 1995 and later:

E31

850Ci from 10/94 to 6/97 production

840Ci from 12/95 to 8/96 production

Utilizes lifetime fill of transmission fluid, no subsequent transmission fluid changes are necessary.

Never mix any other oil with this transmission fluid when doing repairs or topping up.

ESSO LT 711 41, BMW Part No. 83 22 9 407 807.

E38

750iL from 1/95 production to present

740i/iL from 7/94 to 12/96 production

Utilizes lifetime fill of transmission fluid, no subsequent transmission fluid changes are necessary.

Never mix any other oil with this transmission fluid when doing repairs or topping up.

ESSO LT 711 41, BMW Part No. 83 22 9 407 807.

E39

540i/iT from 3/96 to 12/96 production

Utilizes lifetime fill of transmission fluid, no subsequent transmission fluid changes are necessary.

Never mix any other oil with this transmission fluid when doing repairs or topping up.

ESSO LT 711 41, BMW Part No. 83 22 9 407 807.

GA6HP19Z

E82/E88, E90/91/92

325i, 328i, 330i, 335i, All

The transmission fluid has a Condition Based Service interval of approximately 100,000 miles. Never mix any other oil with this transmission fluid when doing repairs or topping up.

Shell M-1375.4, BMW Part No. 83 22 0 142 516.

E60/61

525i, 530i from 8/03 production to present

The transmission fluid has a Condition Based Service interval of approximately 100,000 miles. Never mix any other oil with this transmission fluid when doing repairs or topping up.

Shell M-1375.4, BMW Part No. 83 22 0 142 516.

GA6HP19ZTU

E70 3.0i from start production to present

The transmission fluid has a Condition Based Service interval of approximately 100,000 miles. Never mix any other oil with this transmission fluid when doing repairs or topping up.

Shell M-1375.4, BMW Part No. 83 22 0 142 516.

GA6HP26Z

E60

545i from 8/03 production to present

550i All

The transmission fluid has a Condition Based Service interval of approximately 100,000 miles. Never mix any other oil with this transmission fluid when doing repairs or topping up.

Shell M-1375.4, BMW Part No. 83 22 0 142 516.

E63, E64

645Ci, 645CiC from start of production to present

650Ci, 650CiC All

The transmission fluid has a Condition Based Service interval of approximately 100,000 miles. Never mix any other oil with this transmission fluid when doing repairs or topping up.

Shell M-1375.4, BMW Part No. 83 22 0 142 516.

E65

745i from 11/2001 production to present

750i All

The transmission fluid has a Condition Based Service interval of approximately 100,000 miles. Never mix any

other oil with this transmission fluid when doing repairs or topping up.

Shell M-1375.4, BMW Part No. 83 22 0 142 516.

E66

745Li from 3/2002 production to present

750Li All

760Li from 9/2002 production to present

The transmission fluid has a Condition Based Service interval of approximately 100,000 miles. Never mix any other oil with this transmission fluid when doing repairs or topping up.

Shell M-1375.4, BMW Part No. 83 22 0 142 516.

GA6HP26ZTU

E70

X5 4.8i from start production to present

The transmission fluid has a Condition Based Service interval of approximately 100,000 miles. Never mix any other oil with this transmission fluid when doing repairs or topping up.

Shell M-1375.4, BMW Part No. 83 22 0 142 516.

4.0 CHECKING TRANSMISSION FLUID LEVEL

Due to the substantial expansion of transmission fluid when heated it is only possible to measure the oil level correctly at specified oil temperatures (after driving a distance of about 12 mi./20 km). All transmissions should be checked between a

ZF 3HP and 4HP

Due to the substantial expansion of transmission fluid when heated it is only possible to measure the oil level correctly at specified oil temperatures (after driving a distance of about 12 mi./20 km).

A5S 560Z, A5S440Z, GA6HP19Z, GA6HP26Z, GA6HP26Z, A5S325Z, A5S 310Z

All 5 and 6 speed transmissions require the fluid to be checked when fluid temperature is between 30-50° Celsius using DIS Plus or GT1. Do not check fluid level after temperature has exceeded 50° Celsius.

A4S 270R, A4S 310R and A5S 360R

See appropriate AUTOMATIC TRANSMISSION article for fluid level check procedure. These transmissions

generally do not have a dipstick and fluid level check (if necessary) must be performed through the oil fill hole.

TRANSMISSION

Automatic Transmission - Repair Instructions - X3

00 TRANSMISSION ASSEMBLY

00 DANGER OF POISONING IF OIL IS INGESTED/ABSORBED THROUGH THE SKIN

Danger of poisoning!

Ingesting oil or absorbing through the skin may cause poisoning!

Possible symptoms are:

- Headaches
- Dizziness
- Stomach aches
- Vomiting
- Diarrhoea
- Cramps/fits
- Unconsciousness

Protective measures/rules of conduct:

- Pour oil only into appropriately marked containers
- Do not pour oil into drinking vessels (drinks bottles, glasses, cups or mugs)
- Observe country-specific safety regulations

First aid measures:

- Do not induce vomiting.

If the person affected is still conscious, he/she must rinse out their mouth with water, drink plenty of water and consult a doctor immediately.

If the person affected is unconscious, do not administer anything by mouth, place the person in the recovery position and seek immediate medical attention.

00 RISK OF INJURY IF OIL COMES INTO CONTACT WITH EYES AND SKIN

Danger of injury!

Contact with eyes or skin may result in injury!

Possible symptoms are:

- Impaired sight
- Irritation of the eyes
- Reddening of the skin
- Rough and cracked skin

Protective measures/rules of conduct:

- Wear protective goggles
- Wear oil-resistant protective gloves
- Observe country-specific safety regulations

First aid measures:

- Eye contact: Rinse eyes immediately with plenty of water for at least 15 minutes; if available, use an eye-rinsing bottle. If irritation of the eyes persists, consult a doctor.
- Skin contact: Wash off with soap and water immediately. If irritation persists, consult a doctor.

NOTE: Do not use solvents/thinners.

00 SAFETY INSTRUCTIONS FOR HANDLING OIL

**WARNING: Danger of poisoning if oil is ingested/absorbed through the skin!
Risk of injury if oil comes into contact with eyes and skin!**

Recycling:

Observe country-specific waste-disposal regulations.

Measures if oil is unintentionally released:

- Personal precautionary measures: Danger of slipping! Keep non-involved persons away from the work area. Wear personal protective clothing/equipment.
- Environmental protection measures: Prevent oil from draining into drain channels, sewerage systems, pits, cellars, water and the ground.
- Limiting spread: Use oil blocks to prevent the surface spread of oil.
- Cleaning procedure: Bind and dispose of escaped oil with nonflammable absorbents.

NOTE: Do not flush oil away with water or aqueous cleaning agents.

00 11 237 CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (GA6L45R)

**IMPORTANT: Use only the approved transmission fluid.
Failure to comply with this requirement will result in serious damage to the**

automatic transmission!

Remove exhaust system bracket (1).

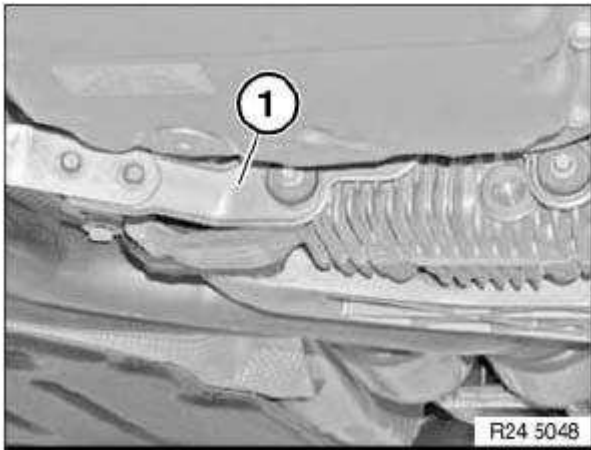


Fig. 1: Exhaust System Bracket

Courtesy of BMW OF NORTH AMERICA, INC.

Topping up transmission fluid after a repair:

Stand vehicle on a level surface and secure against rolling off.

Undo filler plug (1).

Installation:

Replace sealing ring.

Top up transmission fluid until it emerges from filling orifice.

Start engine.

Replenish transmission fluid until it emerges from filling orifice.

Screw in filler plug (1).

Tightening torque: 24 11 7AZ, see **24 11 TRANSMISSION HOUSING, TRANSMISSION OIL SUMP** .

Press brake pedal to floor and shift through all gears several times at idle speed. Then shift to "P" position (Park).

Then check fluid level.

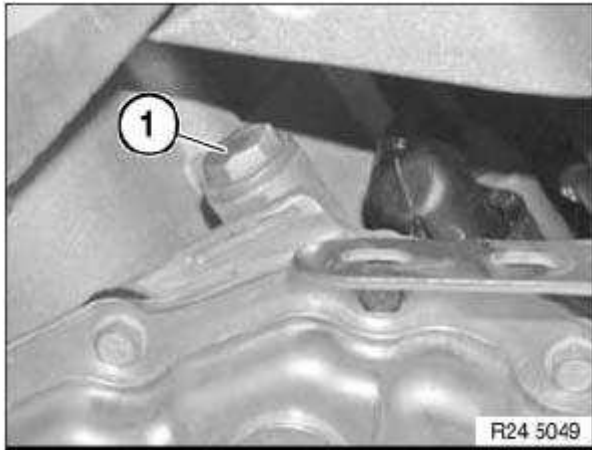


Fig. 2: Filler Plug

Courtesy of BMW OF NORTH AMERICA, INC.

Checking fluid level:

- Connect BMW Diagnosis and Information System (DIS) to vehicle.
- Call up Service functions (drive).
- Carry out fluid level check in accordance with instructions.

23 TRANSMISSION DESIGNATIONS

BREAKDOWN OF BMW DESIGNATION

A5S 300J (old designation)		
A	Transmission type	<ul style="list-style-type: none"> ○ S = Manual transmission ○ A = Automatic transmission
5	Number of forward gears	
S	Type of top gear	<ul style="list-style-type: none"> ○ D = Direct gear ○ S = Overdrive gear
300	Max. input torque (Nm)	
J	Code letter of transmission manufacturer	<ul style="list-style-type: none"> ○ G = Getrag ○ J = Jatco ○ R = GMPT (General Motors Powertrain) ○ Z = ZF (Zahnradfabrik Friedrichshafen)
SMG	Notes	SMG = Sequential M gearbox/transmission
GS6-37BZ (new designation according to BMW Group Standard GS 90007)		
G	Transmission	
S	Transmission type	<ul style="list-style-type: none"> ○ S = Manual transmission ○ A = Automatic transmission
6	Number of forward gears	

-		<ul style="list-style-type: none"> ○ - = Standard with manual gearshift ○ HP = Hydraulic planetary gear
37	Transmission type	<ul style="list-style-type: none"> ○ 26 = D-transmission ○ 31 = C-transmission ○ 39 = F-transmission ○ 37 = H-transmission ○ 53 = G-transmission ○ 17 = I-transmission ○ 47 = J-transmission
B	Gear set	<ul style="list-style-type: none"> ○ B = Petrol/gasoline gear ratio ○ D = Diesel gear ratio
Z	Code letter of transmission manufacturer	<ul style="list-style-type: none"> ○ G = Getrag ○ Z = ZF (Zahnradfabrik Friedrichshafen)

MANUAL TRANSMISSION

BMW designation	Manufacturer	Manufacturer designation	Remark
S5D 200G	Getrag	B transmission (220/5)	
S5D 200G	Getrag	B transmission (221/5)	for M41 engine only
S5D 250G	Getrag	B transmission (220/5)	Reinforced design
S5D 260Z	ZF	C-transmission (S5-31 D)	for M51 engine only
S5D 280Z	ZF	C-transmission (S5-31)	
S5D 310Z	ZF	C-transmission (S5-31)	up to 9.95
S5D 320Z	ZF	C-transmission (S5-31)	from 9.95 (reinforced design)
GS5S31BZ (SMG)	ZF	C transmission	SMG
GS5-39DZ	ZF	F transmission	
S6S 420G	Getrag	D-transmission (226/6)	
S6S 420G (SMG)	Getrag	D transmission	SMG
S6S 560G	Getrag	E-transmission (286/6)	
GS6-37BZ	ZF	H-transmission	
GS6S37BZ (SMG)	ZF	H-transmission	
GS6-37DZ	ZF	H-transmission	
GS6-37BG	Getrag	H-transmission	
GS6-53BZ	ZF	G-transmission	

GS6-53DZ	ZF	G-transmission	
GS6-17BG	Getrag	I-transmission	
GS7S47BG (SMG)	Getrag	J-transmission (247)	SMG 7-speed

AUTOMATIC TRANSMISSION

BMW designation	Manufacturer	Manufacturer designation	Remark
A4S 200R	GMPT	GM4	
A4S 270R	GMPT	THM-R1w	Transmission widesteped
A4S 310R	GMPT	THM-R1	
A5S 300J	Jatco	Jatco	
A5S 310Z	ZF	5HP-18	
A5S 325Z	ZF	5HP-19	
A5S 440Z	ZF	5HP-24	
A5S 560Z	ZF	5HP-30	
A5S 360R / 390R	GM	GM5	
GA6HP19Z	ZF	6HP19	
GA6HP26Z	ZF	6HP26	
GA6HP32Z	ZF	6HP32	
GA6L45R	GM	GM6	

23 .. UNIVERSAL TRANSMISSION BRACKET

Special tools required:

- 00 2 030
- 23 0 132 , see **23 MANUAL TRANSMISSION**
- 23 4 050 , see **23 MANUAL TRANSMISSION**

NOTE:

- The universal transmission bracket is introduced for the E60 AWD
- Suitable for manual and automatic transmissions

IMPORTANT: Front and rear supports (1) can be laterally adjusted by means of screws (2).
Carrier (3) of rear supports (1) can be longitudinally adjusted by means of screw.
Supports must be adapted in length and width to the transmission.

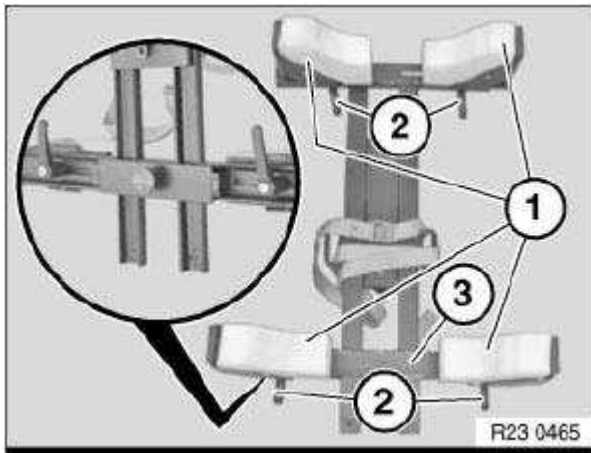


Fig. 3: Rear Supports, Screws And Carrier
Courtesy of BMW OF NORTH AMERICA, INC.

Supporting transmission:

Support transmission with special tools 23 4 050, 23 0 132 , 00 2 030 .

IMPORTANT: Transmission must be secured with tensioning strap (1).

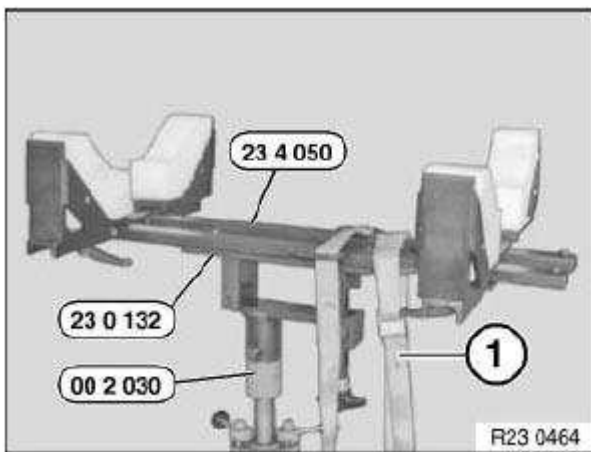


Fig. 4: Special Tools (23 4 050), (23 0 132) And (00 2 030)
Courtesy of BMW OF NORTH AMERICA, INC.

23 UNIVERSAL TRANSMISSION RETAINING BRIDGE

Special tools required:

- 00 1 450
- 24 0 200 SUPPORT

NOTE: ○ The transmission retaining bridge 24 0 200 is suitable for both manual and automatic transmissions

**IMPORTANT: Adapters and spindles must be adapted for positive locking to the transmission.
(Risk of injury)**

Adapt adapters (1) and spindle with thrust piece (3) to transmission.

Adapt length with slide (2).

Screw in spindle (4).

IMPORTANT: Before mounting on assembly stand 00 1 450 , check retaining bridge for secure seating.

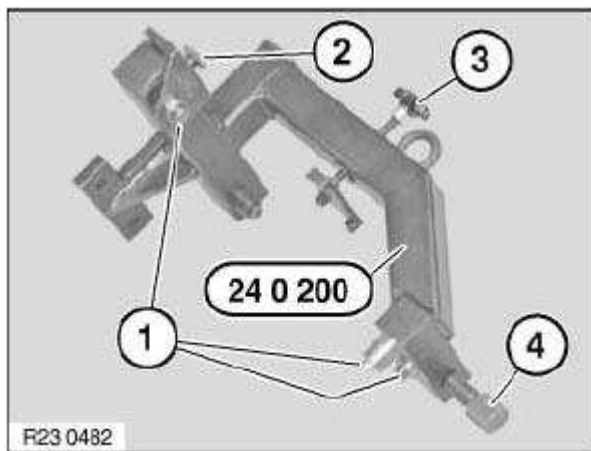


Fig. 5: Adapters, Thrust Piece Spindle And Special Tool (24 0 200)
Courtesy of BMW OF NORTH AMERICA, INC.

24 00 018 ADJUSTING SELECTOR LEVER (A5S 360R / 390R, A4S 200R, 6HP26Z/19Z)

NOTE: **Check cable for ease of movement.
Move selector lever to "P" position.**

Grip clamping sleeve (1).

Slacken nut (2).

Press selector lever (3) forwards into park position. Press cable (4) in direction of arrow and release again.

Grip clamping sleeve (1).

Tighten down nut (2).

Tightening torque 25 16 2AZ , see 25 16 SHIFT CONSOLE - AUTOMATIC TRANSMISSION .

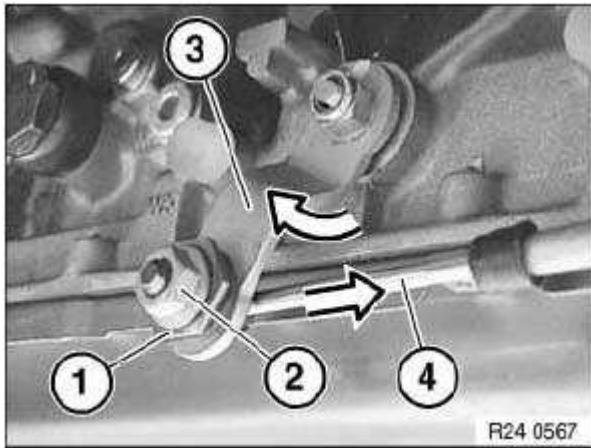


Fig. 6: Clamping Sleeve, Nut And Selector Lever
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Move selector lever to "P" position.

Check whether parking gear is engaged by turning propeller shaft.

24 00 018 ADJUSTING SELECTOR LEVER (GA6L45R) AWD

NOTE: **Check cable for ease of movement.**
 Move selector lever to "P" position.

Grip clamping sleeve (1).

Loosen nut (2).

Press selector lever (3) forward into park position. Press cable (4) in direction of arrow, then release again.

Grip clamping sleeve (1).

Tighten nut (2).

Tightening torque, 25 16 2AZ. , see 25 16 SHIFT CONSOLE - AUTOMATIC TRANSMISSION

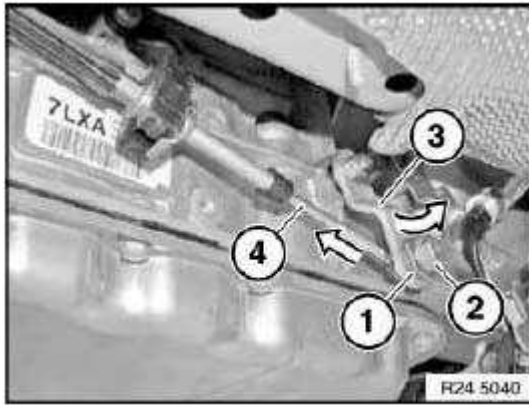


Fig. 7: Clamping Sleeve, Nut, Selector Lever And Cable
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Move selector lever to "P" position.

Check whether parking gear is engaged by turning propeller shaft.

24 00 018 ADJUSTING SELECTOR LEVER (GA6L45R)

NOTE: Check cable for ease of movement. Move selector lever to "P" position.

Grip clamping sleeve (1). Slacken nut (2). Press selector lever (3) forwards into park position. Press cable (4) in direction of arrow and release again. Grip clamping sleeve (1). Tighten down nut (2). Tightening torque, see 25 16 2AZ in **25 16 SHIFT CONSOLE - AUTOMATIC TRANSMISSION** .

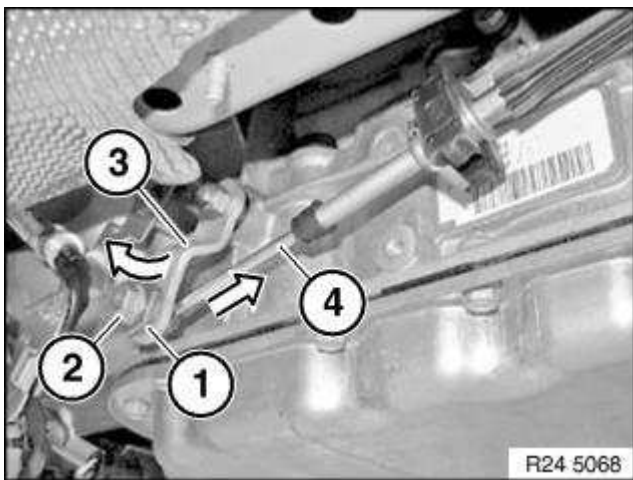


Fig. 8: Press Cable (4) In Direction Of Arrow And Release Again
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Move selector lever to "P" position. Check whether parking gear is engaged by turning propeller shaft.

24 00 032 REMOVING AND INSTALLING AUTOMATIC TRANSMISSION (GA6L45R)

Special tools required:

See **MAINTENANCE AND GENERAL INFORMATION - SPECIAL TOOLS** , **23 MANUAL TRANSMISSION** , **24 AUTOMATIC TRANSMISSION**

- 00 2 030
- 00 9 010
- 00 9 120
- 00 9 130
- 23 0 132
- 23 4 050
- 24 1 110
- 24 2 390
- 24 4 160
- 24 4 161
- 24 4 166

IMPORTANT: After completion of work, check transmission fluid level, see **00 11 237 CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (GA6L45R)** .

Use only the approved transmission fluid .

Failure to comply with this requirement will result in serious damage to the automatic transmission!

IMPORTANT: Aluminium-magnesium materials.

No steel screws/bolts may be used due to the threat of electrochemical corrosion.

A magnesium crankcase requires aluminium screws/bolts exclusively.

Aluminium screws/bolts must be replaced each time they are released .

The end faces of these screws/bolts are painted blue for the purposes of reliable identification.

Jointing torque and angle of rotation must be observed without fail (risk of damage) .

Necessary preliminary tasks:

- Disconnect battery negative lead, see **THE BATTERY** .
- Remove underbody protection with bracket at front and rear.
- Remove reinforcement plate

- Remove complete exhaust system
- Remove heat shields
- Remove front propeller shaft at transfer box and tie to one side
- Support engine with lifter when removing transmission

Release bolts (1).

Remove bracket and heat shield.

Unclip lines (2).

Remove bracket (3).

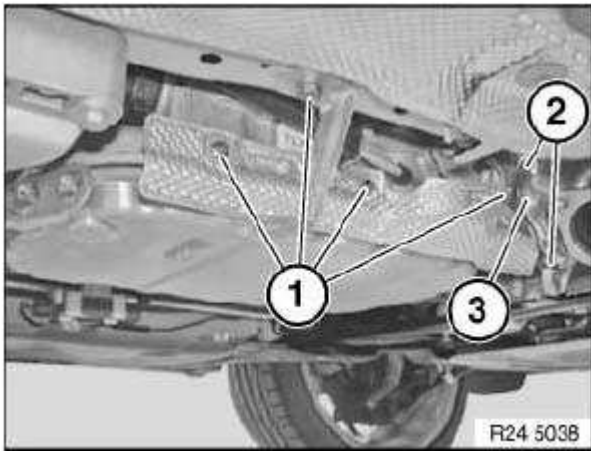


Fig. 9: Bolts, Lines And Bracket
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connector (1).

Release screws (2).

Remove retaining plate (3).

Tightening torque: 24 00 2AZ, see **24 00 TRANSMISSION IN GENERAL** .

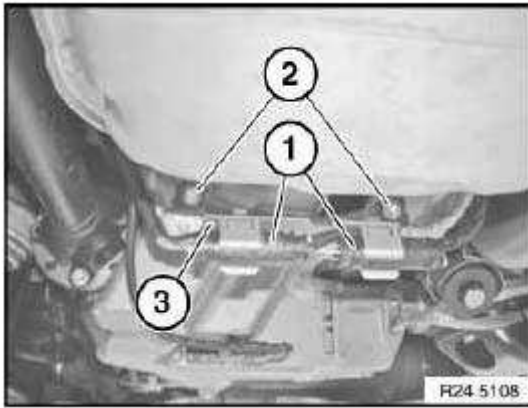


Fig. 10: Plug Connector, Screws And Retaining Plate
Courtesy of BMW OF NORTH AMERICA, INC.

Release aluminium screws on right next to cable retaining plate with special tool 00 9 010 .

Blue aluminium screws/bolts must be replaced.

Tightening torque: 24 00 2AZ, see **24 00 TRANSMISSION IN GENERAL** .

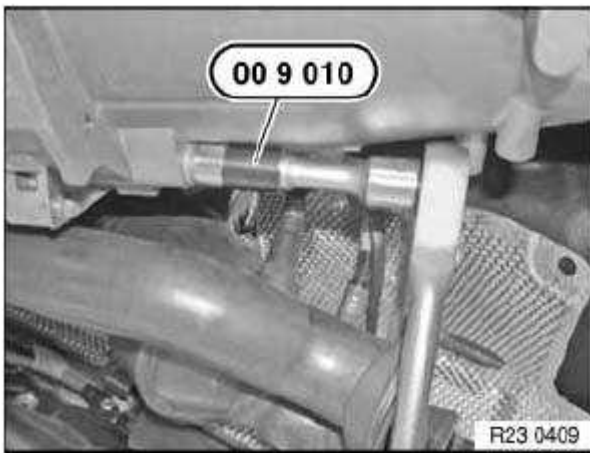


Fig. 11: Special Tool (00 9 010)
Courtesy of BMW OF NORTH AMERICA, INC.

Grip clamping sleeve (1).

Loosen nut (2).

Release screws (3).

Remove cable (4).

Tightening torque: 25 16 1AZ, see **25 16 SHIFT CONSOLE - AUTOMATIC TRANSMISSION** .

Installation:

Adjust selector lever, see 24 00 018 Adjusting selector lever (A5S 360R / 390R, A4S 200R, 6HP26Z/19Z).

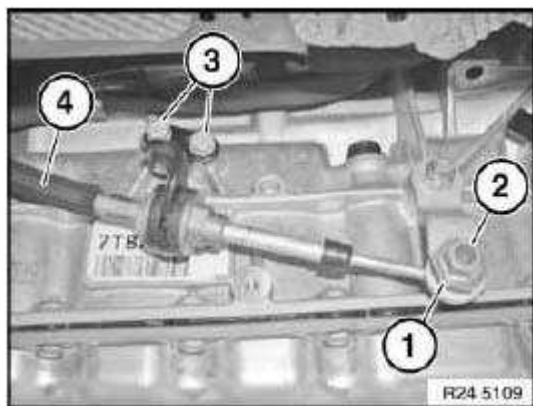


Fig. 12: Clamping Sleeve, Nut, Screws And Cable
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

Disconnect hydraulic lines (2) to transmission fluid cooler.

Installation:

Replace sealing rings.

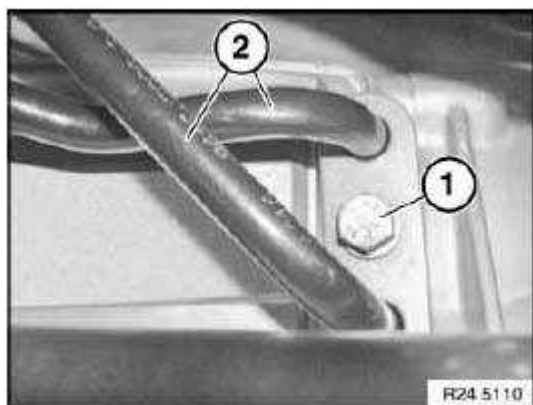


Fig. 13: Screws And Hydraulic Lines
Courtesy of BMW OF NORTH AMERICA, INC.

Release nut (1) and bracket from transmission oil lines on oil sump.

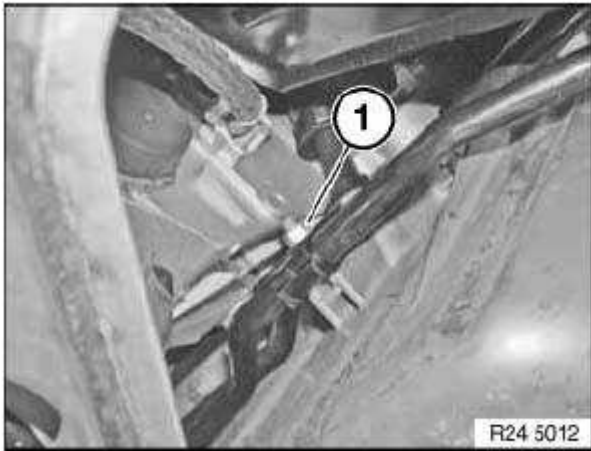


Fig. 14: Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Detach plugs (1) and (2) from servomotor.

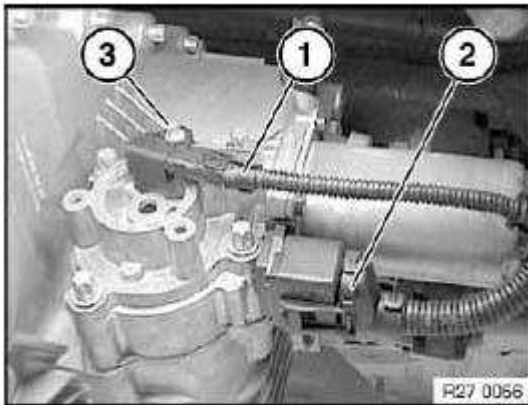


Fig. 15: Plugs And Servomotor
Courtesy of BMW OF NORTH AMERICA, INC.

Supporting transmission:

Support transmission with special tools 23 4 050, 23 0 132 and 00 2 030 .

Secure transmission with tensioning strap (1).

Tasks are described in Transmission bracket, see **23 .. UNIVERSAL TRANSMISSION BRACKET** .

After completion of work, check transmission oil level.

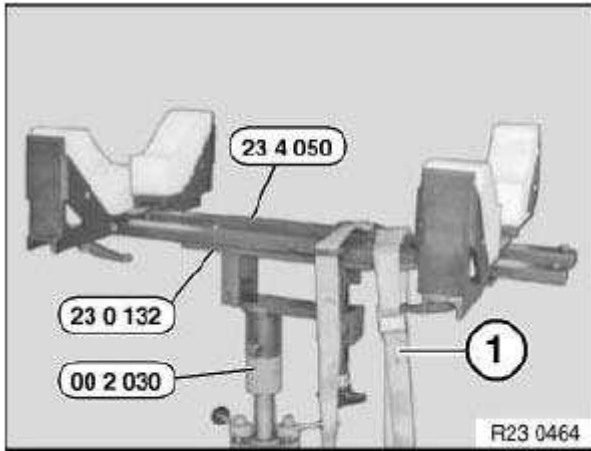


Fig. 16: Special Tools (23 4 050), (23 0 132) And (00 2 030)
Courtesy of BMW OF NORTH AMERICA, INC.

- Remove propeller shaft from transmission.
- Release center bearing.
- Tie propeller shaft to one side.

Tasks are described in Removing propeller shaft, see **26 11 000 REMOVING AND INSTALLING PROPELLER SHAFT (CARDAN UNIVERSAL JOINT) COMPLETELY** .

IMPORTANT: Do not allow propeller shaft to hang from fixed ball joint (risk of damage) .

Unfasten screws and remove transmission cross-member.

Tightening torque: 24 71 1AZ, see **24 71 TRANSMISSION MOUNTS** .

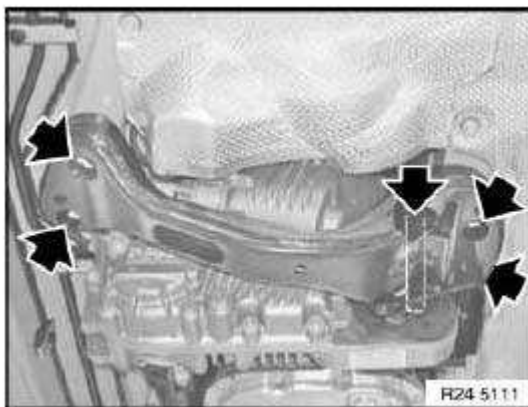


Fig. 17: Locating Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Crank engine at vibration damper in direction of rotation until screw (1) is visible in opening.

Release all screws of torque converter with special tool 24 1 110 .

Crank engine further and release remaining 5 bolts.

Tightening torque: 24 40 1AZ, see **24 40 TORQUE CONVERTER** .

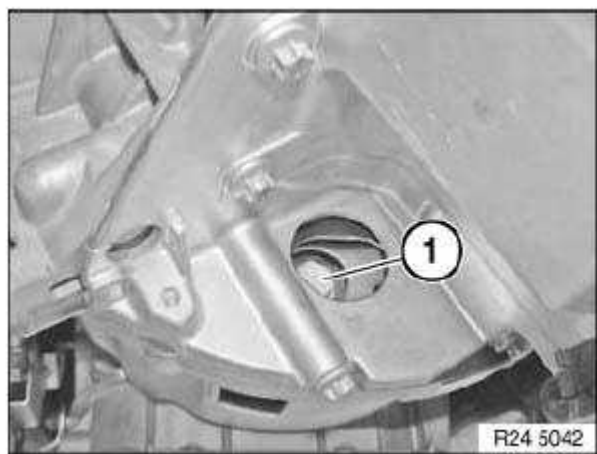


Fig. 18: Screw

Courtesy of BMW OF NORTH AMERICA, INC.

Prepare special tool (1) 24 4 161 with shaped piece (2) 24 4 166.

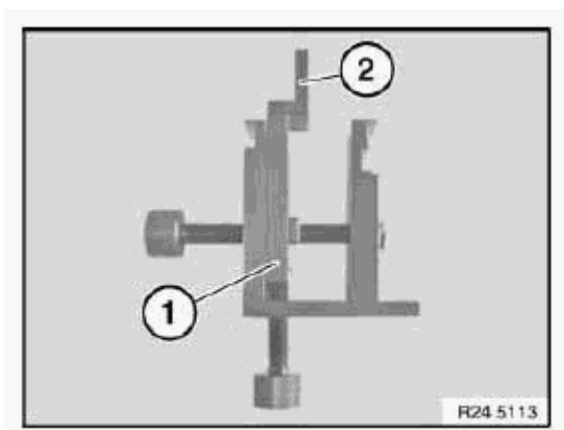


Fig. 19: Special Tool (24 4 161) And Shaped Piece

Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool 24 4 160 into opening of transmission housing and tensions slightly with screw (1).

Raise by turning screw (2) and clamp down.

Then tighten down screw (1).

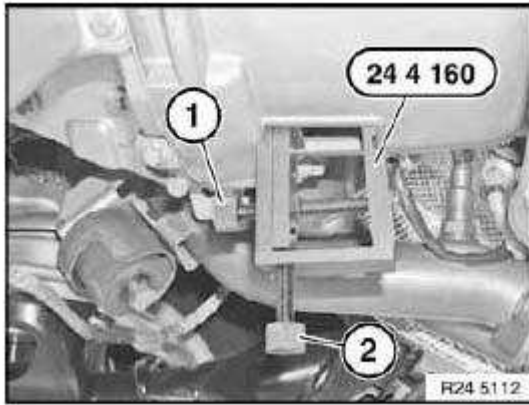


Fig. 20: Screws And Special Tool (24 4 161)
Courtesy of BMW OF NORTH AMERICA, INC.

- Unlock and disconnect plug (1) by turning.
- Do not touch pins.
- Release cable from retainers.
- Insert special tool 24 2 390 in sealing sleeve.

Operations are described in

Notes on mechatronics, see **24 34 561 Notes on mechatronics (GA6L45R)**.

IMPORTANT: Read and comply with important note.

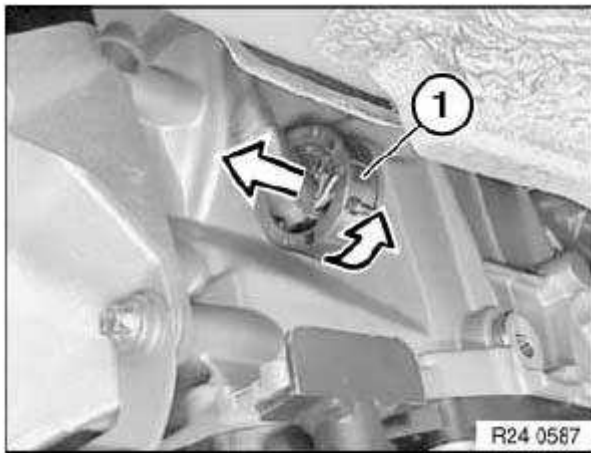


Fig. 21: Disconnecting Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws.

Installation:

Observe **screw fastening sequence** without fail.

Tightening torque: 24 00 1AZ, see **24 00 TRANSMISSION IN GENERAL** .

Aluminium screws **must** be replaced.

Tightening torque: 24 00 2AZ, see **24 00 TRANSMISSION IN GENERAL** .

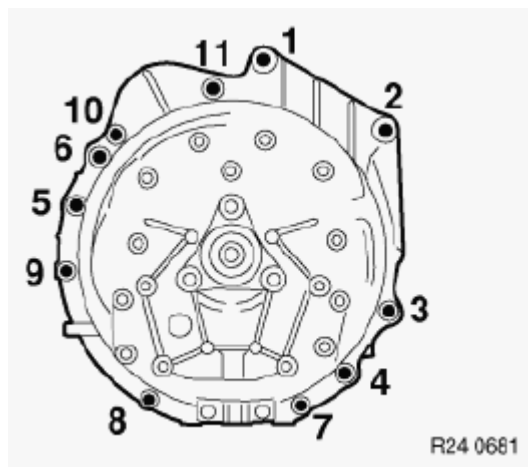


Fig. 22: Screw Fastening Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Tighten down screws/bolts to specified torque.

Secure special angle of rotation tool 00 9 120 with magnet 00 9 130 to underbody and screw down blue aluminium screws/bolts in accordance with angle of rotation.

Tightening torque: 24 00 2AZ, see **24 00 TRANSMISSION IN GENERAL** .

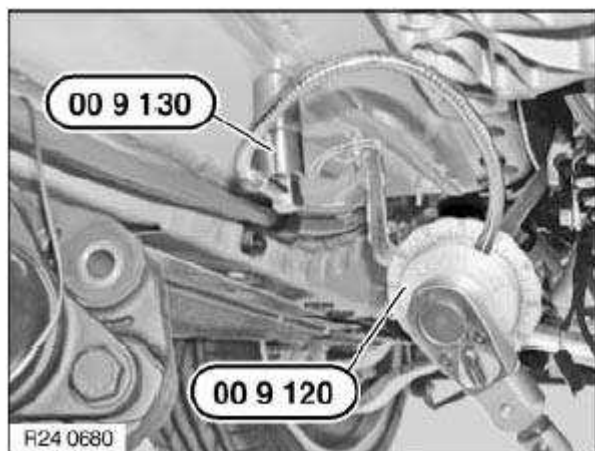


Fig. 23: Special Tools (00 9 120) And (00 9 130)

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Bore (1) in driving disk must be accessible from opening on engine oil pan.

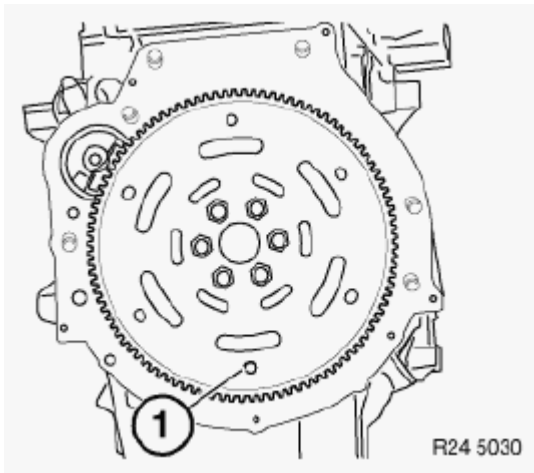


Fig. 24: Bore In Driving Disk

Courtesy of BMW OF NORTH AMERICA, INC.

Check that dowel sleeves are correctly seated.

Replace damaged dowel sleeves.

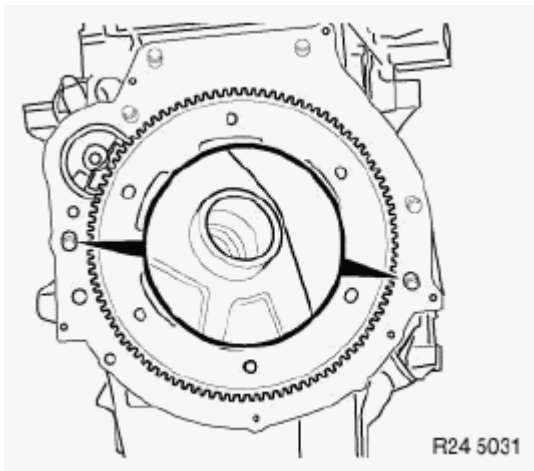


Fig. 25: Dowel Sleeves

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Rotate torque converter until bore in torque converter is flush with bore in driving disk.

Flange automatic transmission to engine.

24 00 050 INSTALLING REPLACEMENT TRANSMISSION (GA6L45R)

Drain automatic transmission fluid at oil drain plug.

Tightening torque: 24 11 6AZ, see 24 11 TRANSMISSION HOUSING, TRANSMISSION OIL SUMP .

Recycling:

Catch and dispose of escaping transmission fluid.

Observe country-specific waste-disposal regulations

IMPORTANT:

- **Before installing replacement transmission, always flush transmission fluid cooler together with lines, see 17 21 500 FLUSHING OIL COOLER WITH LINES (AUTOMATIC TRANSMISSION) .**
- **After completion of work, check transmission fluid level, see 00 11 237 CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (GA6L45R) .**

Replacement transmission is supplied filled with transmission fluid.

Use only the approved transmission fluid .

Failure to comply with this instruction will result in serious damage to the transmission.

Necessary preliminary tasks:

- Remove transfer case (AWD), see 27 10 010 REMOVING AND INSTALLING TRANSFER CASE (ATC 400 X-DRIVE) .
- Remove automatic transmission, see 24 00 032 Removing and installing automatic transmission (GA6L45R).

Remove transportation lock (1).

Convert all cable holders.

Convert all seal plugs.

Remove protective cap on output shaft.

IMPORTANT: After removing transportation lock, secure torque converter against slipping out.

Transmission identification:

- on type plate

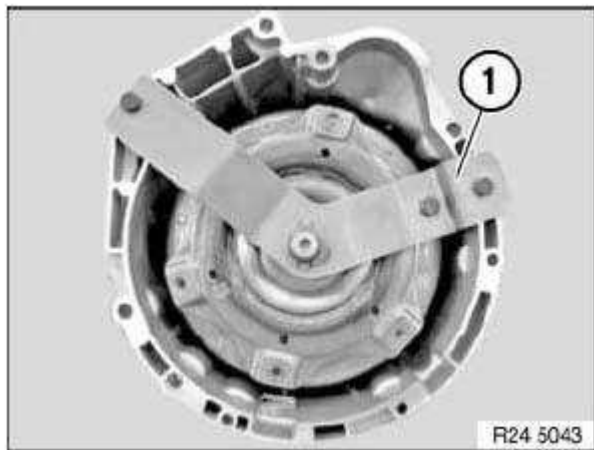


Fig. 26: Transportation Lock

Courtesy of BMW OF NORTH AMERICA, INC.

11 TRANSMISSION CASE, OIL SUMP

24 11 007 REPLACING SEALING PLUG (GA6L45R)

Special tools required:

- 24 4 340 (Lever)

IMPORTANT: After completion of work, check transmission fluid level, see 00 11 237 CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (GA6L45R) . Use only approved transmission oil, see 00 11 237 CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (GA6L45R) . Failure to comply with this instruction will result in serious damage to the transmission.

Necessary preliminary tasks: Remove rear underbody protection.

Remove holder (2).

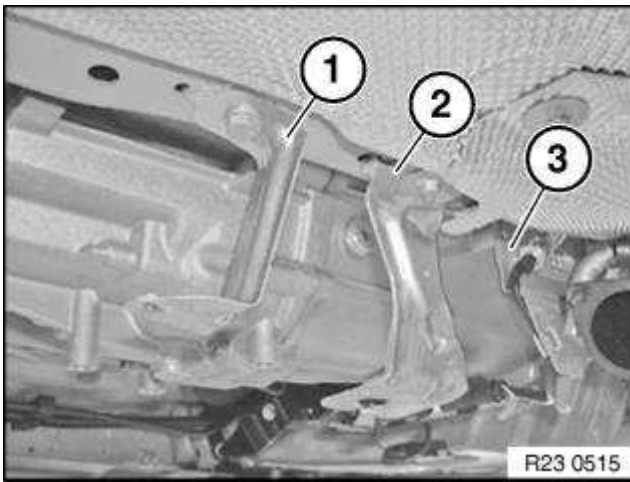


Fig. 27: Remove Holder (2)

Courtesy of BMW OF NORTH AMERICA, INC.

Unlock sealing plug with special tool 24 4 340 in direction of arrow and remove.

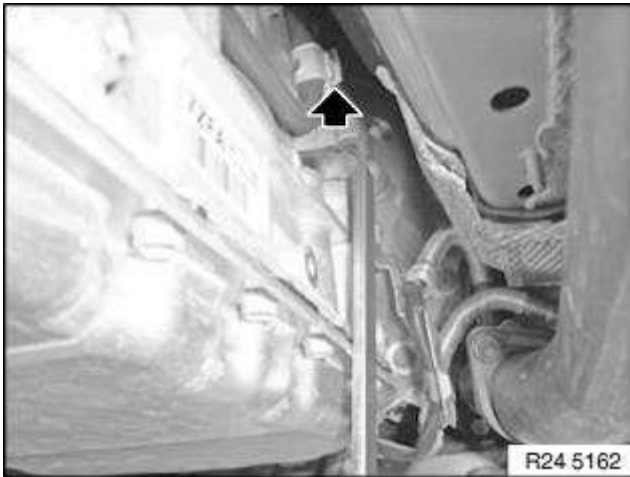


Fig. 28: Unlock Sealing Plug With Special Tool 24 4 340

Courtesy of BMW OF NORTH AMERICA, INC.

24 11 011 REMOVING AND INSTALLING/SEALING OR REPLACING TRANSMISSION SUMP (GA6L45R)

IMPORTANT: Remove transmission sump only after it has cooled down.

After completion of work, check transmission fluid level, see 00 11 237 CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (GA6L45R) .

Use only the approved transmission fluid. See AUTOMATIC TRANSMISSION - OPERATING FLUIDS . .

Failure to comply with this requirement will result in serious damage to the automatic transmission!

Recycling:

Catch and dispose of escaping transmission fluid.

Observe country-specific waste-disposal regulations.

Necessary preliminary tasks:

Remove rear underbody protection.

Remove exhaust system bracket from transmission.

Remove oil drain plug (1).

Tightening torque: 24 11 6AZ, see **24 11 TRANSMISSION HOUSING, TRANSMISSION OIL SUMP** .

Drain automatic transmission fluid.

Installation:

Replace oil drain plug.

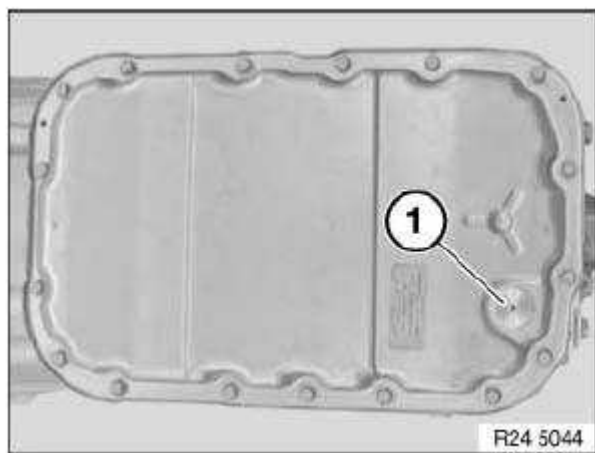


Fig. 29: Oil Drain Plug

Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew all bolts.

Remove transmission sump (1).

Installation:

Screw in bolts (1 to 17) in specified order until bolt heads make contact.

Tightening torque: 24 11 5AZ, see **24 11 TRANSMISSION HOUSING, TRANSMISSION OIL SUMP** .

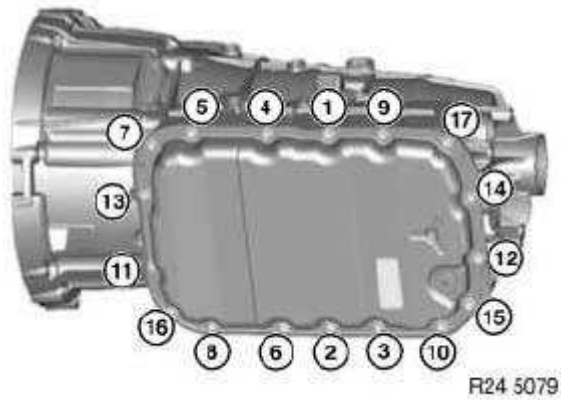


Fig. 30: Tightening Sequence Of Bolts
 Courtesy of BMW OF NORTH AMERICA, INC.

Clean sump magnet (1) and check for metal filings/borings.

Remove gasket (2) from transmission sump.

Clean sealing faces and groove with a cloth.

Insert new gasket in transmission sump groove.

IMPORTANT: Do not degrease transmission sump with cleaning agent.

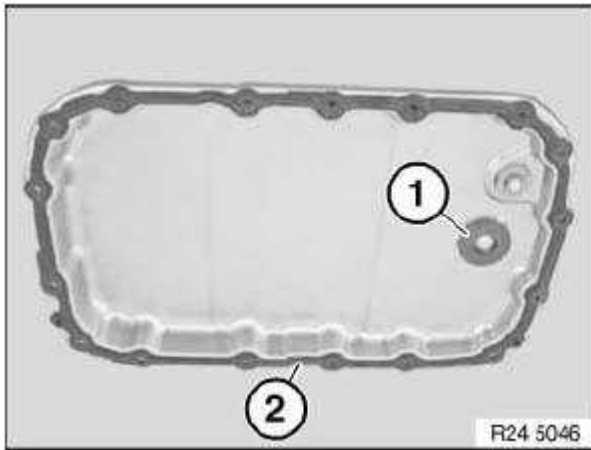


Fig. 31: Sump Magnet And Gasket
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

The gasket is correctly installed when it is engaged in the locating openings of the transmission sump.

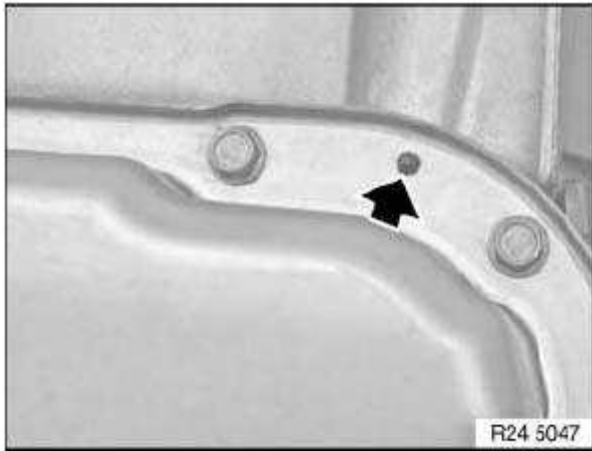


Fig. 32: Locating Openings Of Transmission Sump
Courtesy of BMW OF NORTH AMERICA, INC.

24 11 665 REMOVING AND INSTALLING/REPLACING TRANSMISSION OIL FILTER (GA6L45R)

IMPORTANT: After completion of work, check transmission fluid level, see 00 11 237 CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (GA6L45R) . Use only approved transmission oil, see 00 11 237 CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (GA6L45R) . Failure to comply with this instruction will result in serious damage to the transmission.

Necessary preliminary tasks:

- Remove transmission fluid sump.

Remove transmission oil filter (1) with a suitable tool (2). Installation: Replace oil filter gasket.

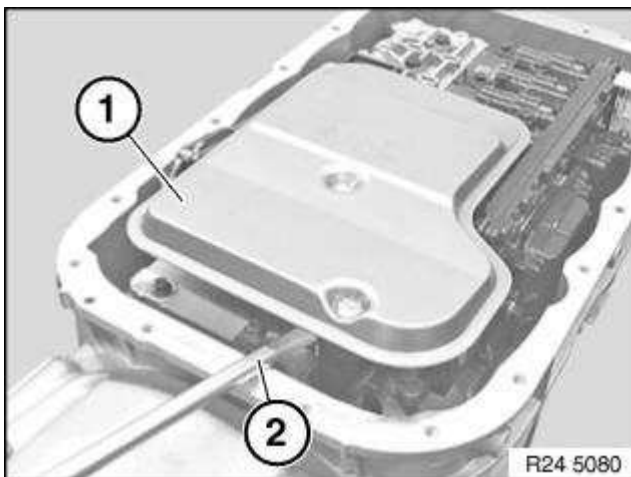


Fig. 33: Remove Transmission Oil Filter (1) With A Suitable Tool (2)
Courtesy of BMW OF NORTH AMERICA, INC.

24 11 666 REMOVING AND INSTALLING/REPLACING TRANSMISSION OIL FILTER GASKET (GA6L45R)

Special tools required:

- 13 5 250
- 24 4 390
- 24 4 400

IMPORTANT: After completion of work, check transmission fluid level, see 00 11 237 CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (GA6L45R) . Use only approved transmission oil, see 00 11 237 CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (GA6L45R) . Failure to comply with this instruction will result in serious damage to the transmission.

Necessary preliminary tasks: Remove transmission oil filter.

Pull transmission oil filter gasket out of housing with special tools 24 4 390 and 13 5 250.

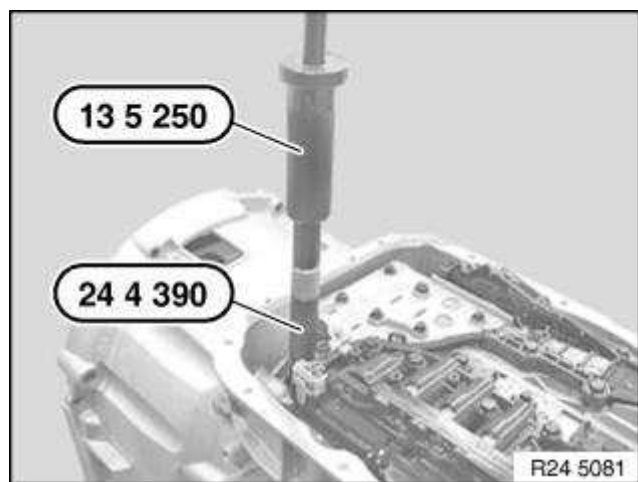


Fig. 34: Pull Transmission Oil Filter Gasket Out Of Housing With Special Tools 24 4 390 And 13 5 250
Courtesy of BMW OF NORTH AMERICA, INC.

Drive transmission filter gasket into housing with special tool 24 4 400.

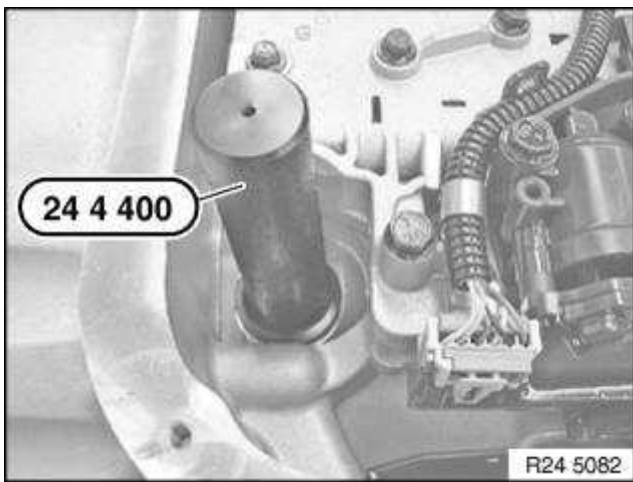


Fig. 35: Drive Transmission Filter Gasket Into Housing With Special Tool 24 4 400
Courtesy of BMW OF NORTH AMERICA, INC.

13 EXTENSION HOUSING, BEARINGS, SEAL

24 13 014 REPLACING OUTPUT FLANGE RADIAL SHAFT SEAL (GA6L45R) AWD

Special tools required:

- 24 4 320
- 24 4 330

IMPORTANT: After completion of work, check transmission fluid level, see **00 11 237 CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (GA6L45R)** . Use only approved transmission oil, see **00 11 237 CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (GA6L45R)** . Failure to comply with this instruction will result in serious damage to the transmission.

Necessary preliminary tasks:

- Remove rear underbody protection.
- Remove exhaust system.
- Remove heat shields.
- Support **transmission**.
- Remove transmission cross-member. See **22 32 050 REPLACING CROSS-MEMBER FOR TRANSMISSION MOUNTING** .
- Remove transfer box. See **27 10 010 REMOVING AND INSTALLING TRANSFER CASE (ATC 400 X-DRIVE)** .

Mount special tool 24 4 320 and secure with hook wrench (1). Screw in spindle (2) until radial shaft seal is released.

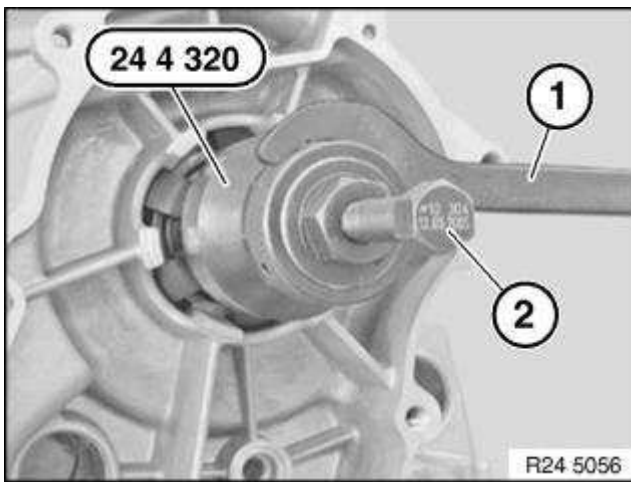


Fig. 36: Mount Special Tool 24 4 320 And Secure With Hook Wrench (1)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation: Coat sealing lips of new radial shaft seal with clean transmission oil. Drive in radial shaft seal with special tool 24 4 330 until it stops.

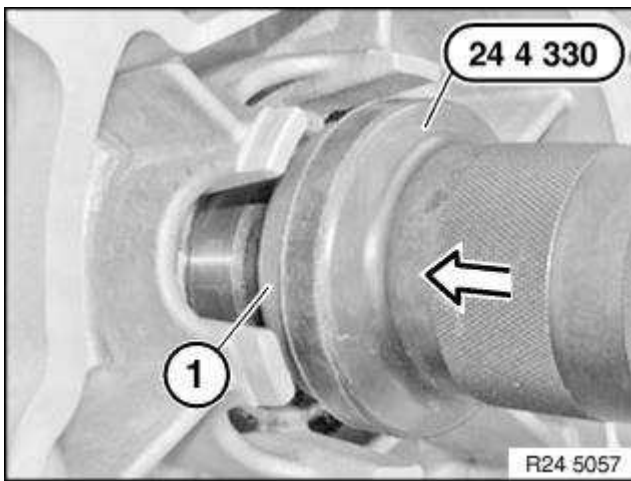


Fig. 37: Drive In Radial Shaft Seal With Special Tool 24 4 330
Courtesy of BMW OF NORTH AMERICA, INC.

24 13 014 REPLACING OUTPUT FLANGE SHAFT SEAL (GA6L45R)

Special tools required:

- 23 0 020
- 23 1 210
- 24 4 360
- 24 4 370

IMPORTANT: After completion of work, check transmission fluid level, see 00 11 237

CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (GA6L45R) . Use only approved transmission oil, see 00 11 237
CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (GA6L45R) . Failure to comply with this instruction will result in serious damage to the transmission.

Necessary preliminary tasks:

- Remove underbody protection.
- Remove heat shields.
- Remove complete exhaust system
- Remove front muffler (N45T/N46T)
- Remove transmission cross-member

Remove propeller shaft from transmission. Release centre bearing. Tie propeller shaft to one side. Tasks are described in **.26 11 000 REMOVING AND INSTALLING PROPELLER SHAFT (CARDAN UNIVERSAL JOINT) COMPLETELY .**

NOTE: To rotate propeller shaft, unlock parking gear.

Release screws. Remove transmission bearing block (1). Tightening torque, see 24 71 6AZ in **24 13 TRANSMISSION EXTENSION, BEARINGS, SEALS .**

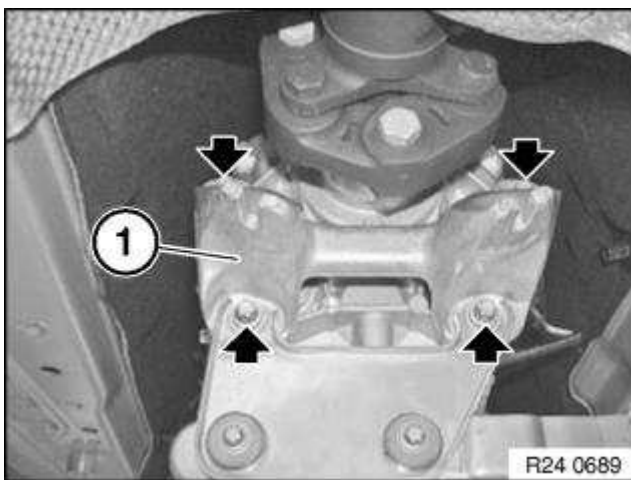


Fig. 38: Remove Transmission Bearing Block (1)
Courtesy of BMW OF NORTH AMERICA, INC.

Grip output flange (1) with special tool 23 0 020. Release nut with special tool 23 1 210. Tightening torque, see 24 13 3AZ in **24 13 TRANSMISSION EXTENSION, BEARINGS, SEALS .** Installation: Apply a streak of Loctite 277 over complete thread width. Replace nut and secure with a mandrel (8 mm) by caulking.

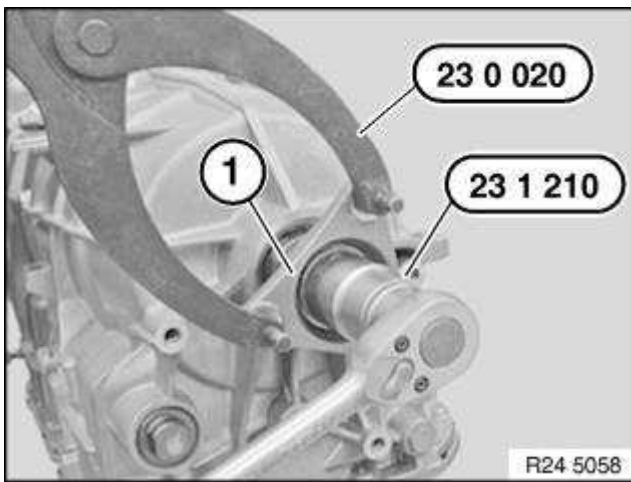


Fig. 39: Grip Output Flange (1) With Special Tool 23 0 020
Courtesy of BMW OF NORTH AMERICA, INC.

Detach output flange from output shaft. Remove spacer.

Push special tool 24 4 360 onto output shaft (1). Locking hooks (2) must enter completely.

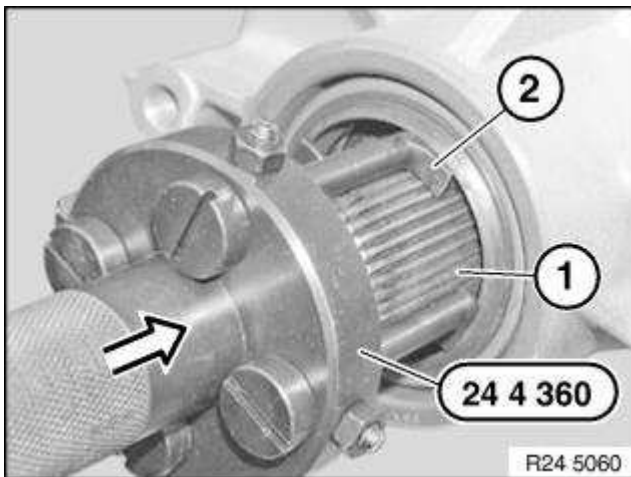


Fig. 40: Locking Hooks (2) Must Enter Completely
Courtesy of BMW OF NORTH AMERICA, INC.

Turn locks (1) counterclockwise. Screw in bolt (2) until radial shaft seal is released.

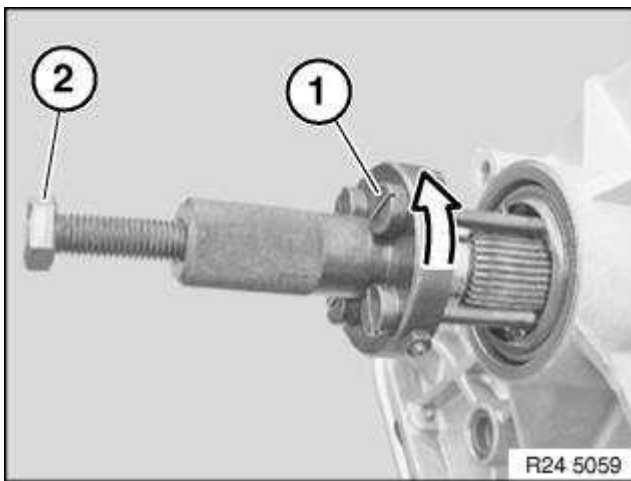


Fig. 41: Screw In Bolt (2) Until Radial Shaft Seal Is Released
 Courtesy of BMW OF NORTH AMERICA, INC.

Oil sealing lip on radial shaft seal (1). Drive radial shaft seal (1) firmly home with special tool 24 4 370.

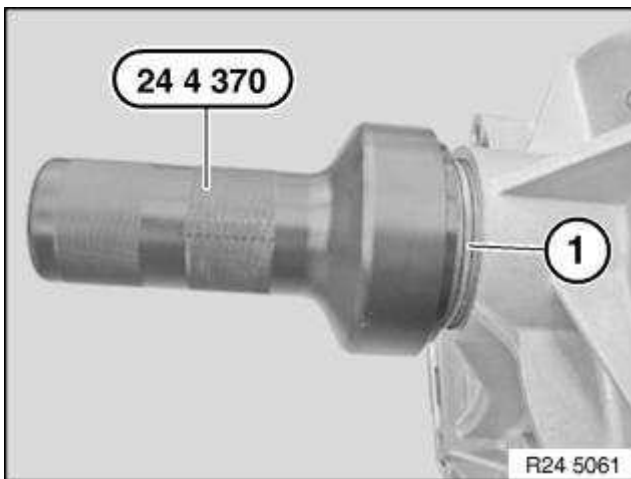


Fig. 42: Oil Sealing Lip On Radial Shaft Seal (1)
 Courtesy of BMW OF NORTH AMERICA, INC.

14 MECHANICAL ATTACHMENTS

24 14 005 REPLACING SEALING CAP FOR SELECTOR SHAFT (GA6L45R)

IMPORTANT: After completion of work, check transmission fluid level, see 00 11 237 CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (GA6L45R) . Use only approved transmission oil, see 00 11 237 CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (GA6L45R) . Failure to comply with this instruction will result in serious damage to the transmission.

Necessary preliminary tasks:

- Remove rear underbody protection. See **51 47 491 REMOVING AND INSTALLING/REPLACING REAR UNDERBODY PROTECTION** .
- Remove front propeller shaft from transfer case and tie to one side. Tasks are described in **REMOVING AND INSTALLING PROPELLER SHAFT (CARDAN UNIVERSAL JOINT) COMPLETELY**

Screw special tool 23 0 490 into sealing cap. Drive out sealing cap with impact weight (1).

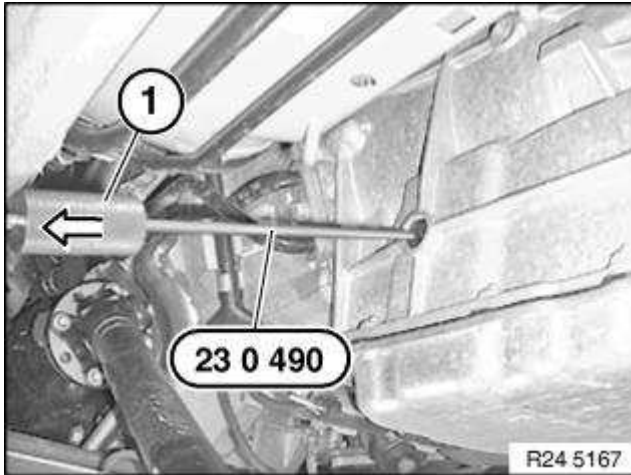


Fig. 43: Drive Out Sealing Cap With Impact Weight (1)
 Courtesy of BMW OF NORTH AMERICA, INC.

Place new sealing cap (1) on drift (2).

NOTE: Drift (2) for driving in sealing cap is contained in repair kit.

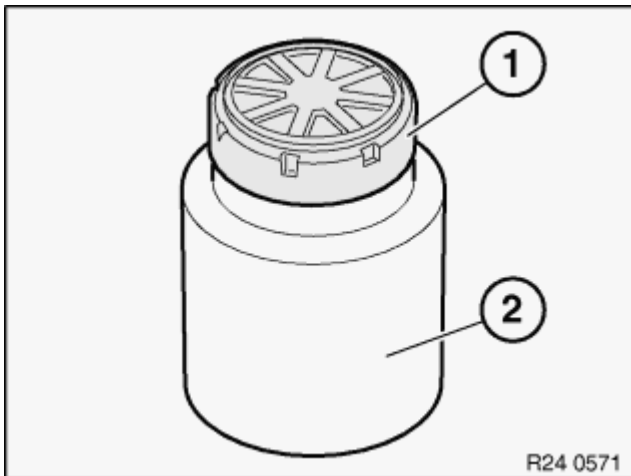


Fig. 44: Place New Sealing Cap (1) On Drift (2)
 Courtesy of BMW OF NORTH AMERICA, INC.

Drive in new sealing cap (1) with drift (2) as far as it will go.

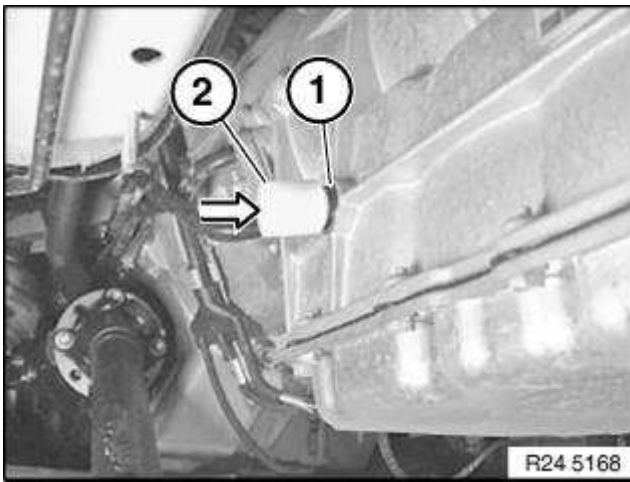


Fig. 45: Drive In New Sealing Cap (1) With Drift (2)
Courtesy of BMW OF NORTH AMERICA, INC.

24 14 003 REPLACING SELECTOR SHAFT SEAL (GA6L45R)

Special tools required:

- 24 4 381
- 24 4 382
- 24 5 361
- 24 5 362

IMPORTANT: After completion of work, check transmission fluid level, see 00 11 237 CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (GA6L45R) . Use only approved transmission oil, see 00 11 237 CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (GA6L45R) . Failure to comply with this instruction will result in serious damage to the transmission.

Necessary preliminary tasks: Remove heat shields.

Slacken nut (1). Take off holder (2). Tightening torque 24 51 1AZ. After completing work: Adjust shift lever.

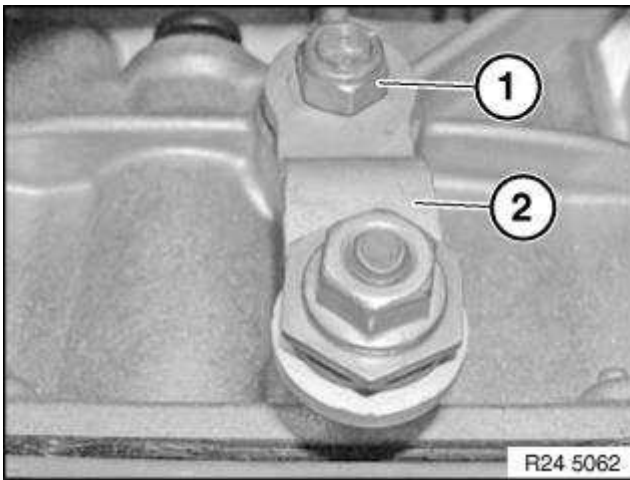


Fig. 46: Slacken Nut (1) And Take Off Holder (2)
Courtesy of BMW OF NORTH AMERICA, INC.

Screw in special tool 24 5 361 until it is firmly connected with shaft seal.

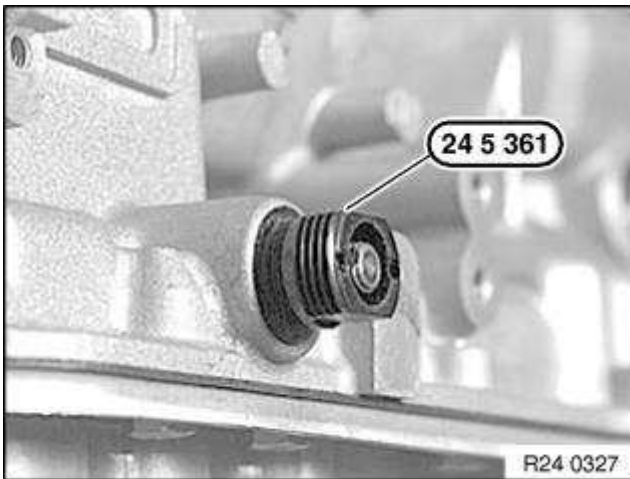


Fig. 47: Screw In Special Tool 24 5 361
Courtesy of BMW OF NORTH AMERICA, INC.

Screw special tool 24 5 362 onto special tool 24 5 361 and tighten down. This pulls the shaft seal out of the transmission housing.

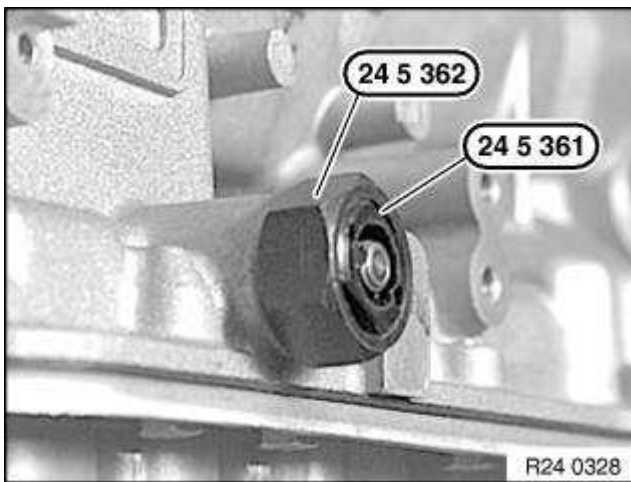


Fig. 48: Screw Special Tool 24 5 362 Onto Special Tool 24 5 361
Courtesy of BMW OF NORTH AMERICA, INC.

Oil sealing lip on shaft seal. Screw in shaft seal with special tools 24 4 381 and 24 4 382 as far as it will go.

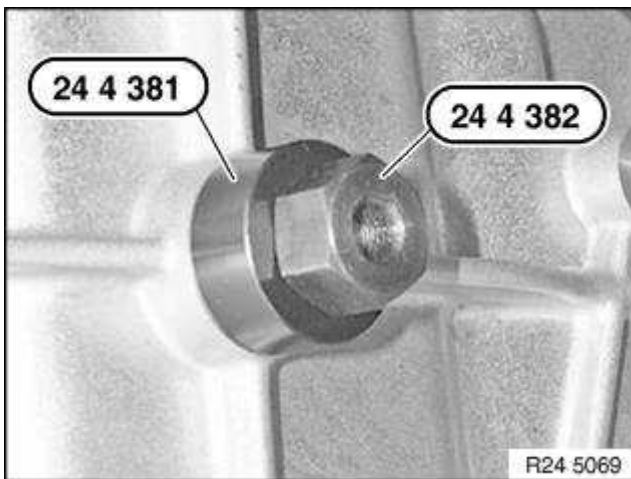


Fig. 49: Screw In Shaft Seal With Special Tools 24 4 381 And 24 4 382
Courtesy of BMW OF NORTH AMERICA, INC.

31 OIL PUMP

24 31 575 REPLACING OIL PUMP O-RINGS (GA6HP26/19Z)

Special tools required:

- 24 1 180
- 24 1 184

IMPORTANT: After completion of work, check transmission fluid level, see 00 11 237 CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (GA6L45R) . Use only approved transmission oil, see 00 11 237

CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (GA6L45R) . Failure to comply with this instruction will result in serious damage to the transmission.

Necessary preliminary tasks:

- Remove automatic transmission
- Secure transmission with transmission holding bridge on assembly stand. See **23 UNIVERSAL TRANSMISSION RETAINING BRIDGE** .
- Remove **torque converter**
- Remove **mechatronics**

Remove adapter (1). Installation: Note installation position.

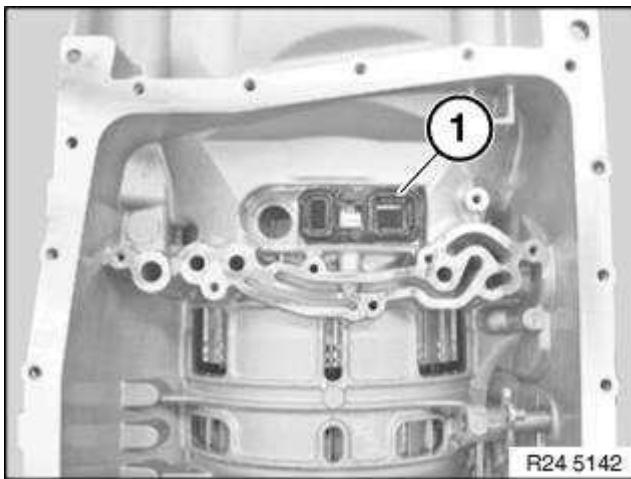


Fig. 50: Remove Adapter (1)

Courtesy of BMW OF NORTH AMERICA, INC.

Release screws. Tightening torque, see 24 31 3AZ in .

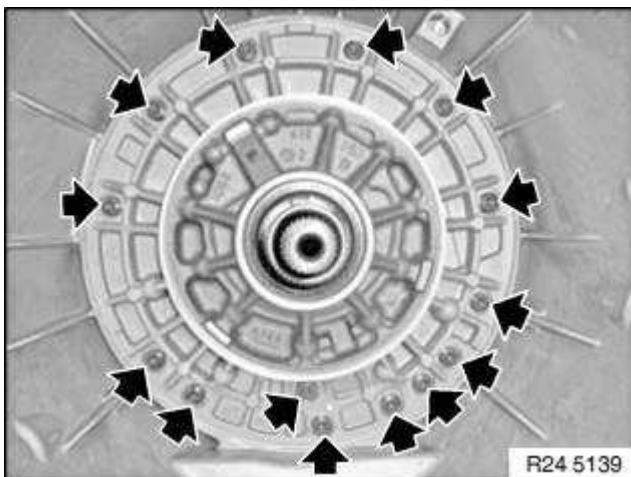


Fig. 51: Identifying Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Slide special tool 24 1 184 completely into puller 24 1 180.

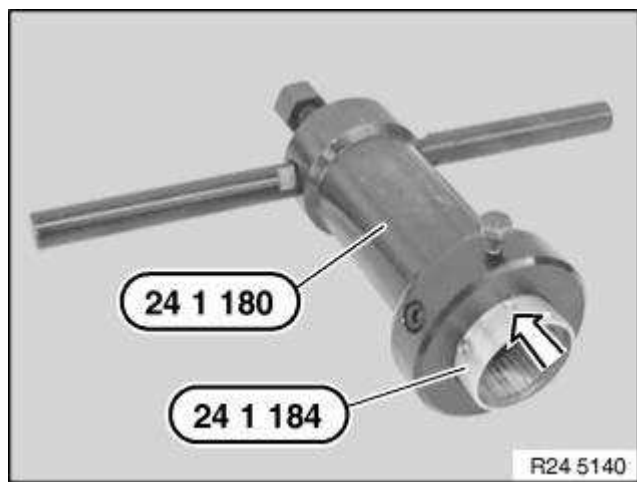


Fig. 52: Slide Special Tool 24 1 184 Completely Into Puller 24 1 180

Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 24 1 180 and secure with screw (1). Insert screw (2) and release oil supply unit from transmission housing.

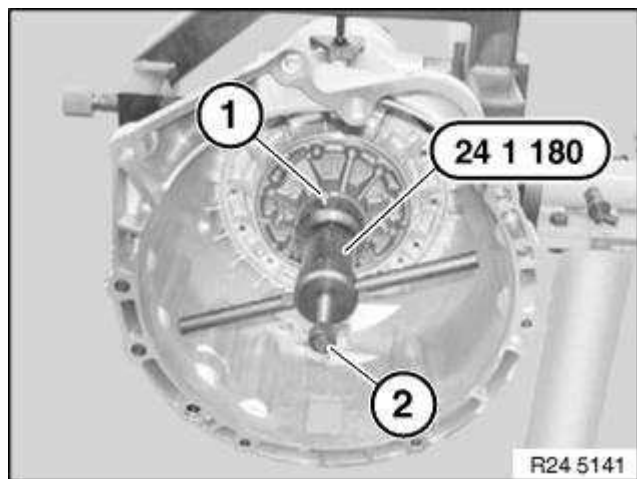


Fig. 53: Insert Screw (2) And Release Oil Supply Unit From Transmission Housing

Courtesy of BMW OF NORTH AMERICA, INC.

Release screws. Tightening torque 24 31 1AZ.

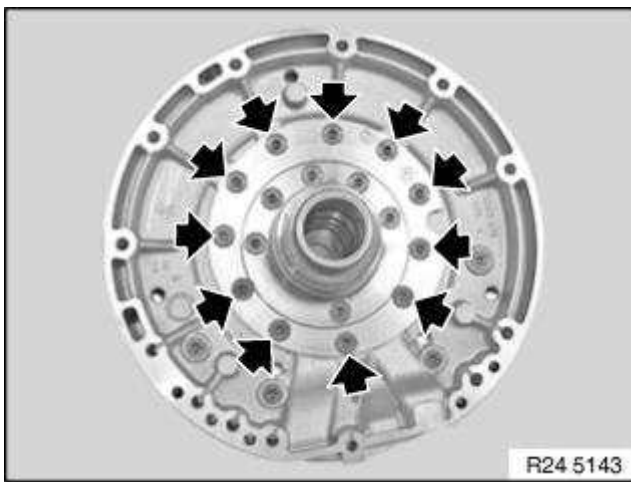


Fig. 54: Identifying Screws
 Courtesy of BMW OF NORTH AMERICA, INC.

Detach cover (1) from pump body (2). Replace O-rings (3 + 4). Installation: Pay attention to installation position of gears during disassembly.

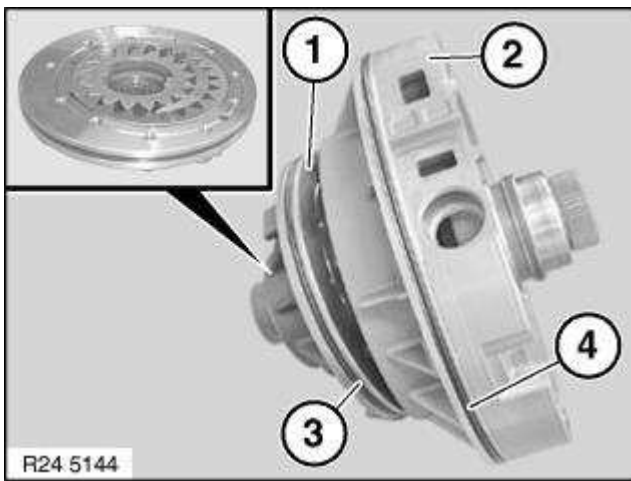


Fig. 55: Detach Cover (1) From Pump Body (2)
 Courtesy of BMW OF NORTH AMERICA, INC.

24 31 012 REPLACING TORQUE CONVERTER RADIAL SHAFT SEAL (GA6L45R)

Special tools required:

- 00 1 450 .
- 24 0 200 .
- 24 2 351 .
- 24 2 352 .
- 24 2 354 .
- 24 2 360 .

Necessary preliminary tasks:

- Remove automatic transmission

IMPORTANT: After completion of work, check transmission fluid level, see 00 11 237 CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (GA6L45R) . Use only approved transmission oil, see 00 11 237 CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (GA6L45R) . Failure to comply with this instruction will result in serious damage to the transmission.

Secure transmission with special tool 24 0 200 on assembly stand 00 1 450 . Remove torque converter .

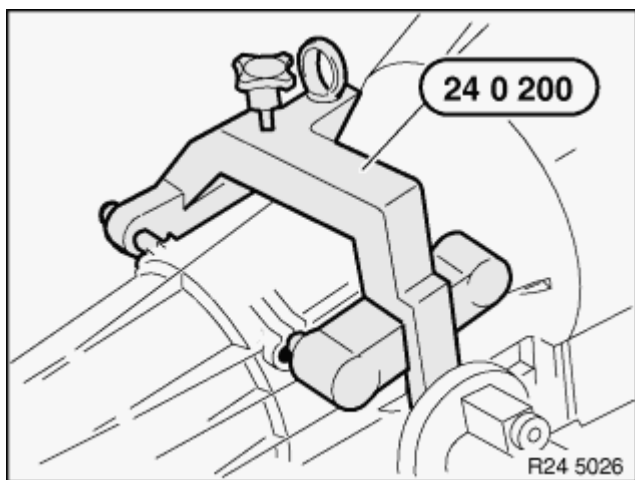


Fig. 56: Secure Transmission With Special Tool 24 0 200
Courtesy of BMW OF NORTH AMERICA, INC.

Remove retaining ring (1) with a suitable tool (2).

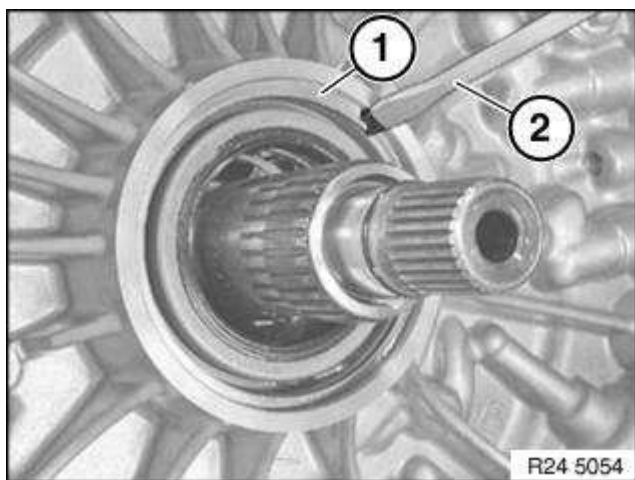


Fig. 57: Remove Retaining Ring (1) With A Suitable Tool (2)
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 24 2 354 to input shaft (1).

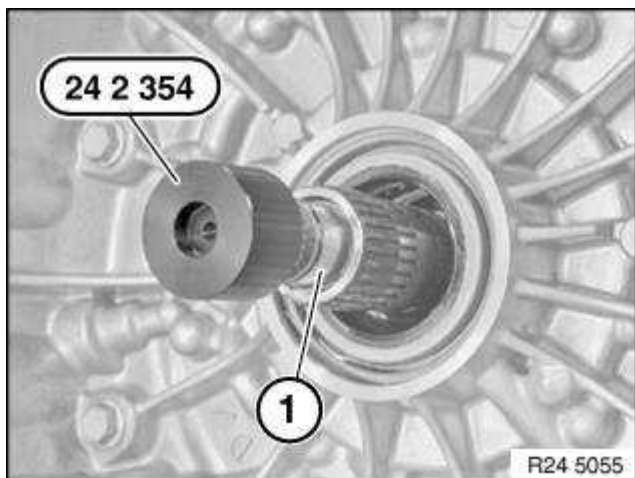


Fig. 58: Attach Special Tool 24 2 354 To Input Shaft (1)
Courtesy of BMW OF NORTH AMERICA, INC.

Screw in special tool 24 2 351 until it is firmly connected with radial shaft seal. Screw in special tool 24 2 352 to remove radial shaft seal.

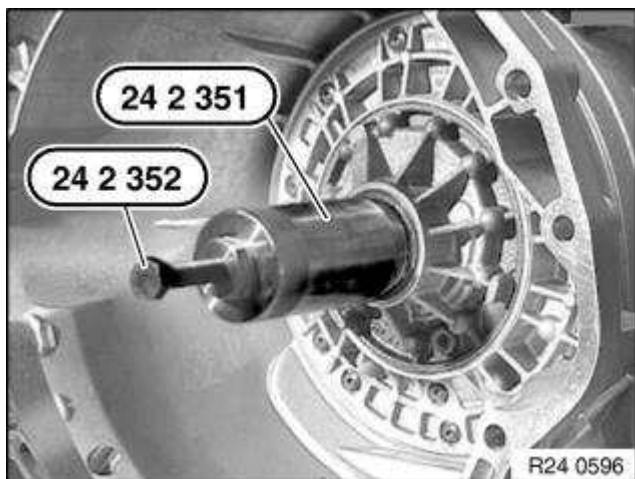


Fig. 59: Screw In Special Tool 24 2 352 To Remove Radial Shaft Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Oil sealing lip on radial shaft seal. Drive in radial shaft seal (1) with special tool 24 2 360 as far as it will go.

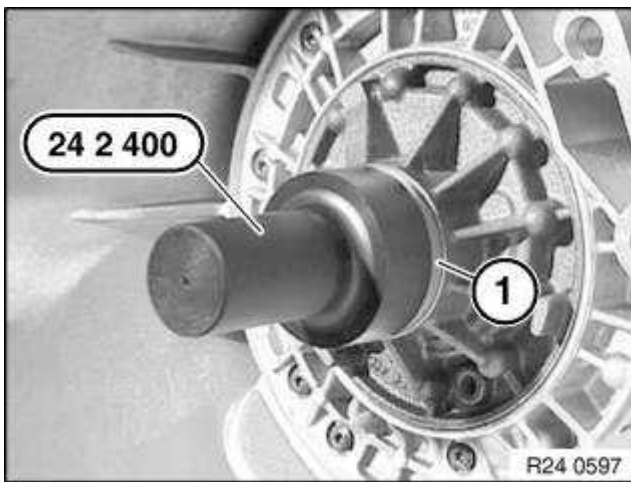


Fig. 60: Drive In Radial Shaft Seal (1) With Special Tool 24 2 360
Courtesy of BMW OF NORTH AMERICA, INC.

33 GEAR SELECTOR VALVE

24 33 530 REPLACING GEAR SELECTOR VALVE (GA6L45R)

IMPORTANT: After completion of work, check transmission fluid level, see 00 11 237 CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (GA6L45R) . Use only approved transmission oil, see 00 11 237 CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (GA6L45R) . Failure to comply with this instruction will result in serious damage to the transmission.

Necessary preliminary tasks:

- Remove mechatronics.

Release screw (1). Place gear position switch (2) to one side. Tightening torque 24 30 1AZ, see 24 30 HYDRAULIC / ELECTRIC CONTROL PARTS AND CONTROLLING ELEMENTS .

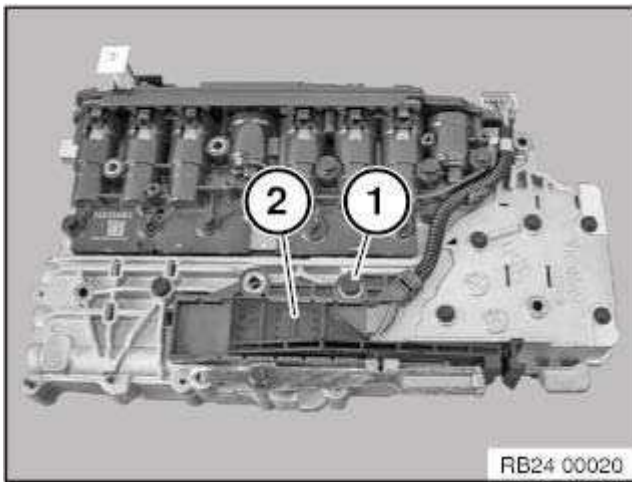


Fig. 61: Place Gear Position Switch (2) To One Side
 Courtesy of BMW OF NORTH AMERICA, INC.

Slightly press bracket (1) upwards. Using suitable tool (2) push gear selector valve (3) out of the mechatronics system.

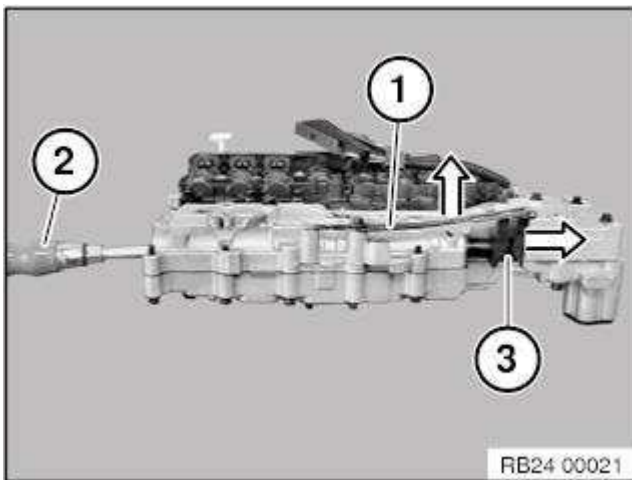


Fig. 62: Slightly Press Bracket (1) Upward
 Courtesy of BMW OF NORTH AMERICA, INC.

34 SHIFT VALVES, PARKING

24 34 561 NOTES ON MECHATRONICS (GA6L45R)

Special tools required:

- 24 2 390 , see **24 AUTOMATIC TRANSMISSION** .

IMPORTANT: After completing work:

- Load specific data version with DIS

- After completion of work, check transmission fluid level, see 00 11 237 CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (GA6L45R) .

Use only approved transmission fluid .

Failure to comply with this requirement will result in serious damage to the automatic transmission!

IMPORTANT: Read and comply with 61 35 ... NOTES ON ESD PROTECTION (ELECTROSTATIC DISCHARGE) .

Unscrew plug (1) and disconnect.

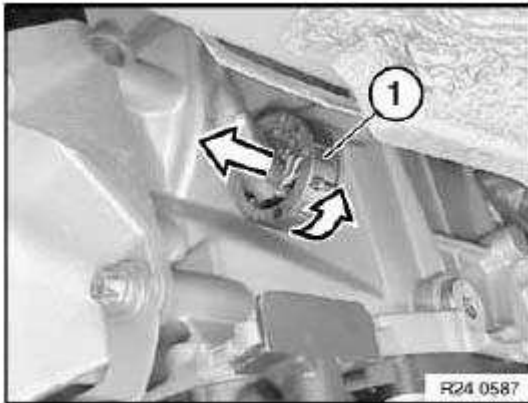


Fig. 63: Disconnecting Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool 24 2 390 in sealing sleeve (1).

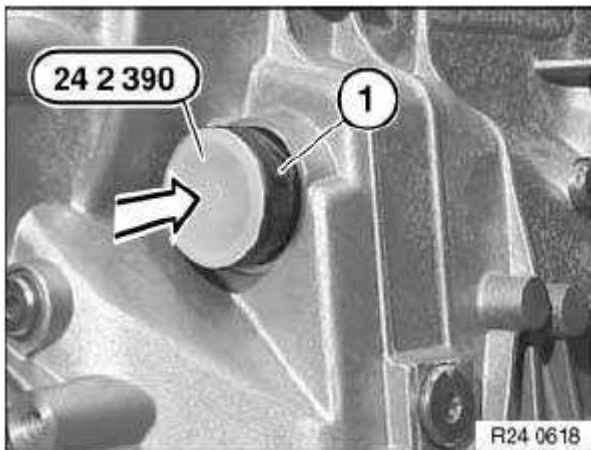


Fig. 64: Inserting Special Tool (24 2 390) In Sealing Sleeve

Courtesy of BMW OF NORTH AMERICA, INC.

24 34 562 REPLACING MECHATRONICS (GA6L45R)

Special tools required:

- 24 2 390
- 24 4 350

NOTE: After completing work:

- Load specific data version with DIS.

IMPORTANT: After completion of work, check transmission fluid level, see 00 11 237 CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (GA6L45R) .

Use only approved transmission fluid .

Failure to comply with this requirement will result in serious damage to the automatic transmission!

IMPORTANT: Read and comply with 61 35 ... NOTES ON ESD PROTECTION (ELECTRO STATIC DISCHARGE) .

Necessary preliminary tasks:

- Remove heat shields.
- Support automatic transmission with hydraulic lifter.
- Remove transmission cross-member.

Grip clamping sleeve (1).

Loosen nut (2).

Detach retainer (3) towards bottom using a screwdriver.

Pull cable (4) out of holder.

Installation:

Adjust selector lever.

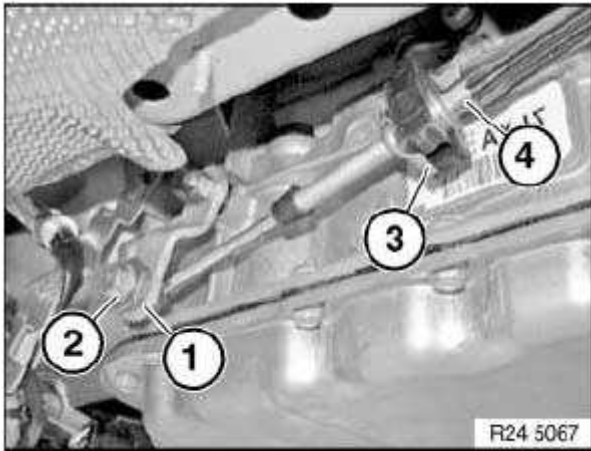


Fig. 65: Clamping Sleeve, Nut, Retainer And Cable
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Mechatronics can be destroyed by static discharges. Therefore the contacts inside the plug must not be touched. Insert special tool immediately after work step.

Unscrew plug (1) and disconnect.

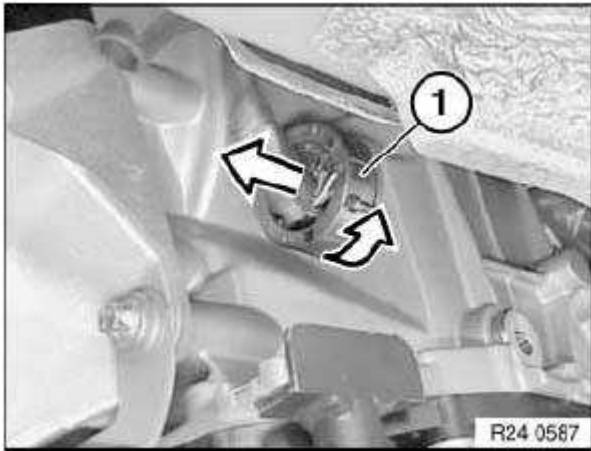


Fig. 66: Disconnecting Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool 24 2 390 in sealing sleeve (1).

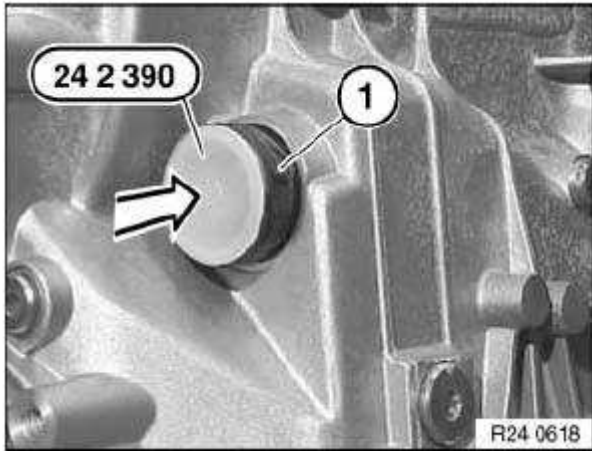


Fig. 67: Inserting Special Tool (24 2 390) In Sealing Sleeve
Courtesy of BMW OF NORTH AMERICA, INC.

Remove transmission oil sump.

Unlock sealing sleeve with slide (1).

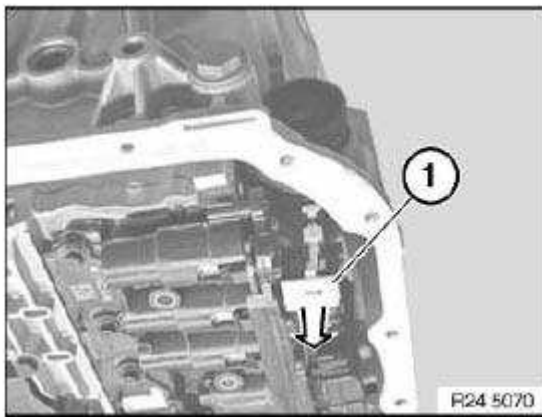


Fig. 68: Unlocking Sealing Sleeve With Slide
Courtesy of BMW OF NORTH AMERICA, INC.

Note position of sealing sleeve.

Pull out sealing sleeve (1).

Installation:

Screw in sealing sleeve partially (lug in upper area). Turn until lug engages in groove of transmission. Slide in sealing sleeve.

Lug on sealing sleeve must not be damaged!

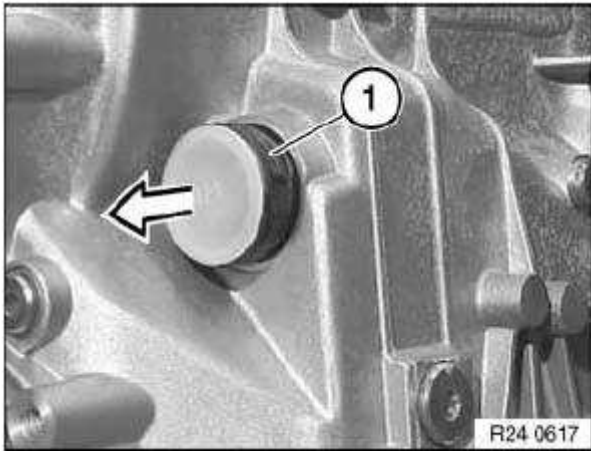


Fig. 69: Pulling Out Sealing Sleeve
Courtesy of BMW OF NORTH AMERICA, INC.

Release all bolts (1) with special tool 24 4 350.

Remove mechatronics.

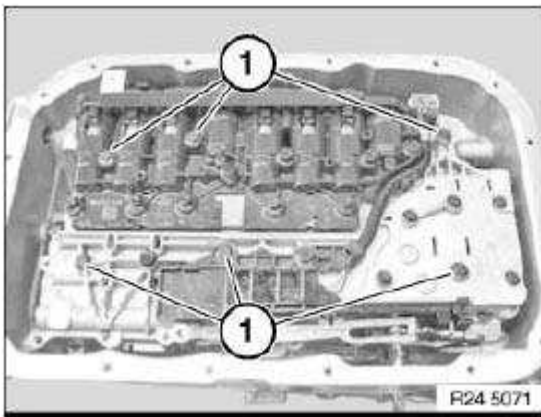


Fig. 70: Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace gasket (1).

Coat new seals with automatic transmission fluid and install.

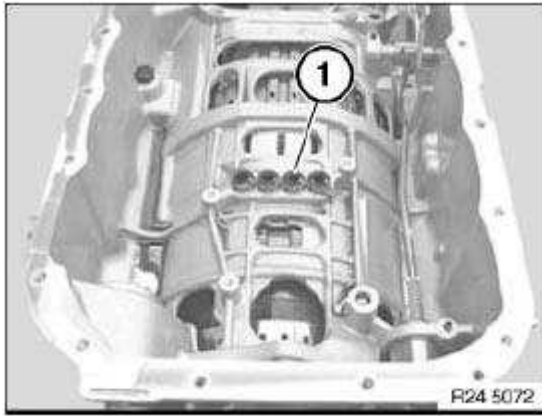


Fig. 71: Gasket
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace gaskets (1).

Coat new seals with automatic transmission fluid and install.

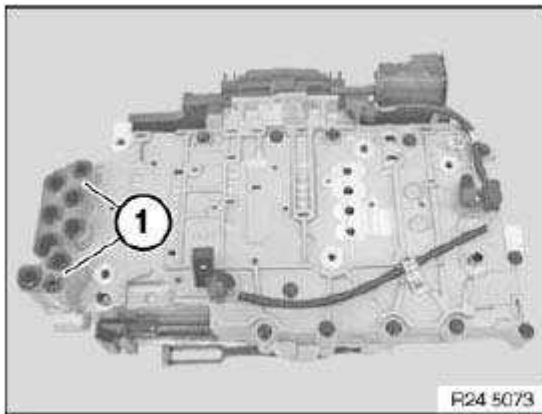


Fig. 72: Gasket
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Tighten down bolts in sequence (1 to 6).
Failure to comply with this requirement will result in serious damage to the automatic transmission!
Tightening torque: 24 30 1AZ, see 24 30 HYDRAULIC / ELECTRIC CONTROL PARTS AND CONTROLLING ELEMENTS .

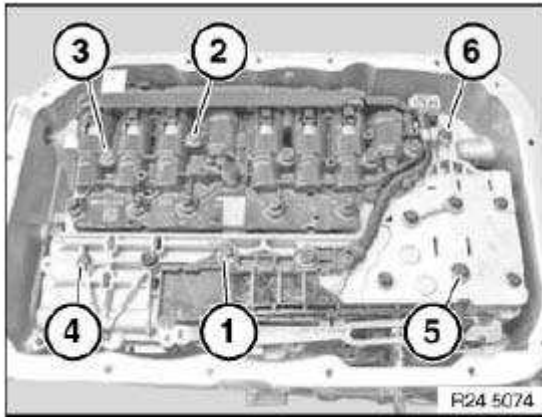


Fig. 73: Tightening Sequence Of Bolts
 Courtesy of BMW OF NORTH AMERICA, INC.

35 WIRING HARNESS, SHIFT ELEMENTS AND SENSORS

24 35 700 REMOVING AND INSTALLING/REPLACING INPUT AND OUTPUT SPEED SENSOR (GA6L45R)

IMPORTANT: After completion of work, check transmission fluid level, see 00 11 237 CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (GA6L45R) . Use only approved transmission oil, see 00 11 237 CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (GA6L45R) . Failure to comply with this instruction will result in serious damage to the transmission.

Necessary preliminary tasks: Remove mechatronics.

Unlock and disconnect plug (1). Release screws (2). Detach input and output speed sensor from mechatronics. Tightening torque, see 24 30 4AZ in 24 30 HYDRAULIC / ELECTRIC CONTROL PARTS AND CONTROLLING ELEMENTS .

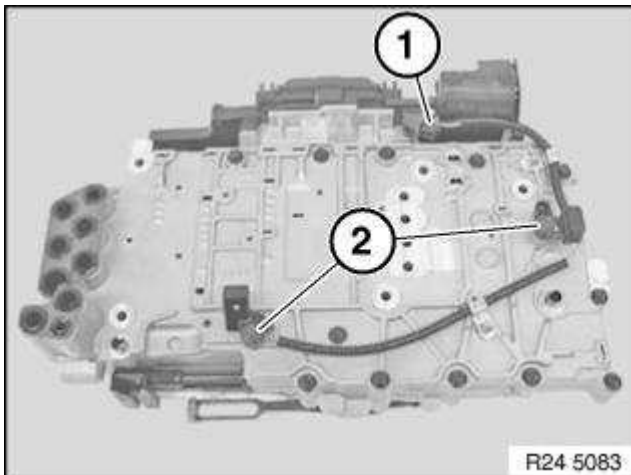


Fig. 74: Unlock And Disconnect Plug (1), Release Screws (2)
Courtesy of BMW OF NORTH AMERICA, INC.

24 35 610 REMOVING AND INSTALLING/REPLACING TRANSMISSION POSITION SWITCH (GA6L45R)

IMPORTANT: After completion of work, check transmission fluid level, see 00 11 237 CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (GA6L45R) . Use only approved transmission oil, see 00 11 237 CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (GA6L45R) . Failure to comply with this instruction will result in serious damage to the transmission.

Necessary preliminary tasks: Remove transmission oil filter.

Unlock and disconnect plug (1). Release screws (2). Remove transmission position switch (3). Tightening torque, see 24 30 1AZ in 24 30 HYDRAULIC / ELECTRIC CONTROL PARTS AND CONTROLLING ELEMENTS .

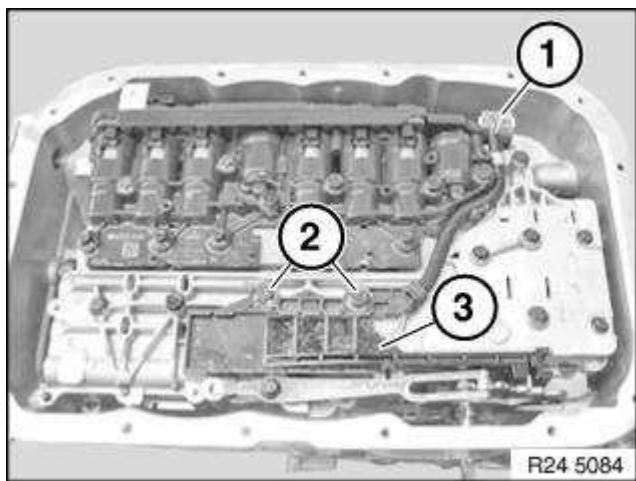


Fig. 75: Remove Transmission Position Switch (3)
Courtesy of BMW OF NORTH AMERICA, INC.

40 TORQUE CONVERTER

24 40 011 REMOVING AND INSTALLING/REPLACING TORQUE CONVERTER (GA6L45R)

Special tools required:

- 00 2 550
- 24 4 000

IMPORTANT: After completion of work, check transmission fluid level, see 00 11 237 CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION

(GA6L45R) .

Use only approved transmission oil .

Failure to comply with this instruction will result in serious damage to the transmission.

Necessary preliminary tasks:

- Remove automatic transmission, see **24 00 032 Removing and installing automatic transmission (GA6L45R).**

Screw special tool 24 4 000 into torque converter.

Remove torque converter.

NOTE: When torque converter is removed, transmission oil flows out.

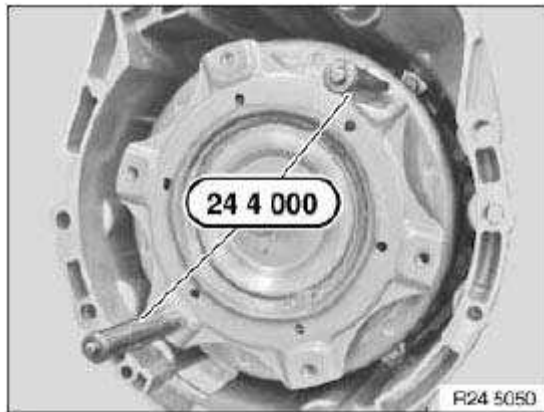


Fig. 76: Special Tool (24 4 000)

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

When installing, do not damage shaft seal and bearing.

If the torque converter is not correctly installed, the driver of the pump impeller may be damaged when the transmission is flanged to the engine.

Remove torque converter and set down vertically.

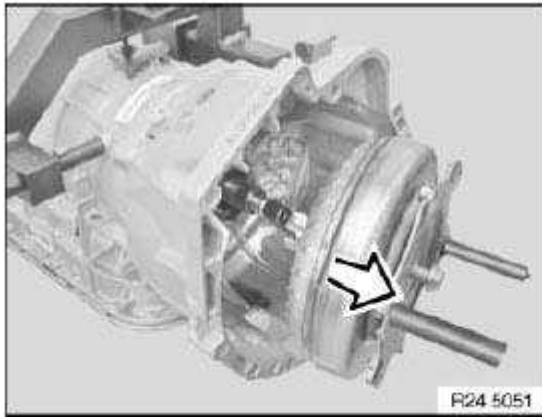


Fig. 77: Removing Torque Converter
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Push torque converter through shaft seal onto transmission shaft as far as it will go.

Press torque converter by hand into converter housing and turn in the process. Converter hub opening must snap into place in driver of pump impeller. Torque converter must be felt to slip inwards.

Determine distance between contact surface and surface (1) of tapped hole in torque converter with special tool 00 2 550 .

NOTE: Measured value must be greater than 25 mm.

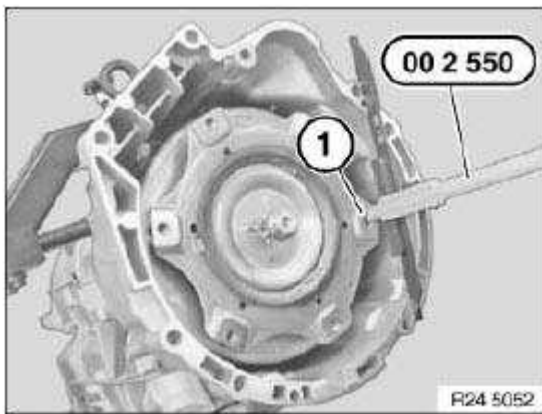


Fig. 78: Special Tool (00 2 550)
Courtesy of BMW OF NORTH AMERICA, INC.

50 SHIFT FUNCTION

24 50 030 REPLACING SELECTOR SHAFT (GA6L45R)

IMPORTANT: After completion of work, check transmission fluid level, see 00 11 237 CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (GA6L45R) .

Use only approved transmission oil .

Failure to comply with this instruction will result in serious damage to the transmission.

Necessary preliminary tasks:

- Remove mechatronics
- Remove selector shaft seal
- Remove transmission (AWD only)

Drive a metal pin (1) - dia. approx. 3 mm - into clamping pin (2) (to prevent clamping pin from being compressed). Grip clamping pin (2) with side nippers.

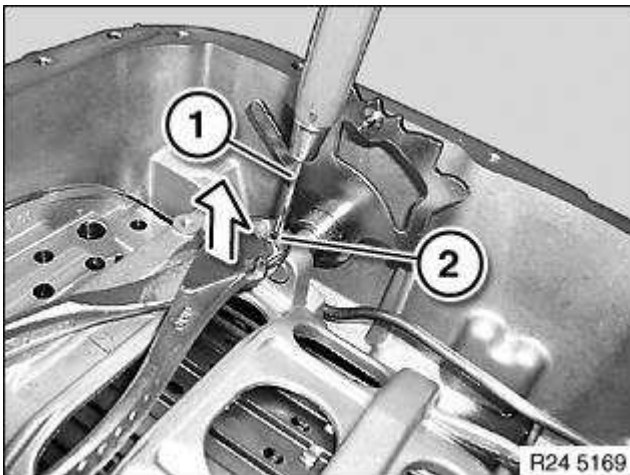


Fig. 79: Grip Clamping Pin (2) With Side Nippers
Courtesy of BMW OF NORTH AMERICA, INC.

Drive clamping pin (2) with a suitable tool out of selector shaft. Remove selector shaft.

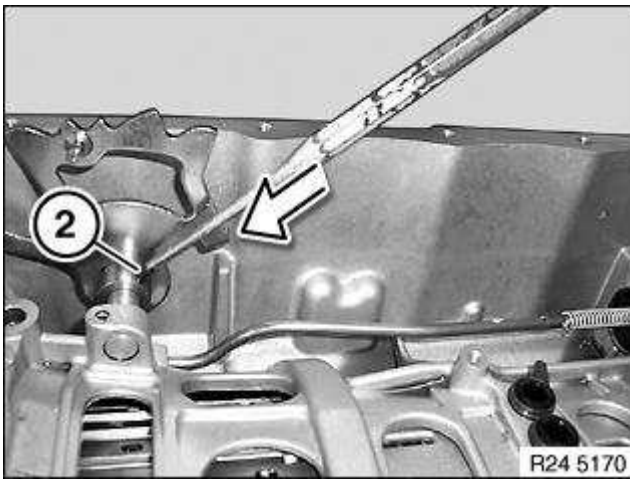


Fig. 80: Drive Clamping Pin (2) With A Suitable Tool Out Of Selector Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION

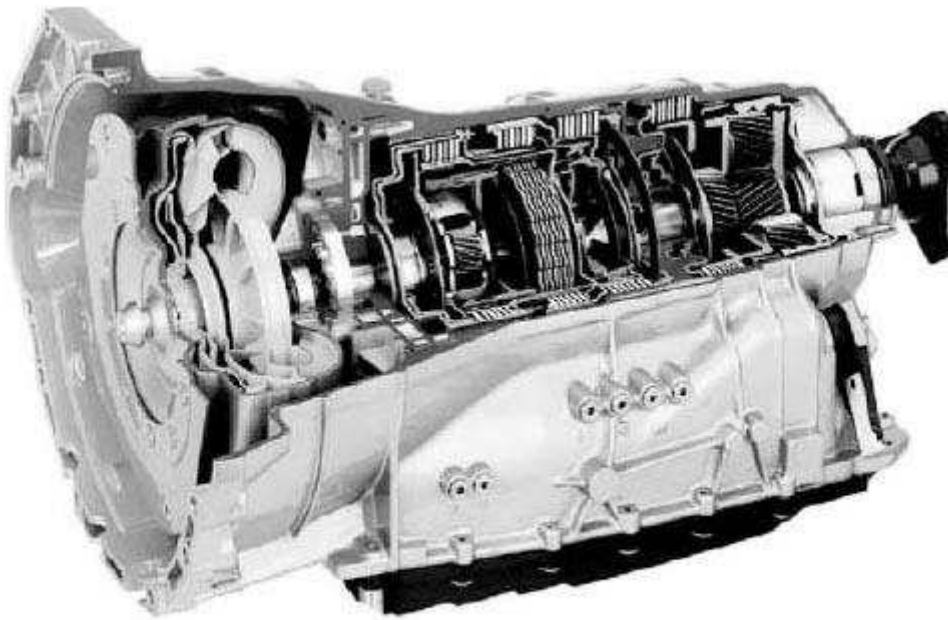
Automatic Transmission - SI Techniques - X3

24 AUTOMATIC TRANSMISSION

VS-42 je Baugruppe/Group: 24 weltweit Datum/Date: 09/2003 Update: 24 01 03 (040) 05/2007

6-SPEED AUTOMATIC TRANSMISSION

E53, E60, E61, E63, E64, E65, E66, E70, E81, E83, E85, E86, E87, E90, E91, E92, E93



T2403020

Fig. 1: 6-Speed Automatic Transmission
Courtesy of BMW OF NORTH AMERICA, INC.

INTRODUCTION

The 6-speed automatic transmissions were jointly developed by BMW and ZF (Zahnradfabrik Friedrichshafen).

- > E53, E83, E85, E86
- > E60, E61, E63, E64 before 09/2005
- > E60, E61 from 09/2005 until 03/2007 and E63, E64 from 09/2005 until 09/2007
- > E60, E61 from 03/2007
- > E60, E61 from 06/2007 with sport automatic transmission and E63, E64 from 09/2007 with sport automatic transmission

- > E65, E66
- > E70
- > E81, E87, E90, E91, E92, E93

Depending on the model concerned, the automatic transmission is either standard or special equipment (option 205).

- > E60, E61 from 06/2007

From 06/2007, besides option 205 "Automatic transmission", option 2TB "Sport automatic transmission" is also available.

The special equipment "Sport automatic transmission" includes, amongst other features, gearshift paddles and a SPORT button.

- E63, E64 from 09/2007 Option 205 "Automatic transmission" is discontinued.

On E63, E64 vehicles, only option 2TB "Sport automatic transmission" is available. Depending on the model concerned, the "sport automatic transmission" is either standard or special equipment.

The sport automatic transmission differs from the automatic transmission as follows:

- Gearshift paddles on steering wheel
- SPORT button in the selector lever trim
- Sport program also possible in selector lever position "D"
- Separate gear selector switch (GWS)

So as to be compatible with the engines with higher torques, the automatic transmissions are designed with different strengths. The automatic transmissions thus differ, e.g. through different torque converters.

Depending on the engine fitted, the following 6-speed automatic transmissions are fitted:

- GA6HP19Z (designed for maximum torque of 400 Nm)
- GA6HP19Z TU (designed for maximum torque of 400 Nm)
- GA6HP26Z (designed for maximum torque of 600 Nm)
- GA6HP26Z TU (designed for maximum torque of 650 Nm)
- GA6HP32Z (designed for maximum torque of 750 Nm)

(technical updates, e.g. of transmissions, are indicated with the letters "TU".)

The automatic transmission requires 5 multi-plate clutches to shift between the 6 gears: 3 input clutches and 2 brake clutches.

Electric steering lock discontinued:

On vehicles with automatic transmission, the electric steering lock is discontinued as follows:

- E90, E91, E92, E93 from 12/2006 (US version only)
- E60, E61 from 03/2007
- E63, E64 from 09/2007
- E70 from start of series production

BRIEF DESCRIPTION OF COMPONENTS

The automatic transmission consists of the following components:

- **Mechatronics module**

The automatic transmission is controlled by the mechatronics module. The mechatronics module is a combination of hydraulic unit and electronics module.

The hydraulic control unit is the hydraulic part of the transmission control system.

The electronics module contains the EGS control unit, the sensors and the electrical connections within the transmission. (EGS is the abbreviation for electronic transmission control)

- **Selector lever, selector lever position display**

- > E53, E81, E83, E85, E86, E87, E90, E91, E92, E93
- > E60, E61 until 03/2007
- > E63, E64 until 09/2007

The selector lever has the following positions:

P for Park

R for Reverse

N for Neutral

D for Drive (= automatic mode)

M/S M for manual mode = Steptronic, S for sport program = automatic mode with sporty map

The selector lever position display is located in the selector lever trim.

- > E65, E66

The selector lever is located on the steering column.

The selector lever has the following positions:

p for Park

R for Reverse

N for Neutral

D for Drive (= automatic mode)

The selector lever position display is located in the instrument cluster.

○ **GWS: Gear selector switch**

- > E60, E61 from 03/2007
- > E63 from 09/2007
- > E70

The gear selector switch is configured as a control unit in its own right. With the gear selector switch, the transmission is no longer actuated mechanically, but rather electronically.

○ **SPORT button for Dynamic Driving Control**

- > E60, E61, E63, E64 with sport automatic transmission

Dynamic Driving Control (FDC) is activated with the SPORT button: Gearshift times are shortened and the shift characteristics are made more sporty. The engine responds more spontaneously to movements of the accelerator pedal. The steering and holding forces of the steering tuned for a sportier feel - for Servotronic or active front steering (AFS). AFS includes Servotronic.

- > E70

On the E70 with the option "Adaptive Drive", only the damping characteristics are changed (normal or sport).

○ **Steering wheel with buttons for sport program and manual mode**

- > E65, E66

The steering wheel has a button for selecting the program. The following drive programs can be selected in a predefined sequence: Sport program, manual mode or automatic mode.

The steering wheel also houses the buttons for changing up and down in manual mode.

Program selection and control in manual mode are described in the Owner's Handbook.

○ **Gearshift paddles**

Vehicles with gearshift paddles:

In addition to the sequential gear selection with the selector lever, the gears can also be selected using the

2 gearshift paddles on the steering wheel.

The shift pulse is transmitted electrically to the EGS control unit. With this gearshift method ("shift-by-wire") there is no mechanical linkage between the gearshift paddles and the transmission.

Pull one of the gearshift paddles briefly to change up a gear.

Press one of the gearshift paddles briefly to change down a gear.

○ **Instrument cluster display**

The drive ranges and drive program are displayed in the instrument cluster, the signal required for this is sent from the electronic transmission control.

○ **CID: Central Information Display**

- > E60, E61, E63, E64, E70, E81, E85, E86, E87, E90, E91, E92, E93

The CID displays detailed information about the Check-Control messages in the instrument cluster.

The instrument cluster controls these messages on the K-CAN (body CAN).

In addition to the visual display, the Check Control also alerts the driver with acoustic signals. Depending on the importance of the associated message, a single or double gong with varying volume and tone will sound. The instrument cluster controls these warnings by means of the K-CAN. Acoustic warnings are emitted by the M-ASK (multi-audio system controller) or CCC (Car Communication Computer).

○ **CD: Control display**

- > E65, E66

The control display is the central display for the information and communication system.

The control display is used as an interface between the MOST and K-CAN data buses. (MOST = "Media Oriented System Transport"; K-CAN = body controller area network".)

Amongst other things, detailed information about the Check-Control messages in the instrument cluster are displayed on the control display.

The instrument cluster controls these messages on the K-CAN (body CAN).

The electronic transmission control requires signals from the following components (in alphabetical order):

○ **Brake light switch**

The signal from the brake light switch is needed for the function of the selector lever lock and the adaptive transmission control.

○ **DME or DDE: Digital engine electronics or digital diesel electronics**

The DME or DDE sends messages about the current operating status of the engine to the EGS (e.g. engine speed or torque).

The EGS reports the current operating status of the transmission back to the DME or DDE.

○ **DSC: Dynamic Stability Control**

The DSC optimizes both driving stability when pulling away or accelerating and traction. Within the limitations of the laws of physics, DSC compensates for driving conditions such as over/understeering. As part of this process, dynamic driving signals (e.g. wheel rotation speed, lateral acceleration) are sent to the DSC control unit. DSC transmits the processed signals regarding cornering, acceleration and winter detection to the EGS control unit.

○ **Accelerator pedal module**

The signal from the accelerator pedal module is needed for the adaptive transmission control.

○ **JBE: Junction box electronics**

- > E70, E81, E87, E90, E91, E92, E93

The JBE is the data interface (= gateway) between the K-CAN and the PT-CAN. Signals from the F-CAN are simply looped through. (K-CAN = body CAN; PT-CAN = powertrain CAN; F-CAN = chassis CAN.)

The junction box consists of the JBE and the power distributor.

The power distributor provides power, amongst other things, for the gate pattern diagram and the EGS control unit.

○ **KGM: Body gateway module**

- > E60, E61, E63, E64 from 09/2005

From 09/2005, the vehicle electrical system has been modified. The body gateway module (KGM) supersedes the SGM.

The KGM is the data interface (= gateway) between the K-CAN and the PT-CAN. (K-CAN = body CAN; PT-CAN = powertrain CAN.) The diagnosis wire is connected to the KGM.

○ **SGM: Safety and gateway module**

- > E60, E61, E63, E64 up to 09/2005
- > E65, E66

The SGM is the data interface (= gateway) between the K-CAN, **byteflight** and the PT-CAN. (K-CAN = body CAN; PT-CAN = powertrain CAN.) The diagnosis wire is connected to the SGM.

SYSTEM FUNCTIONS

The automatic transmission has the following system functions:

- Adaptive transmission control
- Overlap control
- Starter inhibitor
- Parking lock
- Warming-up program
- Engine intervention
- Downshift inhibitor
- Reverse gear inhibitor
- Selector lever lock (shiftlock)
- Standstill decoupling
- Interlock
- Emergency program

Adaptive transmission control

As with earlier automatic transmissions, the 6-speed automatic transmissions offer the choice between a comfort program and a sport program.

The adaptive transmission control (component of electronic transmission control) adapts the shift characteristics of the comfort program and sport program to the driver's wish and the driving situation.

In both programs, the adaptive transmission control changes from a basic map to a performance - orientated map, as required:

- Comfort program in selector lever position "D"

The comfort program is based on 2 maps: The XE map (extreme economy) and the E map (economy). The EGS control unit normally selects the economical XE map (= basic map). In case of particular demands (e.g. load requirements), the system will change to the performance - orientated E map. If the input signals change in favor of a more gentle driving style, the system will change back to the more economical XE map.

- Sport program in selector lever position "M/S"

The sport program effects dynamic, sporty shift characteristics. In the sport program, there is the basic S map (sport) and the performance-orientated XS map (extreme sport). If an extremely dynamic driving style is called for, the system will change from the S map to the performance - orientated XS map.

The adaptive transmission control takes the following demands into account:

- Adaptation to driver type
- Driving uphill or trailer towing

- Driving downhill
- Braking deceleration and automatic upshift
- Winter program

Adaptation to driver type

The adaptation to different driver types is done using the following values:

○ Kick-fast

If the accelerator pedal is depressed rapidly, the shift program is changed accordingly. This is achieved by the detected accelerator-pedal value being compared with threshold values in the EGS control unit. The result of this comparison is the proposal of one of the two possible programs (XE or E in comfort program, S or XS in sport program).

○ Cornering detection

Cornering detection reacts to the vehicle's lateral acceleration with an indirect adaptation to the driver type.

Lateral acceleration is considered an indirect statement of the preferred driving dynamics and does not cause an immediate gearshift response (shifts when cornering could adversely affect driving stability).

Lateral acceleration is calculated from the signals from the wheel-speed sensors, from the yaw rate and road speed.

○ Brake evaluation

The braking action is evaluated in a similar way to "kick-fast".

The braking deceleration is measured and compared with threshold values in the EGS control unit. The result of this comparison is the proposal of one of the two possible programs (XE or E in comfort program, S or XS in sport program).

The driver-type adaptation is restarted each time the vehicle pulls away from a standstill.

Driving uphill or trailer towing

These functions are based on a comparison of actual car acceleration with a nominal value. From the current engine operating situation, the acceleration with normal load on a level surface is calculated. If the actual acceleration is significantly below the theoretical value, the "Driving uphill or trailer towing" function is activated.

The design of the corresponding shift characteristics allows a high-speed driving style. Undesirable upshifts and frequent up/downshifts are eliminated or greatly reduced.

Driving downhill

If the EGS control unit detects downhill driving, it will automatically shift down a gear if the vehicle's speed picks up. This enhances the engine's braking effect. A downshift is only effected if the engine speed is below the maximum speed of the lower gear.

The EGS control unit detects downhill driving on the basis of signals from the throttle valve potentiometer (load), wheel speed sensor (road speed) and brake light switch (brake activation).

Braking deceleration and automatic upshift

To decelerate the vehicle, the foot is taken off the gas and the brake depressed as necessary. The gearshift map triggers an upshift when the throttle is closed. These gearshifts are not necessary in conjunction with brake applications as they prevent the engine's braking effect from being exploited.

The intention to apply the brakes can often be anticipated from the accelerator pedal being rapidly released to the zero position. If such an action is detected, the upshift is suppressed for as long as the accelerator pedal is in the zero position and the vehicle is in overrun mode.

Winter program (only with selector lever in position "D")

The winter program is automatically activated if the drive wheels start to spin even at a low rate of acceleration. The winter program ensures better traction by not using 1st gear. Early upshifts reduced the reactions caused by load changes. The winter program is deactivated if the wheels do **not** spin for several seconds despite high drive torque.

Overlap control

Overlap control provides gentle shift characteristics as follows: With overlap control, several multi-plate clutches are in use at the same time. Here, pressure is reduced in the active multi-plate clutch and at the same time built up in the clutch that is about to be activated. The reduction and build-up of pressure is maintained until a synchronized speed is reached. At this point, the hydraulic pressure for the multi-plate clutch to be activated can be built up completely. Overlap control is active for all gearshifts from 1st to 6th gear and from 6th to 1st gear.

Starter inhibitor

It is only possible to start the engine when the selector lever is in position "P" or "N".

- > E53, E83, E85, E86

The EWS (electronic immobilizer) evaluates the following signal from the EGS (electronic transmission control) for the start:

- Selector lever position "P" or "N" as signal via the direct wire
- > E60, E61, E63, E64, E65, E66, E70, E81, E87, E90, E91, E92, E93

The CAS (Car Access System) evaluates the following signals from the EGS (electronic transmission control) for the start:

- Selector lever position "P" or "N" as CAN message via the powertrain CAN
- Selector lever position "P" or "N" as signal via the direct wire

In principle, the CAN message is used. If the message is incorrect or invalid, it switches to the signal from the direct wire.

Parking lock

The parking lock locks the transmission output shaft. The vehicle is prevented from rolling unexpectedly. The parking lock is designed to provide a reliable brake on gradients up to 32 %.

- > E53, E81, E83, E85, E86, E87, E90, E91, E92, E93
- > E60, E61 until 03/2007
- > E63, E64 until 09/2007

When the vehicle is stationary, the parking lock is engaged purely mechanically via the selector lever (Bowden cable from selector lever to mechatronics module).

- > E65, E66, E70
- > E60, E61 from 03/2007
- > E63, E64 from 09/2007

With the electric version of the parking lock, the parking lock is applied and electrically secured via a mechanical spring system in the transmission.

The parking lock is activated under the following conditions:

- Pressure on the button on the selector lever and roadspeed signal less than 2 km/h.
- Remote control removed from the insert compartment and roadspeed signal 0 km/h.
- Engine ON

and

Transmission position "D", "N" or "R"

and

Driver's door open

and

Driver's seat not occupied

(roadspeed signal less than 2 km/h).

The parking lock is only released when the engine is ON. Reason: Only when the engine is ON is there enough hydraulic pressure to open the parking lock (mechanical emergency release possible).

- > E65, E66, E70

If the parking brake (EMF = "electromechanical parking brake") fails, the parking lock can still be applied.

Example: A fault in the system prevents the parking brake from being moved from "Hold" to "Park". In this event, the EGS control unit will apply the parking lock after performing a plausibility check.

The locking conditions are as follows:

- Selector lever in position "N"
- Speed 0 km/h
- Engine OFF and ignition OFF

Warming-up program

The warming-up program is activated after each engine start with the engine temperature lower than approx. 60 °C. In the warming-up program, the automatic transmission remains in the performance-orientated map E or XS up to a certain temperature. Gearshift are only executed at higher speeds. This enables the engine and the catalytic converter to reach their operating temperatures more quickly.

Up to a transmission oil temperature of approximately 35 °C, the converter lockup clutch is neither controlled nor closed.

Engine intervention

During the gearshift, the EGS control unit emits signals to influence the digital engine electronics (DME) or digital diesel electronics (DDE).

The DME then retards the ignition timing for a few milliseconds.

The DDE reduces the fuel quantity for a few milliseconds by reducing the injection period.

This action briefly reduces the torque, improves shift quality, reduces the load on the transmission and shortens the shifting time.

Downshift inhibitor

A downshift inhibitor prevents the transmission shifting to a lower gear until the engine speed is below the maximum speed for the next gear down. The engine speed signal is transmitted by the DME/DDE to the EGS control unit.

The downshift inhibitor prevents damage to the engine and transmission.

Reverse gear inhibitor

The reverse gear inhibitor electronically prevents reverse gear from being engaged when the vehicle is moving forwards at speeds above 5 km/h (3 mph). When this road speed is exceeded, the corresponding solenoid valves are no longer actuated. This prevents multi-plate clutches B and D (for reverse gear) from being charged.

Selector lever lock (shiftlock)

- > E53, E60, E61, E63, E64, E81, E83, E85, E86, E87, E90, E91, E92, E93

The selector lever is locked in positions "P" and "N" by an electromagnet. The electromagnet is actuated by the EGS control unit. The selector lever lock is engaged when selector lever position "P" or "N" is detected and the ignition (terminal 15) is ON.

- Position change from selector lever position "P" or "N":

A position change is only possible at road speeds of less than 5 km/h and if the brake is applied at an engine speed of less than 2500 rpm.

Standstill decoupling (depends on national version)

The standstill decoupling of the torque converter decouples the torque converter from the drive when the vehicle is at a standstill. Thus only a minimum load remains, and fuel consumption is reduced. Decoupling is effected by a clutch regulation system (clutch A) within the transmission (depending on the load signal and output speed).

Interlock

- > E53, E83, E85, E86 and

E60, E61, E63, E64 up to 09/2005:

The ignition lock is mechanically linked to the selector lever by a Bowden cable (as on the E38). The interlock only allows the ignition key to be removed when the selector lever is in position P.

Conversely, the selector lever can only be moved from position "P" when the ignition key is in the ignition lock and turned at least to ignition ON.

- > E60, E61 from 03/2007 and

E63, E64 from 09/2007 and

E65, E66 and

E70

The remote control can only be removed when the CAS registers a roadspeed signal of less than 1 km/h. If the remote control is removed from the insert compartment after the engine has been switched OFF, the parking lock will automatically be applied.

- > E81, E87, E90, E91, E92, E93 and E60, E61 from 09/2005 until 03/2007 and E63, E64 from 09/2005 until 09/2007

The selector lever is locked in position P by an electromagnet when terminal 15 is OFF. When the remote control is not in the insert compartment, the selector lever is locked in position "P". When terminal 15 is activated, the EGS control unit applies current to the electromagnet and the selector lever is released. A microswitch registers the locking or unlocking of the selector lever. The microswitch transmits a signal to the CAS (Car Access System) to enable the remote control.

- Interlock **without** convenience access

If the selector lever is not engaged in position "P", the remote control cannot be removed from the insert compartment. The selector lever is locked when the selector lever is in position P and the ignition is OFF. The remote control can be removed.

- Interlock **with** convenience access

The engine and terminal 15 (ignition) can only be switched off when the selector lever is in position "P".

Emergency program

The emergency program is activated if the transmission management should fail or detect a malfunction that could lead to critical driving conditions. In the emergency program, the vehicle remains operational, albeit with limitations.

If the electronic transmission control fails (without current), the following forward gears can be engaged:

Failure in 1st-3rd gear -> emergency 3rd gear

Failure in 4th-6th gear -> emergency 5th gear

A restart will be performed in 3rd gear.

SPECIAL SITUATIONS (FUNCTIONS IN EGS)

- > E60, E61 from 03/2007
- > E63, E64 from 09/2007
- > E70

DIRECTION CHANGE MEMORY FUNCTION

The driver wishes to change from selector lever position "D" to selector lever position "R" or from selector lever position "R" to selector lever position "D".

- At $v \pm 5$ km/h, the driver's wish is carried out by the electronic transmission control (EGS).

- At $5 \pm v \pm 10$ km/h, selector lever position "N" is engaged by the electronic transmission control, the display of the currently engaged gear range changes to the driver's desired selector lever position "D" or selector lever position "R".

The driver's wish is stored. If the vehicle's speed drops below 5 km/h within 1 second, the driver's wish for selector lever position "D" or selector lever position "R" is carried out by the electronic transmission control. If the speed stays above this threshold, selector lever position "N" remains and the display changes to selector lever position "N".

- If $v > 10$ km/h, selector lever position "N" is engaged by the electronic transmission control

PARKING LOCK MEMORY FUNCTION

The driver wishes to engage selector lever position "P" (parking lock)

- At $v \pm 2$ km/h, selector lever position "P" is engaged by the electronic transmission control (EGS).
- At $2 \pm v \pm 5$ km/h, the current selector lever position remains, the driver's wish is stored. If the vehicle's speed drops below 2 km/h within a second, selector lever position "P" is engaged by the electronic transmission control
- At $v > 5$ km/h, the driver's wish is not accepted. The current selector lever position remains and the Check-Control message "Transmission position P only at standstill" is displayed

POSITION "N" HOLD TIME

If $v \pm 2$ km/h, the engine is OFF, selector lever position "N" is engaged and the ID transmitter is inserted, the selector lever position "N" hold time starts for 30 minutes.

During this time, information is transmitted by the electronic transmission control (EGS), the function display remains on and selector lever position "N" lights up in the gate pattern diagram. At the end of selector lever position "N" hold time, the display flashes and the electronic transmission control (EGS) engages selector lever position "P" after 10 seconds.

If the selector lever is moved during position "N" hold time, the 30 minutes selector lever position "N" hold time start afresh.

OPERATION

The different automatic transmission drive positions are selected with the selector lever.

When driving, there are the following possibilities:

- **D = Automatic mode**

When the selector lever is in position "D", gears are selected by the adaptive transmission control.

- **Gearshift using gearshift paddles**

If the selector lever is in position "D" and a gearshift is initiated using the gearshift paddles, the automatic transmission will automatically change to manual mode.

If no gearshift is made and the vehicle does not accelerate significantly within 6 seconds, the automatic transmission will change back to automatic mode.

- **SD = Automatic mode, sport program**

When the selector lever is moved to the right from position "D" into the shift gate "M/S", the automatic transmission's sport-shift program is activated. The display in the instrument cluster changes from "D" to "SD".

- **M1 to M6 = Steptronic**

If the selector lever is in shift gate "M/S" and is briefly moved to "-" or "+", the electronic circuitry changes to Steptronic. Permanent manual mode is activated with the selector lever or gearshift paddles. The display in the instrument cluster changes from "SD" to "M1" to "M6".

In manual mode (Steptronic), upshifts and downshifts are only executed by the transmission control if road speed and engine speed are suitable. Gearshifts that would result in an excessively high or low engine speed are suppressed.

- **Sport program via SPORT button**

When the SPORT button is pressed, the electronics will change to the sport program regardless of the drive range engaged or the current selector lever position.

TRANSMISSION

Automatic Transmission - Special Tools - X3

24 AUTOMATIC TRANSMISSION

24 0 010 FIXTURE

In conjunction with: 00 2 510

Note: For checking axial play of drive shaft

Transmission: 4 HP 22, 4 HP 24, A5S 310Z, A5S 560Z

Storage location: B23

Order number: 24 0 010

Fixture

Consisting of:

1 = 24 0 011 Dial gauge holder

2 = 24 0 012 Clamping piece

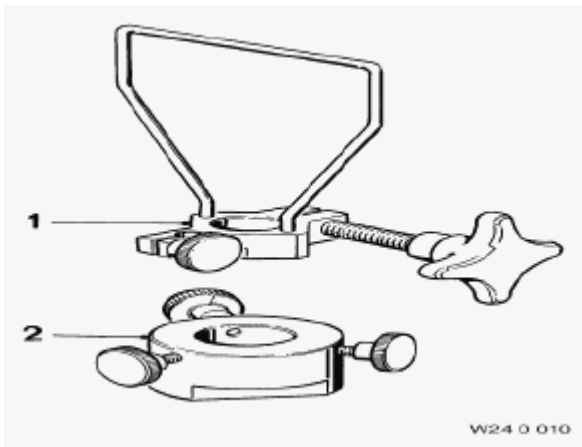


Fig. 1: Fixture (24 0 010)

Courtesy of BMW OF NORTH AMERICA, INC.

24 0 020 OIL PRESSURE TEST ACCESSORIES

Minimum set: Mechanical tools

In conjunction with: 13 3 061 and BMW DIS

Note: For pressure gauge 13 3 061 or BMW DIS for checking oil pressure

Transmission: 3 HP 12, 3 HP 20, 3 HP 22, 4 HP 22, 4 HP 24, A4S 270R, A4S 310R, A5S 300J, A5S 310Z, A5S 440Z, A5S 560Z

Storage location: B23, B24, single

Order number: 24 0 020

Oil pressure test accessories

Consisting of:

1 = 24 0 021 Pressure hose with connection

Note: Pressure hose 1.7 m, connection M12x1.5 - M14x1.5 external thread/for checking the various converter pressures / Transmission: A4S 310R, A4S 270R

2 = 24 0 022 Reducer

Note: For checking main pressure (3 HP 22, A5S 310Z) and clutch A (ZF transmissions) / transmission: 3 HP 22, A5S 310Z, A5S 560Z and all ZF transmissions

In conjunction with: 24 0 140

3 = 24 0 023 Pipe bend, 145 mm

Note: Extended length 145 mm / Transmission: 4 HP 22, 4 HP 24

In conjunction with: 13 6 052

4 = 24 0 024 Pipe bend, 90 mm

Note: Extended length 90 mm

In conjunction with: 13 6 052

5 = 24 0 025 Banjo bolt

Note: M20x1.5 - M18x1.5 / For checking converter pressure / Transmission: 3 HP 12

In conjunction with: 24 0 024

6 = 24 0 026 Reducer

Note: M24x1.5 - 20x1.5 / For checking main pressure / Transmission: 3 HP 20

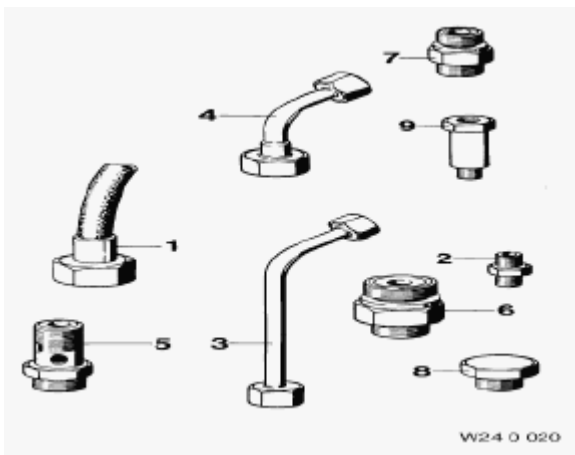


Fig. 2: Oil Pressure Test Accessories (24 0 020)
Courtesy of BMW OF NORTH AMERICA, INC.

In conjunction with: 24 0 024

7 = 24 0 027 Reducer

Note: M20x1.5 - M18x1.5 / For checking main pressure (3 HP 12) and converter pressure (3 HP 20) /
 Transmission: 3 HP 12, 3 HP 20

In conjunction with: 24 0 024

8 = 24 0 028 Screw plug

Note: M18x1.5 / For closing off oil supply lines while checking converter pressure / Transmission: 3 HP 20

9 = 24 0 029 Adapter

Note: For closing off supply and return lines while checking main pressure / Transmission: 3 HP 22

24 0 030 ADAPTER

In conjunction with: 13 3 061, 24 0 021, 24 0 023

Note: For pressure gauge 13 3 061 / For checking converter pressure

Transmission: 4 HP 22

Storage location: B23

Order number: 24 0 030

Adapter

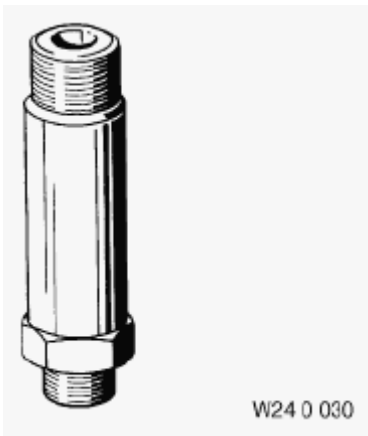


Fig. 3: Adapter (24 0 030)

Courtesy of BMW OF NORTH AMERICA, INC.

24 0 040 RETAINING FIXTURE

Note: For removing and installing disc pack

Transmission: 3 HP 20, 3 HP 22, 4 HP 22, 4 HP 24

Storage location: C27

Order number: 24 0 040

Retaining fixture

Consisting of:

1 = 24 0 041 Disc

2 = 24 0 042 Ring

3 = 24 0 043 Half shells

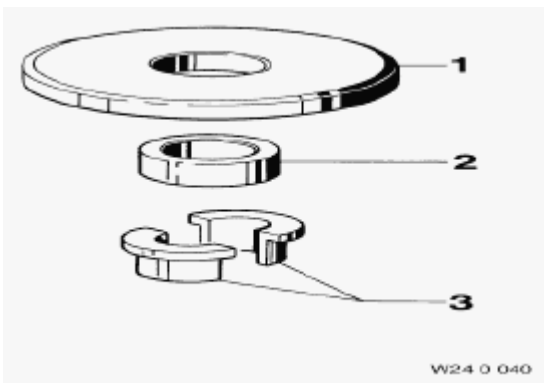


Fig. 4: Retaining Fixture (24 0 040)

Courtesy of BMW OF NORTH AMERICA, INC.

24 0 050 EXTRACTOR GRIP

Note: For sealing plug in bottom section of transmission casing

Transmission: 3 HP 12, 3 HP 20, 3 HP 22, 4 HP 22, 4 HP 24

Storage location: A24

Order number: 24 0 050

Extractor grip

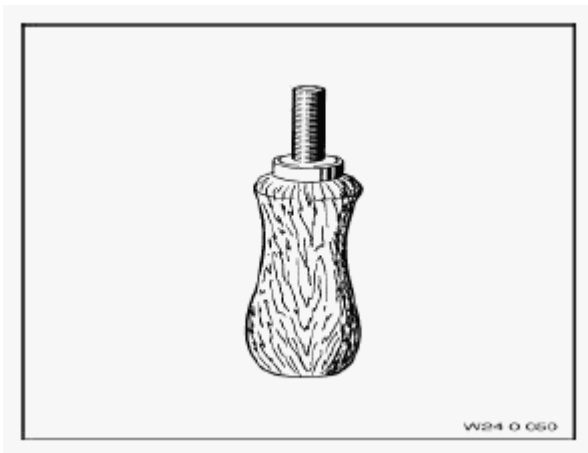


Fig. 5: Extractor Grip (24 0 050)

Courtesy of BMW OF NORTH AMERICA, INC.

24 0 070 ADAPTER

In conjunction with: 13 3 061 (pressure gauge), 24 0 021, 24 0 023

Note: For checking pump pressure

Transmission: 4 HP 22, 4 HP 24

Storage location: B23

Order number: 24 0 070

Adapter

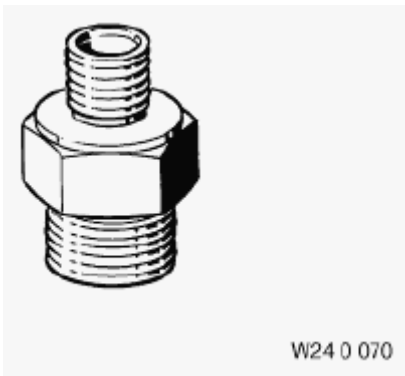


Fig. 6: Adapter (24 0 070)

Courtesy of BMW OF NORTH AMERICA, INC.

24 0 080 FUNNEL

Minimum set: Mechanical tools

Note: For filling transmission fluid in transmission

Transmission: 240/5, 242/4, 245/5, 245/5Sport, 260/5, 262/4, 265/5, 265/5Sport, 280/5Sport, 3 HP 12, 3 HP 20, 3 HP 22, 4 HP 22, 4 HP 24, A4S 270R, A4S 310R, A5S 300J, A5S 310Z, A5S 440Z, A5S 560Z, BW 65, S5D 200G, S5D 250G, S5D 260Z, S5D 310Z, S6S 420G, S6S 560G, ZF S5-16

Order number: 24 0 080

Funnel



Fig. 7: Funnel (24 0 080)

Courtesy of BMW OF NORTH AMERICA, INC.

24 0 090 DRIFT

Note: For driving in radial seal in transmission case front section / Replaced by 24 0 110, November 96

Transmission: 4 HP 22, 4 HP 24

Order number: 24 0 090

Drift



W24 0 090

Fig. 8: Drift (24 0 090)

Courtesy of BMW OF NORTH AMERICA, INC.

24 0 120 ATTACHMENT FOR TROLLEY

Note: For removing and installing transmission / Replaced by 24 0 130, March 87

Transmission: 4 HP 22

Order number: 24 0 120

Attachment for trolley

24 0 130 TAKE-UP SUPPORT FOR TRANSMISSION

In conjunction with: 00 2 030 (not included in minimum kit)

Note: For removal and installation

Transmission: 4 HP 22, 4 HP 24

SI number: 1 02 87(721)

Order number: 24 0 130

Take-up support for transmission

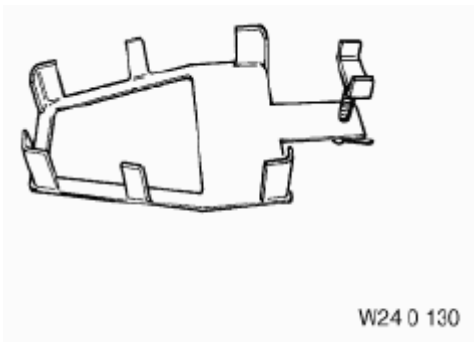


Fig. 9: Take-Up Support For Transmission (24 0 130)
Courtesy of BMW OF NORTH AMERICA, INC.

24 0 140 PIPE MANIFOLD

Minimum set: Mechanical tools

In conjunction with: 13 3 061, 24 0 021, 24 0 022, 13 6 051, 13 6 052, 24 5 190

Note: For pressure gauge 13 3 061 and BMW DIS for measuring oil pressure in transmission

Transmission: A4S 270R, A4S 310R, A5S 310Z, A5S 560Z

Storage location: C3

SI number: 1 01 92(469)

Order number: 24 0 140

Pipe manifold

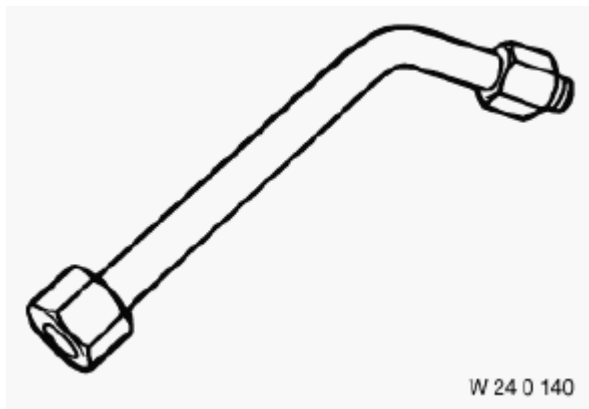


Fig. 10: Pipe Manifold (24 0 140)
Courtesy of BMW OF NORTH AMERICA, INC.

24 0 150 MOUNTING BRACKET

In conjunction with: 00 1 450

Note: For mounting transmission on assembly stand

Transmission: 3 HP 12, 3 HP 20, 3 HP 22, 4 HP 22, A4S 270R, A4S 310R, A5S 310Z

Order number: 24 0 150

Mounting bracket

Consisting of:

2 = 24 0 152 Baseframe

3 = 24 0 153 Spindle with rotary handle

6 = 24 0 156 Spindle

Note: With thrust piece, transmission: all

In conjunction with: 00 1 450

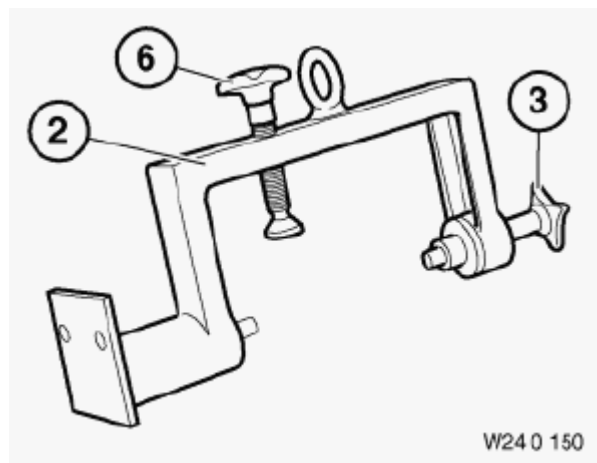


Fig. 11: Mounting Bracket (24 0 150)

Courtesy of BMW OF NORTH AMERICA, INC.

24 0 170 SUPPORT

In conjunction with: 00 2 030 (not included in minimum kit)

Note: For removing and installing transmission

Transmission: A5S 560Z

SI number: 1 06 92(509)

Order number: 24 0 170

Support

Consisting of:

24 0 171 Adjusting screw

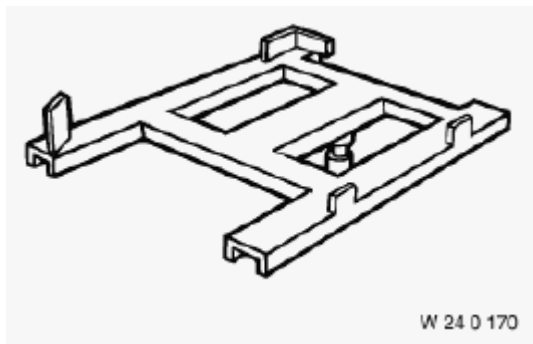


Fig. 12: Support (24 0 170)

Courtesy of BMW OF NORTH AMERICA, INC.

24 0 180 SUPPORT

In conjunction with: 00 1 450

Note: For mounting transmission on assembly stand.

Transmission: A5S 310Z, A5S 325Z, A5S 360R, A5S 440Z, A5S 560Z, GA6 HP19Z, GA6 HP26Z

SI number: 1 06 92 (509)

Order number: 24 0 180

Support

Consisting of:

1 = 24 0 181 Baseframe

2 = 24 0 182 Pressure spindle with star handle

4 = 24 0 184 Spindle, long (2 x)

5 = 24 0 185 Adapter

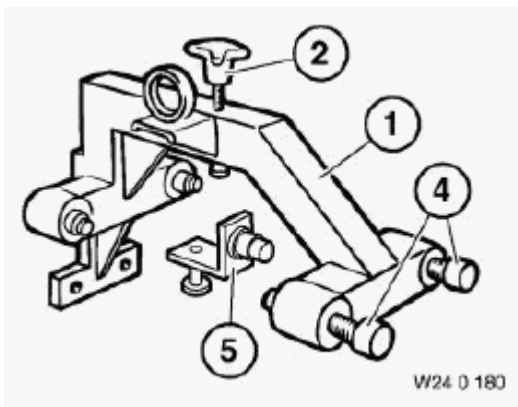


Fig. 13: Support (24 0 180)

Courtesy of BMW OF NORTH AMERICA, INC.

24 0 190 HOLDING FIXTURE

Minimum set: Mechanical tools

Note: For output flange of propeller shaft while releasing and tightening slotted nut

Transmission: A5S 310Z, A5S 325Z, A5S 360R, A5S 560Z

SI number: 1 06 92(509)

Order number: 24 0 190

Holding fixture

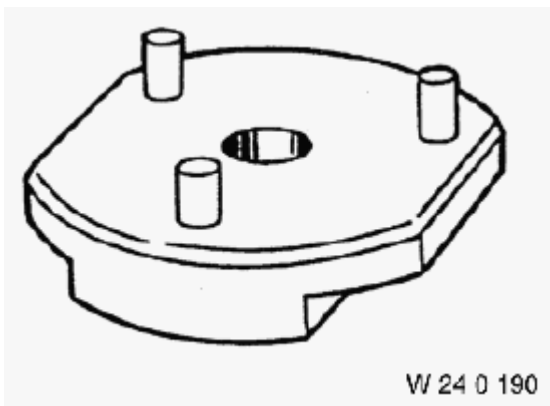


Fig. 14: Holding Fixture (24 0 190)

Courtesy of BMW OF NORTH AMERICA, INC.

24 0 200 SUPPORT

In conjunction with: 00 1 450

Note: For mounting transmission on assembly stand.

Transmission: A5S 440Z, A5S 560Z, GA6 HP19Z, GA6 HP26Z, GA6 HP32Z

SI number: 1 27 06 (328)

Order number: 24 0 200

Support

Consisting of:

1 = 24 0 201 Basic body

2 = 24 0 202 Spindle with thrust member

3 = 24 0 203 Spindle with screw

4 = 24 0 204 Sliding piece

5 = 24 0 205 Adapter (long)

6 = 24 0 206 Adapter (medium)

7 = 24 0 207 Adapter (short)

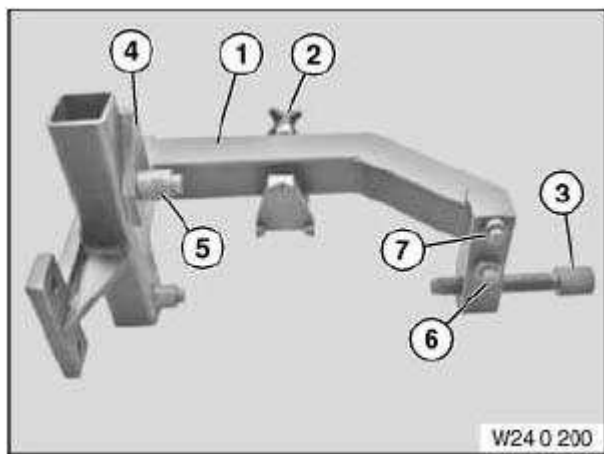


Fig. 15: Support (24 0 200)

Courtesy of BMW OF NORTH AMERICA, INC.

24 0 250 TAKE-UP SUPPORT FOR TRANSMISSION

In conjunction with: 24 5 301 and 00 2 030 (not included in minimum tool kit)

Note: For removing and installing transmission.

Transmission: A5S 440Z

SI number: 1 08 96(080)

Order number: 24 0 250

Take-up support for transmission

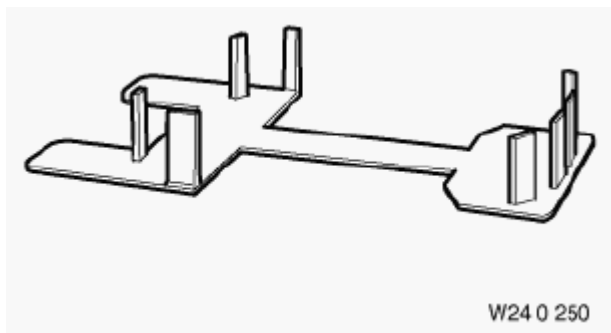


Fig. 16: Take-Up Support For Transmission (24 0 250)
Courtesy of BMW OF NORTH AMERICA, INC.

24 1 010 INSTALLATION SLEEVE

Note: For removing disc pack (4th gear) as well as fitting needle bearing in oil pump housing (A5S 560Z)

Transmission: 4 HP 22, 4 HP 24, A5S 560Z

Storage location: A18

Order number: 24 1 010

Installation sleeve



Fig. 17: Installation Sleeve (24 1 010)
Courtesy of BMW OF NORTH AMERICA, INC.

24 1 050 IMPACT BUSH

Note: For fitting rotary shaft seal for torque converter in oil pump housing

Transmission: 3 HP 20, 3 HP 22

Storage location: C29

Order number: 24 1 050

Impact bush

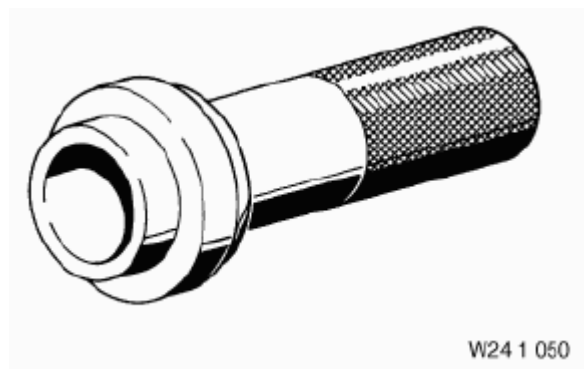


Fig. 18: Impact Bush (24 1 050)

Courtesy of BMW OF NORTH AMERICA, INC.

24 1 060 IMPACT BUSH

Note: For fitting rotary shaft seal for torque converter in oil pump housing and on output flange

Transmission: 3 HP 20, 3 HP 22, A5S 300J, BW 65

Storage location: B29, C29

Order number: 24 1 060

Impact bush

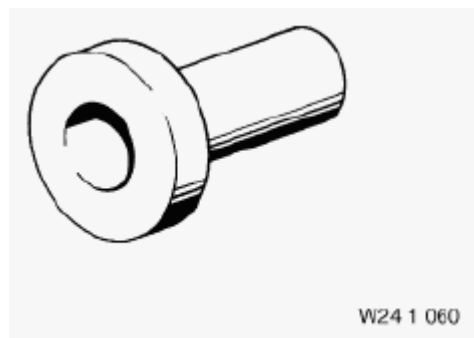


Fig. 19: Impact Bush (24 1 060)

Courtesy of BMW OF NORTH AMERICA, INC.

24 1 070 IMPACT BUSH

Minimum set: Mechanical tools

Note: For fitting rotary shaft seal in oil pump housing

Transmission: A5S 325Z

Storage location: B36

SI number: 1 03 98(303)

Order number: 24 1 070

Impact bush

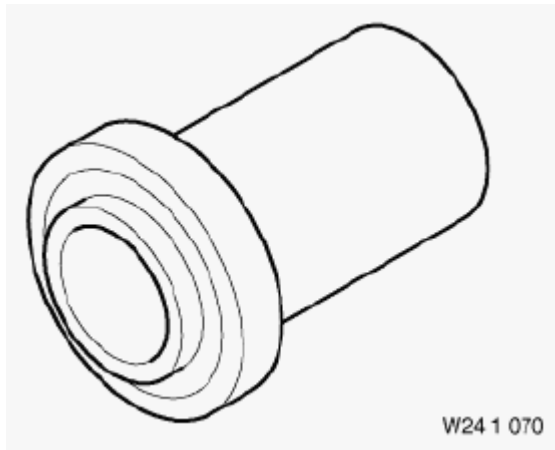


Fig. 20: Impact Bush (24 1 070)

Courtesy of BMW OF NORTH AMERICA, INC.

24 1 080 BUSH (ALUMINIUM)

Minimum set: Mechanical tools

In conjunction with: 00 5 010

Note: For fitting on input shaft while removing rotary shaft seal from oil pump housing

Transmission: A5S 325Z

Storage location: A36

SI number: 1 03 98(303)

Order number: 24 1 080

Bush (aluminium)

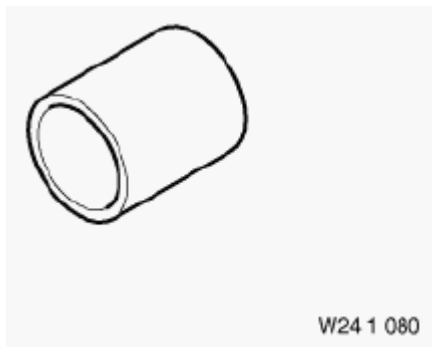


Fig. 21: Bush (24 1 080)

Courtesy of BMW OF NORTH AMERICA, INC.

24 1 090 IMPACT BUSH

Note: For installing rotary shaft seal on output flange

Transmission: A5S 390G

SI number: 1 08 98(333)

Order number: 24 1 090

Impact bush

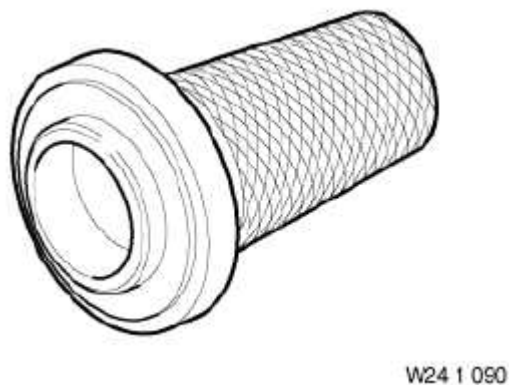


Fig. 22: Impact Bush (24 1 090)

Courtesy of BMW OF NORTH AMERICA, INC.

24 1 100 IMPACT BUSH

Note: For fitting rotary shaft seal for output flange in transmission extension

Transmission: 3 HP 12, 3 HP 20, 3 HP 22

Order number: 24 1 100

Impact bush

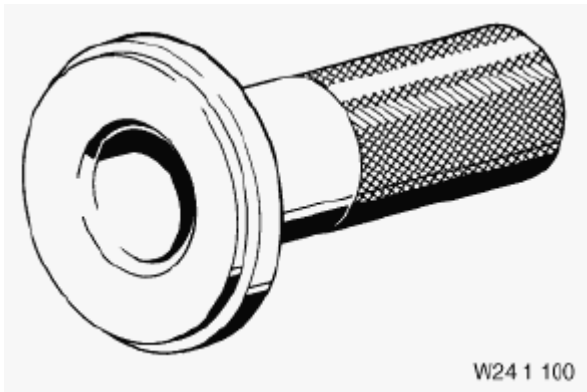


Fig. 23: Impact Bush (24 1 100)

Courtesy of BMW OF NORTH AMERICA, INC.

24 1 110 SOCKET WITH MAGNET

Minimum set: Mechanical tools

Note: For loosening and tightening converter mounting

Transmission: 3 HP 12, 3 HP 20, 3 HP 22, 4 HP 22, 4 HP 24, A4S 200R, A4S 270R, A4S 310R, A5S 300J, A5S 310Z, A5S 325Z, A5S 360R, A5S 390G, A5S 390R, A5S 440Z, A5S 560Z, GA6 HP19Z, GA6 HP26Z, GA6 HP32Z

Storage location: B19

SI number: 1 04 86 (566)

Order number: 24 1 110

Socket with magnet

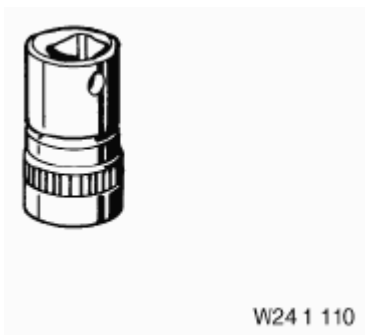


Fig. 24: Socket With Magnet (24 1 110)

Courtesy of BMW OF NORTH AMERICA, INC.

24 1 120 GAUGE

Note: For adjusting position switch in "P" position during assembly / Model year: As from 03/96

Transmission: A4S 270R

SI number: 1 07 96(068)

Order number: 24 1 120

Gauge

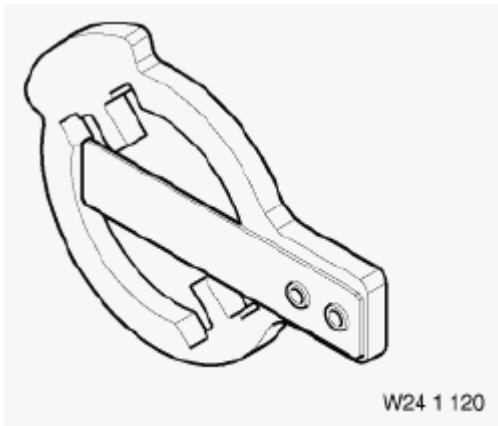


Fig. 25: Gauge (24 1 120)

Courtesy of BMW OF NORTH AMERICA, INC.

24 1 170 PIN WRENCH

Minimum set: Mechanical tools

Note: For releasing and tightening slotted nut on output flange

Transmission: A5S 310Z

Storage location: A35

SI number: 1 09 90(282)

Order number: 24 1 170

Pin wrench



Fig. 26: Pin Wrench (24 1 170)

Courtesy of BMW OF NORTH AMERICA, INC.

24 1 180 FIXTURE

In conjunction with: 24 1 080 (A5S 325Z)

Note: For removing and installing oil pump

Transmission: A5S 310Z, A5S 560Z

Storage location: B18

SI number: 1 09 90(282)

Order number: 24 1 180

Fixture

Consisting of:

1 = 24 1 181 Retaining tube

2 = 24 1 182 Thread spindle

3 = 24 1 183 Retaining ring, inner

Note: (not shown)

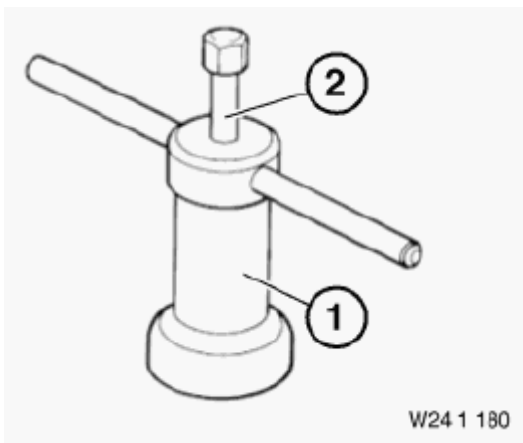


Fig. 27: Fixture (24 1 180)

Courtesy of BMW OF NORTH AMERICA, INC.

24 1 190 DRIFT

Minimum set: Mechanical tools

In conjunction with: 00 5 500

Note: For fitting rotary shaft seal in front section of transmission casing

Transmission: A5S 310Z

Storage location: B28

SI number: 1 09 90(282)

Order number: 24 1 190

Drift

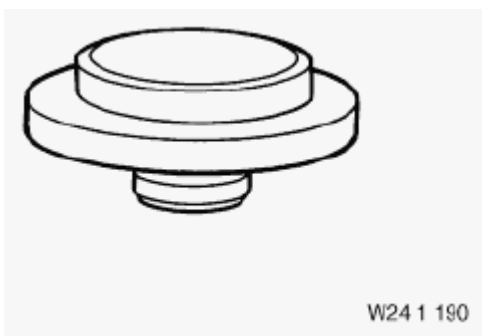


Fig. 28: Drift (24 1 190)

Courtesy of BMW OF NORTH AMERICA, INC.

24 1 200 INSTALLATION SLEEVE

Minimum set: Mechanical tools

Note: For preventing damage to rotary shaft seal while fitting on gearshift shaft

Transmission: A5S 310Z

Storage location: B18

SI number: 1 09 90(282)

Order number: 24 1 200

Installation sleeve



Fig. 29: Installation Sleeve (24 1 200)

Courtesy of BMW OF NORTH AMERICA, INC.

24 1 210 RETAINING PLATE FOR DISC PACKAGE

Note: Not required as from transmission No. 11 2 300

Transmission: A5S 310Z

Storage location: B22

SI number: 1 09 90(282)

Order number: 24 1 210

Retaining plate for disc package

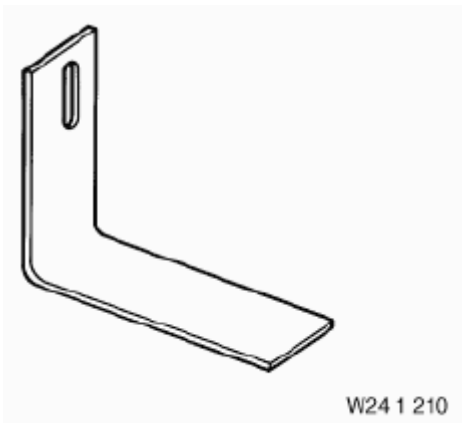


Fig. 30: Retaining Plate For Disc Package (24 1 210)
Courtesy of BMW OF NORTH AMERICA, INC.

24 1 220 TAKE-UP SUPPORT FOR DRIVE FLANGE

In conjunction with: 24 1 170 (A5S 310Z), 24 4 110 (A5S 440Z)

Note: When loosening slotted nut

Transmission: A5S 310Z, A5S 440Z

SI number: 1 09 90(282)

Order number: 24 1 220

Take-up support for drive flange

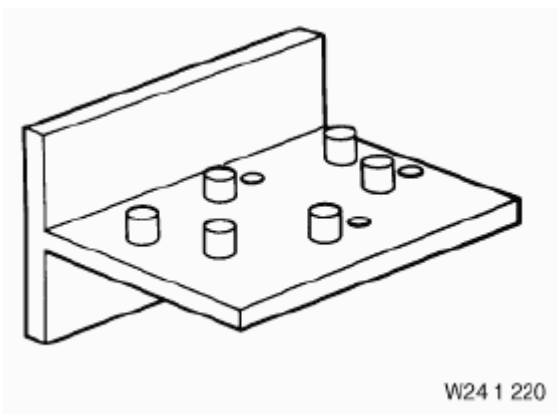


Fig. 31: Take-Up Support For Drive Flange (24 1 220)
Courtesy of BMW OF NORTH AMERICA, INC.

24 1 230 PRESSING TOOL

Note: For removing and installing piston (cover) on brake Ct

Transmission: A5S 310Z

Storage location: B20

SI number: 1 14 93(718)

Order number: 24 1 230

Pressing tool

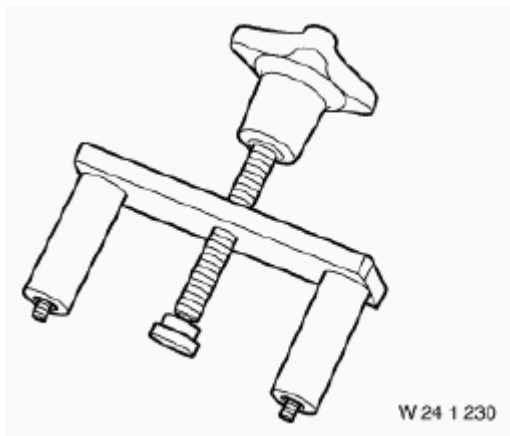


Fig. 32: Pressing Tool (24 1 230)

Courtesy of BMW OF NORTH AMERICA, INC.

24 1 240 MEASURING DEVICE

Note: For determining spacers on brake C

Transmission: A5S 310Z

Storage location: B20

SI number: 1 14 93(718)

Order number: 24 1 240

Measuring device

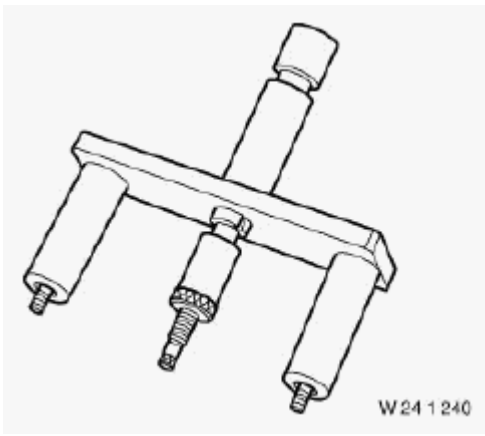


Fig. 33: Measuring Device (24 1 240)

Courtesy of BMW OF NORTH AMERICA, INC.

24 1 250 LIFTING GEAR

Note: For removing and installing brake clutch unit D/G incl. sprag wheel

Transmission: A5S 310Z

Storage location: B11, C11

SI number: 1 14 93(718)

Order number: 24 1 250

Lifting gear

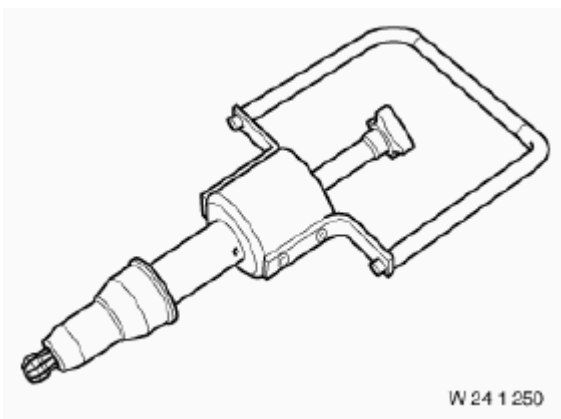


Fig. 34: Lifting Gear (24 1 250)

Courtesy of BMW OF NORTH AMERICA, INC.

24 1 260 REMOVAL AND MOUNTING FIXTURE

Note: For removing and installing cylinder D/E with planetary gear train

Transmission: A5S 560Z

Storage location: C1, C2

SI number: 1 01 95(892)

Order number: 24 1 260

Removal and mounting fixture

Consisting of:

1 = 24 1 261 Handle

2 = 24 1 262 Spindle with knurled nut

3 = 24 1 263 Centering bush

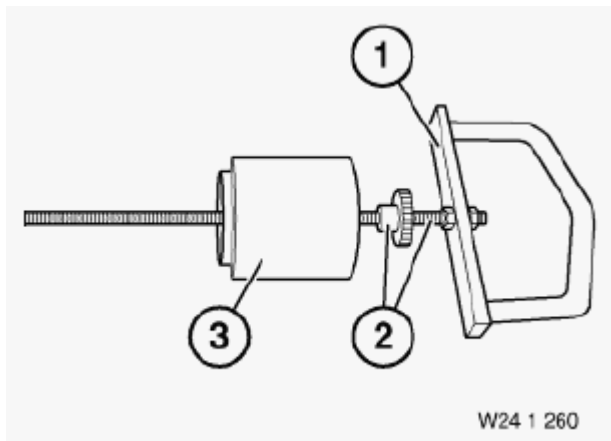


Fig. 35: Removal And Mounting Fixture (24 1 260)
Courtesy of BMW OF NORTH AMERICA, INC.

24 1 270 REMOVAL AND MOUNTING FIXTURE

Note: For removing and installing clutch A/B/C

Transmission: A5S 560Z

Storage location: B14, B15, B3

SI number: 1 01 95(892)

Order number: 24 1 270

Removal and mounting fixture

Consisting of:

1 = 24 1 271 Lifting tube with eye bolt

2 = 24 1 272 Lock pin

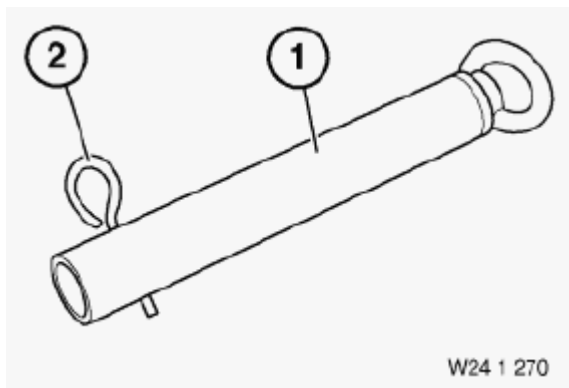


Fig. 36: Removal And Mounting Fixture (24 1 270)
Courtesy of BMW OF NORTH AMERICA, INC.

24 1 280 REMOVAL AND MOUNTING FIXTURE

Note: For removing and installing brake clutch F

Transmission: A5S 560Z

Storage location: C20

SI number: 1 01 95(892)

Order number: 24 1 280

Removal and mounting fixture

Consisting of:

1 = 24 1 281 Handle with spindle

2 = 24 1 282 Knurled nut

3 = 24 1 283 Centering handle

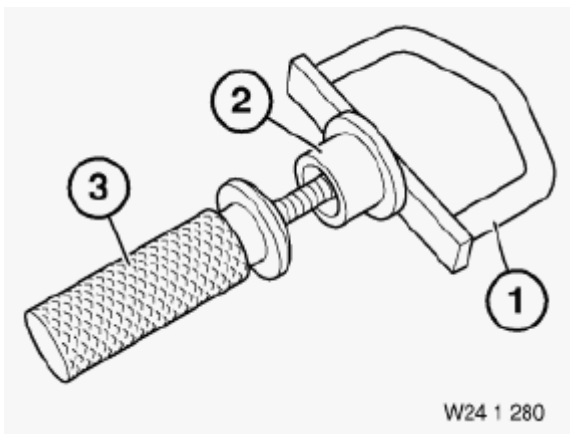


Fig. 37: Removal And Mounting Fixture (24 1 280)
Courtesy of BMW OF NORTH AMERICA, INC.

24 1 290 WEDGES

Note: For fixing disc pack C in position while securing retainer tabs

Transmission: A5S 560Z

Storage location: C17

SI number: 1 01 95(892)

Order number: 24 1 290

Wedges

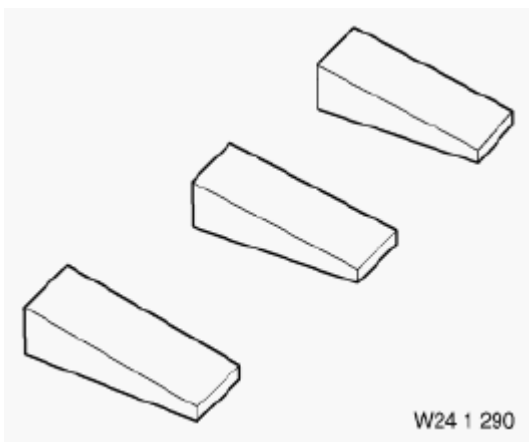


Fig. 38: Wedges (24 1 290)
Courtesy of BMW OF NORTH AMERICA, INC.

24 1 300 IMPACT TOOL

Note: For securing retainer tabs on disc pack C

Transmission: A5S 560Z

Storage location: C17

SI number: 1 01 95(892)

Order number: 24 1 300

Impact tool

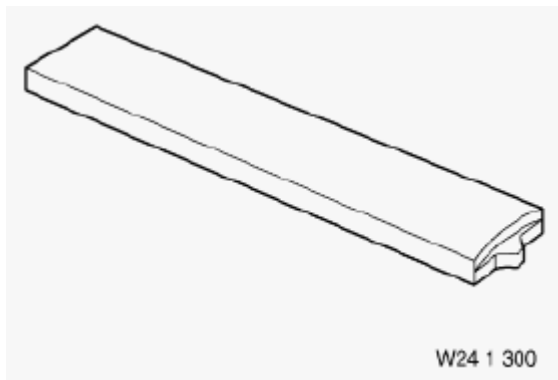


Fig. 39: Impact Tool (24 1 300)

Courtesy of BMW OF NORTH AMERICA, INC.

24 1 310 RELEASING TOOL

Note: For releasing retainer tabs on disc pack C

Transmission: A5S 560Z

Storage location: C2

SI number: 1 01 95(892)

Order number: 24 1 310

Releasing tool

Consisting of:

1 = 24 1 311 Profile section (slide)

2 = 24 1 312 Basic body

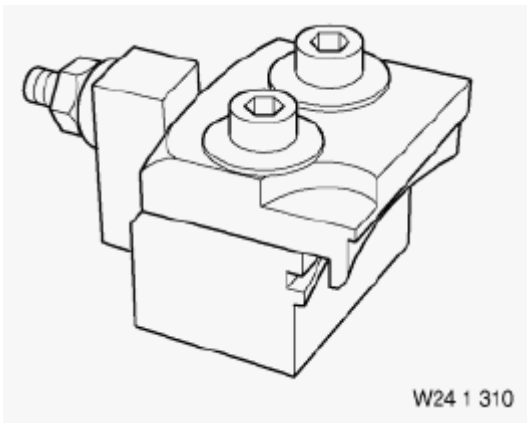


Fig. 40: Releasing Tool (24 1 310)

Courtesy of BMW OF NORTH AMERICA, INC.

24 2 020 TOOL

Note: For compressing disc spring

Transmission: 4 HP 22, 4 HP 24

Storage location: C32

Order number: 24 2 020

Tool

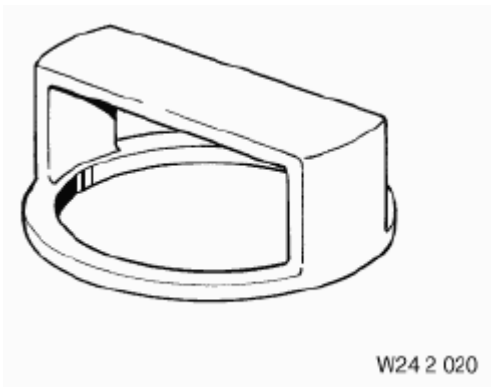


Fig. 41: Tool (24 2 020)

Courtesy of BMW OF NORTH AMERICA, INC.

24 2 030 TOOL

Note: For compressing disc spring

Transmission: 3 HP 20, 3 HP 22, 4 HP 22, 4 HP 24

Storage location: C32

Order number: 24 2 030

Tool

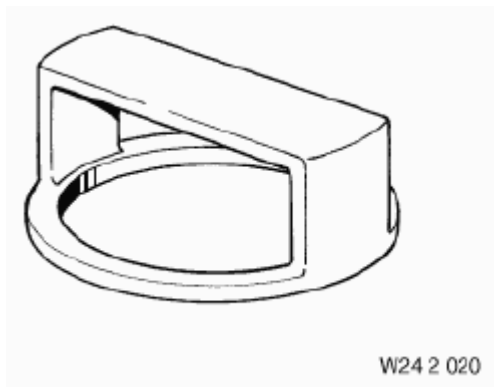


Fig. 42: Tool (24 2 020)

Courtesy of BMW OF NORTH AMERICA, INC.

24 2 040 TOOL

Note: For compressing disc spring

Transmission: 3 HP 12, 3 HP 20, 3 HP 22, 4 HP 22, 4 HP 24

Storage location: C32

Order number: 24 2 040

Tool

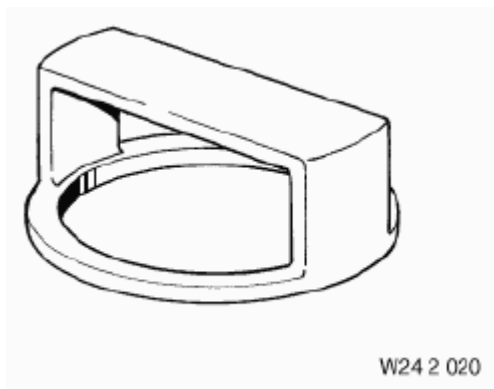


Fig. 43: Tool (24 2 020)

Courtesy of BMW OF NORTH AMERICA, INC.

24 2 050 EXTRACTOR GRIP

Note: For sealing plugs in transmission case lower section / Replaced by 24 0 050

Order number: 24 2 050

Extractor grip

24 2 140 TENSIONING TOOL

Note: For removing and installing snap ring in front of centering plate of ZF transmissions

Transmission: 3 HP 12, 3 HP 20, 3 HP 22

Order number: 24 2 140

Tensioning tool

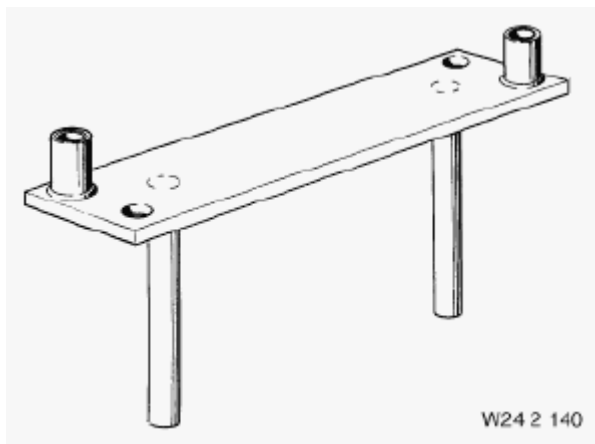


Fig. 44: Tensioning Tool (24 2 140)

Courtesy of BMW OF NORTH AMERICA, INC.

24 2 310 TOOL KIT FOR REMOVING AND INSTALLING REVERSE GEAR PISTON

Note: For disassembling and assembling transmission for "Sealing intermediate plate" job

Transmission: A4S 270R, A4S 310R

SI number: 1 22 97(239)

Order number: 24 2 310

Tool kit for removing and installing reverse gear piston

Consisting of:

1 = 24 2 311 Pressure plate

Note: For removing and installing spring retainer

2 = 24 2 312 Spindle with pressure plate

Note: Spindle M14x1.5, nut M14, pressure plate and washer / For removing and installing spring retainer

3 = 24 2 313 Guide pin (2)

Note: For fixing gaskets and intermediate plates on intermediate housing

4 = 24 2 314 Slip bush

Note: For removing piston in cylinder of intermediate plate

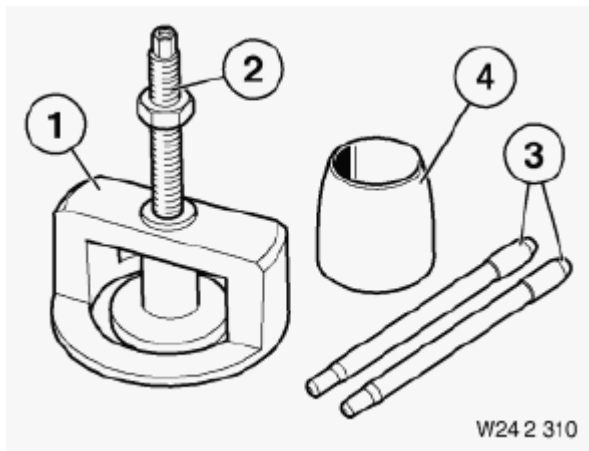


Fig. 45: Tool Kit For Removing And Installing Reverse Gear Piston (24 2 310)
Courtesy of BMW OF NORTH AMERICA, INC.

24 2 320 BOX SPANNER

In conjunction with: 24 2 330

Note: For 3/16" socket head cap screw with 1/4" socket for adjusting brake band

Transmission: A4S 270R, A4S 310R

SI number: 1 24 97(257)

Order number: 24 2 320

Box spanner

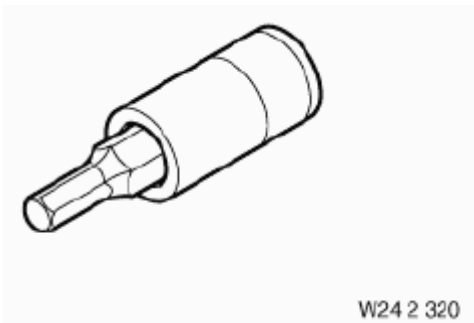


Fig. 46: Box Spanner (24 2 320)
Courtesy of BMW OF NORTH AMERICA, INC.

24 2 330 1/2" OPEN-ENDED SPANNER

In conjunction with: 24 2 320

Note: For adjusting brake band

Transmission: A4S 270R, A4S 310R

SI number: 1 24 97(257)

Order number: 24 2 330

1/2" open-ended spanner



Fig. 47: 1/2" Open-Ended Spanner (24 2 330)
Courtesy of BMW OF NORTH AMERICA, INC.

24 3 040 GAUGE

Note: For adjusting restrictor piston when installing gearshift unit

Transmission: 3 HP 12, 3 HP 20, 3 HP 22

Order number: 24 3 040

Gauge

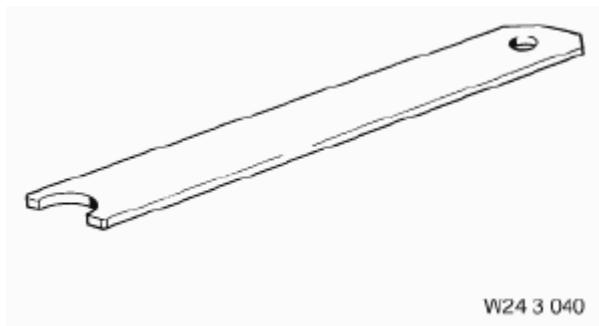


Fig. 48: Gauge (24 3 040)

Courtesy of BMW OF NORTH AMERICA, INC.

24 3 050 GAUGE

Note: For aligning hydraulic gearshift unit in transmission

Transmission: 3 HP 20, 3 HP 22, 4 HP 22, 4 HP 24

Order number: 24 3 050

Gauge

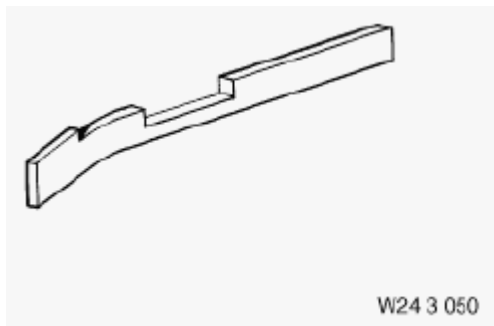


Fig. 49: Gauge (24 3 050)

Courtesy of BMW OF NORTH AMERICA, INC.

24 3 140 DRIVE BUSH

Note: For checking smooth movement of oil pump

Transmission: 3 HP 12, 3 HP 20, 3 HP 22, 4 HP 22, 4 HP 24, A5S 560Z

Storage location: A20

Order number: 24 3 140

Drive bush

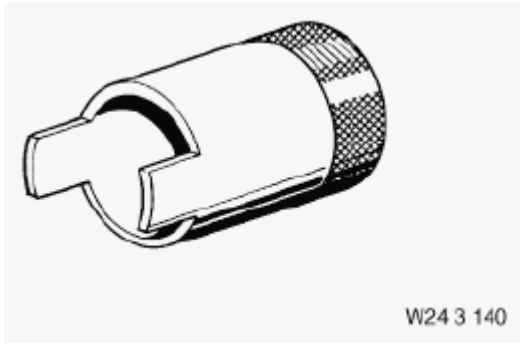


Fig. 50: Drive Bush (24 3 140)

Courtesy of BMW OF NORTH AMERICA, INC.

24 3 150 DRIVE BUSH

Note: For checking smooth movement of oil pump

Transmission: 3 HP 20, 3 HP 22

Storage location: A20

Order number: 24 3 150

Drive bush

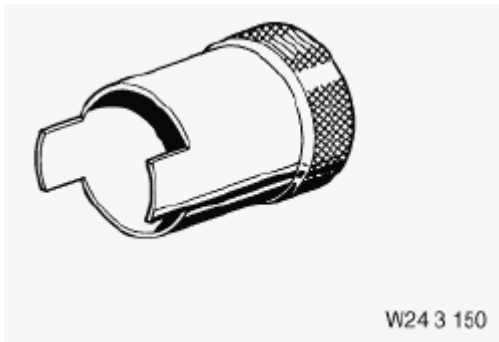


Fig. 51: Drive Bush (24 3 150)

Courtesy of BMW OF NORTH AMERICA, INC.

24 4 000 ASSEMBLY GRIP (2)

Minimum set: Mechanical tools

Note: For removing and installing torque converter

Transmission: A4S 200R, A4S 270R, A4S 310R, A5S 300J, A5S 310Z, A5S 325Z, A5S 360R, A5S 390G, A5S 390R, A5S 440Z, A5S 560Z, GA6 HP19Z, GA6 HP26Z, GA6 HP32Z

Storage location: C18

Order number: 24 4 000

Assembly grip (2)

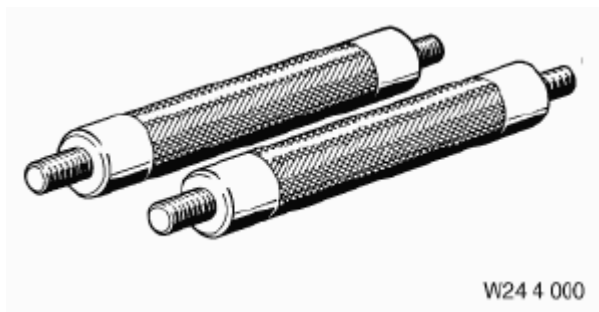


Fig. 52: Assembly Grip (24 4 000)

Courtesy of BMW OF NORTH AMERICA, INC.

24 4 070 FIXTURE

Note: For checking torque converter for leaks

Transmission: 3 HP 20, 3 HP 22, 4 HP 22

Order number: 24 4 070

Fixture

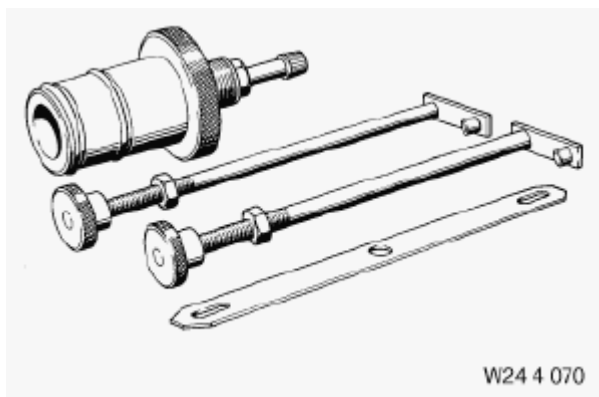


Fig. 53: Fixture (24 4 070)

Courtesy of BMW OF NORTH AMERICA, INC.

24 4 080 FIXTURE

Note: For firmly holding torque converter in position while removing and installing transmission

Transmission: 4 HP 22, 4 HP 24

Storage location: Single

Order number: 24 4 080

Fixture

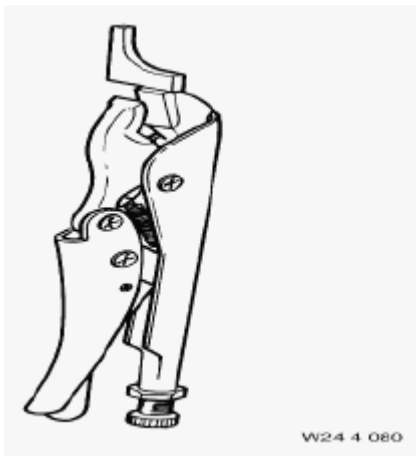


Fig. 54: Fixture (24 4 080)

Courtesy of BMW OF NORTH AMERICA, INC.

24 4 090 DRIFT

Minimum set: Mechanical tools

In conjunction with: 00 5 500

Note: For fitting rotary shaft seal on output end

Transmission: A5S 440Z, A5S 560Z

Storage location: B28

SI number: 1 06 92(509)

Order number: 24 4 090

Drift

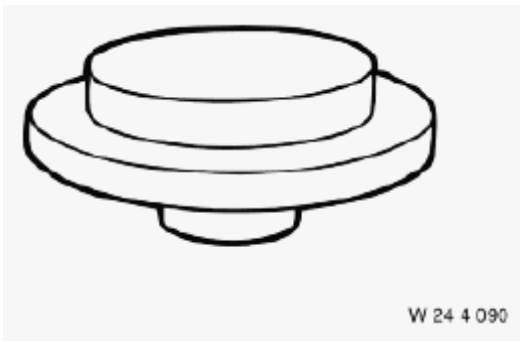


Fig. 55: Drift (24 4 090)

Courtesy of BMW OF NORTH AMERICA, INC.

24 4 100 DRIFT

Minimum set: Mechanical tools

Note: For fitting rotary shaft seal on drive side (behind converter)

Transmission: A5S 440Z, A5S 560Z

Storage location: C29

SI number: 1 06 92(509)

Order number: 24 4 100

Drift

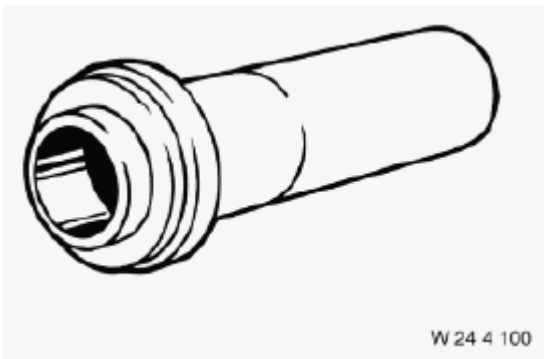


Fig. 56: Drift (24 4 100)

Courtesy of BMW OF NORTH AMERICA, INC.

24 4 110 SPANNER

Minimum set: Mechanical tools

Note: For releasing and tightening slotted nut on output flange

Transmission: A5S 440Z, A5S 560Z

Storage location: A23

SI number: 1 06 92(509)

Order number: 24 4 110

Spanner

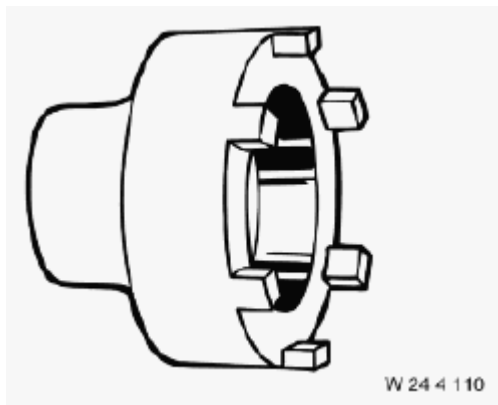


Fig. 57: Spanner (24 4 110)

Courtesy of BMW OF NORTH AMERICA, INC.

24 4 120 FIXTURE

Note: For firmly holding torque converter in position while removing and installing transmission.

Replaced by 24 4 130.

Order number: 24 4 120

Fixture

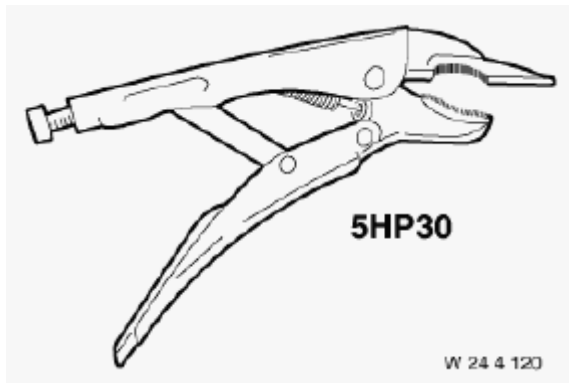


Fig. 58: Fixture (24 4 120)

Courtesy of BMW OF NORTH AMERICA, INC.

24 4 130 LOCATING TOOL

Minimum set: Mechanical tools

Note: For firmly holding torque converter in position while removing and installing transmission

Transmission: A4S 310R, A5S 300J, A5S 310Z, A5S 325Z, A5S 360R, A5S 390G, A5S 440Z, A5S 560Z, GA6 HP26Z

Storage location: A33

SI number: 1 05 97 (181)

Order number: 24 4 130

Locating tool

Consisting of:

1 = 24 4 131 Base unit

2 = 24 4 132 Blade

Note: Transmission: A5S 440Z, GA6HP26Z (N62)

3 = 24 4 133 Blade

Note: Transmission: A4S 310R and A5S 390G

4 = 24 4 134 Blade

Note: Transmission: A5S 310Z, A5S 560Z, A5S 300J and A5S 325Z

5 = 24 4 135 Blade

Note: Transmission: A5S 560Z, GA6 HP26Z (M67), GA6 HP32Z (N73)

6 = 24 4 136 Counter plate

7 = 24 4 137 Blade

Note: Transmission: A5S 360R

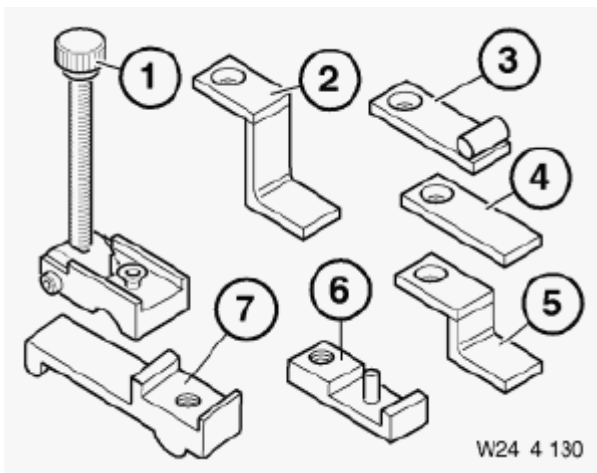


Fig. 59: Locating Tool (24 4 130)

Courtesy of BMW OF NORTH AMERICA, INC.

24 4 160 SUPPORT BRACKET

Minimum set: Mechanical tools

Note: For securing converter during removal and installation of transmission

Series: E53, E60, E61, E63, E64, E65, E66, E67, E70, E83, E85, E87, E90, E92, RR1

Transmission: GA6 HP19Z, GA6 HP26Z, GA6 HP32Z

Storage location: A47, C46

SI number: 1 11 02 (908)

Order number: 24 4 160

Support bracket

Consisting of:

1 = 24 4 161 Basic body

2 = 24 4 162 Shaped section

Note: For converter variant N73

3 = 24 4 163 Shaped section

Note: For converter variant M57TU

4 = 24 4 164 Shaped section

Note: For converter variant M54

5 = 24 4 165 Shaped section

Note: Transmission: GA6 HP19 in E87, E90

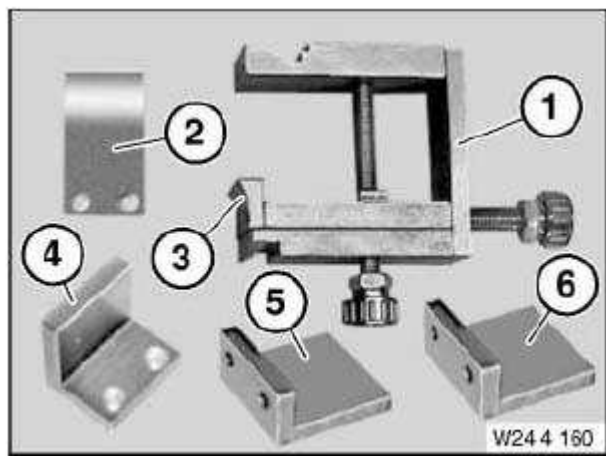


Fig. 60: Support Bracket (24 4 160)

Courtesy of BMW OF NORTH AMERICA, INC.

24 4 200 DRIFT AND SLIP BUSH

Minimum set: Mechanical tools

Note: For driving in shaft seal on drive shaft.

Transmission: GACVT16Z

Order number: 24 4 200

Drift and slip bush

Consisting of:

1 = 24 4 201 Drift

2 = 24 4 202 Slip bush



Fig. 61: Drift And Slip Bush (24 4 200)

Courtesy of BMW OF NORTH AMERICA, INC.

24 4 210 SOCKET WAF 46

Note: For releasing and tightening down output shaft screw/bolt (bearing side).

Transmission: GACVT16Z

SI number: 1 09 05 (188)

Order number: 24 4 210

Socket WAF 46



Fig. 62: Socket WAF 46 (24 4 210)

Courtesy of BMW OF NORTH AMERICA, INC.

24 4 220 EXTRACTOR

Note: For removing primary bearing on drive shaft.

Transmission: GACVT16Z

SI number: 1 09 05 (188)

Order number: 24 4 220

Extractor

Consisting of:

1 = 24 4 221 Basic body

2 = 24 4 222 Claws (2 x)

3 = 24 4 223 Thrust piece

4 = 24 4 224 Ring

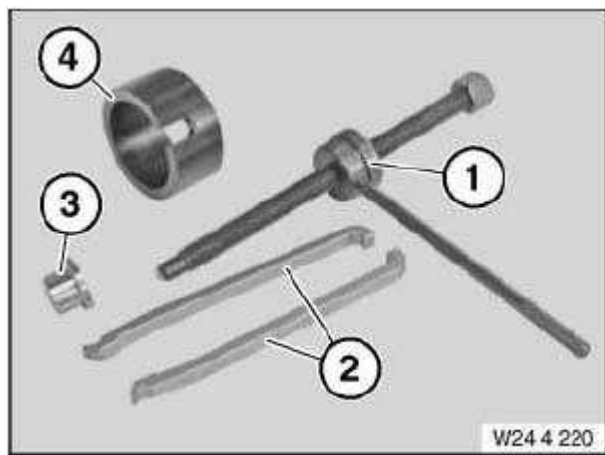


Fig. 63: Extractor (24 4 220)

Courtesy of BMW OF NORTH AMERICA, INC.

24 4 230 DRIFT

Note: For driving in primary bearing on drive shaft.

Transmission: GACVT16Z

SI number: 1 09 05 (188)

Order number: 24 4 230

Drift



Fig. 64: Drift (24 4 230)

Courtesy of BMW OF NORTH AMERICA, INC.

24 5 120 TOOL

Note: For centering converter bell housing with respect to oil pump during assembly

Transmission: A4S 270R, A4S 310R

Storage location: B2

SI number: 1 04 95(906)

Order number: 24 5 120

Tool

Consisting of:

1 = 24 5 121 Centering bush

2 = 24 5 122 Centering pin (3)

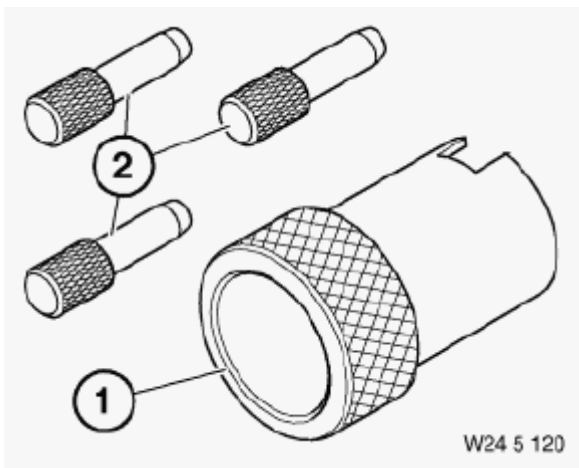


Fig. 65: Tool (24 5 120)

Courtesy of BMW OF NORTH AMERICA, INC.

24 5 140 CENTERING PIN

Note: For transfer plate and gasket to shift unit (2 x)

Transmission: A4S 310R

Order number: 24 5 140

Centering pin

24 5 150 CENTERING PIN WITH THREAD (2)

Note: For centering gearshift unit in transmission during assembly

Transmission: A4S 270R, A4S 310R

Storage location: A2

SI number: 1 03 90(184)

Order number: 24 5 150

Centering pin with thread (2)



Fig. 66: Centering Pin With Thread (24 5 150)
Courtesy of BMW OF NORTH AMERICA, INC.

24 5 160 CENTERING PINS

Note: For centering main housing with respect to intermediate and converter housing (2)

Transmission: A4S 270R, A4S 310R

Storage location: A2, B2

SI number: 1 03 93(663)

Order number: 24 5 160

Centering pins

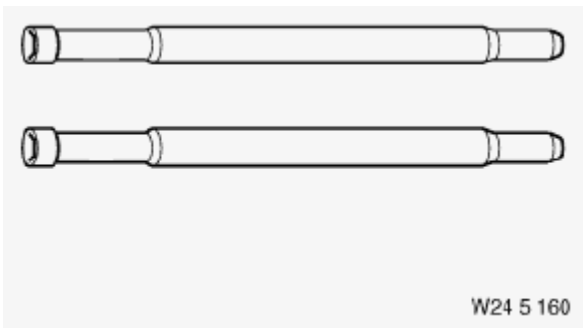


Fig. 67: Centering Pins (24 5 160)
Courtesy of BMW OF NORTH AMERICA, INC.

24 5 190 ADAPTER

In conjunction with: 13 3 061, 13 3 067, 24 0 021, 24 0 023, 24 0 140

Note: For pressure gauge 13 3 061 for checking oil pressure in transmission

Transmission: A4S 270R, A4S 310R

Storage location: C20

SI number: 1 03 90(184)

Order number: 24 5 190

Adapter

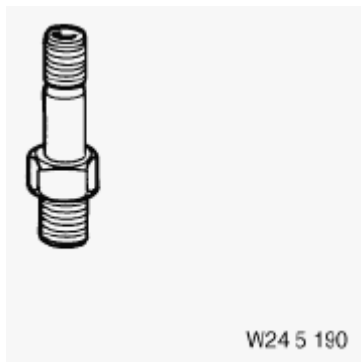


Fig. 68: Adapter (24 5 190)

Courtesy of BMW OF NORTH AMERICA, INC.

24 5 200 IMPACT BUSH

Note: For driving in radial seal of selector lever shaft / Replaced by 24 5 360

Transmission: A4S 270R, A4S 310R

SI number: 1 03 90 (184)

Order number: 24 5 200

Impact bush

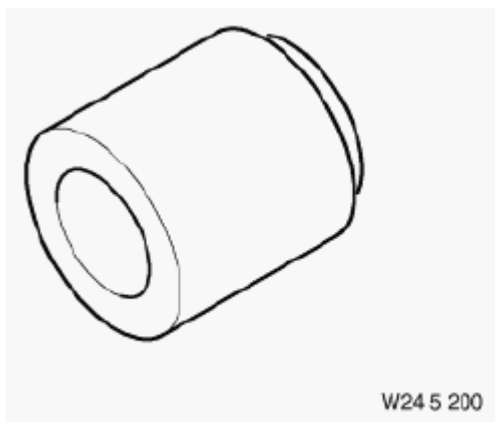


Fig. 69: Impact Bush (24 5 200)

Courtesy of BMW OF NORTH AMERICA, INC.

24 5 210 HOLDER

Note: For loosening and tightening gearshift cable

Transmission: 4 HP 22, 4 HP 24, A4S 270R, A4S 310R, A5S 310Z

Storage location: B19

SI number: 1 04 91(372)

Order number: 24 5 210

Holder

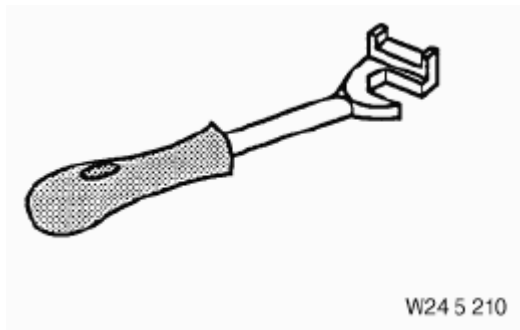


Fig. 70: Holder (24 5 210)

Courtesy of BMW OF NORTH AMERICA, INC.

24 5 220 HOLDER

Note: For loosening and tightening gearshift cable

Transmission: A5S 300J, A5S 310Z

Storage location: B19

SI number: 1 04 91(372)

Order number: 24 5 220

Holder

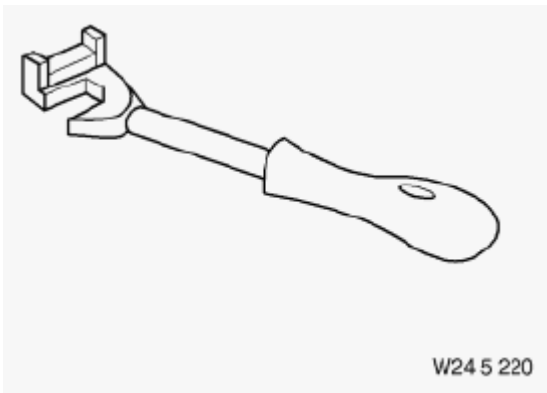


Fig. 71: Holder (24 5 220)

Courtesy of BMW OF NORTH AMERICA, INC.

24 5 230 ASSEMBLY RING

Minimum set: Mechanical tools

Note: For fitting rotary shaft seal on gearshift shaft

Transmission: 4 HP 22, 4 HP 24, A5S 310Z

Storage location: B19

SI number: 1 04 91(372)

Order number: 24 5 230

Assembly ring

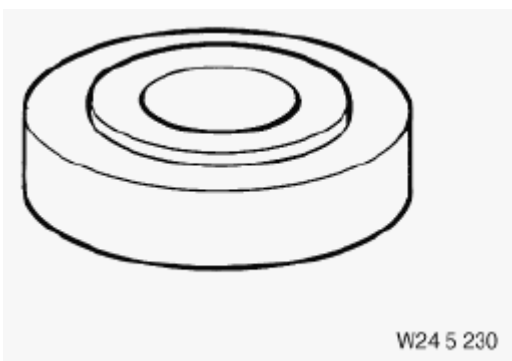


Fig. 72: Assembly Ring (24 5 230)

Courtesy of BMW OF NORTH AMERICA, INC.

24 5 240 HOLDER

Note: For releasing and tightening gearshift cable / transmission with position switch

Transmission: A5S 310Z, A5S 560Z

Storage location: B19

SI number: 1 06 92(509)

Order number: 24 5 240

Holder

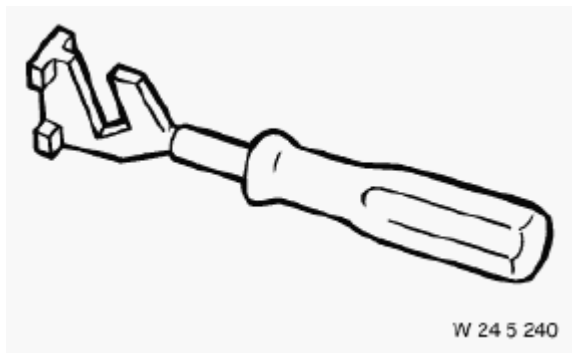


Fig. 73: Holder (24 5 240)

Courtesy of BMW OF NORTH AMERICA, INC.

24 5 250 BUSH

Minimum set: Mechanical tools

In conjunction with: 24 5 490

Note: For fitting rotary shaft seal on selector shaft

Transmission: A5S 310Z, A5S 560Z

Storage location: B19

SI number: 1 02 95(896)

Order number: 24 5 250

Bush

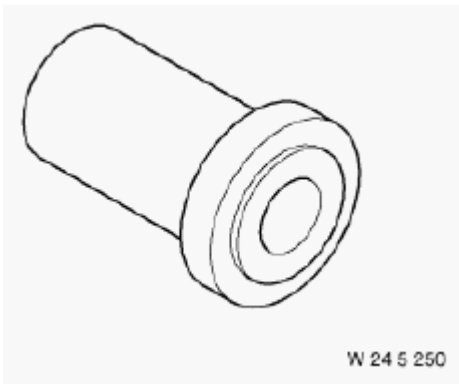


Fig. 74: Bush (24 5 250)

Courtesy of BMW OF NORTH AMERICA, INC.

24 5 260 EXTRACTOR TOOL

Minimum set: Mechanical tools

Note: For removing rotary shaft seal of selector shaft / transmission with position switch

Transmission: A5S 310Z, A5S 440Z, A5S 560Z

Storage location: B19

SI number: 1 02 95 (896)

Order number: 24 5 260

Extractor tool

Consisting of:

1 = 24 5 261 Insert

2 = 24 5 262 Bushing

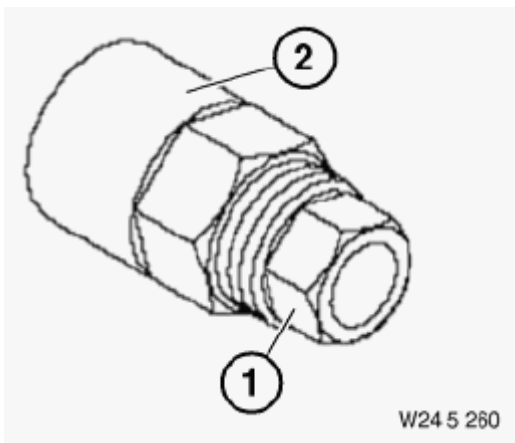


Fig. 75: Extractor Tool (24 5 260)

Courtesy of BMW OF NORTH AMERICA, INC.

24 5 270 BUSH

Minimum set: Mechanical tools

In conjunction with: 24 5 490

Note: For fitting rotary shaft seal on selector shaft

Transmission: A5S 440Z

Storage location: B18

SI number: 1 08 96(080)

Order number: 24 5 270

Bush

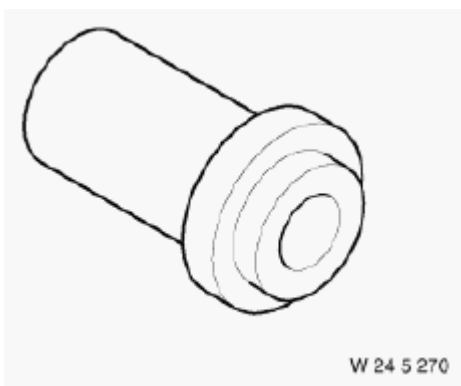


Fig. 76: Bush (24 5 270)

Courtesy of BMW OF NORTH AMERICA, INC.

24 5 350 TAKE-UP SUPPORT FOR AUTOMATIC TRANSMISSION

Note: Miscellaneous: Japan and South Africa only

Transmission: A5S 300J

Order number: 24 5 350

Take-up support for automatic transmission

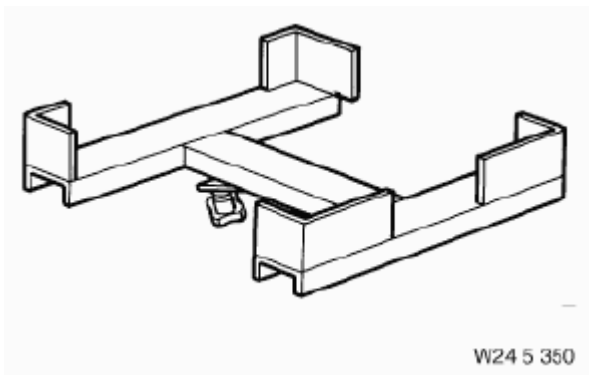


Fig. 77: Take-Up Support For Automatic Transmission (24 5 350)
Courtesy of BMW OF NORTH AMERICA, INC.

24 5 400 DRIFT

In conjunction with: 00 5 500

Note: For drive shaft seal.

Transmission: GACVT16Z

Order number: 24 5 400

Drift

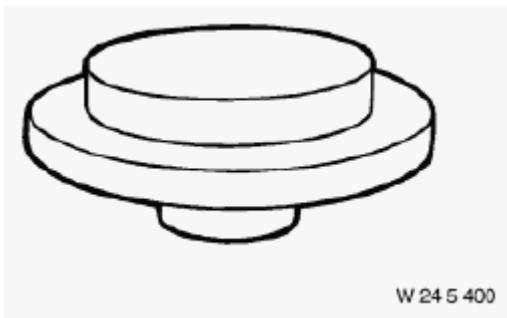


Fig. 78: Drift (24 5 400)
Courtesy of BMW OF NORTH AMERICA, INC.

24 5 490 SLIP SLEEVE (5)

Minimum set: Mechanical tools

Note: For preventing damage to rotary shaft seal while fitting on gearshift shaft

Transmission: A5S 310Z, A5S 440Z, A5S 560Z

SI number: 1 02 95 (896)

Order number: 24 5 490

Slip sleeve (5)

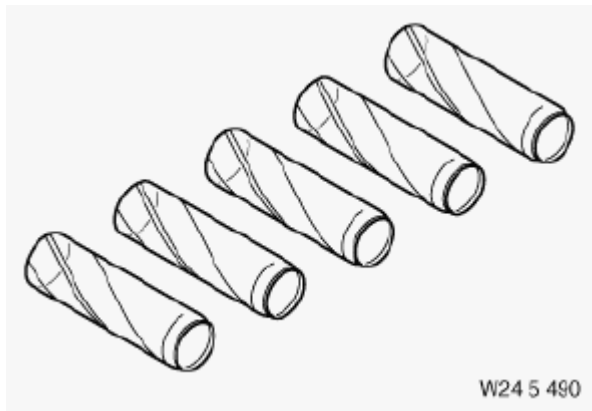


Fig. 79: Slip Sleeve (5) (24 5 490)

Courtesy of BMW OF NORTH AMERICA, INC.

24 6 000 TEST CABLE, 8-PIN

In conjunction with: Test box 88 -pin 614410

Note: For automatic transmission (EH transmission)

Transmission: 4 HP 22, 4 HP 24

Storage location: A 101

SI number: 2 03 91 (313)

Order number: 24 6 000

Test cable, 8-pin



Fig. 80: Test Cable, 8-Pin (24 6 000)
Courtesy of BMW OF NORTH AMERICA, INC.

24 6 010 TEST CABLE, 9-PIN

In conjunction with: Test box 88 -pin 614410

Note: For automatic transmission (EH transmission)

Transmission: A4S 270R, A4S 310R

Storage location: A 102

SI number: 2 03 91 (313)

Order number: 24 6 010

Test cable, 9-pin



Fig. 81: Test Cable, 9-Pin (24 6 010)
Courtesy of BMW OF NORTH AMERICA, INC.

24 6 020 TEST CABLE, 14-PIN

In conjunction with: Test box 88 -pin 614410

Note: For automatic transmission (EH transmission)

Transmission: A5S 310Z

Storage location: A 103

SI number: 0 02 99 (399)

Order number: 24 6 020

Test cable, 14-pin

Consisting of:

24 6 029 Operating instructions



Fig. 82: Test Cable, 14-Pin (24 6 020)

Courtesy of BMW OF NORTH AMERICA, INC.

24 6 060 TEST CABLE, 16-PIN

Note: For automatic transmission (EH transmission)

Transmission: A5S 310Z, A5S 560Z

Storage location: A 106

SI number: 2 02 93 (650)

Order number: 24 6 060

Test cable, 16-pin

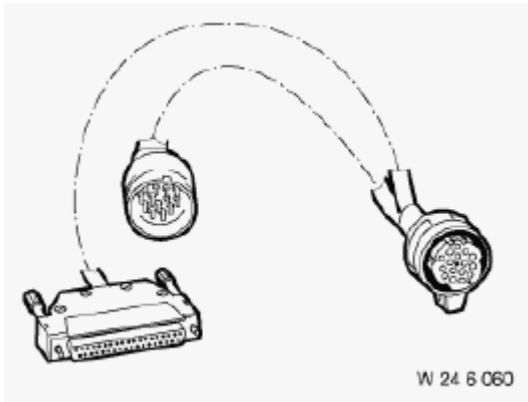


Fig. 83: Test Cable, 16-Pin (24 6 060)

Courtesy of BMW OF NORTH AMERICA, INC.

24 6 070 TEST CABLE, 20-PIN

Minimum set: Measuring and testing equipment

In conjunction with: 61 1 459

Note: For automatic transmission GM5

Transmission: A5S 360R

Storage location: A 107

SI number: 2 01 99 (468)

Order number: 24 6 070

Test cable, 20-pin

24 6 080 TEST LEAD, 16-PIN

Minimum set: Measuring and testing equipment

In conjunction with: 61 1 459

Transmission: GA6 HP26Z

Storage location: L204

SI number: 2 06 01 (763)

Order number: 24 6 080

Test lead, 16-pin

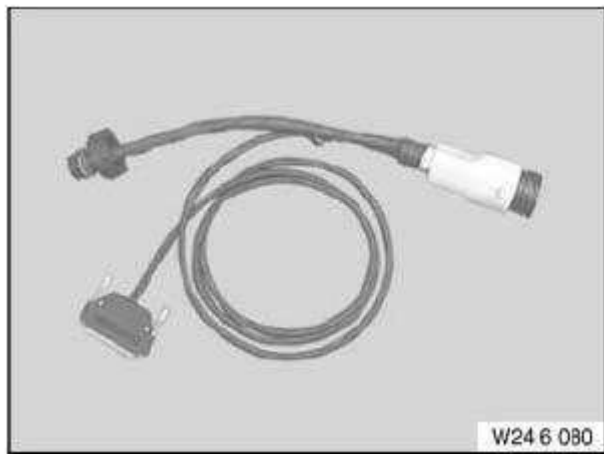


Fig. 84: Test Lead, 16-Pin (24 6 080)

Courtesy of BMW OF NORTH AMERICA, INC.

24 8 100 ADAPTER

Minimum set: Mechanical tools

Note: For filling automatic transmission

Transmission: GACVT16Z

SI number: 1 05 01 (718)

Order number: 24 8 100

Adapter



Fig. 85: Adapter (24 8 100)

Courtesy of BMW OF NORTH AMERICA, INC.

24 8 110 DRIFT

Minimum set: Mechanical tools

In conjunction with: 00 5 500

Note: For driving shaft seal onto drive flange

Transmission: GACVT16Z

SI number: 1 02 02 (823)

Order number: 24 8 110

Drift



Fig. 86: Drift (24 8 110)

Courtesy of BMW OF NORTH AMERICA, INC.

24 8 120 RUBBER PROFILE

Minimum set: Mechanical tools

Note: For protecting shaft seal in transmission when installing output shafts.

Transmission: GACVT16Z, GS5-65BH, GS6-85BG, GS6-85DG

SI number: 1 02 02 (823)

Order number: 24 8 120

Rubber profile



Fig. 87: Rubber Profile (24 8 120)

Courtesy of BMW OF NORTH AMERICA, INC.

24 8 130 DRIFT

In conjunction with: 00 5 550

Note: For driving in shaft seal on input shaft. Transmission: CVT automatic transmission Replaced by 24 4 200

Transmission: GACVT16Z

SI number: 1 02 02 (823)

Order number: 24 8 130

Drift



Fig. 88: Drift (24 8 130)

Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION

Automatic Transmission - Technical Data - X3

00 TRANSMISSION ASSEMBLY

24 00 TRANSMISSION IN GENERAL E83 GA5R390R

TECHNICAL DATA - TRANSMISSION GENERAL E83 GA5R390R

Manual shift		
1st gear		3.24
2nd gear		2.22
3rd gear		1.60
4th gear		1.00
5th gear		0.75
6th gear		
Reverse gear		3.03
Total oil volume (transmission and torque converter drained)	approx. ltr.	9.0

TRANSMISSION

Automatic Transmission - Tightening Torques - X3

00 TRANSMISSION ASSEMBLY

24 00 TRANSMISSION IN GENERAL

TRANSMISSION IN GENERAL - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Transmission to engine				
Hex screws	A4S 200R / A4S 270R / A4S 310R / A5S 300J / A5S 310Z / A5S 325Z / A5S 440Z / A5S 560Z / A5S 360R/A5S 390R / GA6HP19Z / GA6HP26Z / GA6HP32Z	M8		24 Nm
Hex screws	A4S 200R / A4S 270R / A4S 310R / A5S 300J / A5S 310Z / A5S 325Z / A5S 440Z / A5S 560Z / A5S 360R/A5S 390R / GA6HP19Z / GA6HP26Z / GA6HP32Z	M10		45 Nm
Hex screws	A4S 200R / A4S 270R / A4S 310R / A5S 300J / A5S 310Z / A5S 325Z / A5S 440Z / A5S 560Z / A5S 360R/A5S 390R /	M12		82 Nm

	GA6HP19Z / GA6HP26Z / GA6HP32Z			
Torx bolts	A4S 200R / A4S 270R / A4S 310R / A5S 300J / A5S 310Z / A5S 325Z / A5S 440Z / A5S 560Z / A5S 360R/A5S 390R	M8		21 Nm
Torx bolts	A4S 200R / A4S 270R / A4S 310R / A5S 300J / A5S 310Z / A5S 325Z / A5S 440Z / A5S 560Z / A5S 360R/A5S 390R	M10		42 Nm
Torx bolts	A4S 200R / A4S 70R / A4S 310R / A5S 300J / A5S 310Z / A5S 325Z / A5S 440Z / A5S 560Z / A5S 360R/A5S 390R	M12		72 Nm
Torx bolts	GA6HP19Z / GA6HP26Z	M6		9 Nm
Torx bolts	GA6HP19Z / GA6HP26Z	M8		22 Nm
Torx screws N62TU	GA6HP26Z	M8		19 Nm
Torx screws N62TU	GA6HP26Z	M10		38 Nm
Torx bolts	GA6HP19Z / GA6HP26Z	M12		73 Nm
Torx screws, steel N51/N52/N54/N47/N53/N43/N45K	GA6HP19Z / GA6L45R	M8		19 Nm
Torx screws, steel N51/N52/N54/N43/N47/N53/N52K	GA6HP19Z / GA6L45R	M12		66 Nm
2AZ Transmission to engine N51/N52/N54/N53/N52K Aluminium screws are marked blue	GA6HP19Z / GA6L45R		Replace screws Jointing torque and angle of rotation must be observed without fail	

	GA6HP19Z / GA6L45R	M10x30	Jointing torque	20 Nm
			Torque angle	90-110°
	GA6HP19Z	M10x85	Jointing torque	20 Nm
			Torque angle	180- 200°
	GA6HP19Z	M12	Jointing torque	34 Nm
			Torque angle	90-110°
	GA6HP19Z / GA6L45R	M12x76	Jointing torque	25 Nm
			Torque angle	130°
3AZ Reinforcement shell to transmission/extension	A4S 200R / A4S 270R / A4S 310R / A5S 300J / A5S 310Z / A5S 325Z / A5S 440Z / A5S 60Z / A5S 360R/A5S 390R / GA6HP19Z / GA6HP26Z / GA6HP32Z	M8		23 Nm
4AZ Cover plate for transmission	GA6HP19Z	M6		9 Nm

11 TRANSMISSION CASE, OIL SUMP

24 11 TRANSMISSION CASE, OIL SUMP

TRANSMISSION CASE, OIL SUMP - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
8AZ Oil filler pipe	3HP-22			105 Nm
	4HP-22/4HP-24/ A5S310Z			98 Nm
9AZ Plug	A4S 200R / A4S 270R / A4S 310R / A5S 300J / A5S 310Z / A5S 325Z / A5S 440Z / A5S 560Z / A5S 360R/A5S 390R / GA6HP19Z /	M18		43 Nm

	GA6HP26Z / GA6HP32Z		
10AZ Oil duct screw plugs	A5S 300J		8 Nm
	A5S310Z / A5S 560Z		15 Nm
11AZ Damper cover on transmission case	A5S 300J	M6	10 Nm
12AZ Radial shaft seal to converter housing	A4S 270R / A4S 310R / A5S 360R/A4S 360R	M4	3 Nm
13AZ Intermediate plate on intermediate housing	A4S 270R / A4S 310R	5/16 inch	25 Nm

24 11 TRANSMISSION HOUSING, TRANSMISSION OIL SUMP

TRANSMISSION HOUSING, TRANSMISSION OIL SUMP - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Transmission extension	A4s 200R / A5S 300J / A5S 310Z / A5S 325Z / A5S 440Z / A5S 560Z / A5S 390R / GA6HP19Z / GA6HP26Z / GA6HP32Z	M8		25 Nm
	A4S 270R / A4S 310R	5/16 inch		32 Nm
	A5S 360R / A4S 360R	M8		22 Nm
2AZ Guard	A4s 200R / A5S 300J / A5S 310Z / A5S 325Z / A5S 440Z / A5S 560Z / A5S 390R / GA6HP19Z / GA6HP26Z / GA6HP32Z	M6		9 Nm
3AZ Converter housing	A4s 200R / A5S 300J / A5S 310Z / A5S 325Z / A5S 440Z / A5S 560Z / A5S 390R / GA6HP19Z / GA6HP26Z / GA6HP32Z	M8		25 Nm
	4HP-22/4HP-24	M10		46 Nm

	A4S 270R / A4S310R	1/2"		42 Nm
4AZ Screw plug to intermediate plate	A4s 200R / A5S 300J / A5S 310Z / A5S 325Z / A5S 440Z / A5S 560Z / A5S 390R / GA6HP19Z / GA6HP26Z / GA6HP32Z	M10		16 Nm
	4HP-22 / 4HP-24	M14		40 Nm
	4HP-22 / 4HP-24	M20		50 Nm
	A5S 440Z	M12		23 Nm

24 11 TRANSMISSION HOUSING, TRANSMISSION OIL SUMP

TRANSMISSION HOUSING, TRANSMISSION OIL SUMP - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
5AZ Transmission oil sump	4HP-22 / 4HP-24 / A5S310Z / A5S 325Z	M6		6 Nm
	A5S 560Z / A5S 440Z	M6		10 Nm
	A4S 270R / A4S310R	M6		12 Nm
	A5S 360R / A4S 360R	M6		10 Nm
	A5S 300J			9 Nm
	GA6HP26Z / GA6HP19Z / GA6L45R / GA6HP32Z	M6		10 Nm
6AZ Oil drain plug	A4S 200R / A5S 310Z /	M10		16 Nm
	A5S 325Z			35 Nm
	A5S 440Z	M16x1.5		30 Nm
	A5S 560Z			50 Nm
	A5S 360R / A5S 390R	M14		18 Nm
	A4S 270R / A4S310R			25 Nm
	A5S 300J			35 Nm
	GA6L45R	M12x1.75		14 Nm
	GA6HP19Z / GA6HP26Z / GA6HP32Z	M10x1	Metal oil sump	12 Nm
	GA6HP19Z / GA6HP26Z / GA6HP32Z	M16x1.5 M24x1	Plastic oil sump	8 Nm
7AZ Oil filler plug	A5S 325Z			30 Nm
	A5S310Z / A5S 560Z			100 Nm
	A5S 440Z	M18x1.5		35 Nm
	A4S 270R / A4S310R			33 Nm
	A5S 360R / A4S 360R	M14		18 Nm

	A5S 300J		40 Nm
	GA6HP26Z / GA6HP32Z	M30x1.5	80 Nm
	GA6HP19Z / GA6HP26Z / GA6HP32Z	M18x1.5	35 Nm
	GA6L45R	M18x1.5	19 Nm

13 EXTENSION HOUSING, BEARING, SEAL

24 13 TRANSMISSION EXTENSION, BEARINGS, SEALS

TRANSMISSION EXTENSION, BEARINGS, SEALS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Slotted nut/output flange	A5S310Z / A5S 440Z / A5S 560Z / A5S 325Z			120 Nm
2AZ Double hexagon nut/output flange	GA6HP26Z / GA6HP19Z			80 Nm
3AZ Output shaft nut to output flange	GA6L45R	22x1.5		100 Nm

15 ELECTRICAL ATTACHMENTS

24 15 ELECTRICAL FITTINGS

ELECTRICAL FITTINGS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Position switch on transmission	A4S 200R / A4S 270R / A4S 310R / A5S 300J / A5S 310Z / A5S 325Z / A5S 440Z / A5S 560Z / A5S 360R / A5S 390R / GA6HP19Z / GA6HP26Z / GA6HP32Z	M6		10 Nm

21 DRIVE/INTERMEDIATE OUTPUT SHAFTS

24 21 INPUT, INTERMEDIATE AND OUTPUT SHAFTS

INPUT, INTERMEDIATE AND OUTPUT SHAFTS - TIGHTENING TORQUES

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	Type	Thread	Tightening specification	Measure
1AZ Flange nut, output flange	A5S 300J			225 Nm
Flange nut, output flange without spring washer	A5S 360R			30 Nm
Flange nut, output flange, with spring washer	A5S360R / A5S 390R / A4S 200R			60 Nm
	A4S 270R / A4S310R			100 Nm

22 PLANETARY DRIVE

24 22 PLANETARY GEAR DRIVE

PLANETARY GEAR DRIVE - TIGHTENING TORQUES

	Type	thread	tightening specification	Measure
1AZ Brake coupling D/G on gear box housing	A5S 310Z / A5S 560Z	M10		
			Insert all screws until contact is made with screw head in each case	
			center bolt	30 Nm
			both outer screws	15 Nm
			center bolt	63 Nm
			both outer screws	30 Nm
			both outer screws	63 Nm

23 RELEASE CLUTCHES

24 23 SHIFT CLUTCHES

SHIFT CLUTCHES - TIGHTENING TORQUES

	Type	thread	tightening specification	Measure
1AZ Torx screws for F clutch on transmission case	4HP-22/4HP-24	M6		10 Nm
	/ A5S 560Z	M8		23 Nm
2AZ Brake band adjusting screw	A 4 S 270 R / A 4 S 310 R	5/16"		5 Nm
3AZ Lock nut of brake band adjusting screw	A 4 S 270 R / A 4S 310 R	5/16"		21 Nm

30 HYDR/EL CONTROL COMPONENTS/ELEMENTS

24 30 HYDRAULIC / ELECTRIC CONTROL PARTS AND CONTROLLING ELEMENTS

HYDRAULIC / ELECTRIC CONTROL PARTS AND CONTROLLING ELEMENTS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Valve body to transmission	3HP-22	M6		11 Nm
	4HP-22/4HP-24/ A5S310Z / A5S 440Z / A5S 300J / A5S 325Z / GA6HP19Z / GA6HP26Z / GA6HP32Z	M6		8 Nm
	A4S 270R / A4S310R	5/16 inch		20 Nm
	A5S360R / A4S 360R	M6		11 Nm
	A5S 560Z	M6x12		6 Nm
	A5S 560Z	M6x55		8 Nm
	GA6L45R	M5Torx		8 Nm
2AZ Valve housing to valve body	A4S 200R / A4S 270R / A4S 310R / A5S 300J / A5S 310Z / A5S 310Z / A5S 440Z / A5S 560Z / A5S 360R/A5S 390R / GA6HP19Z / GA6HP26Z / GA6HP32Z	M6		5 Nm
3AZ Adapter plate on shift unit	A4S 270R / A4S310R			13 Nm
4AZ Input and output speed sensors to mechatronics		M6		12 Nm

31 OIL PUMP

24 31 PRIMARY PUMP

PRIMARY PUMP - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Oil pump to case				
	A4S 270R / A4S310R	5/16 inch		
			1st pass	10 Nm
			2nd pass	20 Nm
	A5S 560Z	M6		10 Nm

	A5S 560Z	M5		5 Nm
	A5S 300J / A5S 440Z / A5S 310Z / A5S325Z	M6		11 Nm
2AZ Oil strainer	A5S 440Z / A5S 560Z			5 Nm
	A5S310Z			6 Nm
	A5S 325Z	M6		6 Nm
	A4S 270R / A4S310R	5/16 inch		20 Nm
	A5S 300J			8 Nm
3AZ Oil pump body	A4S 270R / A4S310R	5/16 inch		20 Nm
	A5S310Z / A5S 560Z	M6		10 Nm
4AZ Oil cooler pipe adapter to transmission	A5S 300J / A4S 270R / A4S 310R			28 Nm
Hollow bolt	A5S 440Z	M18x1.5		25 Nm
Cap screw	A5S 440Z	M18x1.5		20 Nm

32 REGULATOR

24 32 GOVERNOR

GOVERNOR - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Governor flange to transmission	A4S 200R / A4S 270R / A4S 310R / A5S 300J / A5S 310Z / A5S 325Z / A5S 440Z / A5S 560Z / A5S 360R/A5S 390R / GA6HP19Z / GA6HP26Z / GA6HP32Z	M8		16 Nm
2AZ Threaded pin to centrifugal governor	A4S 200R / A4S 270R / A4S 310R / A5S 300J / A5S 310Z / A5S 325Z / A5S 440Z / A5S 560Z / A5S 360R/A5S 390R / GA6HP19Z /	M6		3 Nm

	GA6HP26Z / GA6HP32Z			
3AZ Hexagon nut to threaded pin	A4S 200R / A4S 270R / A4S 310R / A5S 300J / A5S 310Z / A5S 325Z / A5S 440Z / A5S 560Z / A5S 360R/A5S 390R / GA6HP19Z / GA6HP26Z / GA6HP32Z			10 Nm
4AZ Hexagon head screw on centrifugal governor	A4S 200R / A4S 270R / A4S 310R / A5S 300J / A5S 310Z / A5S 325Z / A5S 440Z / A5S 560Z / A5S 360R/A5S 390R / GA6HP19Z / GA6HP26Z / GA6HP32Z	M6		11 Nm
5AZ Governor housing to hub	4HP-22H	M6		11 Nm

34 SHIFT VALVES PARKING

24 34 SHIFT VALVES, PARKING LOCK

SHIFT VALVES, PARKING LOCK - TIGHTENING TORQUES

	Type	thread	tightening specification	Measure
7AZ Pulse generator, output speed	A5S 325Z			6 Nm
8AZ Pulse generator, turbine speed	A5S 325Z			8 Nm
9AZ Plug	A5S 325Z			20 Nm

24 34 SHIFT TRAVEL VALVES, PARKING LOCK

SHIFT TRAVEL VALVES, PARKING LOCK - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Pressure regulator to valve housing	4HP-22EH / 4HP-24EH / A5S310Z	M6		5 Nm
	A4S 270R / A4S310R			10 Nm
2AZ Solenoid valve to valve housing	4HP-22EH / 4HP-24EH / A5S310Z	M6		5 Nm

	A4S 270R / A4S310R			10 Nm
	A5S 560Z			6 Nm
	A5S 300J	M5		3 Nm
	A5S 300J	M6		8 Nm
3AZ Guide Plate / Parking Lock Mechanism	A5S310Z			10 Nm
	A5S 325Z			10 Nm
	A5S 560Z			23 Nm
	A5S360R / A4S 360R	M6		21 Nm
	A5S 440Z	M6		10 Nm
4AZ Pulse sender	A5S310Z / A5S 440Z	M5		5 Nm
	A5S 560Z	M5		6 Nm
		M8		23 Nm
	A5S360R / A4S 360R	M6		11 Nm
	A5S 300J	M5		6 Nm
5AZ Cover for servo piston on shift unit	A4S 270R / A4S310R	5/16 inch		25 Nm
6AZ Retaining plate for solenoid valves and pressure regulator on shift unit	A5S 440Z	M5		5 Nm
	A5S 325Z			6 Nm
7AZ Retaining plate for solenoid valves and EDS valves to hydraulic unit	GA6HP19Z / GA6HP26Z			5 Nm
8AZ Electronic module to hydraulic unit	GA6HP19Z / GA6HP26Z			8 Nm

35 WIRING HARNESS SHIFT ELEMENTS & SENSOR

24 35 WIRE HARNESS, SHIFT ELEMENTS AND SENSOR

WIRE HARNESS, SHIFT ELEMENTS AND SENSOR - TIGHTENING TORQUES

	Type	thread	tightening specification	Measure
1AZ Transmission socket to case	4HP-22EH/4 HP-24EH / A5S310Z	M26		12 Nm
	A4S 270R / A4S310R	M26		14 Nm

40 TORQUE CONVERTER

24 40 TORQUE CONVERTER

TORQUE CONVERTER - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure

1AZ Torque converter to flywheel		M8		26 Nm
	A4S 270R / A4S 310R / A5S 310Z / A5S 300J / A5S 440Z / A5S 560Z / A5S 325Z / A4S 200R / GA6HP26Z / GA6HP19Z	M10 8.8		45 Nm
	A5S360/390R	M10		45 Nm
	A5S360/390R / GA6HP19Z / GA6HP26Z / GA6HP32Z / GA6L45R	M10 10.9		56 Nm

51 EXTERNAL GEARSHIFT

24 51 EXTERNAL SHIFT LINKAGE

EXTERNAL SHIFT LINKAGE - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Selector lever on transmission	A4S 200R / A4S 270R / A4S 310R / A5S 310Z / A5S 325Z / A5S 440Z / A5S 560Z / A5S 360R / A5S 390R / GA6HP19Z / GA6HP26Z / GA6HP32Z / GA6L45R	M8x1		10 Nm
	A5S 300J	M8		15 Nm

52 INTERNAL GEARSHIFT

24 52 INTERIOR SHIFT ELEMENTS

INTERIOR SHIFT ELEMENTS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Shift segment to shaft	A4S 270R / A4S310R			22 Nm
	A5S 300J	M14x1.5		35 Nm
2AZ Detent spring on shift unit	A4S 270R / A4S310R	5/16"		25 Nm

71 TRANSMISSION MOUNTING

24 71 TRANSMISSION MOUNTS

TRANSMISSION MOUNTS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Cross member to body	E36 / E38 / E39 / E46 / E53			21 Nm
	E60 / E85 / E61 / E63 / E64 / E66 / E67 / E68 / E65 / E83 / E81 / E87 / E92 / E91 / E90 / E86	M8		19 Nm
2AZ Rubber mounts to cross member or transmission	E36 / E38 / E39 / E46 / E53			21 Nm
	E81 / E60 / E61 / E63 / E64 / E65 / E66 / E87 / E92 / E91 / E90 / E87 / E86 / E85 / E83 / E68 / E67			19 Nm
3AZ Support tube to engine subframe	E36			42 Nm
4AZ Rubber mounts to carrier pipe	E36			21 Nm
5AZ Carrier plate	E36			21 Nm
6AZ Transmission support block to transmission	E60 / E61 / E63 / E64 / E87 / E85 / E86 / E87 / E90 / E91 / E92 / E81		ASA screw	38 Nm
	E60 / E61 / E63 / E64 / E87 / E85 / E86 / E87 / E90 / E91 / E92 / E81	M10	M10 ISA pan-head screw	48 Nm
7AZ Transmission mount to transmission support bracket/transmission cross-member	E60 / E61 / E63 / E64 / E87 / E90 / E91 / E92 / E81			19 Nm

TRANSMISSION

Clutch - Operating Fluids

1.0 GENERAL INFORMATION

Brake fluid is used as an operating fluid for hydraulic clutch operation.

2.0 SMG: SEQUENTIAL MANUAL GEAR BOX

All models SMG Hydraulic Unit require the use of Pentosin CHF 11S fluid.

3.0 OTHER OPERATING FLUIDS

CLUTCH COMPONENT GREASE

Use UNIREX S2 (replaces Klueber Microlube GL 261) for the lubrication of splines on the transmission input shaft, lubricating groove of the clutch release bearing, piston rod sleeve, clutch master cylinder and front push rod of the clutch slave cylinder.

UNIREX S2 Grease BMW Part No. 83 23 9 416 138

As of 11/93 the clutch release bearings are available as a replacement part which have plastic sliding sleeves instead of aluminum. Such updated bearings should not be lubricated at all. This applies to all models with manual transmission except for 8 Series models.

TRANSMISSION

Clutch - Repair Instructions - X3

00 MAINTENANCE AND INSPECTION

21 00 006 BLEEDING CLUTCH HYDRAULIC SYSTEM

Special tools required:

- 21 5 030

Necessary preliminary tasks:

- Remove transmission underbody protection if necessary.
- Remove microfilter housing is necessary.

IMPORTANT: From 08.06 a plastic clutch slave cylinder is installed in the E8X, E9X.

Important notes on installation are described in this work step.

Unfasten nuts and remove clutch slave cylinder (pressure line remains connected).

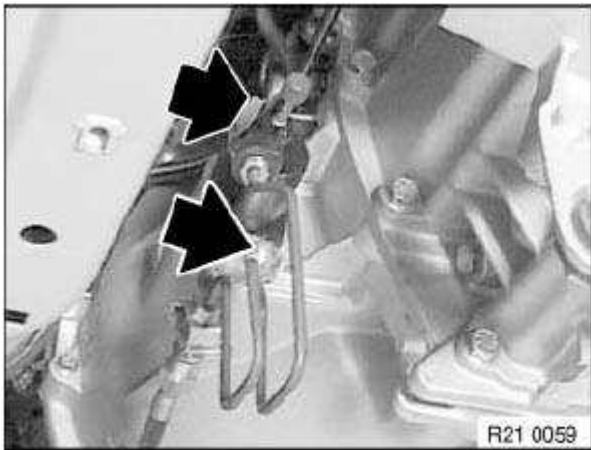


Fig. 1: Clutch Slave Cylinder Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool 21 5 030 on clutch slave cylinder (1).

Press piston rod (2) with aid of spindle completely into clutch slave cylinder.

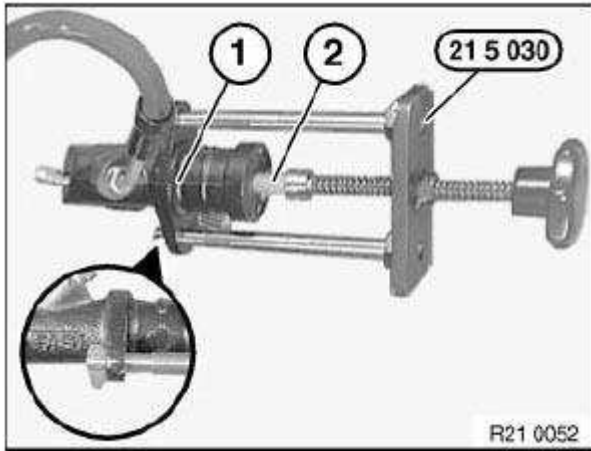


Fig. 2: Special Tool 21 5 030, Clutch Slave Cylinder And Piston Rod
Courtesy of BMW OF NORTH AMERICA, INC.

Connect bleeder unit to brake fluid expansion tank.

IMPORTANT: Check relevant Operating Instructions for each device.

Charging pressure should not exceed 2 bar.

Connect bleeder hose to bleed valve (1).

Hold clutch slave cylinder in illustrated position (refer to figure) with special tool 21 5 030 .

Open bleeder valve (1).

If bubble-free brake fluid emerges, retract piston rod (2) of clutch slave cylinder with aid of spindle a little and press in again.

If no air bubbles escape, close bleeder valve (1), otherwise repeat procedure.

IMPORTANT: Do not under any circumstances remove special tool 21 5 030 from clutch slave cylinder when brake system is pressurized.

Piston with push rod can jump out of clutch slave cylinder.

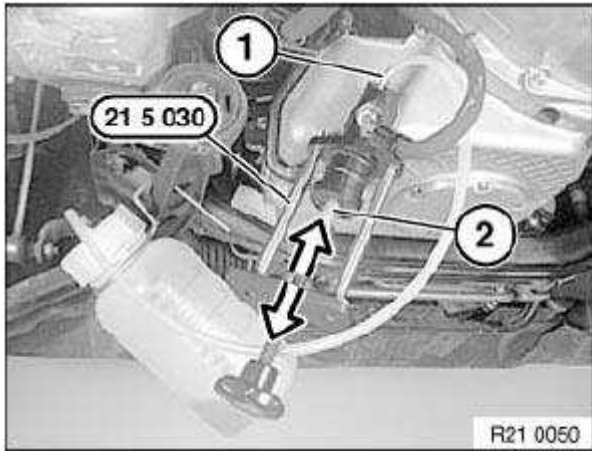


Fig. 3: Retracting Piston Rod Of Clutch Slave Cylinder
 Courtesy of BMW OF NORTH AMERICA, INC.

Switch off bleeder unit or remove from brake fluid expansion tank.

Slowly retract piston rod (2) of clutch slave cylinder (1) with special tool 21 5 030 .

Remove special tool 21 5 030 from clutch slave cylinder (1).

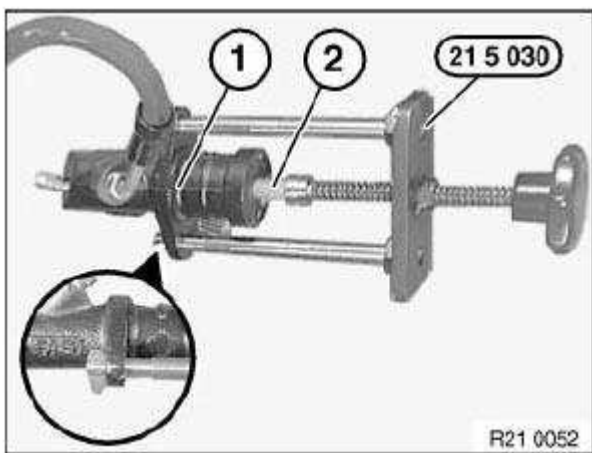


Fig. 4: Special Tool 21 5 030, Clutch Slave Cylinder And Piston Rod
 Courtesy of BMW OF NORTH AMERICA, INC.

Fit clutch slave cylinder to transmission.

Installation:

Replace self-locking nuts.

Tightening torque: 5AZ, see **21 52 CLUTCH OPERATION (HYDRAULIC)** .

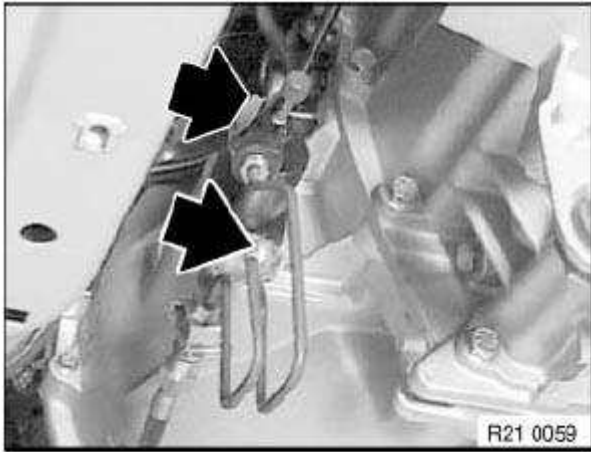


Fig. 5: Clutch Slave Cylinder Nuts

Courtesy of BMW OF NORTH AMERICA, INC.

Correct brake fluid level in expansion tank.

21 CLUTCH WITH DRIVING DISC

11 22 513 REPLACING ROLLER BEARING FOR DUAL-MASS FLYWHEEL

Special tools required:

- 21 2 051
- 21 2 052

NOTE: Flywheel removed!

Using hydraulic press (1) and special tool 21 2 051 , press out dual-mass flywheel downwards on engine side.

**IMPORTANT: Risk of damage:
Roller bearing must not be driven out.**

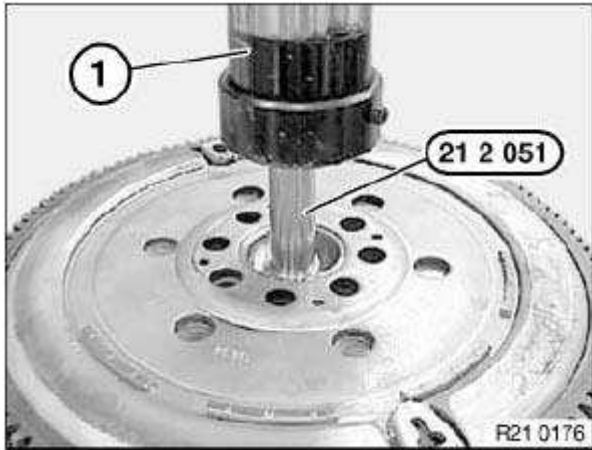


Fig. 6: Hydraulic Press And Special Tool 21 2 051
Courtesy of BMW OF NORTH AMERICA, INC.

Push roller bearing (2) onto special tool 21 2 052 .

Using hydraulic press (1), press roller bearing into dual-mass flywheel as far as it will go on clutch side.

IMPORTANT: Risk of damage:

Observe press-in instruction:

- Roller bearing must not be driven in.
- Roller bearing mounting force/travel monitored:

Min. 2000N 1 mm before end of pressing in.

Max. 15000N during entire press-in procedure.

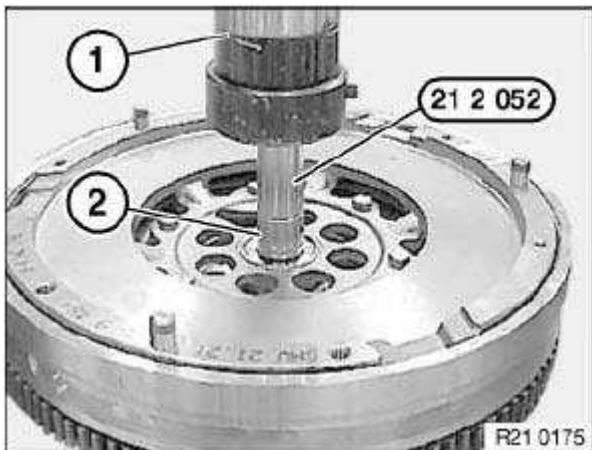


Fig. 7: Roller Bearing, Hydraulic Press And Special Tool 21 2 052

Courtesy of BMW OF NORTH AMERICA, INC.

11 22 513 REPLACING ROLLER BEARING FOR DUAL-MASS FLYWHEEL

Special tools required:

- 00 5 500
- 11 2 010
- 11 2 343
- 11 2 350

NOTE: Flywheel removed!

Position special tool 11 2 010 in roller bearing.

Twist out roller bearing with special tool 11 2 343 .

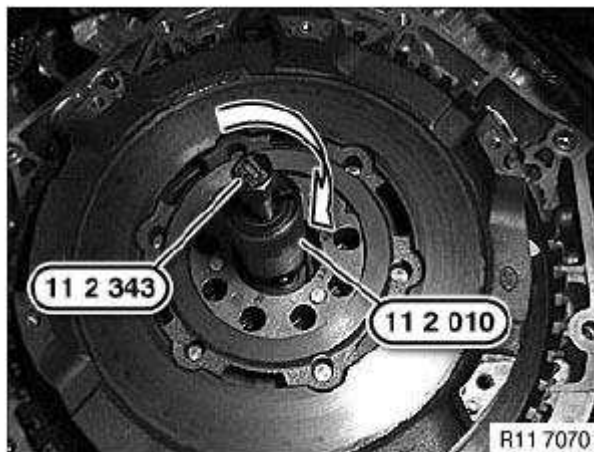


Fig. 8: Twisting Out Roller Bearing With Special Tool 11 2 343

Courtesy of BMW OF NORTH AMERICA, INC.

Assemble special tools 11 2 350 and 00 5 500 .

Drive in roller bearing with special tools 11 2 350 and 00 5 500 in direction of arrow as far as it will go.

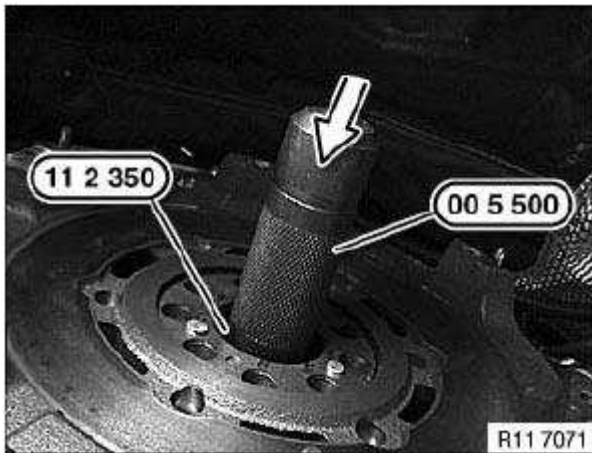


Fig. 9: Roller Bearing

Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 22 513 REPLACING ROLLER BEARING FOR DUAL-MASS FLYWHEEL (N47)

Special tools required:

- 21 2 051
- 21 2 052

NOTE: Flywheel removed!

Using hydraulic press (1) and special tool 21 2 051 , press out dual-mass flywheel downwards on engine side.

**IMPORTANT: Risk of damage:
Roller bearing must not be driven out.**

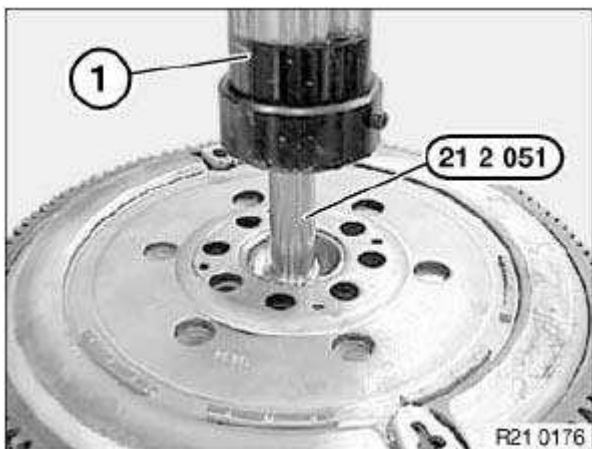


Fig. 10: Hydraulic Press And Special Tool 21 2 051
Courtesy of BMW OF NORTH AMERICA, INC.

Push roller bearing (2) onto special tool 21 2 052 .

Using hydraulic press (1), press roller bearing into dual-mass flywheel as far as it will go on clutch side.

IMPORTANT: Risk of damage:
Observe press-in instruction:

- Roller bearing must not be driven in.
- Roller bearing mounting force/travel monitored:

Min. 2000N 1 mm before end of pressing in.

Max. 15000N during entire press-in procedure.

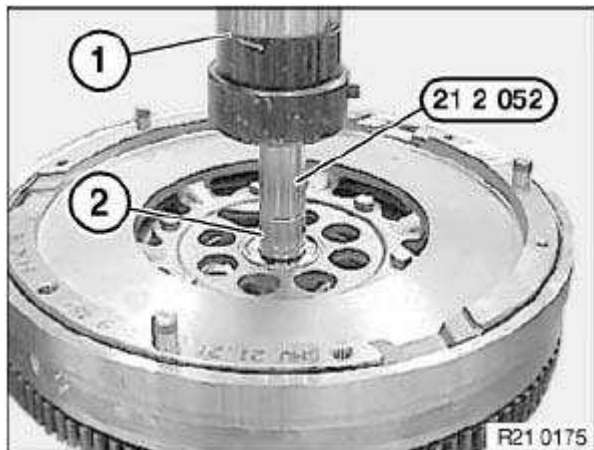


Fig. 11: Roller Bearing, Hydraulic Press And Special Tool 21 2 052
Courtesy of BMW OF NORTH AMERICA, INC.

21 21 500 REMOVING AND INSTALLING/REPLACING CLUTCH (SAC)

Special tools required:

- 11 9 260
- 11 9 263
- 11 9 264
- 11 9 265
- 21 2 141
- 21 2 170
- 21 2 180

- 21 2 201
- 21 2 230
- 21 2 250

Necessary preliminary tasks:

Remove transmission, see **23 00 019 REMOVING AND INSTALLING TRANSMISSION (GS6-37BZ N52K)** .

Installation:

N52/N53

Screws must be replaced.

Jointing torque and angle of rotation must be observed without fail.

M54/M57/N52/N53/S54 only:

Block flywheel with special tools 11 9 260 and 11 9 265 .

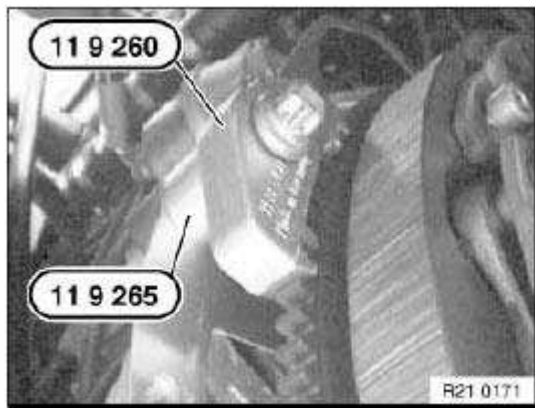


Fig. 12: Special Tools 11 9 260 And 11 9 265
Courtesy of BMW OF NORTH AMERICA, INC.

N62 only:

Block flywheel with special tools 11 9 260 , 11 9 263 and 11 9 264 .

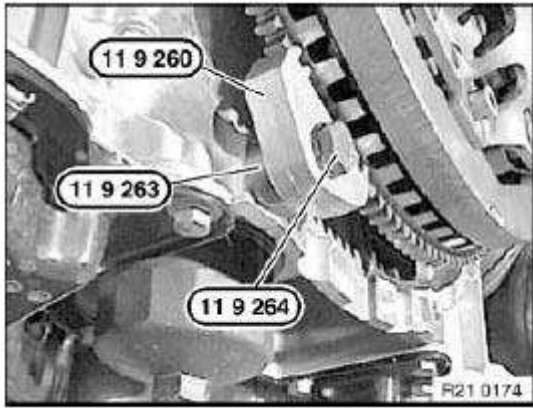


Fig. 13: Special Tools 11 9 260, 11 9 263 And 11 9 264
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws and remove clutch from flywheel.

Installation:

Clean flywheel and check for wear and damage.

Replace damaged flywheel.

IMPORTANT: Always replace clutch plates fouled e.g. by oil, cleaning agent.

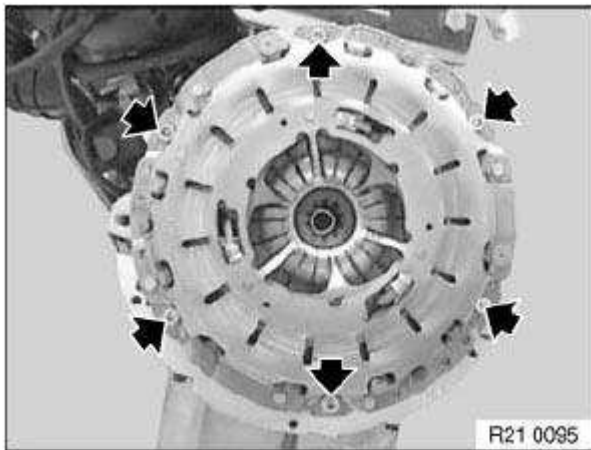


Fig. 14: Locating Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Observe the following procedure when installing the removed clutch and clutch plate.

Installation:

Screws must be replaced.

Joining torque and angle of rotation must be observed without fail.

Insert special tool 21 2 180 in clutch.

Press special tool 21 2 180 together at handles (1) as far as it will go and tighten down knurled screws (2).

Adjustment ring of clutch is now secured in its original position (wear position).

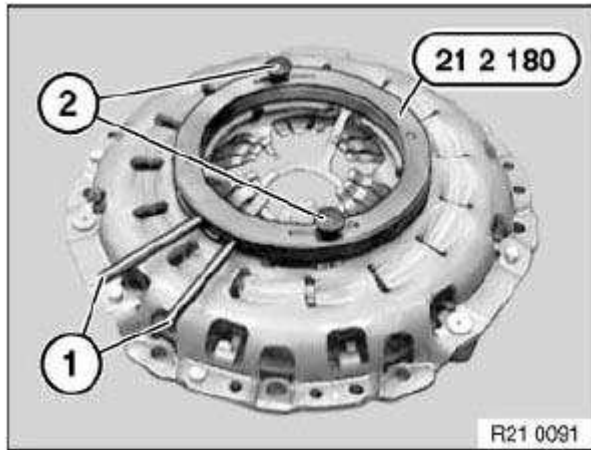


Fig. 15: Special Tool 21 2 180 And Handles
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Locking hooks (1) of special tool 21 2 180 must engage in openings of pressure spring.

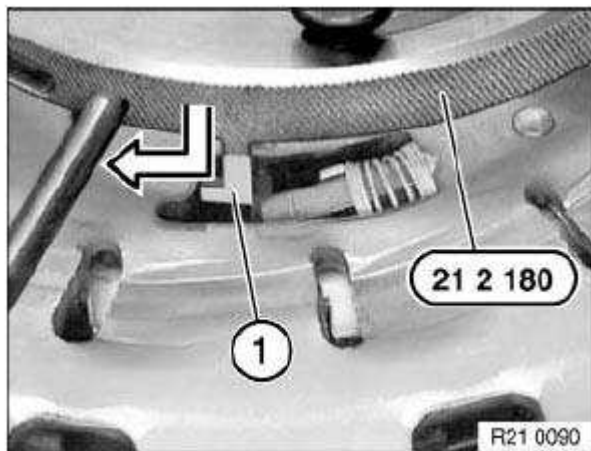


Fig. 16: Locking Hooks Of Special Tool 21 2 180
Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool 21 2 170 and tighten down at knurled screw (1).

Screw in spindle (2) until diaphragm spring (3) is tensioned on stop.

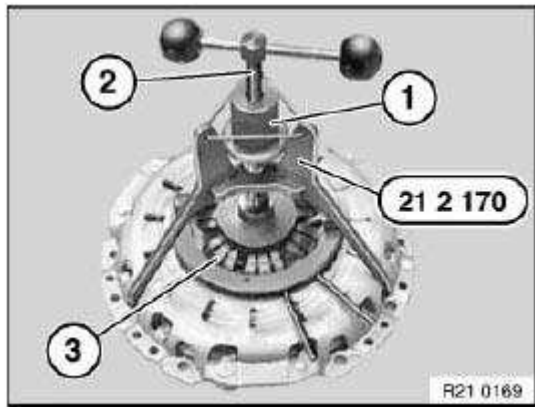


Fig. 17: Special Tool 21 2 170, Spindle And Diaphragm Spring
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Insert special tool 21 2 170 only in area of bores for dowel pins.

Centre clutch plate (1) with special tool in dual-mass flywheel.

IMPORTANT: Install clutch plate in correct position.

Note designation for "engine side" / "transmission side".

Handle clutch plate with care. Do not touch surfaces of friction linings.

Special tool Transmission

21 2 201 GS6-37BZ

21 2 230 GS6-53DZ/BZ

21 2 141 S5D 390Z

21 2 250 GS6-17BG

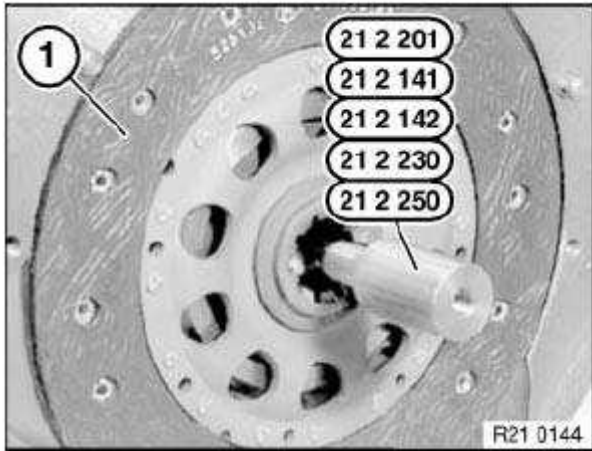


Fig. 18: Clutch Plate And Special Tool
 Courtesy of BMW OF NORTH AMERICA, INC.

Fit clutch (1) to flywheel.

Tightening torque: 1AZ, see 21 21 CLUTCH DISC AND DRIVE PLATE .

NOTE: Clutch (1) must be secured by way of dowel pins (2).

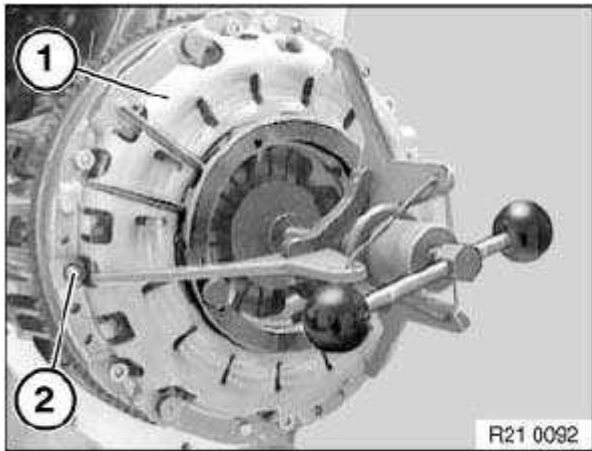


Fig. 19: Clutch And Dowel Pins
 Courtesy of BMW OF NORTH AMERICA, INC.

Release spindle (1) until load is fully removed from diaphragm spring. Remove special tools 21 2 170 and 21 2 180 .

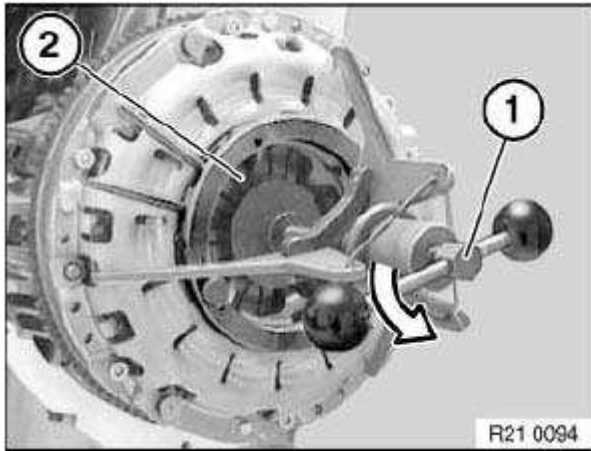


Fig. 20: Releasing Spindle

Courtesy of BMW OF NORTH AMERICA, INC.

Withdraw special tool from clutch plate with aid of accompanying screw (1).

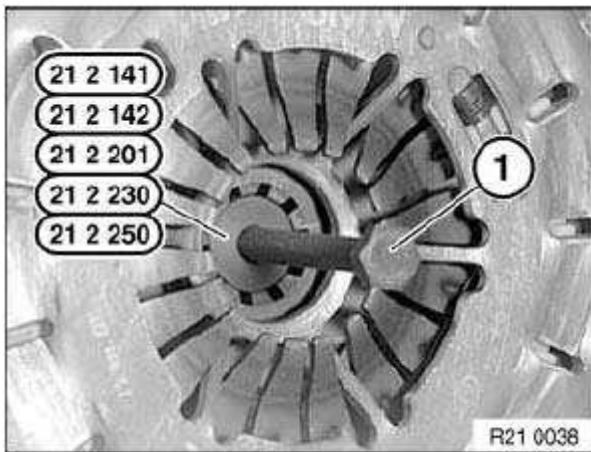


Fig. 21: Special Tool

Courtesy of BMW OF NORTH AMERICA, INC.

Installing removed clutch with new clutch plate:

Installation:

N52

Screws must be replaced.

Jointing torque and angle of rotation must be observed without fail.

IMPORTANT: Before installing a used clutch with a new clutch plate, always reset adjustment ring in new position.

Set clutch down on a clean surface.

Insert special tool 21 2 180 in clutch (1).

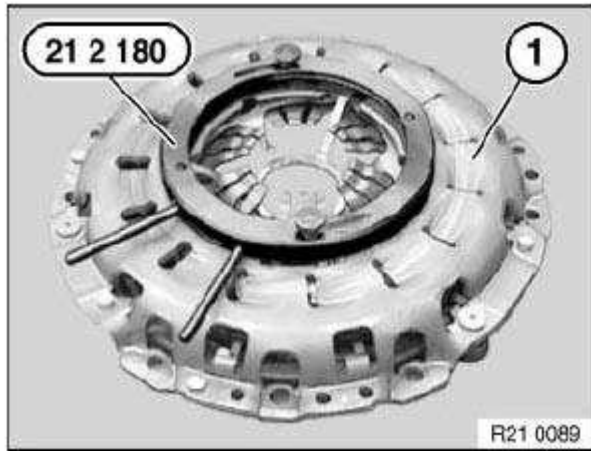


Fig. 22: Special Tool 21 2 180 And Clutch
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Locking hooks (1) of special tool 21 2 180 must engage in openings in clutch.

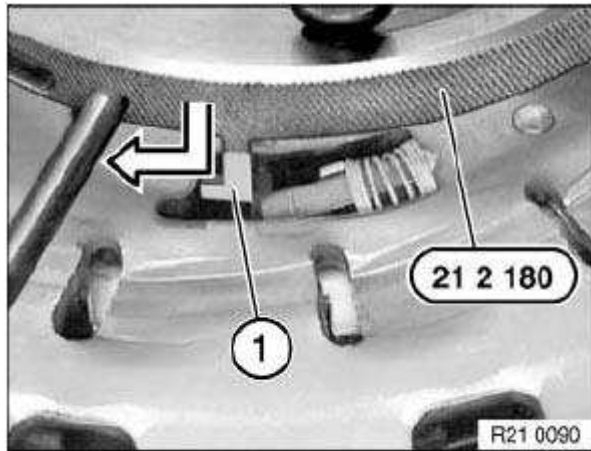


Fig. 23: Locking Hooks Of Special Tool 21 2 180
Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool 21 2 170 and tighten down at knurled screw (1).

NOTE: Insert special tool 21 2 170 only in area of bores for dowel pins.

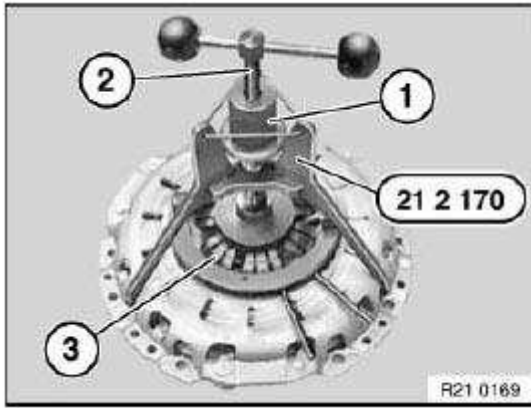


Fig. 24: Special Tool 21 2 170, Spindle And Diaphragm Spring
 Courtesy of BMW OF NORTH AMERICA, INC.

Screw in spindle (1) until adjustment ring of clutch (2) can be turned with special tool 21 2 180 at handles (3).

Press special tool 21 2 180 together at handles (3) as far as it will go and grip firmly.

At same time tighten down knurled screws (2).

Adjustment ring of clutch is now secured in new position.

Screw in spindle (1) until diaphragm spring is tensioned on stop.

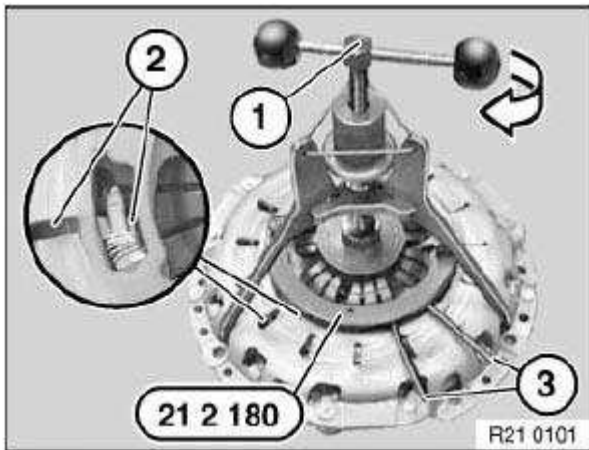


Fig. 25: Screwing In Spindle
 Courtesy of BMW OF NORTH AMERICA, INC.

Centre clutch plate (1) with special tool.

IMPORTANT: Install clutch plate in correct position.
Note designation for "engine side" / "transmission side".

Handle clutch plate with care. Do not touch surfaces of friction linings.

Special tool Transmission

21 2 201 GS6-37BZ

21 2 230 GS6-53DZ/BZ

21 2 141 S5D 390Z

21 2 250 GS6-17BG

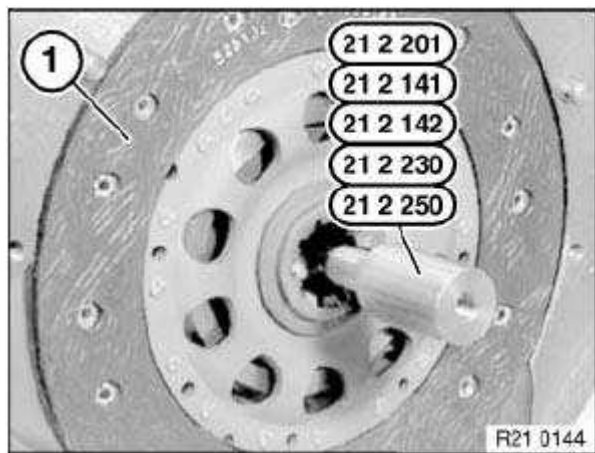


Fig. 26: Clutch Plate And Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Fit clutch (1) to flywheel.

Tightening torque: 1AZ, see 21 21 CLUTCH DISC AND DRIVE PLATE .

IMPORTANT: Clutch (1) must be secured by way of dowel pins (2).

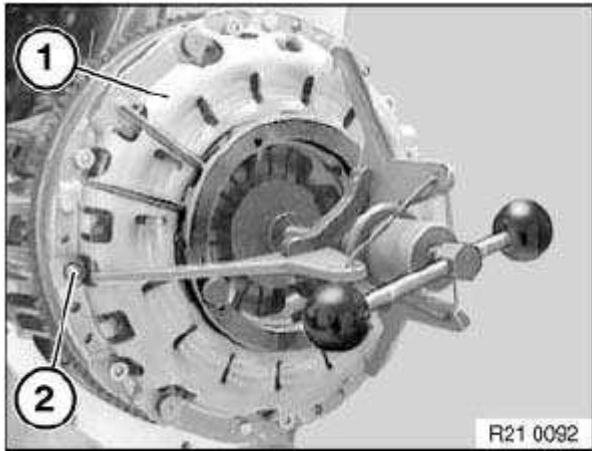


Fig. 27: Clutch And Dowel Pins

Courtesy of BMW OF NORTH AMERICA, INC.

Release spindle (1) until load is fully removed from diaphragm spring (2)

Remove special tools 21 2 170 and 21 2 180 .

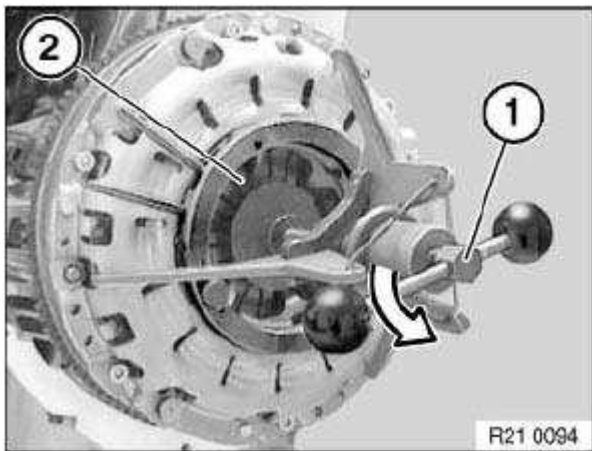


Fig. 28: Releasing Spindle

Courtesy of BMW OF NORTH AMERICA, INC.

Withdraw special tool from clutch plate with aid of accompanying screw (1).

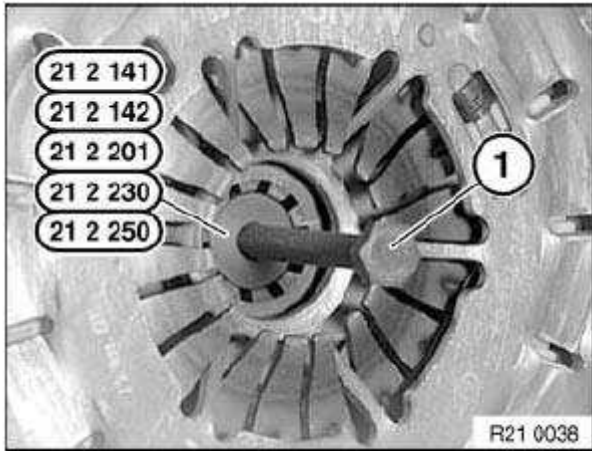


Fig. 29: Special Tool

Courtesy of BMW OF NORTH AMERICA, INC.

Installing new clutch

IMPORTANT: Locking piece may only be removed clutch is screwed down!

Installation:

N52

Screws must be replaced.

Jointing torque and angle of rotation must be observed without fail.

Centre clutch plate (1) with special tool.

IMPORTANT: Install clutch plate in correct position.

Note designation for "engine side" / "transmission side".

Handle clutch plate with care. Do not touch surfaces of friction linings.

Special tool Transmission

21 2 201 GS6-37BZ; GS 6-17BG

21 2 230 GS6-53DZ/BZ

21 2 141 S5D 390Z

21 2 250 GS6-17BG

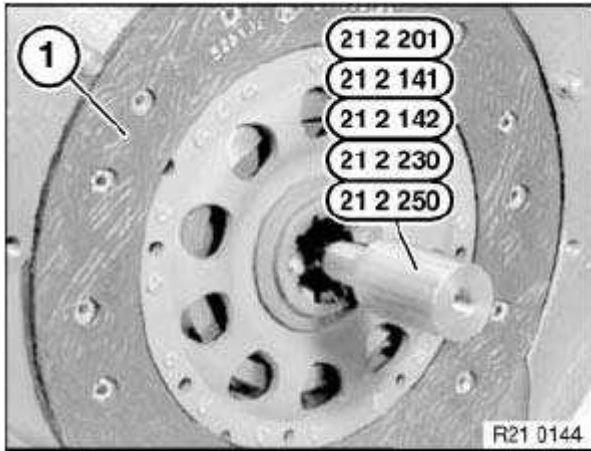


Fig. 30: Clutch Plate And Special Tool
 Courtesy of BMW OF NORTH AMERICA, INC.

Fit clutch to flywheel.

Tightening torque: 1AZ, see 21 21 CLUTCH DISC AND DRIVE PLATE .

IMPORTANT: Clutch must be secured by way of dowel pins (1).

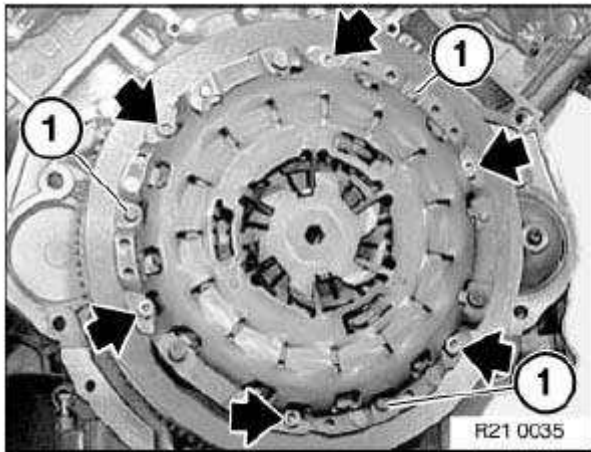


Fig. 31: Dowel Pins
 Courtesy of BMW OF NORTH AMERICA, INC.

Carefully unscrew locking piece (1) clockwise or counterclockwise with a 14 mm WAF hexagon socket wrench (2).

NOTE: A slight snapping of the plate spring while unscrewing the lock is possible.

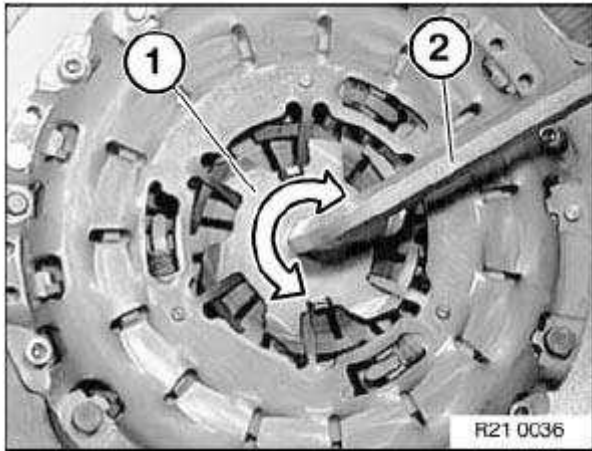


Fig. 32: Unscrewing Locking Piece Clockwise Or Counterclockwise
 Courtesy of BMW OF NORTH AMERICA, INC.

Withdraw special tool from clutch plate with aid of accompanying screw (1).

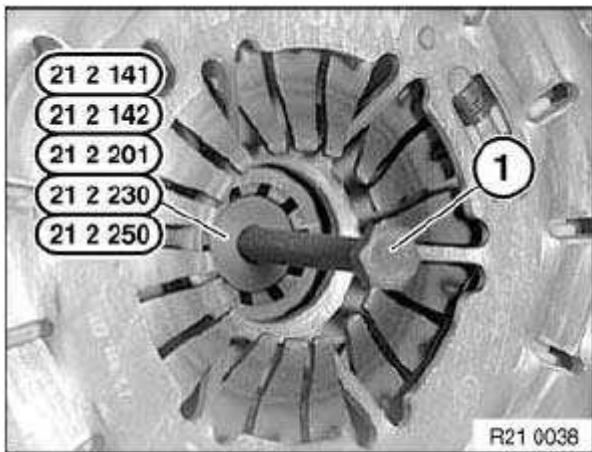


Fig. 33: Special Tool
 Courtesy of BMW OF NORTH AMERICA, INC.

51 CLUTCH RELEASE CONTROL WITH LEVER

21 51 500 REMOVING AND INSTALLING OR REPLACING CLUTCH RELEASE BEARING/LEVER

NOTE: (transmission removed)

Detach release bearing (1).

Installation:

Clean all sliding surfaces on clutch release bearing, check for damage and replace if necessary.

Do **not** grease clutch release bearing.

Sliding surfaces (2) of clutch release bearing must rest on sliding surfaces (3) of release lever.

Apply a thin coating of grease to sliding surfaces (2) of release bearing.

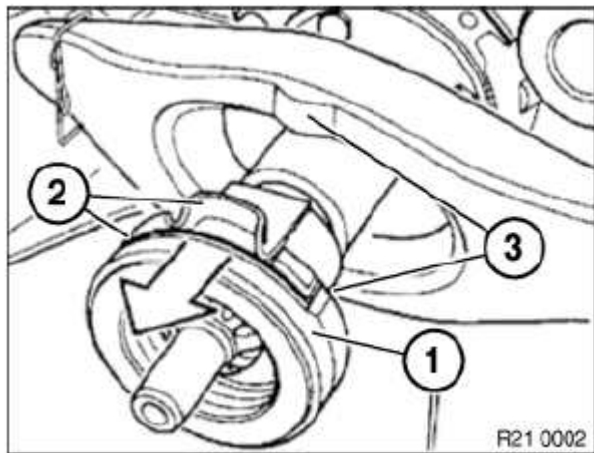


Fig. 34: Detaching Release Bearing

Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: New clutch release bearing fitted!

See following graphic.

IMPORTANT: On E60/E61/E63/E64/M5 and M6 - apply a light coating of grease to bearing guide.

New clutch release bearing:

Clutch release bearing with moving thrust plate (1).

Swivel motion of thrust plate (1) possible.

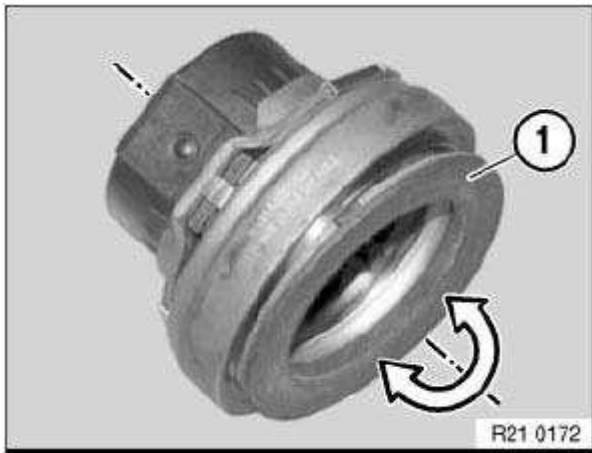


Fig. 35: Swivel Motion Of Thrust Plate
Courtesy of BMW OF NORTH AMERICA, INC.

Previous clutch release bearing:

Clutch release bearing with rigidly positioned thrust plate (1).

Swivel motion of thrust plate (1) not possible.

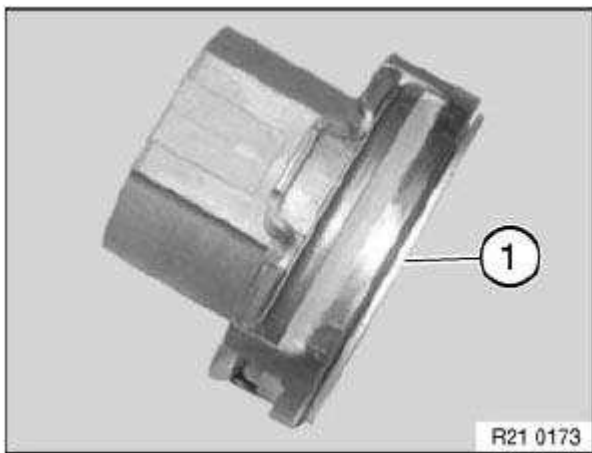


Fig. 36: Thrust Plate
Courtesy of BMW OF NORTH AMERICA, INC.

Withdraw release lever (4) from spring wire clip (5) and remove.

Installation:

Clean release lever.

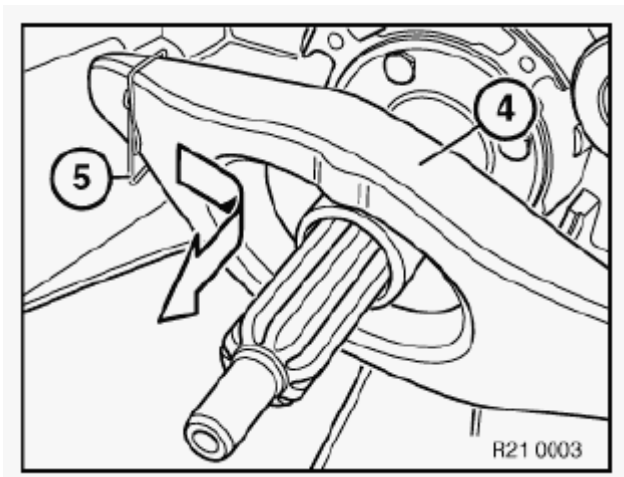


Fig. 37: Release Lever From Spring Wire Clip
 Courtesy of BMW OF NORTH AMERICA, INC.

Apply a thin coating of grease to release lever at sliding surfaces (1 and 2) only.

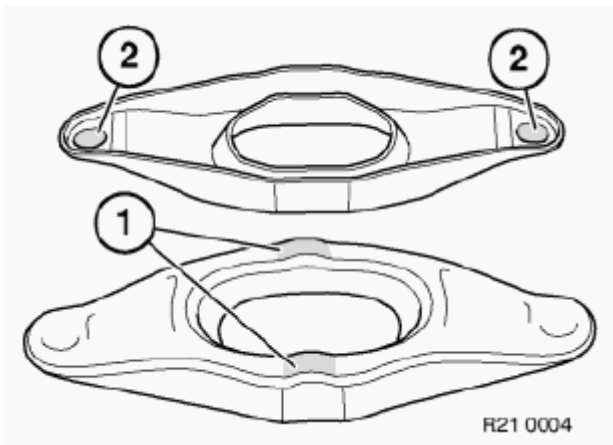


Fig. 38: Sliding Surfaces Of Release Lever
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check spring wire clip (5) and ball pin (6) for damage and replace if necessary.

Apply a thin coating of grease to ball pin (6).

NOTE: **The spring wire clip and ball pin must always be replaced on the S6S 420G transmission.**

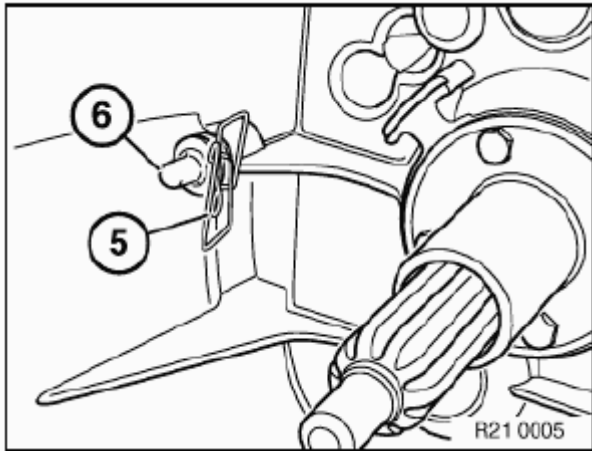


Fig. 39: Spring Wire Clip And Ball Pin
Courtesy of BMW OF NORTH AMERICA, INC.

Note on installation: (except for E60/E61/E63/E64/M5 and M6)

Do **not** grease guide sleeve.

If guide sleeve is greased, the release lever can stick on the guide sleeve.

Clean guide sleeve (7).

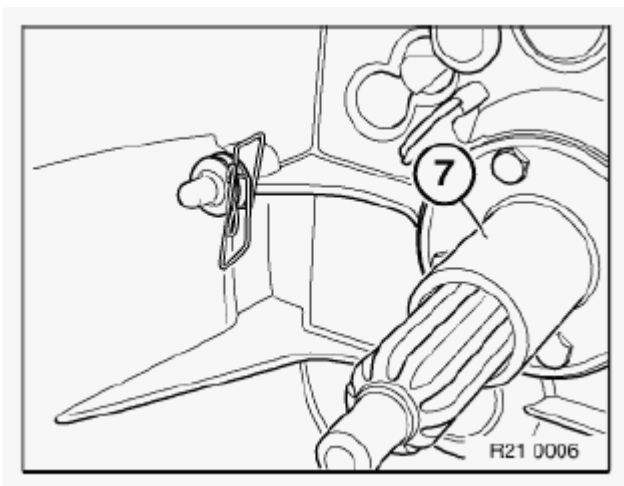


Fig. 40: Guide Sleeve
Courtesy of BMW OF NORTH AMERICA, INC.

52 CLUTCH OPERATION (HYDRAULIC)

21 52 500 REMOVING AND INSTALLING/REPLACING CLUTCH MASTER CYLINDER

NOTE: After completing work, bleed clutch hydraulic system .

Necessary preliminary tasks:

- Remove trim panel for pedal assembly, see **21 00 006 Bleeding clutch hydraulic system.**

Draw off brake fluid up to supply hose of clutch hydraulic system (1). For this purpose, use only a vacuum pipe that is exclusively used for removing brake fluid.

Detach supply hose (1) from expansion tank.

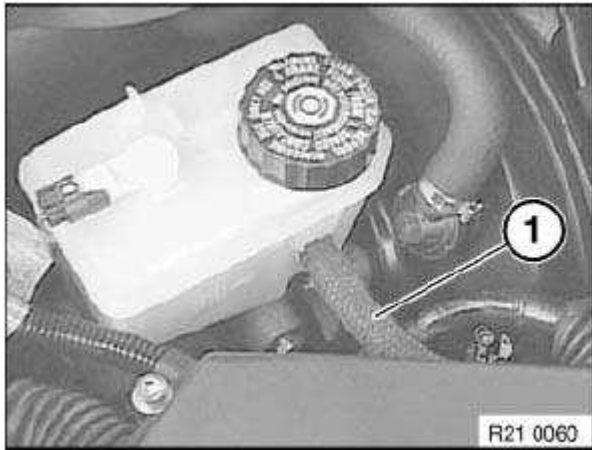


Fig. 41: Supply Hose Of Clutch Hydraulic System
Courtesy of BMW OF NORTH AMERICA, INC.

Press pin (1) out of clutch pedal with a short screwdriver.

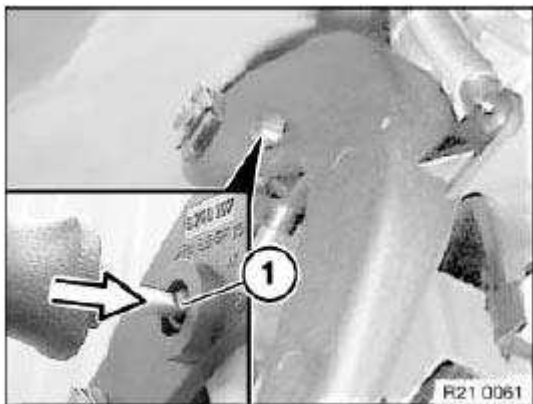


Fig. 42: Pressing Pin Out Of Clutch Pedal
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

The pin is coded by a straight surface (1).

The coding points upwards.

Screw pin with coding upwards. Turn slightly until coding snaps into place. Press in pin until engaged (2).

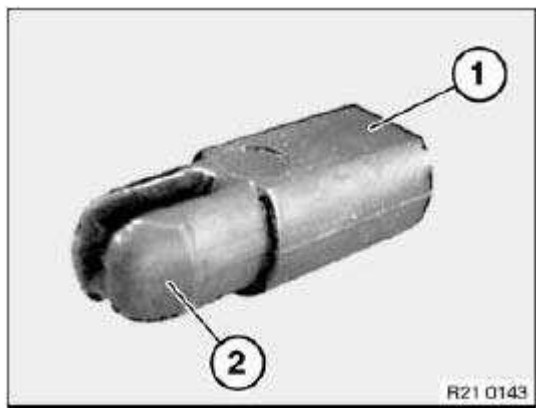


Fig. 43: Straight Surface Of Pin

Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws.

Tightening torque: 2AZ, see **21 52 CLUTCH OPERATION (HYDRAULIC)** .

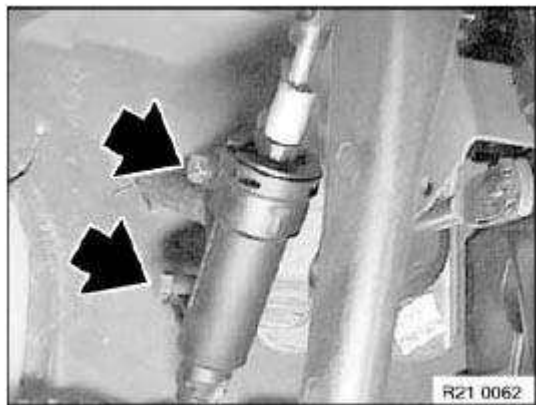


Fig. 44: Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Detach retainer (1) with a screwdriver (2).

NOTE: Do not foul carpet with brake fluid.

Detach hydraulic line from clutch master cylinder.

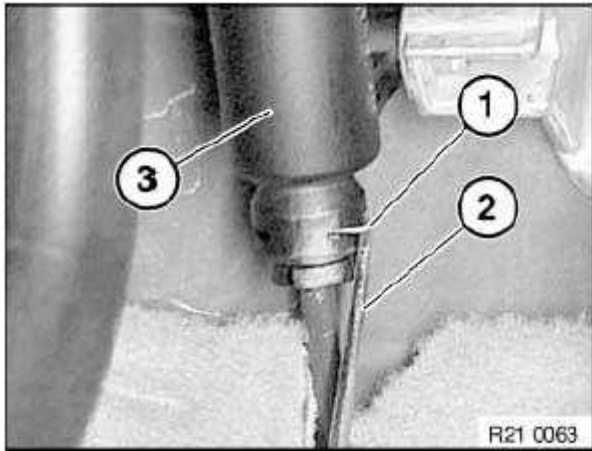


Fig. 45: Retainer

Courtesy of BMW OF NORTH AMERICA, INC.

Detach supply hose (1) from clutch master cylinder and remove clutch master cylinder.

IMPORTANT: Do not pull supply hose completely into interior.

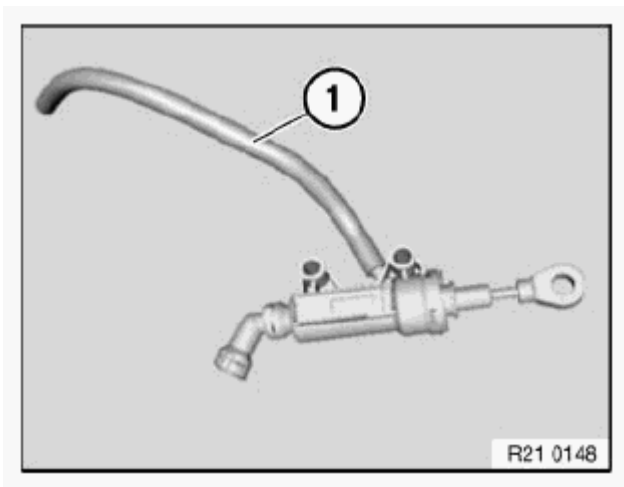


Fig. 46: Supply Hose

Courtesy of BMW OF NORTH AMERICA, INC.

Lever out shift element (1) from clutch master cylinder (2) with screwdriver.

Release plug connection (3) and disconnect plug (4) from shift element (1).

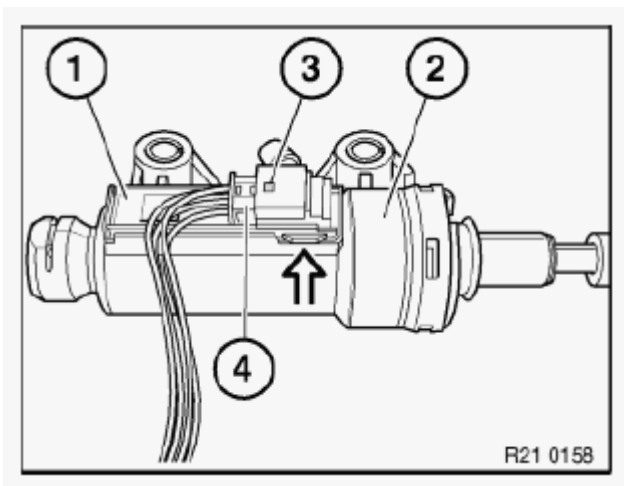


Fig. 47: Plug Connection

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Shift element is secured against incorrect installation.

Shift element must snap audibly into place.

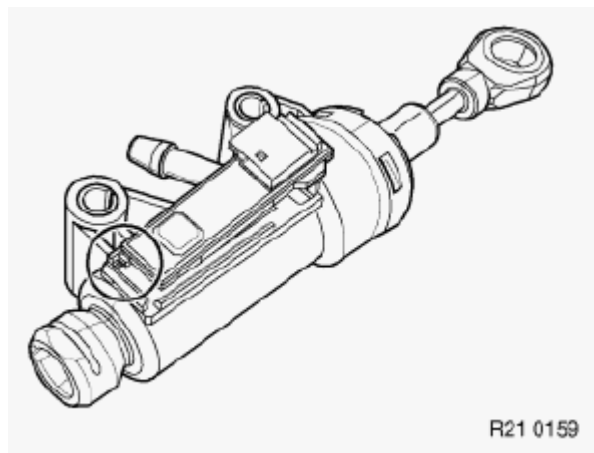


Fig. 48: Shift Element

Courtesy of BMW OF NORTH AMERICA, INC.

21 52 510 REMOVING AND INSTALLING OR REPLACING CLUTCH SLAVE CYLINDER

Special tools required:

- 13 3 010

NOTE: After completing work bleed clutch hydraulic system, see 21 00 006 Bleeding clutch hydraulic system.

IMPORTANT: From 08.06 a plastic clutch slave cylinder is installed in the E8X, E9X.
Important notes on installation are described in this work step.

Seal supply hose to clutch master cylinder with special tool 13 3 010 .

NOTE: Illustration shows E46.

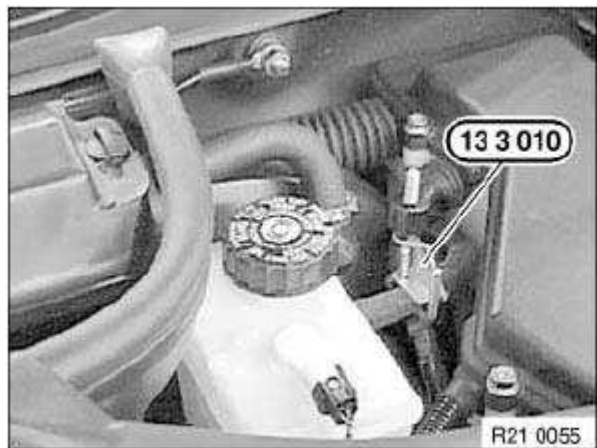


Fig. 49: Special Tool 13 3 010
Courtesy of BMW OF NORTH AMERICA, INC.

Remove transmission underbody protection if necessary.

Release union screw (1) on hydraulic line.

Release nut (2) and remove hydraulic line (3) with bracket.

Installation:

Tightening torque: 1AZ, see **21 52 CLUTCH OPERATION (HYDRAULIC)** .

NOTE: Illustration similar.

Version with throttle valve, tightening torque: 12AZ, see **21 52 CLUTCH OPERATION (HYDRAULIC)** .

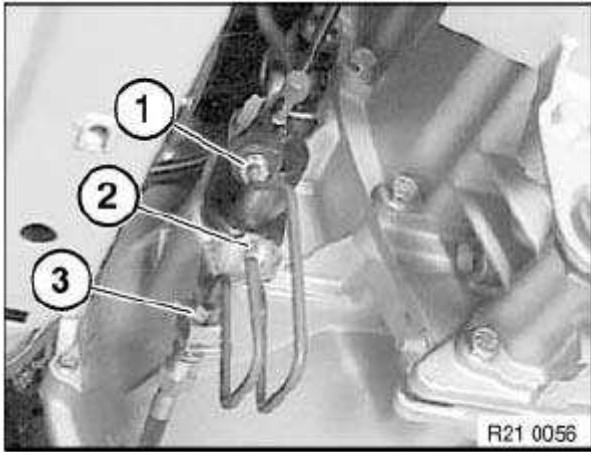


Fig. 50: Hydraulic Line

Courtesy of BMW OF NORTH AMERICA, INC.

Release nut and remove clutch slave cylinder.

Installation:

Tightening torque: 5AZ, see **21 52 CLUTCH OPERATION (HYDRAULIC)** .

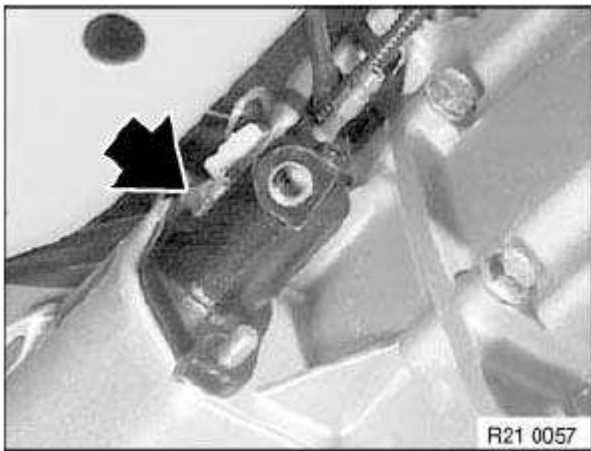


Fig. 51: Locating Clutch Slave Cylinder Nut

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Clean thrust member (1) and contact face on release lever (2).

Lightly grease thrust member (1) on contact face (3).

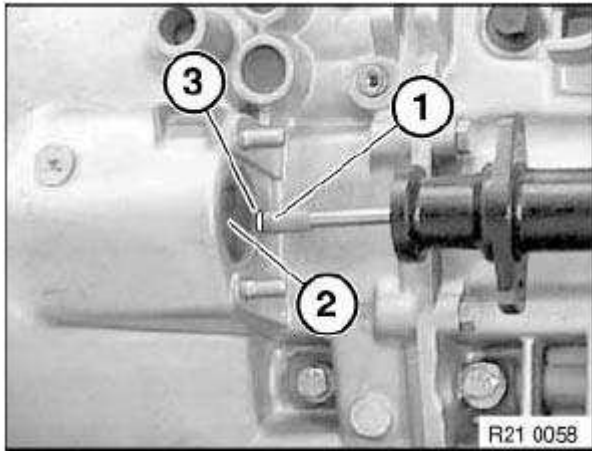


Fig. 52: Thrust Member And Release Lever
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Spacer between fuel line and pressure hose of clutch slave cylinder must be correctly fitted.

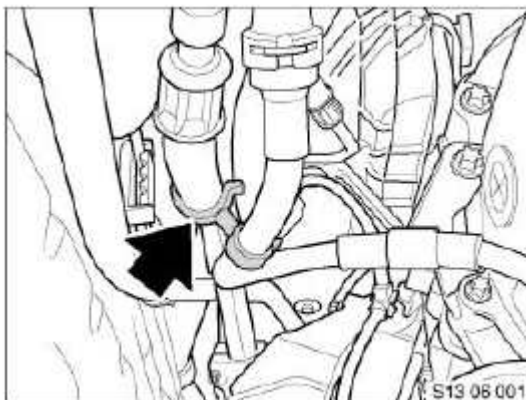


Fig. 53: Spacer Between Fuel Line And Pressure Hose Of Clutch Slave Cylinder
Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION

Clutch - Special Tools - X3

21 CLUTCH

21 2 070 GAUGE

Note: For checking lining thickness on clutch drive plate. Replaced in 8/95 by 21 2 080.

Transmission: S5D 200G, S5D 250G, S5D 260Z, S5D 310Z, S6S 420G, S6S 560G

Order number: 21 2 070

Gauge

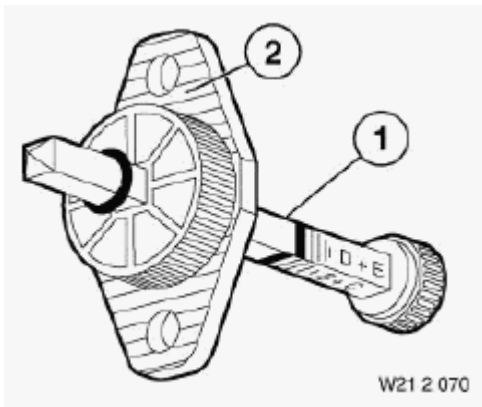


Fig. 1: Gauge (21 2 070)

Courtesy of BMW OF NORTH AMERICA, INC.

21 2 100 DRIFT

Note: For centering clutch disc while installing clutch

Transmission: 240/5, 260/5, 265/5, 265/5 Sport, 280/5 Sport

Storage location: C22

Order number: 21 2 100

Drift

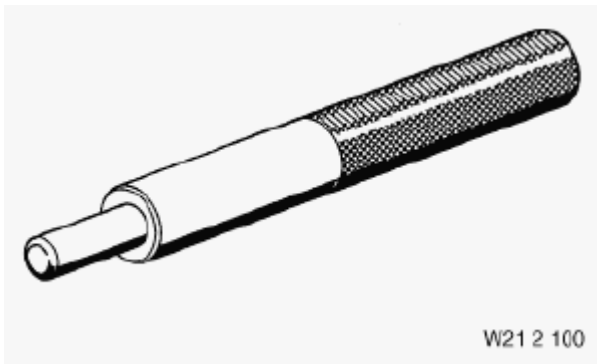


Fig. 2: Drift (21 2 100)
Courtesy of BMW OF NORTH AMERICA, INC.

21 2 120 DRIFT

Minimum set: Mechanical tools

Note: For centering clutch disc while installing clutch

Transmission: S6S 420G, S6S 560G

Storage location: C22

SI number: 1 05 90(207)

Order number: 21 2 120

Drift

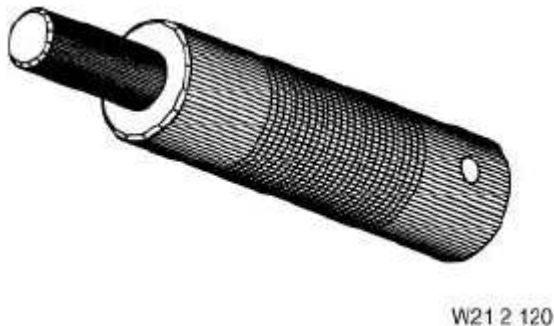


Fig. 3: Drift (21 2 120)
Courtesy of BMW OF NORTH AMERICA, INC.

21 2 130 DRIFT

Minimum set: Mechanical tools

Note: For centering clutch disc while installing clutch

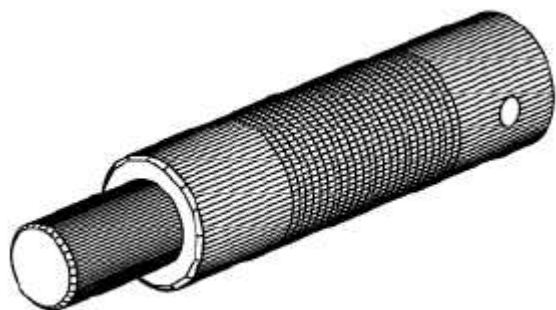
Transmission: S5D 200G, S5D 250G, S5D 260Z, S5D 310Z

Storage location: C22

SI number: 1 01 91(312)

Order number: 21 2 130

Drift



W21 2 130

Fig. 4: Drift (21 2 130)

Courtesy of BMW OF NORTH AMERICA, INC.

21 2 140 CLUTCH CENTERING MANDREL (2 X)

Minimum set: Mechanical tools

Note: For centering clutch disc on flywheel while installing self-adjusting clutch (SAC) - Phase-in of SAC in E46, 09/97

Transmission: S5D 200G, S5D 250G, S5D 260Z, S5D 310Z, S6S 420G, S6S 560G

Storage location: C5

SI number: 1 13 96 (104)

Order number: 21 2 140

Clutch centering mandrel (2 x)

Consisting of:

1 = 21 2 141 Clutch centering tool

Note: With M10 screw - Transmission: S6S 420G, S6S 560G

2 = 21 2 142 Clutch centering tool

Note: With M10 screw - Transmission: S5D 200G, S5D 250G, S5D 260Z, S5D 310Z

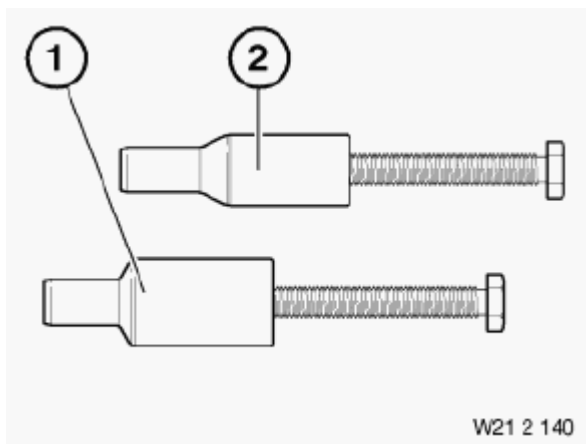


Fig. 5: Clutch Centering Mandrel (2 X) (21 2 140)
Courtesy of BMW OF NORTH AMERICA, INC.

21 2 170 TENSIONING TOOL

Minimum set: Mechanical tools

In conjunction with: 21 2 180, 21 2 190, 21 2 141, 21 2 142

Note: For resetting adjustment ring and installing self adjusting clutch (SAC) on flywheel without tension.

Series: E34, E36, E38, E39, E46, E52, E53, E60, E61, E83, E85, E86, E87, E90, E91

SI number: 1 16 00 (622)

Order number: 21 2 170

Tensioning tool

Consisting of:

1 = 21 2 171 Star with adjusting spindle

2 = 21 2 172 Clamping claw (1 x)

3 = 21 2 173 Pressure spindle with disk

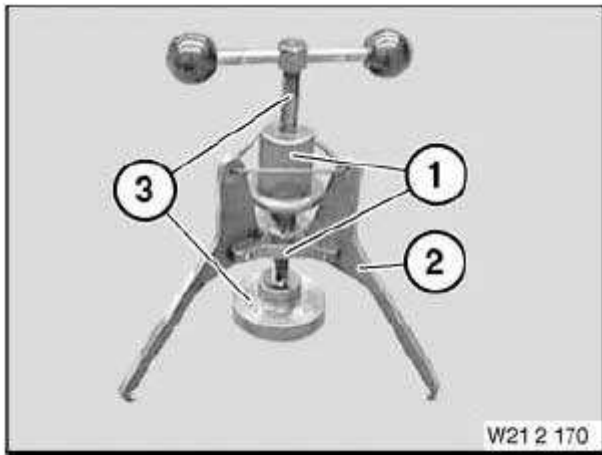


Fig. 6: Tensioning Tool (21 2 170)

Courtesy of BMW OF NORTH AMERICA, INC.

21 2 180 LOCATING RING

Minimum set: Mechanical tools

In conjunction with: 21 2 170

Note: For locating and resetting adjustment ring of SAC clutch on all 6 - and 8-cylinder engines.

Series: E34, E36, E38, E39, E46, E52, E53, E60, E61, E83, E85, E86, E90, E91

Storage location: A44

SI number: 1 16 00 (622)

Order number: 21 2 180

Locating ring

Consisting of:

1 = 21 2 181 Outer ring

2 = 21 2 182 Inner ring

3 = 21 2 183 Pin set

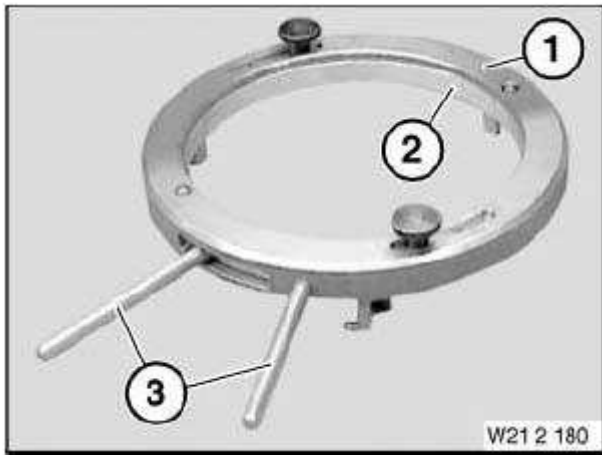


Fig. 7: Locating Ring (21 2 180)

Courtesy of BMW OF NORTH AMERICA, INC.

21 2 190 LOCATING RING

Minimum set: Mechanical tools

In conjunction with: 21 2 170

Note: For locating and resetting adjustment ring of SAC clutch on all 4 -cylinder engines.

Series: E34, E36, E38, E39, E46, E52, E53, E83, E87

Storage location: A44

SI number: 1 16 00 (622)

Order number: 21 2 190

Locating ring

Consisting of:

1 = 21 2 191 Outer ring

2 = 21 2 192 Inner ring

3 = 21 2 193 Driver (1 x)

4 = 21 2 194 Pin set

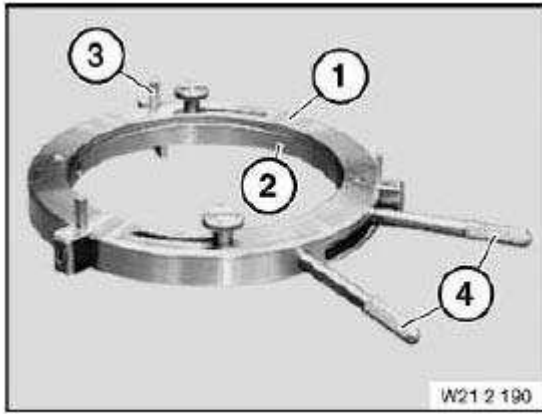


Fig. 8: Locating Ring (21 2 190)

Courtesy of BMW OF NORTH AMERICA, INC.

21 2 200 CLUTCH CENTERING TOOL

Minimum set: Mechanical tools

Note: For centering clutch plate during installation. H-transmission

Transmission: GS6-37BZ, GS6-37DZ

Storage location: B44, C44

SI number: 01 10 02 (907)

Order number: 21 2 200

Clutch centering tool

Consisting of:

1 = 21 2 201 Clutch centering tool

Note: With M10 screw Transmission: GS6-37BZ / DZ (H-transmission)



Fig. 9: Clutch Centering Tool (21 2 200)
Courtesy of BMW OF NORTH AMERICA, INC.

21 2 220 GREASE SCRAPER RING

Minimum set: Mechanical tools

Note: Scraping grease off splines of transmission drive shaft

Series: E53, E60, E63, E64, E83, E85, E86, E87, E90, E91, E92

Transmission: GS6-17BG, GS6-37BZ, GS6-37DZ

SI number: 01 10 02 (907)

Order number: 21 2 220

Grease scraper ring

Consisting of:

1 = 21 2 221 Grease scraper ring

Note: Transmission: GS6-37BZ / DZ (H - transmission), GS6-17BG (i-transmission)



Fig. 10: Grease Scraper Ring (21 2 220)
Courtesy of BMW OF NORTH AMERICA, INC.

21 2 230 CLUTCH CENTERING TOOL

Minimum set: Mechanical tools

Note: With M10 screw (G-transmission)

Transmission: GS6-53BZ, GS6-53DZ

Storage location: A47

SI number: 1 03 03 (960)

Order number: 21 2 230

Clutch centering tool



Fig. 11: Clutch Centering Tool (21 2 230)

Courtesy of BMW OF NORTH AMERICA, INC.

21 2 240 GREASE SCRAPER RING

Minimum set: Mechanical tools

Note: For scraping grease on spline shaft teeth of transmission input shaft (G-transmission)

Transmission: GS6-53BZ, GS6-53DZ

Storage location: A47

SI number: 1 03 03 (960)

Order number: 21 2 240

Grease scraper ring



Fig. 12: Grease Scraper Ring (21 2 220)

Courtesy of BMW OF NORTH AMERICA, INC.

21 2 250 CLUTCH CENTERING TOOL

Minimum set: Mechanical tools

Note: For centering drive plate during installation. Clutch plate with modified toothing.

Transmission: S5D 250G (B transmission)

Series: E46, E46/16, E46/2, E46/3, E46/5, E46/C, E83, E87

Transmission: S5D 250G

Storage location: A50

SI number: 1 20 04 (135)

Order number: 21 2 250

Clutch centering tool



Fig. 13: Clutch Centering Tool (21 2 250)

Courtesy of BMW OF NORTH AMERICA, INC.

21 2 270 CLUTCH CENTERING SLEEVE

Minimum set: Mechanical tools

Note: For centering drive plate to driven plate when installing clutch on engine. Transmission: GS6-53DG with M57T2, GS6-53BZ with N54 in E92, E60.

Transmission: GS6-53BZ, GS6-53DZ

SI number: 1 20 05 (218)

Order number: 21 2 270

Clutch centering sleeve

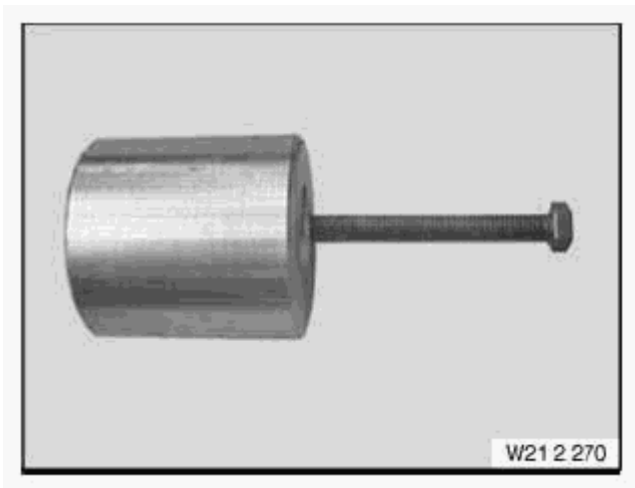


Fig. 14: Clutch Centering Sleeve (21 2 270)
Courtesy of BMW OF NORTH AMERICA, INC.

21 5 010 ADAPTER

In conjunction with: 17 0 002

Note: For expansion tank when bleeding hydraulic clutch system on automatic transmission

Transmission: S6S 420G

Storage location: C17

SI number: 1 06 97 (186)

Order number: 21 5 010

Adapter

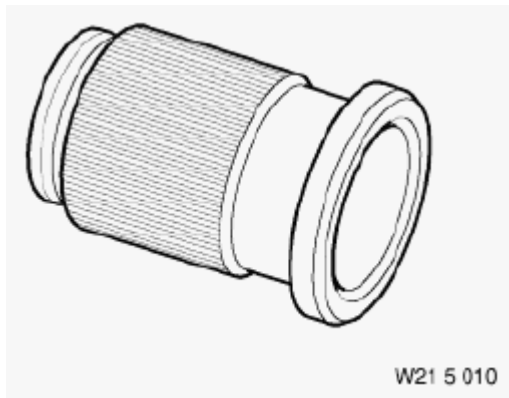


Fig. 15: Adapter (21 5 010)
Courtesy of BMW OF NORTH AMERICA, INC.

21 5 020 BLEEDER FLASK

In conjunction with: 21 5 030

Note: For hydraulic fluid (Pentosin) - for bleeding hydraulic clutch system on sequential M - transmission.

Transmission: S6S 420G

SI number: 1 15 97 (211)

Order number: 21 5 020

Bleeder flask



Fig. 16: Bleeder Flask (21 5 020)

Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION

Clutch - Technical Data - X3

21 CLUTCH WITH DRIVING DISC

21 21 CLUTCH WITH DRIVE PLATE MECH

TECHNICAL DATA - CLUTCH WITH DRIVE PLATE MECH

Lateral runout deviation of diaphragm springs to pressure plate	mm	0.6
Minimum lining thickness of clutch disk: Lining surface up to rivet closing head	mm	1.0

TRANSMISSION

Clutch - Tightening Torques - X3

11 CLUTCH HOUSING

21 11 BELL HOUSING

BELL HOUSING - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Clutch housing to crankcase	E36 / E38 / E39 / E46 / E52 / E53 / E60 / E61 / E63 / E64 / E83 / E85 / E87 / E90 / E91	M8		28 Nm
	E36 / E38 / E39 / E46 / E52 / E53 / E60 / E61 / E63 / E64 / E83 / E85 / E87 / E90 / E91	M10		56 Nm
	E36 / E38 / E39 / E46 / E52 / E53 / E60 / E61 / E63 / E64 / E83 / E85 / E87 / E90 / E91	M12		98 Nm

21 CLUTCH WITH DRIVING DISC

21 21 CLUTCH DISC AND DRIVE PLATE

CLUTCH DISC AND DRIVE PLATE - TIGHTENING TORQUES

	Type	Thread	Work instruction	Measure
1AZ Clutch to flywheel	E36 / E38 / E39 / E46 / E52 / E53 / E60 / E61 / E63 / E64 / E83 / E85 / E86 / E87 / E90 / E91	M8 8.8	Replace screws	25 Nm
	E36 / E38 / E39 / E46 / E52 / E53 / E60 / E61 / E63 / E64 / E83 / E85 / E86 / E87 / E90 / E91	M8 10.9	Replace screws	34 Nm
Clutch to flywheel With ZNS bolts			Replace ZNS bolts Jointing torque and angle of rotation must be observed without fail	
	E60 S85		Jointing torque	15 Nm
			Torque angle	25°
	E60 N52 M47T2, E61 N52 M47T2, E63 N52, E64 N52, E65 N52, E83 N52 M47T2, E85 N52, E86 N52, E90 N52 N54 N46T M47T2, E91 N52 N54 N46T M47T2, E92 N54 N46T, E93 N46T, E81 N47, E87, N47, E81, N43, E87, N43, E87, N45K, E60, N53, E61, N53	M8 10.9	Jointing torque	15 Nm
			Torque angle	90° ± 5°

52 CLUTCH OPERATION (HYDRAULIC)

21 52 CLUTCH OPERATION (HYDRAULIC)

CLUTCH OPERATION (HYDRAULIC) - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Hydraulic line to clutch slave cylinder or throttle.	E36 / E38 / E39 / E52 / E53 / E63 / E64 / E83 / E85 / E86 / E87 / E90 / E91 / E92			14.5 Nm
	E46			20 + 5 Nm
	E60 / E61			14 Nm
2AZ Clutch master cylinder to bearing block	E36 / E38 / E39 / E46 / E52 / E53 / E60 / E61 / E63 / E64 / E85 / E86 / E87 / E90 / E91 / E92 / E93 / E81			22 Nm
	E83			8 Nm
3AZ Fitting screw, clutch master cylinder	E36 / E38 / E39 / E46 / E52 / E53 / E60 / E61 / E63 / E64 / E83 / E85 / E86 / E87 / E90 / E91 / E92 / E93 / E81			22 Nm
4AZ Clutch master cylinder to pedal assembly	E36 / E38 / E39 / E46 / E52 / E53 / E60 / E61 / E63 / E64 / E83 / E85 / E86 / E87 / E90 / E91 / E92 / E93 / E81			9 Nm
5AZ Clutch slave cylinder to clutch housing / transmission case	E36 / E38 / E39 / E46 / E52 / E53 / E60 / E61 / E63 / E64 / E83 / E85 / E86 / E87 / E90 / E91 / E92 / E93 / E81			22 Nm
	E60 / E63	7-speed SMG		25 Nm
6AZ Pressure accumulator to hydraulic unit	E36 / M3			35 Nm
7AZ Coupling bolts for hydraulic pipes	E46 / M3 / E87 / E81			14 Nm
8AZ Pressure accumulator for hydraulic unit	E46 / M3			40 Nm
9AZ Clutch position sensor to clutch slave cylinder	E46 / E60 / E61 / E63 / E64 / E85	6-speed SMG		2.5 Nm
	E60 / E63	7-speed SMG		3.5 Nm
10AZ Banjo bolt, pipe, actuator / pump block	E60 / E63	7-speed SMG		18 Nm
11AZ Filler plug, expansion tank, pump block	E60 / E63	7-speed SMG		2.1 Nm
12AZ Throttle valve to clutch slave cylinder	E60, E61			17 Nm

AUTOMATIC TRANSMISSION

Diagnostic Trouble Codes - 6-Speed ZF Transmission

DIAGNOSTIC TROUBLE CODES

A/T DIAGNOSTIC TROUBLE CODES

DTC (Diagnostic Trouble Code)	DTC Description
P0748	Pressure Control Solenoid 'A' Electrical
P0963	Pressure Control Solenoid 'A' Control Circuit High
P0962	Pressure Control Solenoid 'A' Control Circuit Low
P170A	Pressure Control Solenoid 'A' Shunt Monitoring
P0745	Pressure Control Solenoid 'A'
P0778	Pressure Control Solenoid 'B' Electrical
P0967	Pressure Control Solenoid 'B' Control Circuit High
P0966	Pressure Control Solenoid 'B' Control Circuit Low
P170B	Pressure Control Solenoid 'B' Shunt Monitoring
P0775	Pressure Control Solenoid 'B'
P0798	Pressure Control Solenoid 'C' Electrical
P0971	Pressure Control Solenoid 'C' Control Circuit High
P0970	Pressure Control Solenoid 'C' Control Circuit Low
P170C	Pressure Control Solenoid 'C' Shunt Monitoring
P0795	Pressure Control Solenoid 'C'
P2716	Pressure Control Solenoid 'D' Electrical
P2721	Pressure Control Solenoid 'D' Control Circuit High
P2720	Pressure Control Solenoid 'D' Control Circuit Low
P170D	Pressure Control Solenoid 'D' Shunt Monitoring
P2713	Pressure Control Solenoid 'D'
P2725	Pressure Control Solenoid 'E' Electrical
P2730	Pressure Control Solenoid 'E' Control Circuit High
P2729	Pressure Control Solenoid 'E' Control Circuit Low
P170E	Pressure Control Solenoid 'E' Shunt Monitoring
P2759	Torque Converter Clutch Pressure Control Solenoid Control Circuit Electrical
P2763	Torque Converter Clutch Pressure Control Solenoid Control Circuit High
P2764	Torque Converter Clutch Pressure Control Solenoid Control Circuit Low
P170F	Pressure Control Solenoid 'F' Shunt Monitoring
P1830	Pressure Control Solenoid Current Error in P/R/N
P0977	Shift Solenoid 'B' Control Circuit High
P0976	Shift Solenoid 'B' Control Circuit Low
P0755	Shift Solenoid 'B'
P0979	Shift Solenoid 'C' Control Circuit Low

P0982	Shift Solenoid 'D' Control Circuit Low
P1806	Shift Solenoid 'A' or 'B' Mechanically Stuck
P2815	Pressure Control Solenoid 'G' Control Circuit High
P2814	Pressure Control Solenoid 'G' Control Circuit Low
P173C	Pressure Control Solenoid 'G' Shunt Monitoring
P0715	Input/Turbine Speed Sensor 'A' Circuit
P1811	Input/Turbine Speed Sensor Circuit Low
P0716	Input/Turbine Speed Sensor 'A' Circuit Range/Performance
P1812	Output Speed Sensor Circuit High Input
P1813	Output Speed Sensor Circuit Low Input
P0720	Output Speed Sensor Circuit
P0721	Output Speed Sensor Circuit Range/Performance
P1814	Output Speed Sensor Gradient Too High
P0710	Transmission Fluid Temperature Sensor 'A' Circuit
P1704	Transmission Fluid Temperature Sensor 'A' Circuit Shorted
P1718	Transmission Fluid Temperature Sensor 'A' Unpermitted Temperature Increase
P0711	Transmission Fluid Temperature Sensor 'A' Circuit Range/Performance
P0669	PCM/ECM/TCM Internal Temperature Sensor Circuit High
P0668	PCM/ECM/TCM Internal Temperature Sensor Circuit Low
P0666	PCM/ECM/TCM Internal Temperature Sensor Circuit
P0218	Transmission Fluid Over Temperature Condition
P171F	Internal Transmission Control Module Component CG122 Error
P0741	Torque Converter Clutch Circuit Performance or Stuck Off
P173D	CAN Message Monitoring Transmission Intake Torque
P1729	Engine High Rotational Irregularity
P1728	Engine Overspeed Condition
P1760	Engine Torque Request Plausibility
P17E1	Ratio Monitoring Clutch A
P17E2	Ratio Monitoring Clutch B
P17E3	Ratio Monitoring Clutch C
P17E4	Ratio Monitoring Clutch D
P17E5	Ratio Monitoring Clutch E
P17E6	Ratio Monitoring Shift 1-2
P17E7	Ratio Monitoring Shift 2-3
P17E8	Ratio Monitoring Shift 3-4
P17E9	Ratio Monitoring Shift 4-5
P17EA	Ratio Monitoring Shift 5-6
P17EB	Ratio Monitoring Shift 6-5
P17EC	Ratio Monitoring Shift 5-4
P17ED	Ratio Monitoring Shift 4-3
P17EE	Ratio Monitoring Shift 3-2
P17EF	

	Ratio Monitoring Shift 2-1
P17F0	Ratio Monitoring Clutch A and D
P17F1	Ratio Monitoring Clutch A and C
P17F2	Ratio Monitoring Clutch A and B
P17F3	Ratio Monitoring Clutch A and E
P17F4	Ratio Monitoring Clutch B and E
P17F5	Ratio Monitoring Clutch C and E
P17F6	Ratio Monitoring Clutch B and D
P17F7	Ratio Monitoring Shift 6-4
P17F8	Ratio Monitoring Shift 5-3
P17F9	Ratio Monitoring Shift 4-2
P17FA	Ratio Monitoring Shift 3-1
P1790	Internal Transmission Control Module Memory Check Sum/EPROM Error
P1791	Internal Transmission Control Module Memory Check Sum/EEPROM Error
P171A	Internal Transmission Control Module Watchdog General Error
P171B	Internal Transmission Control Module Watchdog Run Time Error
P171C	Internal Transmission Control Module Watchdog Initialization Error
P171D	Internal Transmission Control Module Watchdog Electrical Error
P171E	Internal Transmission Control Module Watchdog Plausibility Error
P175A	TCM Internal Error Shifting to D without Driver Command
P177A	TCM Internal Error no Shifting despite of Driver Command
P175C	Gear Shift Position 2/4 Circuit Wrong Frequency
P1798	Internal Transmission Control Module Writing Error EEPROM
P1798	Internal Transmission Control Module Monitoring Level 2 Error, Engine Torque Up Request
P1712	Internal Transmission Control Module Monitoring Level 2 Error, Engine Torque Up Request
P1713	Internal Transmission Control Module Monitoring Level 2 Error, Calculation Engine Torque Up Request
P1723	Internal Transmission Control Module Severe QADC Error
P1722	Internal Transmission Control Module Minor QADC Error
P1724	Internal Transmission Control Module TPU AliveCounter Error
P1725	Internal Transmission Control Module TPU RAM Error Internal Transmission Control Module Level 2 Error,
P172E	Interference Counter above Threshold General Error Internal Transmission Control Module Level 2 Error,
P172A	Interference Counter 1 above Threshold
	Internal Transmission Control Module Level 2 Error,
P172B	Interference Counter 2 above Threshold
	Internal Transmission Control Module Level 2 Error,
P172C	Interference Counter 3 above Threshold
	Internal Transmission Control Module Level 2 Error,

P172D	Interference Counter 4 above Threshold
	Internal Transmission Control Module Level 2 Error,
P1754	Interference Counter below Threshold General Error Internal Transmission Control Module Level 2 Error,
P172F	Interference Counter 1 below Threshold
	Internal Transmission Control Module Level 2 Error,
P1733	Interference Counter 2 below Threshold
	Internal Transmission Control Module Level 2 Error,
P1735	Interference Counter 3 below Threshold
	Internal Transmission Control Module Level 2 Error,
P1737	Interference Counter 4 below Threshold
P1891	System Voltage High Input
P1892	System Voltage Low Input
P1890	System Voltage
P1893	Supply Voltage Pressure Control Solenoid/Shift Solenoid Circuit High
P1894	Supply Voltage Pressure Control Solenoid/Shift Solenoid Circuit Low
P1895	Supply Voltage Pressure Control Solenoid/Shift Solenoid No Signal
P1896	Supply Voltage Pressure Control Solenoid/Shift Solenoid
P1897	Supply Voltage Sensors High Input
P1898	Supply Voltage Sensors Low Input
P0705	Transmission Range Sensor 'A' Circuit (PRNDL Input)
P0706	Transmission Range Sensor 'A' Circuit Range/Performance
P1701	Double Error Position Information CAN / Serial Line
P1730	Pressure Control Solenoid Unpermitted Activation
P1702	Combination Substitute Function
P1727	CAN Engine Speed
P1771	CAN Torque Interface Plausibility
U0001	High Speed CAN Communication Bus
U114A	Message Monitoring Engine Control Torque 1 Alive Check
U114B	Lost Communication With Engine Control Torque 1
U114D	Message Monitoring Engine Control Torque 2 Alive Check
U1163	Message Monitoring Engine Control Alive Check
U0100	Lost Communication With ECM/PCM 'A'
U1164	Message Monitoring Engine Control Check Sum Error
U1125	Message Monitoring DSC Status Alive Check
U1126	Lost Communication With DSC Status
U1127	Message Monitoring DSC Status Check Sum Error
U1149	Message Monitoring CAS Alive Check
U1131	Lost Communication With CAS
U1150	Message Monitoring CAS Check Sum Error
U112A	Message Monitoring Instrument Pack Status Alive Check

U112B	Lost Communication With Instrument Pack Status
U112F	Message Monitoring Instrument Pack Status Check Sum Error

GENERAL INFORMATION

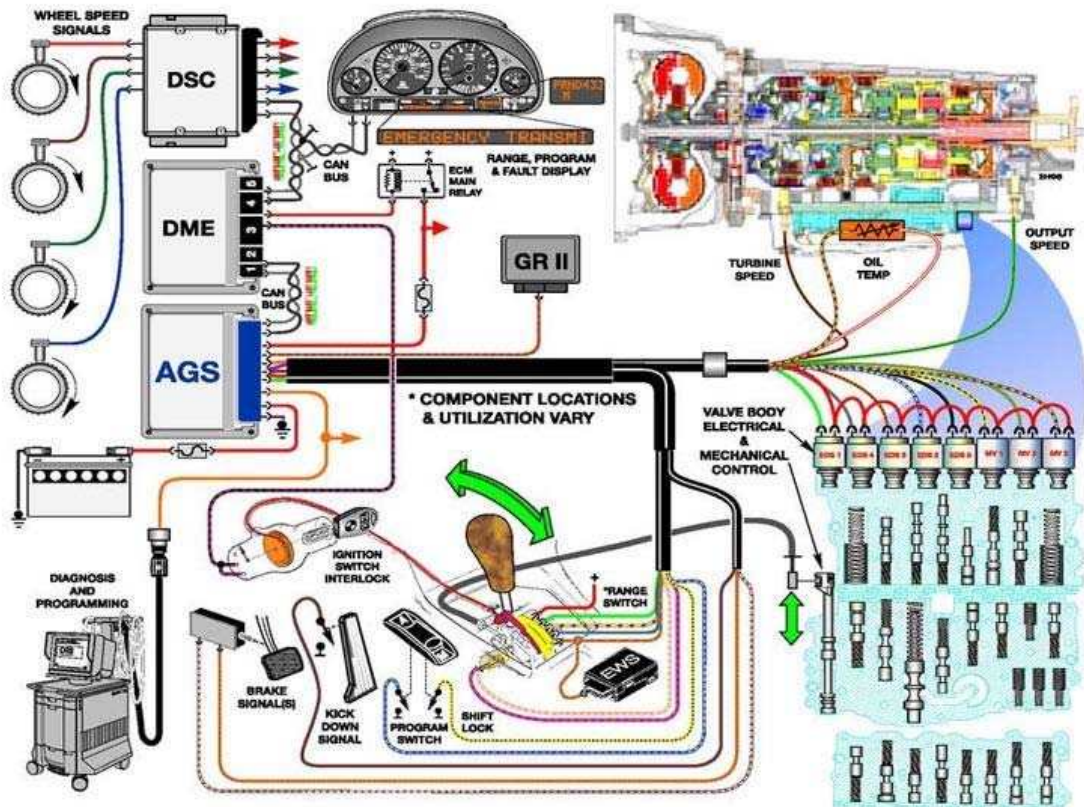
Electronic Transmission Control - Overview

ELECTRONIC TRANSMISSION CONTROL

PURPOSE OF THE SYSTEM

Electronically controlled transmissions were introduced on BMW products in 1986 on 5 and 7 series vehicles. Currently EH (Electro-hydraulic) transmissions are offered on almost every production model (Except E46 M3 and E39 M5). EH transmissions offer the following benefits to the driver:

- Increased driving safety by reducing fatigue. All shifts are automatic as opposed to manual transmissions which require more driver interaction.
- Increased fuel economy through use of lock up torque converter.
- Increased fuel economy through optimized shift points.
- Improved shift comfort by use of "Overlap Shift" technology (ZF).
- More available features through the use of CAN bus technology.



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Fig. 1: Identifying Electro-Hydraulic Transmission Inputs/Outputs
Courtesy of BMW OF NORTH AMERICA, INC.

The EH Control System is designed to work in conjunction with the engine electronics for precise shift control. The TCM receives information on engine RPM, load and throttle position to provide optimum shift points to maximize fuel economy and driver comfort.

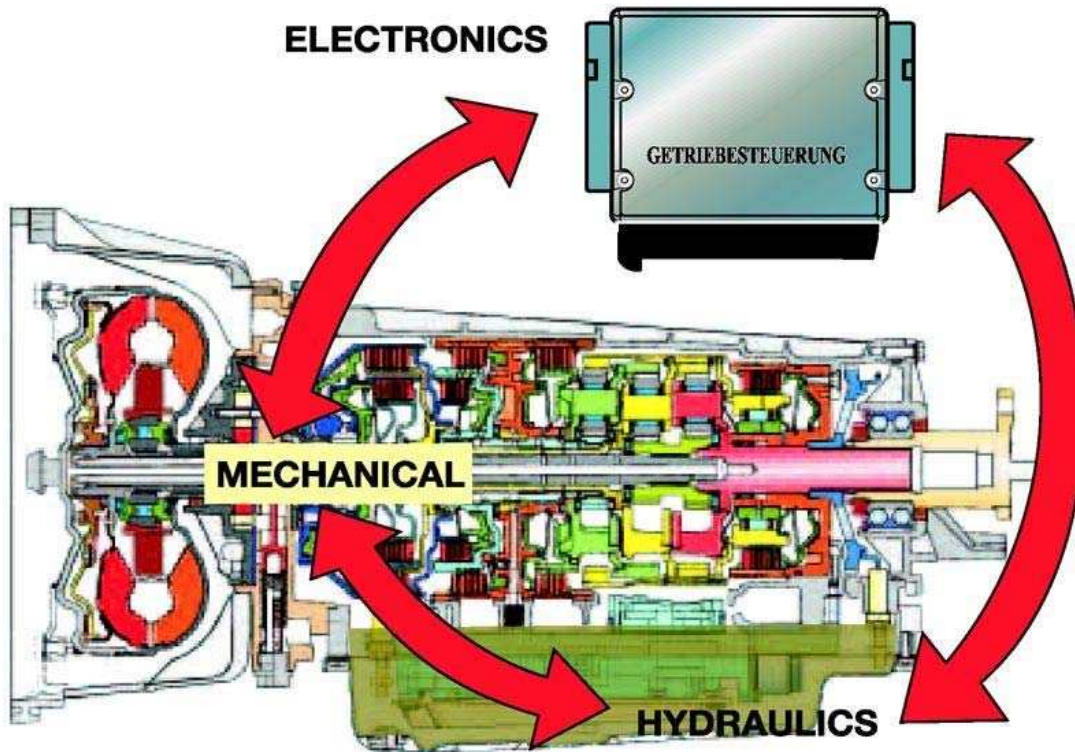
The function of an EGS System is to:

- Monitor all operating conditions through input signals
- Continually assess operating conditions by processing input data and select the appropriate operating program for current conditions.
- Activate transmission system components and to communicate with other drivetrain control systems.
- Respond to driver selected driving program (Economy, Sport or Manual).

In addition to providing shift control, the TCM also adapts to changing conditions within the transmission by monitoring slip ratios and modifying line pressure. This increases the life of the transmission and reduces maintenance and adjustments. The TCM controls the operation of the Lock-Up Torque Converter which further increases economy.

On current models, the TCM also has the capability of adapting to driver habits and responds to changing environmental conditions. Items such as rate of throttle input and kickdown requests are monitored to select the most appropriate shift program.

The EGS system is also required to maintain occupant safety, safeguard drivetrain damage, improve vehicle emissions and operate in fail-safe mode when a malfunction occurs.



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Fig. 2: Identifying EGS System

Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION VERSION AND CONTROL SYSTEMS

Each BMW Electro-hydraulic transmission has a corresponding control system. They are designated "GS" which stands for Transmission Control. This acronym is from the German words **G**etriebe **S**teuerung. Each transmission can have more than one control system, this depends upon application (model year, series etc.). Below is a listing of ZF control systems used on BMW vehicles, Hydramatic control systems are shown on the opposing page.

ZF Control Systems

ZF CONTROL SYSTEMS SPECIFICATIONS

Transmission BMW ID #	Manufacturer ID	Model/Year	Control System	Engine
4HP22 (EH)	4HP22 (EH)	86 535i	GS 1.2X	M30
		86 635i	GS 1.2X	M30
		86 735i	GS 1.2X	M30
4HP24 (EH)	4HP24 (EH)	88-9/91 750iL (E32)	GS 1.27	M70
		92-94 750iL (E32)	GS 1.29	M70
		90-94 850i/Ci (E31)	GS 1.29	M70
A5S310Z	5HP18	93 530i/iT (E34)	GS 7.3	M60

		94 530i/iT (E34) 95 M3 (E36) 96-99 M3 (E36)	GS 7.32 GS 7.11 GS 8.32	M60 S50 (US) S52
A5S325Z	5HP19	00 323i/Ci/CiC (3/00-8/00) 01 323iT (from 4/01) 01-02 325i/Ci/CiC from 9/00 00-01 330i/Ci/CiC from 6/00 01- 525 from 3/01 01- 530 from 3/01 03 Z4 (E85) 2.5i and 3.0i	GS 8.60 GS 8.60 GS 8.60.4 GS 8.60.4 GS 8.60.4 GS 8.60.4 GS 8.60.4	M52 TU M52 TU M54 M54 M54 M54 M54
A5S440Z	5HP24	97 840Ci (E31) from 9/96 97 540i (E39) 1/97- 8/97 97 740i/iL (1/97 - 4/97) 97 740i/iL (5/97- 8/97) 98-03 540i 98-01 740i/iL 00- X5 4.4i	GS 8.55 (CAN index 50) GS 8.55 (CAN index 50) GS 8.55 (CAN index 50) GS 8.55 (CAN index 60) GS 8.60.2 (CAN index 60) GS 8.60.2 (CAN index 60) GS 8.60.2	M62 M62 M62 M62 M62, M62 TU 99-02 M62, M62 TU 99-01 M62TU
A5S560Z	5HP30	93-94 740i/iL (E32) 93 540i (E34) 94-95 540i (E34) 94-95 840Ci (E31) 95 740i/iL (E38) 95-01 750iL (E38) 96-97 740i/iL (- 1/97) 96 840Ci (E31) 95-97 850Ci	GS 9.2 GS 9.2 GS 9.22 GS 9.22 GS 9.22 GS 9.22.1 GS 9.22.1 GS 9.22.1 GS 9.22.1	M60 M60 M60 M60 M60 M73/M73TU M62 M62 M73
GA6HP26Z	GA6HP26Z GA6HP26Z	02- 745Li (E65/E66) 03- 760Li (E66)	GS 19 GS 19	N62 N73

Hydramatic Control Systems

HYDRAMATIC CONTROL SYSTEMS SPECIFICATIONS

Transmission BMW ID #	Manufacturer ID #	Model/Year	Control System	Engine
--------------------------	-------------------	------------	----------------	--------

A4S310R (THM-R1)	4L30-E(A4S310R) >>>	90-92 525i (E34) 93-95 525i (E34) 92 325i, is, ic (E36) 93-95325i, is, ic (E36) 92-95 318ti (E36)	GS 4.14 GS 4.16 GS 4.14 GS 4.16 GS 4.14 & GS 4.16	M50 M50 TU M50 M50 TU M42
A4S270R	4L30-E(A4S270R) >>>	96-98 328i (is, ic - 97) 96-98 318i (is, ic- 97) 96-98 318ti (E36/5) 96-98 Z3 1.9 (E36/7) 96-98 Z3 2.8 97-98 528i (E39)	GS 8.34 GS 8.34 GS 8.34 GS 8.34 GS 8.34 GS 8.34	M52 M44 M44 M44 M52 M52
A5S360R (GMS)	5L40-E (A5S360R) >>	99-00 323i/Ci (7/98- 3/00) 99-00 328i/Ci (6/98- 5/00) 99-00 528i (E39) 9/99-8/00 99-00 Z3 (E36/7) 2.3/2.8	GS 20 GS 20 GS 20 GS 20	M52 TU M52 TU M52 TU M52 TU
A5S390R (GM5)	5L40-E (A5S390R) >>	00-03 X5 3.0i (4/00 -) 01 325iT (8/00-3/01) 01-03 325xi/xiT & 330Xi (-8/00) 01 525i/iT (9/00- 3/01) 01 530i (9/00-3/01) 01-02 Z3 2.5/3.0 (6/00-)	GS 20 GS 20 GS 20 GS 20 GS 20 GS 20	M54 M54 M54 M54 M54 M54



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Fig. 3: Hydramatic Control Systems - GS 20 TCM (Siemens)
Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION IDENTIFICATION

BMW automatic transmission are manufactured by two suppliers for the US market:

- **Zahnradfabrik Friedrichshafen:** Commonly referred to as ZF. ZF manufactures both manual as well as automatic transmissions.
- **GM Powertrain - Hydramatic:** Hydramatic is a manufacturing division of General Motors located in Strasbourg, France. Hydramatic supplies automatic transmissions to BMW for four and six-cylinder vehicles.

BMW has developed an internal numbering system for their transmissions for ordering parts, information research and identification. Also, each transmission manufacturer uses an internal identification system. Here is a breakdown of these identification codes:

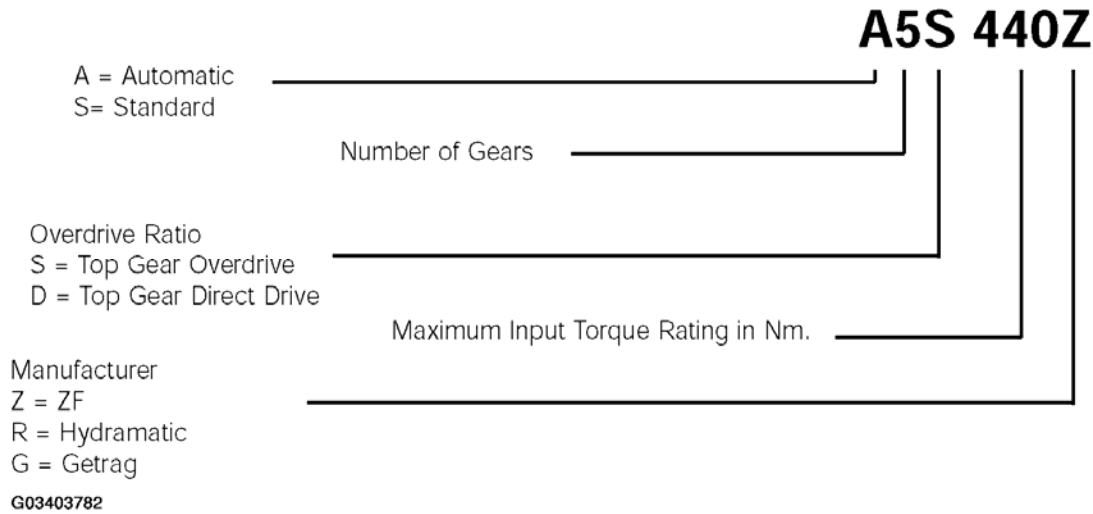


Fig. 4: Identifying BMW Identification Code Breakdown
 Courtesy of BMW OF NORTH AMERICA, INC.

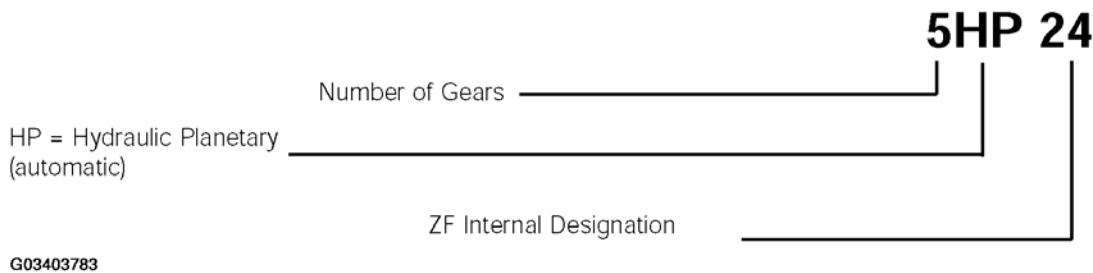


Fig. 5: Identifying ZF Identification Code Breakdown
 Courtesy of BMW OF NORTH AMERICA, INC.

Hydramatic Transmissions have internal designations, however they are not used often. The internal code for the A4S310/270R is 4L30-E and the A5S360/390R is 5L40-E.

Transmission ID Tag Location

In order to identify BMW transmissions there are identification tags located externally on the transmission case. The tag contains information such as Manufacturer, Serial number, transmission type etc. This information is needed when ordering parts, referencing bulletins and calling for technical assistance.

- **ZF - Tag is Located on -**
 1. Right hand side (passenger side) of transmission case. (5HP30 and 5HP18)
 2. Left hand side (drivers side) of transmission case. (6HP26Z, 5HP24 and all 4HP)
 3. Rear under output shaft. (5HP19)



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Fig. 6: Identifying ID Tag Location 5HP19
Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 7: Identifying Typical ZF Tag
Courtesy of BMW OF NORTH AMERICA, INC.

- GM - Located on left hand side (drivers side) of transmission case.



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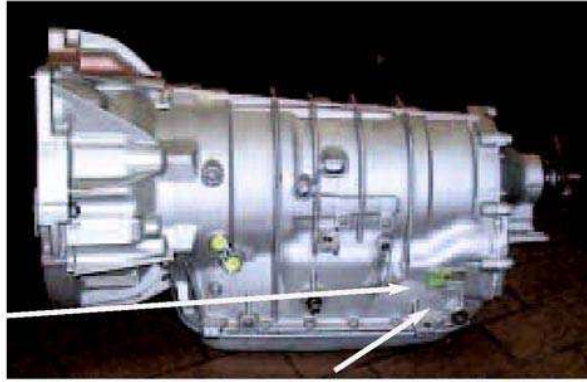
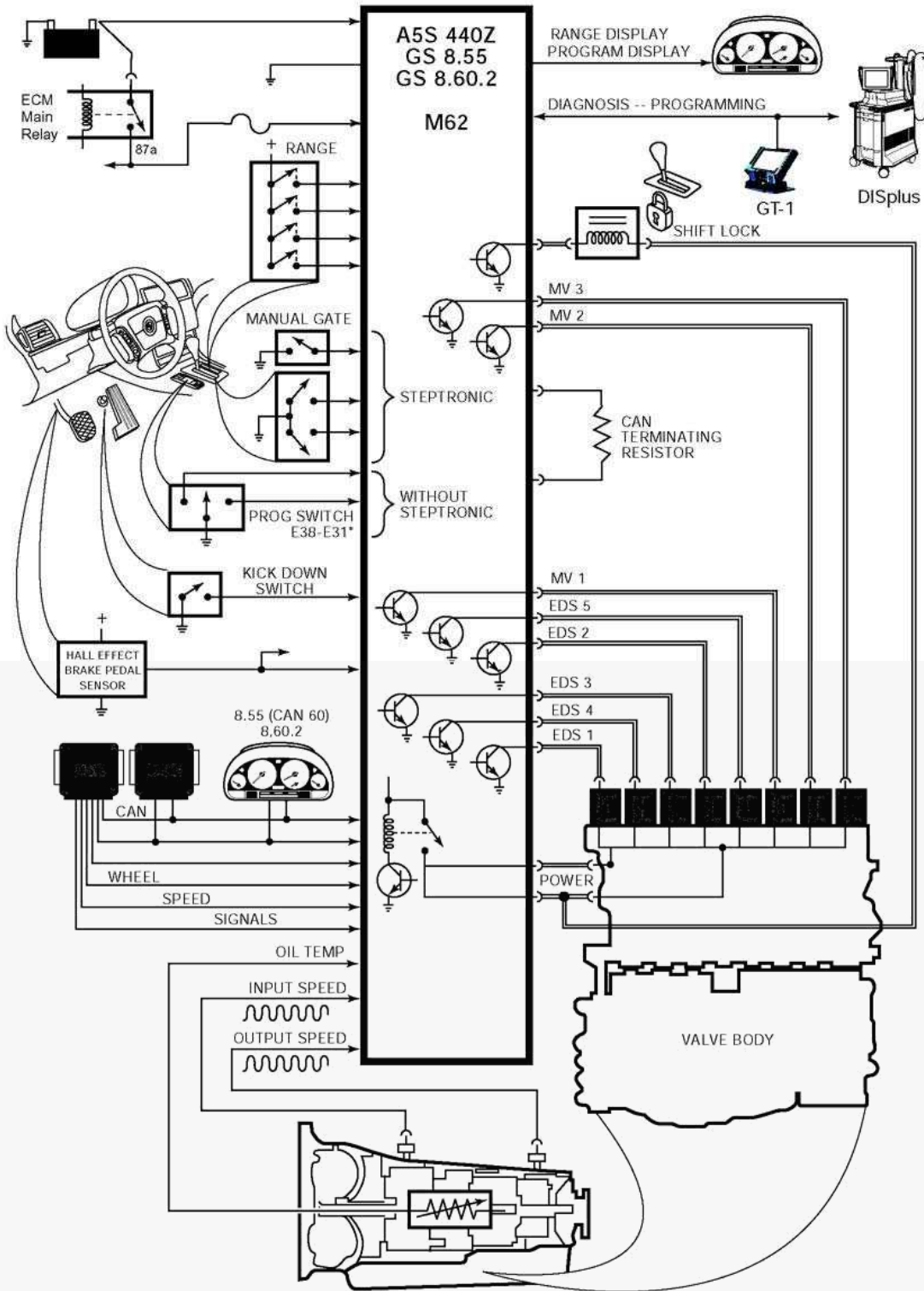


Fig. 8: Identifying GM ID Tag (GM 5)
Courtesy of BMW OF NORTH AMERICA, INC.

SYSTEM COMPONENTS (ELECTRICAL)



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Fig. 9: Identifying System Components (Electrical)
 Courtesy of BMW OF NORTH AMERICA, INC.

Transmission Control Module

The TCM receives inputs, processes information and actuates the output elements to provide optimal shift points. The TCM is programmed for maximum shift comfort and fuel economy. The TCM on most BMW vehicles is located in the E-Box next to the ECM (DME).

There are several types of TCM housings:

- 35 Pin TCM (TCU) - used on the 4HP transmissions
- 55 Pin TCM - used on the A4S310R (THM-R1)
- 88 Pin TCM - used on all others up to 98
- 134 Pin TCM - used on all BMW transmission from the 99 model year. (Note- the 134 pin TCM was introduced on the 98 Models equipped with the A5S440Z).

The 134 Pin TCM is also referred to as SKE (Standard Shell Construction). The SKE housing uses 5 separate connectors. On transmission applications only three connectors 1, 3 and 4) are used. Connectors 2 and 5 are blank and are **NOT** used. The connectors are blue in color to avoid confusion with the ECM (DME) connectors which are black.

!34 Pin control modules are supplied by Bosch for ZF transmissions and Siemens for Hydramatic transmissions. Bosch and Siemens control modules are **NOT** interchangeable.

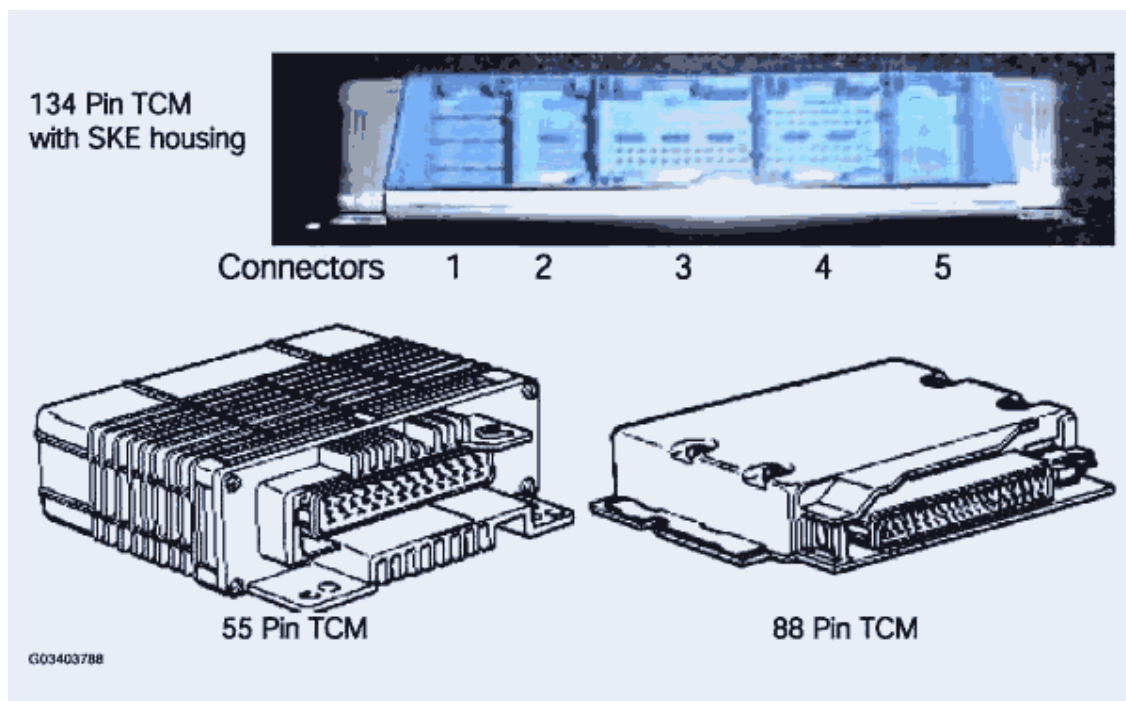


Fig. 10: Identifying Transmission Control Module
Courtesy of BMW OF NORTH AMERICA, INC.

Turbine Speed Sensor

The Turbine Speed Sensor is used to provide input (turbine) shaft speed information to the TCM (EGS). The input shaft speed signal is used in conjunction with the output shaft speed signal to determine gear range and slip time information for processing in the TCM. Not all BMW transmissions use a turbine speed sensor. Some TCM's use the TD (engine speed) signal to determine input shaft speed. All transmissions with the exception of the A5S325Z use an inductive type sensor which generates an AC analog signal. The A5S325Z currently uses a Hall Effect Turbine Speed Sensor which will send a digital square wave signal to the TCM.

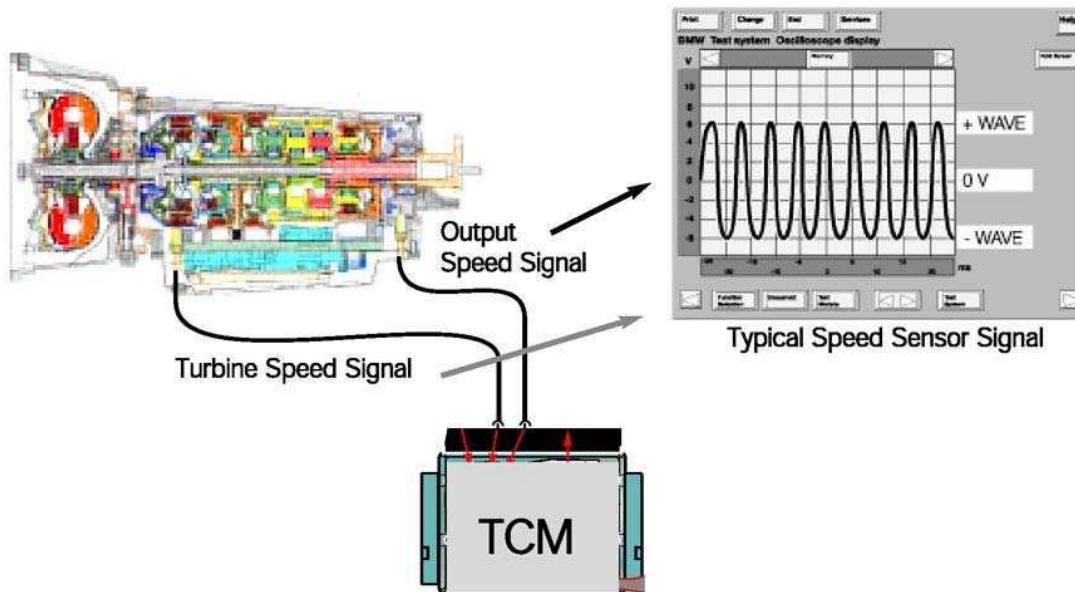
4HP22/24 (EH), A4S310/270R: These transmissions do not use a Turbine Speed Sensor. The TD signal is used to determine input shaft speed. The TD signal is an output signal of the DME control unit.

A5S310Z, A5S325Z, A5S440Z, A5S560Z, A5S360/390R: These transmission use a turbine speed sensor. The TD signal is also used with the turbine speed signal to allow the TCM to monitor Torque Converter Clutch operation. The TCM can control torque converter clutch slippage and also monitor for faults.

Output Shaft Speed Sensor

The Output Shaft Speed Sensor is used to provide output shaft speed information to the TCM. The output shaft speed signal is used in conjunction with the turbine speed signal to provide the TCM with information on gear ranges and slip times.

All BMW electronic transmissions have an output shaft speed sensor. The output shaft speed sensor is an inductive type which will generate an AC analog signal to the TCM. The frequency and amplitude of the signal will increase as output shaft speed increases. The exact location of the output shaft speed sensor varies by transmission model.



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Fig. 11: Identifying Output Shaft Speed Sensor Graph
Courtesy of BMW OF NORTH AMERICA, INC.

Transmission Oil Temp Sensor

The TCM is provided with transmission oil temperature information via a temperature sensor. On most BMW transmissions, the sensor is an NTC element which is part of the transmission internal wiring harness.

4HP22/24 (EH): These transmissions do not use a transmission oil temperature sensor. There are no transmission oil temperature influenced features on the 4HP transmissions.

All Except A5S360/390R, GA6HP26Z: The transmission fluid temp sensor is part of the transmission internal wiring harness. On these transmissions, the sensor cannot be replaced separately. The harness must be replaced.

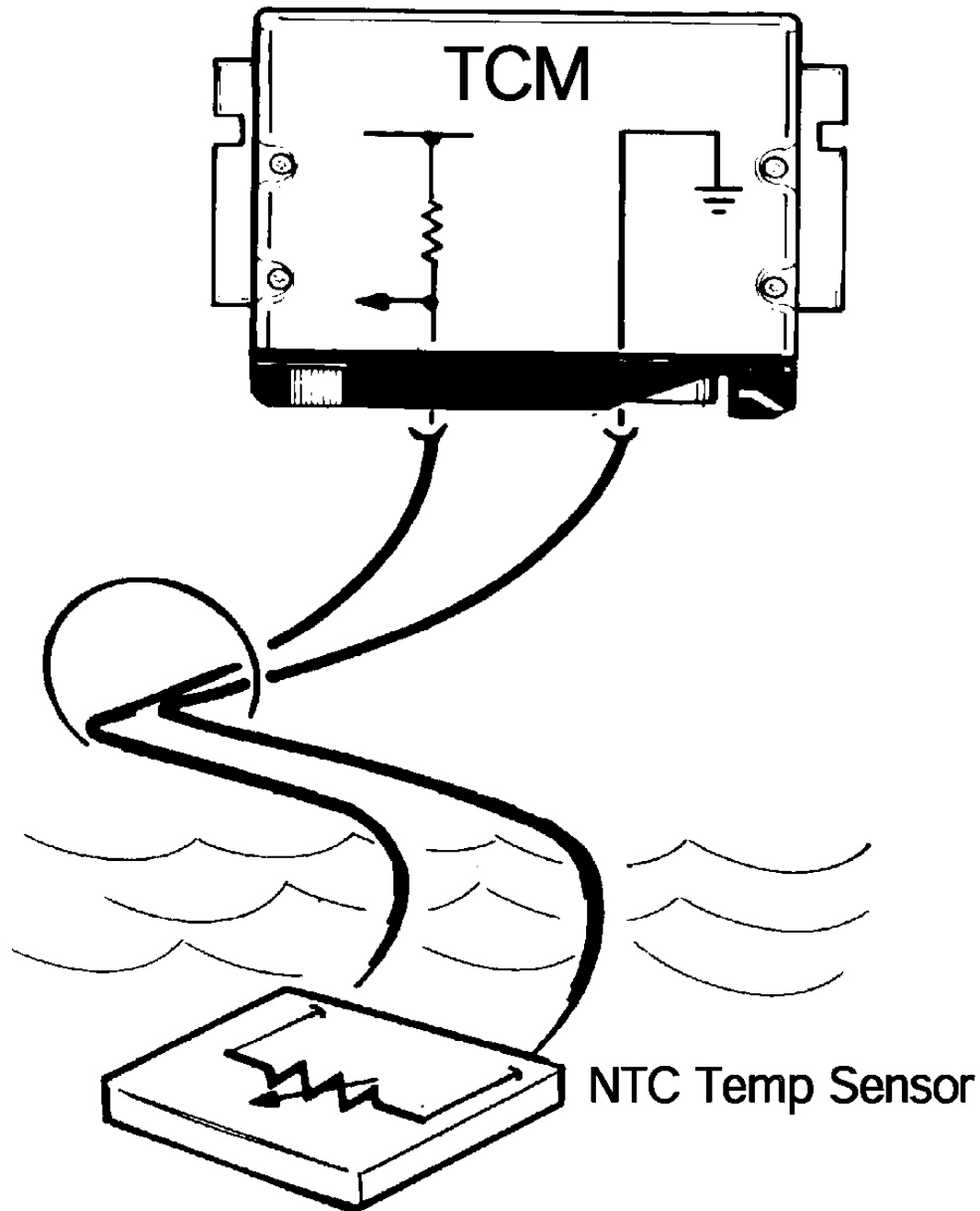
A5S360/390R transmission: the sensor is a separate, replaceable sensor that can be unplugged from the harness.

GA6HP26Z: the sensor is located in the Mechatronics Module, which is located inside of the transmission.

NOTE: The Mechatronics Module is not currently serviceable at this time. Contact the BMW Technical Hotline in the event of a failure. Do not attempt any repair or replacement of the Mechatronics Module.

The transmission oil temperature information is used to:

- Initiate the Warm Up Program
- To inhibit TCC operation until a specified temperature has been reached.
- For determining fluid level when used with diagnostic equipment.



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Fig. 12: Transmission Oil Temperature Sensor Is Connected To TCM
Courtesy of BMW OF NORTH AMERICA, INC.

The transmission oil temperature sensor is connected to the TCM via a 5 Volt reference and a circuit ground. As transmission oil temperature increases, the circuit resistance and voltage decrease proportionately.

Kickdown Switch

The TCM receives a kickdown request via one of two possible methods:

- The kickdown signal is a direct ground input to the TCM. The kickdown input is provided by a kickdown switch located under the accelerator pedal. This method is used on most BMW vehicles without electronic throttle control systems (except M52TU with MDK).



Fig. 13: Identifying Kickdown Switch
Courtesy of BMW OF NORTH AMERICA, INC.

- The kickdown request is provided by the ECM (DME) via the CAN bus. The kick down request originates from the PWG. There is no separate switch in the PWG. When the PWG voltage reaches approximately 4.5 volts, the ECM will process a kickdown request to the TCM via CAN. The PWG contains a kickdown detent to simulate the feel of a kickdown switch.

This method is used on the M62TU, M54, M73, M73TU, N73 and N62 engines.

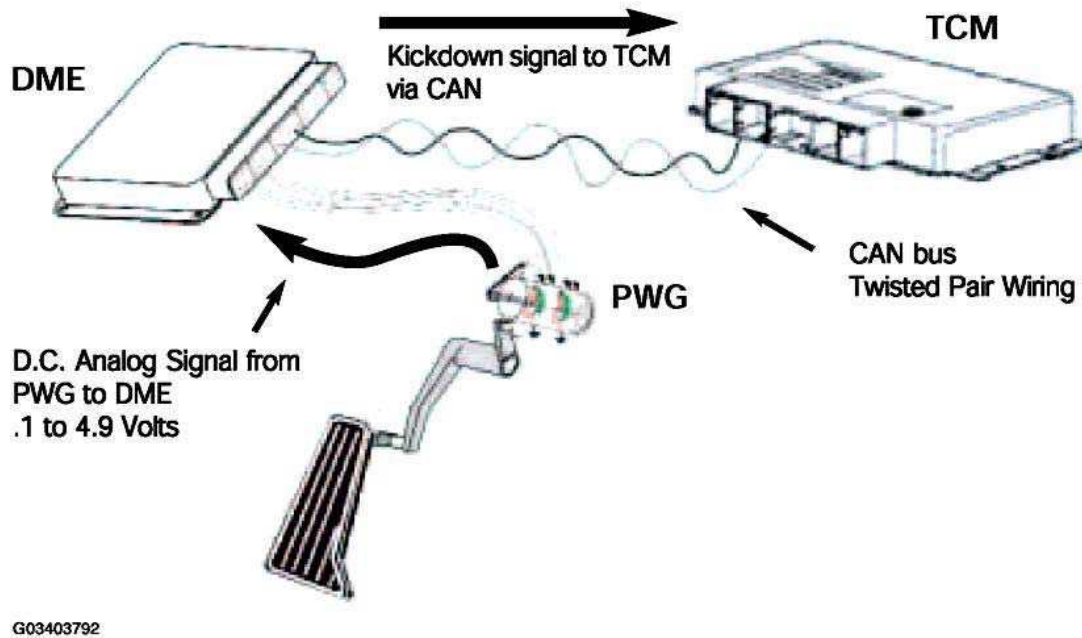


Fig. 14: Identifying Kickdown Signal Is A Direct Ground Input To
Courtesy of BMW OF NORTH AMERICA, INC.

Brake Switch

The brake switch is located on the brake pedal linkage. The brake switch signal is an input to the TCM which is used for:

- De-activation of the shift lock solenoid. When the ignition key is turned to KL15 the shift lock is active. The shift lock solenoid is de-activated when the brakes are applied.
- De-activate the Torque Converter. The TCC is deactivated whenever the brake is applied. (only on Hydramatic Transmissions).

There are two types of brake switches used on BMW vehicles:

- On early vehicles such as E32, E34, E36, E24, E28 and E31 the brake switch is a double-contact mechanical switch. There is a brake light circuit and a brake test circuit. The brake test circuit is used for a plausibility check to indicate faults within the brake light circuit.
- On the E38, E39, E46, E65/66, E85 and E53 the brake switch is a hall effect type switch. The electronic switch is also monitored for faults and plausibility.

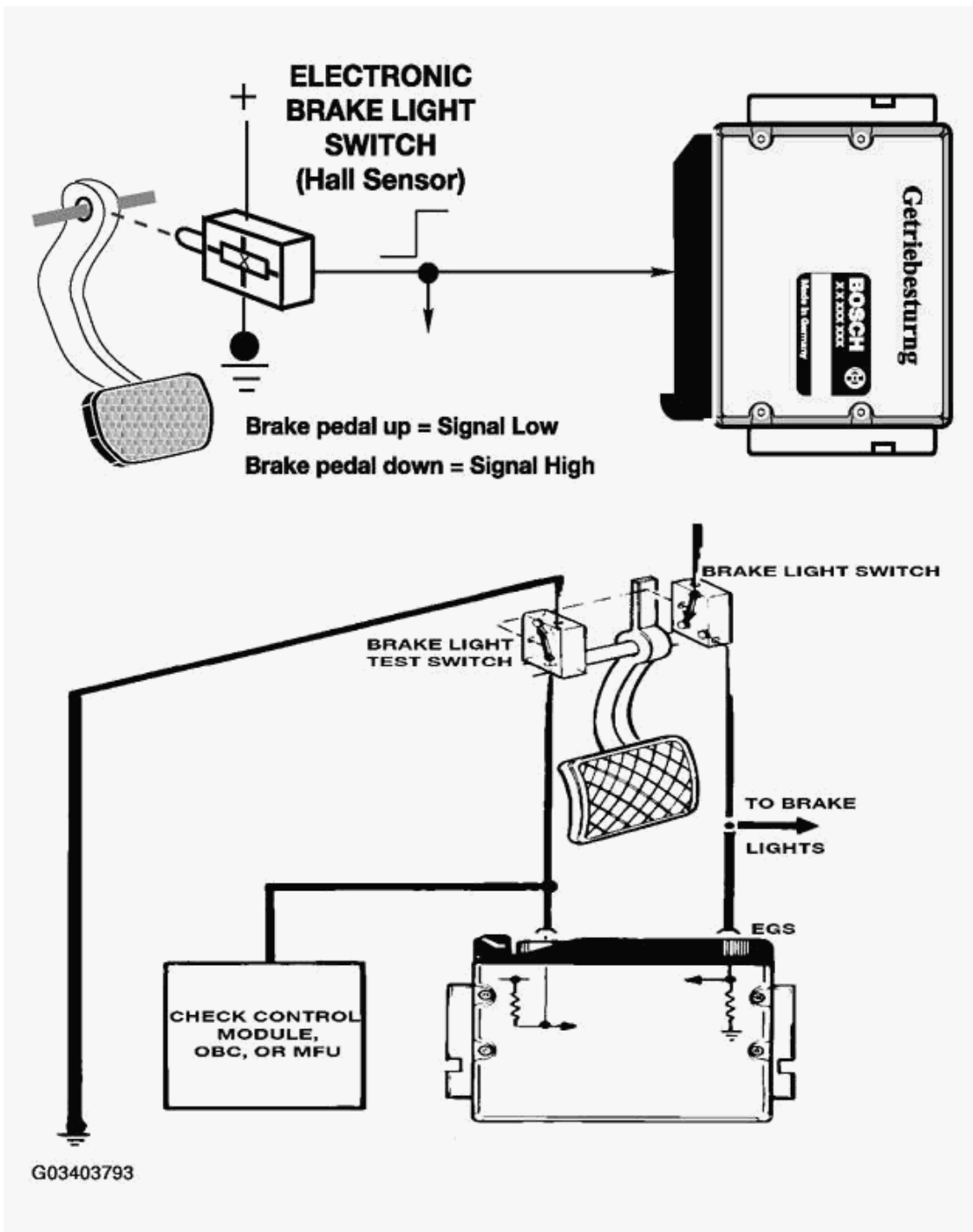


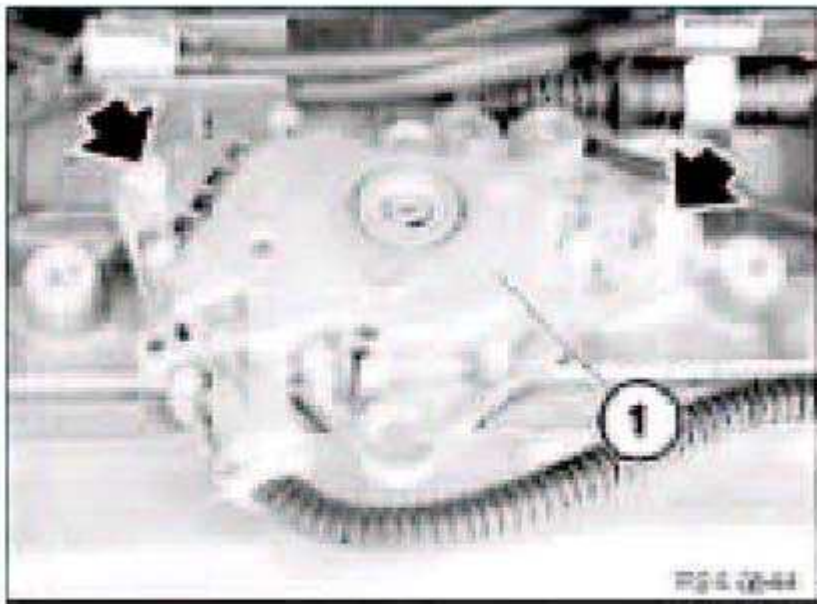
Fig. 15: Identifying Brake Switch Signal Is An Input To TCM
 Courtesy of BMW OF NORTH AMERICA, INC.

Transmission Range Selector Switch

The range selector switch is an input to the TCM. The input is used by the TCM to determine the position of the manual valve. The range switch uses the familiar "coded input" signal to determine selector lever position. On all transmissions except the A5S360/390R, the range switch uses a 4 wire configuration to determine 7 range

selector positions. The A5S360/390R uses a five wire arrangement.

Most range switches are located on the transmission case with some exceptions. The E36 with the A4S270/310R the range switch is located in the center console on the selector lever assembly. The E39 with A4S270R the range switch is located on the transmission case and is adjustable. The range selector switch on the A5S360/390R is located inside the transmission housing. GA6HP26Z is part of the Mechatronics Module.



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Fig. 16: Identifying Transmission Range Selector Switch
Courtesy of BMW OF NORTH AMERICA, INC.

The range switch can be checked by using "Status Requests" in the DISplus or GT-1.

A multimeter or an oscilloscope can also be used to check the range switch. If the reading on "Status Requests" does not match the actual selector lever position, there will be various transmission malfunctions.

Use the switch logic chart to diagnose faults in the switch.

In the example below, the range switch is in neutral. Using the logic chart, switches L1, L2 and L3 are closed providing B+ voltage to the corresponding pins of the TCM. Switch L4 is open and no voltage is sent to the TCM. Malfunctions in the range switch or wiring can cause various shifting complaints and possible No-Start complaints.

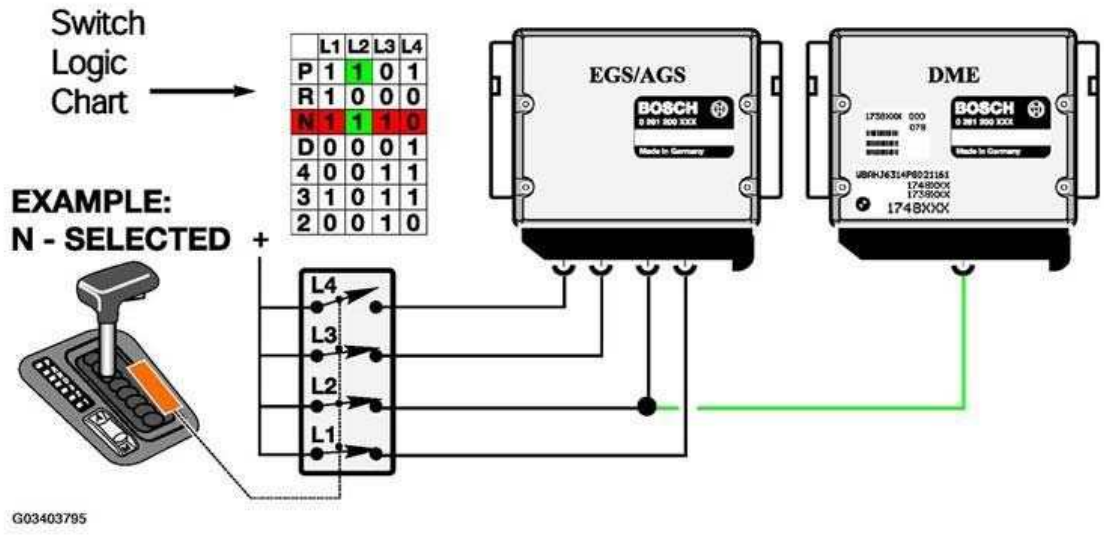


Fig. 17: Identifying Transmission Range Selector Switch Logic Chart
 Courtesy of BMW OF NORTH AMERICA, INC.

Transmission Program Switch

The transmission program switch is used to switch between various operating modes of the transmission. The normal default mode of the TCM is Economy which is indicated in the program display as "E". Economy mode allows the transmission to operate in the most efficient mode. Shift priorities are for maximum economy and shift comfort. On some vehicles the program switch is designated "A" for economy mode. Program switches come in 2 or 3 position configurations. Early vehicles with the 4HP (Early E7) used a rotary program switch.

The TCM can also be switched to "Manual Mode" which on some vehicles is designated "Winter Mode". Manual mode is used to start the vehicle off in a higher gear when encountering slippery conditions. The program display will indicate "M" (manual) or an asterisk symbol for "Winter Mode".

Sport Mode is the third operating mode that is available. Sport mode allows for a slightly delayed and more aggressive shift. Sport mode is obtained a number of ways. On vehicles with 2 position program switches, moving the selector lever out of drive to 4, 3, or 2 with the program switch in Economy will allow Sport mode. On vehicles with 3 position program switches, Sport mode can be obtained by switching to "S".

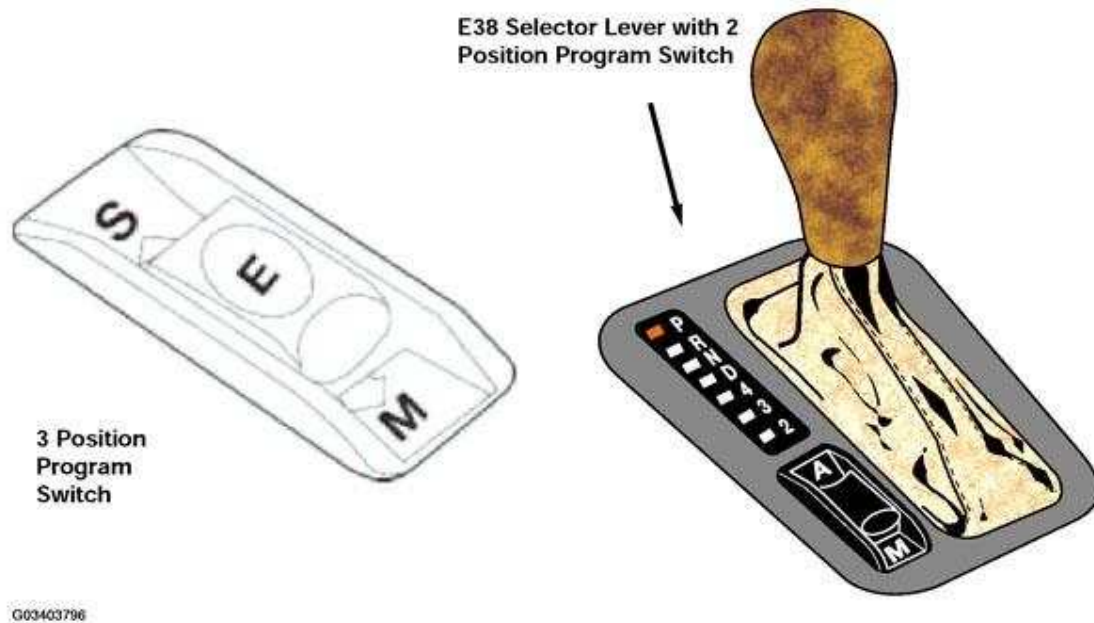


Fig. 18: Identifying Transmission Program Switch
 Courtesy of BMW OF NORTH AMERICA, INC.

Steptronic Components

The Steptronic system uses additional components not found on a conventional system. These components consist of a manual switch and an Up/Down microswitch. Otherwise, the Steptronic system uses the same transmission and TCM.

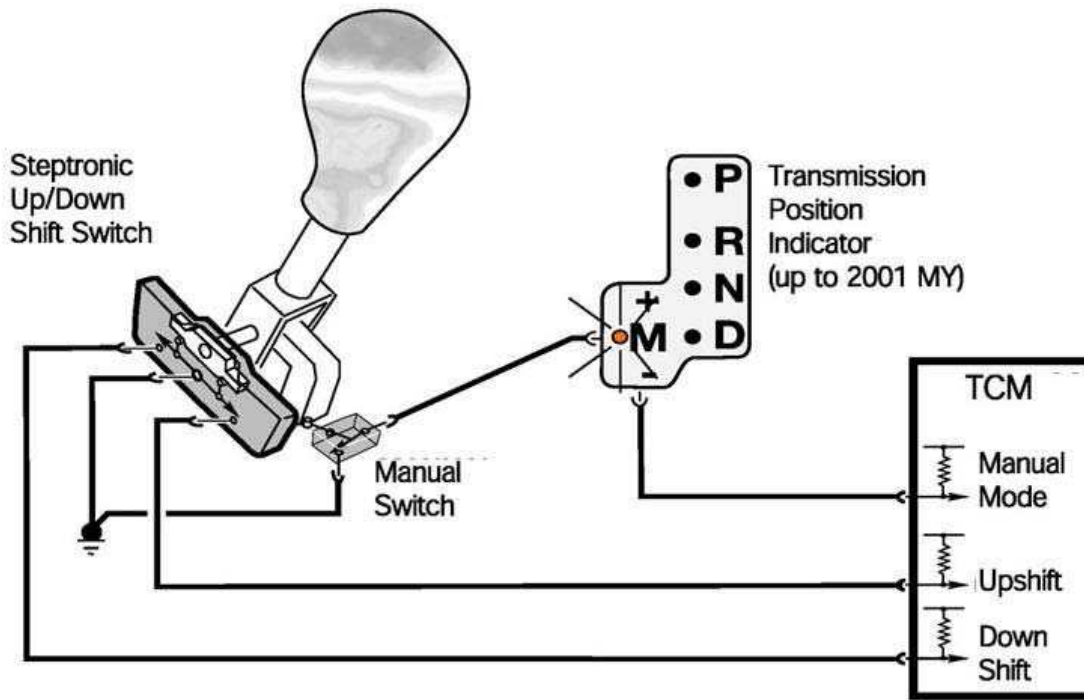
The TCM monitors the Steptronic shifter position from P through D via the conventional range selector switch located on the transmission. The Range Selector Switch provides positions P through D to the TCM because the automatic gate of the shifter only travels through these positions.

When the Steptronic Shifter is moved to the left 15 degrees into the manual gate, the TCM receives a ground input from the manual gate switch. The ground signal is provided to the TCM through the Transmission Position Indicator. The transmission position indicator also provides range position signaling to the range position indicator in the shift console.

Steptronic was introduced on the E31 850Ci (10/94) and the 840Ci (1/96). Steptronic was subsequently introduced into the E38, E39, E46, E36/7 and the E53.

The Steptronic system can be diagnosed through "Status Requests" with the DISplus or GT-1.

From 2002 model year the Steptronic shifter has changed slightly. Downshifts are now achieved by moving the selector lever forward and upshifts are now rearward.



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Fig. 19: Identifying Steptronic Components

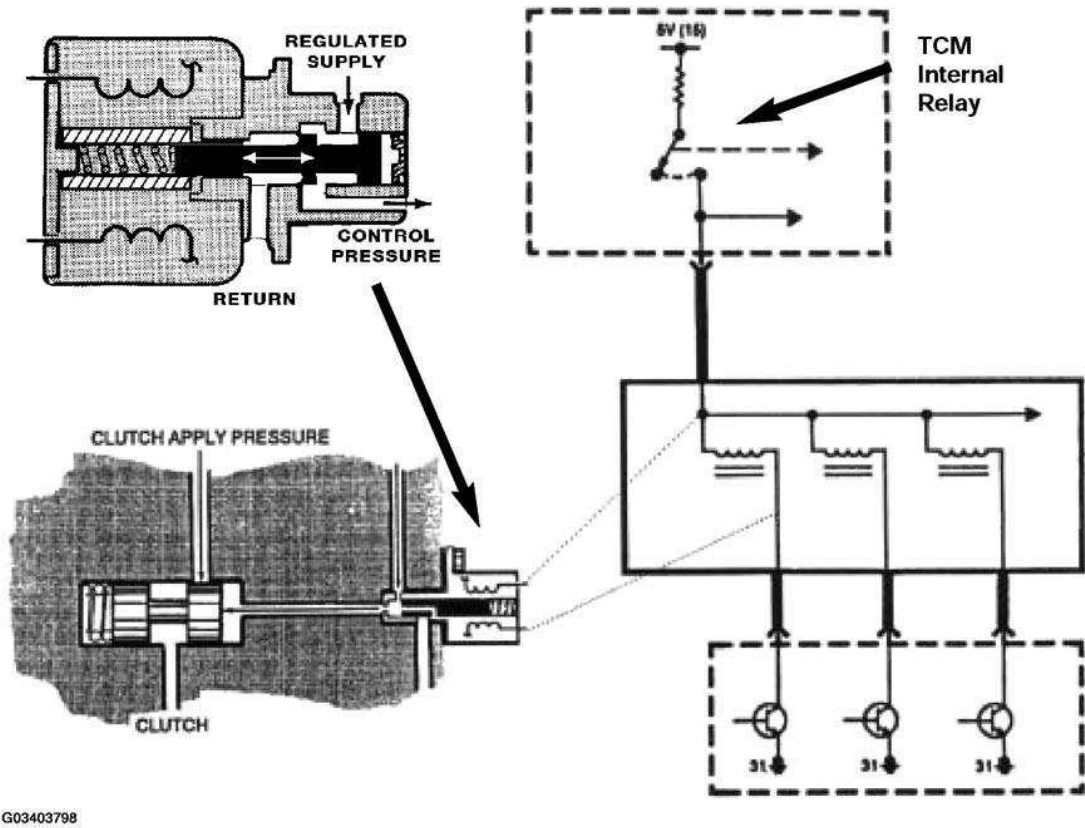
Courtesy of BMW OF NORTH AMERICA, INC.

Magnetic Valves

Magnetic Valves (MV) are used to electronically control hydraulic fluid flow to the various shift elements within the transmission. Magnetic valves are located on the valvebody and replaceable as separate components. In ZF transmissions, MV valves are designated MV1, MV2, MV3 etc. In Hydramatic transmissions, they are designated Shift Valve A, Shift Valve B, Shift Valve C etc.

The magnetic valves are controlled by the TCM. They are supplied power by an internal TCM relay and are ground controlled. The TCM switches one or more of the MV's on or off in various combinations to achieve various shifts. Most transmission have 2 or 3 MV's to control shifting.

In addition to controlling shifts within the transmission, magnetic valves are also used for overlap shifting and pressure regulation on some transmission applications. For example MV4 and MV5 are used for overlap shifting in the A5S310Z. MV5 is used for pressure regulation on the 4HP22/24EH transmissions. When used for pressure regulation, the magnetic valves are pulse width modulated by the TCM.



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Fig. 20: Identifying Magnetic Valves Are Pulse Width Modulated By TCM
 Courtesy of BMW OF NORTH AMERICA, INC.

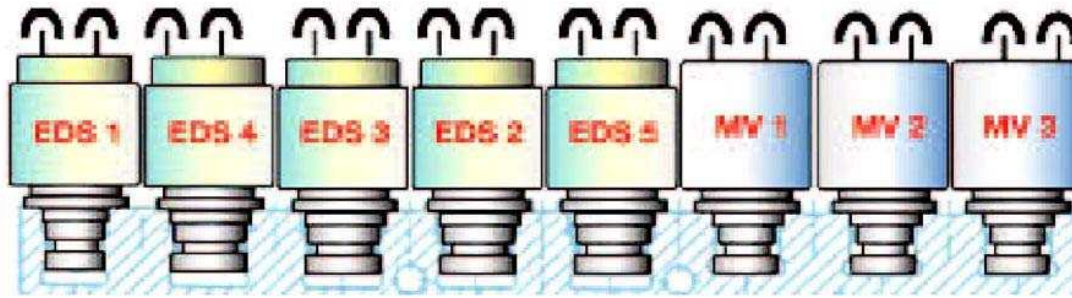
Pressure Regulating Solenoids

Pressure Regulating Solenoids are used to modify line pressure for use in the transmission. There are numerous terms for these solenoids depending upon transmission type and manufacturer. ZF transmissions use the term EDS, while Hydramatic Transmissions use the term DR solenoid, Force Motor Solenoid and Variable Bleed Solenoid (VBS).

EDS valves are used for main line pressure regulation, TCC application and Overlap Shift Pressure Control on the A5S440Z and A5S560Z. All pressure regulating solenoid are controlled by Pulse Width Modulation.

Using the example in the picture below, this is a section of the A5S440Z/560Z valve body. The EDS valves are used for the following:

- EDS 1 is used for main line pressure regulation
- EDS 2, 3 and 5 are used Overlap Shift Pressure Control
- EDS 4 is used for TCC application. (GWK) Gradually applied TCC.

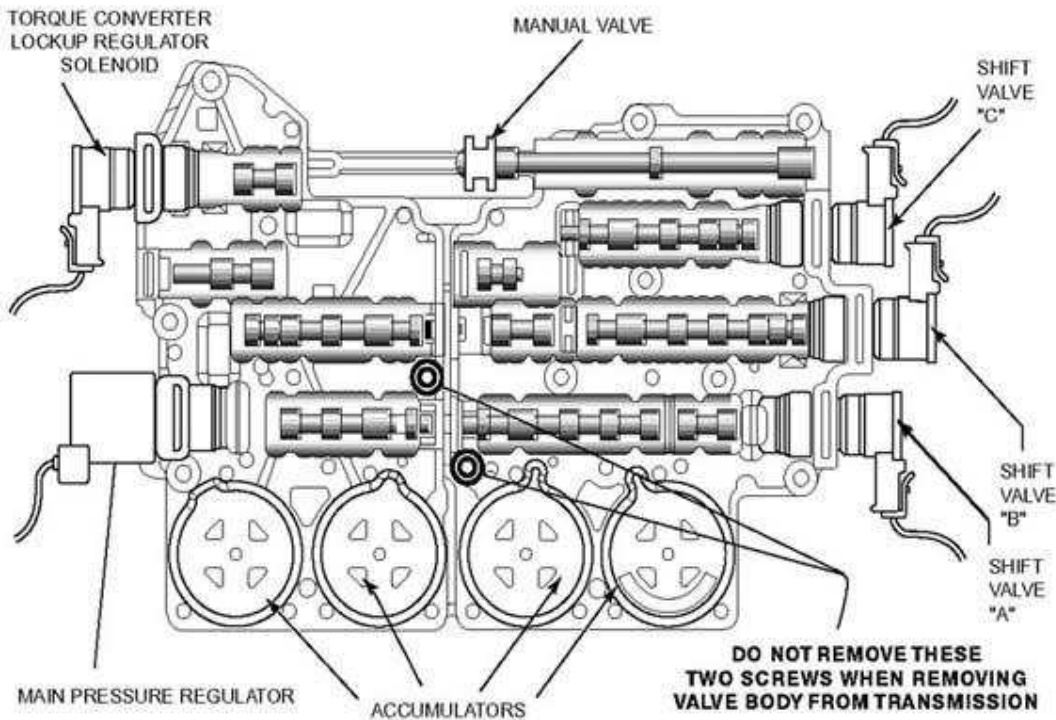


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Fig. 21: Identifying Pressure Regulating Solenoids
 Courtesy of BMW OF NORTH AMERICA, INC.

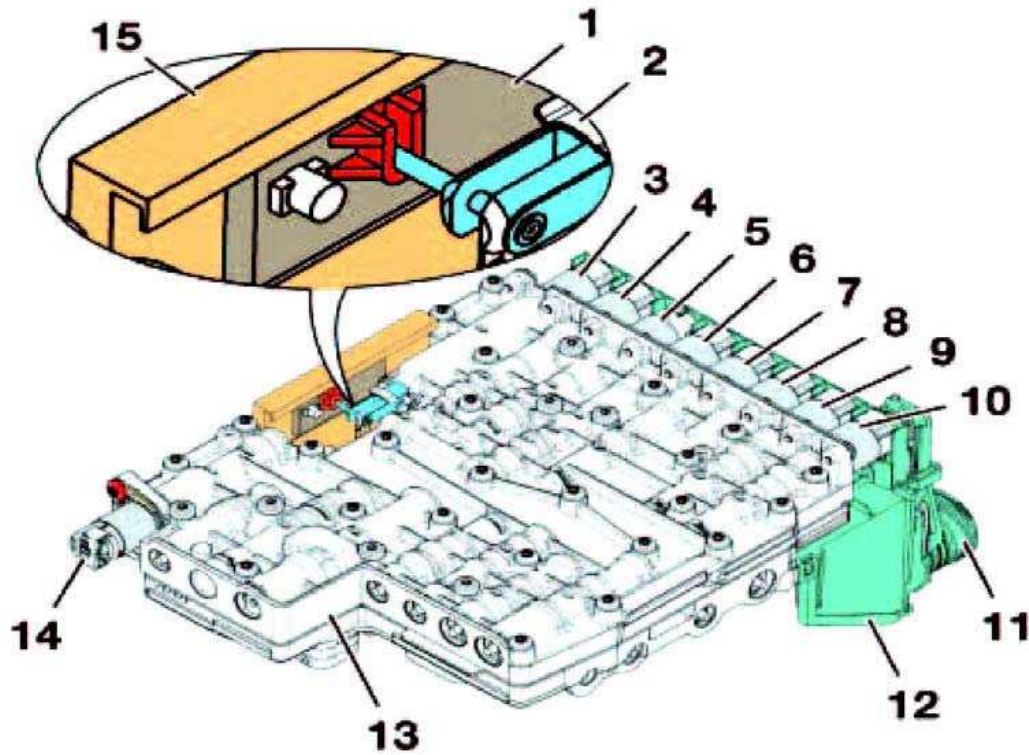
Hydramatic Pressure Regulator

The valve body shown at the right is from the A5S360/390R. Note the location of the main pressure regulator. Depending upon the reference text, the pressure regulator is also known as the Force Motor Solenoid, Variable Bleed Solenoid or PC Solenoid.



G03403800

Fig. 22: Identifying Hydramatic Pressure Regulator
 Courtesy of BMW OF NORTH AMERICA, INC.



1	Position Slide Switch	9	EDS 2
2	Parking Lock Cylinder Piston	10	EDS 1
3	Solenoid Valve 3, parking lock Cylinder	11	Electronic Plug Connector
4	EDS	12	Electronic Module
5	Solenoid Valve 1	13	Hydraulic Module (Valve body)
6	EDS 4	14	Solenoid Valve 2
7	EDS 5	15	Position Switch
8	EDS 3		

G03403801

Fig. 23: Identifying Mechatronics Module GA 6HP26Z
 Courtesy of BMW OF NORTH AMERICA, INC.

Instrument Cluster

The cluster is used to report information to the driver regarding transmission status. There are three items of information needed by the driver:

- **Transmission Range** - this indicates the position of the range selector lever. The driver needs to know whether the transmission is in P, R, N, D, 4, 3, or 2.
- **Transmission Program** - this indicates the mode of operation. There are 3 modes, Economy, Manual and

Sport.

- **Transmission Fault Information** - the driver needs to know of there is a malfunction in the transmission. Depending upon application, transmission faults can be indicated by an icon or by a "Transmission Program" message in the instrument cluster display matrix.

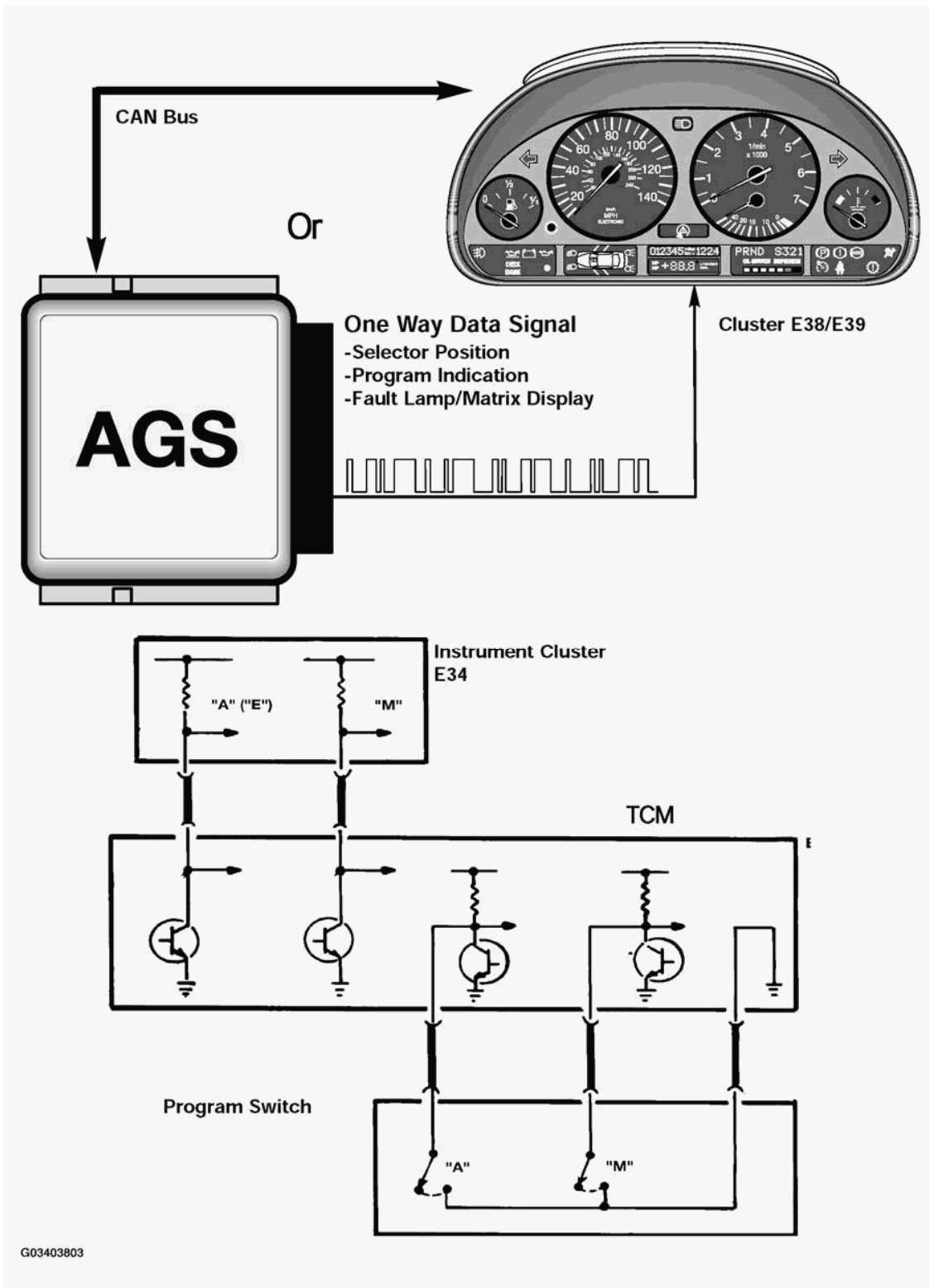


Fig. 24: Identifying Instrument Cluster
Courtesy of BMW OF NORTH AMERICA, INC.

Depending upon vehicle model and transmission, these pieces of information arrive at the cluster through different methods.

- The most current method for this information to arrive at the cluster is through the CAN bus. The cluster processes this information from the TCM via CAN.
- On early E38 and E39 vehicles there is a "One Way Data Signal" from the TCM to the cluster. There is a one way serial data line that transfers this information to the cluster. On later vehicles, the cluster was introduced to the CAN bus and this method was no longer used. This was used on the E38 vehicles to 5/97 and E39 vehicles to 8/97 production.
- Early vehicles such as E32, E34, E36 etc. used a various combination of methods to transfer this data. Some clusters use the "Coded Input" method for the program indicator. Fault indication is done by a ground circuit through the TCM. Transmission range indication is achieved by a direct connection between the range switch and cluster or by a coded input to cluster.

There will be a FC6 in the Kombi when the TCM goes into fail-safe mode.



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Fig. 25: Identifying Instrument Cluster Circuit
 Courtesy of BMW OF NORTH AMERICA, INC.

Adaptive Hydraulic Pressure Control

Pressure adaptation has been a feature of ZF automatic transmissions since the 4HP22EH. The TCM will maximize shift quality by adapting to transmission wear over time. The TCM will adjust transmission shift pressures to compensate for wear in the multi-plate clutches. This is accomplished by monitoring the input and output speeds of the transmission. When the transmission shifts, the TCM monitors the time that it takes to accomplish the shift. The time change in gear ratio is monitored and compared to an internal time value in the TCM. If the ratio change takes more time than the stored value, the TCM will compensate by adjusting the transmission shift pressures via the EDS valve solenoids. The adaptation value is stored in the TCM. This adaptation values can only be cleared by the diagnostic tester (DIS plus or GT-1).

NOTE: DO NOT clear adaptation values unless directed to do so by technical assistance. Clearing pressure adaptations should not be done to resolve a customer complaint. The only time that you would need to do so is after a transmission or valve body replacement or software change. Also it is important not to confuse pressure adaptation with AGS features. AGS features will be discussed later in this chapter. AGS features are not stored on a long term basis and will not be cleared when the pressure adaptations are cleared. Driving style is NOT stored.

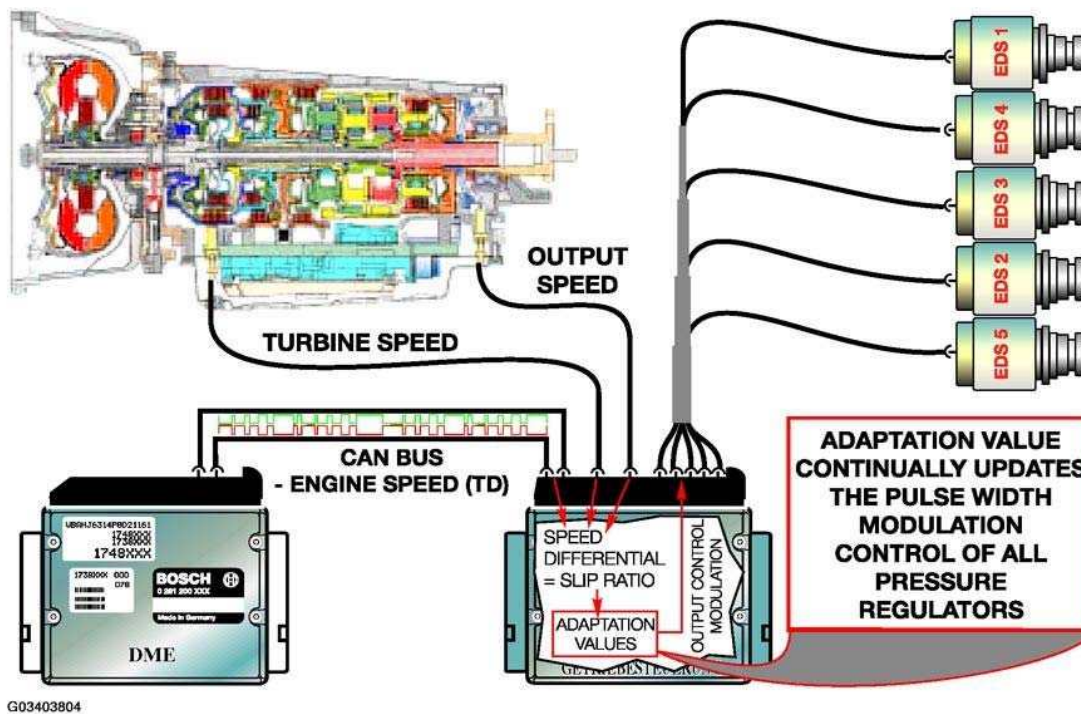


Fig. 26: Identifying Adaptive Hydraulic Pressure Control
Courtesy of BMW OF NORTH AMERICA, INC.

Downshift Protection

Downshift protection is a feature that prevents unwanted or improper downshifting. If the range selector were moved to a lower gear at a high road speed, engine damage could occur from an unintended over-rev. This feature will prevent engine over-rev by delaying or preventing the unwanted downshift until the proper road speed is achieved. The result is increased safety by preventing unwanted deceleration slip.

Reverse Lockout

The TCM will lockout reverse above 3 MPH to prevent drivetrain damage. The range selector lever will go into the reverse detent, but reverse will not engage. This is achieved by the TCM through hydraulic intervention. The transmission will appear to be in neutral.

NOTE: Reverse Lockout is not operative when in fail-safe.

Engine Warm Up Cycle

The transmission shift points are modified after cold start to raise engine RPM during shifting. This allows for a faster engine warm up and reduction of catalyst warm up time. The TCM uses the transmission oil temperature information to determine the implementation of this function.

The warm up phase program will be terminated if any of the following conditions exist:

- The vehicle exceeds 25 MPH or
- Transmission oil temperature exceeds 60 Degrees Celsius or
- A Maximum of three minutes is exceeded.

ASC/DSC Shift Intervention

During ASC/DSC regulation upshifts are inhibited to enhance the effectiveness of tractional control. Depending upon vehicle model, this action can take place via the CAN bus or a dedicated shift intervention signal wire. On later model vehicles where the ASC/DSC module is connected to the CAN bus, the shift intervention signal is sent to the TCM via CAN.

Torque Reduction

In order to allow a smoother shift and reduce load on the transmission, engine torque is reduced during shifting. This is accomplished by a signal that is sent from the TCM (EGS) to the ECM (DME) during shifting. The ECM will retard timing momentarily during the shift for a few milliseconds. This timing change is transparent to the driver. Depending upon application, the torque reduction signal is sent over a dedicated wire or a signal over the CAN bus.

Emergency Program

When a malfunction occurs within the transmission, the Emergency program (fail-safe mode) will be initiated. The Emergency Program will prevent unintended gear engagement and ensure driver safety. The following will occur during Fail-safe Operation:

- All shift solenoids are de-energized via TCM internal relay.

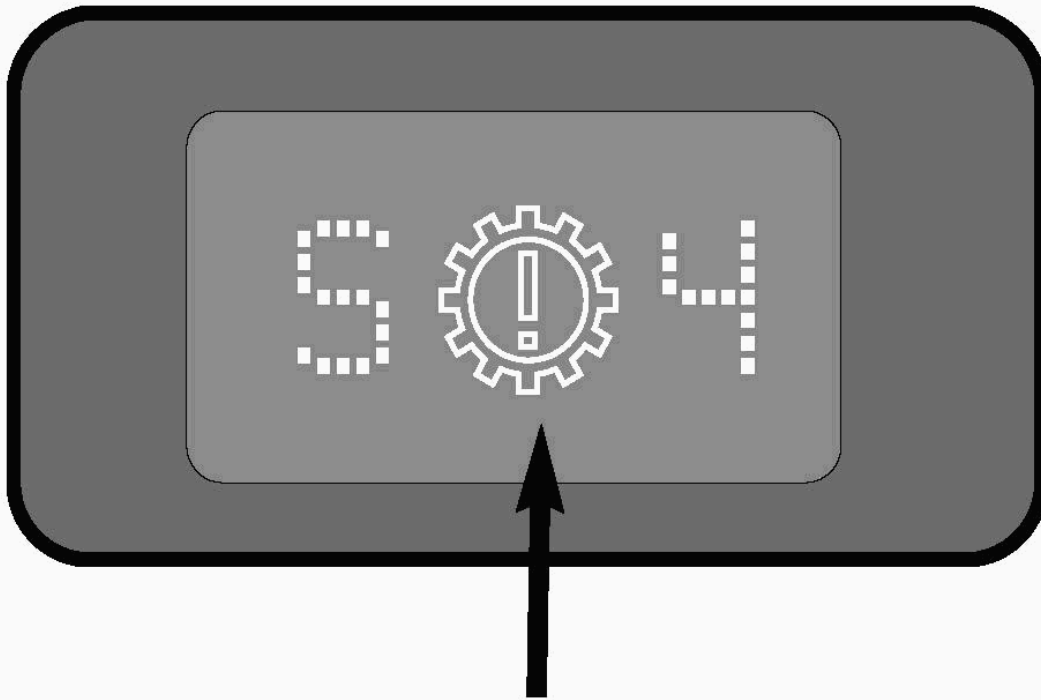
- The pressure regulation solenoid is de-energized resulting in maximum line pressure.
- The Torque Converter Clutch is de-activated.
- The Reverse Lockout function is cancelled.
- Shift lock solenoid is de-energized.
- Fault indicators are active.

The fault indicator varies depending upon model, year and cluster type etc. High version instrument cluster will display a message in the matrix display. Vehicles with low version clusters will display a fault symbol in the cluster.

During fail-safe mode the transmission will be shifted into a higher gear to allow the vehicle to be driven to a service location. Depending upon application, the transmission will shift into 3rd or 4th gear (on a 4spd) and 4th or 5th gear (on a 5 spd). For example the A5S360R transmission will go into 5th gear when there is a malfunction and 4th when there is a power failure to the TCM. Since pressure regulation ceases, the shift to fail-safe mode will be abrupt or harsh, unless the transmission is already in the fail-safe gear.

On newer OBD II compliant vehicles, the MIL light will also be illuminated by the ECM (DME).

NOTE: When diagnosing transmission related complaints, it is possible to have an erroneous fault indicator warning. Faults in the cluster can cause a false indication or "Trans Program" message. One indication of this scenario would be a transmission fault message in the cluster with no transmission faults stored in the TCM.



E46 Transmission Fault Indicator

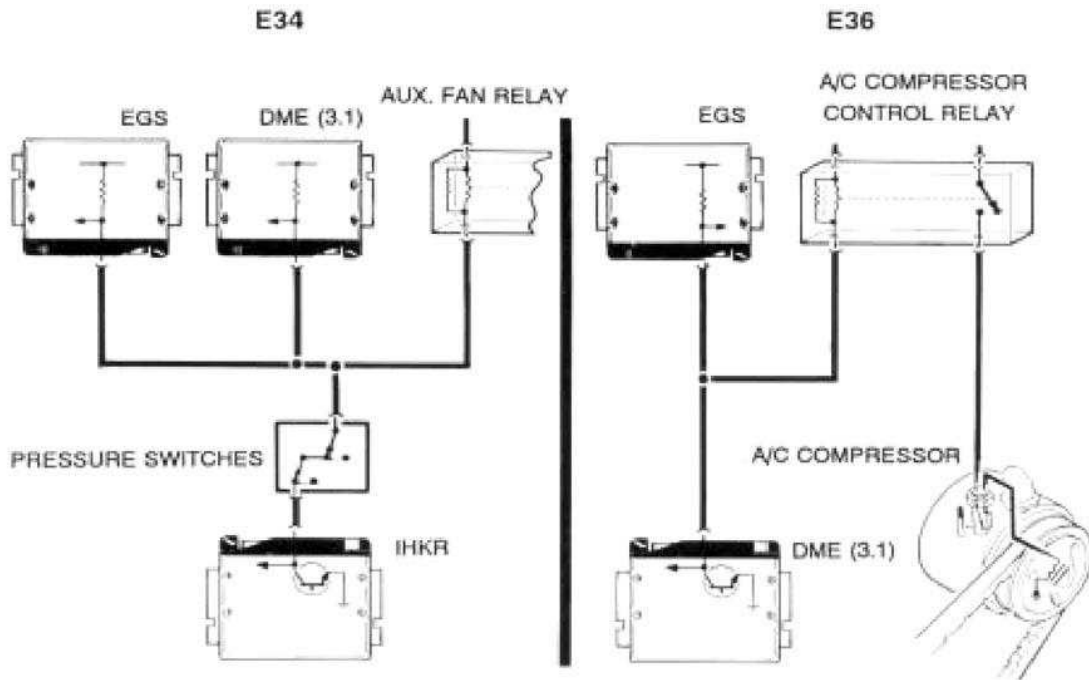
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Fig. 27: Identifying E46 Transmission Fault Indicator
Courtesy of BMW OF NORTH AMERICA, INC.

AC Compressor Load Sensing (Hydramatic Transmissions)

When the AC Compressor is switched on, additional load is placed on the engine. To compensate for the additional load, the TCM modifies line pressure and shift points. On the THMR-1, the TCM receives these signals via a direct connection to the AC compressor control circuit.

On vehicles equipped with CAN bus technology, the "AC on" signal is sent to the TCM from the DME as a CAN bus message.



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Fig. 28: Identifying AC Compressor Load Sensing (Hydramatic Transmissions)
 Courtesy of BMW OF NORTH AMERICA, INC.

Shift Lock

The shift lock solenoid is mounted on the selector lever assembly and locks the selector lever in Park or Neutral when the ignition is ON. This prevent the selection of a gear unless the brake pedal is depressed. The solenoid is activated by a switched ground from the TCM. Power is supplied by the TCM internal relay. During fail-safe operation, the shift lock is disabled. On later models, the shift lock will also be active when the TD signal is present and the shifter will remain locked above an engine speed of 2500 RPM regardless of brake application.

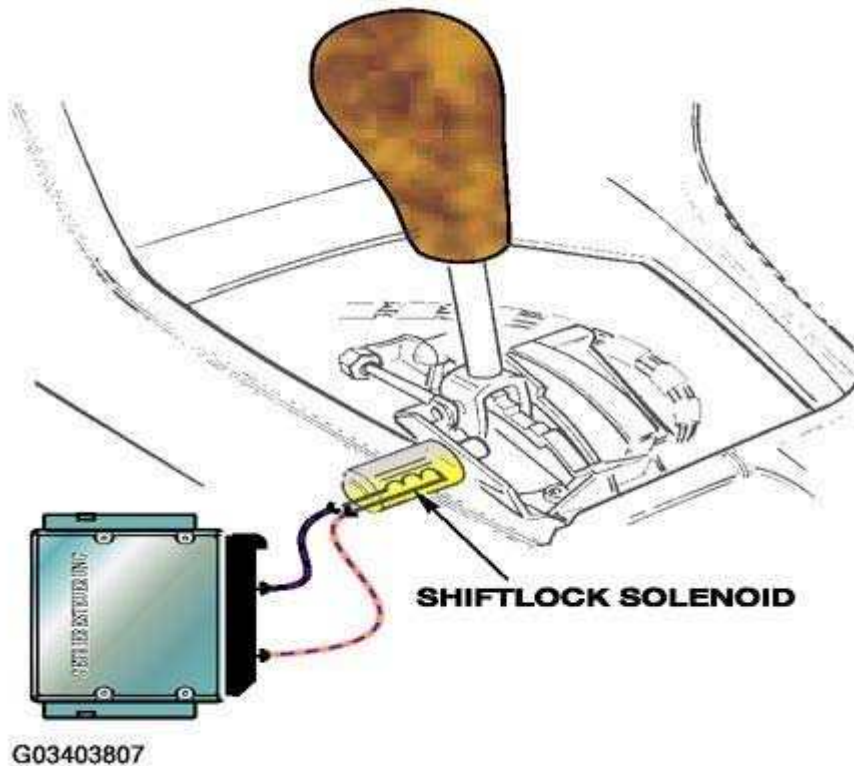


Fig. 29: Identifying Shift Lock Solenoid
 Courtesy of BMW OF NORTH AMERICA, INC.

Torque Converter Clutch

Since the efficiency of the torque converter at coupling speed is approximately 1.1 to 1, fuel economy is compromised. To offset this a torque converter clutch was added on EH controlled transmissions. The torque converter clutch locks the turbine to the converter housing. This creates a mechanical coupling with a ratio of 1:1. This can only be achieved at higher engine speeds, the torque converter clutch must be disengaged at low engine speeds to prevent stalling.

There are two methods for controlling the torque converter clutch on BMW transmissions:

- **A4S310/270R, 4HP22/24 EH, A5S310Z** - These transmissions use an on/off control method to lock and unlock the torque converter. The Torque Converter Clutch is either completely engaged or disengaged. This method of engagement provides an abrupt sensation when the TCC is locking and unlocking. This abrupt sensation can be undesirable to some drivers.
- **A5S560Z, A5S440Z, A5S325Z, GA6HP26Z, A5S360/390R** - These transmissions use a gradual approach to TCC control. The TCC is gradually applied and released, this method reduces the abrupt feel of the on/off type TCC. The TCC solenoid is controlled by pulse width modulation. This allows fluid to be gradually introduced and released to the TCC.

The TCC is spring loaded to the engaged position. Pressurized fluid releases the TCC, when the pressurized fluid is released, the TCC is engaged. Depending on transmission application, the TCC can be engaged in 3rd, 4th or 5th gear. The TCC must be disengaged at low speeds to prevent stalling.

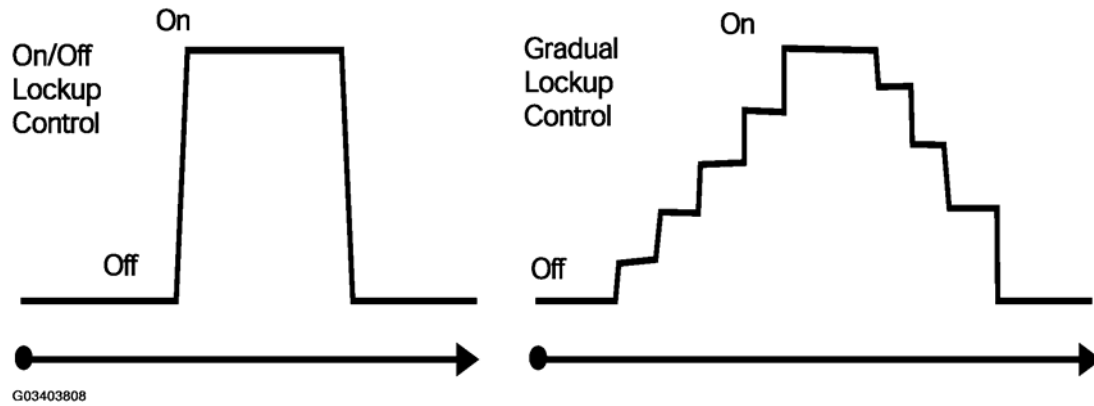
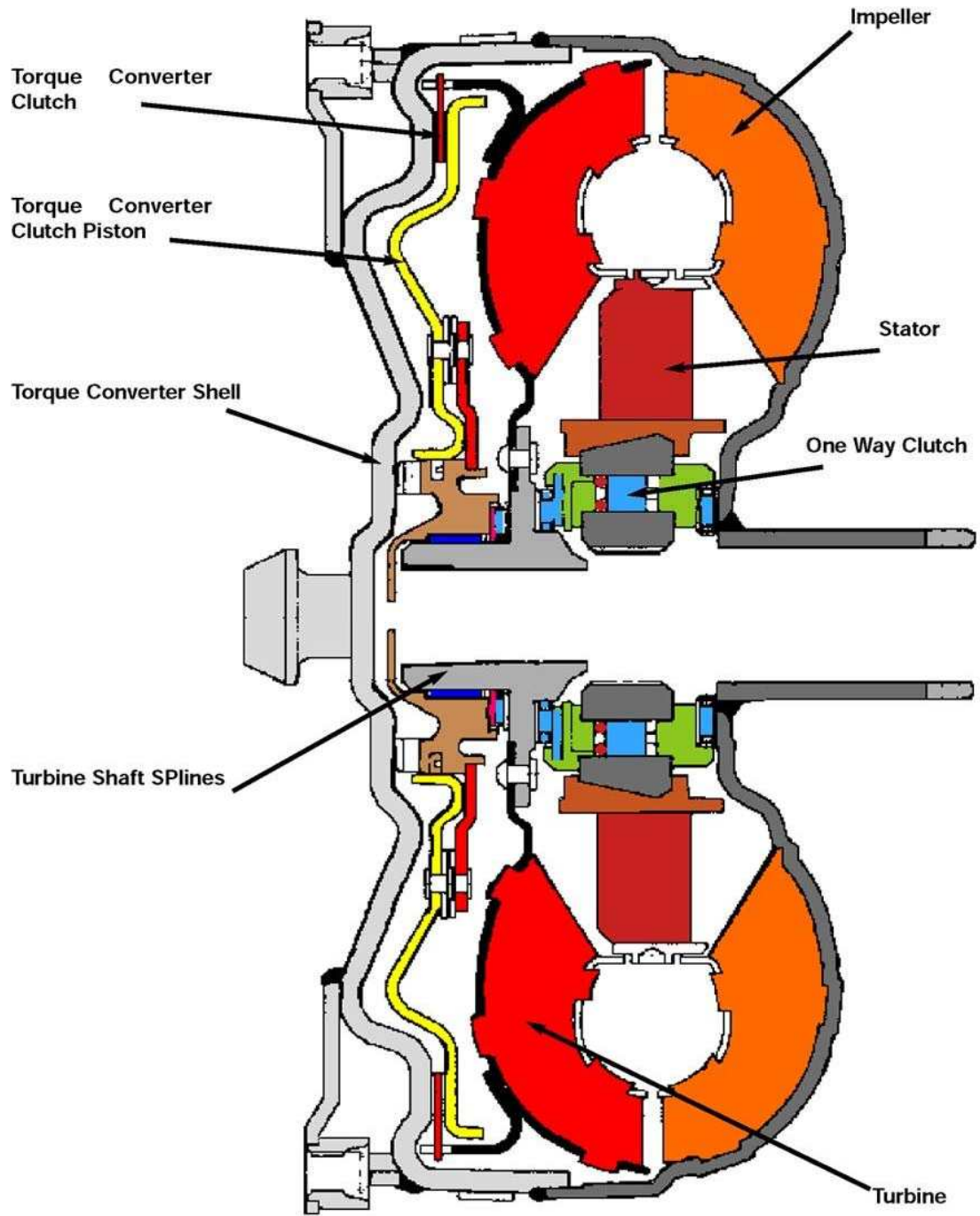


Fig. 30: Identifying Two Methods For Controlling Torque Converter Clutch On BMW Transmissions
Courtesy of BMW OF NORTH AMERICA, INC.

Lock-Up Torque Converter



G03403809

Fig. 31: Identifying Cross Section View Of Lock-Up Torque Converter
 Courtesy of BMW OF NORTH AMERICA, INC.

Shift Solenoid Control

Magnetic valves are used to direct the flow of transmission fluid to control shift elements in the transmission. Another Term for "Magnetic Valve" is "Shift Valve". Magnetic valves (MV) are solenoids controlled by the

TCM. They can be switched by B+ or B-.

On ZF transmissions, magnetic valves are designated MV1, MV2, MV3 etc. On GM transmissions they are designated Shift Valve A, Shift Valve B, Shift Valve C etc.

Either valve can be checked for proper resistance using a multi-meter, DISplus or GT-1. Also, the "Activate Components" function can be used to check the Magnetic valves. Most all magnetic valves are switched on/off instead of Pulse Width Modulation (PWM).

All magnetic valves (except THM R-1 to 12/95) are supplied power from an internal relay located in the TCM. The magnetic valves are switched on and off by final stage transistors in the TCM. During fail-safe operation, power to all MV's is switched off by the internal relay.

Magnetic valves are located on the valve body. They can be replaced individually.

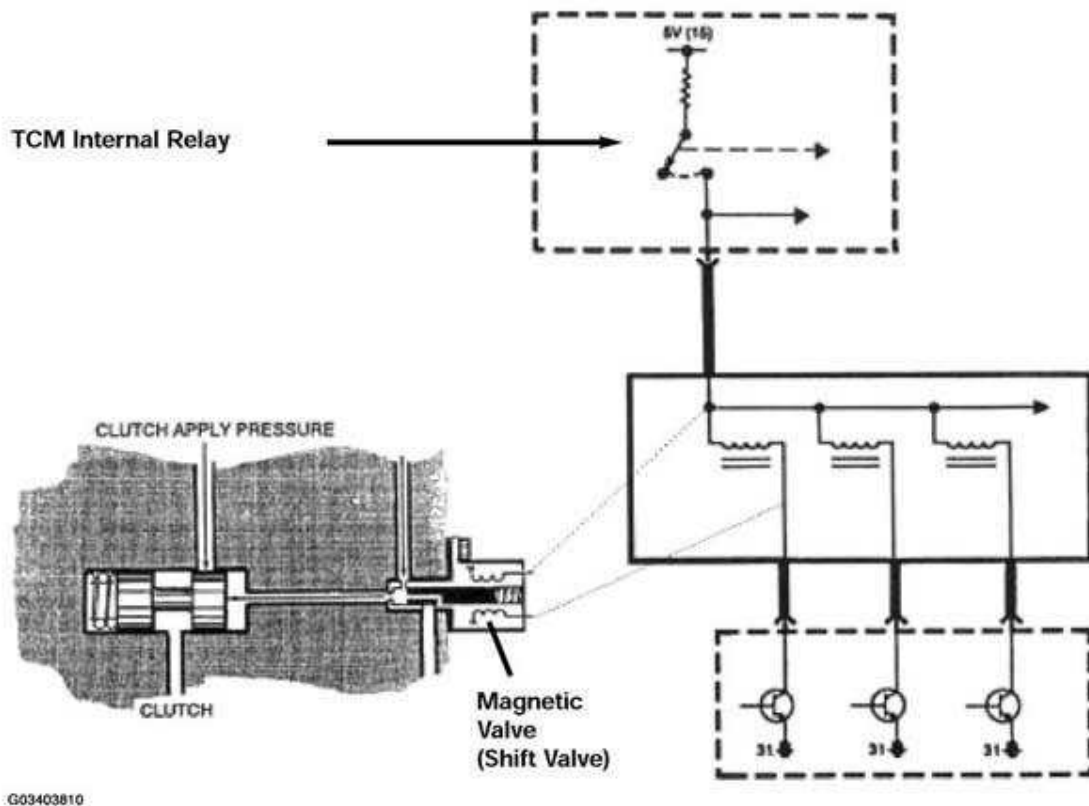


Fig. 32: Identifying Shift Solenoid Control Circuit Diagram
Courtesy of BMW OF NORTH AMERICA, INC.

Pressure Regulation

Pressure regulating solenoids modify line pressure for hydraulic operation. Solenoids for pressure regulation are referred to as EDS valves in ZF transmissions. GM transmissions have a few terms such as Force Motor Solenoid, Variable Bleed Solenoid, and DR solenoid. Regardless of the name used, they are all used to control

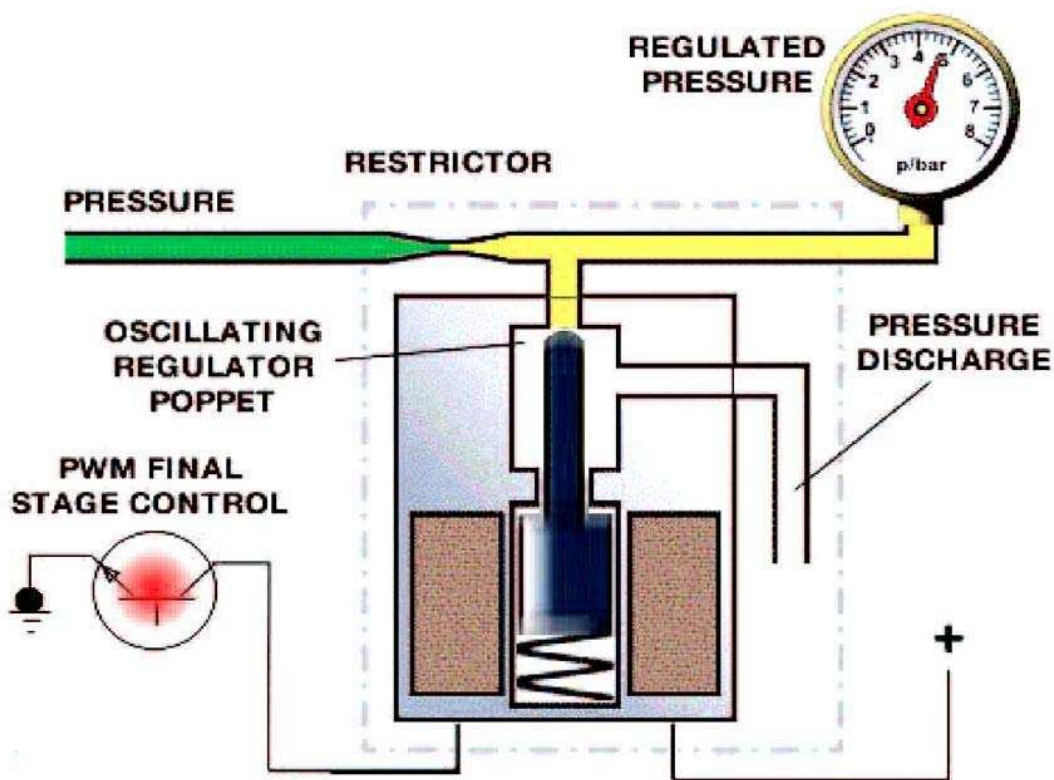
main line pressure based on throttle position and engine load.

On ZF transmissions, EDS valves are also used to control "Overlap Shifting". This allows for improved shift comfort by controlling pressures during shifting.

Depending upon transmission application, pressure regulating solenoids can be controlled using Pulse Width Modulation on B+ or B-.

The TCM will increase line pressure by regulating current flow to the pressure regulator. Current flow is controlled by pulse width modulation. When the duty cycle is low, the current flow to the solenoid is low. This allows spring pressure to close the valve. Therefore maximum line pressure is achieved. As the duty cycle increases, the current flow also increases. The valve opening increases, which allows pressure to be released through the pressure discharge which in turn decreases line pressure.

Main line pressure is also increased during fail-safe operation and when needed during "Adaptive Hydraulic Pressure Control" functions. Mainline pressure will also default to maximum pressure when power to the TCM is switched off.



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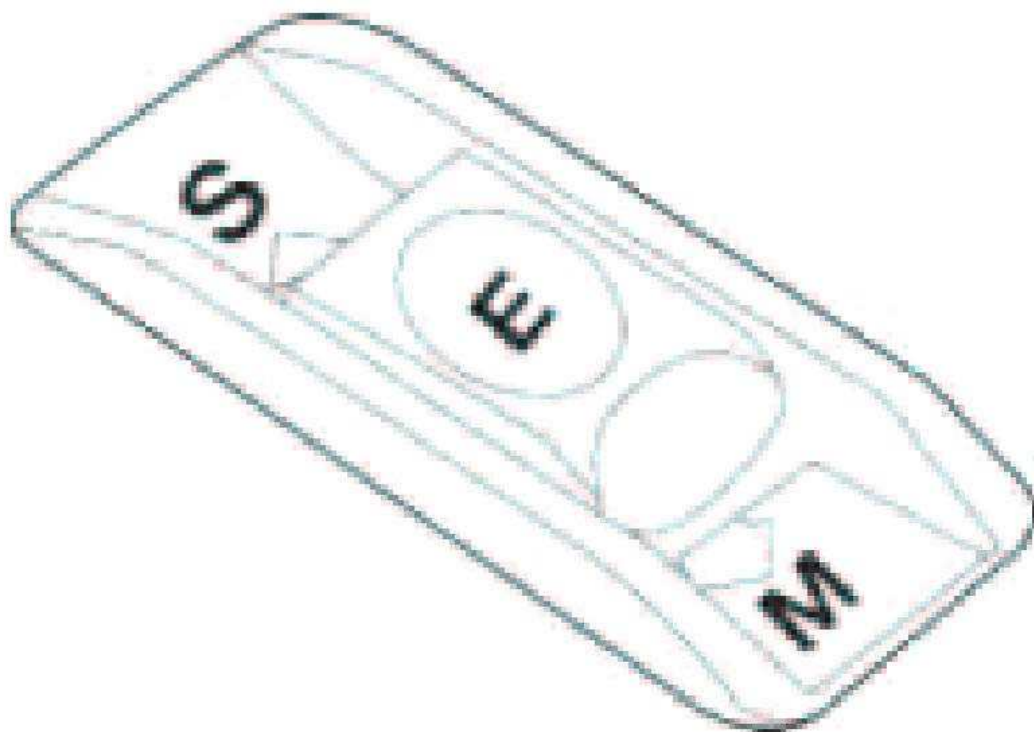
Fig. 33: Identifying Pressure Regulation
Courtesy of BMW OF NORTH AMERICA, INC.

BMW EH transmissions have selectable shift programs (or modes) to suit driver needs and operating conditions. There are 3 basic shift programs available:

- **Economy Program** - The economy program is the default program which is adopted every time the vehicle is started. When in economy mode, the operating priority is for maximum economy and shift comfort. Shifts will take place at low engine RPM and road speed. The economy mode is indicated by an "A" on the program switch. The cluster will display an "E" to indicate economy mode.
- **Manual Mode (Winter Mode)** - Manual mode is used to start out the vehicle in a higher gear on slippery surfaces when more traction is needed. A higher gear will reduce torque to the rear wheels. Manual mode can also be used to select a lower gear when needed such as when climbing a hill. Depending upon vehicle application an "M" will appear in the cluster when in Manual Mode or an asterisk (*) symbol will appear in the instrument cluster to indicate Winter Mode.
- **Sport Mode** - Sport Mode provides raised shift points and a more aggressive shift program for the "Enthusiastic" BMW driver. The cluster will display an "S" when in sport mode.

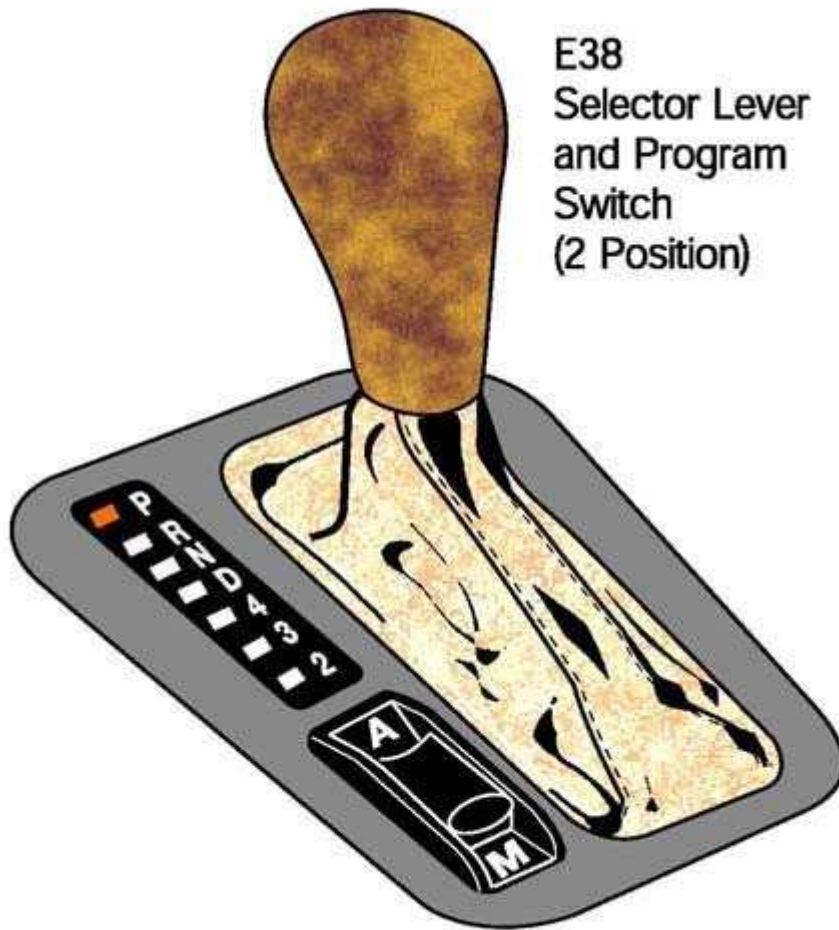
Regardless of vehicle application, the program switch provides a momentary ground to the TCM to switch between modes. There have been numerous designs of the program switch since its introduction. The program switch configurations are as follows:

- **2 Position Slide Switch** - This switch has the "A" and the "M" selection. Sport mode is achieved by moving the selector lever from "D" to 4, 3 or 2 when in the Economy Mode. The 2 Position slide switch is used on most models. These vehicles usually have a range and program display located in the instrument cluster.
- **2 Position Rocker Switch** - This switch operates the same as the slide switch, but it is used exclusively on the E36. The E36 does not have a program indicator in the cluster. The rocker switch will illuminate, indicating the current program.
- **3 Position Slide Switch** - This switch has the added position for sport mode. The shifter does not have to be moved out of drive (D) to be in sport mode. This switch is used on the E36 M3 and the 4HP22/24 EH (Version Late E-7).
- **3 Position Rotary Switch** - This switch is used only on the Early 4HP22 EH transmissions (Version Early E-7).
- **No Program Switch** - On some vehicles with AGS features, there is no program switch. Shift modes are obtained by moving the shift lever out of "D" range or automatically by adaptive shift functions. (Example E39)



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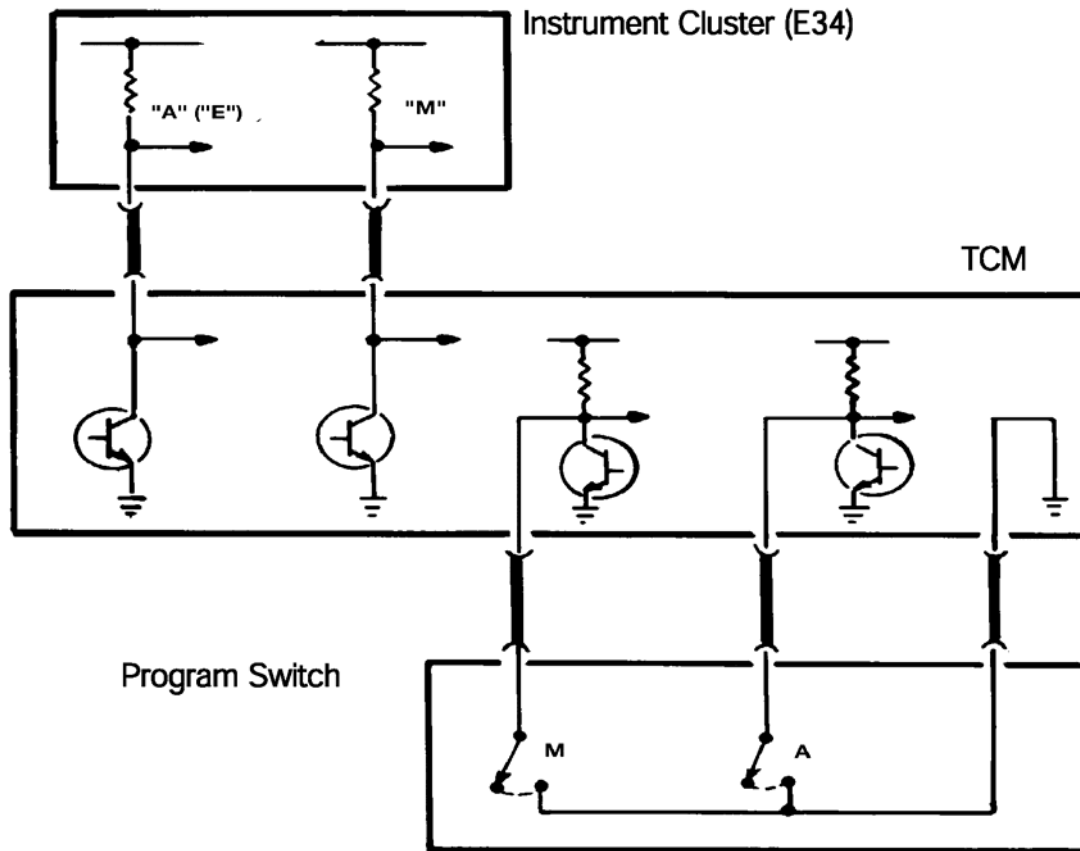
Fig. 34: Identifying 3 Position Program Switch
Courtesy of BMW OF NORTH AMERICA, INC.



E38
Selector Lever
and Program
Switch
(2 Position)

G03403813

Fig. 35: Identifying E38 Selector Lever And Program Switch (2 Position)
Courtesy of BMW OF NORTH AMERICA, INC.



G03403814

Fig. 36: Shift Programs Circuit
 Courtesy of BMW OF NORTH AMERICA, INC.

Steptronic Shift Modes

The Steptronic shifting system was introduced to the BMW model line on the 95 E31 850Ci (from 10/94). Steptronic was subsequently added to other BMW models and is available on all BMW models with automatic transmissions. Other than a few additional components in the shifter mechanism, Steptronic equipped vehicles use the same transmission and TCM as non-Steptronic equipped vehicles.

Since the introduction of Steptronic, there have been several variations in Steptronic function. Regardless of version, the Steptronic system provides the driver with two modes of operation:

- To operate the transmission in fully automatic mode as with a non-Steptronic transmission.
- To operate the transmission in the manual shift mode by tilting the shift lever forward or backward when in the manual gate.

The Steptronic shift lever console contains an automatic and a manual shift gate. The automatic gate contains the gear lever positions P/R/N/D. When the lever is placed in "D" all of the shifting takes place based on the shift map programming in the TCM. To enter the manual gate the shift lever is moved 15 degrees to the left.

Depending upon application, there are three possible configurations of the manual gate:

- On the E31 850Ci, the gate is marked as "M" only. There is a plus and minus sign for manual shifting. Upshifts are achieved by momentarily moving the shifter forward. Downshifts are achieved by moving the shifter rearward. When placing the shifter into the "M" gate, the transmission will adopt the current gear that is engaged. The transmission will stay in that gear until an upshift or down shift request is made.
- On all other vehicles until the 2002 model year, the gate is marked M/S. There is also a plus and minus sign for manual shifting. When placing the shifter into the M/S gate, the transmission will adopt Sport mode. All shifts will still be automatic. Full manual mode is achieved when an upshift or downshift request is made. Upshifts are achieved by moving the shifter forward momentarily and downshifts are achieved by moving the shifter rearward.
- On all models with Steptronic from 2002, the only change is to the manual shifting modes. In order to be consistent with SMG operation, the positions were reversed. Upshifts are now achieved by moving the shifter rearward and downshifts are now forward. Otherwise, Steptronic operation is identical to the previous models.

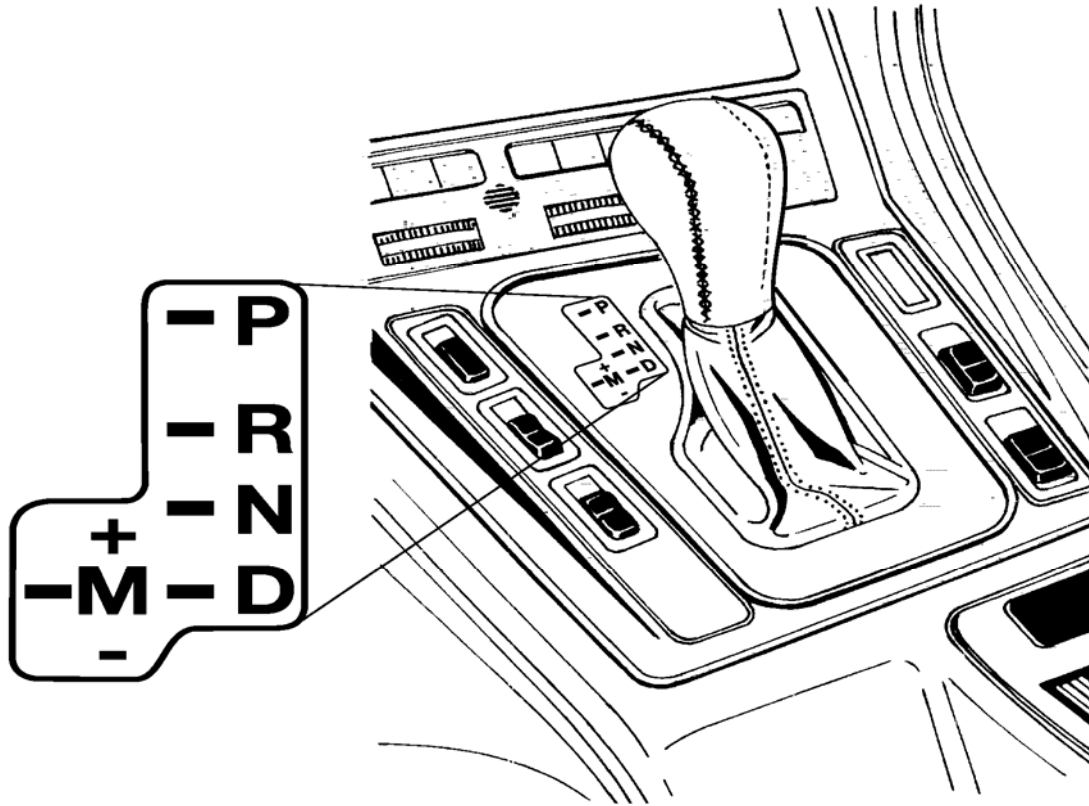
Automatic Functions In Manual Mode

When in manual mode there are certain functions which occur automatically to prevent drivetrain damage and improve driveability:

- **Engine Overspeed Prevention:** To prevent engine over-rev, the TCM will upshift automatically just prior to max engine cutoff.
- **Kickdown:** If plausible, the TCM will automatically shift down to the next lower when a kickdown request is received.
- **Decelerating:** If in 5th gear and coasting to a stop, the TCM will automatically down shift to 4th gear at approximately 31 mph and then 3rd gear at approximately 19 mph. The automatic downshift allows for an acceptable gear when re-accelerating. (6 cylinder models will shift to 2nd gear when stopping vehicle)
- **Implausible Gear Requests:** Certain shift requests are ignored by the TCM. For example, requesting a downshift at a high rate of speed would be ignored. Any shift request that would cause the engine to exceed the maximum RPM limit would not be allowed. Also starting out in a high gear is also not allowed. Only 1st, 2nd or third gear is allowed when accelerating from a stop.

E31 850Ci Shifter Console

1995 to 1997 Model Year.



G03403815

Fig. 37: Identifying E31 850Ci Shifter Console
Courtesy of BMW OF NORTH AMERICA, INC.

Steptronic Shifter Circuit

In order to achieve manual shifts with Steptronic, the selector lever is moved 15 degrees to the left. A pin on the selector lever engages the "up/down" microswitches which are a ground input to the TCM. The selector lever also triggers the "M" gate microswitch which is also a ground input to the TCM.

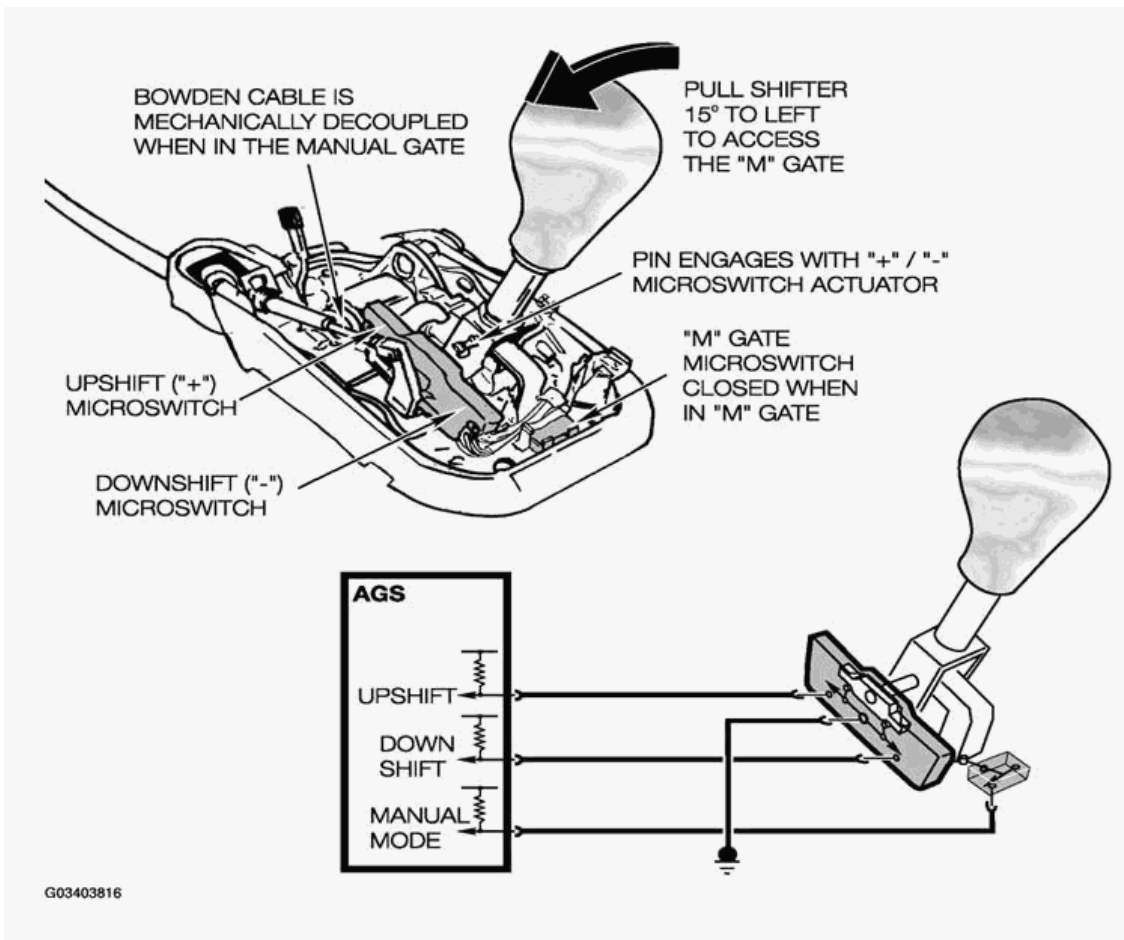
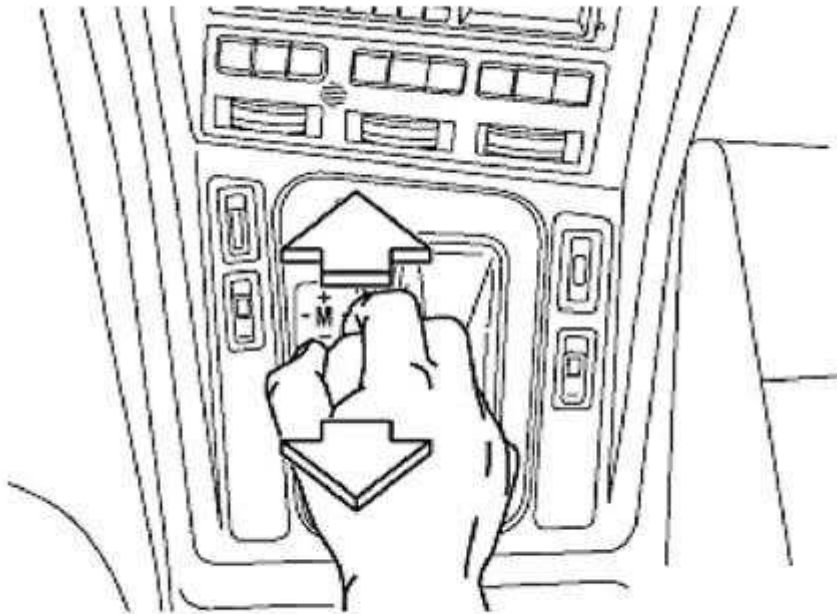


Fig. 38: Identifying Steptronic Shifter Circuit
 Courtesy of BMW OF NORTH AMERICA, INC.

The example on the right shows a typical shift console for an E31. Note the shift pattern, upshifts are forward and downshifts are rearward. This shift pattern was used on vehicles up to the end of 2001 production. On vehicles from 2002 production, the shift pattern is reversed.



G03403817

Fig. 39: Identifying Shift Pattern

Courtesy of BMW OF NORTH AMERICA, INC.

Steptronic System Comparison

STEPTRONIC SYSTEM COMPARISON

Detail	E31 850Ci 1995 to 1997	All model except E31 850Ci up to 2001 Model year with Steptronic.	All Models from 2002 model year with Steptronic
Shift Console Layout	"M" Gate	M/S Gate	M/S Gate
Selection of Manual Mode	Shift to "M" gate	Shift to "M/S" gate and move lever momentarily to "+" or to "-".	Shift to "M/S" gate and move lever momentarily to "+" or to "-".
Gear Range in Manual Mode.	2nd to 5th gear (1st gear only accepted for 2 minutes after cold start. If the throttle is pressed 100% a 2-1 shift will occur	1st to 5th gears	1st to 5th gears
Un-allowable gear requests.	4th and 5th gear after vehicle standstill. Downshifts that can cause engine over-rev. 1st gear after engine warm up.	4th and 5th gear after vehicle standstill. Downshifts that can cause engine over-rev.	4th and 5th gear after vehicle standstill. Downshifts that can cause engine over-rev.

Upshifts/Downshifts

Upshifts - Forward
Downshifts - Rear

Upshifts - Forward
Downshifts - Rear

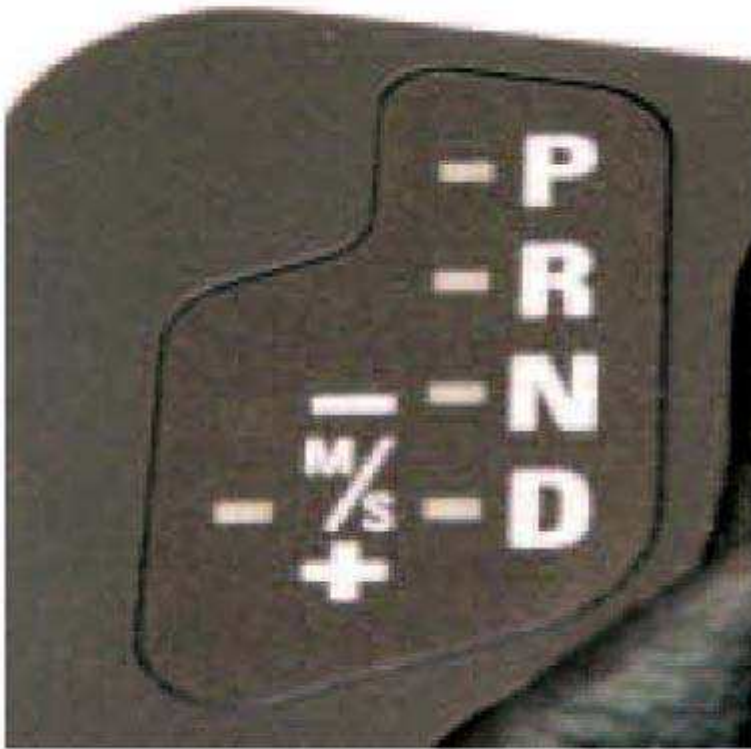
Upshifts - Rear
Downshifts - Forward



G03403818

Fig. 40: Identifying Shift Pattern Up To 2001

Courtesy of BMW OF NORTH AMERICA, INC.



G03403819

Fig. 41: Identifying Shift Pattern From 2002
Courtesy of BMW OF NORTH AMERICA, INC.

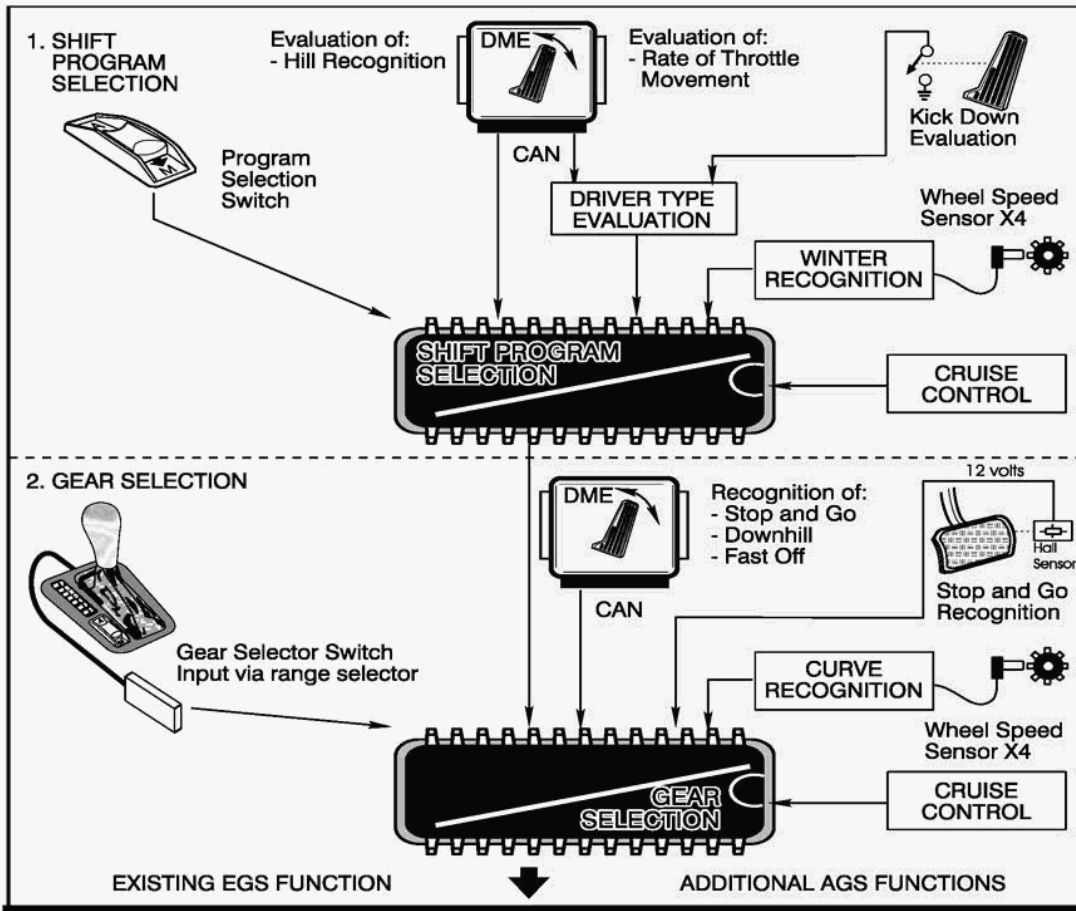
ADAPTIVE FEATURES (AGS)

AGS features were introduced in 1994 with the A5S560Z transmission. AGS control consists of adaptive features that will modify transmission operation according to various factors. AGS operation can be influenced by two major functional groups:

- Driver influenced features (influenced by throttle and kickdown input)
- Environmental influences (such as road conditions - icy, traffic etc.)

--EGS-- CONDITIONS THAT INFLUENCE SHIFT PROGRAM

--AGS-- ADDITIONAL CONDITIONS THAT INFLUENCE SHIFT PROGRAM



G03403820

Fig. 42: Identifying Adaptive Features (AGS)
 Courtesy of BMW OF NORTH AMERICA, INC.

The driving program selection is not adapted on a long term basis - nor is it stored in the control module memory when the ignition is switched off. It continually changes as the driver of the vehicle changes driving habits.

Driver Influenced Features Of AGS

The adaptive drive program is based primarily on throttle input. The throttle information comes from the ECM (DME) via the CAN bus. The TCM continuously monitors the throttle input for:

- The current throttle position
- The rate of change in pedal movement
- The number of acceleration requests
- The number of kickdown requests

Drive Away Evaluation

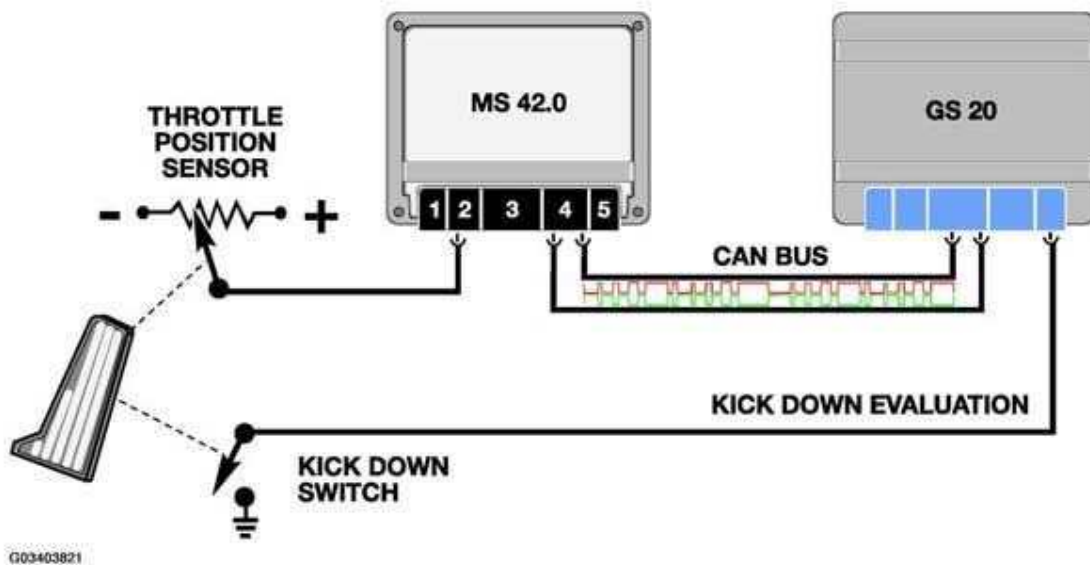
The AGS system selects the appropriate shift program based on the amount of acceleration that occurs during takeoff. When driving away under full throttle the transmission will shift from XE to E.

Kick Fast Feature

Based on these inputs, the AGS will select one three different driving programs as follows:

- Extreme Economy - Shift points are a low speeds for maximum comfort and economy
- Economy - The shift points are raised for more performance with economy as priority
- Sport - The shift points are higher to take advantage of full engine performance.

Under full throttle acceleration at high speed, single gear downshifts are possible. A two gear downshift is possible if the accelerator pedal is moved quickly to kick-down. The Extreme Sport program was eliminated as part of the kick-fast feature.



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Fig. 43: Identifying Kick Fast Feature
Courtesy of BMW OF NORTH AMERICA, INC.

Environmentally Influenced AGS Features

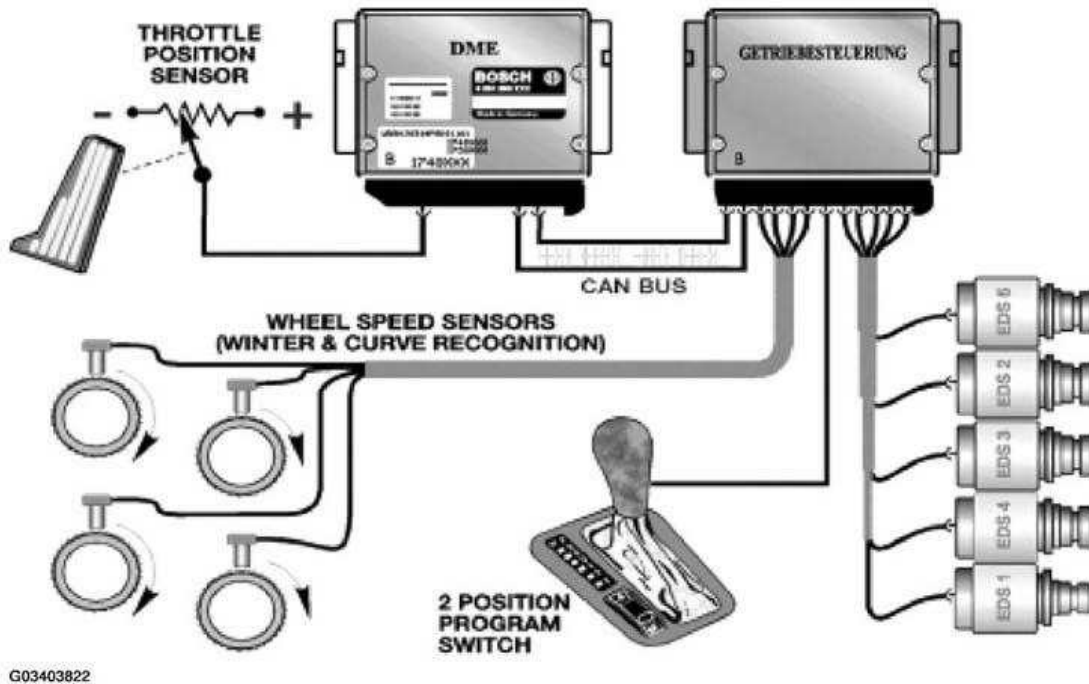


Fig. 44: Identifying Environmentally Influenced AGS Features
 Courtesy of BMW OF NORTH AMERICA, INC.

STOP And GO

The feature is activated by defined sequence of shifts which are as follows:

- Upshift from first to second - followed by a downshift from second to first - followed by another upshift from first to second. This is then followed by the vehicle coming to a complete stop.

After this sequence occurs, the transmission will stay in second gear. The AGS control has recognized stop and go driving and this function will prevent excessive shifting during heavy conditions. The second gear start will be cancelled when:

- The vehicle speed exceeds 40 MPH
- The throttle pedal is pressed more than 90%
- The range selector is moved to Park, Neutral, Reverse or Sport (4, 3 or 2)
- The vehicle is in Sport Mode

Winter Drive Program

This feature is activated when the TCM detects slippage at the rear wheels by comparing front and rear wheel speed signals. When slippage is detected by the TCM, the transmission will start in second gear and the shift points will be lowered. This will reduce torque to the rear wheels allowing improved driveability and traction on slippery roads.

Hill Recognition Program

There are two hill recognition programs, one for Uphill and one for Downhill. The TCM will activate this feature when it receives a high engine load signal at slower road speeds. The TCM will perceive this information as being consistent with climbing a hill. The shift points will be raised to prevent constant up and down shifting. This is referred to as the pendulum shift effect. When driving downhill, road speed will increase with minimal throttle input. The TCM will detect a downhill situation and hold the current gear to prevent an upshift when going downhill.

Curve Recognition

This feature will inhibit upshifts when the vehicle is in a curve. This is to improve stability when the vehicle is cornering at high speeds. The TCM will initiate this feature when it detects a difference between left and right (front) wheel speed signals. The difference in these signals will indicate that the vehicle is in a curve. Be aware that improper tire sizes, brands and inflation pressures can influence this feature. Always address these issues first when diagnosing delayed upshift complaints.

Cruise Control Drive program

A special cruise control shift map is selected by the TCM when cruise control is active. The TCM will prevent unwanted locking and unlocking of the torque converter clutch. Also, upshifting and downshifting will be minimized. Depending upon application, the cruise control interfaces with TCM via a single wire data link or as on vehicles with electronic throttle control, the TCM will interface with the ECM (DME).

Manually Selected "Extreme Sport" Program

This feature is activated by moving the shift lever to position 4, 3 or 2. This activates the "Extreme Sport Program" where the shift points are raised for maximum RPM and performance. On Steptronic equipped vehicles, the sport program is obtained by moving the shifter to the manual gate to initiate the "Sport Program".

Modifications To AGS Features

Since the introduction of AGS features in 1994, there have been some software changes to address customer concerns. Some AGS features have been perceived by the customer as malfunctions. To correct this, some of the AGS features were modified with updated software. The AGS features previously discussed in this text reflect the updated modifications.

CAN BUS COMMUNICATION

The CAN bus is a serial communications bus in which all connected control units can send as well as receive information. Data over the CAN bus operates at a rate of up to 1Mb/s (megabits per second).

The CAN protocol was developed by Intel and Bosch in 1988 for use in the automotive industry to provide a standardized, reliable and cost-effective communications bus to combat the increasing size of wiring harnesses.

The CAN bus was originally introduced on BMW automobiles in the 1993 E32 740i/IL as a data link between the TCM (EGS) and the ECM (DME).

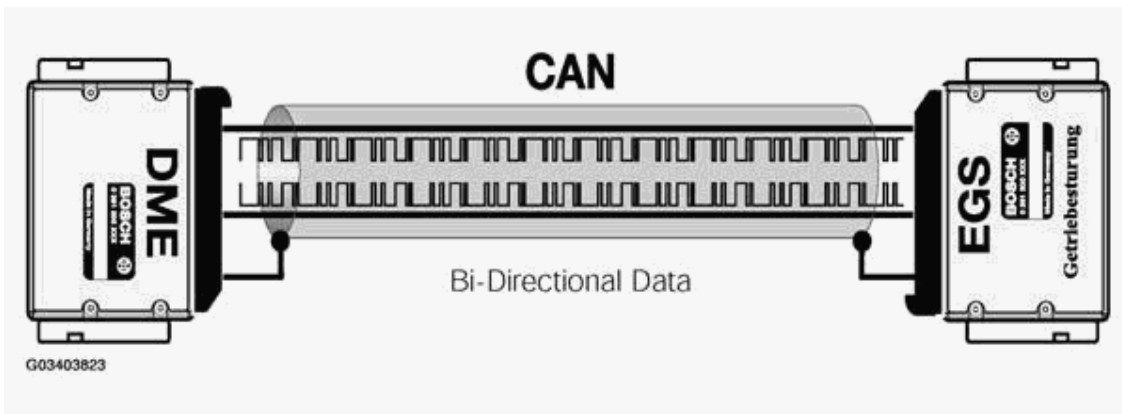


Fig. 45: Identifying CAN Bus

Courtesy of BMW OF NORTH AMERICA, INC.

On earlier EGS systems, various signals were transmitted on individual signal wires. This reduced reliability and increased the amount of wiring needed. The CAN bus allows faster signal transmission and increased versatility. For example, the signals listed in the chart below were previously transmitted on individual wires, now these signals are all on the CAN bus. This chart represents only some of the signals on the CAN bus, there are many more signals transmitted between the TCM and ECM.

EGS SYSTEMS SIGNALS

Sender	Information Item	Receiver	Signal Use
ECM	Engine Temperature	TCM	Shift Point Calculation
ECM	Engine Load (tL)	TCM	Shift Point Calculation
ECM	Engine RPM (TD)	TCM	TCC Slippage
ECM	Throttle Position (DKV)	TCM	Shift Point Calculation
ECM	A/C Compressor ON	TCM	Fine tune shift points to compensate for increased engine load.
TCM	Transmission Range	ECM	Engine Idle Speed Control
TCM	Torque Reduction Signal (ME)	ECM	Timing Retard during shifts.
TCM	TCC Lockup Status	ECM	Engine Timing Map adjustment.

CAN Bus Topology

The CAN bus consists of two twisted copper wires. Each wire contains an opposing signal with the exact same information (CAN-High, CAN-Low). The opposing signals transmitted through the twisted wire serve to suppress any electrical interference. Early CAN bus wiring included a grounded shield around the two wires, later vehicles discarded the shield in favor of the unshielded twisted pair wiring.

Due to the linear structure of the network, the CAN bus is available for other modules in the event of a disconnected or failed control unit. This is referred to as a "Tree" structure with each control unit occupying a branch.

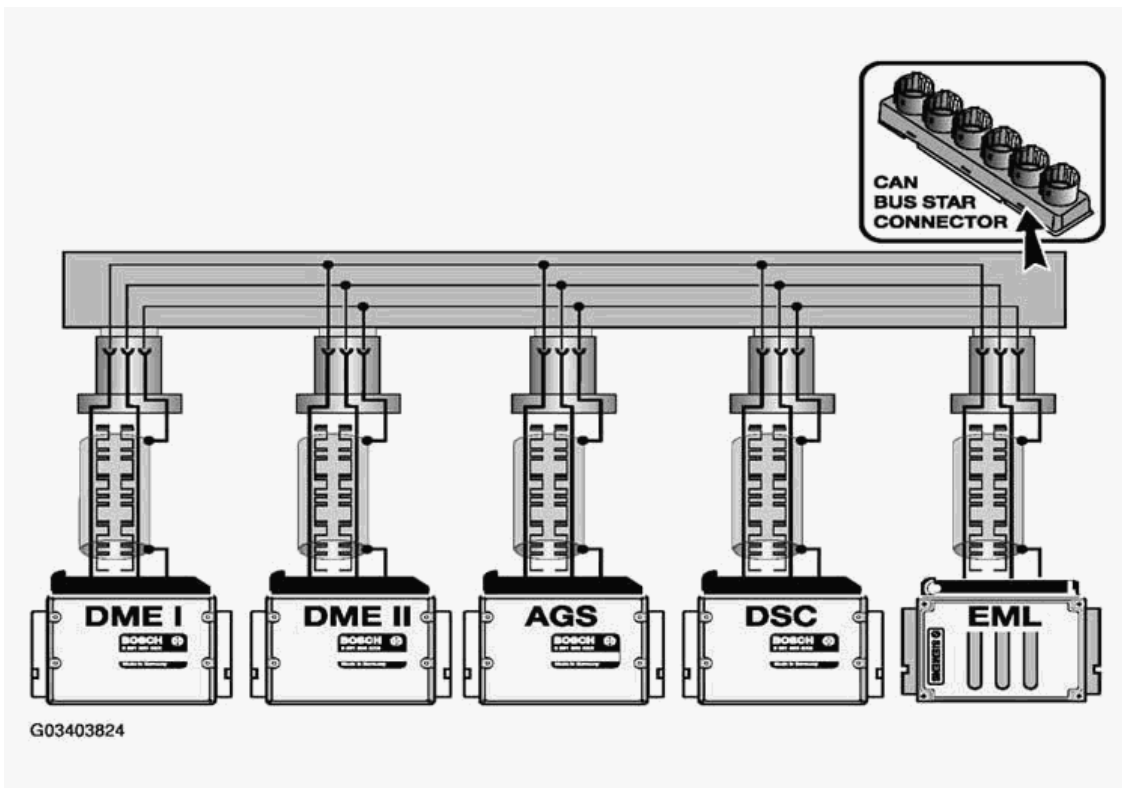


Fig. 46: Identifying CAN Bus Topology
 Courtesy of BMW OF NORTH AMERICA, INC.

As previously mentioned, the CAN bus initially was used as a high speed communication link between the DME and AGS control units.

With the introduction of the E38 750iL (95 M.Y.), the CAN bus was expanded to include the EML and DSC control modules. The 750iL made exclusive use of the "star coupler" to link the individual CAN bus ends to a common connector.

The 1998 model year introduced new users of the CAN bus. The instrument cluster and the steering angle sensor were linked to expand the signal sharing capabilities of the vehicle.

The 1999 750iL was the last vehicle to use the shielded cable, after which the entire CAN bus went to twisted pair wiring.

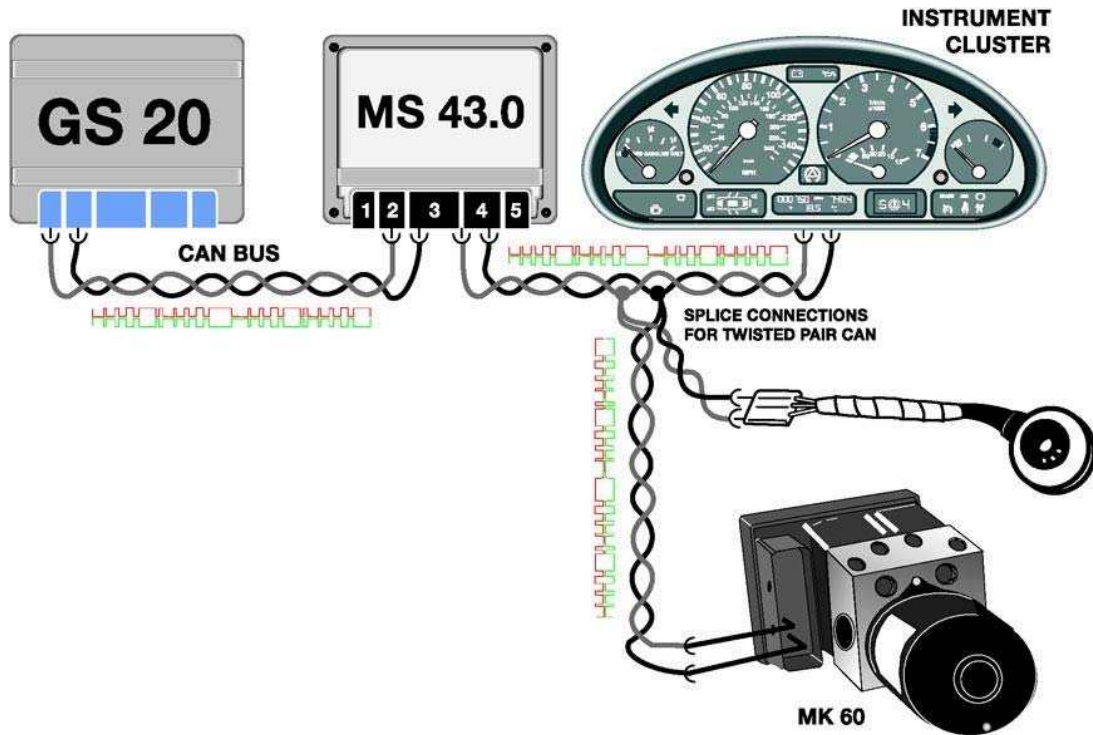


Fig. 47: Identifying CAN Bus Signal Sharing Capabilities
 Courtesy of BMW OF NORTH AMERICA, INC.

On most current models the CAN bus provides data exchange between the following control modules:

- ECM (DME)
- EML (750iL E38)
- TCM (EGS)
- IKE/Kombi
- ASC/DSC
- LEW

On models that use twisted pair, the wire color of the CAN bus is uniform throughout the vehicle with: CAN-Low GE/BR and CAN-High GE/SW or GE/RT. Shielded wiring is easily identified by the black sheath surrounding the CAN bus.

Troubleshooting The CAN Bus

The failure of communication on the CAN bus can be caused by several sources:

- Failure of the CAN bus cables.
- Failure of one of the control units attached to the CAN.

- Failure of the voltage supply or ground to individual modules.
- Interference in the CAN bus cables.

Failure of the CAN bus cables

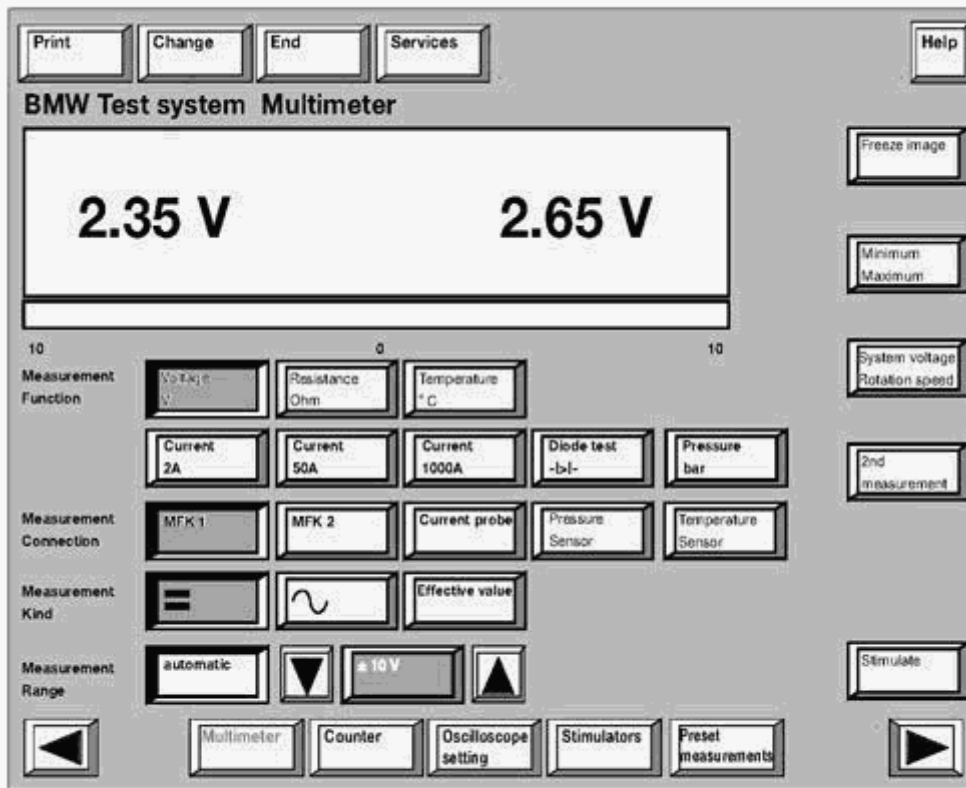
The following faults can occur to the CAN bus wiring:

- CAN-H/L interrupted
- CAN-H/L shorted to battery voltage
- CAN-H/L shorted to ground
- CAN-H shorted to CAN-L
- Defective plug connections (damaged, corroded, or improperly crimped)

In each instance, the connected control units will store a fault due to the lack of information received over the CAN bus.

The voltage of the CAN bus is divided between the two data lines: CAN-High and CAN-Low for an average of 2.5V per line. The voltage measurement is taken from each data line to ground. Each module on the CAN contributes to this voltage.

The fact that 2.5V are present does not mean that the CAN bus is fault free, it just means that the voltage level is sufficient to support communication.



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Fig. 48: Identifying BMW Test System Multimeter Display
 Courtesy of BMW OF NORTH AMERICA, INC.

Terminal Resistors: are used in the CAN bus circuit to establish the correct impedance to ensure fault free communication. A 120 Ohm resistor is installed in two control units of the CAN between CAN-H and CAN-L. Because the CAN is a parallel circuit, the effective resistance of the complete circuit is 60 Ohms. On some vehicles there is a jumper wire that connects the two parallel branches together, others have an internal connection at the instrument cluster.

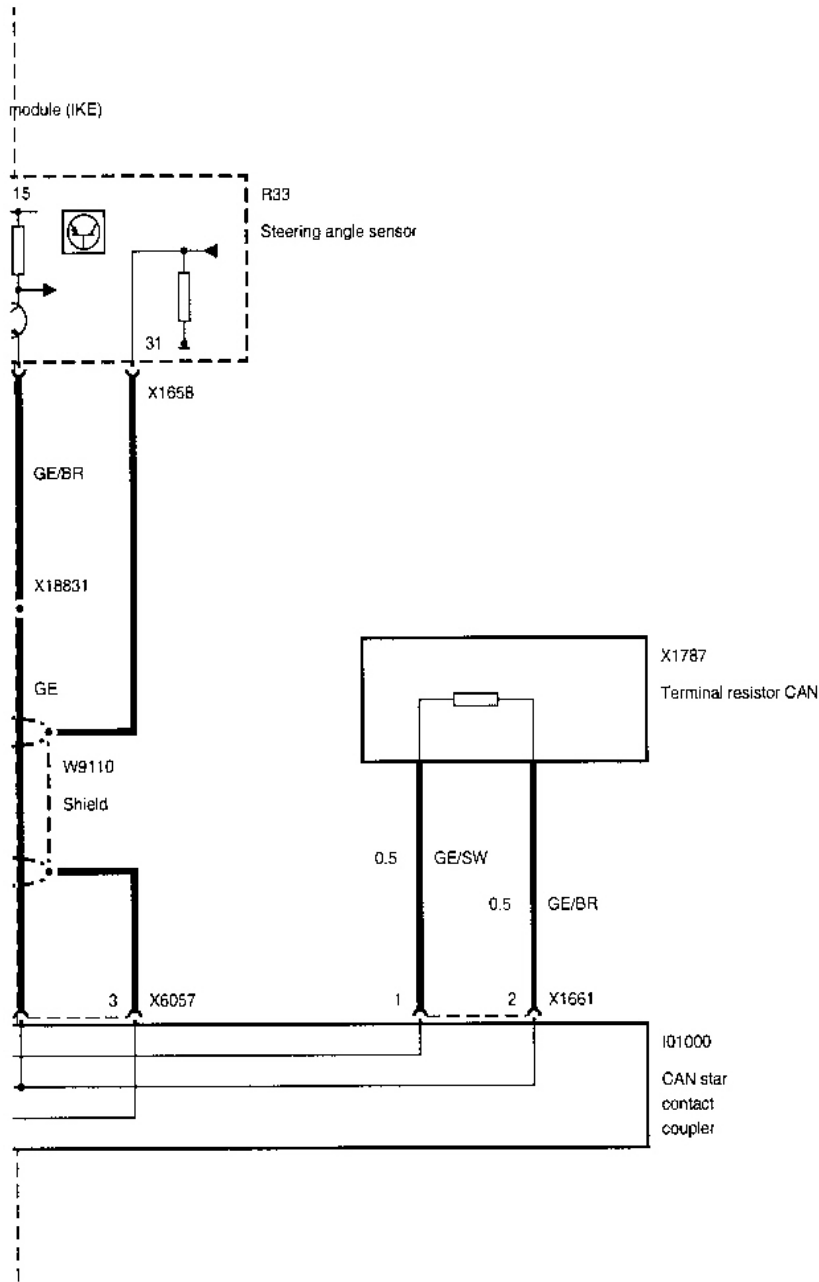
The resistance is measured by connecting the appropriate adapter to any of the modules on the CAN and measuring the resistance between CAN-L and CAN-H. The resistance should be 60 Ohms. The CAN bus is very stable and can continue to communicate if the resistance on the CAN bus is not completely correct; however, sporadic communication faults will occur.

The terminal resistors are located in the ASC/DSC control unit and either the instrument cluster or in the DME.

Early 750iL vehicles that used the star connector have a separate external resistor which connect CAN-H and CAN-L together.

Modules which do not have the terminal resistor can be checked by disconnecting the module and checking the

resistance directly between the pins for CANH and CAN-L. The value at these control units should be between 10 kOhms and 50 kOhms.



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Fig. 49: Identifying Terminal Resistor Circuit
Courtesy of BMW OF NORTH AMERICA, INC.

DIAGNOSIS AND TROUBLESHOOTING

Due to the cost and complexity of today's electronic transmissions, BMW recommends that the technical hotline be contacted before any repairs are performed. It is important that the technician perform some basic diagnostic procedures before contacting technical assistance. The following procedures should be followed:

- Always Verify customer complaint, make sure the complaint is not related to normal operation. (i.e. Warm Up Phase, AGS operation etc.)
- Survey Fault Memory - Perform **complete** quick test. There may be other systems that interface with EGS that could cause faults. (i.e DME, ASC/DSC, IKE/Kombi etc.)
- Print out all fault code with fault conditions. Also print out copy of Identification page and diagnostic report.
- CHECK TO SEE IF THERE ARE ANY SERVICE BULLETINS THAT APPLY TO YOUR SPECIFIC COMPLAINT. THIS INCLUDES THE SERVICE ROUND TABLE.
- Ensure that battery voltage is sufficient. Battery voltage must be greater than 12.5 with ignition switched off. Check battery connections for tightness and condition.
- Check ground connections. (chassis to engine, grounds to bulkhead and shock tower.)
- Check over vehicle to look for transmission leaks, physical damage, loose connections etc.
- If necessary, check fluid level and condition using DISplus or GT-1.
- Check to see if any aftermarket or performance components have been installed that could effect transmission operation. (DME or EGS software as well as any engine modifications).
- Check repair history to see if there were any recent repairs that could effect the proper operation of the transmission (i.e. Engine replacement with damaged dowel pin etc.).
- Check DCS for any open campaigns or recalls pertaining to drivetrain.
- Check and record chassis number, production date and transmission serial # before contacting technical assistance.

Establishing A Diagnostic Plan

Once all of the pre-diagnostic criteria has been satisfied, a logical diagnostic plan should be followed. A logical, well organized diagnostic plan will help avoid improper diagnosis, unnecessary parts replacement and lost diagnostic time. A technician's goal should be to satisfy the customer by "Fixing it the first time, on time, every time". The productivity of the technician can also be improved by following a logical, common-sense approach to problem solving. The following steps are recommended to form a diagnostic plan:

- **Verify the Customer Complaint** - This step is the most important, but also the most overlooked. The focus should always be on the exact customer concern. Make sure that the customer complaint is not a misunderstanding of proper vehicle operation. This step can avoid unnecessary diagnosis and lost time. If the customer concern is not exactly identified, any subsequent repairs can not be verified as being effective. This is the most common cause of "comeback" repairs. Communication between the customer to advisor and the advisor to technician must be clear. Vague or misunderstood customer complaints are often improperly diagnosed. Also make sure that the conditions under which the concern has occurred are duplicated. For example: If the customer is complaining about a shifting concern after a cold start, then the vehicle should be road tested under those conditions.
- **Analyze the Problem** - Once the complaint has been verified, then all available resources should be used

to find the "root cause" of the complaint. Start out by checking Service Information Bulletins, DCS messages, and Service Round table information. Use the DISplus or GT-1 to access the diagnostic program and perform Diagnostic Test Modules where applicable. Electrical Troubleshooting Manuals (ETM's) should also be used when needed.

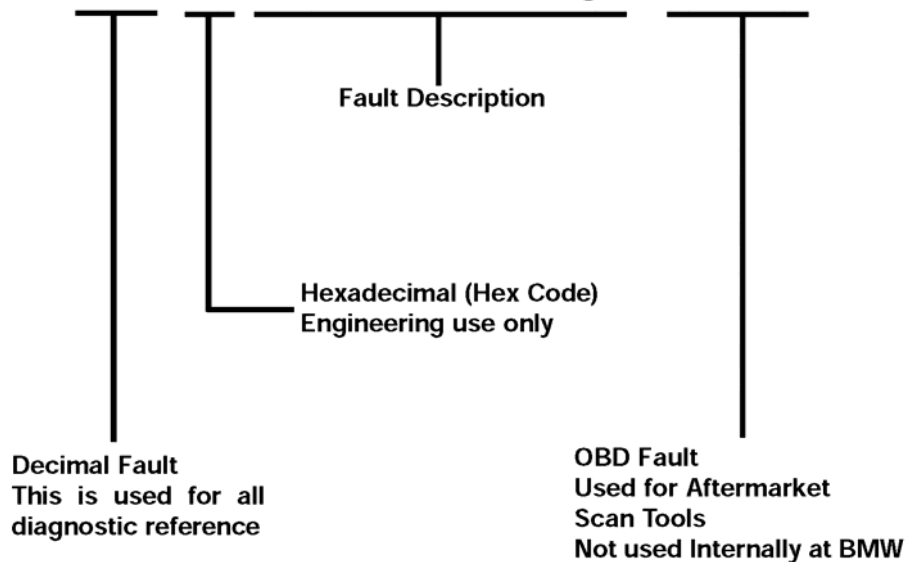
- **Isolate the Problem** - Now, the problem can be narrowed down into the final steps of diagnosis. Using proper tools and procedures, the technician can "Isolate" by using the process of elimination and common sense. Having a working knowledge of BMW systems is helpful in this area. When applicable, use all available BMW special tools and equipment. Perform all necessary electrical checks such as Voltage Drop, resistance measurements etc.
- **Repair the Problem** - Once the concern has been correctly identified, perform all necessary repairs as per BMW guidelines. Make sure all repairs are properly documented to comply with warranty policies and procedures.
- **Verify the Repair** - Make sure the customer concern has been rectified. Road test the vehicle under the same conditions whenever possible. Failure to complete this step properly is almost a guaranteed comeback. Repeat repair attempts are costly to the BMW Center and the BMW Service Technician.

REMEMBER - Fix it the first time, On Time, Every time.

Fault Codes

When diagnosing transmission fault codes, always print out the fault code(s) and the fault conditions. When referring to the fault code itself, be aware that there are actually 3 formats for the fault code. The fault code breakdown is as follows:

Fault Code (050) 32 Gear Monitoring 1 (P0731)



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Fig. 50: Identifying Fault Codes
Courtesy of BMW OF NORTH AMERICA, INC.

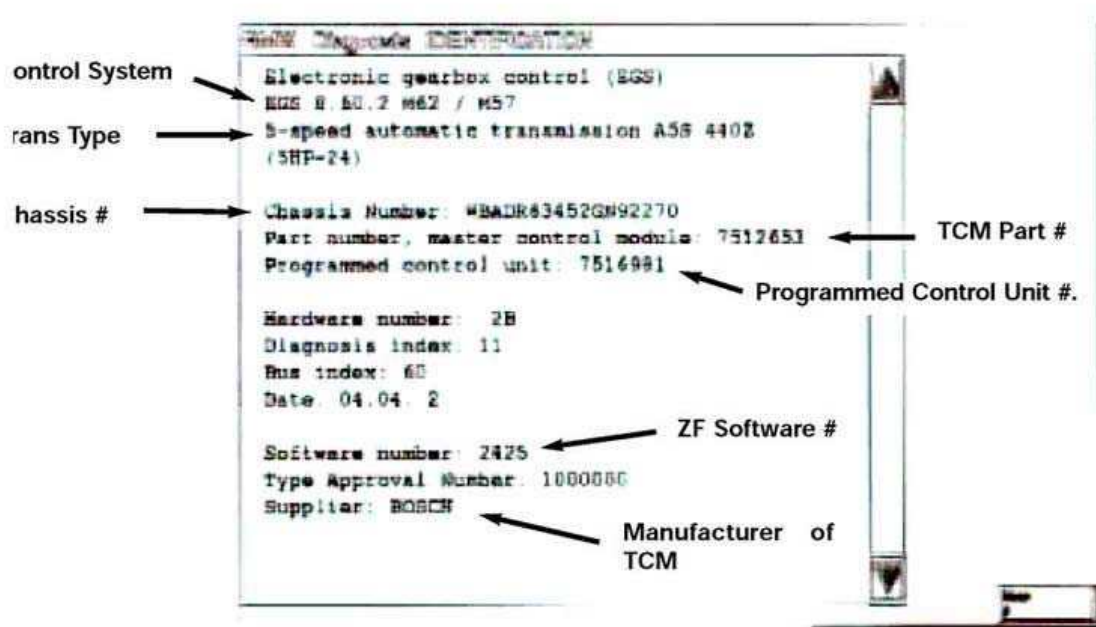
When referring to the "Fault Code" during diagnosis always use the fault that is in Decimal Format. The Decimal fault is referred to in all reference material such as Service Information Bulletins, Test Modules and DCS messages etc. In the example above, FC 050 would be the correct choice.

Fault Conditions

When a fault code is set, it is stored with a set of environmental conditions. The environmental conditions are used to aid in pinpointing the root cause of the fault. Some of the information found in the fault conditions contain information on transmission temperature, engine speed and road speed etc. This information is also helpful when trying to duplicate the customer complaint. For example, if a customer complains about a shifting complaint when cold, check the fault conditions to verify this complaint. Remember to always print out the fault codes with the fault conditions. This information is helpful to the technician as well as technical assistance.

Identification Page

The ID page is helpful to determine the Transmission and control system used as well as the chassis number and current software version. Always print out a copy of the ID page when performing any diagnosis or programming procedures.



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Fig. 51: Identifying Identification Page
Courtesy of BMW OF NORTH AMERICA, INC.

Diagnosis Program

There are two diagnostic formats (programs) used on current model BMW vehicles. The earlier diagnostic program was used on the E38 and E39. The latter diagnostic program was introduced as the "E46 Diagnostic Concept". This is used on the E46, E65 and the E52 (Z8). The E53 X5 uses a mixture of both diagnostic programs depending upon engine/transmission options. Below is an example of the earlier diagnostic program.

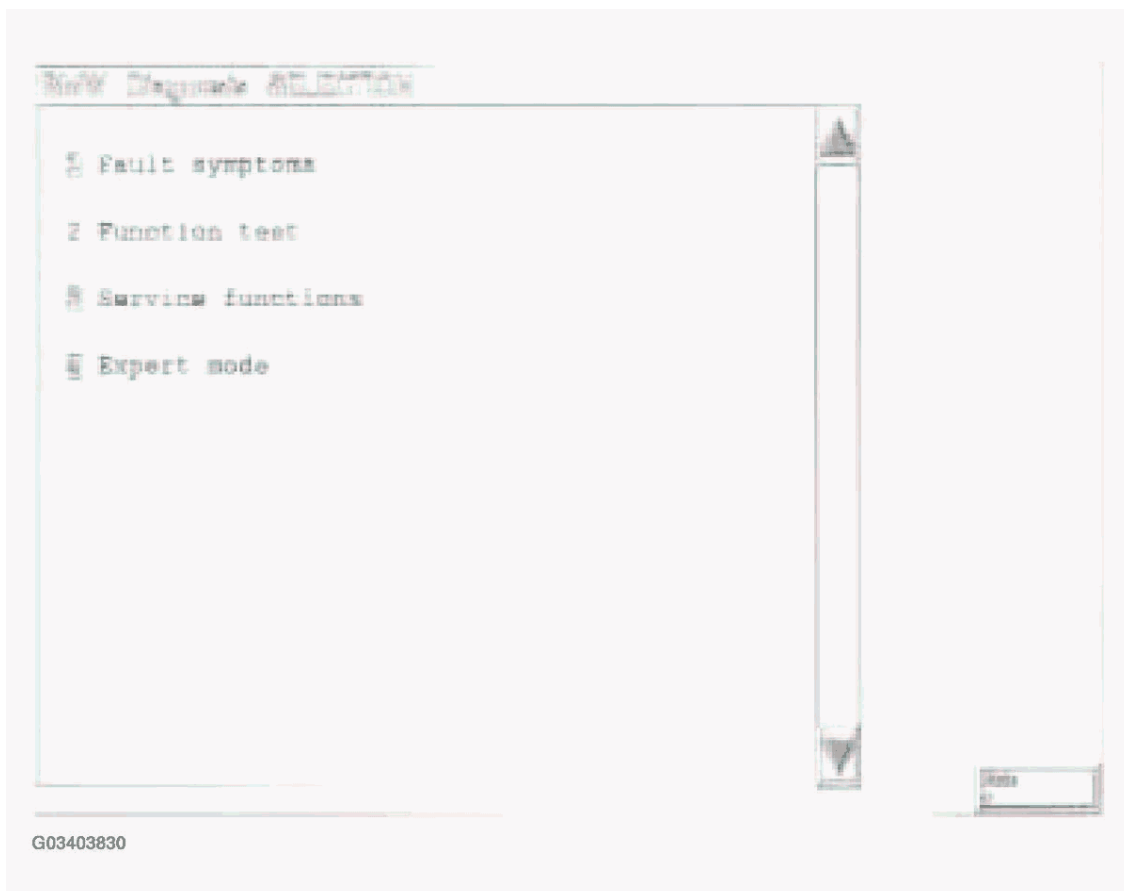


Fig. 52: Identifying Diagnosis Program

Courtesy of BMW OF NORTH AMERICA, INC.

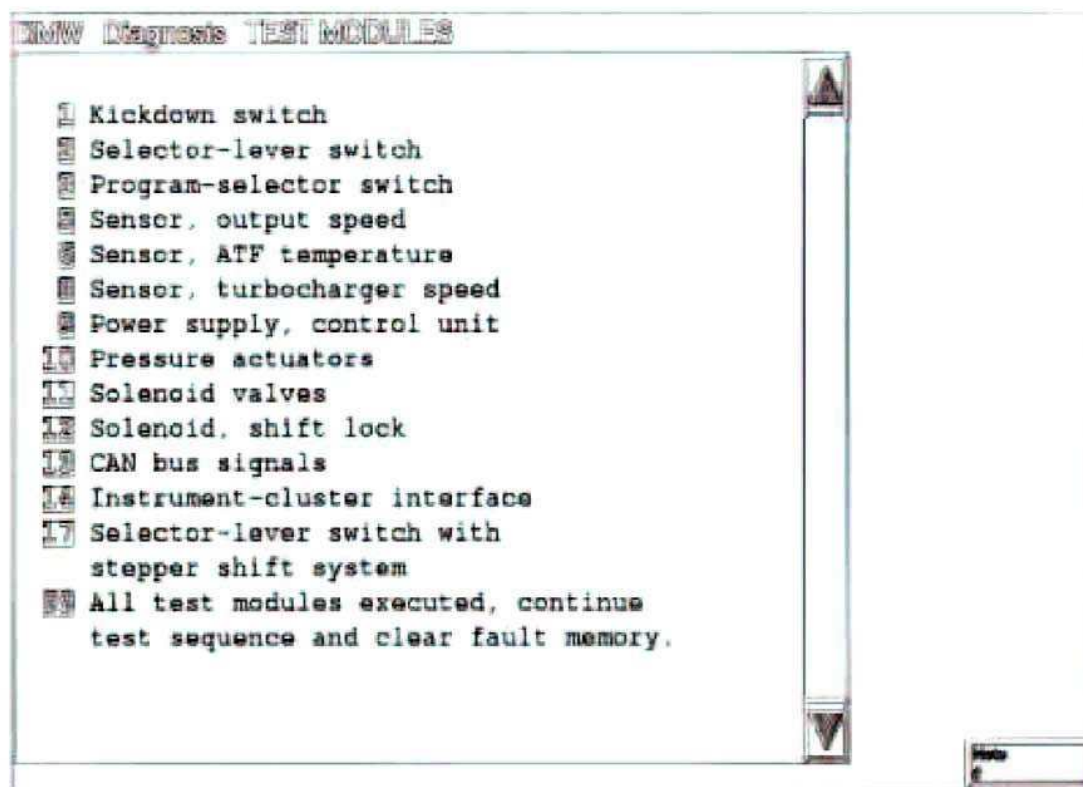
The diagnostic program contains the following features:

- **Fault Symptoms** - This is a symptom driven program that will lead the technician into guided diagnostics. It contains several possible fault scenarios that are common to electronic transmissions. This path is helpful when the technician is not sure where to start in his diagnostic plan.
- **Function Test** - There are no function tests for electronic transmissions.
- **Service Functions** - This is where you will find the ATF level check function. Also Test Codes can be obtained and printed out for warranty purposes. The Adaptation values can be cleared as well as printed out.
- **Expert Mode** - Expert Mode should be used when the technician has a thorough working knowledge of the system. You will find several items in expert mode: Read/Clear fault memory, Diagnosis (Status) requests, Component Activation and Test Modules.

Test Modules

Test modules are found in the diagnosis program of the DISplus and GT-1. These allow the technician to take advantage of a guided diagnostic plan. The program will direct the technician through the various steps using a "trouble tree" format. When using test modules it is important to follow the instructions exactly. Due to the complex nature of some faults, the test modules are not always conclusive. The test module is only as effective

as the information provided by the technician. The technician also needs to rely on his experience and some common sense. The test modules should be used to assist the technician, not as a replacement for good diagnostic skills.



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Fig. 53: Identifying Test Modules
Courtesy of BMW OF NORTH AMERICA, INC.

Test modules come in two formats. The one shown above is used on E38/E39 vehicles and the E53 with 4.4 and 4.6 engines. The E46, E65 and E53 (with 3.0 M54) uses the new "E46 Diagnostic Concept" which was introduced with the E46 in the 1999 model year. Regardless of the format used, the technician is still guided through a step by step procedure.

Diagnostic Tips

The following consists of some helpful hints to assist the BMW diagnostic technician. It is designed to assist the technician to form a logical path of diagnosis. These suggestions should be used in conjunction with other approved diagnostic routines. This does not exclude the technician from the responsibility to contact technical assistance. All major repairs and transmission replacement must be pre-approved by the BMW Technical Hotline. Transmission concerns can be broken down into several categories:

- **Shift Quality Complaints** - Shift Quality complaints consist of harsh up or down shifts, improper shift points and erratic shifting. These complaints could be related to electronic/software issues or hydraulic/mechanical problems. Perform quick test and check SIB's before proceeding. As with most

concerns, check the transmission fluid level and condition as well.

Do not clear adaptation values unless instructed to do so by BMW Technical Hotline.

- **Delayed/No Upshifts** - Before proceeding on delayed upshift complaints, make sure you are aware of the conditions that this occurs. This could be normal operation, such as the "Warm-up Phase" program. Always check front tires for proper inflation pressures, correct size and type. Also check for uneven tire wear. Variations in front tire size from left to right can activate the AGS "Curve Recognition" feature. The TCM will interpret the difference in wheel speed signals as being a turn and suppress (or delay) upshifts.
- **Slipping** - This type of issue is usually associated with a fault code. Be sure to check the transmission fluid level and condition.
- **Noise, Vibration** - Noises and vibrations should be checked over by a good visual inspection. Look for loose transmission or engine mounts. Check the driveshaft, center bearing and flexible coupling (or constant velocity joints). Also check the lateral alignment of the driveshaft. There are several SIB's pertaining to noise and vibration.
- **No Forward or Reverse Gear** - Start by checking transmission fluid level and note the fluid condition. Inspect for leaks and external transmission damage.
- **Leaks** - When investigation transmission leaks, be sure to verify that the suspected leak is actually transmission fluid. Engine oil, hydraulic and brake fluid can be mistaken for a transmission leak. Check the transmission cooler lines, transmission cooler and transmission pan gasket. Try to locate the source of the leak. Do not make any major repairs until the technical hotline is contacted.
- **Fault Codes** - Perform COMPLETE short test (Quick test) on all vehicle systems. It is important to survey all systems in the event that a related system is causing the transmission fault. Always print out the ID Page, Fault codes and fault conditions.

Information Resources

When diagnosing transmission related concerns it is important to use all information resources available. The following information sources should be utilized at all times:

- Service Information Bulletins
- Technical Data
- ETM Electrical Troubleshooting Manual
- DCS (Dealer Communication System)
- Repair Instructions
- Tightening Torques
- Technical Training Manuals
- Special Tool Information

Technical Information System (TIS)

Most of the above information can be accessed by using the BMW TIS CD or by logging on the BMW TIS website through **www.bmwcenternet.com**. The BMW TIS website contains a wealth of helpful information for the technician. The information is updated on a regular basis.

Service Round Table

In addition to the above sources of information, the technician should be up to date on the latest edition of the BMW Service Round table. The round table will cover the most recent topics and offer some hints that will assist the technician. The Service Round table is broadcast live on a monthly basis via the BMW Visionwerke Network. In addition to live broadcasts, the round table is rebroadcast on a regular schedule during the month.

TCM CODING AND PROGRAMMING

As with other control modules used on BMW systems, the TCM must be programmed and/or coded for the vehicle. Over the years, these methods have varied from system to system.

Coding

Coding will assign the control unit to a particular application. Information such as differential ratio, tire size, vehicle series, engine, engine control system, w/wo AC etc. are some of the possible variants that have to be considered. Transmission control units are coded using various methods.

- **Grounding pins in wiring harness connector** - On early models equipped with the 4HP22/24 EH transmissions, the TCM was coded to the vehicle by means of grounding pins in the wiring harness connector for the TCM. By selectively grounding specific pins in the harness, the TCM was assigned to that vehicle. For Example: The TCM could be installed in a 535, 635, or a 735. This only applies to the Early E- 7 Versions. (E23, E24, E28)
- **TCM ordered for Specific Application** - On some later models, the TCM was ordered for a specific vehicle application, coding was not necessary.
- **Coding performed during programming** - On systems that use a flash programmable TCM, the coding process is done during flash programming.

Programming

Programming refers to the instructions that the TCM is to follow. The TCM is programmed to apply certain shift maps according to operating conditions such as vehicle speed, engine speed, engine temperature, engine load and throttle position. This information can be entered into the TCM via an updated EPROM or through flash programming.

Flash programmable control units use a EEPROM which is Electronically Erasable. The EEPROM is also soldered into the TCM and cannot be removed or replaced. Flash programmable TCM's can be programmed up to 14 times (with a new TCM).

NOTE: Always clear adaptations after programming.

NOTE: Do not program a TCM to correct a complaint unless there is a specific SIB that covers the issue. Only program when installing a new TCM or when instructed to do so by BMW Technical Assistance. Always have the ID page available when calling for technical assistance.

TCM PROGRAMMING

Control System	Transmission	Coding	Programming	TCM Type
GS 1.26 GS 1.27 GS 1.29	4HP22 EH (Early E-7) 4HP22/24 EH (Late E-7 and E-9)	Grounding pins in Harness. (Early E-7 Only) TCM ordered for specific application. Coding not needed.	Replaceable EPROM Replaceable EPROM	35 Pin 35 Pin
GS 7.3 GS 7.32 GS 7.11 GS 8.32	A5S310Z (5HP18)	TCM ordered for specific application. Coding not needed.	Replaceable EPROM	88 Pin
GS 8.60 GS 8.60.4	A5S325Z (5HP19)	Coding done when Programmed	Flash Programming (EEPROM)	134 Pin SKE
GS 8.55 GS 8.60.2	A5S440Z (5HP24)	Coding done when programmed	Flash Programming (EEPROM)	88 Pin up to 98 (E38 M62) 134 Pin SKE from 98 to present.
GS 9.2 GS 9.22 GS 9.22.1 GS 8.60.3	A5S560Z (5HP30) A5S560Z (5HP30) (E38 M73TU)	TCM ordered for specific application. Coding not needed. Coding done when programmed.	Replaceable EPROM Flash Programming (EEPROM)	88 Pin 134 Pin
GS 4.14 GS 4.16	A4S310R (THMR-1)	TCM ordered for specific application. Coding not needed.	Replaceable EPROM	55 Pin
GS 8.34	A4S270R (THMR-1)	TCM ordered for specific application. Coding not needed.	Replaceable EPROM	88 Pin
GS 20	A5S360R A5S390R	Coding done when programmed	Flash Programming (EEPROM)	134 Pin SKE

TRANSMISSION FLUID INFORMATION

Transmission Fluid (Oil)

The automatic transmission provides filtered, pressure regulated hydraulic fluid for all of the transmissions functional requirements. All BMW automatic transmissions are designed to operate with specific fluids. Use of non-approved oil will cause malfunctions and irreparable transmission damage which is not covered by BMW warranty.

The transmission fluid provides the following functions:

- Lubricates mechanical components (planetary gears, bearings etc.).
- Removes heat and transfers heat to transmission cooling system. (Heat Exchanger).
- Removes debris and contaminants to sump and filter when circulated.
- Provides a transfer of kinetic energy in the torque converter.

- Allows hydraulic operation of mechanical components (clutches, brakes) via control of the valve body.

Also, transmission fluid has various properties to prevent oxidation and breakdown from heat and friction. Each type of transmission fluid has properties specific for each transmission application.

Fluid level is crucial in the proper operation of an automatic transmission. Improper fluid levels will cause improper operation and eventually irreparable transmission damage. Improper fluid level can cause:

- A low fluid level can cause an interruption in oil flow during fast acceleration or hard braking which can cause gear shift malfunctions and noises.
- An excessively high fluid level can cause the rotating mechanical components to paddle in the oil. This produces foam which introduces air into the hydraulic system.
- A low fluid level can also cause transmission overheating causing premature transmission failure.

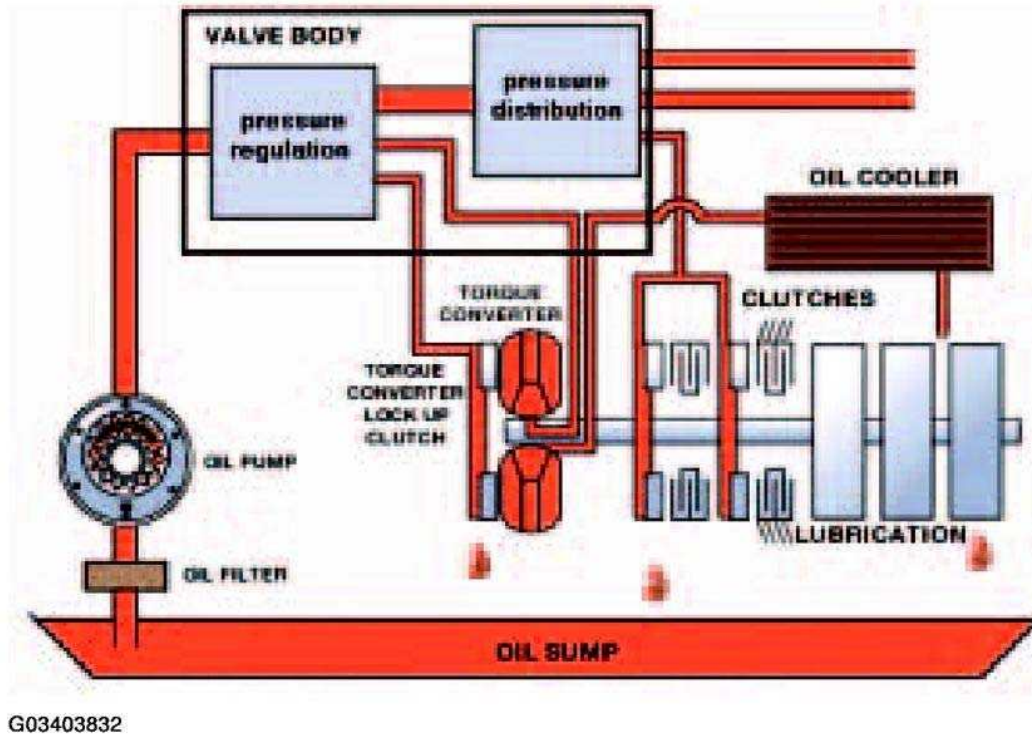


Fig. 54: Identifying Transmission Fluid Flow
 Courtesy of BMW OF NORTH AMERICA, INC.

Transmission Fluid Checking Procedures

Transmission fluid checking is accomplished using the DISplus or GT-1. The DISplus or GT-1 is used to monitor transmission fluid temperature to insure the transmission is not over or under-filled. As with most other current ZF transmissions there is no dipstick, the fluid level is checked and filled at the fill plug. The location of the fill plug varies between transmissions.

Transmission fluid should be checked between 30 and 50 degrees Celsius (unless otherwise specified). Use the DISplus and/or GT-1 to determine transmission temperature. The transmission temperature information can be found in the diagnosis section under Service Functions.

Proper procedures for checking and filling transmission fluid can be found in BMW Service Information Bulletin B 24 01 98.

When checking transmission fluid, observe the following items:

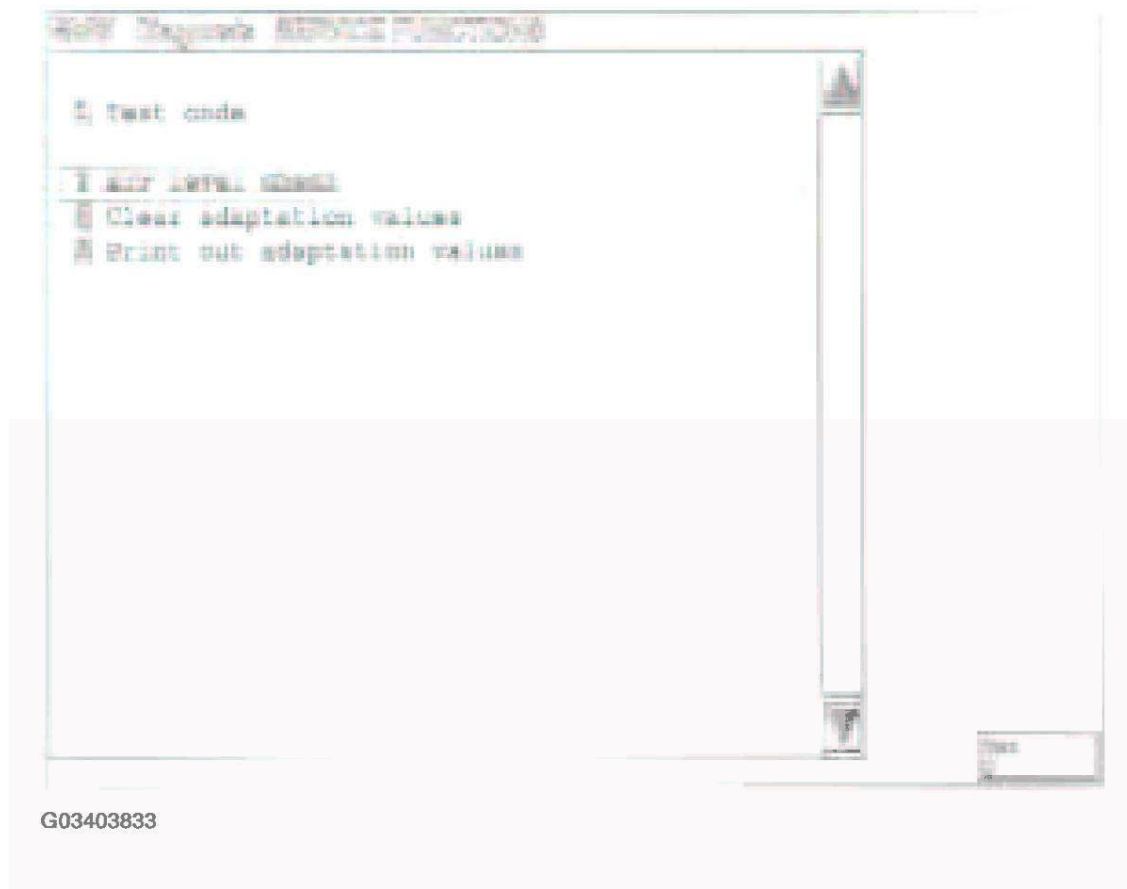


Fig. 55: Identifying Transmission Fluid Checking Procedures
Courtesy of BMW OF NORTH AMERICA, INC.

- Transmission in Park
- Parking brake applied
- Engine Running
- Vehicle level
- No engine load
- Trans Temp 30-50C
- Observe correct drain plug torque

- Use correct fluid

When replacing parts on transmissions that use lifetime fluid, drain fluid into a clean container and reuse.

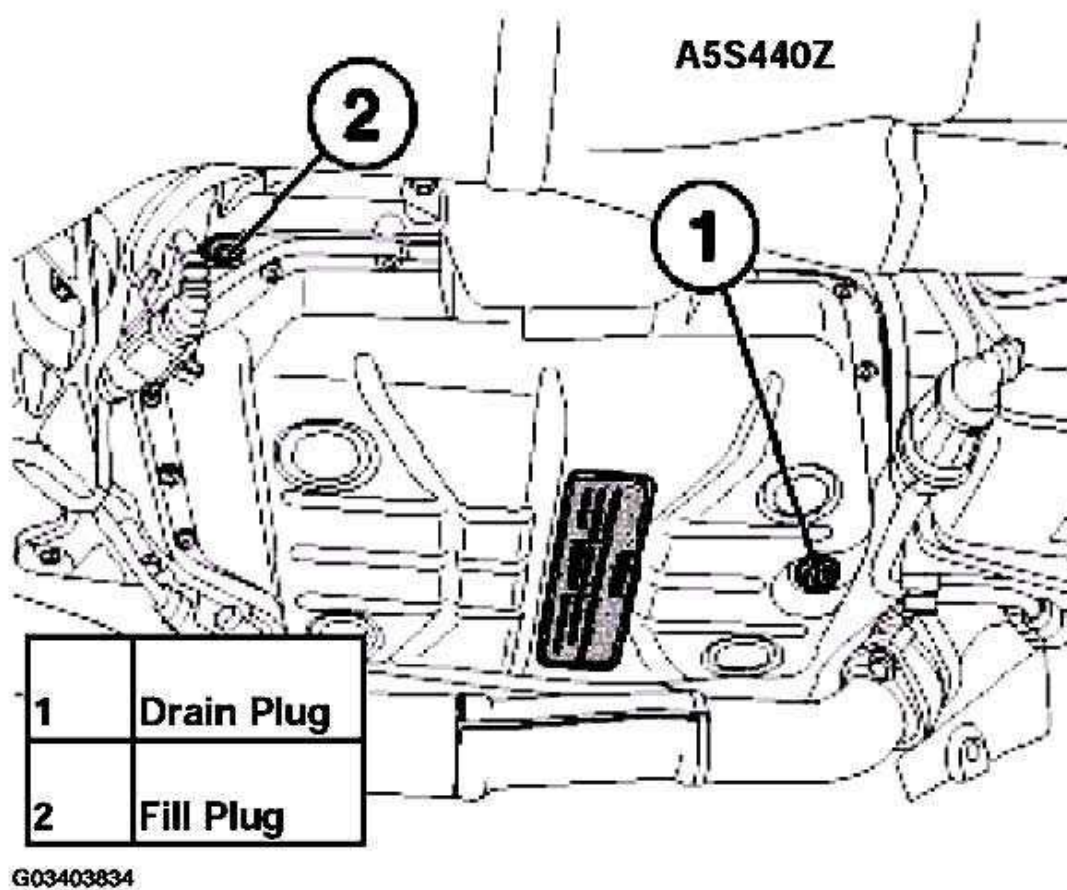


Fig. 56: Identifying Transmissions Drain Plug And Fill Plug
 Courtesy of BMW OF NORTH AMERICA, INC.

Transmission Fluid Application

There are numerous types of transmission fluid used in BMW transmissions. With the exception of the early transmissions (4HP22/24, A4S310/270R and the A5S310Z in the E34) all current BMW transmissions use "Lifetime Fill" transmission fluid. There is no maintenance required for these transmissions. It is important to use the correct fluid. Incorrect use of the transmission fluid can cause non-warrantable transmission damage.

When performing repairs on transmissions with lifetime fluid, it is important to drain the transmission fluid in to a clean container for re-use. New fluid should only be used for transmission replacement and for topping off after repairs.

Also, transmission fluid level is vital to the proper operation of the transmission.

When servicing or repairing BMW automatic transmissions, refer to TIS for fluid capacities.

TRANSMISSION FLUID

Transmission	Fluid Type	BMW Part #	Container	SIB Ref.
4HP22 4HP24	Dexron III Mercon	Available Commercially (Castrol or Texaco)	N/A	
A5S310Z 530i/iT (E34)	Dexron III	Available Commercially (Castrol or Texaco)	N/A	
M3 (E36)	ESSO LT 71141	83 22 9 407 807	20 liter container	B 24 03 95
A5S325Z	ESSO LT 71141	83 22 9 407 807	20 liter container	
A5S440Z	ESSO LT 71141	83 22 9 407 807	20 liter container	
A5S560Z 740 (E32), 540 (E34) 840Ci (E31- 6/93- 12/94) 740i/iL-750iL (E38)	Shell LA2634	83 22 9 407 765	5 liter container	B 24 11 92
540i (3/96-12/96) 850Ci (10/94-6/97)	ESSO LT 71141	83 22 9 407 807	20 liter container	B 24 02 94
A4S310R A4S270R (THM-R1)	Dexron III Mercon	Available Commercially (Castrol or Texaco)	N/A	
A5S360R A5S390R	Texaco ETL 7045E Texaco ETL 8072B	83 22 0 026 922 83 22 0 024 359	25 liter container 25 liter container	
GA6HP26Z GA6HP32Z	Shell M-1375.4	83 22 0 142 516	20 liter container	

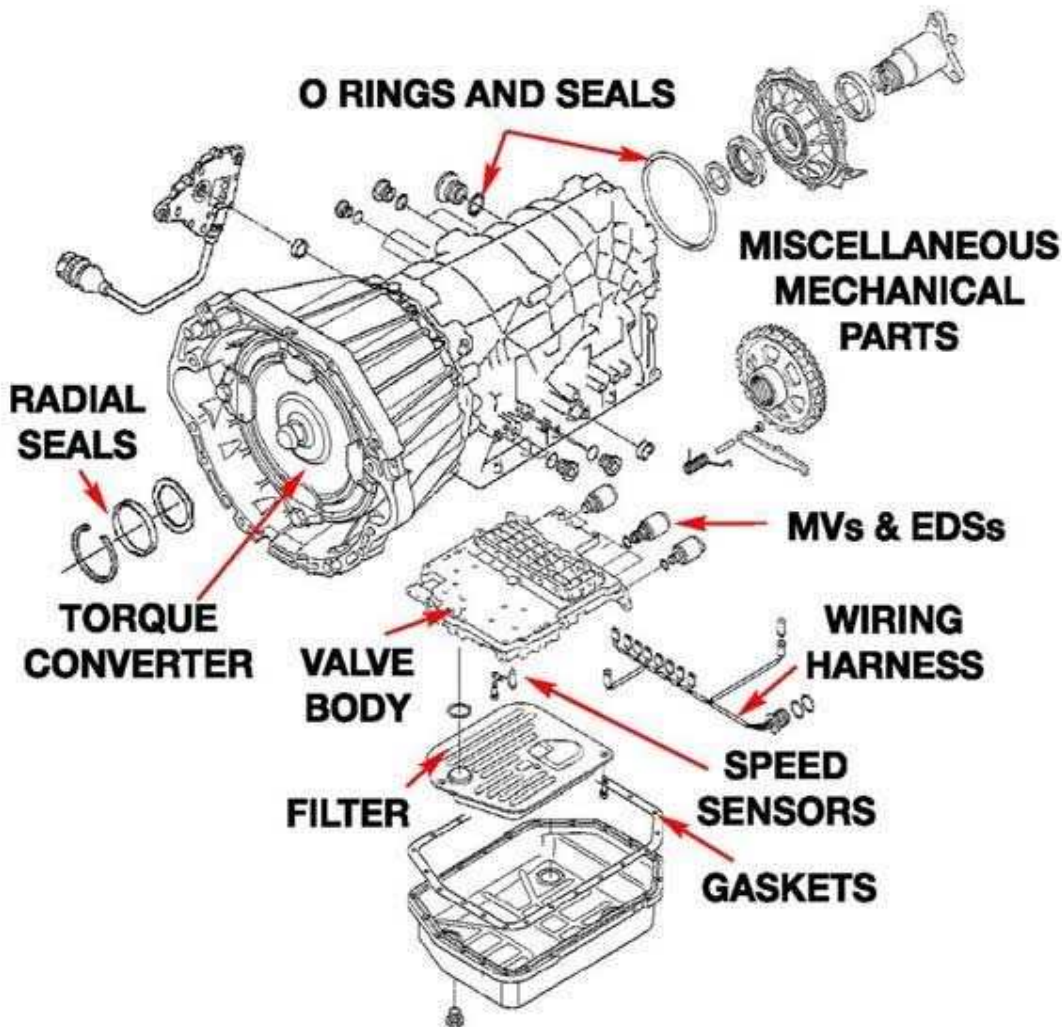
TRANSMISSION SERVICE

Overview Of Allowable Repairs

Currently, service of transmissions covered under warranty is limited to level I. Level I service includes electrical, minor mechanical and hydraulic repairs as well as repair manual provided service adjustments.

Part availability is limited to include the repair of the following:

- **Oil Leaks** - Radial Seals and gaskets.
- **Mechanical/Hydraulic Faults** - Torque Converter, Valve Body, parking pawl, oil pan, output shaft bearing.
- **Electrical Faults** - Solenoid Valves, pressure regulator valves, wiring harness.
- **Signal Sensing** - Turbine and Output Speed Sensors, CAN bus, Temp Sensor.



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Fig. 57: Exploded View Of Transmission Parts
 Courtesy of BMW OF NORTH AMERICA, INC.

BMW Technical Hotline

Before performing any major repairs or transmission replacement, always contact the BMW Technical Hotline at 1-800-472-7222. When prompted to do so, select option 1 for the Drivetrain Group. Be prepared with all necessary information such as transmission serial number, ID page, fault codes etc. Failure to contact the technical hotline could result in the non-payment of warranty claims.

BMW Value Line Program

The Value-Line replacement transmission program provides the availability of factory certified rebuilt units at a very competitive cost.

BMW SPECIAL TOOLS (TRANSMISSION)

The following pages contain information about BMW special tools, this is not an all inclusive list. This is a list of tools that would be helpful in the diagnosis and service of BMW transmissions.

Transmission Removal And Installation

Tool # 24 1 110

This tool is used to remove the torque converter to flexplate bolts. It is a 17 mm socket with 3/8" drive. There is a magnet to help retain the bolt during installation and removal.

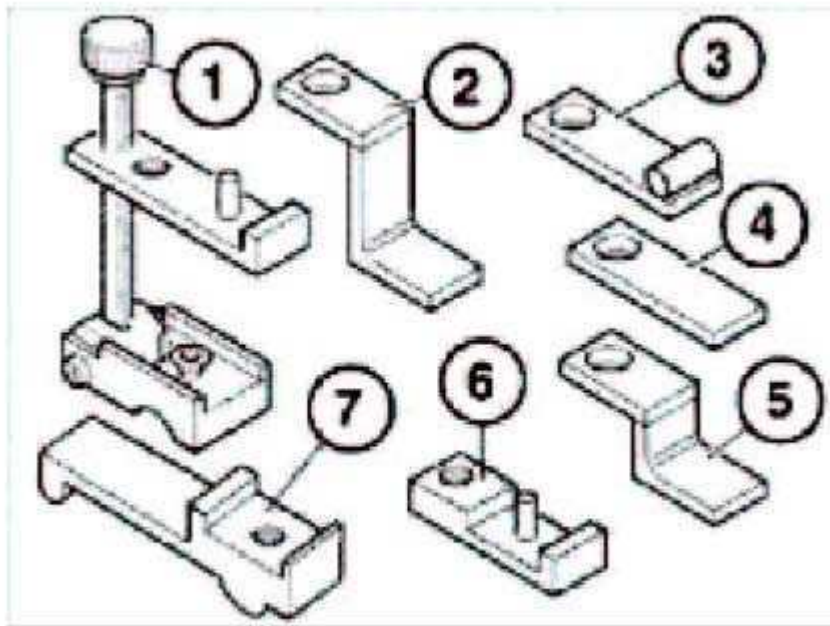


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Fig. 58: Identifying BMW Special Tools - Tool # 24 1 110
Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 4 130

During transmission installation and removal the oil pump must be protected from damage. This tool helps keep the torque converter in place, to prevent oil pump damage due to misalignment.



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Fig. 59: Identifying BMW Special Tools - Tool # 24 4 130
Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 2 300

Used to align torque converter with flexplate during installation. Use on all BMW automatic transmissions.



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Fig. 60: Identifying BMW Special Tools - Tool # 24 2 300
Courtesy of BMW OF NORTH AMERICA, INC.

Transmission Adjustments

Tool # 24 2 320

3/16" socket head cap screw (hex) with 1/4" drive. Used to adjust brake band on the THMR-1.

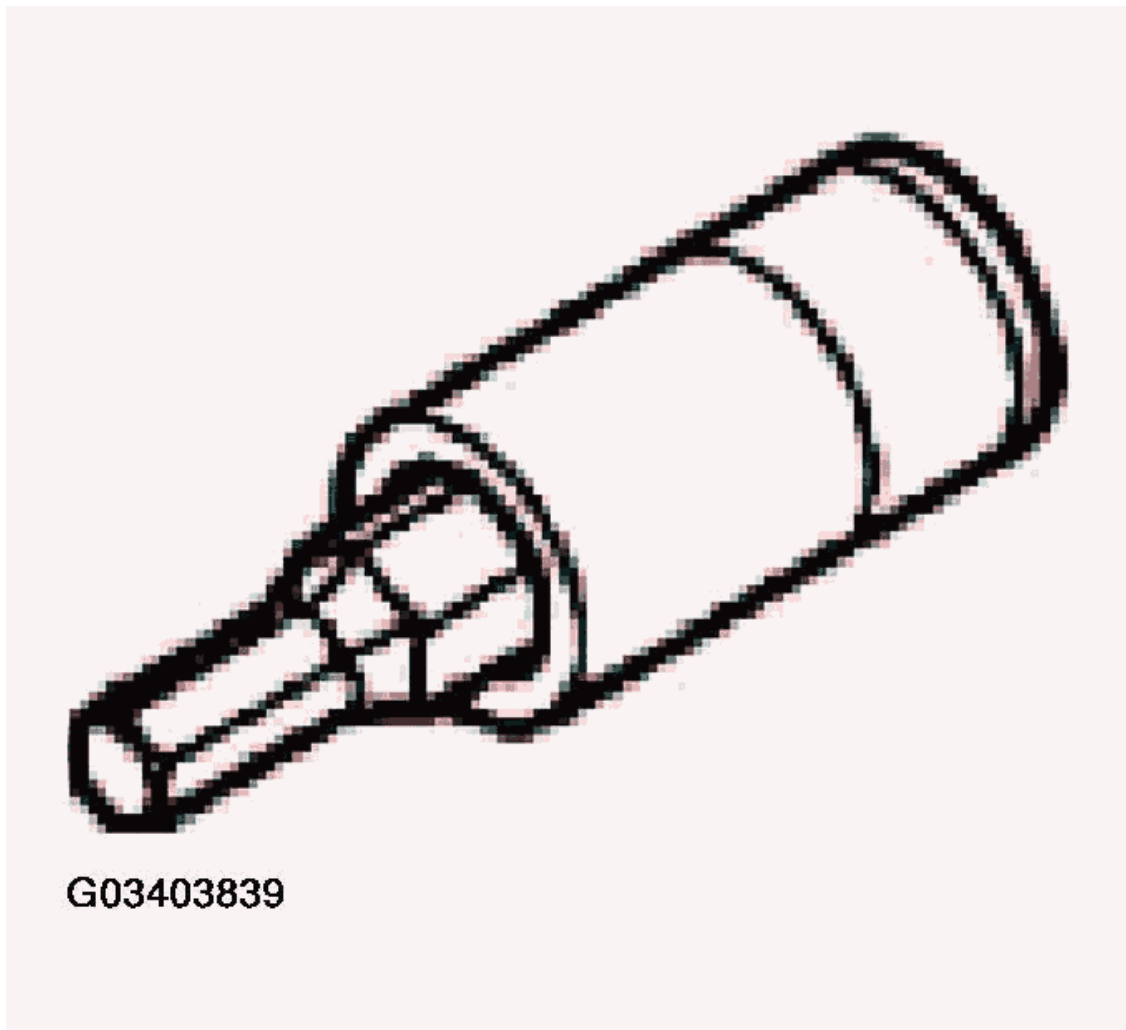


Fig. 61: Identifying BMW Special Tools - Tool # 24 2 320
Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 2 330

1/2 open end wrench used to turn lock-nut on the brake band servo when adjusting the brake band. Used only on the THMR-1 transmissions.

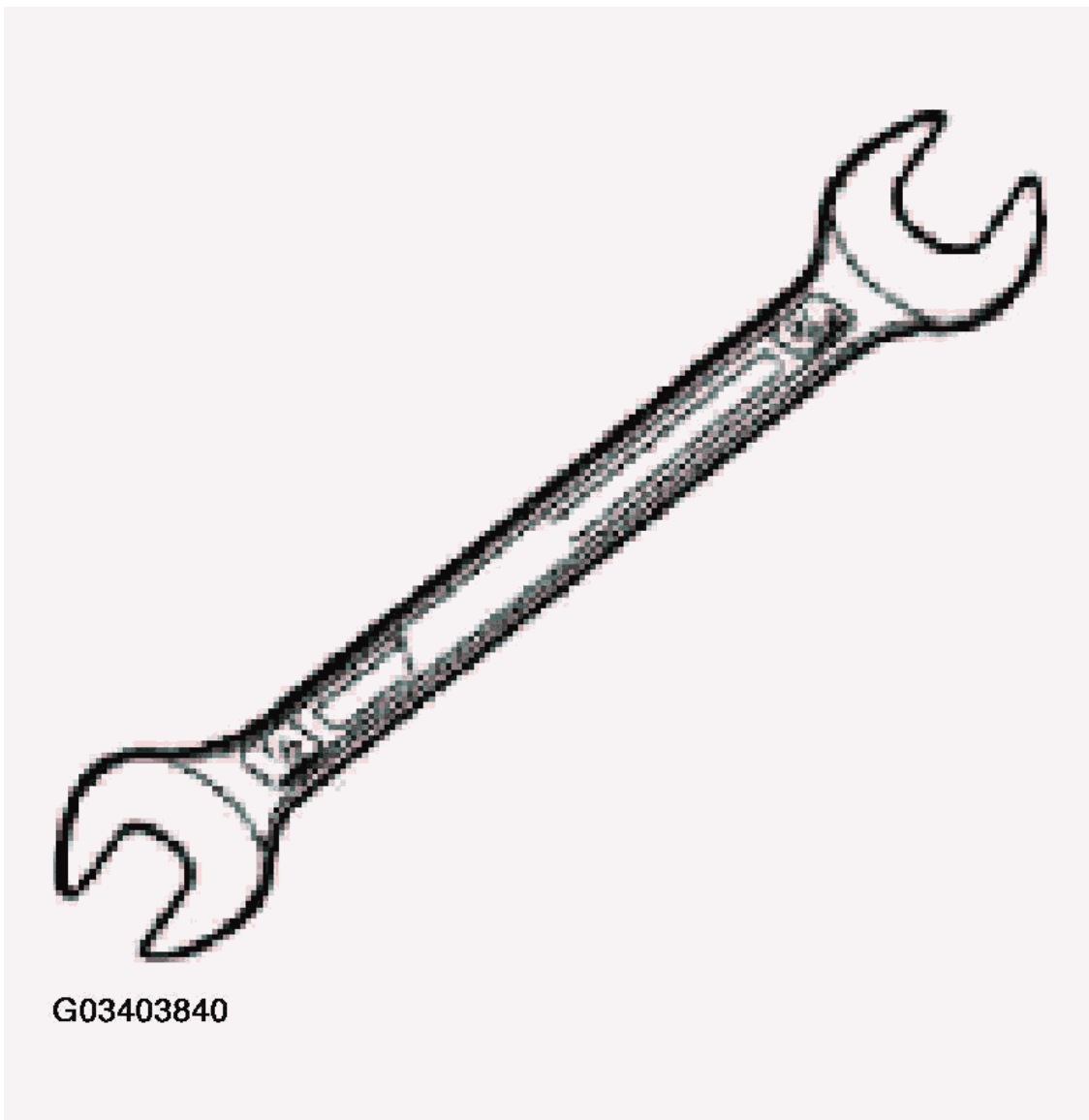
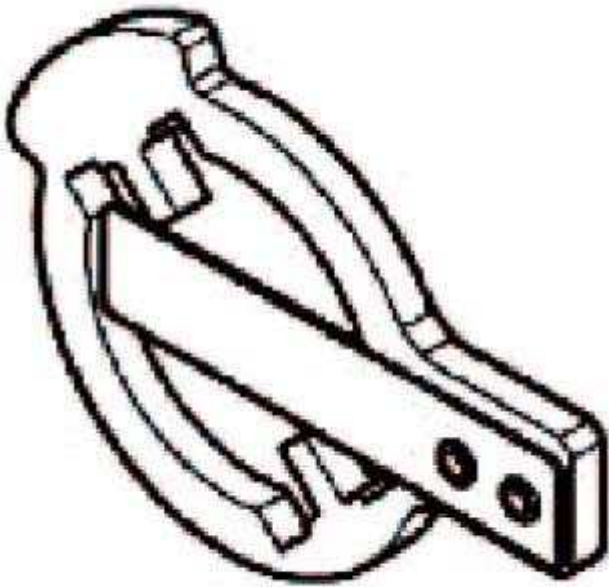


Fig. 62: Identifying BMW Special Tools - Tool # 24 2 330
Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 1 120

Used as guide to lock the range selector switch in "P" when installing. It is used on the A4S270R transmission. Used only for applications which have the selector switch mounted on the transmission case.



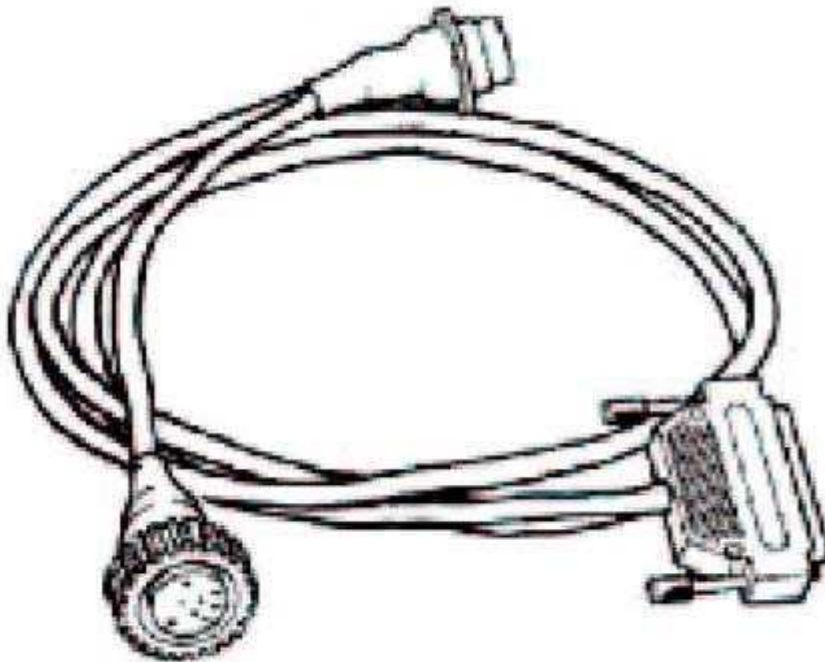
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Fig. 63: Identifying BMW Special Tools - Tool # 24 1 120
Courtesy of BMW OF NORTH AMERICA, INC.

Transmission Diagnostic Tools

Tool # 24 6 000

8-pin test cable used to test the transmission at the "Cannon Plug" located on transmission case. This cable is used for the 4HP22/24 EH. Used in conjunction with 61 1 459.

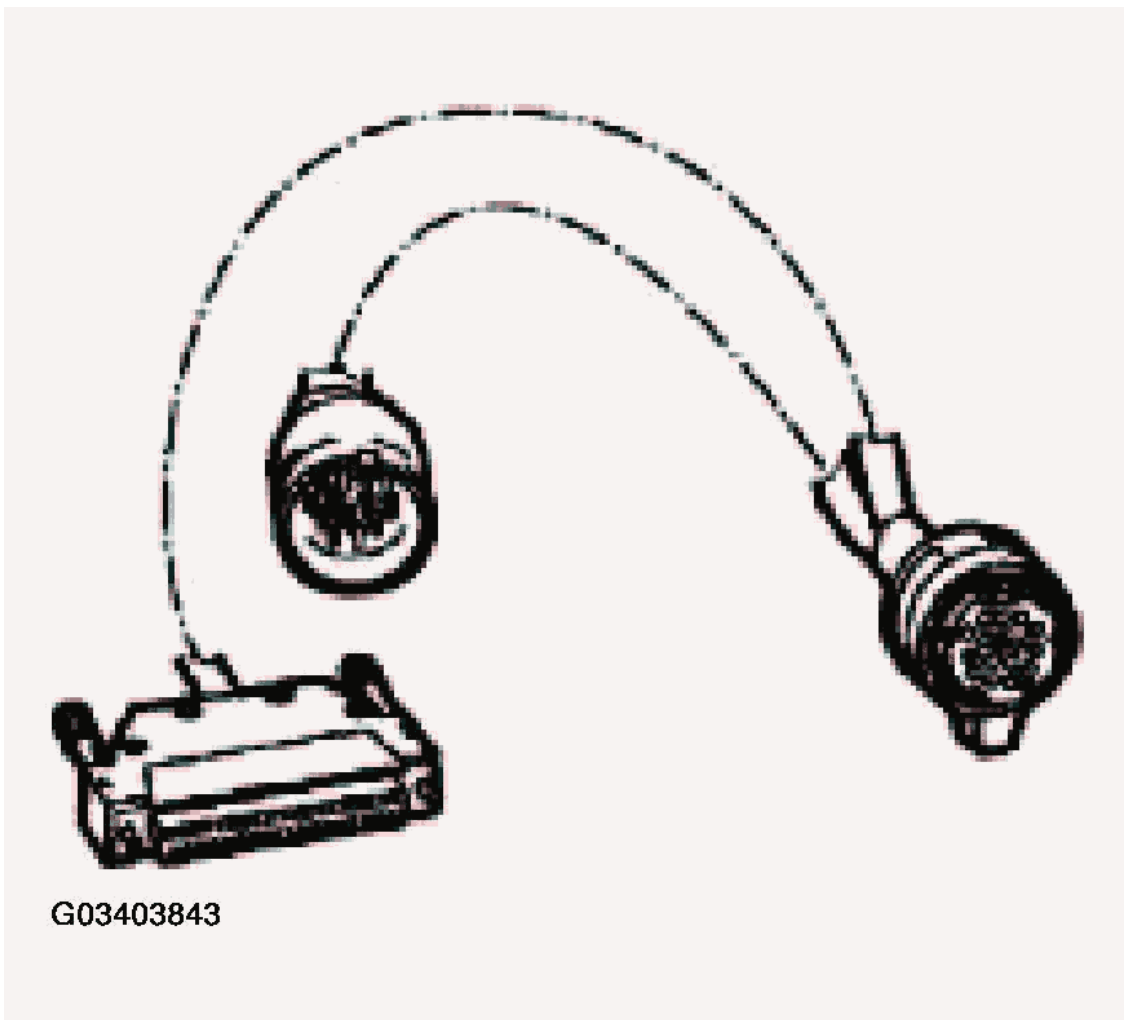


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Fig. 64: Identifying Transmission Diagnostic Tools - Tool # 24 6 000
Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 6 060

16 pin test cable used to test the transmission at the "Cannon Plug" located on the transmission case. This cable is used for the A5S310Z and A5S560Z. Used in conjunction with 61 1 459.



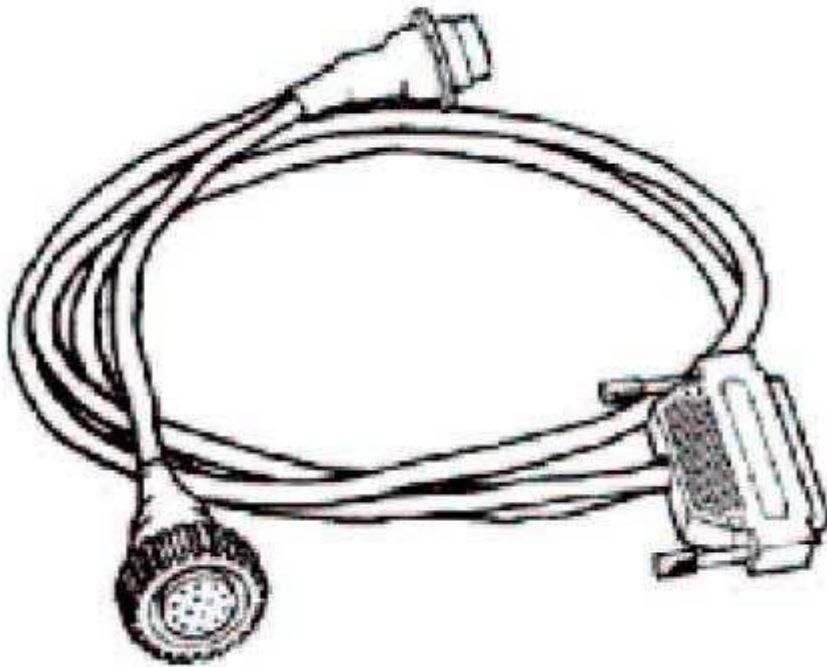
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Fig. 65: Identifying Transmission Diagnostic Tools - Tool # 24 6 060
Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 6 020

14 pin test cable used to test the transmission at the "Cannon Plug" located on the transmission case. This cable is used on the A5S310Z.

Used in conjunction with 61 1 459.



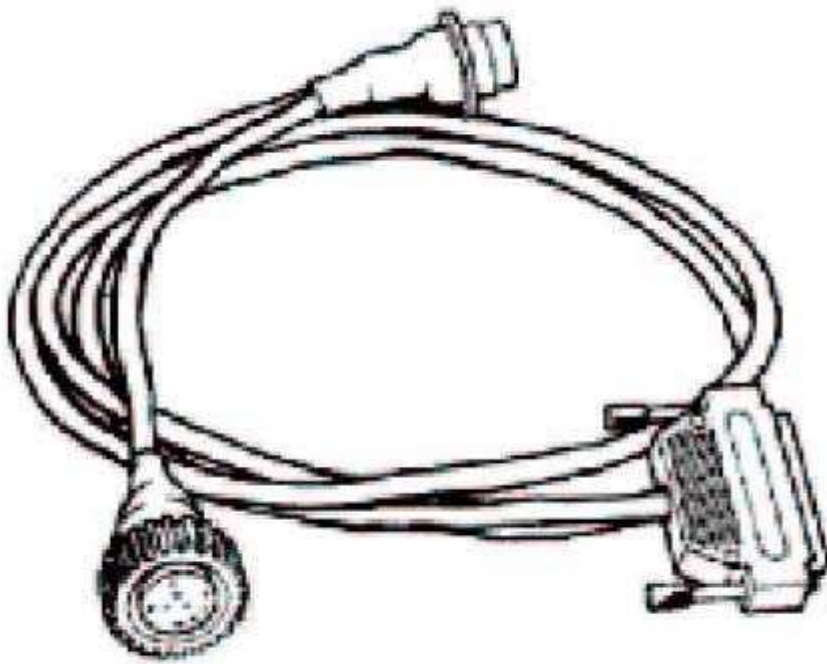
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Fig. 66: Identifying Transmission Diagnostic Tools - Tool # 24 6 020
Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 6 010

8-pin test cable used to test the transmission at the "Canon Plug" located on transmission case. This cable is used for the A4S270/310R.

Used in conjunction with 61 1 459.



G03403845

Fig. 67: Identifying Transmission Diagnostic Tools - Tool # 24 6 010
Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 6 080

16-pin test cable used to test the transmission at the "Canon Plug" located on transmission case. This cable is used for the 6HP26Z.

Used in conjunction with 61 1 459.



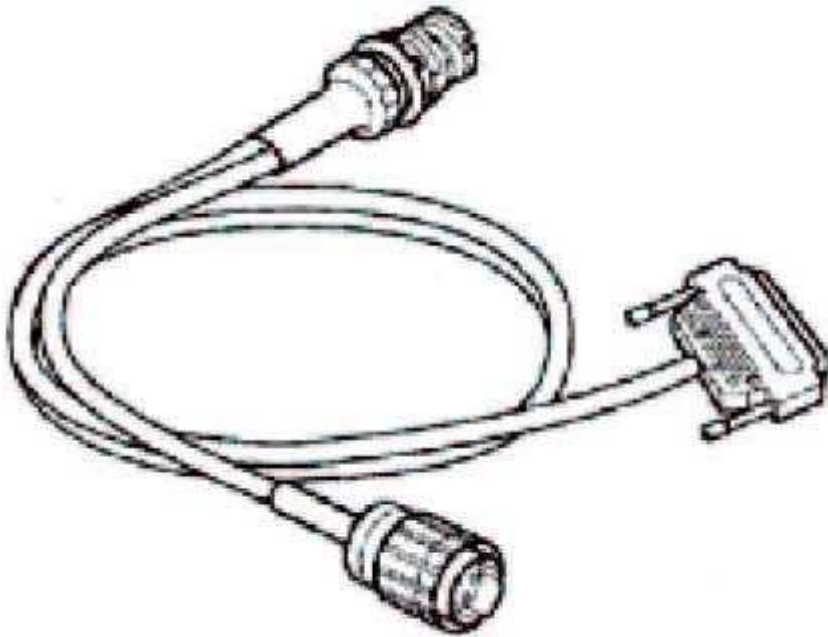
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Fig. 68: Identifying Transmission Diagnostic Tools - Tool # 24 6 080
Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 6 070

20-pin test cable used to test the transmission at the "Canon Plug" located on transmission case. This cable is used for the A5S360/390R.

Used in conjunction with 61 1 459.



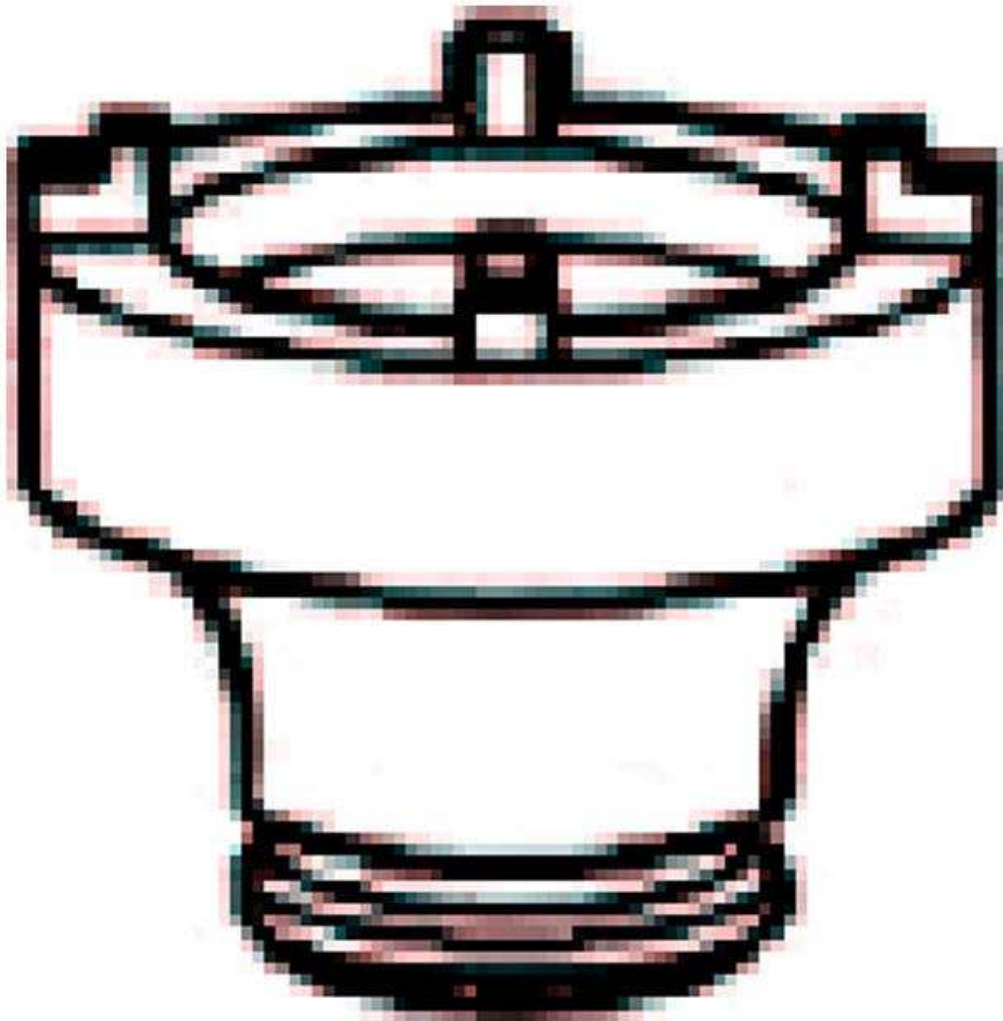
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Fig. 69: Identifying Transmission Diagnostic Tools - Tool # 24 6 070
Courtesy of BMW OF NORTH AMERICA, INC.

Service and Repair Tools

Tool # 24 1 170

For loosening and tightening slotted nut on output drive flange. Used on 5HP18 (A5S310Z). Use in conjunction with tool #24 1 220.



G03403848

Fig. 70: Identifying Service And Repair Tools - Tool # 24 1 170
Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 4 110

For loosening and tightening slotted nut on output drive flange. Used on 5HP24 and 5HP30. Use in conjunction with tool #24 1 220.

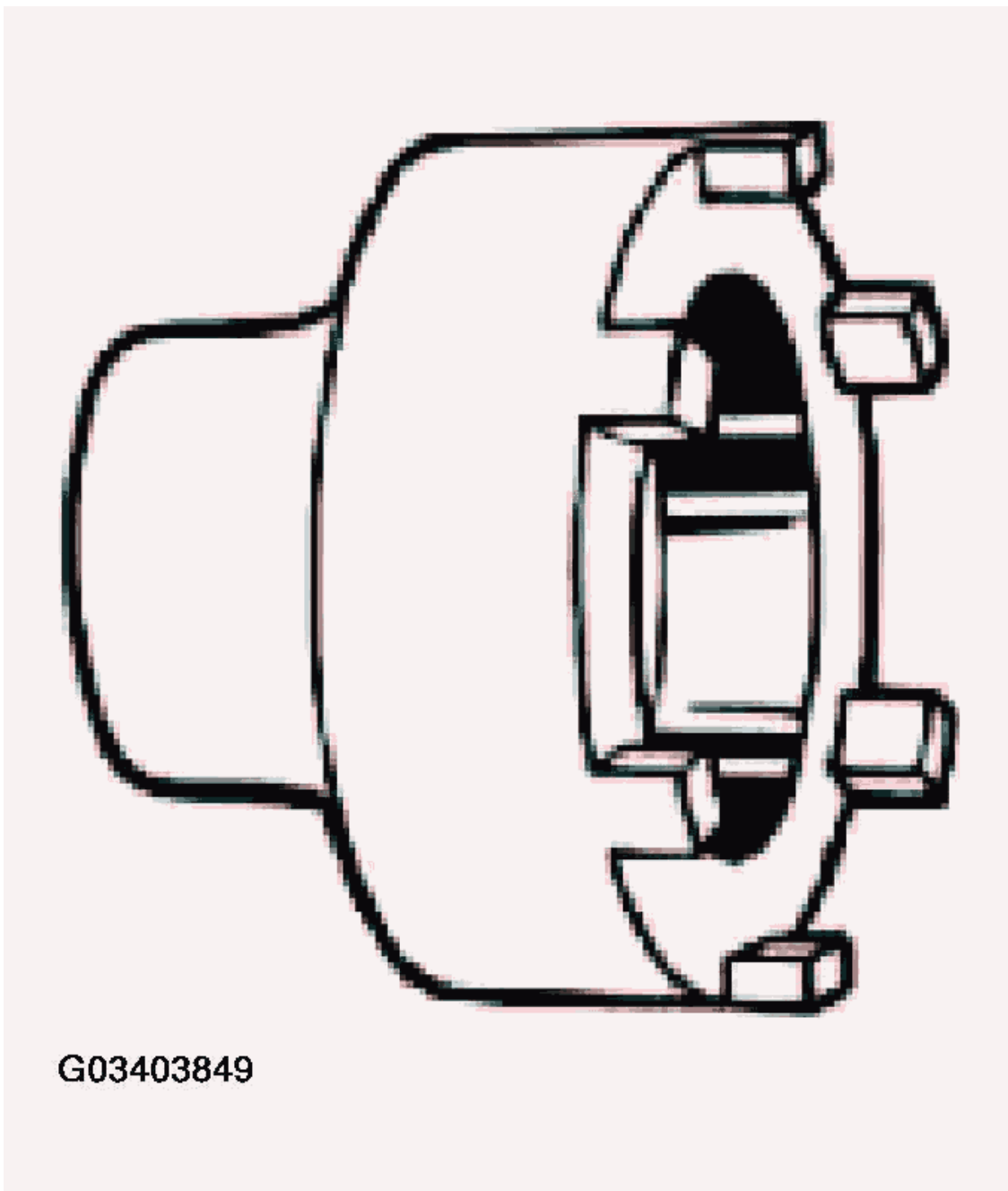
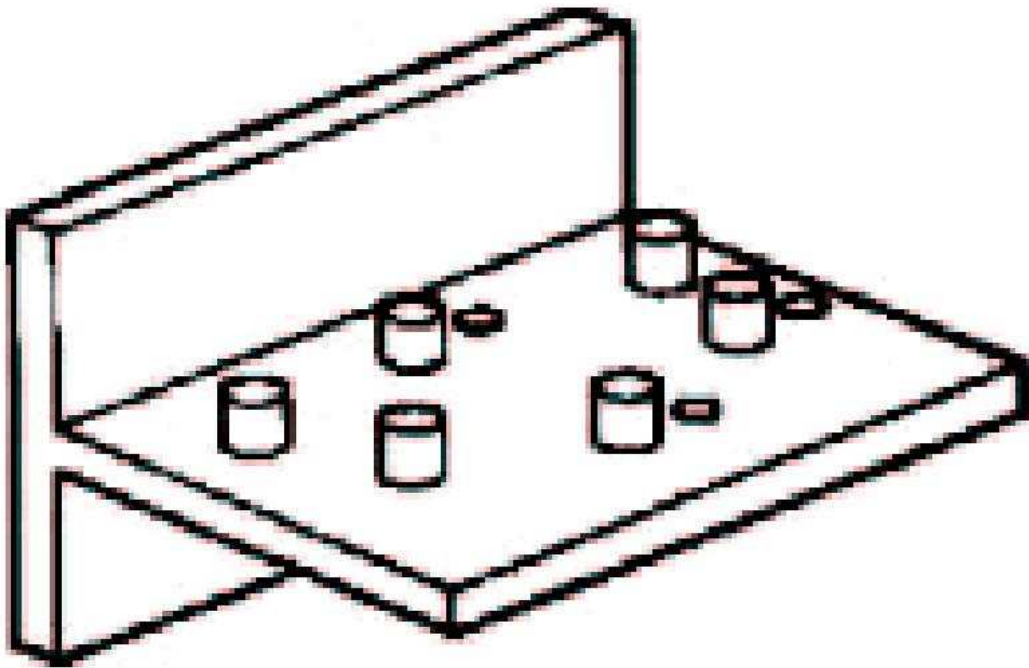


Fig. 71: Identifying Service And Repair Tools - Tool # 24 4 110
Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 1 220

Take up support for drive flange. Used when tightening of loosening slotted nut on output drive flange. Used with tool numbers 24 4 170 and 24 4 110.



G03403850

Fig. 72: Identifying Service And Repair Tools - Tool # 24 1 220
Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 2 380

34 mm Socket used to tighten and loosen nut on output drive flange. Used with special tool 23 0 020. For GA6HP26Z transmission.

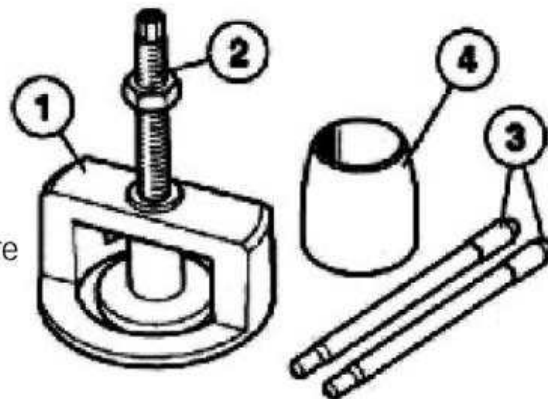


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Fig. 73: Identifying Service And Repair Tools - Tool # 24 2 380
 Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 2 310

Set of tools used to re-seal intermediate plate. Used on A4S310R and A4S270R. Tool Set Consists of:



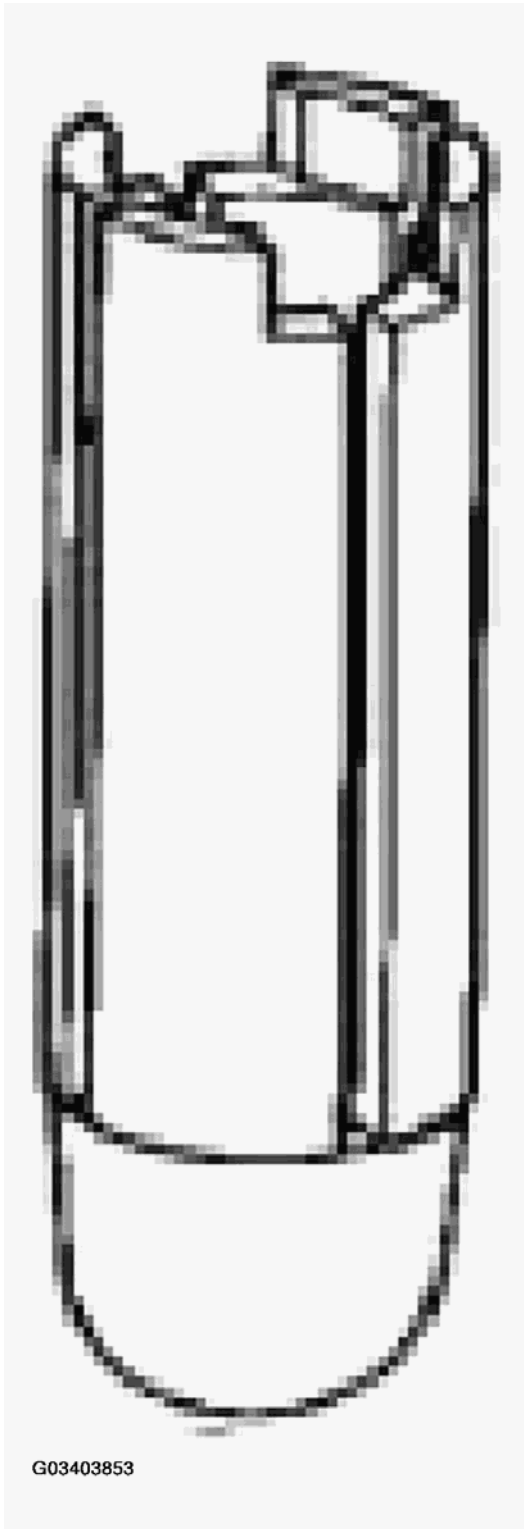
- | | | |
|----|----------|-----------------------------|
| 1. | 24 2 311 | Pressure Plate |
| 2. | 24 2 312 | Spindle with Pressure Plate |
| 3. | 24 2 313 | Guide Pins (2) |
| 4. | 24 2 314 | Slip Bushing |

G03403852

Fig. 74: Identifying Service And Repair Tools - Tool # 24 2 310
 Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 1 200

Used to prevent damage to rotary shift shaft seal when fitting new seal on shift shaft. Used on A5S310Z (5HP18).



G03403853

Fig. 75: Identifying Service And Repair Tools - Tool # 24 1 200
Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION

Gear Shift - Repair Instructions - X3

11 CENTRE SHIFT MANUAL TRANSMISSION

25 11 000 REMOVING AND INSTALLING SHIFT LEVER

Special tools required:

- 25 1 120 PIN WRENCH

Necessary preliminary tasks:

- Remove complete exhaust system, see 18 00 020 REMOVING AND INSTALLING COMPLETE EXHAUST SYSTEM .
- Remove heat shield.
- Remove transmission cross-member, see 22 31 050 REPLACING CROSS-MEMBER FOR TRANSMISSION MOUNTING .

Unfasten screws.

Tightening torque: 6AZ, see 26 11 PROPELLER SHAFT, COMPLETE .

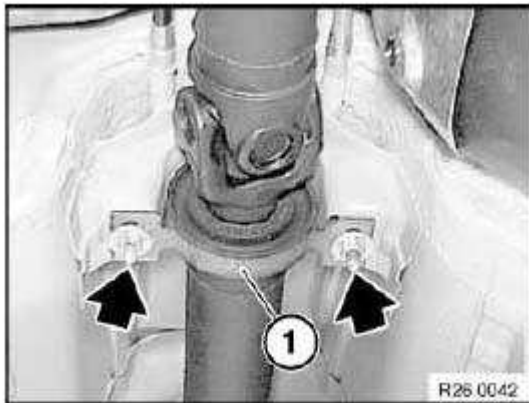


Fig. 1: Screws

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Lower transmission.

IMPORTANT: Risk of damage:
Engine must not rest against bulkhead.

Detach knob with a firm tug.

NOTE: Do not turn knob when detaching as this will shear off the turning lock in the knob.

Installation:

Fit knob on selector lever, align and press on until it snaps noticeably into place.

NOTE: Illustration shows E46.



Fig. 2: Detaching Knob With Firm Tug
Courtesy of BMW OF NORTH AMERICA, INC.

Press installation frame of rubber gaiter (1) together a little and remove rubber gaiter (1) from center console.

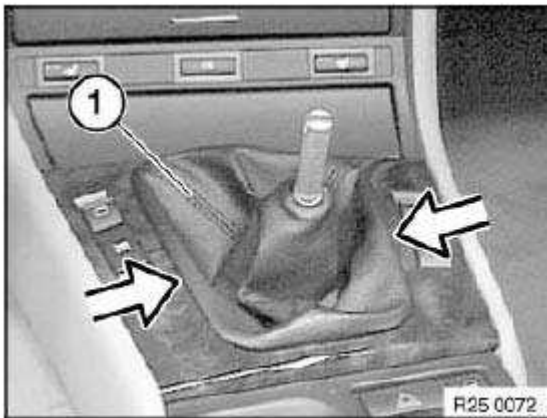


Fig. 3: Rubber Gaiter
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Feed rubber gaiter (1) downwards and fit on selector lever (2).

Pull rubber gaiter (1) over selector lever and insert in center console.

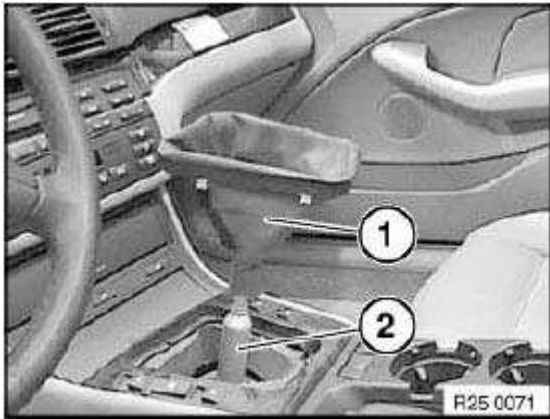


Fig. 4: Rubber Gaiter And Selector Lever
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Push rubber gaiter (1) down until groove (2) is fully exposed.

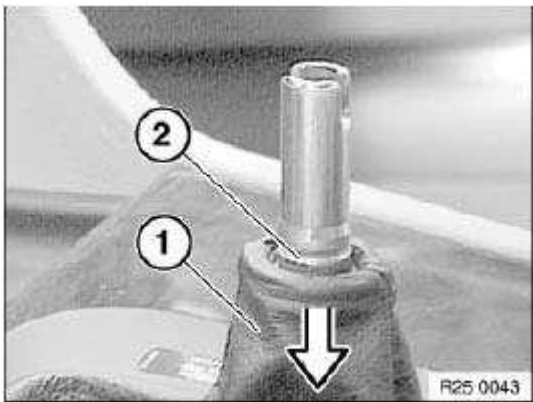


Fig. 5: Pushing Rubber Gaiter Down
Courtesy of BMW OF NORTH AMERICA, INC.

Remove soundproofing (1).

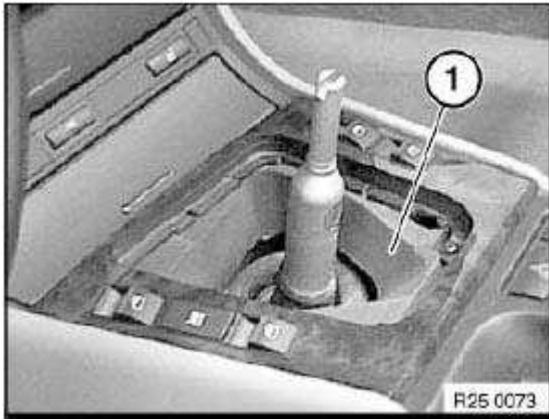


Fig. 6: Soundproofing

Courtesy of BMW OF NORTH AMERICA, INC.

Lever out fixture (1) in direction of arrow.

Remove shims (3).

Pull selector rod (2) in direction of arrow.

Installation:

Grease selector rod pin.

Make sure shims (3) are in correct position.

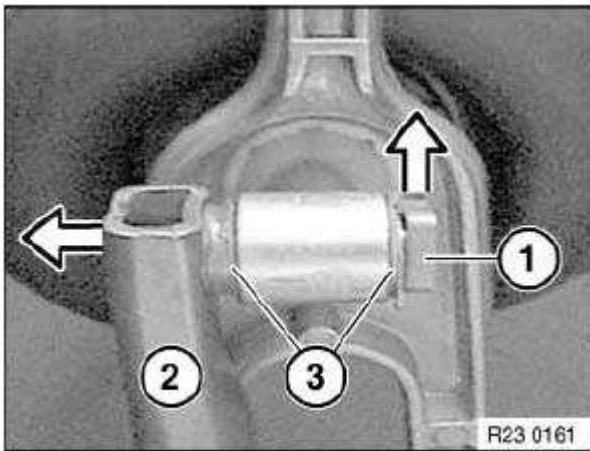


Fig. 7: Pulling Selector Rod

Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool 25 1 120 in mounting and turn 90° counterclockwise.

Press mount upwards out of selector arm.

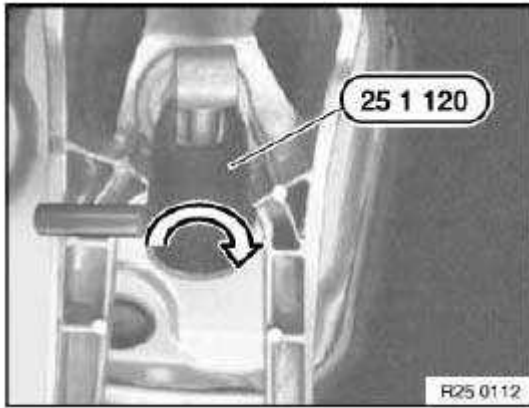


Fig. 8: Inserting Special Tool And Turning Counterclockwise
Courtesy of BMW OF NORTH AMERICA, INC.

Remove rubber gaiter from body cutout and lift out with selector lever.

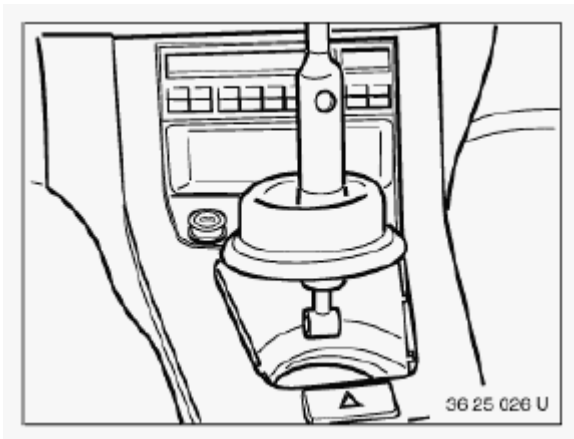


Fig. 9: Rubber Gaiter And Selector Lever
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Insert rubber gaiter with arrow in direction of travel towards front.

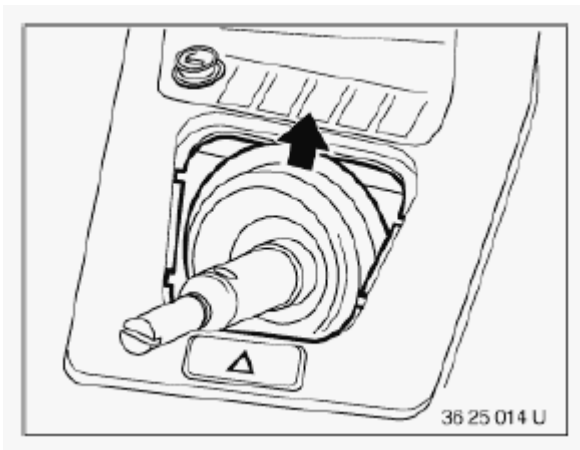


Fig. 10: Inserting Rubber Gaiter
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Grease selector lever ball.

Install selector lever in selector arm.

Align mount:

- Arrows on mount in longitudinal axis of vehicle.
- Retaining lugs of mount, transverse to direction of travel.

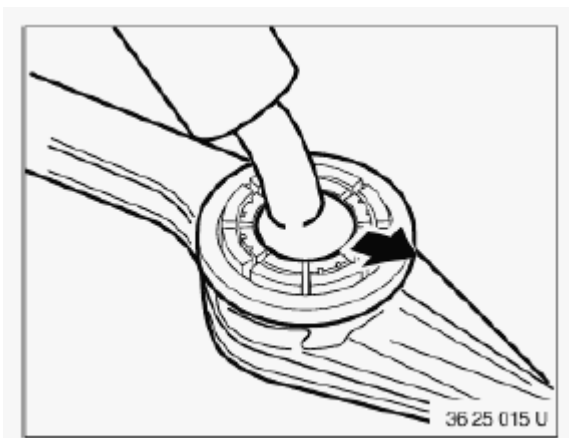


Fig. 11: Aligning Mount In Longitudinal Axis Of Vehicle
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Press mount in area of retaining lugs into selector arm until it audibly snaps into place.

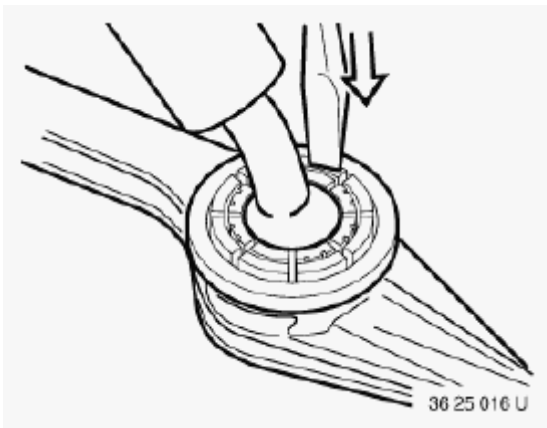


Fig. 12: Pressing Mount In Area Of Retaining Lugs Into Selector Arm
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Pull inner rubber gaiter over bowl on selector arm and press outer rubber gaiter into body cutout.

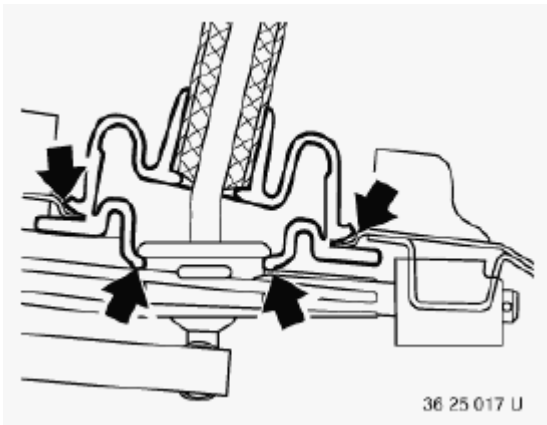


Fig. 13: Pulling Inner Rubber Gaiter Over Bowl On Selector Arm
Courtesy of BMW OF NORTH AMERICA, INC.

25 11 001 REPLACING COMPLETE SHIFT LEVER

Necessary preliminary tasks:

- Remove shift lever, see **25 11 000 Removing and installing shift lever.**
- Remove vibration damper (if fitted).

Detach mount from selector lever.

Installation:

Grease ball joint.

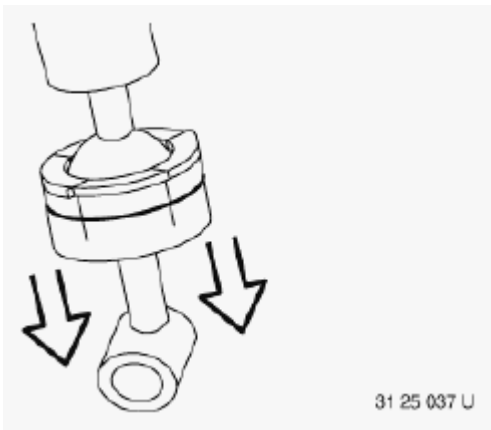


Fig. 14: Detaching Mount From Selector Lever
Courtesy of BMW OF NORTH AMERICA, INC.

Detach rubber gaiter from selector lever.

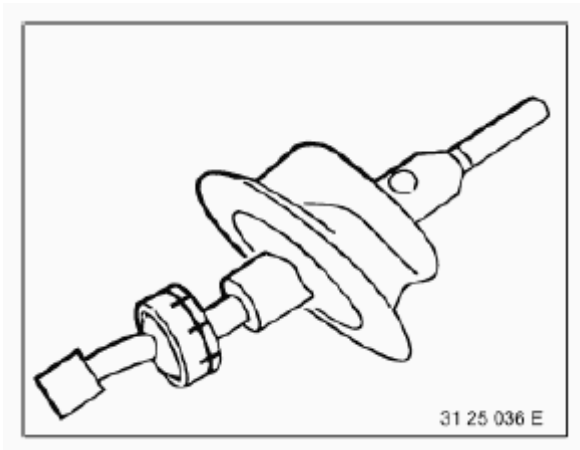


Fig. 15: Rubber Gaiter And Selector Lever
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Degrease selector lever (1).

Coat rubber bellows on inside of shaped section (2) with Circolight.

Pull rubber gaiter from above over selector lever and align.

Arrow (3) on rubber gaiter must point in direction of travel (A).

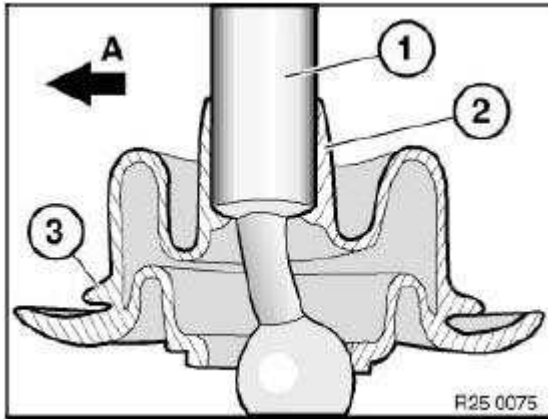


Fig. 16: Selector Lever And Shaped Section
 Courtesy of BMW OF NORTH AMERICA, INC.

25 11 041 REPLACING BEARING SHELL FOR SHIFT LEVER

Necessary preliminary tasks:

- Remove shift lever, see **25 11 000 Removing and installing shift lever.**

Detach mount from selector lever.

Installation:

Grease ball joint.

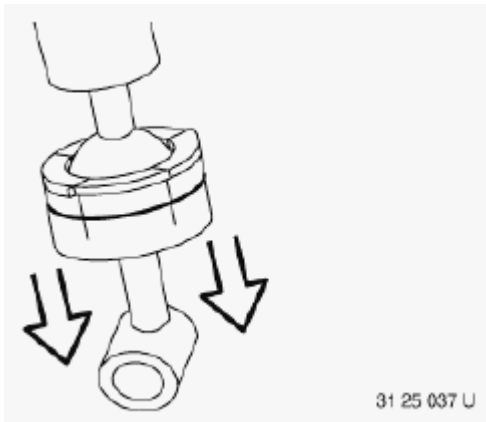


Fig. 17: Detaching Mount From Selector Lever
 Courtesy of BMW OF NORTH AMERICA, INC.

25 11 071 REPLACING KNOB FOR SHIFT LEVER

NOTE: Do not twist knob during removal as this would cause the turning lock in the knob to shear off.

Tug firmly to remove knob.

Installation:

Fit knob on selector lever, align and press on until it snaps noticeably into place.

NOTE: Illustration shows E46.



Fig. 18: Detaching Knob With Firm Tug
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Push rubber gaiter (1) down until groove (2) is fully exposed.

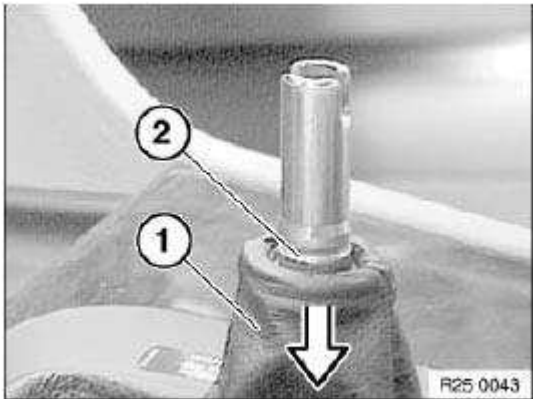


Fig. 19: Pushing Rubber Gaiter Down
Courtesy of BMW OF NORTH AMERICA, INC.

25 11 081 REPLACING GAITER (SHIFT LEVER COVER) FOR SHIFT LEVER

Necessary preliminary tasks:

- Remove knob for shift lever, see 25 11 071 Replacing knob for shift lever.

NOTE: The method for removing the gaiter is the same for manual and automatic transmissions.

Removing gaiter:

1. Carefully pull gaiter taut on leather.
2. Press frame inwards slightly until catch is released.
3. Lift out gaiter.

NOTE: Illustrations show E85.

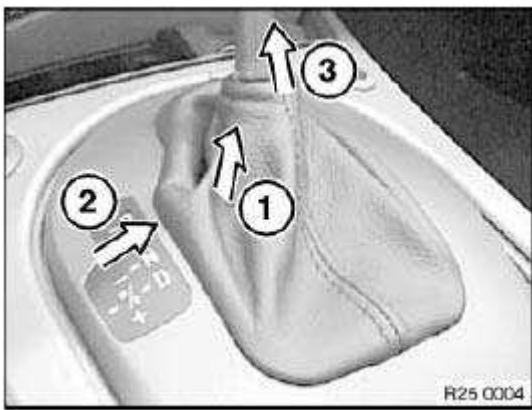


Fig. 20: Lifting Out Gaiter

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Retaining lugs must not be damaged.

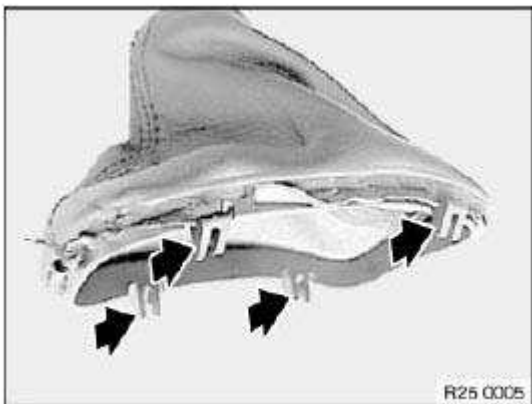


Fig. 21: Retaining Lugs

Courtesy of BMW OF NORTH AMERICA, INC.

25 11 111 REPLACING SHIFT ROD JOINT

Necessary preliminary tasks:

- Remove complete exhaust system, see **18 00 020 REMOVING AND INSTALLING COMPLETE EXHAUST SYSTEM** .
- Remove heat shield.
- Remove transfer box, see **27 10 010 REMOVING AND INSTALLING TRANSFER CASE (ATC 400 X-DRIVE)** .

Lift off retainer (1).

Disconnect shift rod (2).

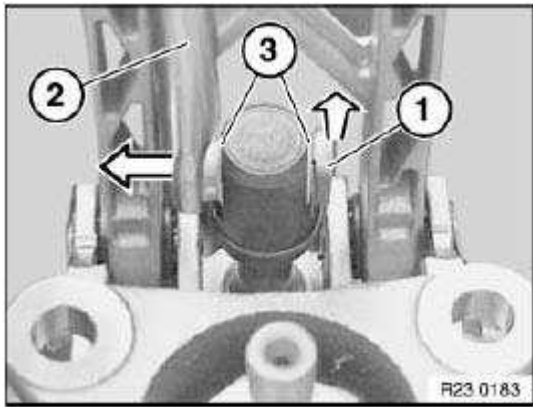


Fig. 22: Lifting Off Retainer

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Grease shift rod.

Make sure shims (3) are in correct position.

Lever spring washer (1) out of groove and push a little towards rear.

Press dowel pin (2) upwards/downwards out of shift rod joint and remove shift rod joint.

Installation:

Grease ball of selector shaft.

Replace spring washer (1).

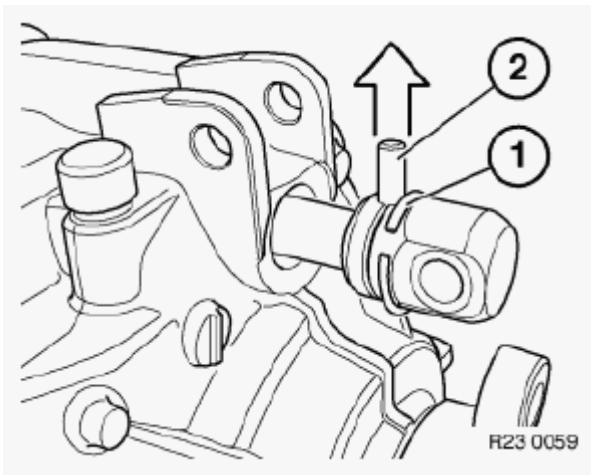


Fig. 23: Spring Washer And Dowel Pin
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check rubber ring (1) in shift rod joint (2) and replace if necessary.

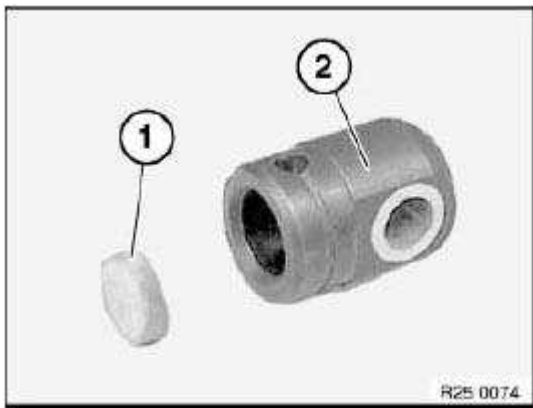


Fig. 24: Rubber Ring And Shift Rod Joint
Courtesy of BMW OF NORTH AMERICA, INC.

25 11 211 REPLACING SHIFT ARM FOR SHIFT-LEVER MOUNT

Necessary preliminary tasks:

- Remove shift lever, see **25 11 000 Removing and installing shift lever.**

Unlock bearing pin (1) in direction of arrow and remove.

Pull shift arm forwards out of rubber mount.

Installation:

Grease bearing pin and bearing journal.

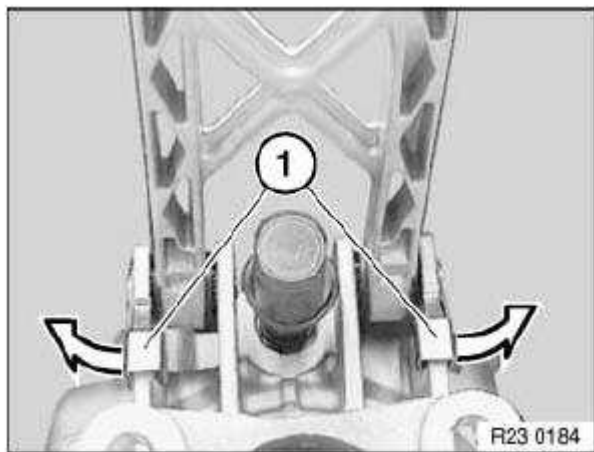


Fig. 25: Unlocking Bearing Pin
Courtesy of BMW OF NORTH AMERICA, INC.

Replace bearing bush if damaged, see **25 11 235 Replacing bearing bushes for shift arm.**

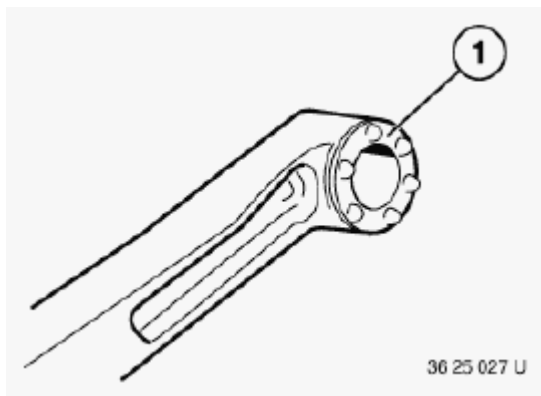


Fig. 26: Bearing Bush
Courtesy of BMW OF NORTH AMERICA, INC.

25 11 235 REPLACING BEARING BUSHES FOR SHIFT ARM

Necessary preliminary tasks:

- Remove shift arm, see **25 11 000 Removing and installing shift lever.**

Press out bearing bush (1).

Coat new bearing bush (1) with Circolight and then press into shift arm until side edges of bush protrude uniformly.

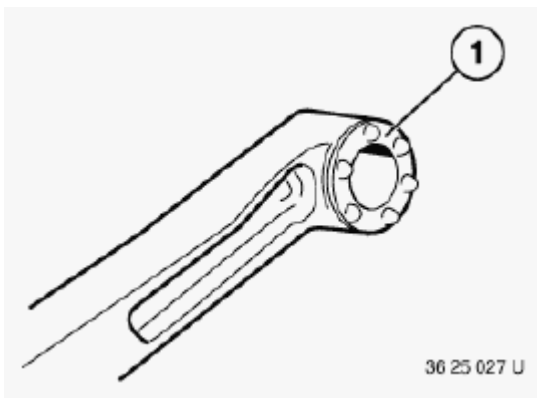


Fig. 27: Bearing Bush

Courtesy of BMW OF NORTH AMERICA, INC.

25 11 245 REPLACING SHIFT-ARM SUPPORT BEARING

Necessary preliminary tasks:

- Remove complete exhaust system, see **18 00 020 REMOVING AND INSTALLING COMPLETE EXHAUST SYSTEM** .
- Remove heat shield.
- Remove propeller shaft from transfer box at rear.
- Release center bearing.
- Tie propeller shaft to one side.

Tasks are described in **26 11 000 REMOVING AND INSTALLING PROPELLER SHAFT (CARDAN UNIVERSAL JOINT) COMPLETELY** .

Lever support bearing (1) with a short screwdriver out of mounting.

Pull support off shift arm.

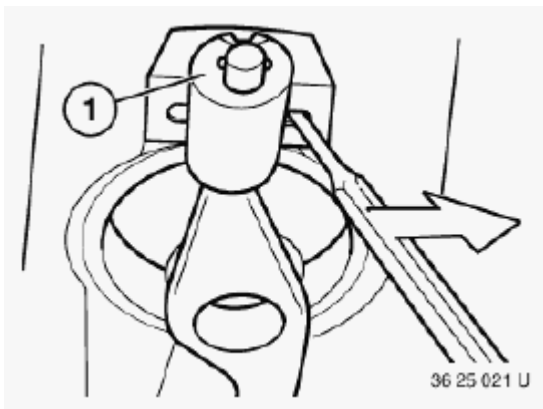


Fig. 28: Pulling Support Off Shift Arm

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Grease bearing pin of shift arm.

Fit support bearing (1) with opening (2) towards top rear onto mounting.

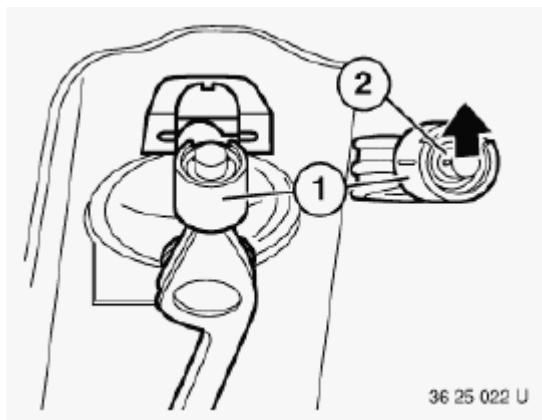


Fig. 29: Fitting Support Bearing With Opening
Courtesy of BMW OF NORTH AMERICA, INC.

16 CENTRE SHIFT AUTOMATIC TRANSMISSION

25 16 056 REMOVING AND INSTALLING / REPLACING SHIFT TOWER (STEPTRONIC)

Necessary preliminary tasks:

- Remove trim for instrument panel, see **51 45 030 REMOVING AND INSTALLING INSTRUMENT PANEL TRIM** .

Move selector lever to "P" position.

Grip clamping sleeve (1) and slacken nut (2).

Installation:

Adjust selector lever, see **24 00 018 ADJUSTING SELECTOR LEVER (A5S 360R / 390R, A4S 200R, 6HP26Z/19Z)** .

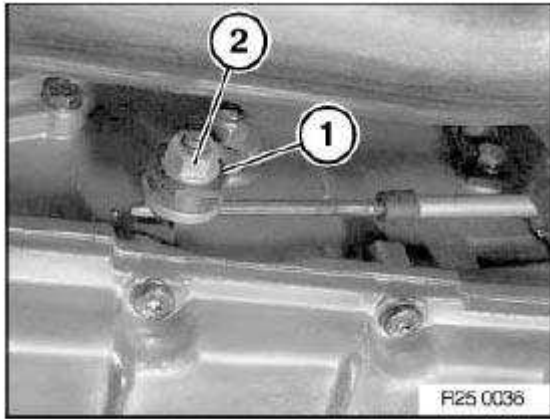


Fig. 30: Clamping Sleeve And Slacken Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Brace cable on hex head (1) and loosen nut (2).

Installation:

Tightening torque: 1AZ, see 25 16 SHIFT CONSOLE - AUTOMATIC TRANSMISSION .

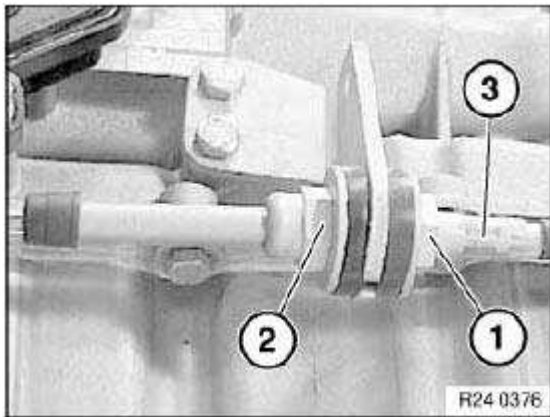


Fig. 31: Hex Head And Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Pull cable (2) out of holder.

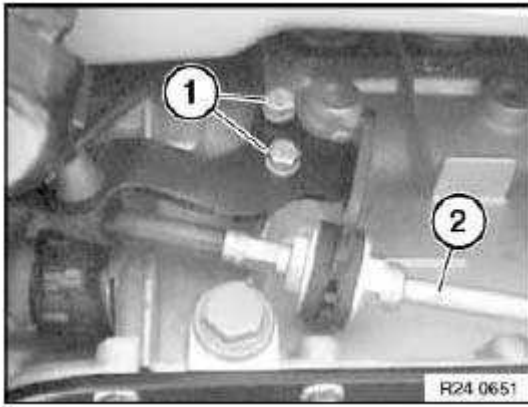


Fig. 32: Screws And Cable
 Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plugs (1 and 2).

Unscrew bolt (3).

Tightening torque: 5AZ, see **25 16 SHIFT CONSOLE - AUTOMATIC TRANSMISSION** .

Slide interlock cable (4) down using a screwdriver (5) from shaft of interlock locking pawl towards left.

Installation:

Adjust interlock cable and check interlock function, see **25 16 175 Adjusting interlock cable.**

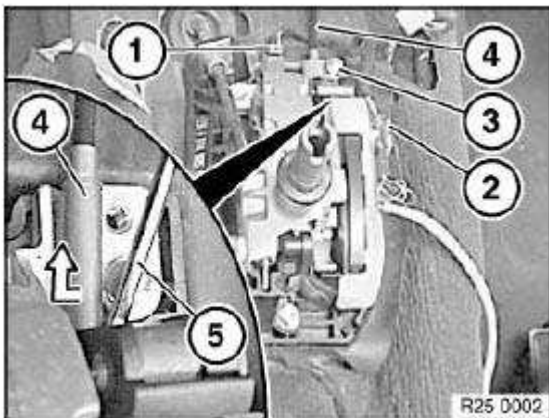


Fig. 33: Plugs, Bolt, Interlock Cable And Screwdriver
 Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque: 3AZ, see **25 16 SHIFT CONSOLE - AUTOMATIC TRANSMISSION** .

Feed sleeve (2) out of body and remove shift tower.

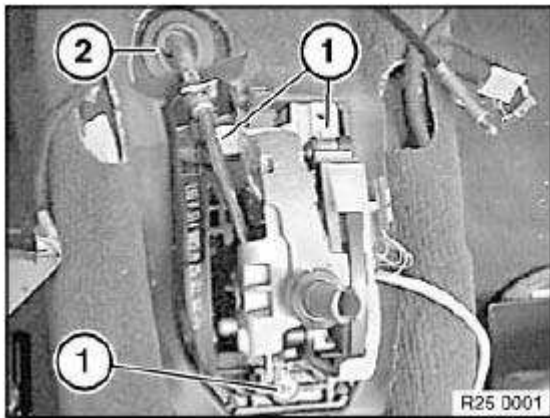


Fig. 34: Screws And Sleeve
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Insert rubber seal (1) of shift cable (2) in transmission tunnel (3).

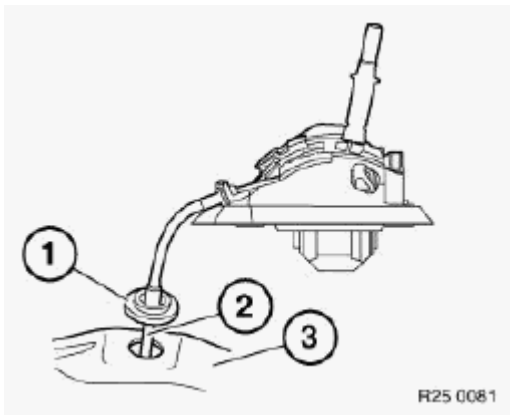


Fig. 35: Rubber Seal, Shift Cable And Transmission Tunnel
Courtesy of BMW OF NORTH AMERICA, INC.

25 16 061 REPLACING GRIP/KNOB FOR SHIFT LEVER

NOTE: The method for removing the grip/knob is identical for manual and automatic transmissions.

Do not twist grip/knob when removing as the turning lock in the knob will shear off.

Detach grip/knob in direction of arrow with a firm tug.

NOTE: Illustrations show E85.



Fig. 36: Detach Grip/Knob
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Fit grip/knob on shift lever, align and press on until it can be felt to snap into place.

25 16 065 REPLACING GAITER (SELECTOR LEVER COVER) FOR SHIFT TOWER

Necessary preliminary tasks:

- Remove grip, see **25 16 061 Replacing grip/knob for shift lever.**
1. Carefully pull gaiter taut on leather
 2. Gently press frame inwards until catch is released
 3. Lift out gaiter



Fig. 37: Lifting Out Gaiter
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Start removing at top left, otherwise the frame will be damaged.

Installation:

Retaining lugs must not be damaged.

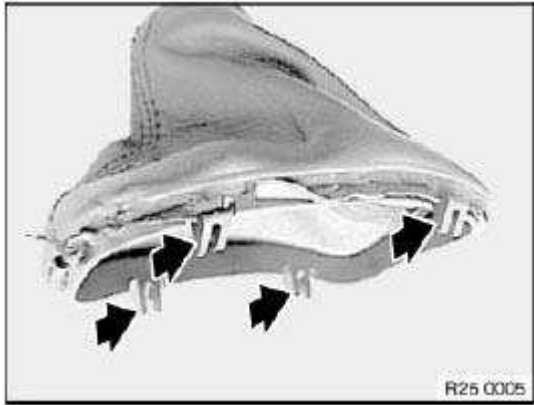


Fig. 38: Retaining Lugs

Courtesy of BMW OF NORTH AMERICA, INC.

25 16 175 ADJUSTING INTERLOCK CABLE

Necessary preliminary tasks:

- Remove function carrier, see **51 45 106 REMOVING AND INSTALLING/REPLACING FUNCTION CARRIER ON INSTRUMENT PANEL TRIM** .

Move selector lever (1) to "P" position (front stop of shifting gate).

Loosen screw (4).

Tightening torque: 5AZ, see **25 16 SHIFT CONSOLE - AUTOMATIC TRANSMISSION** .

It must be possible to move cable (2) slightly in holder (3).

Move ignition key to "zero" position and remove.

Press interlock locking pawl (5) downwards as far as it will go.

Tighten screw (4).

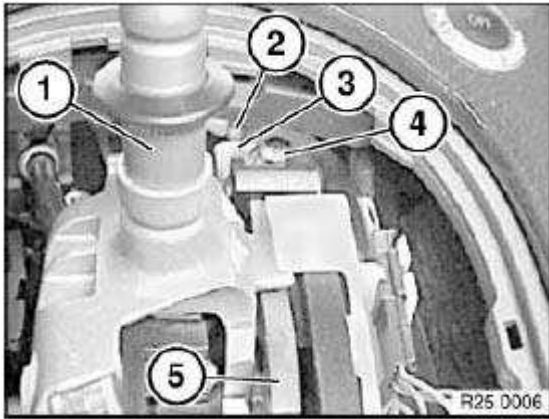


Fig. 39: Selector Lever, Cable, Holder, Screw And Locking Pawl
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Check adjustment of Interlock:

- Turn ignition key to "ignition" position and then back to "zero" position.
- Interlock locking pawl (1) must rest (3) on contact face in shift tower (2).
- If necessary, adjust interlock cable again.

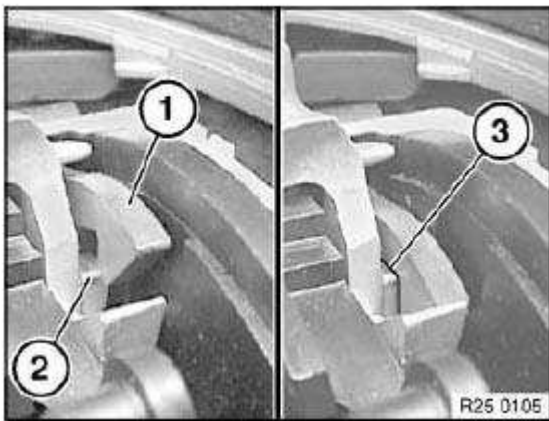


Fig. 40: Locking Pawl And Shift Tower
 Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION

Gear Shift Mechanism - Operating Fluids

1.0 GENERAL INFORMATION

Components of the gear shift mechanism located outside of the transmission housings, such as ball cups, bearing bushings, gearshift joints, etc. may be lubricated with Polylub GLY 801 (BMW Part No. 81 22 9 407 647).

TRANSMISSION

Gear Shift Mechanism - Special Tools - X3

25 GEAR SHIFT MECHANISM

25 1 120 PIN WRENCH

Minimum set: Mechanical tools

Note: For removing gear lever (releasing gear lever bearing).

Series: E31, E36, E60, E61, E83, E85, E87, E90, E91, E92

SI number: 1 17 05 (212)

Order number: 25 1 120

Pin wrench



Fig. 1: Pin Wrench (25 1 120)

Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION

Gear Shift Mechanism - Tightening Torques - X3

11 CENTER SHIFT MANUAL TRANSMISSION

25 11 SHIFT CONSOLE - MANUAL TRANSMISSION

SHIFT CONSOLE - MANUAL TRANSMISSION TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Front console to shift console	E36 / E38 / E39 / E46 / E53 / E60 / E61 / E63 / E64 / E83 / E85 / E86 / E87/E90/E91/ E92, with sheet metal console			25 Nm
2AZ Shift console to transmission	E36 / E38 / E39 / E46 / E53 / E60 / E61 / E63 / E64 / E83 / E85 / E86 / E87/E90/E91/ E92, with sheet metal console			23 Nm
3AZ Rear shift console to body	E36 / E38 / E39 / E46 / E53 / E60 / E61 / E63 / E64 / E83 / E85 / E86 / E87/E90/E91/ E92			11 Nm
4AZ Aluminium shift arm console to transmission	E30 / M3			21.5 Nm
5AZ Aluminium shift arm to console	E30 / M3			11 Nm
6AZ Shift arm console to body	E36 / E38 / E39 / E46 / E53 / E60 / E61 / E63 / E64 / E83 / E85 / E86 / E87/E90/E91/ E92			21 Nm
	E31			9 Nm
7AZ Adjustable shift rod (clamping sleeve)	E31			23 Nm
8AZ Support bearing to transmission tunnel	E53			21.5 Nm
10AZ Hose clamp, vibration damper	E60 / E61			6 Nm

16 CENTER SHIFT AUTOMATIC TRANSMISSION

25 16 SHIFT CONSOLE - AUTOMATIC TRANSMISSION

SHIFT CONSOLE - AUTOMATIC TRANSMISSION TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Bowden cable on shift	E36 / E38 / E39 / E46 / E53 / E60 / E61 / E63 /			15 Nm

tower/transmission	E64 / E65 / E66 / E67 / E68 / E83 / E85 / E86 / E87 / E90 / E91 / E92 / E81			
2AZ Clamping screw on shift lever	E36 / E38 / E39 / E46 / E53 / E60 / E61 / E63 / E64 / E65 / E66 / E67 / E68 / E83 / E85 / E86 / E87 / E90 / E91 / E92 / E81			9 Nm
3AZ Shift console to tunnel	E36 / E38 / E39 / E46 / E53 / E60 / E61 / E63 / E64 / E65 / E66 / E67 / E68 / E83 / E85 / E86 / E87 / E90 / E91 / E92 / E81			7 Nm
4AZ Switch to shift console	E36 / E38 / E39 / E46 / E53 / E60 / E61 / E63 / E64 / E65 / E66 / E67 / E68 / E83 / E85 / E86 / E87 / E90 / E91 / E92			4.5 Nm
5AZ Interlock cable to shift tower	E36 / E38 / E39 / E46 / E53 / E60 / E61 / E63 / E64 / E65 / E66 / E67 / E68 / E83 / E85 / E86			7 Nm
6AZ Cable retaining tab to transmission	E91 / E92 AWD	M8x18		19 Nm
7AZ Oval-head screw for emergency release device	E60, E61			1.6 Nm
8AZ Screw for adjusting cable on transmission	E90 / E91 / E92/E81/E87/E60/E61		With ball head	13 Nm
9AZ Vulcanized support angle to transmission	E81 / E87	M6		9 Nm

2007-10 TRANSMISSION

Manual Transmission - Operating Fluids

1.0 GENERAL INFORMATION ON GEAR LUBRICANTS

Gear lubricants for manual transmissions must conform to the following requirements due to the different transmission designs with considerable variation in loads, temperature and speeds.

The qualities of a recommended gear lubricant are:

- A. Load carrying capacity, i.e. high-pressure resistance.
- B. Noise reduction.
- C. Non-corrosive to various metals.
- D. Non-foaming.
- E. Non-separation of additives at operating temperatures.
- F. Non-sludge forming.
- G. Prevention of swelling, hardening and shrinking of seals.

These properties are already provided in manual transmission oil by:

- High-pressure additives.
- Corrosion inhibitors.
- Oxidation inhibitors (inhibitors which limit or prevent chemical reactions).
- Anti-foaming agents.

2.0 OIL ADDITIVES

BMW manual transmissions are designed so that they do not require aftermarket oil additives.

BMW disapproves the use of any oil additives and cannot accept the liability for any consequential damage that results from using oil additives.

3.0 MANUAL TRANSMISSION OIL REQUIREMENTS AND SPECIFICATIONS

BMW

- A. All reputable brand mineral-based transmission oils of viscosity class SAE 80 according to specifications MIL-L-2105 or API GL-4 (**no label** on transmission bell housing).
- B. Synthetic transmission fluid, Mobil SHC 630 (325e/528e without dual mass flywheel, produced before mid-1986). Manual transmissions which are filled with Mobil SHC 630 synthetic gear lube have a **green label** with the words "Special Oil" located next to the oil filter plug.



Fig. 1: Identifying Manual Transmission - Green Label
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Mobil SHC 630 is available in 5-gallon pails or 55-gallon drums from:

Filling BMW transmissions with unapproved synthetic gear lubes could cause the following damage:

- Premature synchromesh ring wear
- Reduced service life of bearings
- Tooth profile damage
- Faster wear of selector forks
- Damage to radial shaft oil seals

Transmission gear clashing will eventually result.

NOTE: Do not use synthetic fluid Mobil SHC 630 in other vehicles. The transmission synchronizers of cars other than listed above are not compatible with synthetic fluid and premature wear will result.

NOTE: To reduce the physical effort required to change gear at low ambient temperatures, the following oils can be used in the transmission during the winter:

- Single-grade HD mineral engine oils SAE40, SAE30, SAE20
- In countries where the ambient temperatures are particularly low, ATF oils can also be used.

This has the disadvantage that the transmission tends to rattle or knock while in neutral at higher temperatures.

CAUTION: These transmissions must never be filled with synthetic engine oils or multigrade engine oils, since these oils contain coefficient of friction-reducing agents that can adversely affect operation of the synchromesh mechanism.

- C. Automatic Transmission Fluid (ATF) of Dexron® II or Dexron® III formulation on any of the following:
- Dual mass flywheel
 - Direct drive fifth gear as of 9/90
 - Six-speeds

Manual transmissions which are filled with ATF have 17mm external hex plugs in the filler and drain openings as well as an **orange label** on the transmission bell housing next to the filler plug.



Fig. 2: Identifying Manual Transmission - Orange Label
Courtesy of BMW OF NORTH AMERICA, INC.

- D. From model year 1998 (9/97 production) all manual transmissions are filled with Esso/Exxon "MTF-LT-1" lifetime fluid. A **yellow label** with the letters "MTF-LT-1" is located next to the oil filler plug.

No oil change is required for the entire service life of these transmissions.

In the event of a repair, the transmission must only be filled with the lifetime oil.

Esso/Exxon MTF-LT-1

BMW P/N 83 22 9 408 942.

- E. From model year 2004 some manual transmissions are filled with Castrol "MTF-LT-2" lifetime fluid. This fluid has the same properties as the "MTF-LT-1" fluid indicated above in section D. The "MTF-LT-1" fluid may be mixed and/or substituted for the "MTF-LT-2" manual transmission fluid.

2006 MY and later E60 M5 and E63/64 M6 equipped with and without SMG utilizes only MTF-LT-2 fluid.

2006 MY and later E85 M Roadster and Coupe require MTF-LT-2 fluid.

MTF-LT-2 Fluid

BMW P/N 83 22 0 309 031

- F. From Model Year 2006 all vehicles equipped with a manual transmission and the N52 engine require the MTF-LT-3 lifetime fluid.

N52 equipped vehicles:

- E60 from 3/2005 production
- E85 from 9/2005 production
- E86 from 1/2006 production
- E90/91 from 3/2005 production
- E92 from 7/2006 production

- E83 from 9/2006 production

MTF-LT-3

BMW P/N 83 22 0 409 878

No oil change is required for the entire service life of these transmissions.

MANUAL TRANSMISSION COLD SHIFT EFFORT

NOTE: The following information does not apply to transmissions filled with lifetime fluid.

Transmission cold shift effort is reduced by replacing the original oil (SAE 80 or Mobil SHC 630) with a reputable brand single-grade HD engine mineral oil of API-SE standards (SAE 20, SAE 30, or SAE 40). Thinner oils will run the risk of increased gear noise.

A further reduction in shift effort can be obtained by using ATF, but gear noise will be more noticeable compared to single-grade engine mineral oils.

For summer operation it is recommended that ATF or engine oil be drained and replaced by the original lubricant, either SAE 80 or Mobil SHC 630 (as specified) transmission fluid.

CAUTION: Never fill a manual transmission with synthetic engine oils or multigrade mineral-based engine oils, since they have friction-reducing components that could impair the function of the synchronizers.

4.0 TRANSMISSION OIL CHANGE INTERVAL

Starting with 1998 models all manual transmissions are filled with lifetime fluid and require no fluid changes for the life of the vehicle.

5.0 SMG: SEQUENTIAL MANUAL GEAR BOX

All models SMG Hydraulic Unit require the use of Pentosin CHF 11S fluid.

TRANSMISSION

Manual Transmission - Repair Instructions - X3

00 COMPLETE TRANSMISSION

00 DANGER OF POISONING IF OIL IS INGESTED/ABSORBED THROUGH THE SKIN

Danger of poisoning!

Ingesting oil or absorbing through the skin may cause poisoning!

Possible symptoms are:

- Headaches
- Dizziness
- Stomach aches
- Vomiting
- Diarrhoea
- Cramps/fits
- Unconsciousness

Protective measures/rules of conduct:

- Pour oil only into appropriately marked containers
- Do not pour oil into drinking vessels (drinks bottles, glasses, cups or mugs)
- Observe country-specific safety regulations

First aid measures:

- Do not induce vomiting.

If the person affected is still conscious, he/she must rinse out their mouth with water, drink plenty of water and consult a doctor immediately.

If the person affected is unconscious, do not administer anything by mouth, place the person in the recovery position and seek immediate medical attention.

00 RISK OF INJURY IF OIL COMES INTO CONTACT WITH EYES AND SKIN

Danger of injury!

Contact with eyes or skin may result in injury!

Possible symptoms are:

- Impaired sight
- Irritation of the eyes
- Reddening of the skin
- Rough and cracked skin

Protective measures/rules of conduct:

- Wear protective goggles
- Wear oil-resistant protective gloves
- Observe country-specific safety regulations

First aid measures:

- Eye contact: Rinse eyes immediately with plenty of water for at least 15 minutes; if available, use an eye-rinsing bottle. If irritation of the eyes persists, consult a doctor.
- Skin contact: Wash off with soap and water immediately. If irritation persists, consult a doctor.

NOTE: Do not use solvents/thinners.

00 SAFETY INSTRUCTIONS FOR HANDLING OIL

**WARNING: Danger of poisoning if oil is ingested/absorbed through the skin!
Risk of injury if oil comes into contact with eyes and skin!**

Recycling:

Observe country-specific waste-disposal regulations.

Measures if oil is unintentionally released:

- Personal precautionary measures: Danger of slipping! Keep non-involved persons away from the work area. Wear personal protective clothing/equipment.
- Environmental protection measures: Prevent oil from draining into drain channels, sewerage systems, pits, cellars, water and the ground.
- Limiting spread: Use oil blocks to prevent the surface spread of oil.
- Cleaning procedure: Bind and dispose of escaped oil with nonflammable absorbents.

NOTE: Do not flush oil away with water or aqueous cleaning agents.

00 11.. ... DRAINING/TOPPING UP GEAR OIL IN MANUAL TRANSMISSION

**NOTE: Gearbox must be at normal operating temperature.
Gear oil:**

Filling capacities:

Draining gear oil:

- Release oil drain plug (1) and filler plug (2).
- Clean oil drain plug (1) and screw in.

Tightening torque: 23 00 4AZ, see **23 00 TRANSMISSION IN GENERAL** .

Fill transmission with ATF.

- Pour in gear oil until overflowing.
- Tighten in filler screw (2).

Tightening torque: 23 00 4AZ, see **23 00 TRANSMISSION IN GENERAL** .

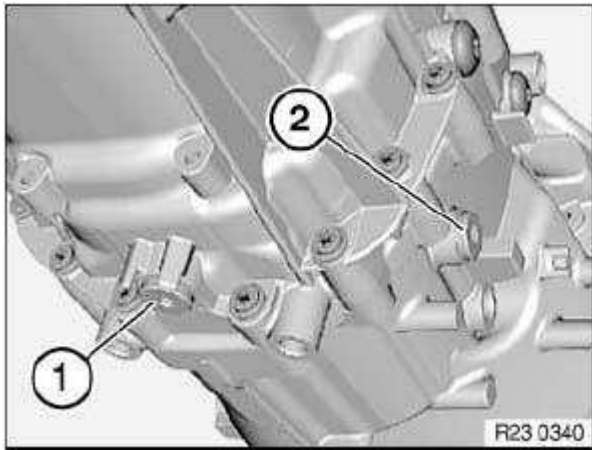


Fig. 1: Oil Drain Plug And Filler Plug
Courtesy of BMW OF NORTH AMERICA, INC.

23 TRANSMISSION DESIGNATIONS

BREAKDOWN OF BMW DESIGNATION

A5S 300J (old designation)		
A	Transmission type	<ul style="list-style-type: none">○ S = Manual transmission○ A = Automatic transmission
5	Number of forward gears	
S	Type of top gear	<ul style="list-style-type: none">○ D = Direct gear○ S = Overdrive gear
300	Max. input torque (Nm)	
		<ul style="list-style-type: none">○ G = Getrag

J	Code letter of transmission manufacturer	<ul style="list-style-type: none"> ○ J = Jatco ○ R = GMPT (General Motors Powertrain) ○ Z = ZF (Zahnradfabrik Friedrichshafen)
SMG	Notes	SMG = Sequential M gearbox/transmission
GS6-37BZ (new designation according to BMW Group Standard GS 90007)		
G	Transmission	
S	Transmission type	<ul style="list-style-type: none"> ○ S = Manual transmission ○ A = Automatic transmission
6	Number of forward gears	
-		<ul style="list-style-type: none"> ○ - = Standard with manual gearshift ○ HP = Hydraulic planetary gear
37	Transmission type	<ul style="list-style-type: none"> ○ 26 = D-transmission ○ 31 = C-transmission ○ 39 = F-transmission ○ 37 = H-transmission ○ 53 = G-transmission ○ 17 = I-transmission ○ 47 = J-transmission
B	Gear set	<ul style="list-style-type: none"> ○ B = Petrol/gasoline gear ratio ○ D = Diesel gear ratio
Z	Code letter of transmission manufacturer	<ul style="list-style-type: none"> ○ G = Getrag ○ Z = ZF (Zahnradfabrik Friedrichshafen)

BREAKDOWN OF BMW DESIGNATION (MANUAL TRANSMISSION)

BMW designation	Manufacturer	Manufacturer designation	Remark
S5D 200G	Getrag	B transmission (220/5)	
S5D 200G	Getrag	B transmission (221/5)	for M41 engine only
S5D 250G	Getrag	B transmission (220/5)	Reinforced design
S5D 260Z	ZF	C-transmission (S5-31 D)	for M51 engine only
S5D 280Z	ZF	C-transmission (S5-31)	
S5D 310Z	ZF	C-transmission (S5-31)	up to 9.95
S5D 320Z	ZF	C-transmission (S5-31)	from 9.95 (reinforced design)
GS5S31BZ (SMG)	ZF	C transmission	SMG
GS5-39DZ	ZF	F transmission	
S6S 420G	Getrag	D-transmission (226/6)	
S6S 420G (SMG)	Getrag	D transmission	SMG
S6S 560G	Getrag	E-transmission (286/6)	
GS6-37BZ	ZF	H-transmission	

GS6S37BZ (SMG)	ZF	H-transmission	
GS6-37DZ	ZF	H-transmission	
GS6-37BG	Getrag	H-transmission	
GS6-53BZ	ZF	G-transmission	
GS6-53DZ	ZF	G-transmission	
GS6-17BG	Getrag	I-transmission	
GS7S47BG (SMG)	Getrag	J-transmission (247)	SMG 7-speed

BREAKDOWN OF BMW DESIGNATION (AUTOMATIC TRANSMISSION)

BMW designation	Manufacturer	Manufacturer designation	Remark
A4S 200R	GMPT	GM4	
A4S 270R	GMPT	THM-R1w	Transmission widesteped
A4S 310R	GMPT	THM-R1	
A5S 300J	Jatco	Jatco	
A5S 310Z	ZF	5HP-18	
A5S 325Z	ZF	5HP-19	
A5S 440Z	ZF	5HP-24	
A5S 560Z	ZF	5HP-30	
A5S 360R / 390R	GM	GM5	
GA6HP19Z	ZF	6HP19	
GA6HP26Z	ZF	6HP26	
GA6HP32Z	ZF	6HP32	
GA6L45R	GM	GM6	

23 .. UNIVERSAL TRANSMISSION BRACKET

Special tools required:

See **23 MANUAL TRANSMISSION** .

- 00 2 030
- 23 0 132
- 23 4 050

NOTE:

- The universal transmission bracket is introduced for the E60 AWD
- Suitable for manual and automatic transmissions

IMPORTANT: Front and rear supports (1) can be laterally adjusted by means of screws (2). Carrier (3) of rear supports (1) can be longitudinally adjusted by means of screw.
Supports must be adapted in length and width to the transmission.

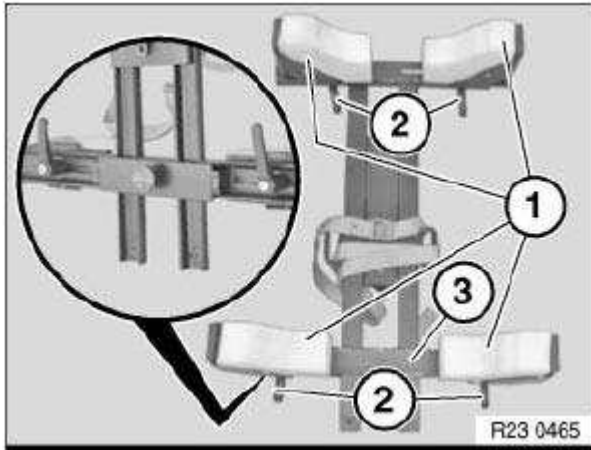


Fig. 2: Rear Supports And Rear Supports Carrier
Courtesy of BMW OF NORTH AMERICA, INC.

Supporting transmission:

Support transmission with special tools 23 4 050, 23 0 132 , 00 2 030 .

IMPORTANT: Transmission must be secured with tensioning strap (1).

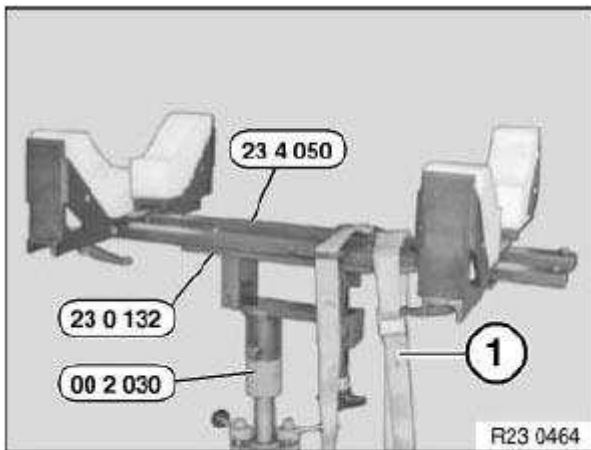


Fig. 3: Special Tools And Tensioning Strap
Courtesy of BMW OF NORTH AMERICA, INC.

23 ... UNIVERSAL TRANSMISSION RETAINING BRIDGE

Special tools required:

See 24 AUTOMATIC TRANSMISSION

- 00 1 450
- 24 0 200

NOTE:

- The transmission retaining bridge 24 0 200 is suitable for both manual and automatic transmissions

IMPORTANT: Adapters and spindles must be adapted for positive locking to the transmission.
(Risk of injury)

Adapt adapters (1) and spindle with thrust piece (3) to transmission.

Adapt length with slide (2).

Screw in spindle (4).

IMPORTANT: Before mounting on assembly stand 00 1 450 , check retaining bridge for secure seating.

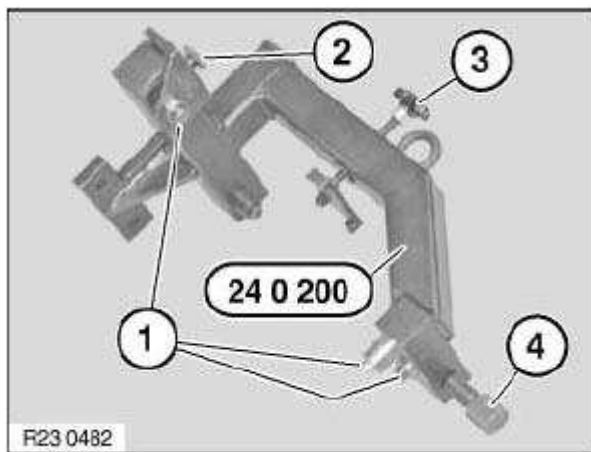


Fig. 4: Adapters, Spindle And Thrust Piece
Courtesy of BMW OF NORTH AMERICA, INC.

23 00 019 REMOVING AND INSTALLING TRANSMISSION (GS6-37BZ N52K)

Special tools required:

- **00 2 030 UNIVERSAL HYDRO-LIFTER BASIC UNIT**
- **00 9 110 CIRCLIP PLIERS**
- **00 9 120 TORQUE ANGLE MEASURING DIAL**
- **00 9 130 MAGNET WITH 1/2" CONNECTION**
- 21 2 221, see **21 CLUTCH**
- 23 0 132, see **23 MANUAL TRANSMISSION**
- 23 4 050, see **23 MANUAL TRANSMISSION**

**IMPORTANT: After completion of work, check transmission oil level, see 00 11.. ... DRAINING/TOPPING UP GEAR OIL IN MANUAL TRANSMISSION .
Use only the approved gear oil .**

Failure to comply with this requirement will result in serious damage to the manual transmission.

IMPORTANT: Aluminium-magnesium materials.

No steel screws/bolts may be used due to the threat of electrochemical corrosion.

A magnesium crankcase requires aluminium screws/bolts exclusively.

Aluminium screws/bolts must be replaced each time they are released .

The end faces of these screws/bolts are painted blue for the purposes of reliable identification.

Jointing torque and angle of rotation must be observed without fail (risk of damage) .

Necessary preliminary tasks:

- Disconnect battery
- Remove underbody protection with bracket at front and rear
- Remove reinforcement plate
- Remove complete exhaust system
- Remove heat shields
- Remove front propeller shaft at transfer box and tie to one side, see **REMOVAL & INSTALLATION** .
- Support engine with lifter when removing transmission
- Remove propeller shaft from transmission.
- Release center bearing.
- Tie propeller shaft to one side.

Tasks are described in Removing propeller shaft, see **REMOVAL & INSTALLATION** .

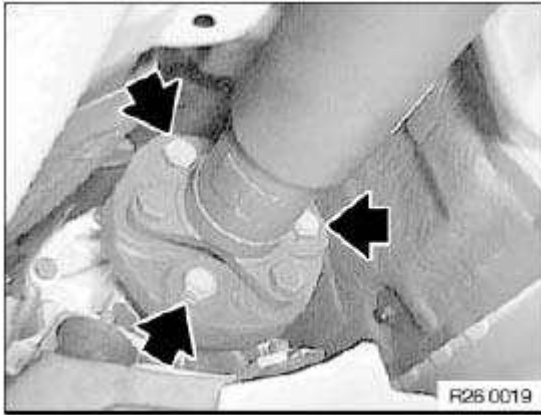


Fig. 5: Locating Propeller Shaft Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Detach plugs (1) and (2) from servomotor.

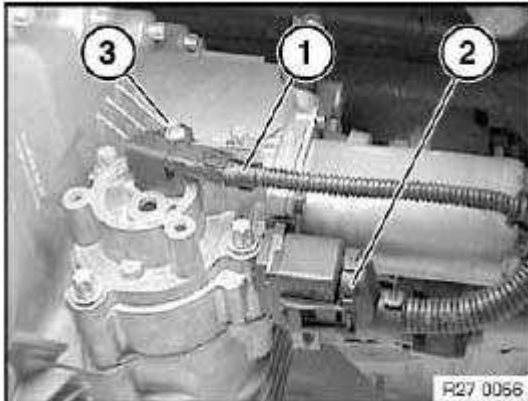


Fig. 6: Plugs
Courtesy of BMW OF NORTH AMERICA, INC.

Detach plug (1) from reversing light switch.

Release cable from mountings and tie to one side.

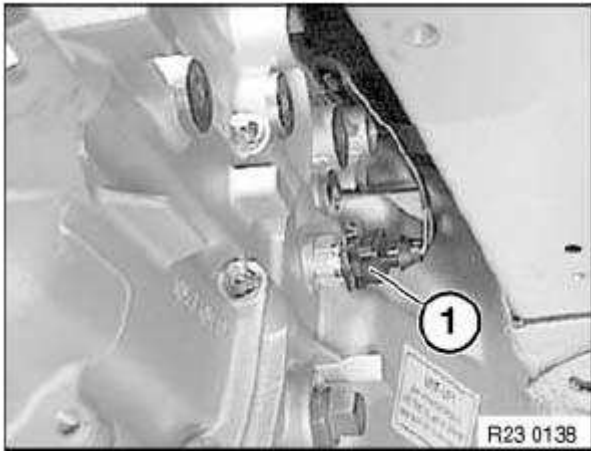


Fig. 7: Plug

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Pressure line of clutch slave cylinder remains connected.

IMPORTANT: Relieve tension on clutch slave cylinder slowly; otherwise air will be drawn in through sealing sleeve.

Release nuts and remove clutch slave cylinder.

Tightening torque: 21 52 5AZ, see **21 52 CLUTCH OPERATION (HYDRAULIC)** .

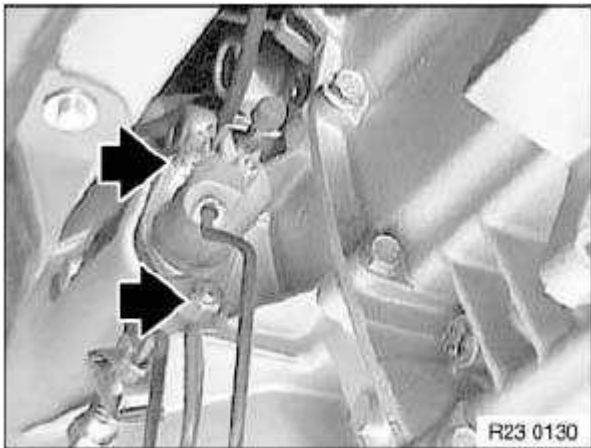


Fig. 8: Locating Clutch Slave Cylinder Nuts

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Release aluminium screw on right next to cable retaining plate with special tool 00 9 010 .

Installation:

Aluminium screws must be replaced.

Tightening torque: 23 00 2AZ, see **23 00 TRANSMISSION IN GENERAL** .

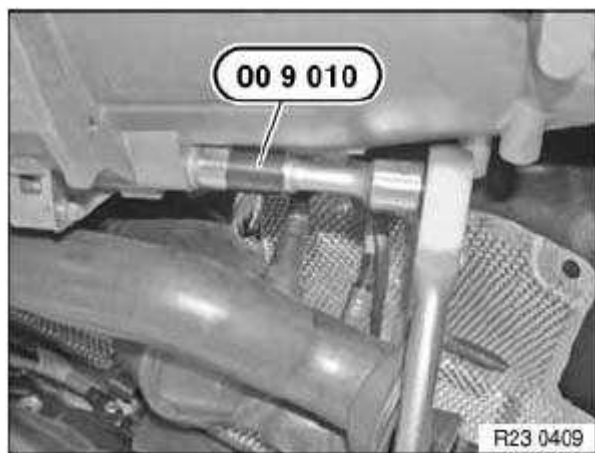


Fig. 9: Special Tool 00 9 010

Courtesy of BMW OF NORTH AMERICA, INC.

Supporting transmission:

Support transmission with special tools 23 4 050, 23 0 132 , 00 2 030 .

Secure transmission with tensioning strap (1).

Tasks are described in **23 .. UNIVERSAL TRANSMISSION BRACKET** .

After completion of work, check transmission oil level.

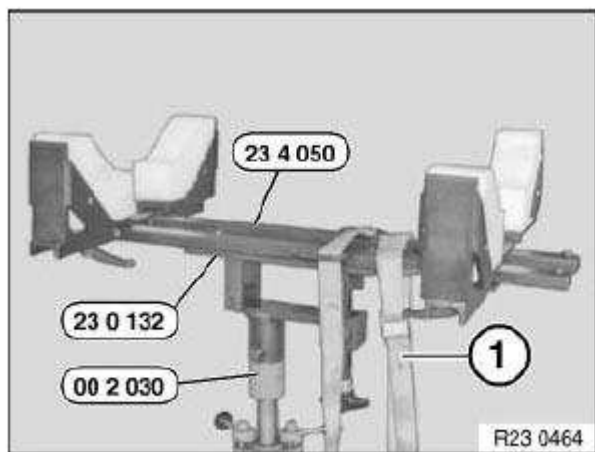


Fig. 10: Special Tools And Tensioning Strap

Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws and remove transmission cross-member.

Tightening torque: 22 32 4AZ/5AZ, see 22 32 TRANSMISSION MOUNTS .

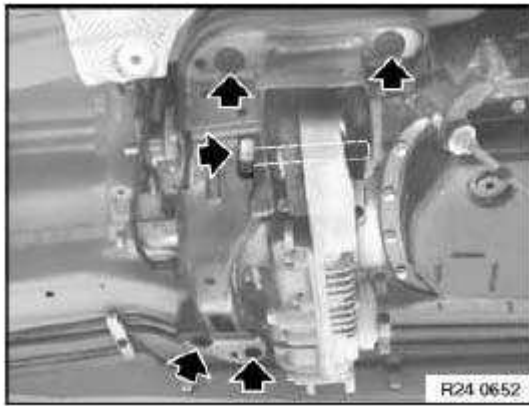


Fig. 11: Transmission Cross-Member Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock bearing pin (1) in direction of arrow and remove.

Lift out shift arm.

Installation:

Grease bearing pins (1).

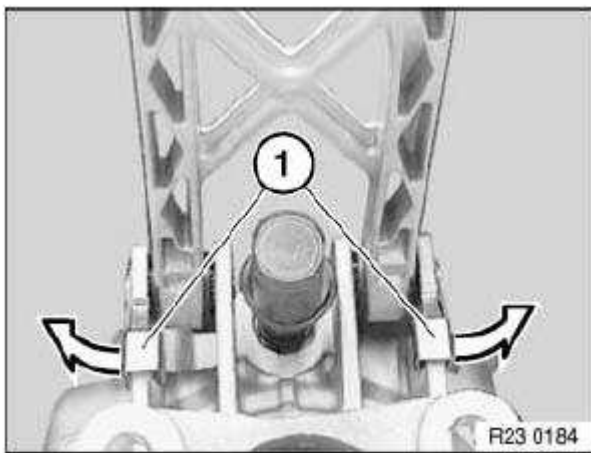


Fig. 12: Unlocking Bearing Pin
Courtesy of BMW OF NORTH AMERICA, INC.

Lift off retainer (1).

Disconnect shift rod (2).

Installation:

Grease shift rod.

Make sure shims (3) are in correct position.

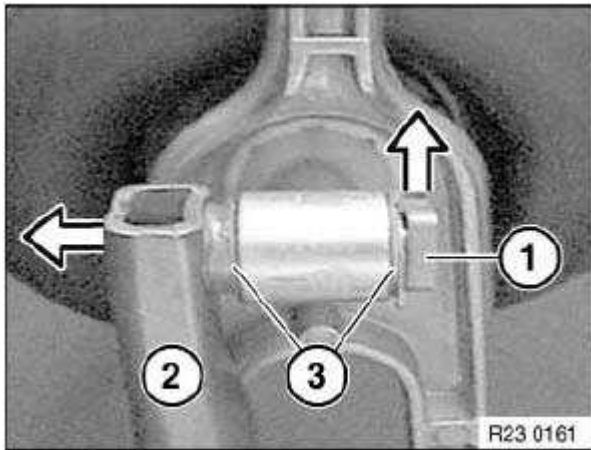


Fig. 13: Disconnecting Shift Rod

Courtesy of BMW OF NORTH AMERICA, INC.

Release screws.

Installation:

Observe **screw fastening sequence** without fail.

Tightening torque, steel screws: 23 00 1AZ, see **23 00 TRANSMISSION IN GENERAL** .

Aluminium screws **must** be replaced.

Tightening torque and angle of rotation

Aluminium screws: 23 00 1AZ, see **23 00 TRANSMISSION IN GENERAL** .

IMPORTANT: Do not allow transmission to hang from the transmission input shaft when removing and installing, as the clutch disk will be deformed. Pull transmission downwards and remove.

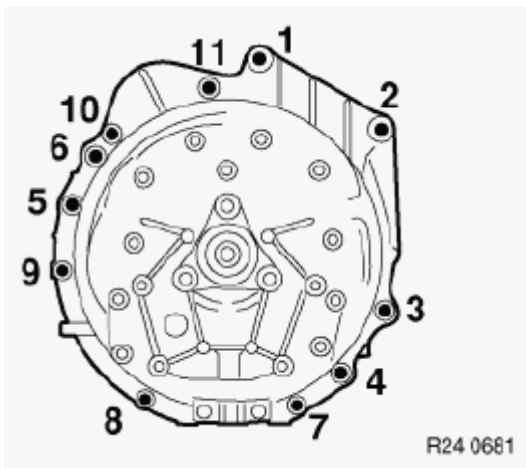


Fig. 14: Tightening Sequence Of Screws
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Secure angle of rotation special tool 00 9 120 with magnet 00 9 130 to floor plate.

Screw down aluminium screws according to angle of rotation.

Angle of rotation: 23 00 2AZ, see **23 00 TRANSMISSION IN GENERAL** .

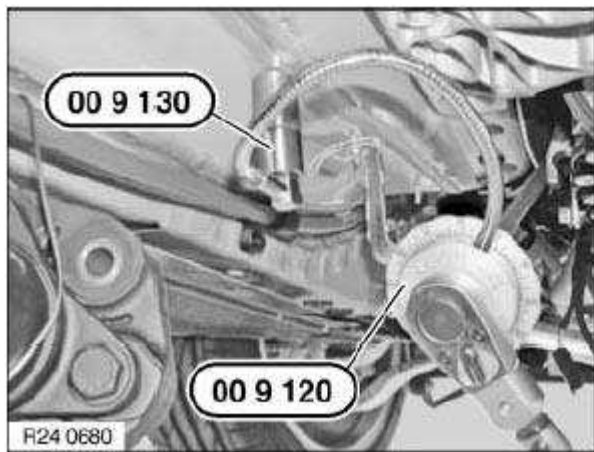


Fig. 15: Special Tool 00 9 120 And 00 9 130
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check that dowel sleeves are correctly seated.

Replace damaged dowel sleeves.

Ensure correct position of cover plate.

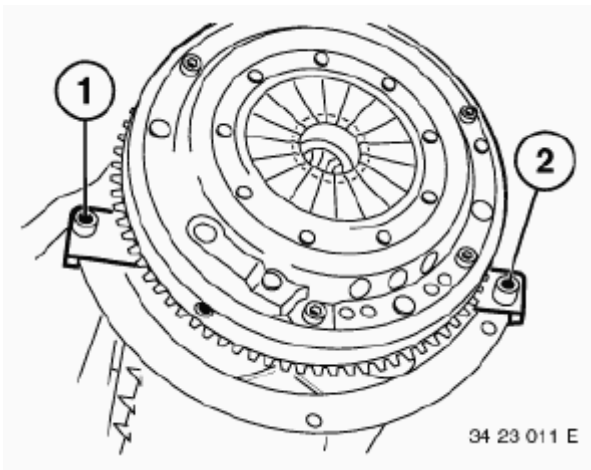


Fig. 16: Dowel Sleeves

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check lubrication of transmission input shaft for sticky consistency. If grease is sticky, clean input shaft and replace clutch plate, see **21 21 500 REMOVING AND INSTALLING/REPLACING CLUTCH (SAC)** .

Check clutch plate for friction rust in splines and replace if necessary.

Mechanically remove existing grease and lining abrasion from splines of clutch plate (with a cloth).

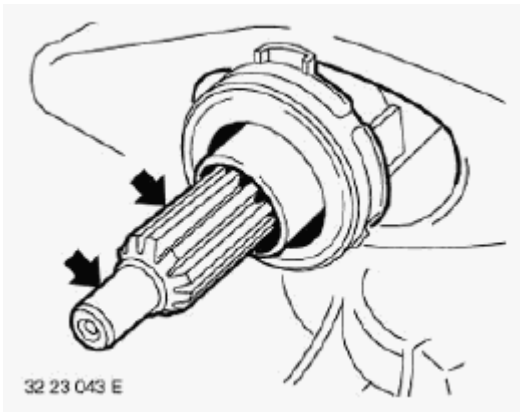


Fig. 17: Locating Input Shaft

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Greasing specification:

- o Remove and clean release bearing and release lever, see **21 51 500 REMOVING AND INSTALLING OR REPLACING CLUTCH RELEASE BEARING/LEVER** .
- o Push on grease scraper ring 21 2 221 as far as it will go.

- Grease splines (1) of input shaft with a brush.
- Detach grease scraper ring.

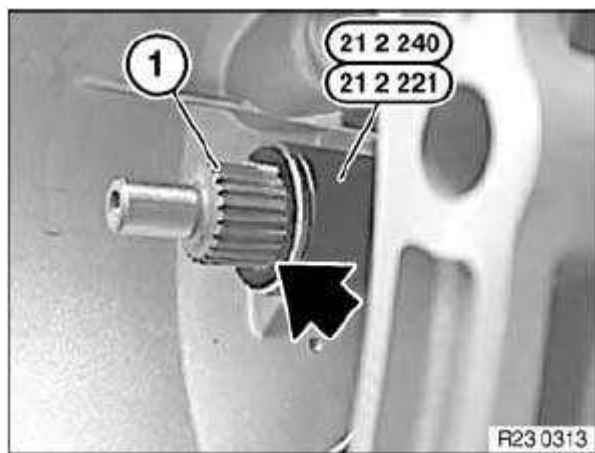


Fig. 18: Splines Of Input Shaft

Courtesy of BMW OF NORTH AMERICA, INC.

23 00 036 INSTALLING REPLACEMENT TRANSMISSION (GS6-37BZ/DZ)

IMPORTANT: After completion of work, check transmission oil level, see 00 11... ..
DRAINING/TOPPING UP GEAR OIL IN MANUAL TRANSMISSION .
Use only the approved transmission fluid .

Failure to comply with this instruction will result in serious damage to the transmission.

Recycling:

Catch and dispose of escaping transmission fluid.

Observe country-specific waste-disposal regulations

Necessary preliminary tasks:

- Drain gear oil at oil drain plug.

Tightening torque: 23 00 4AZ, see 23 00 TRANSMISSION IN GENERAL .

- Remove transfer box.
- Remove transmission, see 23 00 019 Removing and installing transmission (GS6-37BZ N52K).

Convert following parts from previous transmission to new transmission.

- Release bearing and release lever, see 21 51 500 REMOVING AND INSTALLING OR REPLACING

CLUTCH RELEASE BEARING/LEVER .

- Ball pin and spring wire clip.
- Studs for clutch slave cylinder.
- Reversing light switch tightening torque: 23 41 5AZ, see **23 41 EXTERNAL GEARSHIFT COMPONENTS .**

Convert shift rod joint.

Push back retaining ring (1) and drive out dowel pin (2).

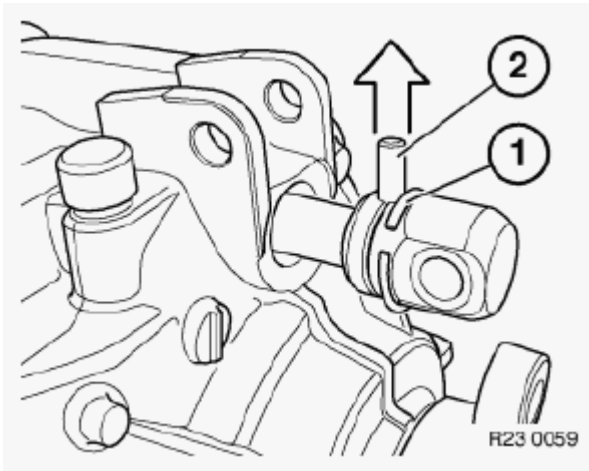


Fig. 19: Removing Dowel Pin

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Check damping disk (6) for damage and replace if necessary.

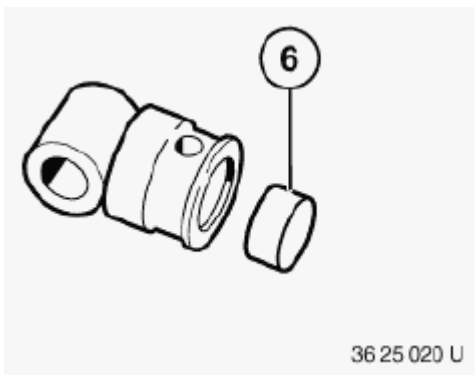


Fig. 20: Damping Disk

Courtesy of BMW OF NORTH AMERICA, INC.

Add final details to vehicle.

Check oil level.

Installation:

Observe greasing specification .

23 00 036 INSTALLING REPLACEMENT TRANSMISSION (GS6-37BZ) AWD

IMPORTANT: After completion of work, check transmission fluid level. See **DRAINING/TOPPING UP GEAR OIL IN MANUAL TRANSMISSION** . Use only the approved transmission fluid. Failure to comply with this instruction will result in serious damage to the transmission.

NOTE: **Recycling:** Catch and dispose of escaping transmission fluid. Observe country-specific waste-disposal regulations.

Necessary preliminary tasks:

- Drain gear oil at oil drain plug. Tightening torque, see 23 00 4AZ in **00 COMPLETE TRANSMISSION** .
- Remove transfer case.
- Remove transmission.

Convert following parts from previous transmission to new transmission:

- Release bearing and release lever. See **51 CLUTCH RELEASE CONTROL WITH LEVER** .
- Knurled pin for clutch slave cylinder.
- Reversing light switch tightening torque, see 23 41 5AZ in **23 41 EXTERNAL GEARSHIFT COMPONENTS** .

Convert shift rod joint. Push back retaining ring (1) and drive out dowel pin (2).

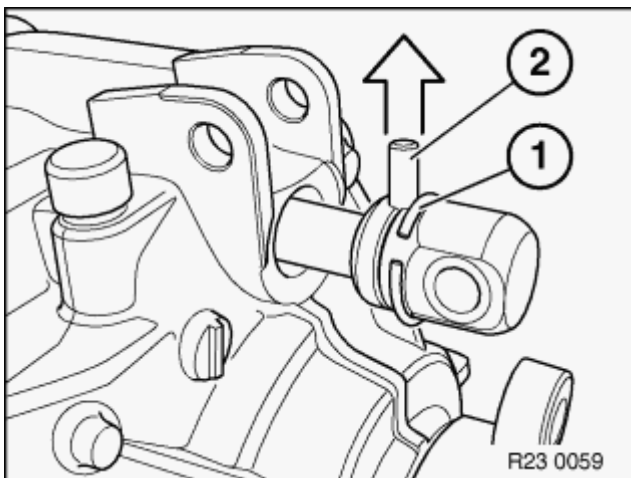


Fig. 21: Push Back Retaining Ring (1) And Drive Out Dowel Pin (2)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Check damping disk (6) for damage and replace if necessary.

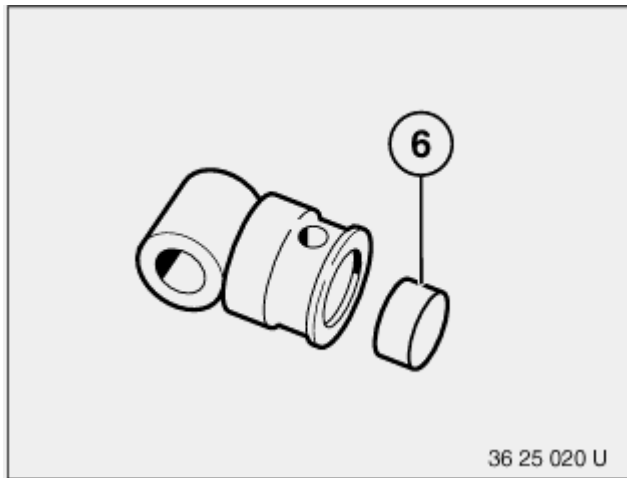


Fig. 22: Checking Damping Disk (6) For Damage
Courtesy of BMW OF NORTH AMERICA, INC.

Add final details to vehicle. Check oil level. Installation: Observe greasing specification.

11 HOUSING WITH COVER

23 11 614 REPLACING GUIDE TUBE FOR CLUTCH RELEASE UNIT (GS6-37BZ/DZ)

NOTE: (transmission removed)

Necessary preliminary tasks:

Remove clutch release bearing and release lever from guide tube, see **21 51 500 REMOVING AND INSTALLING OR REPLACING CLUTCH RELEASE BEARING/LEVER** .

Unfasten screws.

Remove guide tube (1).

Installation:

Clean thread.

Install screws with Loctite 243.

Tightening torque: 23 11 2AZ, see **23 11 CASE AND COVER** .

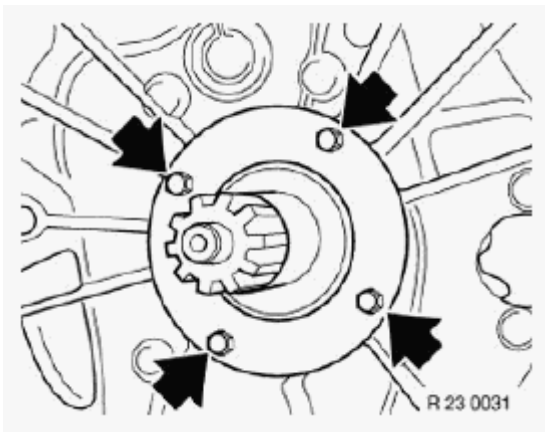


Fig. 23: Locating Screws

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Remove sticker (1) and adhesive with a suitable solvent.

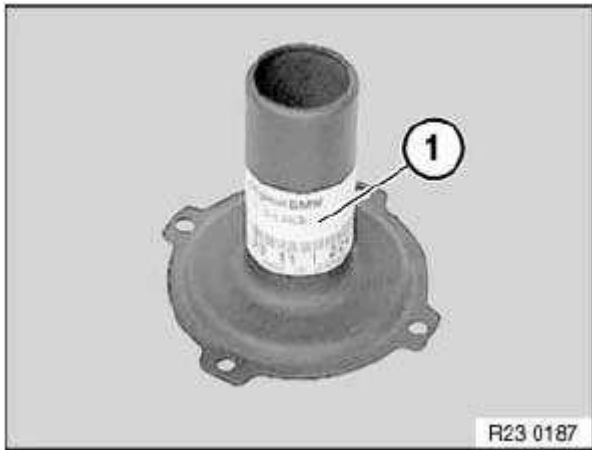


Fig. 24: Sticker

Courtesy of BMW OF NORTH AMERICA, INC.

12 BEARING IN HOUSING, SEALING RING

23 12 050 REPLACING RADIAL SHAFT SEAL FOR OUTPUT FLANGE (GS6-37BZ / DZ H-TRANSMISSION)

Special tools required:

See 23 MANUAL TRANSMISSION .

- 23 0 020
- 23 2 320
- 23 3 161

- 23 3 162
- 33 1 150

IMPORTANT: After completion of work, check transmission oil level, see 00 11... ..
DRAINING/TOPPING UP GEAR OIL IN MANUAL TRANSMISSION .
Use only approved transmission oil .
Failure to comply with this instruction will result in serious damage to the
transmission.

Necessary preliminary tasks:

- Remove exhaust system, see 18 00 020 REMOVING AND INSTALLING COMPLETE EXHAUST SYSTEM (M54) .
- Support transmission, see 23 00 019 Removing and installing transmission (GS6-37BZ N52K).
- Remove transmission cross-member, see 23 00 019 Removing and installing transmission (GS6-37BZ N52K).
- Remove transmission bearing block, see 23 00 019 Removing and installing transmission (GS6-37BZ N52K).
- Unflange propeller shaft from transmission and tie up to one side

Brace output flange with special tool 23 0 020 .

Release collar nut with special tool 23 2 320 .

Installation:

Mark flange with thermo pin and heat to min. 100°C.

WARNING: Scalding hazard! Fit flange wearing suitable protective gloves only!

IMPORTANT: Do not drive on flange.

Secure collar nut with Loctite 243.

- Loctite 243: BMW Parts Service.

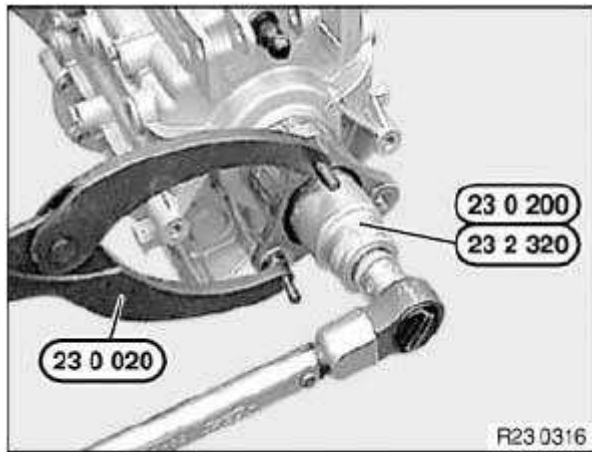


Fig. 25: Special Tool 23 0 020 And 23 2 320
Courtesy of BMW OF NORTH AMERICA, INC.

- Tightening torque: 23 21 1AZ, see **23 21 TRANSMISSION SHAFTS** .

Detach output flange with special tool 33 1 150 from output shaft.

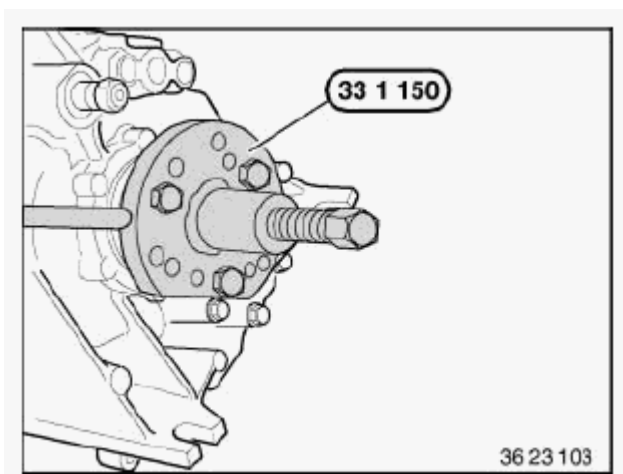


Fig. 26: Special Tool 33 1 150
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw on special tool 23 3 161 .

Push special tool over output shaft and screw firmly into sealing ring.

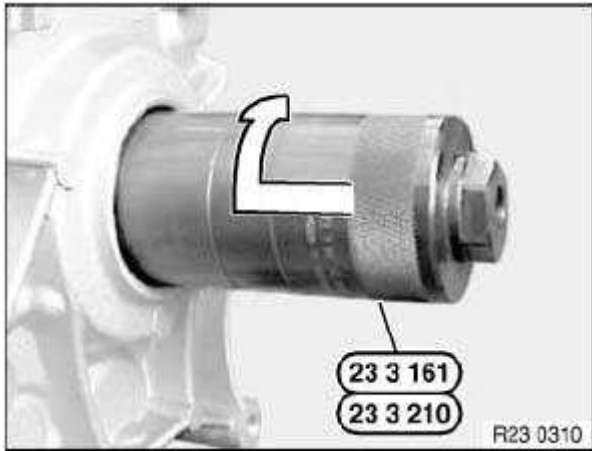


Fig. 27: Pushing Special Tool Over Output Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Insert screw into special tool again and continue turning until sealing ring is pulled out of transmission housing.

If necessary, remove Woodruff key of sealing ring.

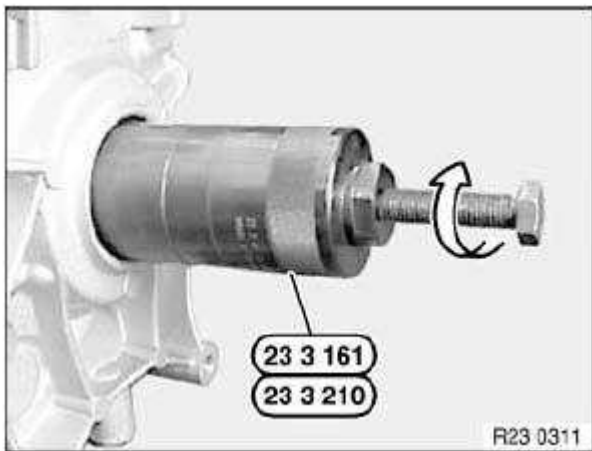


Fig. 28: Turning Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Coat sealing lips of new radial seal with gear oil.

Drive in radial seal as far as it will go with special tool 23 3 162 and plastic hammer.

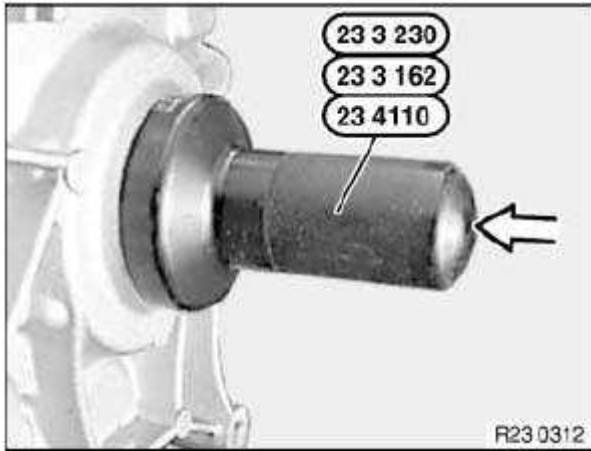


Fig. 29: Installing Radial Seal

Courtesy of BMW OF NORTH AMERICA, INC.

23 12 088 REPLACING RADIAL SEAL FOR SELECTOR SHAFT (GS6-37BZ)

Special tools required:

See **23 MANUAL TRANSMISSION**

- 23 0 210
- 23 0 220

IMPORTANT: After completion of work, check transmission oil level, see 00 11... .. DRAINING/TOPPING UP GEAR OIL IN MANUAL TRANSMISSION .

Use only approved transmission oil .

Failure to comply with this instruction will result in serious damage to the transmission.

Necessary preliminary tasks:

- Remove transfer case, see **27 10 010 REMOVING AND INSTALLING TRANSFER CASE (ATC 400 X-DRIVE)** .
- Shift transmission into 2nd gear

Transmission extension N46

Release bolts and remove transmission extension (1).

Tightening torque: 23 2 5AZ, see **23 00 TRANSMISSION IN GENERAL** .

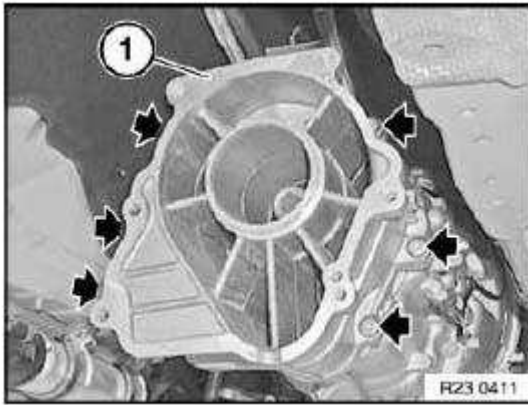


Fig. 30: Transmission Extension
Courtesy of BMW OF NORTH AMERICA, INC.

Lever retaining ring (1) out of groove with a small screwdriver.

Slide locking ring (1) towards rear.

Drive out cylinder pin (2).

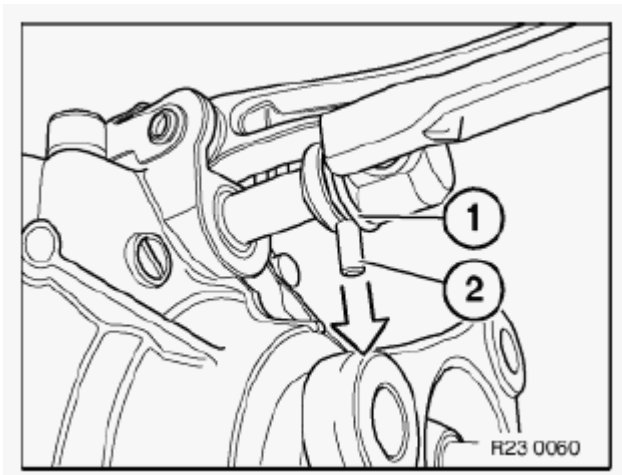


Fig. 31: Removing Cylinder Pin
Courtesy of BMW OF NORTH AMERICA, INC.

Screw in special tool 23 0 210 until it is firmly connected with radial seal (1).

Pull out radial seal with special tool 23 0 210 .

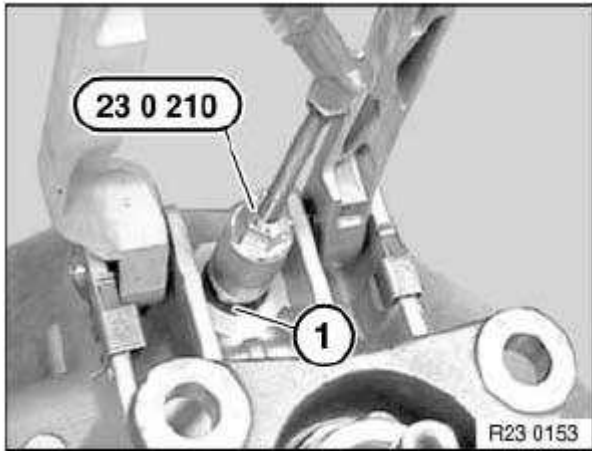


Fig. 32: Radial Seal And Special Tool 23 0 210
Courtesy of BMW OF NORTH AMERICA, INC.

Coat sealing lips of radial seal and selector shaft with transmission oil.

Drive in radial seal with special tool 23 0 220 .

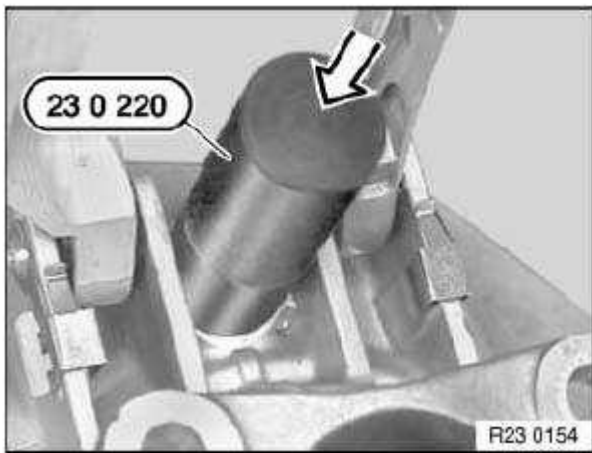


Fig. 33: Installing Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

23 12 508 REPLACING RADIAL SHAFT SEAL FOR DRIVE SHAFT (GS6-37BZ/DZ)

Special tools required:

See **23 MANUAL TRANSMISSION**

- 23 3 151
- 23 3 152

IMPORTANT: After completion of work, check transmission fluid level, see 00 11.. ... DRAINING/TOPPING UP GEAR OIL IN MANUAL TRANSMISSION .
Use only approved transmission oil .
Failure to comply with this requirement will result in serious damage to the automatic transmission!

Necessary preliminary tasks:

- Remove transmission, see 23 00 036 Installing replacement transmission (GS6-37BZ/DZ).
- Remove clutch release unit and release lever from guide tube, see 21 51 500 REMOVING AND INSTALLING OR REPLACING CLUTCH RELEASE BEARING/LEVER .

Release screws.

Tightening torque: 23 11 2AZ, see 23 11 CASE AND COVER .

Remove guide tube (1).

Installation:

Clean guide tube.

Do not grease guide tube.

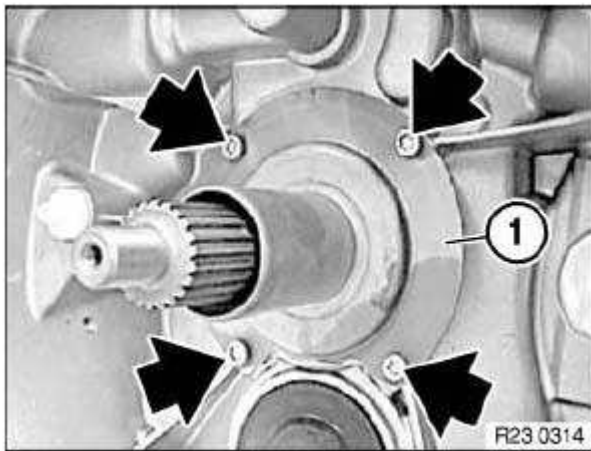


Fig. 34: Locating Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Release screw on special tool 23 3 151 .

Push special tool onto drive shaft and screw into sealing ring.

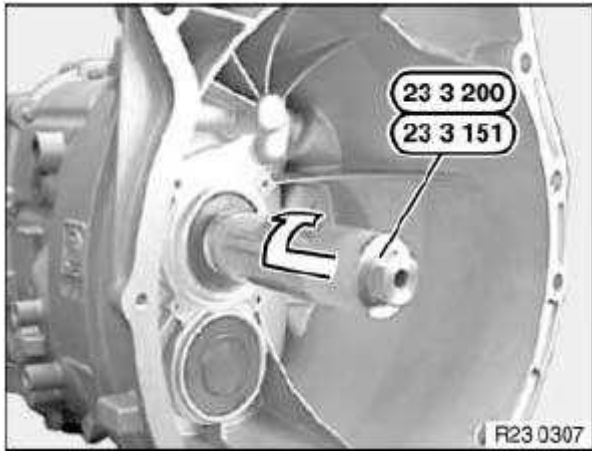


Fig. 35: Pushing Special Tool Onto Drive Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Insert screw into special tool 23 3 151 again and continue turning until sealing ring is pulled out of transmission housing.

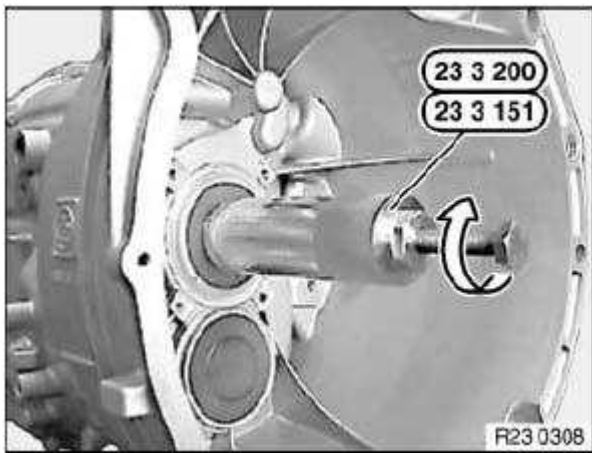


Fig. 36: Turning Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Coat sealing lips of radial seal with gear oil.

Push radial seal (1) onto drive shaft up to housing.

Drive in radial seal (1) as far as it will go with special tool 23 3 152 and plastic hammer.

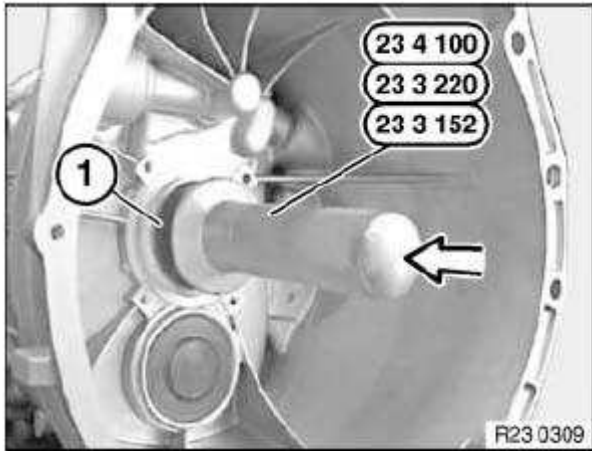


Fig. 37: Installing Radial Seal

Courtesy of BMW OF NORTH AMERICA, INC.

14 ELECTRICAL ADD-ON PARTS

23 14 ... REPLACING REVERSING LIGHT SWITCH

Necessary preliminary tasks:

- Remove rear underbody protection.

GS6-17DG/BG and GS6-37DG/BG transmissions only. Disconnect plug connection (1) on reverse gear switch.

Remove reverse gear switch. Tightening torque 23 14 1AZ.

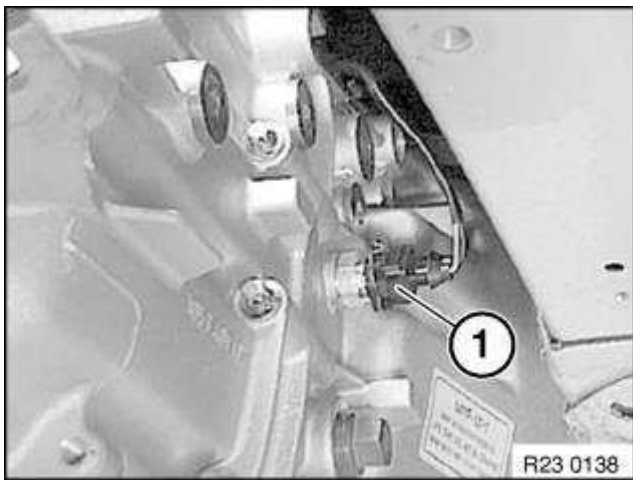


Fig. 38: Disconnect Plug Connection (1) On Reverse Gear Switch (GS6-17DG/BG and GS6-37DG/BG Transmission)

Courtesy of BMW OF NORTH AMERICA, INC.

GS6-53DG/BG transmission only Disconnect plug connection (1) on reverse gear switch. Remove reverse gear

switch. Tightening torque 23 14 1AZ.

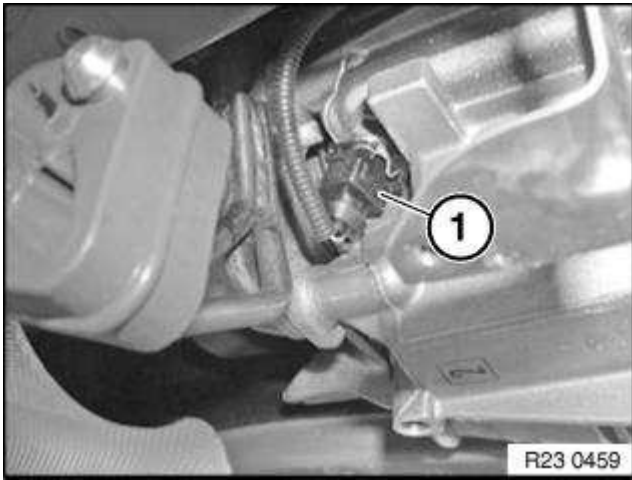


Fig. 39: Disconnect Plug Connection (1) On Reverse Gear Switch (GS6-53DG/BG Transmission)
Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION

Manual Transmission - SI Techniques - X3

KINEMATIC DIAGNOSIS SYSTEM AND ENVIRONMENT

32 01 99 (503) all countries BMW KDS (Beissbarth)

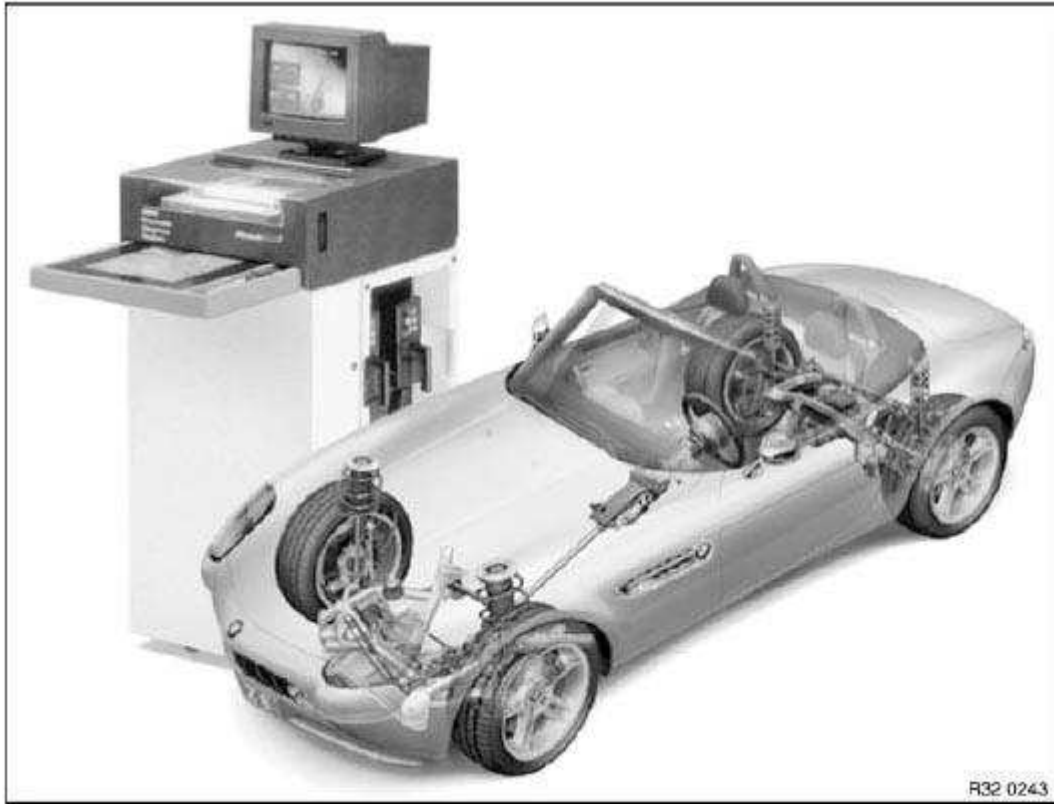


Fig. 1: Kinematic Diagnosis System
Courtesy of BMW OF NORTH AMERICA, INC.

1. FOREWORD

1.1 Objectives

Wheel alignment has become an increasingly complex subject. The aim of this BMW Service Technology bulletin, therefore, is to achieve several objectives:

- Creation of guidelines for working with the BMW Kinematic Diagnosis System (KDS).
- Familiarization with wheel alignment technology for current vehicles and clarifying any questions which arise in this connection.
- Transparency and clarification of different terms.
- Clarification of the causes of errors in the past, such that they can be avoided after reading this document.

- Creation of conditions for dealing safely with the BMW KDS.

1.2 Further development of the BMW Kinematic Diagnosis System

- The BMW Kinematic Diagnosis System is an integrated part of automotive system concepts. It ensures that work is carried out in a particularly rational manner which is appropriate for BMW requirements, such that you can also be certain of being prepared for future technological developments. As far as precision and performance in wheel alignment and tuning is concerned, BMW, together with leading manufacturers, has made the best of what is technically feasible: the BMW Kinematic Diagnosis System.
- The BMW Kinematic Diagnosis System manufactured by Beissbarth is more than just the further development of conventional wheel alignment equipment. It sets new standards in precision, performance, speed and handling. It is a guarantor for the perfection which BMW service customers rely on.
- Ride comfort, road safety and tire wear depend to a large extent on the perfect interplay of the vehicle's kinematic functions. BMW is constantly launching new generations of chassis which are even better than their predecessors. This is why there are fewer kinematics system adjusting points and narrower tolerances when measuring and tuning the chassis.
- With the use of the multi-link rear suspension and the E36, the electronic wheel alignment devices are no longer suitable for BMW wheel alignment purposes. This applies to both the measuring procedure and measuring precision. The generation of equipment which was approved with the E36 series still fulfils all the requirements placed on a modern wheel alignment device, including the use of the latest computer technology.
- Only BMW Kinematic Diagnosis Systems manufactured by Beissarth and Bosch may be used for wheel alignment.

1.3 Technical Data



Fig. 2: Display Kinematic Diagnosis Systems Technical Data
 Courtesy of BMW OF NORTH AMERICA, INC.

KINEMATIC DIAGNOSIS SYSTEMS TECHNICAL DATA

1. Display	17" graphic screen with high-resolution graphics (640x480 pixels with 256 colours)
2. On-screen text	in the appropriate national language
3. Wheel dimensions	12" ...20"
4. Vehicle memory locations	unlimited
5. Rotating plates	Loadbearing capacity 1000 kg, angle of rotation $\pm 360^\circ$, 450 x 450 x 50 mm (L x W x H), sliding range ± 50 mm, weight 18 kg
6. Sliding plates	Loadbearing capacity 1000 kg, angle of rotation $\pm 10^\circ$, 450 x 450 x 50mm (L x W x H), sliding range ± 65 mm, weight 17 kg
7. Electrical connection	100...115 V / 220...240 V 50/60 Hz, 0.5 kW (other connections on request)

1.4 Scope of delivery

- 1 PC display device with graphic screen, graphical tablet, small or large equipment cabinet including automatic charging station, DIN A4 dot matrix printer
- 4 Measuring sensors with CCD camera technology and infrared data transmission with built-in power supply
- 1 Cable set (comprising 4 cables)
- 1 Brake clamping device
- 1 Steering lock device
- 2 Electronic precision rotating plates with integrated sensor without access ramps
- 2 Sliding plates without access ramps
- 4 BMW quick-clamping units, comprising a P8-68 locating bell and P267 01 quick-acting clamp including coated holding claws
- 1 Operating instructions for BMW KDS (8 languages)
- 1 BMW software and the BMW vehicle setpoint data with setting screens as well as text for the measurement preparations

1.5 Accessories required

- 2 Locating rods for positioning the vehicle
- 1 Set of sand bags for the prescribed loading

1.6 Accessories recommended

- 4 Quick-clamping units
- 2 Sets of access ramps
- 1 Remote control / display

1 Trolley (for ballast bags, rotating and sliding plates and 4 quick-acting clamps)

2. MEASURING OPTIONS USING THE BMW KINEMATIC DIAGNOSIS SYSTEM

2.1 Front axle

- Toe-in (single and total toe-in in relation to the geometrical drive axis)
- Camber (with steering wheel pointing straight ahead)
- Wheel displacement (in relation to the left-hand front wheel)
- Castor, kingpin inclination and toe-differential angle

2.2 Rear axle

- Toe-in (single and total toe-in in relation to the longitudinal center plane of the vehicle --> previously called symmetrical axis)
- Geometrical drive axis
- Camber

2.3 Other measuring options

- Rear wheel displacement
- Wheelbase difference
- Lateral displacement on right
- Lateral displacement on left
- Track difference
- Axial displacement

3. SYSTEM DESCRIPTION

3.1 BMW Kinematic Diagnosis System 1, based on the Beissbarth ML4000

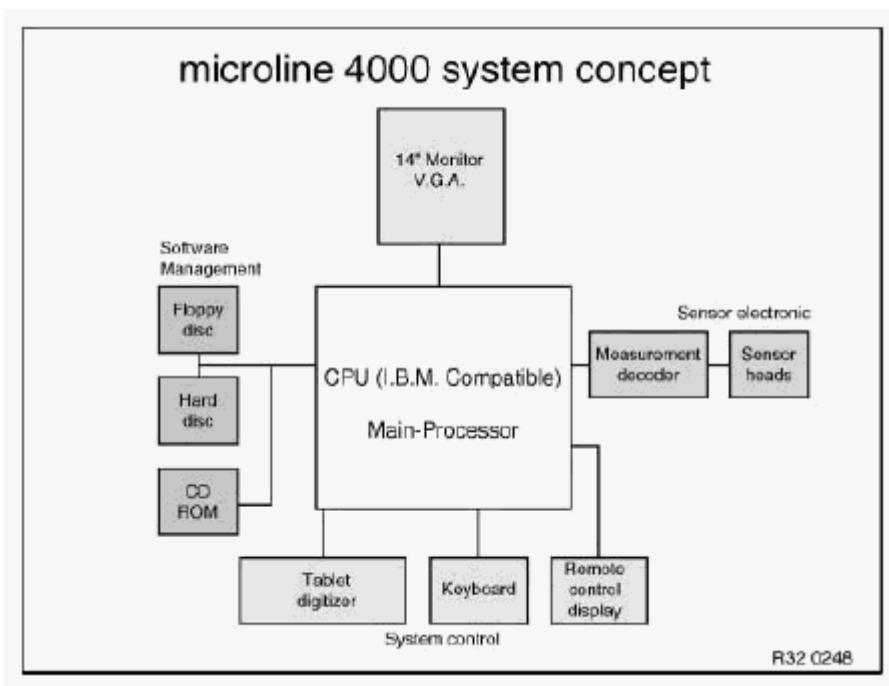


Fig. 3: BMW Kinematic Diagnosis System Diagram
 Courtesy of BMW OF NORTH AMERICA, INC.

The KDS 1 is available in two different designs at no extra charge:

1. Mobile workstation



Fig. 4: Mobile Workstation
 Courtesy of BMW OF NORTH AMERICA, INC.

2. Mobile compact cabinet



Fig. 5: Mobile Compact Cabinet
Courtesy of BMW OF NORTH AMERICA, INC.

The larger workstation offers a small storage area for accessories, while the compact cabinet is mobile and ideal for restricted working areas. Both variants can be supplied as a cableless measuring system (infrared). From the point of view of measuring technology, there is only a difference in the handling and equipping of the system. For both designs, the four measuring sensors are stored in integrated inserts with rechargeable battery charging points. When automatically charged over night, the measuring sensor batteries provide enough power for 10 hours of continuous use.

3.2 Computer

- The KDS 1 system comprises tested and reliable industrial components. The computer is an IBM-compatible, 32-bit Intel processor with CD ROM drive to the industry standard.



Fig. 6: Computer
Courtesy of BMW OF NORTH AMERICA, INC.

3.3 Graphical tablet

- All functions are shown in graphical form on a "pictogram" panel. The panel is protected by a plexiglass cover. It can easily be replaced if more extensive design modifications are necessary. The operator interface has no membrane and is thus protected against damage. The main functions are activated by

clicking the icon with the digital pen.

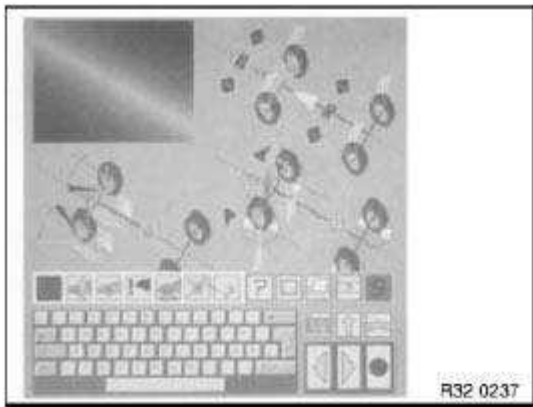


Fig. 7: Graphical Tablet

Courtesy of BMW OF NORTH AMERICA, INC.

3.4 Equipment cabinet

- The PC with graphic monitor and removable operating panel, supports for the measuring sensors, the remote control and the A4 printer are integrated into the workstation. The charging station is located in the cabinet and can also be connected to the measuring sensors and the remote control using the plug-in cables (operating while simultaneously charging the batteries).

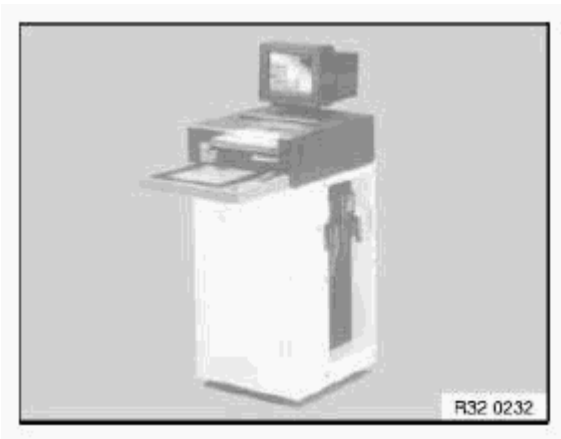


Fig. 8: Equipment Cabinet

Courtesy of BMW OF NORTH AMERICA, INC.

3.5 Remote display

A cableless remote display can be supplied on request. The remote control keys are only active during measuring and adjustment (not for customer data input, or if selecting a vehicle or editing the setpoint data etc.). The following displays are supported by the remote control:

- Measured value with setpoint / actual comparison and tolerance bar
- Steering graphics for steering routines

- Live overview of the track / camber values with a setpoint / actual comparison
- Rim run-out compensation



Fig. 9: Remote Display
Courtesy of BMW OF NORTH AMERICA, INC.

3.6 Measuring sensors with CCD camera

The measuring sensors are each equipped for automatic measurement with two CCD cameras and their own processor for the cableless infrared transmission of data with integrated batteries. Benefits:

- No temperature deviation
- Very high measuring resolution (the track could theoretically be measured in angular seconds)
- Single track range of more than ± 9 degrees for the constant display of toe-in when changing the tie-rod ends
- Exact system accuracy, i.e. when carrying out measurements at the vehicle following rim run-out compensation, the toe-in and camber measurements are accurate to 2 angular minutes



Fig. 10: Measuring Sensors With CCD Camera
Courtesy of BMW OF NORTH AMERICA, INC.

3.7 BMW Quick-acting clamp

- BMW quick-acting clamp for holding the measuring sensors precisely in position and measuring without rim run-out compensation.

NOTE: Any existing quick-acting clamps, e.g. from older F1600s or ML-3000s, must not be used on the BMW KDS.

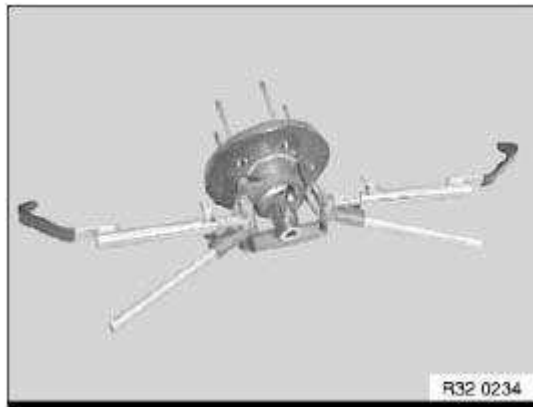


Fig. 11: BMW Quick-Acting Clamp
Courtesy of BMW OF NORTH AMERICA, INC.

3.8 Rotating / sliding plates

- Electronic precision rotating plates for the front wheels with integrated sensor (360 degree measuring range)
- Stable sliding plates for the rear wheels with a swivelling / rotating top plate
- Accessories: Cover hood for aluminium rotating plates

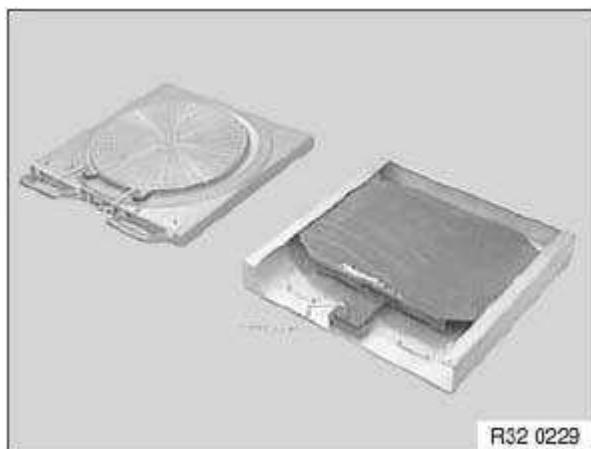


Fig. 12: Rotating/Sliding Plates
Courtesy of BMW OF NORTH AMERICA, INC.

3.9 Sensor pins

- A new BMW light alloy wheel (styling no. 18) has been available as optional equipment from April 1993. When measurements are being made on vehicles with these wheels, new sensor pins are required for the quick-acting clamps of the recommended wheel alignment equipment.
- The new sensor pins are included in the scope of supply for new deliveries of KDS 1 (order number: BS 90 19 11).

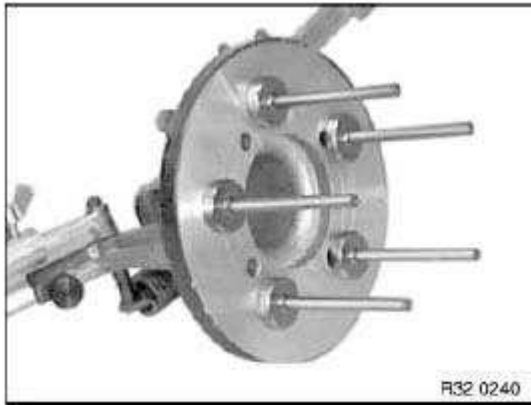


Fig. 13: Sensor Pins

Courtesy of BMW OF NORTH AMERICA, INC.

3.10 Spoiler adapter

- In the case of vehicles with very low spoilers, the sensor beam may be broken by the spoiler between the measuring sensors. This primarily occurs in front of the front axle.
- The spoiler adapter is used here as a connecting element between the measuring equipment clamp and the measuring sensor. Thanks to the adapter, the sensors are placed 50 mm lower, thus allowing the sensor beam to move freely below the spoiler.



Fig. 14: Spoiler Adapter

Courtesy of BMW OF NORTH AMERICA, INC.

3.11 Quick-clamping units

- Quick-clamping units for wheel alignment on non-BMW vehicles with rim run-out compensation.
- Rims without sensors boreholes (rims for BMW vehicles from other manufacturers)

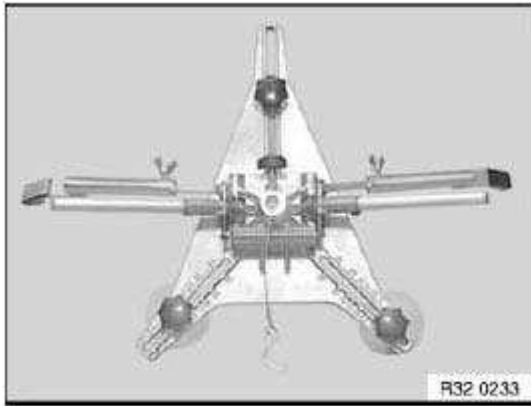


Fig. 15: Quick-Clamping Units
 Courtesy of BMW OF NORTH AMERICA, INC.

3.12 Retainers

- The most varied clamping options for the measuring equipment are possible thanks to the versatile retainers and the rubber-coated thrust pieces, even on exotic light-alloy rims.

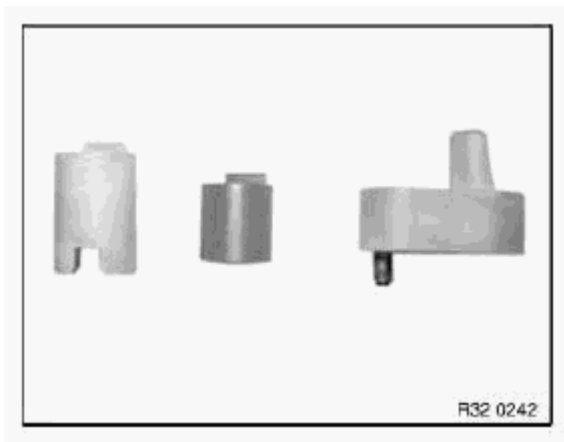


Fig. 16: Retainers
 Courtesy of BMW OF NORTH AMERICA, INC.

4. WORKSTATION

4.1 Environment

DESCRIPTION AND REQUIREMENTS REFERENCE

Description:	Requirements:
	<ul style="list-style-type: none"> ○ Wheel alignment pits

All lifting platforms currently recommended by BMW (see) for wheel alignment meet the requirements for the BMW KDS.

No particular requirements have to be met in respect of the location at which the BMW KDS is used. The measuring device can be installed over working pits or on lifting platforms.

- Pillar-type lifts with set-down device
- 2 plunger-type lifting platforms with set-down device
- Repair stands with set-down device
- One measuring area (approx. 4.5 m x 7.0 m).
- The rotating plates must be pinned to the platform

The support surfaces for the rotating and sliding plates may only display the following maximum height difference:

- from left to right ± 0.5 mm
- from front to back ± 1.0 mm
- diagonally ± 1.0 mm.

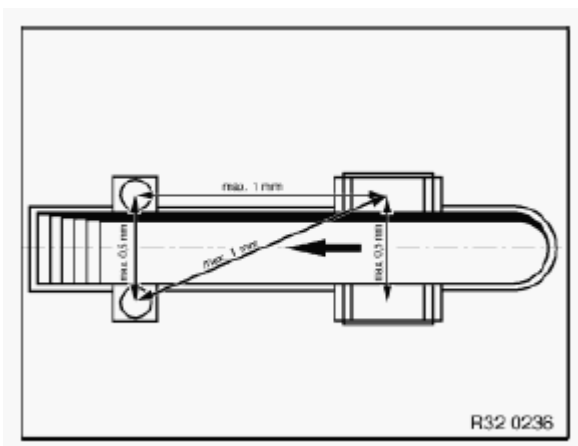


Fig. 17: Rotating And Sliding Plates Height Difference
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: A difference in the height of the rotary plates of ± 2 mm from left to right results in a measuring error of 4.8° in the camber.
As a comparison: The camber tolerance on the E36 is $\pm 10'$. The tire tread difference or varying tire pressure cause measuring errors of the same magnitude.

4.2 Preconditions for alignment

When carrying out the wheel alignment, the front and rear wheels must be centered on the rotating and sliding plates in order that all wheel suspensions remain free of tension during the steering routine and adjustment

work. As a result, the rotating and sliding plates for the relevant wheel bases and track widths of the vehicle to be aligned must be moved.

4.3 Measuring tolerance

All measuring tolerances are system tolerances. This means that the sum of all individual tolerances gives the value shown in the example. Example of camber: Quick-acting clamp + measuring sensor + computer = 1' at a measuring range of $\pm 3^\circ$ (all BMW vehicles are within this measuring range).

4.4 Levelling the measuring station

The manufacturers of the BMW KDS (Beissbarth / Bosch) are able to measure the measuring area to the required accuracy using levelling devices. Any "normal" water level is not suitable for this. Lifting platforms must be levelled under load so that the uneven deflection in the travel rails is taken into account.

IMPORTANT: Adjustment work for the lifting platform concerned must be executed by a specialist (manufacturer's after - sales service).

5. CHASSIS-RELATED TERMS

5.1 Toe-differential angle

- The toe-differential angle (a) is the angular position of the internal wheel on the curve in relation to the external wheel on the curve when driving round bends. The steering is designed such that the angular position of the wheels in relation to each other changes as the steering angle increases.
- In ideal cases, the wheel axes meet at point D in any steering position (except for straight ahead).

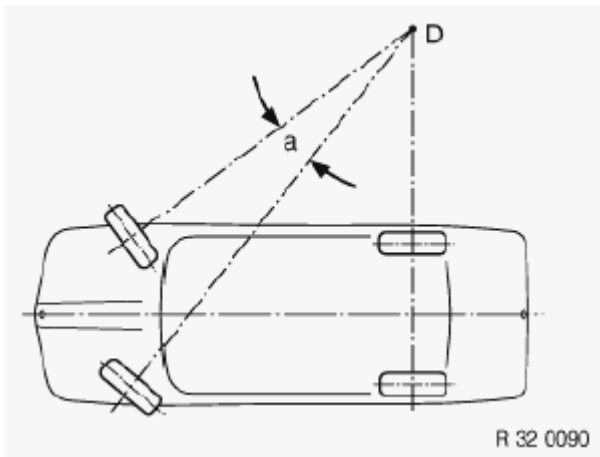


Fig. 18: Toe-Differential Angle
Courtesy of BMW OF NORTH AMERICA, INC.

5.2 Camber

- The camber is the angle of inclination of the wheel in relation to the vertical.

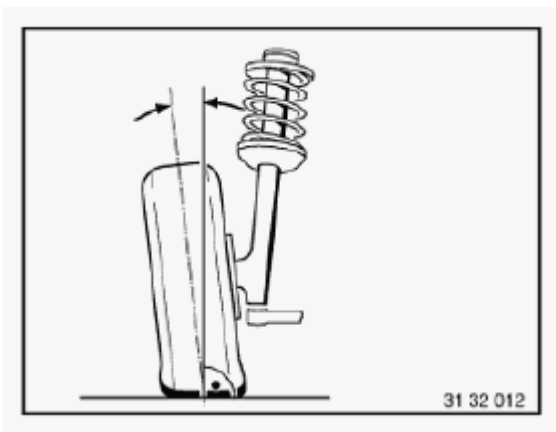


Fig. 19: Camber Angle
Courtesy of BMW OF NORTH AMERICA, INC.

5.3 Toe-in

- The toe-in is the reduction in the distance between the front of the wheels and the rear. The toe-in prevents the wheels from moving apart while driving (wobbling and grinding).

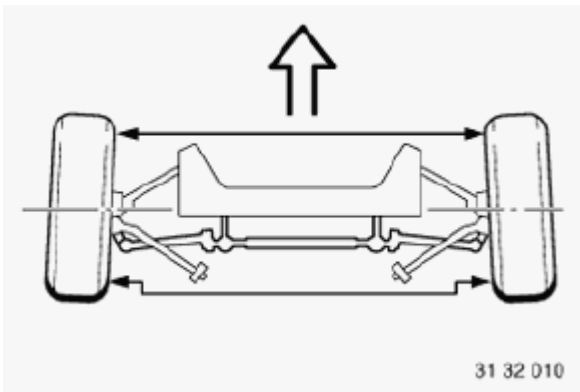


Fig. 20: Toe-In
Courtesy of BMW OF NORTH AMERICA, INC.

5.4 Castor

- The castor is the kingpin angle seen from the side in the opposite direction of travel. The line through the center of the spring strut mount and control arm ball joint corresponds to the kingpin.

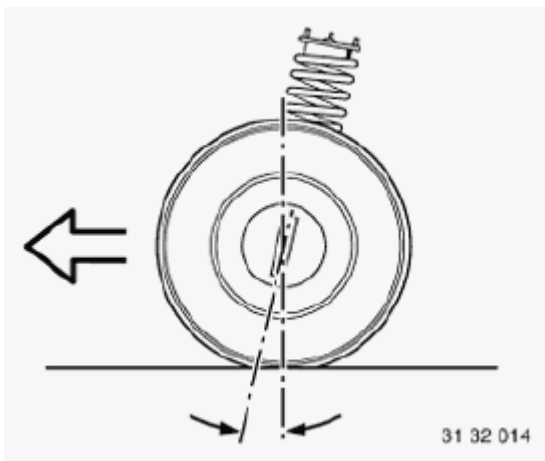


Fig. 21: Castor Angle
 Courtesy of BMW OF NORTH AMERICA, INC.

5.5 Geometrical drive axis / symmetrical axis

- (1) The geometrical drive axis is the line bisecting the angle of the overall rear wheel toe. The measurements of the front wheels relate to this axis.
- (2) The symmetrical axis represents the center line through the front and rear axes.

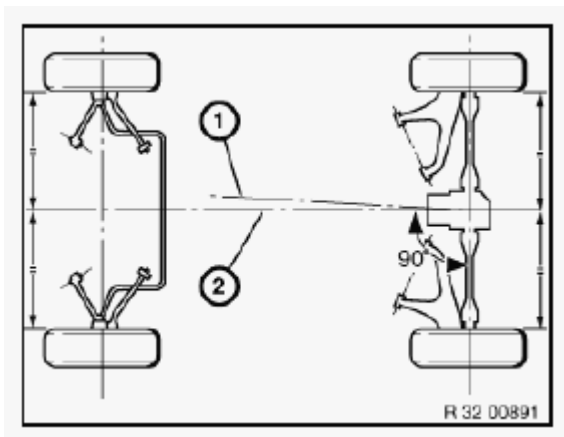


Fig. 22: Geometrical Drive Axis/Symmetrical Axis
 Courtesy of BMW OF NORTH AMERICA, INC.

5.6 Wheel displacement angle

- The wheel displacement angle is the angular deviation of the connecting line of the wheel contact points in relation to a line running at 90° to the geometrical drive axis. The wheel displacement angle is positive if the right-hand wheel is displaced to the front, and is negative if it is displaced to the rear.

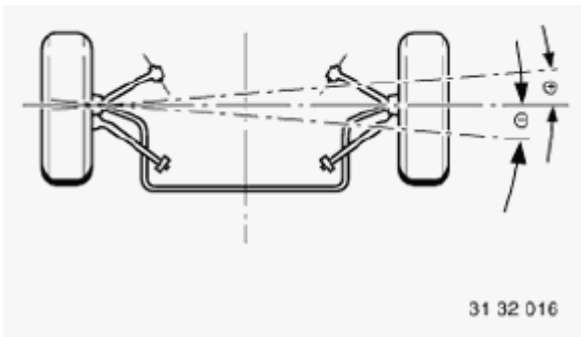


Fig. 23: Wheel Displacement Angle
 Courtesy of BMW OF NORTH AMERICA, INC.

5.7 Kingpin offset

- The kingpin offset is the distance from the center of the wheel contact point to the contact point of the kingpin extrapolation.

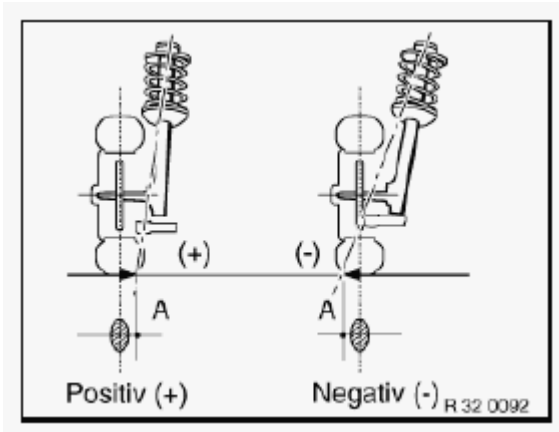


Fig. 24: Kingpin Offset
 Courtesy of BMW OF NORTH AMERICA, INC.

6. WHEEL SUSPENSION

Those parts which connect the wheel to the mostly load-bearing floor elements of the bodywork and guide it in the required direction belong to the wheel suspension. They are connected by axles or other comparable structures and guided by the arms. The wheel suspension plays a decisive role in the handling characteristics of a vehicle. Two main groups have to be distinguished: 1. Rigid axle suspension and 2. Independent wheel suspension.

6.1 Rigid axle suspension

RIGID AXLE SUSPENSION ADVANTAGES AND DISADVANTAGES

Description	Advantages	Disadvantages
The rigid axle suspension has a rigid connection between both wheels or wheel pairs. Any change in one wheel is more or	In the event of deflection taking place, there are no changes to the camber or	Non-driven rear axles may also acquire negative camber

less transferred to the other. It is now only fitted as a rear axle, if at all. However it is frequently used for lorries or busses.	wheel toe. This means: less tyre wear and good track stability.	as well as increasing tyre lateral guidance, thus increasing tyre wear.
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6.2 Independent wheel suspension

INDEPENDENT WHEEL SUSPENSION ADVANTAGES AND DISADVANTAGES

Description	Advantages	Disadvantages
State-of-the-art individual wheel suspension is available on BMW vehicles on the front and rear axles. This development has its cause in mass inertia, as a reduction in the non-suspended mass improves wheel and ground contact, and the wheel stays better on the road. Control arms and trailing arms, which have to absorb high longitudinal and lateral forces to some extent, are required for guiding independently suspended wheels.	Wheels suspended independently from each other have no mutual influence on each other.	Depending on the type, changes may occur in the camber, wheel toe, track width, castor and wheelbase.

7. WHEEL ALIGNMENT / PROCEDURE

7.1 Measuring options

An overview of all measuring options and values (VA = front axle, HA = rear axle) is shown below.

WHEEL ALIGNMENT SPECIFICATION

Measuring options	Measuring accuracy	In measuring range	Total measuring range
Total wheel toe (VA + HA)	± 2'	± 2°	± 18°
Single wheel toe (VA + HA)	± 2'	± 2°	± 9°
Camber (VA + HA)	± 1	± 3°	± 10°
Wheel displacement (VA)	± 2'	± 2°	± 9°
Geometrical drive axis	± 2'	± 2°	± 9°
Castor	± 4'	± 18°	± 22°
Kingpin inclination	± 4'	± 18°	± 22°
Toe-differential angle	± 4'	± 20°	± 20°
Maximum steering angle (VA)	± 4'	± 60°	± 300°
Maximum steering angle (HA)	± 4'	± 9°	± 9°
Castor correction range	± 4'	± 7°	± 10°

NOTE: The measuring accuracy details only apply when using the precision rotating and sliding plates as well as the BMW quick-acting clamps.

7.2 Preparatory work

Before commencing the measurement, preparatory work must be carried out at the measuring area and on the vehicle. Preparatory work includes:

- Easy-running rotating and sliding plates
- Aligning the rotating and sliding plates in relation to the track width and wheelbase
- Centering the vehicle on the plates
- Applying the parking brake
- Removing the lock pins on the plates to prevent tension in the chassis under loading
- Checking the rim and tire size, tread depth, tire pressure, steering wheel play, wheel bearings and condition of suspension and shock absorbers
- Fastening the measuring equipment to the wheels
- Loading the vehicle according to BMW KDS specifications
- Rock the vehicle firmly with the brakes released to ensure a stable center position
- Lock the service brake using the brake clamping device

7.3 Initial / final measurement

This measurement can be carried out as a program-guided measurement in the same way as any subsequent adjusting work and the final measurement. The sequence of the chassis measuring points to be called up is specified and controlled by the system software. The individual steps comprise:

- Driving straight ahead to correctly record the wheel toe and camber values for the rear axle
- Steering routine for recording the castor, kingpin inclination and toe-differential angle
- Recording the wheel toe and camber of the front axle (adjust the steering center point in advance)
- Steering routine for measuring the maximum steering angle on the left/right
- Checking the overview of measured values with the setpoint and actual comparison of all measured values

7.4 Printing out the data



Fig. 25: Printing Layout Of Customer And Vehicle Identification Data
 Courtesy of BMW OF NORTH AMERICA, INC.

The report printout from the integrated DIN A4 printer is subdivided into three sections:

- Header lines with customer and vehicle identification data --> the customer data entered before beginning the measurement as well as vehicle data are printed out here.
- Centre section with vehicle data --> this includes the make, type, model and vehicle model year defined when the setpoint data record was selected. The values previously measured for height level, tire pressure and tread depth are also printed in this section.
- The end section with all vehicle alignment values comprises the 3 columns initial measurement, setpoint values and output measurement. The measured values are recorded separately in these three columns.

8. SPECIAL FEATURES

8.1 Free wheel alignment

With free wheel alignment the selection and sequence of the measuring points is freely selectable. The following points must be observed for attaining the correct measurement results:

- Carry out all work in the same way as with the program-guided measurement.
- Before measuring the wheel toe and camber values for the rear axle, the steering must be in the "straight ahead" position to ensure that it is perfectly aligned in relation to the longitudinal center plane of the vehicle.
- Before measuring the single wheel toe values on the front axle, the center of steering must be established to ensure the correct position of the steering wheel.

8.2 System settings

The following settings must only be entered or set once: language, display format, date/time, advertising text, remote control with display, rotating plate selection and printer settings. They remain stored.

9. BMW KINEMATIC DIAGNOSIS SYSTEM COMPARISON (BOSCH - BEISSBARTH)

BMW KINEMATIC DIAGNOSIS SYSTEM COMPARISON (BOSCH - BEISSBARTH)

	Bosch	Beissbarth
Measured value recording	Infrared	CCD camera
Data transmission	Cable	Infrared / cable
Measuring sensor power supply	Cable	Battery / cable
Remote control	Infrared	Infrared
Remote control with measured value display	Cable	Infrared
Setpoint data memory	Floppy disk	Hard disk
Measured value memory	Always the last vehicle measured	Unlimited vehicle memory
Operating system	---	MS-DOS
Languages	English and one language on request	EN, DE, NI, SV, IT, FR, SP (further languages can be called up)
Update	3.5" floppy disk	3.5" floppy disk using TIS/DIS
Monitor	20"	17"
Computer	---	Pentium
Disk drives	2 x floppy disk	1 x floppy, 1 x CD ROM

10. CONTROL MODIFICATION (MENU)

10.1 Remote control with display

The following steps show how the remote control with display is activated:

1. Call up the "**Service**" menu in special functions ("S" key)
2. Call up the "**Remote control**" sub-menu in the "**Service**" menu.
3. Select the "**Remote control with display**" item in the "**Remote control**" sub-menu-this configuration is retained.

IMPORTANT: In the case of equipment without remote control, this must be configured to "No remote control".

10.2 Brief operating instructions

1. Activate the remote control with the "**ON**" button (it may also be switched on during alignment). The title page will appear on the LCD.
2. Select "**Straight ahead**" of the "**Initial measurement**", "**Adjustment work**" or "**Final measurement**" at the measuring equipment cabinet. The steering graphics for "**Straight ahead**" will appear on the LCD.

3. Use the "**Forward arrow**" to change to the next measurement image. Display blocks will appear on the LCD with the designation of the measured value and tolerance bar with the measured value. If the measured value is within the tolerance range, it is shown in dark figures against a light background. If the measured value is outside the tolerance range, it will be shown in inverse video (light figures against a dark background).
4. By pressing the "**F**" key shortly, you can move alternately between the designation of the measured value and the setpoint value with the tolerance inside the display blocks.
5. You can scroll through the measured values using the "**Forward arrow**", "**Backward arrow**" and "**Cancel**" (**red dot**) keys. The function of these keys is identical to that of the keys on the graphics panel.
6. Even with "**Free alignment**", it is possible to scroll through the measured values in the same way as with "**Program-guided alignment**".
7. During measurement, the report print-out can be initiated using the "**Printer**" key. The remote control keys are only active during measurement and adjustment (not during customer data input, vehicle selection etc.).

10.3 Display support

- Measured values with a setpoint/actual comparison and tolerance bar (setpoint figures can be displayed with the "**F**" key)
- Steering graphics for steering routines
- Overview of measured values with current setpoint/actual comparison
- Rim run-out compensation
- With all other functions (e.g. customer input), the title illustration appears on the LCD display

NOTE: If the data transmission from the remote control to the computer is interrupted, the remote control icon in the bottom right-hand corner of the screen changes color from green to red and the illustration on the LCD display is shown inversely - black turns to white, white to black. This change does not take place in the title illustration. Once the line-of-sight connection has been re-established, the remote control continues to operate from the point of interruption in the program. A continuous visual connection during alignment is therefore not necessary.

- The "**Hour glass**" icon in the LCD display means: "**Please wait**".
- The "**Battery**" icon in the top right-hand corner of the LCD display means that the battery reserve has been reached.
- To switch off the remote control: press the "**F**" key for 5 seconds, then return it to its charging unit or connect it to a charge cable. The title illustration will again appear as a charging check.
- If, during the measurement, the remote control has been placed back in the charging unit, it must be switched on again using the "**ON**" button.

11. UPDATING THE SOFTWARE / SETPOINT DATA

Floppy disks will no longer be sent to BMW partners who have acquired a "**BMW KDS** (Beissbarth / Bosch)".

For cost-related reasons, you can create these disks yourself on the "**DIS-tester**" or on the "**TIS/EPC server**". The data for this is regularly updated on the TIS CD.

11.1 Requirements

- BMW KDS (Beissbarth / Bosch)
- TIS CD program status (Beissbarth): from CD 12/95
- EPC program status: from 12/95
- TIS CD program status (Bosch): from CD 08/97
- DIS program status: from V6.0
- 3.5" diskettes, 1.44 MB (Beissbarth 5 diskettes / Bosch 1 diskette)

11.2 Procedure (Beissbarth)

1. Go to the "Administration" screen
2. Select the **KDS button**
3. Select **Beissbarth**
4. Insert "**Diskette 1**" on request and confirm with "**OK**" (program diskette 1 of 2 is created, label it)
5. Insert "**Diskette 2**" on request and confirm with "**OK**" (program diskette 2 of 2 is created, label it)
6. Insert "**Diskette 3**" on request and confirm with "**OK**" (setpoint data diskette 1 of 3 is created, label it)
7. Insert "**Diskette 4**" on request and confirm with "**OK**" (setpoint data diskette 2 of 3 is created, label it)
8. Insert "**Diskette 5**" on request and confirm with "**OK**" (setpoint data diskette 3 of 3 is created, label it)
9. Perform update and/or setpoint data on the KDS in the usual manner with the diskettes which have just been created.

11.3 Procedure (Bosch)

1. Go to the "Administration" screen
2. Select the **KDS button**
3. Select **Bosch**
4. Label "**Diskette 3.1**", insert it into the drive on request and confirm with "**OK**" (2x) --> Setpoint data is copied to the diskettes.
5. Insert setpoint data diskette 3.1 into the 3.1 floppy disk drive, insert operating system diskette 3.0 into the 3.0 drive.
6. Switch on the machine in the usual manner.

IMPORTANT: When creating the KDS diskettes, all data on the diskettes used is overwritten.

NOTE: In the event of an error, a corresponding message is shown and the program is cancelled completely. The procedure must be run from the beginning again and all data on the diskette will be deleted. A new diskette may have to be used.

12. CREATING, COPYING AND EDITING SETPOINT DATA

12.1 Copying

- Press the "C " button and select the vehicle to be copied.
- Select the "**Edit setpoint data** " menu item from the special functions. Create a new vehicle in the usual manner. The setpoint values for the last vehicle selected will appear in the data input screen. Enter the data and save the data record.

12.2 Creating

- Press the "C " button and select the "**Edit setpoint data** " menu item from the special functions. Create a new vehicle in the usual manner. An empty data input screen will appear. Enter the data and save the data record.

12.3 Editing

- Factory-programmed setpoint data can neither be deleted nor modified. If this data does need to be modified, a new vehicle with modified setpoint data must be created. New vehicles created by the user are identified by a "+" " in the selection menu. These vehicles can be deleted by the user using the "-" " key or modified using the "<> " key. These keys only appear if vehicles have been entered by the user.

13. SPECIAL FUNCTIONS

13.1 Customer-specific printer report header

The sub-item "**Customer-specific text** " must be called up in the "**Special functions** " menu. An input screen will appear on the monitor. This input screen must be filled out with the name and address and stored with the "S " screen key. The text entered is inserted into the report header.

13.2 Adjusting options

- Call up the "**Service** " menu in the special functions ("S " key).
- Select the "**Wheel toe adjustment** " item or the "**Camber adjustment** " item from the "**Adjustment** " sub-menu. The toe and camber adjustment program will guide the user step by step through the adjustment using text and images. The measuring deviation for each measuring sensor will be shown on the screen when the adjustment has been completed.
- You can store the adjustment values in the measuring sensor using the "**Store** " key or you can quit the program with the "**Red dot key** " without saving them (check). The adjustment values can be printed out.

13.3 Rotating plate test

- Call up the "**Service** " menu in the special functions ("S " key).
- Call up the "**Rotating plate** " item in the "**Service** " menu. Turn the left-hand and right-hand rotating plate and check the display on the screen. Important: The measuring range is ± 306 degrees.

13.4 Viewing and deleting customer entries from database

- Call up the menu item "**Delete**" in the "**Database**" menu in the special functions. The data input screen will appear. Fill in the search fields with the data to be deleted.
- Use the "-" button to delete this data record. A new data record can then be highlighted and deleted with the digital pen.
- You can scroll through the entire database with the "**Arrow up**" and "**Arrow down**" keys.
- You can quit the delete function by pressing the cancel key (red dot).

14. MODIFICATIONS WITHIN PROGRAM

Further modifications were carried out within the program which only slightly change the program sequence but which optimizes the alignment in respect of comfort and speed. This is described below:

- Optimization of the rim run-out compensation in respect of speed.
- Optimization of the steering routines: Highlighted values within the gate can still be corrected. The message "**Rotating plates not connected**" no longer causes the steering routine to be cancelled. Further measurements can be carried out after the rotating plates have been connected.
- Standardization of screen colors with the colors on the tablet.
- Addition of texts in several foreign languages.
- Elimination of program-related and cosmetic faults.
- Electronic water level.
- Omission of kingpin inclination measurement.

15. FAULTS

15.1 Tyre faults

TYRE FAULTS DESCRIPTION CHART

Fault	Effect
1 Wheel toe, camber, toe-differential angle and castor not correct	1 Severe tyre squeaking even at relatively low speeds
2 Excessive toe-in and excessive positive camber	2 Tyres are worn down on one outside edge in the longitudinal direction
3 Excessive negative camber	3 Tyre wear on inside edge
4 Worn front-axle suspension on front-wheel-drive vehicles	4 Increased noise / Vehicle pulls on one side when accelerating
5 Incorrect wheel alignment	5 Wheels scrubbing / Tyre surface shows feathering in the tread
6 Play in the suspension due to mechanical parts (suspension, steering)	6 Washout / Wobbling of front wheels
7 Tyre pressure too low	7 Outside tyre surface wear

15.2 Front axle faults

FRONT AXLE FAULTS DESCRIPTION CHART

Fault	Cause	Remedy
1. Toe deviation	<ul style="list-style-type: none"> a) Vehicle not in normal position b) Tie rod(s) bent c) Tie rod ball joints worn d) Rubber mount in control arm defective 	<ul style="list-style-type: none"> a) Correct height level b) Replace tie rod(s) c) Replace tie rod(s) d) Replace control arm
2. Camber deviation: The camber is fixed during the design stage and cannot be adjusted.	<ul style="list-style-type: none"> a) Rubber mount in control arm defective b) Control arm deformed c) Spring strut deformed d) Traction strut worn e) Spring deflection too great f) Front axle carrier deformed g) Spring strut mount deformed h) Distortion in the floor assembly (engine bracket) 	<ul style="list-style-type: none"> a) Replace control arm b) Replace control arm c) Replace spring strut d) Replace control arm e) Replace coil spring, height level f) Replace front axle carrier g) Repair forward structure h) Repair body
3. Castor deviation: The castor is fixed during the design stage and cannot be adjusted.	<ul style="list-style-type: none"> a) Rubber mount for tension / traction strut defective b) Tension / traction strut deformed c) Control arm deformed d) Spring strut deformed e) Wheelhouse deformed (spring strut mount) f) Distortion in the floor assembly (engine bracket) 	<ul style="list-style-type: none"> a) Replace rubber mount b) Replace tension / traction strut c) Replace control arm d) Replace spring strut e) Repair forward structure f) Repair body
4. Toe-differential angle deviation	<p>Requirement: camber and castor are correct</p> <ul style="list-style-type: none"> a) Tie rods unevenly adjusted 	<ul style="list-style-type: none"> a) Set wheel toe on left and right to identical values
5. Wheel displacement deviation	<p>Requirement: Front wheels have same single toe in relation to the geometrical axis</p> <ul style="list-style-type: none"> a) Front axle carrier deformed b) Engine bracket deformed c) Control arm deformed d) Tension / traction strut deformed 	<ul style="list-style-type: none"> a) Replace front axle carrier b) Repair body c) Replace control arm d) Replace tension /

15.3 Rear axle faults

REAR AXLE FAULTS DESCRIPTION CHART

Fault	Cause	Remedy
1. Camber deviation	a) Vehicle not in normal position: spring deflection too great b) Rubber mount on rear axle carrier defective c) Rear axle carrier deformed d) Control arm deformed e) Traction strut deformed f) Distortion in the floor assembly g) Swinging arm deformed	a) Correct height level b) Replace rubber mount c) Check rear axle carrier and replace, if necessary d) Check control arm and replace, if necessary e) Check traction strut and replace, if necessary f) Repair body g) Replace swinging arm
2. Rear wheel position is not correct	a) Rear axle carrier has been shifted laterally b) Distortion in the floor assembly	a) Check the rubber mounts on the rear axle carrier and replace, if necessary b) Repair body
3. Toe deviation	a) Vehicle not in normal position, i.e. spring deflection too great b) Rubber mount in rear axle carrier defective c) Control arm deformed d) Rubber mount and swinging arm defective e) Rear axle carrier deformed f) Traction strut deformed	a) Correct height level b) Replace rubber mount c) Replace control arm d) Replace swinging arm e) Check rear axle carrier and replace, if necessary f) Check traction strut and replace, if necessary
4. Deviation from the geometrical drive axis	Requirement: Total wheel toe is correct a) Distortion in the floor assembly	a) Repair body

Further details on the "Kinematic Diagnosis System" can be found in the operating instructions for the BMW KDS (Beissbarth / Bosch).

Functional and system descriptions are not subject to change. Parts availability and immediate ordering availability cannot be derived from this information. The specialist departments will be providing further details at the relevant time.

TIRES WITH EMERGENCY RUNNING CHARACTERISTICS AND TIRE PRESSURE WARNING SYSTEMS

All models

GENERAL INFORMATION

Warning systems

BMW AG offers two different systems to warn the driver of a drop in tire pressure.

WARNING SYSTEMS REFERENCE

System	Description	Measuring principle
RDC	Tyre pressure control	Tyre pressure/temperature
RDW	Tyre pressure warning	Comparison of wheel speeds

EMERGENCY RUNNING SYSTEMS

In addition to the warning systems, two emergency running systems are also employed to prevent a depressurized tire from caving in:

Components of emergency running system with self-supporting tires:

EMERGENCY RUNNING SYSTEMS REFERENCE

RDW (standard equipment)	Tyre pressure warning
RDC (available as option from 03/2000)	Tyre pressure control
SST	Self Supporting Tyre
EH2 disc wheel	Disc wheel with Extended Hump 2

Components of emergency running system with integrated support ring:

COMPONENTS OF EMERGENCY RUNNING SYSTEM WITH INTEGRATED SUPPORT RING

Support ring	NOTE: In the future, only for heavy safety vehicles (E38/3)
RDC (optional)	Tyre pressure control
H2 disc wheel	Standard disc wheel with Hump 2

TYRE PRESSURE CONTROL (RDC)

RDC system description

RDC permanently monitors the tire pressure and the temperature in the tires, both while the vehicle is being driven and when it is stationary. Data is transmitted via data telegram by the wheel electronic units to the

antennas installed in the wheel housing and on to the RDC control unit. There, the data received is compared with the stored limit values.

After correcting the air pressure with the engine off and the ignition on, press the Set button and hold (approx. 6 seconds) until the words "Set tire pressure" appear in the instrument cluster (instrument cluster high) or the yellow LED lights up (basic instrument cluster).

If the limit values are exceeded, the driver will be warned via the instrument cluster in two stages, as follows:

LOSS OF TYRE PRESSURE AND WARNING REFERENCE

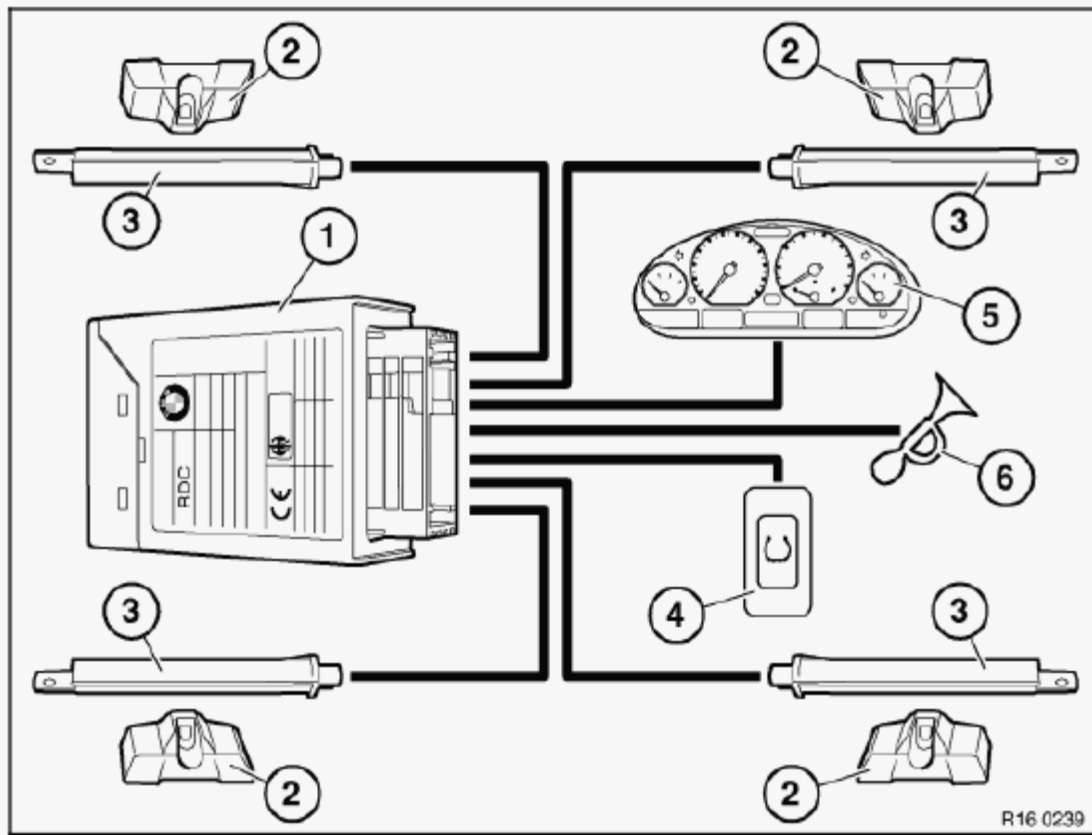
Loss of tyre pressure	Warning
Drop in tyre pressure of 0.2 to 0.4 bar	Yellow LED on basic instrument cluster or Text: "Check tyre pressure" on instrument cluster high Gong: no
Drop in tyre pressure of more than 0.4 bar	Red LED on basic instrument cluster or Text: "Tyre failure" on instrument cluster high Gong: yes

Advantages of RDC

ADVANTAGES OF RDC

1. Safety	<ul style="list-style-type: none"> ○ early warning in the event of rapid loss of pressure ○ warning of loss of tyre pressure through normal diffusion
2. Comfort	<ul style="list-style-type: none"> ○ unchanging ride comfort ○ instruction to check tyre pressure as necessary
3. Service life, economy	<ul style="list-style-type: none"> ○ minimisation of tyre wear ○ minimisation of fuel consumption
4. New developments	<ul style="list-style-type: none"> ○ allow tyres with emergency running characteristics to be fitted ○ no spare wheel if tyres with emergency running characteristics are fitted (saves weight)

RDC SYSTEM LAYOUT



R16 0239

- | | |
|--|-------------------------------|
| (1) RDC control unit | (4) Set button |
| (2) Wheel electronic units (4 off)
Wheel electronic unit for spare wheel (optional) | (5) Display element |
| (3) Receiving antennas (4 off) | (6) Anti-theft warning system |
| | - Wiring harness |

Fig. 26: RDC System Layout

Courtesy of BMW OF NORTH AMERICA, INC.

Component description

RDC control unit

Fully diagnosis-compatible

Task:

evaluates the following telegrams from the wheel electronic units:

- tire pressure
- tire air temperature
- identification number (ID) of wheel electronic unit

- remaining service life of wheel electronic unit battery

If required, information or a warning is transmitted.

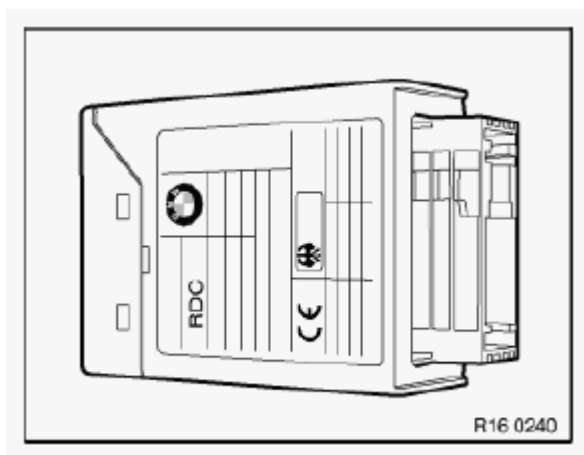


Fig. 27: RDC Control Unit
Courtesy of BMW OF NORTH AMERICA, INC.

Wheel electronic unit with valve

Components:

- pressure sensor
- temperature sensor
- transmitter
 - frequencies according to country

power supply

- service life: approx. 7 years
- not exchangeable

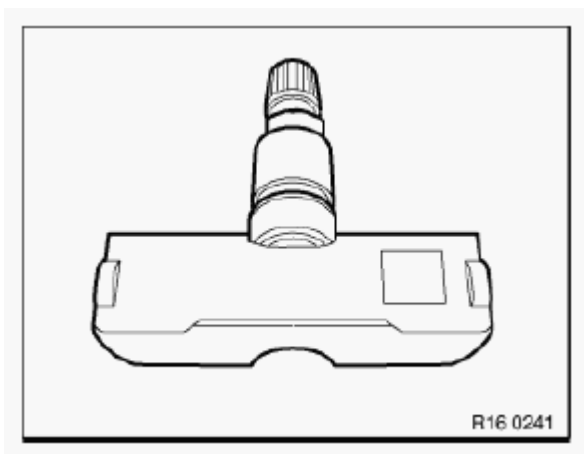


Fig. 28: Wheel Electronic Unit With Valve
Courtesy of BMW OF NORTH AMERICA, INC.

Installation location of wheel electronic unit in disc wheel

The wheel electronic unit (1) is screwed to the valve (2) on the disc wheel (3)

Identifying feature:

metal tire valves

NOTE: Different valves have to be used to allow for the different disc wheel sizes. The valves are color-coded. The correct coding can be taken from the spare parts catalogue.

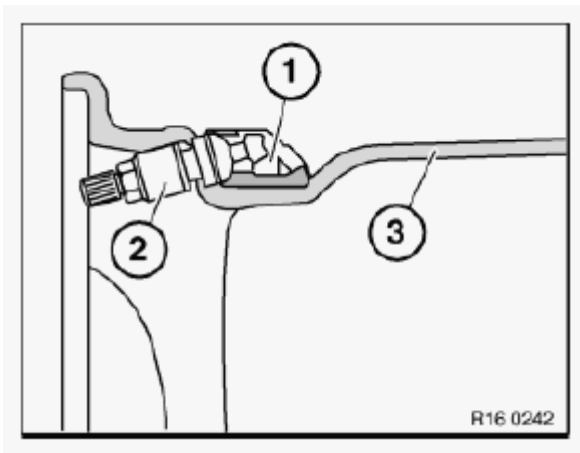


Fig. 29: Wheel Electronic Unit, Valve And Disc Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

Antenna

There is an antenna in each wheel housing.

Task:

receives telegrams and forwards these to the RDC control unit.

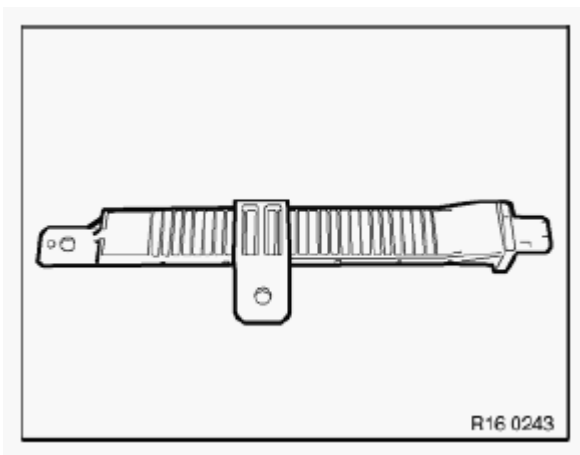


Fig. 30: Antenna

Courtesy of BMW OF NORTH AMERICA, INC.

COMPONENT DESCRIPTION

Set button

Installed in the instrument panel to the right of the steering wheel. (E46: in the center console)

Symbol: tire cross-section

Task:

initialization after resetting cold tire pressure or after changing tire or wheel location.

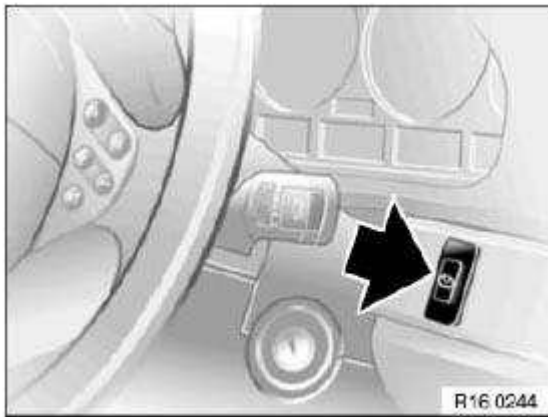


Fig. 31: Set Button

Courtesy of BMW OF NORTH AMERICA, INC.

Display element in instrument cluster

Indicator lamp lights up yellow:

- drop in tire pressure of 0.2 to 0.4 bar Indicator lamp lights up red:
- drop in tire pressure greater than 0.4 bar

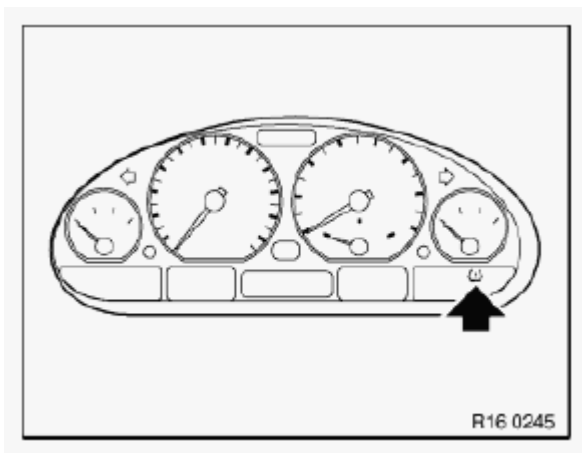


Fig. 32: Indicator Lamp

Courtesy of BMW OF NORTH AMERICA, INC.

TYRE PRESSURE WARNING RDW

RDW system description

RDW measures the wheel speeds on all four wheels, using the wheel speed sensors of the ABS/ASC or ABS/DSC system. It compares the wheel speeds of the diagonally opposite wheels and of the average speed.

In the event of a drop in tire pressure, the dynamic diameter of a wheel will change, leading to a changed wheel speed.

A drop in tire pressure of $30 \pm 10\%$ can be detected on all wheels from about 15 km/h (10 mph) up to the vehicle's top speed.

If this value is exceeded, the driver will be warned via the instrument cluster as follows:

LOSS OF TYRE PRESSURE AND WARNING REFERENCE

Loss of tyre pressure Warning

Loss of tyre pressure
of $30 \pm 10\%$

Red LED

Text: "Tyre failure"

Gong: yes

The vehicle is not to be driven faster than 80 km/h (50 mph).

NOTE:

A cautious driving style with moderate forward and transverse acceleration will help to prolong the service life of the defective tyre.

ADVANTAGES OF RDW

With two exceptions, the advantages of RDC also apply to RDW.

Exceptions:

- no warning of loss of tire pressure through normal diffusion
- tire pressure still have to be checked regularly, every 14 days

RDW SYSTEM LAYOUT

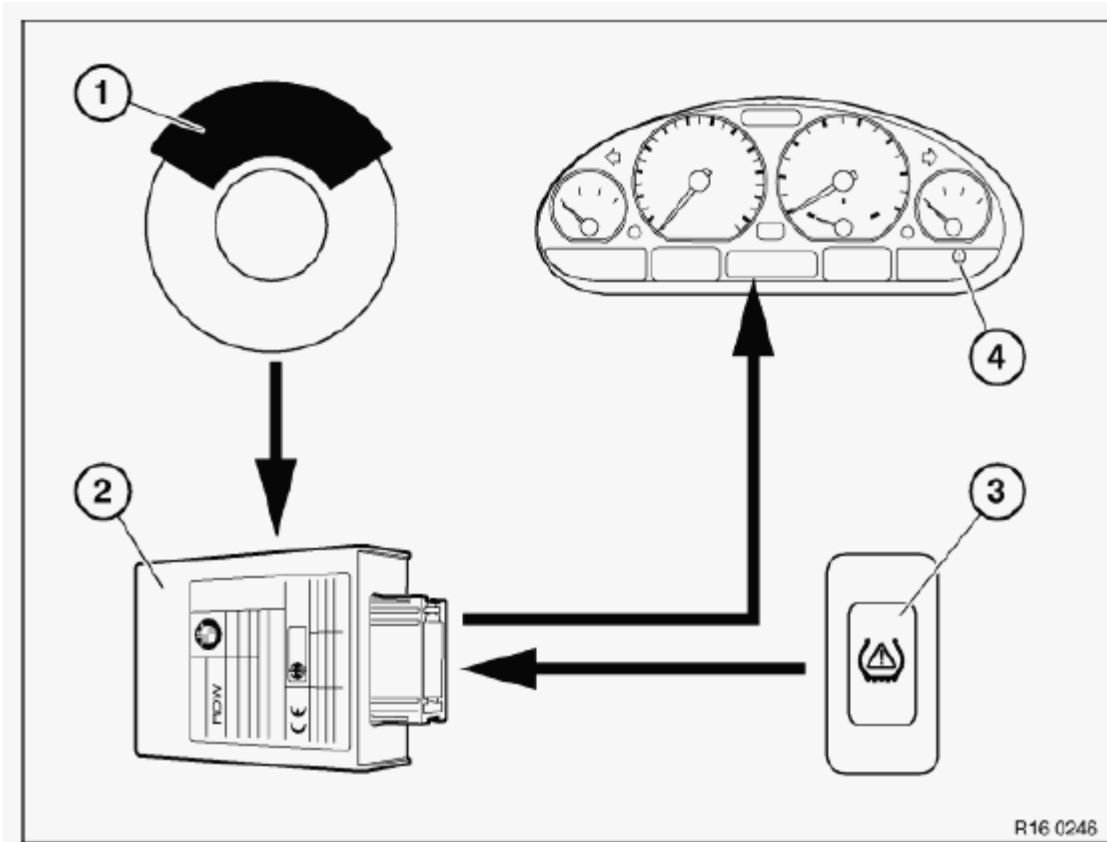


Fig. 33: RDW System Layout

Courtesy of BMW OF NORTH AMERICA, INC.

COMPONENT DESCRIPTION

RDW control unit

Fully diagnosis-compatible

Task:

- evaluates wheel speeds.
- a warning is transmitted as required.

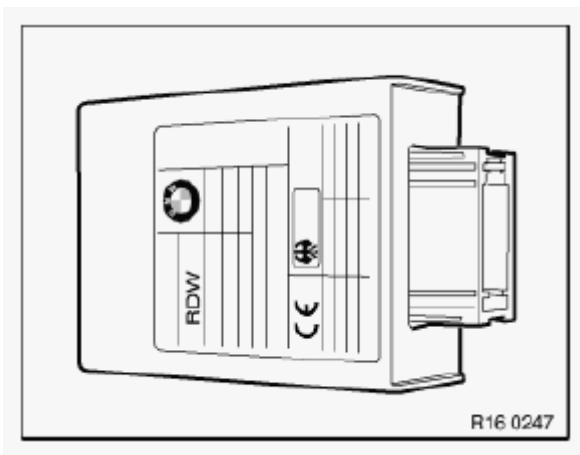


Fig. 34: RDW Control Unit
Courtesy of BMW OF NORTH AMERICA, INC.

Set button

Installed in the dashboard to the right of the steering wheel. Symbol: tire cross-section with warning triangle

Task:

initialization after resetting cold tire pressure or after changing tire or wheel location.

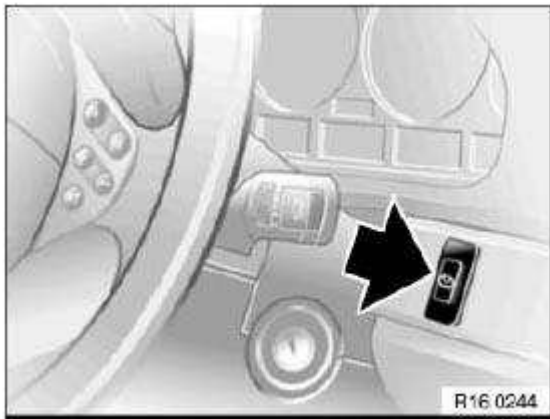


Fig. 35: Set Button
Courtesy of BMW OF NORTH AMERICA, INC.

Display element in instrument cluster

Indicator lamp lights up red:

- drop in tire pressure $30 \pm 10 \%$

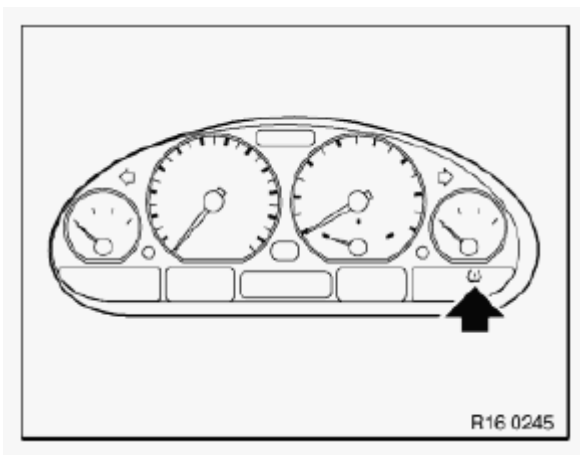


Fig. 36: Indicator Lamp

Courtesy of BMW OF NORTH AMERICA, INC.

EMERGENCY RUNNING SYSTEMS

Introduction

Tires with emergency running characteristics can still be used for a certain distance even if they suffer a complete loss of pressure. There are two different systems which meet these requirements:

- emergency running system with self-supporting tires
- emergency running system with integrated support ring

EMERGENCY RUNNING SYSTEMS SETUP

Emergency running system with self-supporting tires

The side walls of the self-supporting tire are reinforced. In conjunction with a special disc wheel, the tire can still be used for a certain distance even if it suffers a complete loss of pressure.

Mobility is retained for the following distances up to a speed of 80 km/h (50 mph) and with a cautious, suitably adapted driving style:

DISTANCES FOR RETAINED MOBILITY

Unloaded vehicle	max. 500 km (300 miles)
Unloaded roadster	less than 250 km (150 miles)
Fully loaded vehicle	max. 50 km (30 miles)

Self-supporting tires demand permanent monitoring of the tire pressure to ensure that the driver is given adequate warning if pressure is lost during a journey. For this reason, these tires are only available in conjunction with the warning system RDW and from 03/2000 also with RDC.

To prevent the self-supporting tires from becoming detached from the disc wheel in the event of a complete loss of tire pressure, they must be fitted to newly developed wheels with modified disc wheel humps, but with

unchanged tire seating (= standard disc wheel).

However, the new wheels can also be used for standard tires of the same size.

COMPARISON STANDARD TIRES / SELF-SUPPORTING TIRES

Standard tires, unpressurized

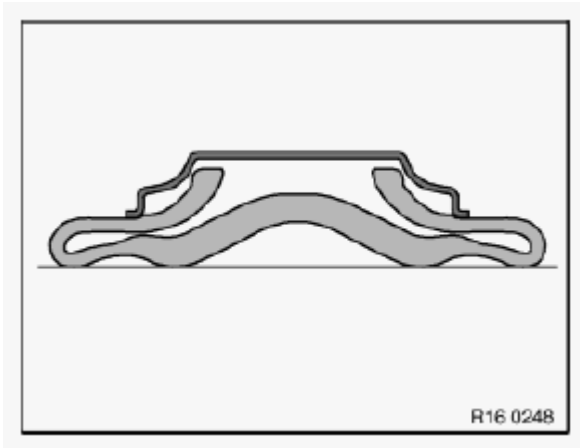


Fig. 37: Standard Tires, Unpressurized
Courtesy of BMW OF NORTH AMERICA, INC.

Self-supporting tires, unpressurized

Envulcanised reinforcement (1) made of a temperature-resistant rubber compound.

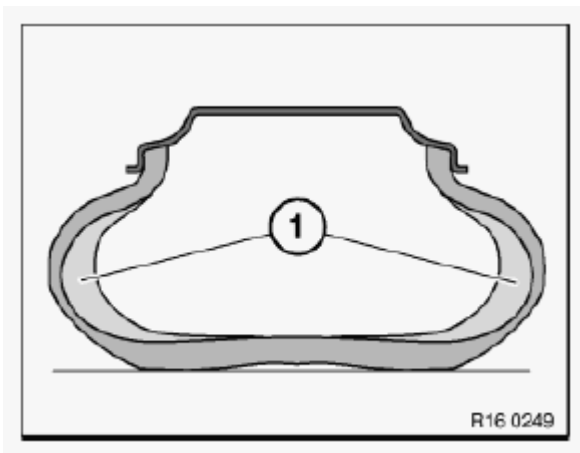


Fig. 38: Identifying Envulcanised Reinforcement
Courtesy of BMW OF NORTH AMERICA, INC.

DISC WHEELS

H2 disc wheel (standard disc wheel) for emergency running system with integrated support ring

1. Hump 2 of standard disc wheel

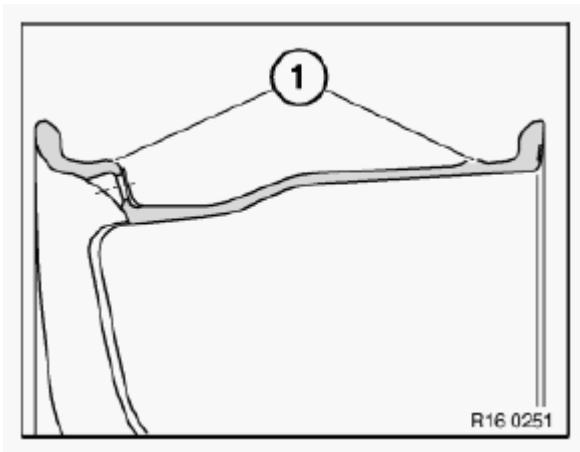


Fig. 39: Hump 2 Of Standard Disc Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

EH2 disc wheel for emergency running system with self-supporting tire

1. Extended Hump 2 of disc wheel
2. Drop center relocated a few millimeters to the center (precentering on outside)

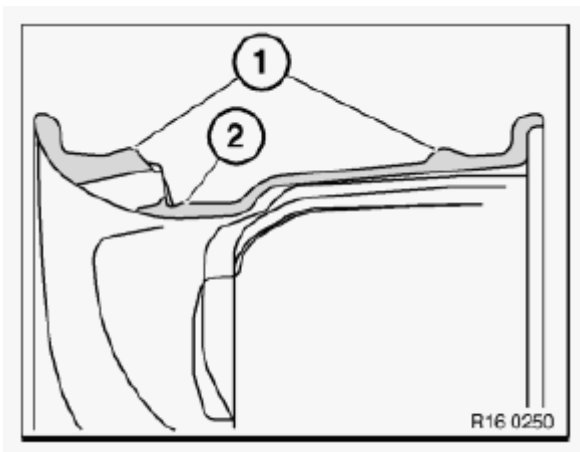


Fig. 40: Extended Hump 2 Of Disc Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The new EH2 disc wheels (extended Hump 2 inner and outer) will be used more frequently on BMW vehicles in the future as they can also help to delay standard tires from being lost in the event of a drop in tire pressure.

Example: from current 1.1 bar to 0.6 bar (X5 or Landrover disc wheel)

Emergency running system with integrated support ring

(In the future, primarily on heavy safety vehicles)

The support ring is made of a high-strength resilient plastic and is fitted on the disc wheel inside the tire. The support ring can only be removed using special tools which have been specially approved by BMW. It can only be removed after destroying the tire.

Emergency running systems with integrated support ring are used in particular on heavy safety vehicles. They allow the vehicle to be driven away from a potential danger without dropping speed even if the tires have suffered a complete loss of pressure (flight situation).

It is possible as an option to have the tire pressure monitored by an RDC system. The RDC is installed by pressing the components into the support ring before it is fitted.

Wheel structure with integrated support ring

Emergency running system with integrated support ring

1. Tyre
2. Support ring

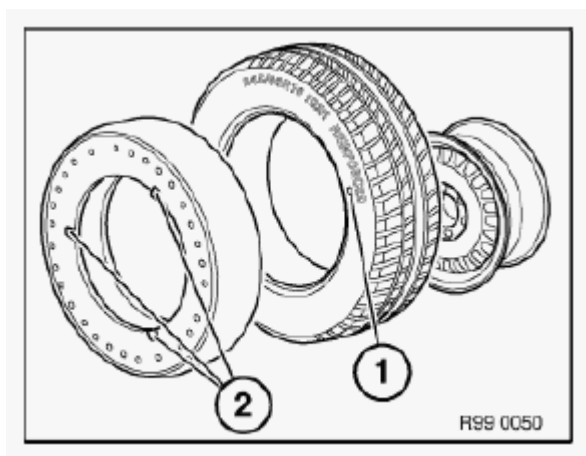


Fig. 41: Tyre And Support Ring

Courtesy of BMW OF NORTH AMERICA, INC.

Installation location of RDC wheel electronic unit

1. Wheel electronic unit
2. Support ring

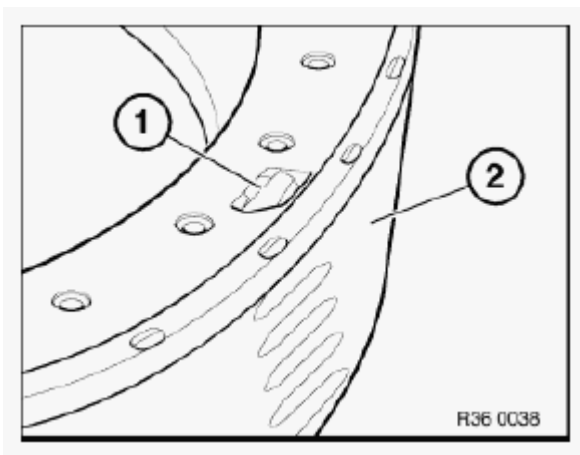


Fig. 42: Wheel Electronic Unit And Support Ring
Courtesy of BMW OF NORTH AMERICA, INC.

For further information on the subject of "Tyre pressure warning systems and tires with emergency running characteristics", please refer to the vehicle Owner's Handbook.

A Parts Information bulletin will be published with information on how to order parts.

Functional and system descriptions are not subject to change. Parts availability and immediate ordering availability cannot be derived from this information. The specialized departments will inform the markets with further details at the appropriate time.

VS-23/Hack Baugruppe/Group: 36 weltweit 11/1999

36 04 99 (502) all countries

STORING WHEELS AND TIRES

all models

WHEELS / TIRES - GENERAL NOTES

The service of storing a customer's wheels is one which is now almost taken for granted. For this reason, we have published this BMW Technical Service bulletin to provide a uniform storage concept, which will prevent damage being caused due to incorrect storage.

The tire's rubber will age under the influence of sunlight, heat, humidity, movements in the air and ozone, and will thus lose some of its stability and elasticity. For this reason, tires should never be stored in the open-air. If open-air storage cannot be avoided, the wheels / tires must be stored in a clean and dry condition and covered with waterproof material. It is essential that wheels / tires are protected against rain, snow and sunlight, but due to the risk of corrosion they must not be stored in tire sacks.

Wheels / tires with tire pressure control (RDC) must not be cleaned with high-pressure cleaning equipment.

Storage requirements

The following requirements apply in general to storage in enclosed rooms:

STORAGE REQUIREMENTS

cool	15...25 °C / sources of heat screened, or 1 m minimum distance from source of heat
dry	Prevent water and condensation Avoid contact with mineral lubrication products
dark	Protect from direct sunlight and high-UV artificial light
moderate ventilation	Avoid a supply of oxygen and ozone

In short, the storage room should be cool and dry. It is not necessary to heat the room during the winter. In the summer, the doors and windows should be kept closed to ensure that no air can circulate. In addition, the windows can also be coated with sun protection paint.

The storage room should not contain any working electric machinery, welding equipment, distribution boxes etc. as electrical sparks generate ozone which can have a serious impact on the surface of the tire (ozone cracks).

Tires should not be allowed to come into contact with oil, petrol, or other mineral lubricants as these dissolve rubber, making the tire porous.

Preparing wheels / tires

1. Before removing a wheel, mark its position on the vehicle.
2. Whenever possible, keep the tire on its wheel (complete wheels).
3. Correct the inflation pressure and recheck every 2 months.
4. Ensure that tires are stored at a sufficient distance above the ground. Wheels / tires should never be stored on the ground.
5. Complete the storage forms. These should contain the following data:
 - Type and size of tire
 - Condition and tread depth
 - Customer's address
 - Date and signature of customer

Wheel / tire storage requirements

A. Tyre fitted to wheel

Do not store upright,...

NOTE: If storing the wheels upright cannot be avoided, the inflation pressure must be increased to 3.5 bar.

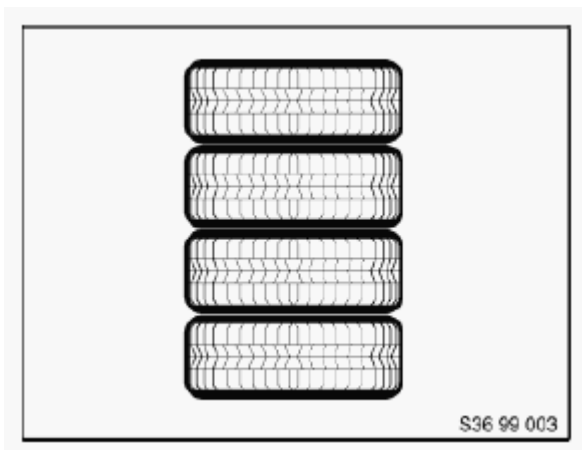


Fig. 45: Precaution For Storing Wheels And Tires - Stack
Courtesy of BMW OF NORTH AMERICA, INC.

B. Tires not fitted

Do not stack,...

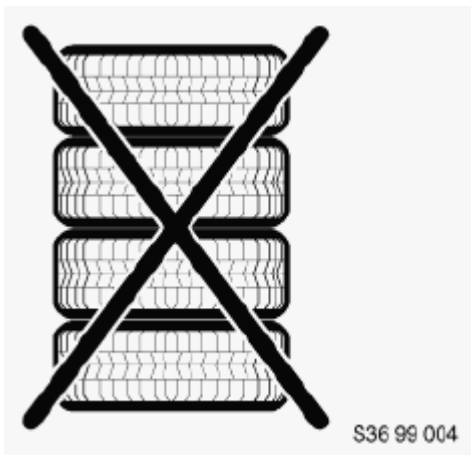


Fig. 46: Precaution For Storing Wheels And Tires - Do Not Stack
Courtesy of BMW OF NORTH AMERICA, INC.

... do not hang,...

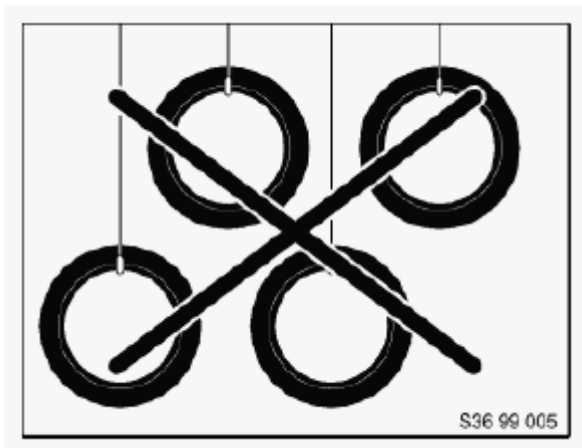


Fig. 47: Precaution For Storing Wheels And Tires - Do Not Hang
Courtesy of BMW OF NORTH AMERICA, INC.

... but rather store them upright and turn them every 4 weeks.

NOTE: **Never store tires on the ground.**
 Use commercially available shelves.

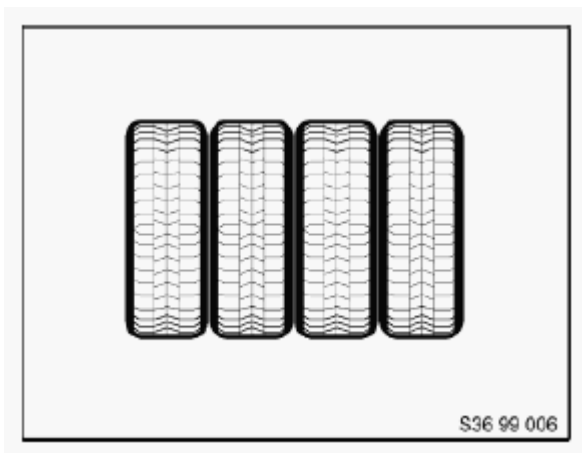


Fig. 48: Precaution For Storing Wheels And Tires - Store Upright
Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION

Manual Transmission - Special Tools - X3

23 MANUAL TRANSMISSION

23 0 000 ATTACHMENT

Note: For car jack, for removing and installing manual and automatic transmissions

Order number: 23 0 000

Attachment

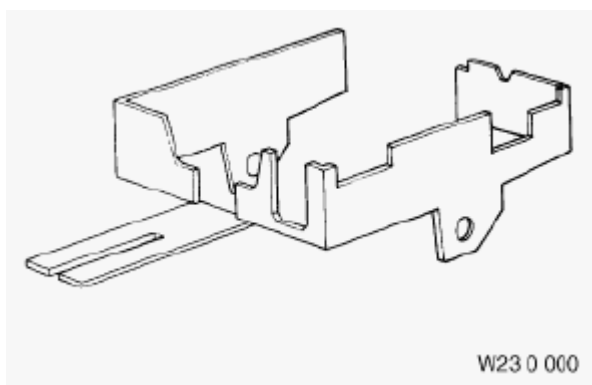


Fig. 1: Attachment (23 0 000)

Courtesy of BMW OF NORTH AMERICA, INC.

23 0 020 HOLDER

Minimum set: Mechanical tools

Note: For all three- and four-hole flanges during releasing and tightening down

Series: E38, E39, E46, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E83, E85, E86, E87, E90, E91, E92

Transmission: A4S 200R, A5S 360R, A5S 390R, GA6 HP19Z, GS6-17BG, rear diff. type M, S5D 200G, S5D 250G

Storage location: A5, B5, C5

Order number: 23 0 020

Holder



Fig. 2: Holder (23 0 020)

Courtesy of BMW OF NORTH AMERICA, INC.

23 0 030 SUPPORT

Note: For Getrag transmission

Transmission: 280/5 Sport

Order number: 23 0 030

Support

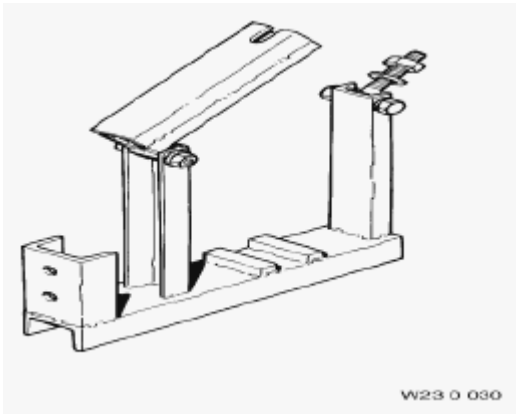


Fig. 3: Support (23 0 030)

Courtesy of BMW OF NORTH AMERICA, INC.

23 0 040 SUPPORT

In conjunction with: 00 2 030

Note: For transmissions for removal and installation. Replaced by 23 0 110.

Transmission: S6S 420G, S6S 560G

SI number: 1 05 90(207)

Order number: 23 0 040

Support

Consisting of:

1 = 23 0 041 Locating cage

Note: Transmission: S6S 560G

2 = 23 0 042 Support bracket

Note: Transmission: S6S 420G

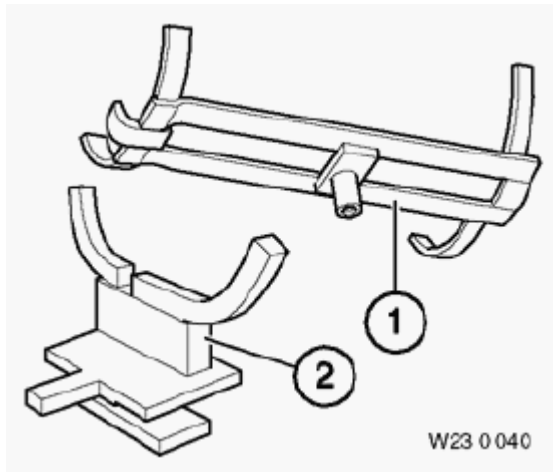


Fig. 4: Support (23 0 040)

Courtesy of BMW OF NORTH AMERICA, INC.

23 0 050 SUPPORT

In conjunction with: 00 1 450

Note: For all 4-speed and 5-speed transmissions

Transmission: 242/4

Order number: 23 0 050

Support

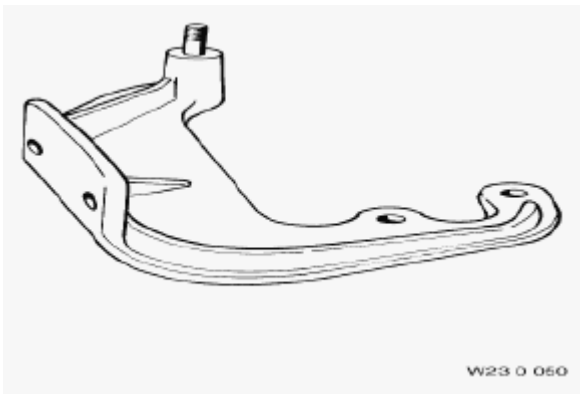


Fig. 5: Support (23 0 050)

Courtesy of BMW OF NORTH AMERICA, INC.

23 0 060 SUPPORT

In conjunction with: 00 1 450

Note: For Getrag transmission

Transmission: 245/5, 245/5 Sport

Order number: 23 0 060

Support

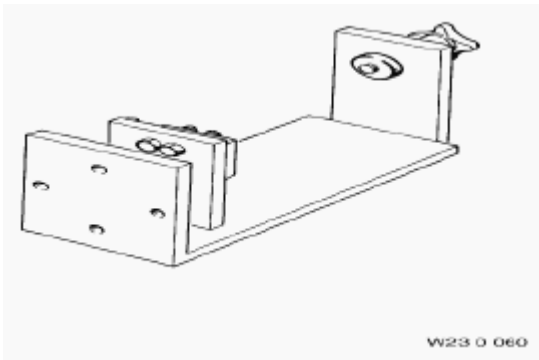


Fig. 6: Support (23 0 060)

Courtesy of BMW OF NORTH AMERICA, INC.

23 0 070 MOUNTING BRACKET

In conjunction with: 00 1 450

Note: For Getrag transmission

Transmission: 265/5, 265/5 Sport

Order number: 23 0 070

Mounting bracket

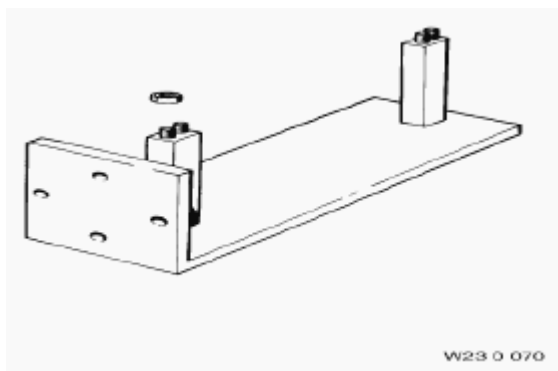


Fig. 7: Mounting Bracket (23 0 070)

Courtesy of BMW OF NORTH AMERICA, INC.

23 0 080 FIXTURE

Note: For removing 5th gear wheel

Transmission: 265/5, 265/5 Sport, 280/5 Sport

Order number: 23 0 080

Fixture

Consisting of:

23 0 081 Puller jaws (2)

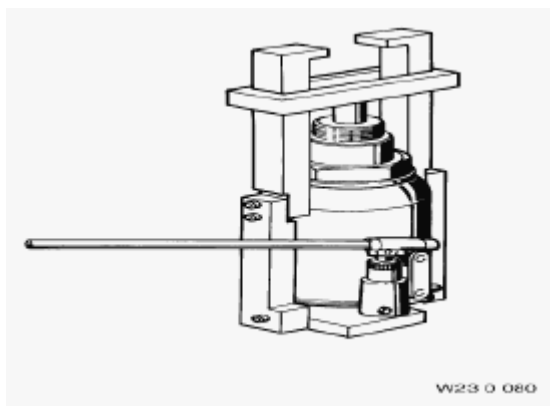


Fig. 8: Fixture (23 0 080)

Courtesy of BMW OF NORTH AMERICA, INC.

23 0 090 SUPPORT

In conjunction with: 00 1 450

Note: For ZF and Getrag transmissions

Transmission: 240/5, 260/5, ZF S5-16

Order number: 23 0 090

Support

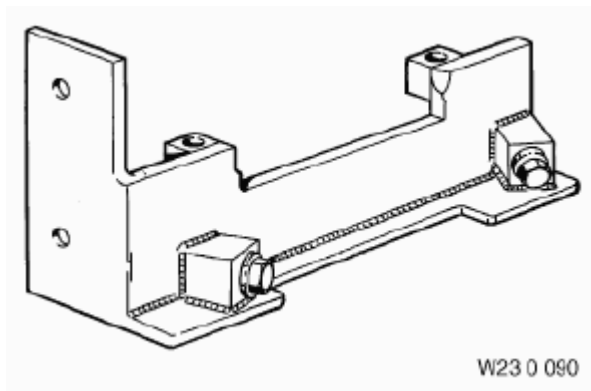


Fig. 9: Support (23 0 090)

Courtesy of BMW OF NORTH AMERICA, INC.

23 0 100 SUPPORT

In conjunction with: 00 1 450

Note: For mounting transmission on assembly stand

Transmission: S5D 200G, S5D 250G, S5D 260Z, S5D 310Z, S5D 320Z

SI number: 1 07 90 (244)

Order number: 23 0 100

Support

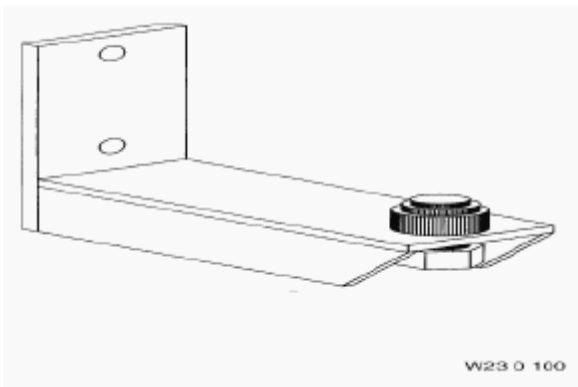


Fig. 10: Support (23 0 100)

Courtesy of BMW OF NORTH AMERICA, INC.

23 0 100 SUPPORT

In conjunction with: 00 2 030

Note: For removing and installing transmission.

Transmission: S6S 420G, S6S 560G

SI number: 1 02 00 (551)

Order number: 23 0 110

Support

Consisting of:

1 = 23 0 111 Take-up support

Note: Transmission: S6S 560G

2 = 23 0 112 Locating bracket (not shown)

Note: Transmission: S6S 420G

In conjunction with: 21 0 111 Take-up support

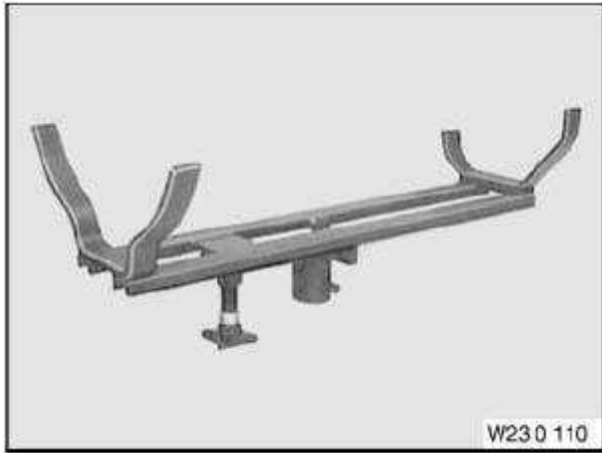


Fig. 11: Support (23 0 100)

Courtesy of BMW OF NORTH AMERICA, INC.

23 0 130 TAKE-UP SUPPORT FOR TRANSMISSION

In conjunction with: 00 2 030

Note: For accommodating transmission during removal and installation.

Series: E39, E46, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E83, E85, E86, E87, E90, E91, E92, E93

Transmission: GS6-17BG, GS6-37BZ, GS6-37DZ, GS6-53BZ, GS6-53DZ, GS7S47BG, S5D 280Z, S5D 320Z

SI number: 1 06 00 (575)

Order number: 23 0 130

Take-up support for transmission

Consisting of:

1 = 23 0 131 Basic body

2 = 23 0 132 Adjusting unit

3 = 23 0 133 Take-up support

Note: Transmission: S5D 280Z in E53

4 = 23 0 134 Take-up support

Note: Transmission: GS6-37BZ (Htransmission), GS6-17BG (i-transmission)

5 = 23 0 135 Take-up support

Note: Transmission: GS6-37BZ, GS6-53BZ SMG H-SMG

In conjunction with: 23 0 131 / 132, 23 0 134 (front take-up support)

6 = 23 0 136 Take-up support

Note: Transmission: GS6-53BZ, GS6-53DZ

7 = 23 0 137 Take-up support

Note: Transmission: GS6 37BZ, GS6 37DZ (H-transmission) in E87, E90.

In conjunction with: 23 0 131 / 132 / 134 / 136

23 0 138 Take-up support

Note: Transmission: GS6 37DZ (H-transmission) in E83/M47TU.

In conjunction with: 23 0 131 / 132 / 133

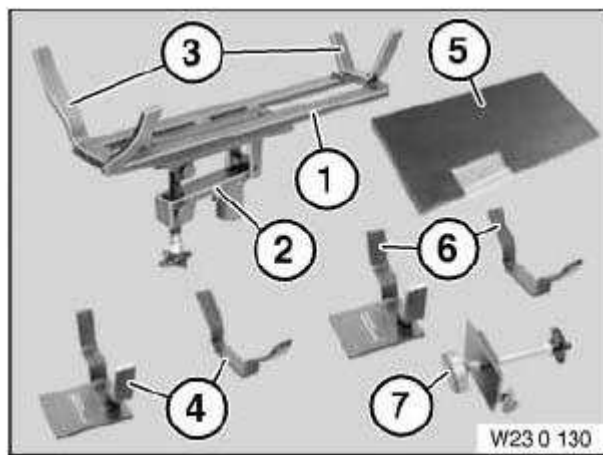


Fig. 12: Take-up Support For Transmission (23 0 130)
Courtesy of BMW OF NORTH AMERICA, INC.

23 0 139 Take-up support

Note: Transmission: GS7S47BG in E60/S85 (M5)

In conjunction with: 23 0 131 / 132 / 133

23 0 140 SUPPORT

In conjunction with: 00 2 030

Note: For accommodating transmission during removal and installation. Transmission: F-transmission

Transmission: S5D 320Z, S5D 390Z

SI number: 1 20 98(378)

Order number: 23 0 140

Support

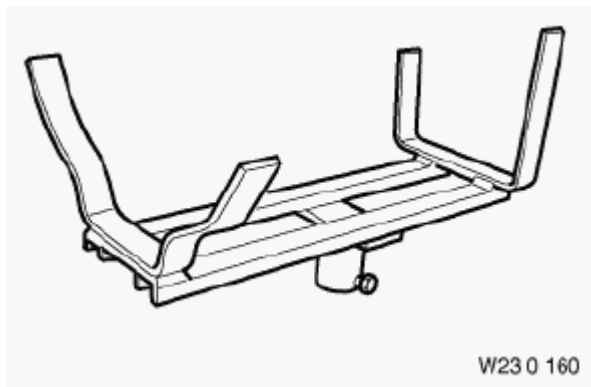


Fig. 13: Support (23 0 140)

Courtesy of BMW OF NORTH AMERICA, INC.

23 0 150 SUPPORT

In conjunction with: 00 1 450

Note: For accommodating transmission on assembly stand. For ZF transmission.

Transmission: ZF S5-16

Order number: 23 0 150

Support

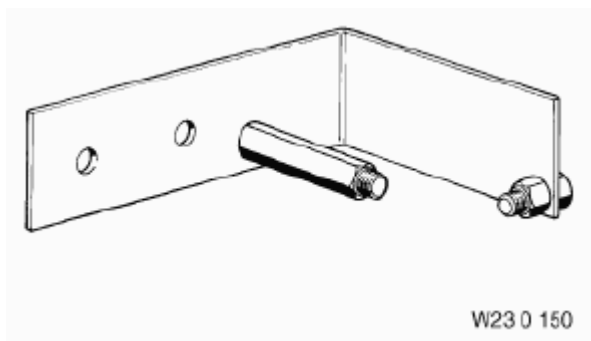


Fig. 14: Support (23 0 150)

Courtesy of BMW OF NORTH AMERICA, INC.

23 0 160 SUPPORT

In conjunction with: 00 1 450

Note: For Getrag transmission

Transmission: 262/4

Order number: 23 0 160

Support

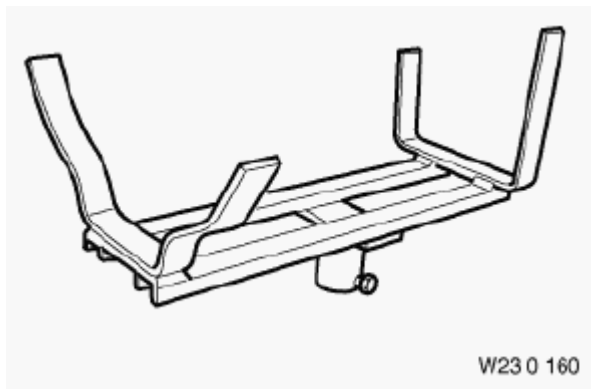


Fig. 15: Support (23 0 140)

Courtesy of BMW OF NORTH AMERICA, INC.

23 0 170 SUPPORT

In conjunction with: 00 1 450

Note: For mounting F-transmission on assembly stand

Transmission: S5D 390Z

SI number: 1 14 99(482)

Order number: 23 0 170

Support

Consisting of:

1 = 23 0 171 Basic body

2 = 23 0 172 Spindle (2)

Note: With handle

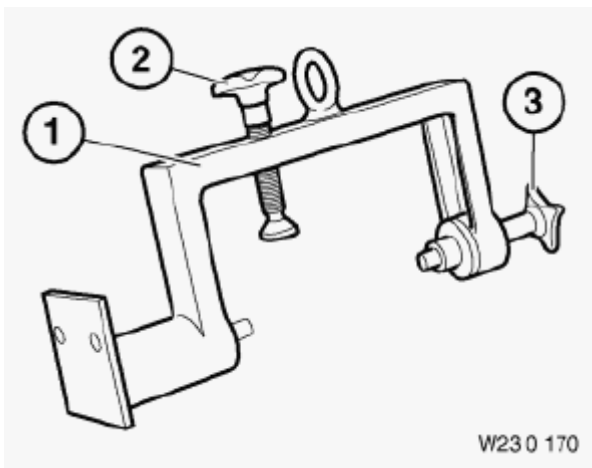


Fig. 16: Support (23 0 170)

Courtesy of BMW OF NORTH AMERICA, INC.

23 0 180 IMPACT RING WITH SLIP SLEEVE

Minimum set: Mechanical tools

In conjunction with: 23 2 491

Note: For driving in radial shaft seal on drive side - F transmission

Transmission: S5D 390Z

SI number: 1 14 99(482)

Order number: 23 0 180

Impact ring with slip sleeve

Consisting of:

1 = 23 0 181 Impact ring

2 = 23 0 182 Slip sleeve

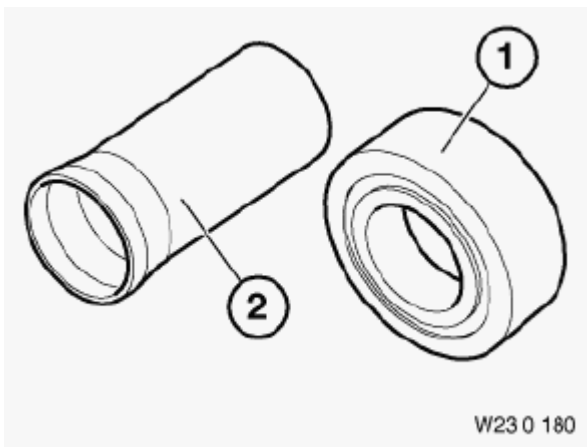


Fig. 17: Impact Ring With Slip Sleeve (23 0 180)
Courtesy of BMW OF NORTH AMERICA, INC.

23 0 190 IMPACT BUSH

Minimum set: Mechanical tools

Note: For driving in radial shaft seal on output side - F transmission

Transmission: S5D 280Z, S5D 320Z, S5D 390Z

Storage location: B39

SI number: 1 14 99(482)

Order number: 23 0 190

Impact bush

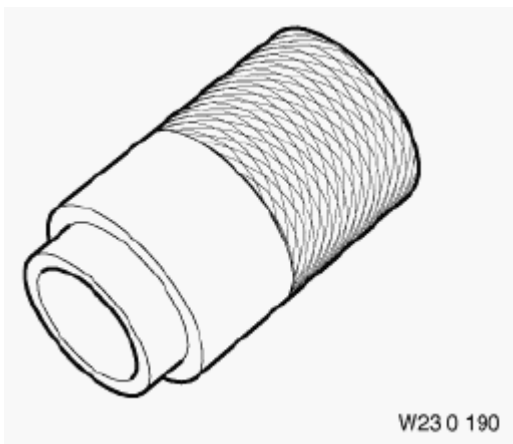


Fig. 18: Impact Bush (23 0 190)
Courtesy of BMW OF NORTH AMERICA, INC.

23 0 200 SOCKET 41 A/F

Minimum set: Mechanical tools

Note: Long version for releasing and tightening down output flange - F-transmission

Transmission: S5D 390Z

SI number: 1 14 99(482)

Order number: 23 0 200

Socket 41 A/F



Fig. 19: Socket 41 A/F (23 0 200)

Courtesy of BMW OF NORTH AMERICA, INC.

23 0 250 HOLDER

Minimum set: Mechanical tools

Note: Assistance in releasing and tightening down output flange

Transmission: GS5-39DZ, S5D 280Z, S5D 320Z

Storage location: B41

SI number: 1 06 00(575)

Order number: 23 0 250

Holder

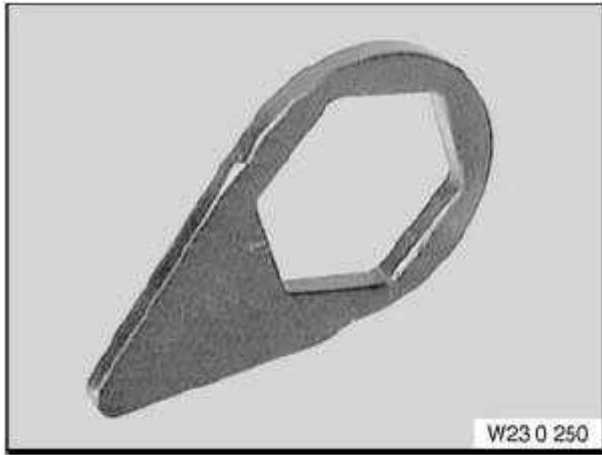


Fig. 20: Holder (23 0 250)

Courtesy of BMW OF NORTH AMERICA, INC.

23 0 370 DRIFT

Minimum set: Mechanical tools

Note: For driving in shaft seal on differential on left and right (output shaft).

Transmission: GS6-53BG, GS6-55BG

SI number: 01 23 06 (308)

Order number: 23 0 370

Drift



Fig. 21: Drift (23 0 370)

Courtesy of BMW OF NORTH AMERICA, INC.

23 0 490 EXTRACTOR

Note: For removing shaft seal

Series: E34, E34tou, E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E53, E60, E61, E63, E64, E70, E83, E85, E87, E90, E91, E92, R50, R52

Transmission: GS5-39DZ, GS5-65BH, GS6-17BG, GS7S47BG, S5D 200G, S5D 250G, S5D 260Z, S5D 280Z, S5D 310Z, S5D 320Z, S5D 390Z, S6S 420G, S6S 560G

Storage location: B6, C6

SI number: 1 15 96 (106)

Order number: 23 0 490

Extractor

Consisting of:

1 = 23 0 491 Rod

Note: With self-tapping screw

2 = 23 0 492 Impact weight

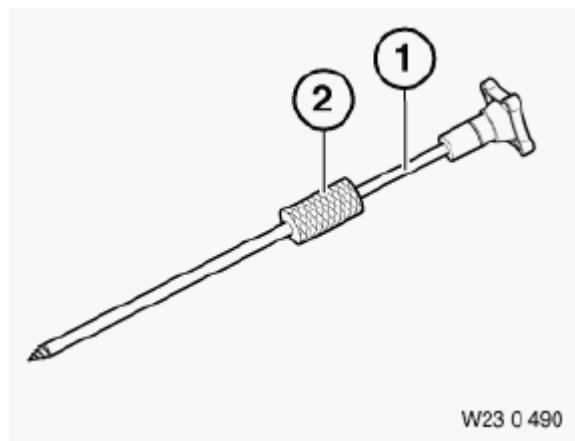


Fig. 22: Extractor (23 0 490)

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 000 FIXTURE

Note: For pressing-on transmission casing and deep groove ball bearing on transmission input shaft and in transmission casing

Transmission: 240/5, 242/4, 245/5, 245/5Sport, 260/5, 262/4, 265/5, 265/5Sport, 280/5Sport, 3 HP 12, 3 HP 20,

3 HP 22, 4 HP 22, 4 HP 24, A4S 270R, A4S 310R, A5S 300J, A5S 310Z, A5S 440Z, A5S 560Z, BW 65, S5D 260Z

Storage location: C15, C16

Order number: 23 1 000

Fixture

Consisting of:

1 = 23 1 001 Sleeve

2 = 23 1 002 Dowel pin (2 x)

3 = 23 1 003 Thrust piece, long

4 = 23 1 004 Thrust piece, short

5 = 23 1 005 Handle

7 = 23 1 007 Thrust piece for Getrag transmissions

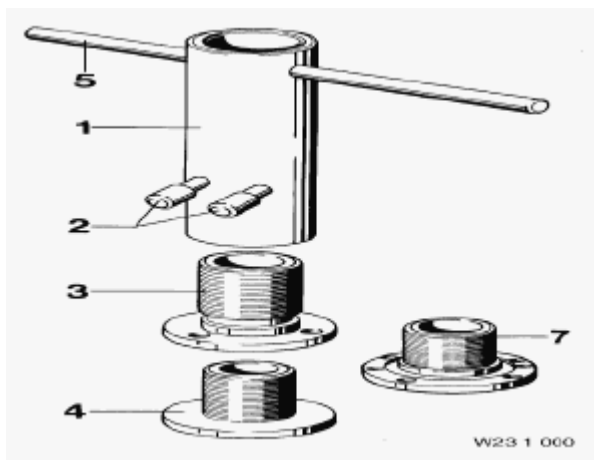


Fig. 23: Fixture (23 1 000)

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 010 FITURE FOR REMOVING REAR SECTION OF TRANSMISSION CASING

Transmission: 280/5 Sport

Order number: 23 1 010

Fixture for removing rear section of transmission casing

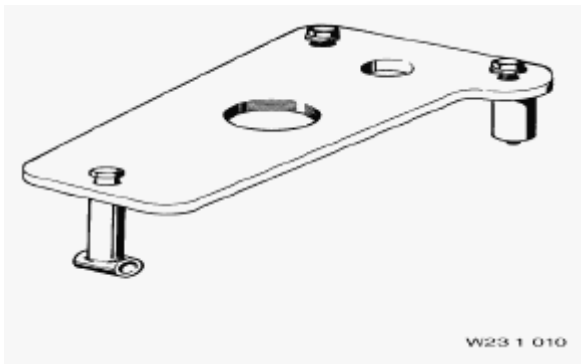


Fig. 24: Fixture For Removing Rear Section Of Transmission Casing (23 1 010)
Courtesy of BMW OF NORTH AMERICA, INC.

23 1 020 FIXTURE FOR REMOVING TRANSMISSION CASING (FRONT AND REAR SECTION)

In conjunction with: 33 1 301

Transmission: 245/5 Sport

Storage location: C32

Order number: 23 1 020

Fixture for removing transmission casing (front and rear section)



Fig. 25: Fixture For Removing Transmission Casing (23 1 020)
Courtesy of BMW OF NORTH AMERICA, INC.

23 1 030 DRIFT FOR FITTING INNER BEARING RACE ON COUNTERSHAFT

Transmission: 245/5, 265/5

Storage location: C22

Order number: 23 1 030

Drift for fitting inner bearing race on countershaft



Fig. 26: Drift For Fitting Inner Bearing Race On Countershaft (23 1 030)
Courtesy of BMW OF NORTH AMERICA, INC.

23 1 040 DRIFT

Note: For mounting sliding section (5th gear) and driving water pipe out of crankcase Engine: N73

Transmission: 245/5Sport, S5D 200G, S5D 250G

Storage location: C23

Order number: 23 1 040

Drift



Fig. 27: Drift (23 1 040)
Courtesy of BMW OF NORTH AMERICA, INC.

23 1 050 PULLER (KUKKO)

Note: For 5th gear as well as reverse gear wheel

Transmission: 240/5, 245/5, 260/5, 265/5Sport, 280/5Sport, S5D 260Z, S5D 310Z, S5D 320Z, ZF S5 -16

Order number: 23 1 050

Puller (Kukko)

Consisting of:

1 = 23 1 051 Claw

23 1 060 FIXTURE

In conjunction with: 33 1 301

Note: For removing inner bearing race - reverse gear wheel

Transmission: 245/5, 265/5 Sport

Storage location: B20

Order number: 23 1 060

Fixture

Consisting of:

1 = 23 1 061 Shells (2)

2 = 23 1 062 Threaded ring

3 = 23 1 063 Holding sleeve

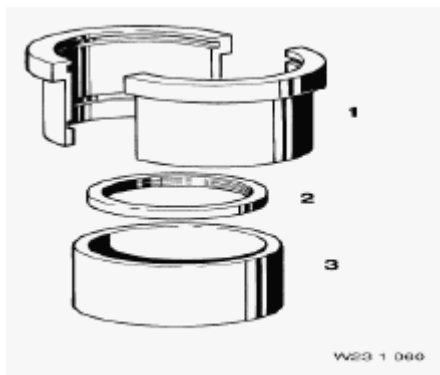


Fig. 28: Fixture (23 1 060)

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 070 MEASURING RING

Note: For determining shim ring between outer bearing race and circlip of countershaft

Transmission: 245/5

Storage location: B28

Order number: 23 1 070

Measuring ring



Fig. 29: Measuring Ring (23 1 070)

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 080 DRIFT

In conjunction with: 00 5 500

Note: For removing and installing outer bearing race in front section of transmission casing/centre section of countershaft and of ball bearing in rear section of transmission casing, input shaft

Transmission: 245/5, 265/5

Storage location: A28

Order number: 23 1 080

Drift



Fig. 30: Fixture (23 1 060)

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 090 DRIFT

In conjunction with: 00 5 500

Note: For removing and installing outer bearing race of input shaft in front section of transmission casing

Transmission: 245/5, 265/5, GS5-65BH

Storage location: A28

Order number: 23 1 090

Drift



Fig. 31: Drift (23 1 090)

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 100 PULLER CLAWS

In conjunction with: 00 7 500

Note: For speedometer gear

Transmission: 245/5, 265/5, 280/5Sport

Storage location: B29

Order number: 23 1 100

Puller claws

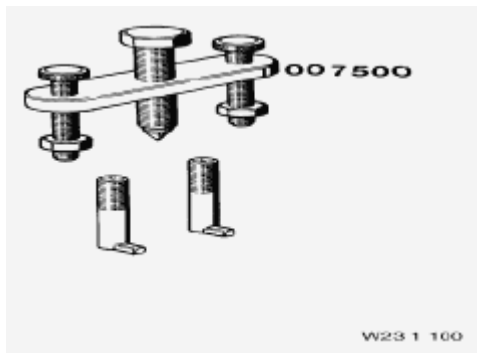


Fig. 32: Puller Claws (23 1 100)

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 110 DRIFT

In conjunction with: 00 5 500

Note: For installing bearing of output shaft in rear section of transmission casing

Transmission: 245/5

Storage location: A28

Order number: 23 1 110

Drift

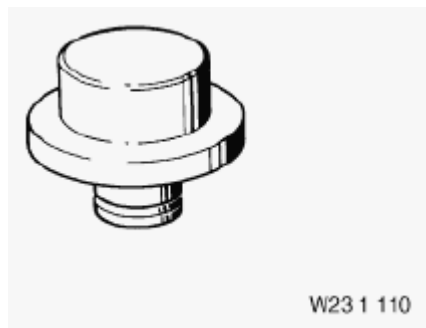


Fig. 33: Drift (23 1 110)

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 120 DRIFT

In conjunction with: 00 5 500

Note: For removing outer bearing race of countershaft in centre section of transmission casing

Transmission: 240/5, 245/5, 260/5, 280/5Sport, ZF S5-16

Storage location: A29

Order number: 23 1 120

Drift



Fig. 34: Drift (23 1 120)

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 130 DRIFT

Note: For removing bearing of input shaft and roller bearing in centre section of transmission casing

Transmission: 245/5, 280/5Sport

Storage location: A29

Order number: 23 1 130

Drift

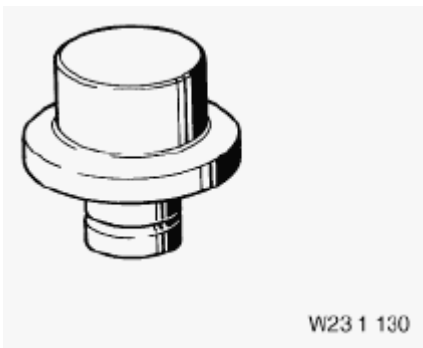


Fig. 35: Drift (23 1 130)

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 170 FIXTURE

Note: For removing front section of transmission casing

Transmission: 265/5

Order number: 23 1 170

Fixture

Consisting of:

1 = 23 1 171 Plate

2 = 23 1 172 Knurled screw (3)

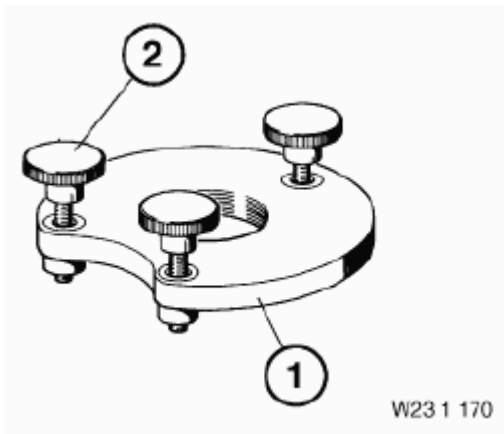


Fig. 36: Fixture (23 1 170)

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 180 DRIFT

In conjunction with: 00 0 500

Note: For fitting rotary shaft seal in guide tube of clutch release mechanism

Transmission: 260/5, 265/5, 265/5Sport, 280/5Sport

Storage location: A29

Order number: 23 1 180

Drift

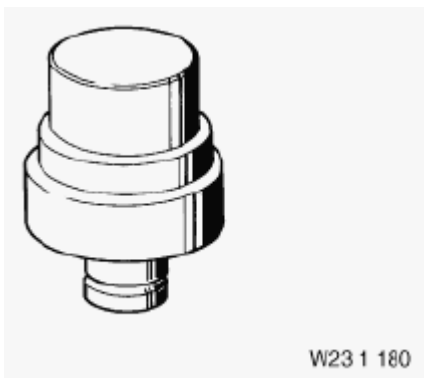


Fig. 37: Drift (23 1 180)

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 190 DRIFT

In conjunction with: 00 5 500

Note: For removing and installing ball bearing of input shaft in front section of transmission casing

Transmission: 265/5, 280/5 Sport

Order number: 23 1 190

Drift

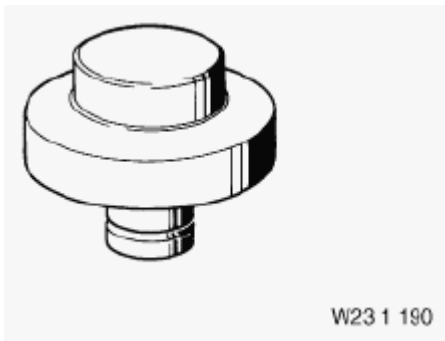


Fig. 38: Drift (23 1 190)

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 200 GUIDE BUSH

In conjunction with: 23 1 210

Note: For centering wrench socket when releasing and tightening transmission output flange and input flange of rear axle differential

Transmission: 265/5

Storage location: B30

Order number: 23 1 200

Guide bush



Fig. 39: Guide Bush (23 1 200)

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 220 DRIFT

In conjunction with: 00 5 500

Note: For removing and installing roller bearing of countershaft shaft in front section of transmission casing

Transmission: 260/5, 265/5, A5S 310Z

Storage location: A29

Order number: 23 1 220

Drift

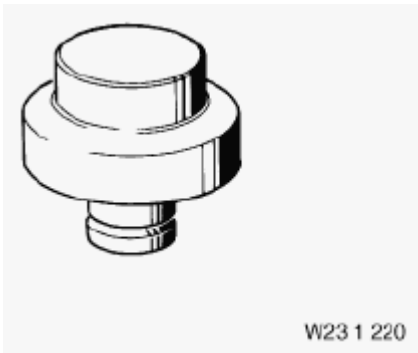


Fig. 40: Drift (23 1 220)

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 230 SPINDLE (2)

In conjunction with: 00 7 500

Note: For removing inner bearing race from input shaft in front section of transmission casing

Transmission: 265/5

Order number: 23 1 230

Spindle (2)

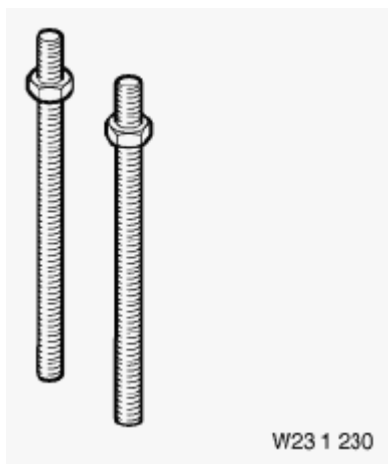


Fig. 41: Spindle (23 1 230)

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 240 DRIFT

Minimum set: Mechanical tools

Note: For fitting rotary shaft seal on gearshift shaft

Transmission: 240/5, 242/4, 245/5, 245/5Sport, 260/5, 262/4, 265/5, 265/5Sport, 280/5Sport, 3 HP 12, 3 HP 20, 3 HP 22, 4 HP 22, 4 HP 24, A4S 270R, A4S 310R, A5S 300J, A5S 310Z, A5S 440Z, A5S 560Z, BW 65, S5D 200G, S5D 250G, S6S 420G, ZF S5-16

Storage location: A20

Order number: 23 1 240

Drift



Fig. 42: Drift (23 1 240)

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 270 DRIFT

In conjunction with: 00 5 500

Note: For removing outer bearing race on countershaft in front section of transmission casing as well as for removing seal and needle bearing from oil pump housing (A5S 560Z)

Transmission: 240/5, 260/5, A5S 560Z

Storage location: A29

Order number: 23 1 270

Drift



Fig. 43: Drift (23 1 270)

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 300 FIXTURE

Minimum set: Mechanical tools

In conjunction with: 23 2 150

Note: For fitting output flange on all manual and automatic transmissions, for installing deep groove ball bearing on transmission output shafts and for fitting input flange on all rear axle differentials

Series: E36, E36/2, E36/3, E36/5, E36/7, E36/C, E38, E39, E46, E52, E53, E60, E61, E63, E64, E65, E66, E67, E83, E85, E86, E87, E90, E91, E92

Transmission: HAG 188kom, HAG 220kom, HAG 225kom, HAG Type G, HAG Type K, HAG Type M, S5D 200G, S5D 250G

Storage location: B15, B16

Order number: 23 1 300

Fixture

Consisting of:

1 = 23 1 301 Adapter

2 = 23 1 302 Support disk

Note: For pressing drive flange onto rear differential

In conjunction with: 33 1 341, 23 1 300

3 = 23 1 303 Mandrel

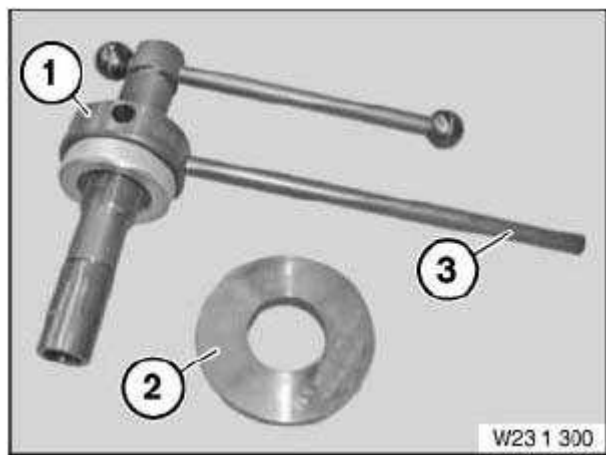


Fig. 44: Fixture (23 1 300)

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 310 TOOL

Note: For fitting locking device on deflection lever

Transmission: 280/5 Sport

Order number: 23 1 310

Tool

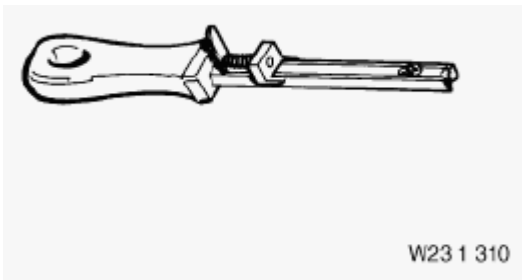


Fig. 45: Tool (23 1 310)

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 350 PULLER FIXTURE

In conjunction with: 33 1 301

Note: For rear section of transmission casing

Transmission: 265/5

Order number: 23 1 350

Puller fixture

Consisting of:

1 = 23 1 351 Plate

2 = 23 1 352 Screw, short (2)

3 = 23 1 353 Screw, long (2)

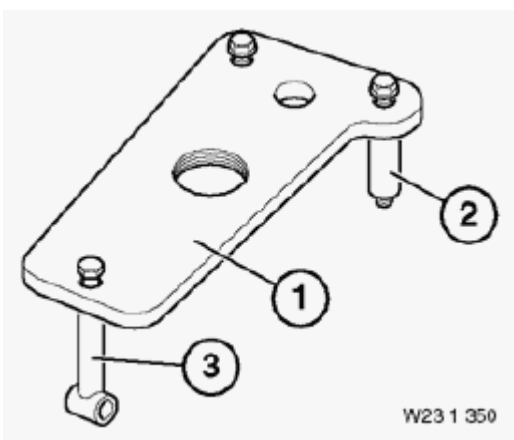


Fig. 46: Puller Fixture (23 1 350)

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 360 DRIFT

In conjunction with: 00 5 500

Note: For fitting rotary shaft seal on transmission input shaft

Transmission: 240/5, 245/5, 262/4, ZF S5-16

Storage location: A35

Order number: 23 1 360

Drift

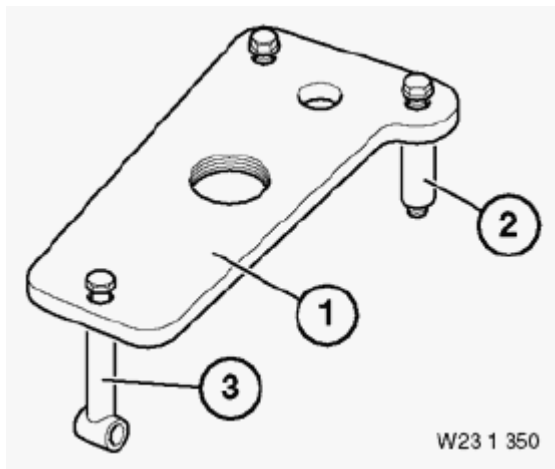


Fig. 47: Drift (23 1 360)

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 370 DRIFT

Note: For fitting rotary shaft seals on transmission output flanges

Transmission: 242/4, 262/4, 265/5, 265/5Sport

Storage location: B28

Order number: 23 1 370

Drift

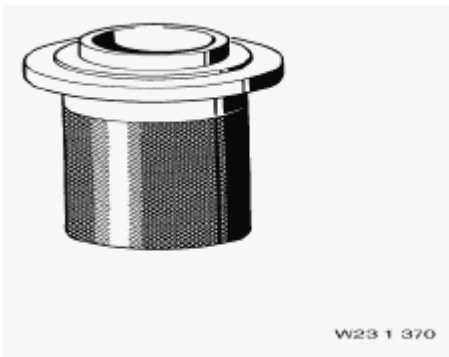


Fig. 48: Drift (23 1 370)

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 380 DRIFT

In conjunction with: 00 0 500

Note: For installing roller bearing of countershaft shaft in rear section of transmission casing

Transmission: 240/5, 245/5, 260/5, 280/5Sport

Storage location: B30

Order number: 23 1 380

Drift

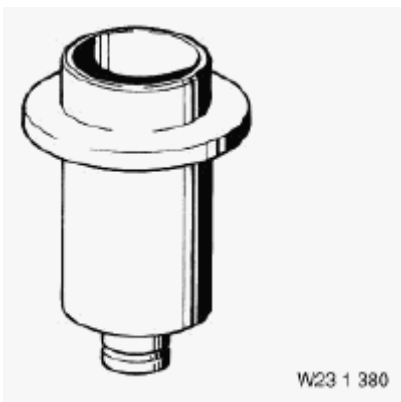


Fig. 49: Drift (23 1 380)

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 390 DRIFT

In conjunction with: 00 5 500

Note: For installing roller bearing of countershaft shaft in rear section of transmission casing

Transmission: 265/5, 280/5 Sport

Storage location: A29

Order number: 23 1 390

Drift

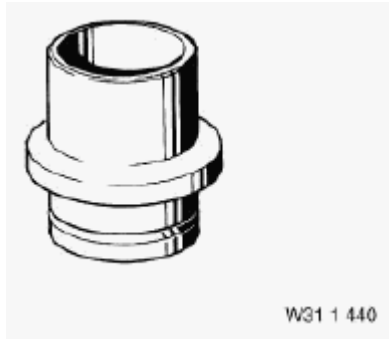


Fig. 50: Drift (23 1 390)

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 400 FIXTURE

Note: For fitting rotary shaft seal in bush of speedometer pinion

Transmission: 242/4, 262/4

Order number: 23 1 400

Fixture

Consisting of:

1 = 23 1 401 Fitting shaft

2 = 23 1 402 Radial plug

3 = 23 1 403 Union sleeve

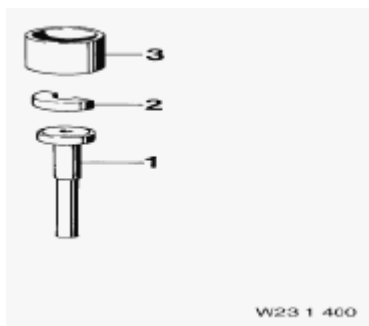


Fig. 51: Fixture (23 1 40)

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 410 DRIFT

In conjunction with: 00 5 500

Note: For fitting ball bearing of output shaft in rear section of transmission casing and roller bearing of output shaft in centre section of transmission casing

Transmission: 260/5, 265/5

Storage location: A29

Order number: 23 1 410

Drift



Fig. 52: Drift (23 1 410)

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 420 FIXTURE

In conjunction with: 33 1 301

Note: For removing slide (5th gear)

Transmission: 265/5

Storage location: C31

Order number: 23 1 420

Fixture

Consisting of:

23 1 421 Clamping screw

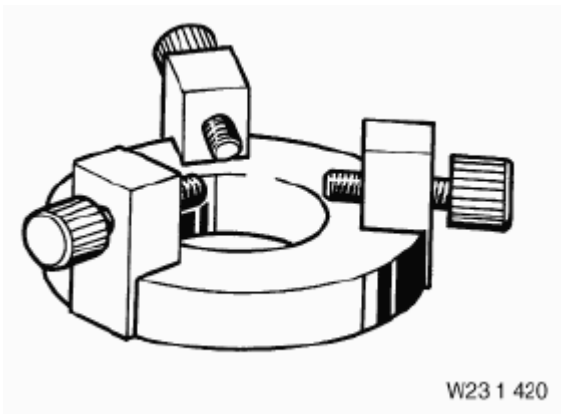


Fig. 53: Fixture (23 1 420)

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 430 THRUST PIECE

Note: For fitting 5th gear wheel

Transmission: 265/5, 280/5 Sport

Storage location: A35

Order number: 23 1 430

Thrust piece

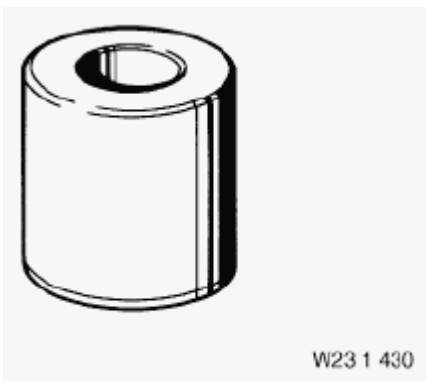


Fig. 54: Thrust Piece (23 1 430)

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 440 HOLDING SLEEVE

Note: For fitting bearing bush and inner bearing race on output shaft as well as for removing bearing on output shaft (S5D 310Z)

Transmission: 265/5, 265/5Sport, 280/5Sport, S5D 310Z

Storage location: C22, C23

Order number: 23 1 440

Holding sleeve

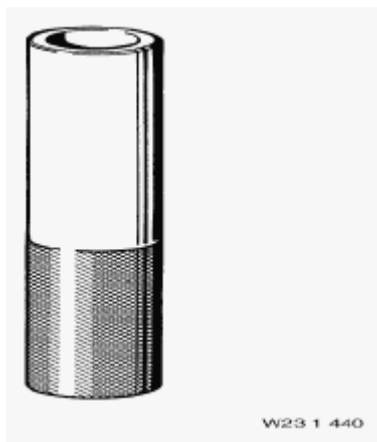


Fig. 55: Holding Sleeve (23 1 440)

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 450 GUIDE PINS (2 X)

Note: For fitting bearing bush in locking device of guide sleeve

Transmission: 245/5, 265/5

Storage location: C3

Order number: 23 1 450

Guide pins (2 x)



Fig. 56: Guide Pins (2 X) (23 1 450)

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 460 PULLER PLATE

In conjunction with: 33 1 301

Note: For front section of transmission casing

Transmission: 260/5, 280/5Sport, ZF S5-16

Storage location: A27

Order number: 23 1 460

Puller plate

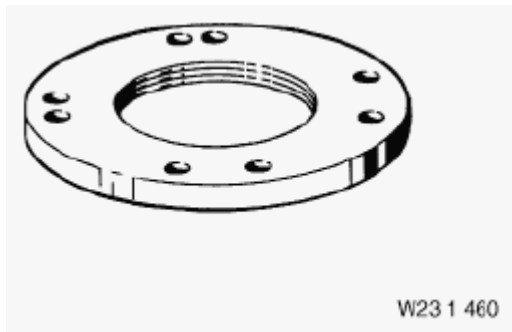


Fig. 57: Puller Plate (23 1 460)

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 480 DRIFT

In conjunction with: 00 5 500

Note: For removing and installing deep groove ball bearing in front section of transmission casing

Transmission: 240/5, 242/4, 260/5, 280/5Sport

Storage location: A29

Order number: 23 1 480

Drift

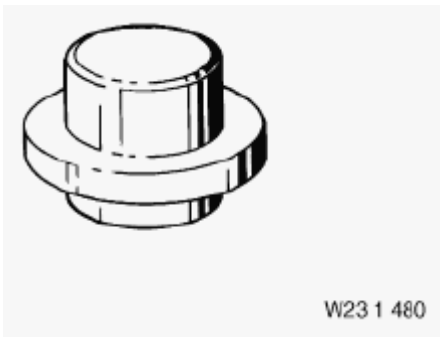


Fig. 58: Drift (23 1 480)

Courtesy of BMW OF NORTH AMERICA, INC.

23 1 490 FIXTURE

Note: For removing gear wheels

Transmission: 240/5, 260/5, 280/5Sport, S5D 200G, ZF S5-16

Order number: 23 1 490

Fixture

Consisting of:

23 1 491 Spacer

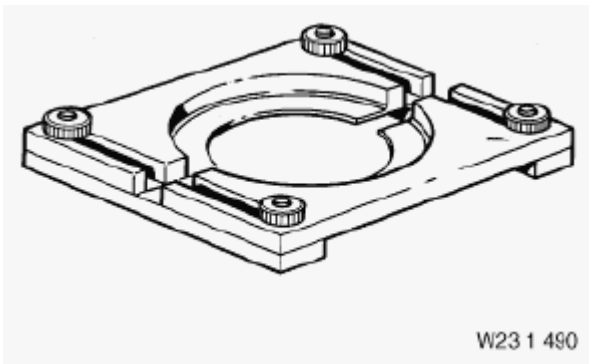


Fig. 59: Fixture (23 1 490)

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 000 RILLEX BALL BEARING EXTRACTOR 6206

Note: 9 balls with steel cage - for removing deep groove ball bearing of transmission input shaft

Order number: 23 2 000

Rillex ball bearing extractor 6206

Consisting of:

1 = 23 2 001 Claw for Rillex 6206 (9 x)

2 = 23 2 002 Union sleeve

3 = 23 2 003 Pressure spindle

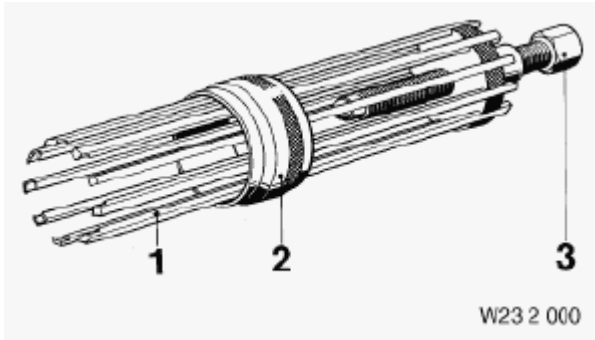


Fig. 60: Rillex Ball Bearing Extractor 6206 (23 2 000)
Courtesy of BMW OF NORTH AMERICA, INC.

23 2 010 RELLEX BALL BEARING EXTRACTOR 6206 E

Note: 8 balls with plastic cage - for removing deep groove ball bearing of transmission input shaft

Transmission: 242/4, 245/5Sport, 265/5

Order number: 23 2 010

Rillex ball bearing extractor 6206 E

Consisting of:

1 = 23 2 011 Claw for Rillex 6206 E (8)

2 = 23 2 012 Union sleeve

3 = 23 2 013 Pressure spindle

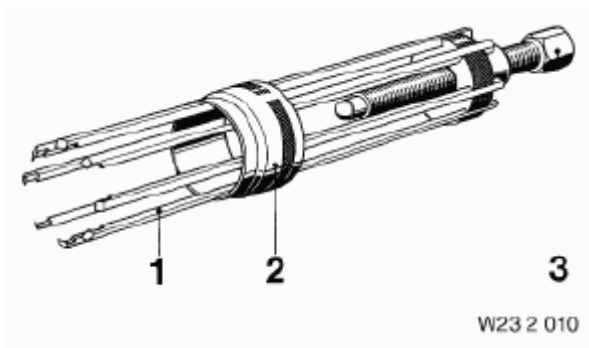


Fig. 61: Rellex Ball Bearing Extractor 6206 E (23 2 010)
 Courtesy of BMW OF NORTH AMERICA, INC.

23 2 020 RILLEX BALL BEARING EXTRACTOR

Note: 7 balls - for removing deep groove ball bearing of transmission input shaft

Transmission: 245/5 Sport, 265/5 Sport

Order number: 23 2 020

Rillex ball bearing extractor

Consisting of:

1 = 23 2 021 Claw for Rillex (7)

2 = 23 2 022 Union sleeve

3 = 23 2 023 Pressure spindle

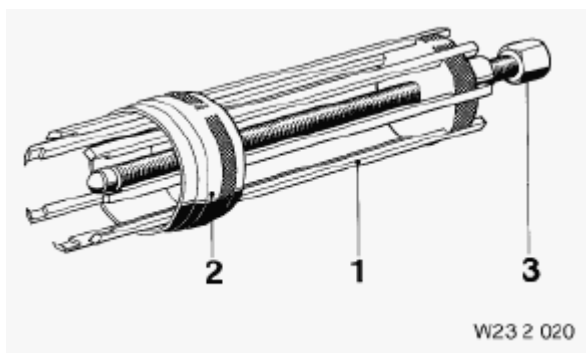


Fig. 62: Rillex Ball Bearing Extractor (23 2 020)
 Courtesy of BMW OF NORTH AMERICA, INC.

23 2 050 RILLEX BALL BEARING EXTRACTOR 6205

Note: For removing deep groove ball bearing of transmission countershaft and transmission output shaft

Transmission: 245/5 Sport, 262/4, 265/5 Sport

Order number: 23 2 050

Rillex ball bearing extractor 6205

Consisting of:

1 = 23 2 051 Claw for Rillex 6305 (8)

2 = 23 2 052 Union sleeve

3 = 23 2 053 Pressure spindle

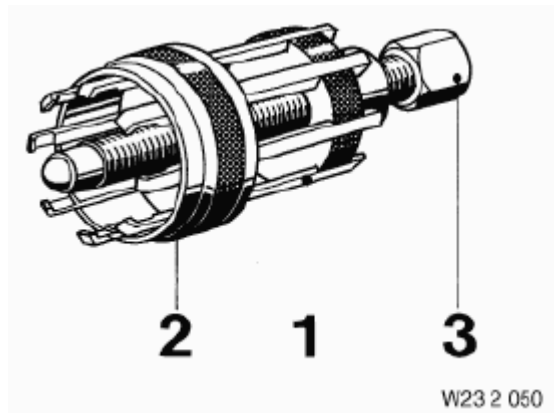


Fig. 63: Rillex Ball Bearing Extractor 6205 (23 2 050)
Courtesy of BMW OF NORTH AMERICA, INC.

23 2 060 RILLEX BALL BEARING EXTRACTOR 6306

Note: For removing deep groove ball bearing of input and output shaft

Transmission: 242/4, 262/4

Order number: 23 2 060

Rillex ball bearing extractor 6306

Consisting of:

1 = 23 2 061 Claw for Rillex 6306 (8)

2 = 23 2 062 Union sleeve

3 = 23 2 063 Pressure spindle

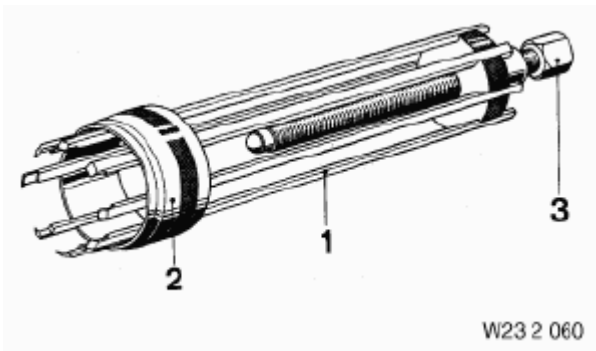


Fig. 64: Rillex Ball Bearing Extractor 6306 (23 2 060)
Courtesy of BMW OF NORTH AMERICA, INC.

23 2 080 ADAPTER

Note: For removing guide sleeve - 2nd/3rd gear

Transmission: 260/5

Storage location: C21

Order number: 23 2 080

Adapter

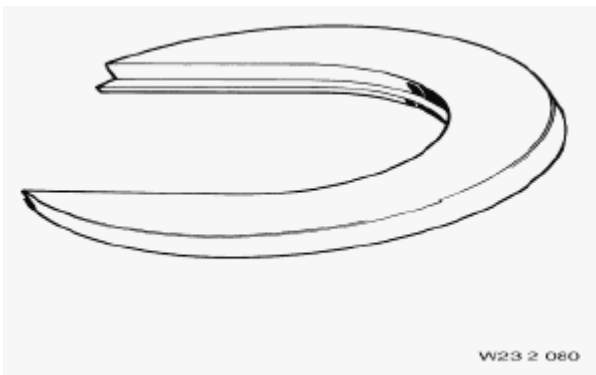


Fig. 65: Adapter (23 2 080)
Courtesy of BMW OF NORTH AMERICA, INC.

23 2 100 PLIERS

Note: For removing and installing circlip on transmission output shaft

Transmission: 240/5, 242/4, 245/5, 245/5Sport, 260/5, 262/4, 265/5, 265/5Sport, 280/5Sport, 3 HP 12, 3 HP 20, 3 HP 22, 4 HP 22, 4 HP 24, A4S 270R, A4S 310R, A5S 300J, A5S 310Z, A5S 440Z, A5S 560Z, BW 65, S5D 200G, S5D 250G, S5D 260Z, S5D 310Z, S6S 420G, S6S 560G, ZF S5-16

Order number: 23 2 100

Pliers

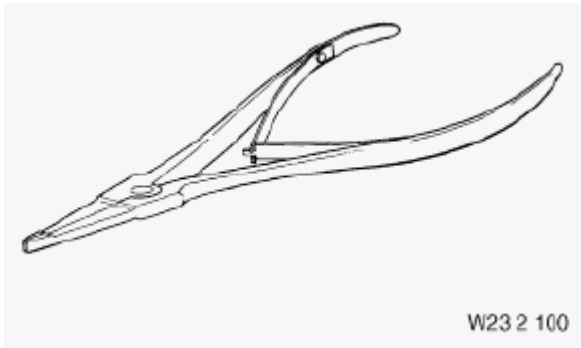


Fig. 66: Pliers (23 2 100)

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 150 PRESSURE SLEEVE

In conjunction with: 23 1 300

Note: For fitting deep groove ball bearing of transmission output shaft (260/5, 245/5), for fitting front tapered roller bearing on drive pinion in all rear axle differentials as well as for mounting cover of countershaft (S5D 310Z)

Transmission: 245/5Sport, 260/5, S5D 260Z, S5D 310Z, S5D 320Z

Storage location: B29

Order number: 23 2 150

Pressure sleeve

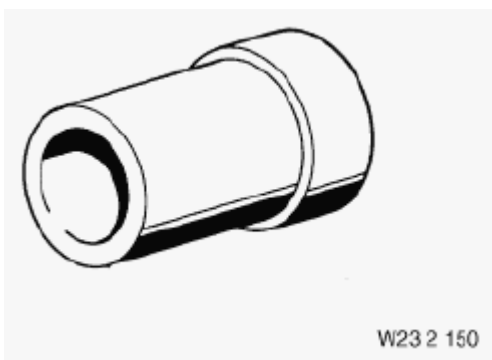


Fig. 67: Pressure Sleeve (23 2 150)

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 160 IMPACT BUSH

Note: For rotary shaft seal in rear section of transmission housing - output shaft

Transmission: 280/5Sport, ZF S5-16

Storage location: B28

Order number: 23 2 160

Impact bush



Fig. 68: Impact Bush (23 2 160)

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 170 FIXTURE

Note: For tensioning transmission leaf spring

Transmission: ZF S5-16

Order number: 23 2 170

Fixture

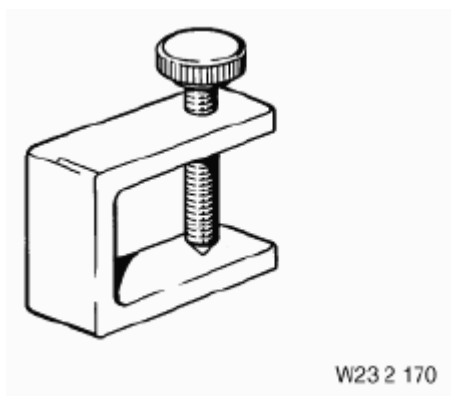


Fig. 69: Fixture (23 2 170)

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 180 GUIDE BUSH

Note: For mounting front section of transmission casing on selector shaft

Transmission: ZF S5-16

Order number: 23 2 180

Guide bush

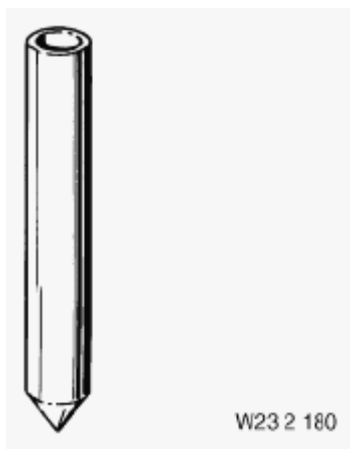


Fig. 70: Guide Bush (23 2 180)

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 200 CIRCLIP PLIERS (STRAIGHT)

Note: For removing and installing external circlips on transmission shafts

Transmission: 240/5, 242/4, 245/5, 245/5Sport, 260/5, 262/4, 265/5, 265/5Sport, 280/5Sport, 3 HP 12, 3 HP 20, 3 HP 22, 4 HP 22, 4 HP 24, A4S 270R, A4S 310R, A5S 300J, A5S 310Z, A5S 440Z, A5S 560Z, BW 65, S5D 200G, S5D 250G, S5D 260Z, S5D 310Z, S6S 420G, S6S 560G, ZF S5-16

Order number: 23 2 200

Circlip pliers (straight)

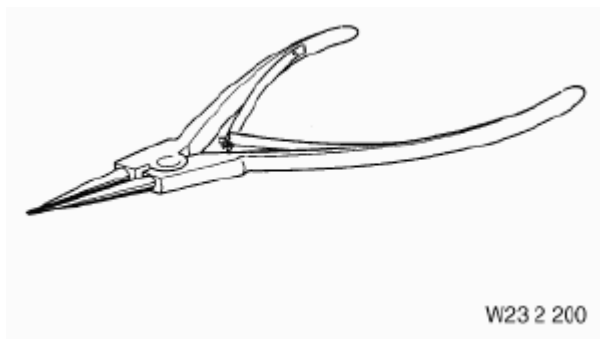


Fig. 71: Circlip Pliers (Straight) (23 2 200)

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 210 CIRCLIP PLIERS (STRAIGHT)

Note: For removing and installing internal circlips in transmission casings when replacing deep groove ball bearings

Transmission: 240/5, 242/4, 245/5, 245/5Sport, 260/5, 262/4, 265/5, 265/5Sport, 280/5Sport, 3 HP 12, 3 HP 20, 3 HP 22, 4 HP 22, 4 HP 24, A4S 270R, A4S 310R, A5S 300J, A5S 310Z, A5S 440Z, A5S 560Z, BW 65, S5D 200G, S5D 250G, S5D 260Z, S5D 310Z, S6S 420G, S6S 560G, ZF S5-16

Order number: 23 2 210

Circlip pliers (straight)

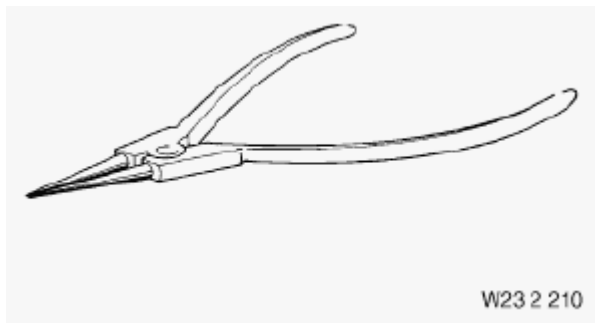


Fig. 72: Circlip Pliers (Straight) (23 2 210)
Courtesy of BMW OF NORTH AMERICA, INC.

23 2 220 DRIFT

Note: For bearing of countershaft shaft in front and rear section of transmission casing

Transmission: ZF S5-16

Order number: 23 2 220

Drift

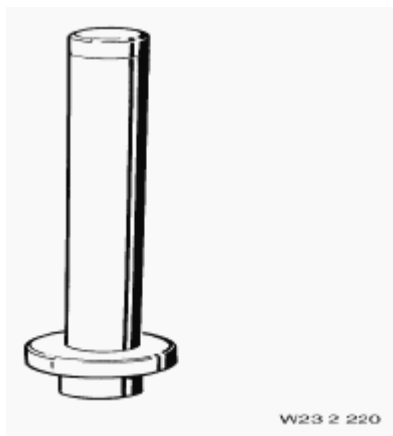


Fig. 73: Drift (23 2 220)

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 230 DISC

In conjunction with: 00 7 500

Note: For removing guide sleeve from gear wheel or output shaft with toothed lock washer

Transmission: 280/5 Sport

Order number: 23 2 230

Disc

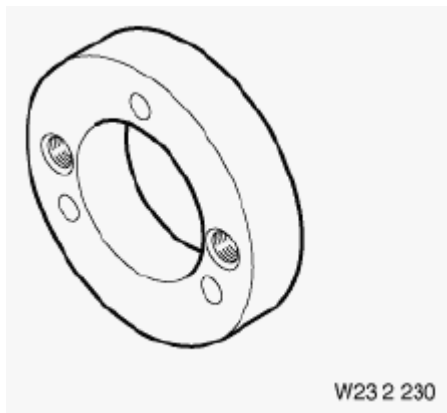


Fig. 74: Disc (23 2 230)

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 250 BRACKET

Note: For tensioning main shaft to countershaft

Transmission: S5D 310Z

Storage location: C20, C24

SI number: 1 07 90(244)

Order number: 23 2 250

Bracket

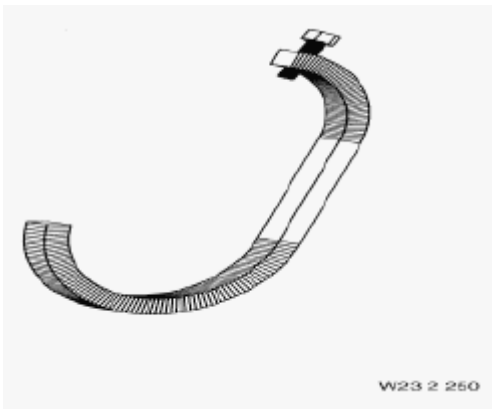


Fig. 75: Bracket (23 2 250)

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 260 INSTALLATION DRIFT

Minimum set: Mechanical tools

Note: For fitting rotary shaft seal on selector shaft of rear section of transmission casing

Transmission: S5D 310Z

Storage location: A20

SI number: 1 07 90(244)

Order number: 23 2 260

Installation drift



W23 2 260

Fig. 76: Installation Drift (23 2 260)

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 270 FIXTURE

Note: For centering selector shaft while mounting front section of transmission casing

Transmission: S5D 310Z

Storage location: C30

SI number: 1 07 90(244)

Order number: 23 2 270

Fixture



Fig. 77: Fixture (23 2 270)

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 280 PULLER PLATE

In conjunction with: 33 1 301

Note: For front section of transmission casing

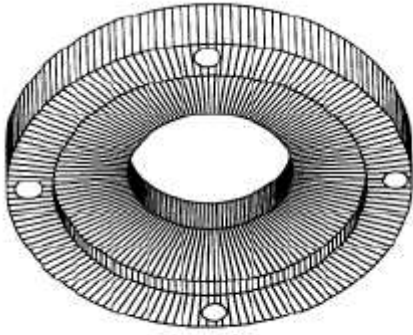
Transmission: S5D 310Z

Storage location: C31

SI number: 1 07 90(244)

Order number: 23 2 280

Puller plate



W23 2 280

Fig. 78: Puller Plate (23 2 280)

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 290 FIXTURE

Note: For mounting front section of transmission casing

Transmission: S5D 310Z

Storage location: C18

SI number: 1 07 90(244)

Order number: 23 2 290

Fixture

Consisting of:

1 = 23 2 291 Base frame

2 = 23 2 292 Support

3 = 23 2 293 Ring

4 = 23 2 294 Set of shells

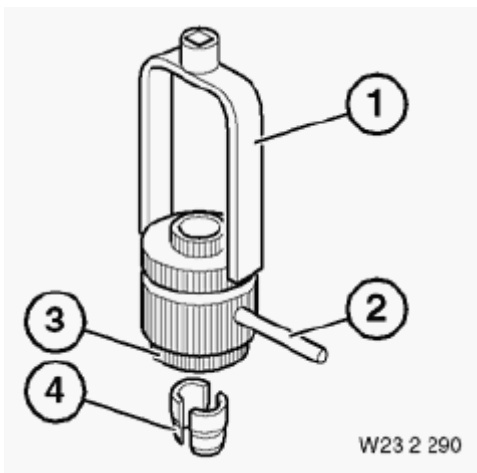


Fig. 79: Fixture (23 2 290)

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 300 DRIFT

Minimum set: Mechanical tools

Note: For fitting rotary shaft seal of output shaft in rear section of transmission casing

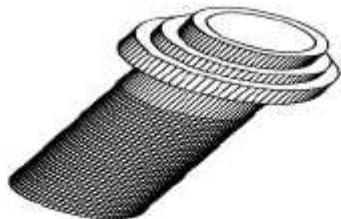
Transmission: S5D 310Z

Storage location: B28

SI number: 1 07 90(244)

Order number: 23 2 300

Drift



W23 2 300

Fig. 80: Drift (23 2 300)

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 310 FIXTURE

Note: For removing 3rd and 4th gear wheel from countershaft

Transmission: S5D 310Z

Storage location: C30

SI number: 1 07 90(244)

Order number: 23 2 310

Fixture

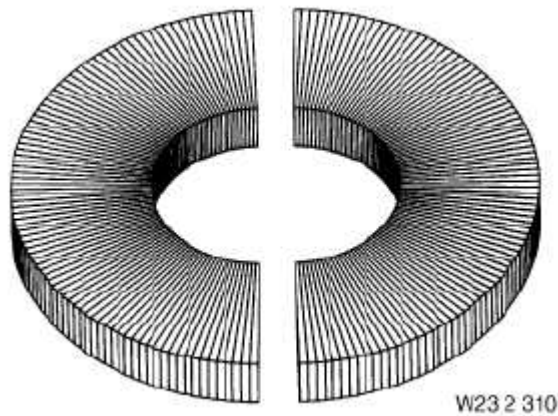


Fig. 81: Fixture (23 2 310)

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 320 SOCKET FOR SOCKET WRENCH WAF 36

Minimum set: Mechanical tools

Note: For loosening and tightening flanged nut

Transmission: S5D 310Z, S6S 420G, S6S 560G

Storage location: B30

SI number: 1 07 90(244)

Order number: 23 2 320

Socket for socket wrench WAF 36



Fig. 82: Socket For Socket Wrench WAF 36 (23 2 320)
Courtesy of BMW OF NORTH AMERICA, INC.

23 2 330 FIXTURE

Note: For installing complete gear train in rear section of transmission housing

Transmission: S5D 310Z

Storage location: C18

SI number: 1 07 90(244)

Order number: 23 2 330

Fixture



W23 2 330

Fig. 83: Fixture (23 2 330)
Courtesy of BMW OF NORTH AMERICA, INC.

23 2 340 DRIFT

Minimum set: Mechanical tools

Note: For fitting rotary shaft seal in front section of transmission casing

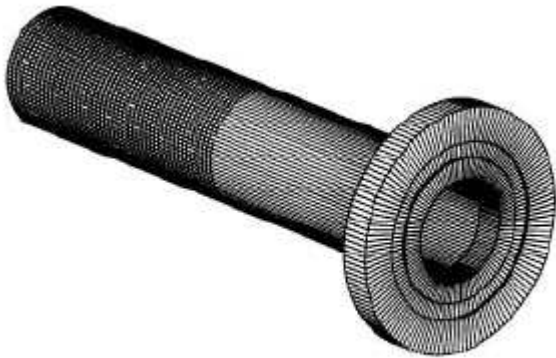
Transmission: S5D 310Z

Storage location: B29, C29

SI number: 1 07 90(244)

Order number: 23 2 340

Drift



W23 2 340

Fig. 84: Drift (23 2 340)

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 350 DRIFT

Note: For fitting sealing cover for notch pin of selector shaft

Transmission: S5D 310Z

Storage location: B14, C14

SI number: 1 07 90(244)

Order number: 23 2 350

Drift



W23 2 350

Fig. 85: Drift (23 2 350)

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 360 DRIFT

Note: For fitting end cover for notch pin

Transmission: S5D 310Z

Storage location: B14, C14

SI number: 1 07 90(244)

Order number: 23 2 360

Drift



W23 2 360

Fig. 86: Drift (23 2 360)

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 370 FIXTURE

In conjunction with: 23 1 050

Note: For removing gear train

Transmission: S5D 310Z

Storage location: C30

SI number: 1 02 91(330)

Order number: 23 2 370

Fixture

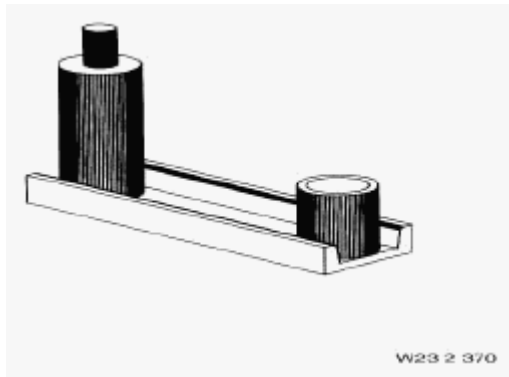


Fig. 87: Fixture (23 2 370)

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 380 INSTALLATION SLEEVE

Note: For retaining ring on input shaft

Transmission: S5D 310Z

Storage location: A5

SI number: 1 02 91(330)

Order number: 23 2 380

Installation sleeve

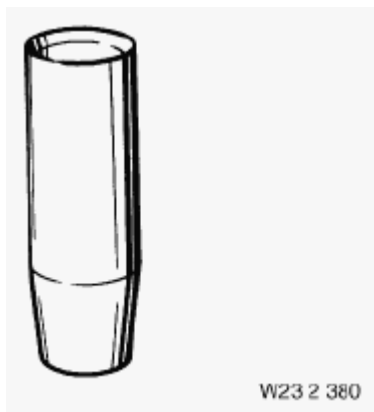


Fig. 88: Installation Sleeve (23 2 380)

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 460 INSTALLATION SLEEVE

Note: For retaining ring on input shaft

Transmission: S5D 200G, S5D 250G

Storage location: A6

SI number: 1 02 91(330)

Order number: 23 2 460

Installation sleeve

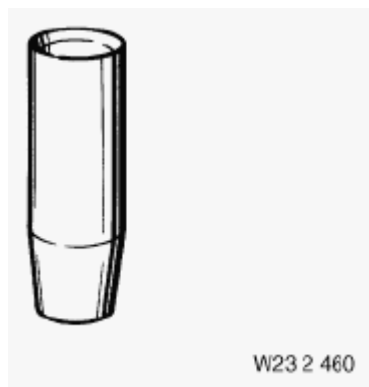


Fig. 89: Installation Sleeve (23 2 460)

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 470 IMPACT BUSH

Note: For fitting tab washer of securing nut on output flange

Transmission: S6S 420G, S6S 560G

Storage location: A25

SI number: 1 10 93(689)

Order number: 23 2 470

Impact bush

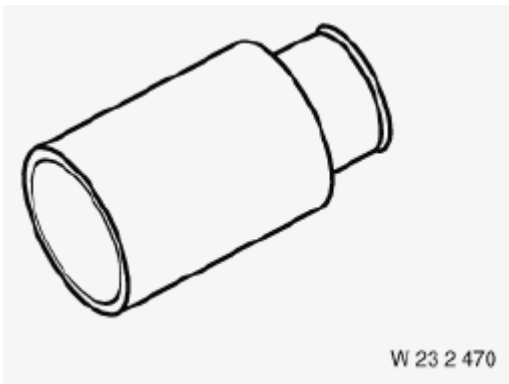


Fig. 90: Impact Bush (23 2 470)

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 480 IMPACT BUSH

Note: For installing radial seal on output shaft

Transmission: S6S 420G, S6S 560G

Storage location: A19

SI number: 1 10 93(689)

Order number: 23 2 480

Impact bush

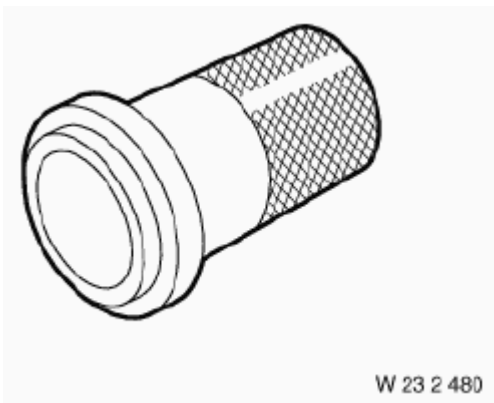


Fig. 91: Impact Bush (23 2 480)

Courtesy of BMW OF NORTH AMERICA, INC.

23 2 490 IMPACT BUSH AND SLIP SLEEVE

Minimum set: Mechanical tools

Note: For fitting rotary shaft seal on input shaft

Transmission: GS5-65BH, S6S 420G, S6S 560G

Storage location: C29

SI number: 1 10 93(689)

Order number: 23 2 490

Impact bush and slip sleeve

Consisting of:

1 = 23 2 491 Impact bush

2 = 23 2 492 Slip sleeve (2-part)

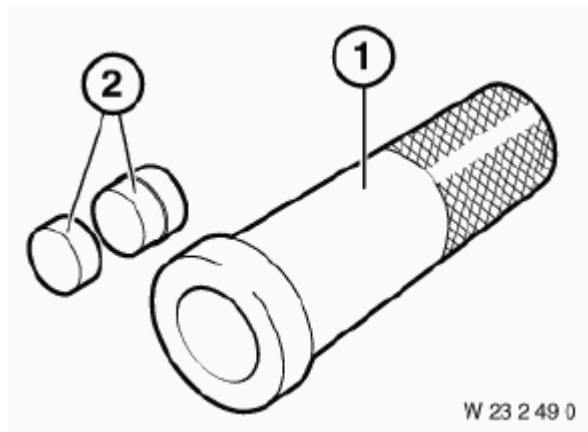


Fig. 92: Impact Bush And Slip Sleeve (23 2 490)
Courtesy of BMW OF NORTH AMERICA, INC.

23 3 010 FIXTURE

Note: For fitting output flange on output shaft

Transmission: S6S 420G, S6S 560G

Storage location: A26

SI number: 1 10 93(689)

Order number: 23 3 010

Fixture

Consisting of:

1 = 23 3 011 Adapter spindle

2 = 23 3 012 Pressure sleeve

3 = 23 3 013 Pressure nut with bearing

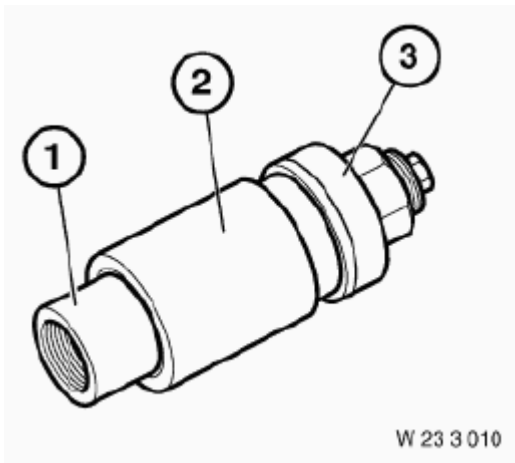


Fig. 93: Fixture (23 3 010)

Courtesy of BMW OF NORTH AMERICA, INC.

23 3 020 MOUNTING SLEEVE

Note: For installing gaiter of selector rod

Transmission: S6S 560G

Storage location: A14, B14

SI number: 1 10 93(689)

Order number: 23 3 020

Mounting sleeve

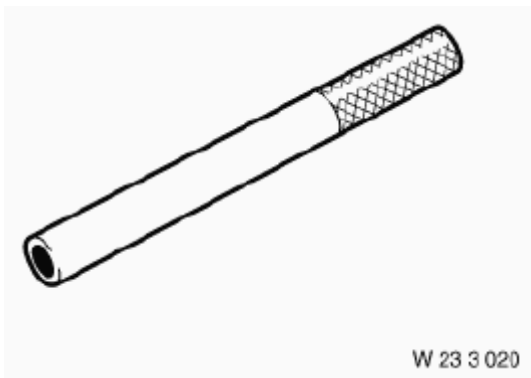


Fig. 94: Mounting Sleeve (23 3 020)

Courtesy of BMW OF NORTH AMERICA, INC.

23 3 110 DRIFT

Note: For driving in guide bushings for catch pins on manual transmissions.

Transmission: GS5-39DZ, S5D 280Z, S5D 320Z, S5D 390Z

SI number: 1 12 02 (918)

Order number: 23 3 110

Drift

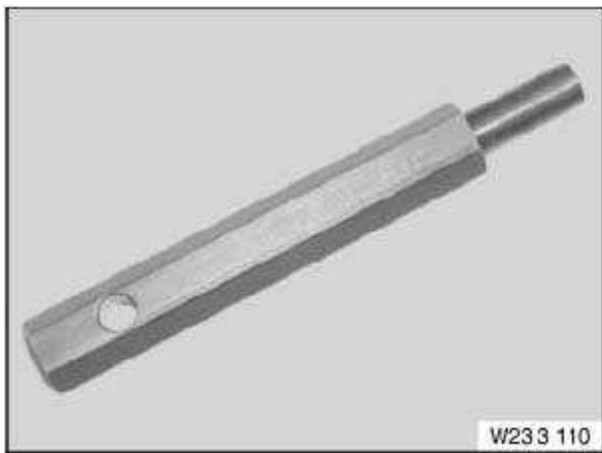


Fig. 95: Drift (23 3 110)

Courtesy of BMW OF NORTH AMERICA, INC.

23 3 160 SET OF TOOLS

Minimum set: Mechanical tools

Note: Removing and installing shaft seal on output shaft

Transmission: GS6-37BZ, GS6-51BZ

SI number: 01 10 02 (907)

Order number: 23 3 160

Set of tools

Consisting of:

1 = 23 3 161 Extractor

2 = 23 3 162 Drift



Fig. 96: Set Of Tools (23 3 160)
Courtesy of BMW OF NORTH AMERICA, INC.

23 3 169 SET OF TOOLS

Minimum set: Mechanical tools

Note: Removing and installing shaft seals on output side

Transmission: GS6-37BZ

Order number: 23 3 169

Set of tools

23 3 200 EXTRACTOR

Minimum set: Mechanical tools

Note: For removing shaft seal on drive shaft

Transmission: GS6-53BZ, GS6-53DZ

Storage location: A49, A50

SI number: 1 11 04 (093)

Order number: 23 3 200

Extractor



Fig. 97: Extractor (23 3 200)

Courtesy of BMW OF NORTH AMERICA, INC.

23 3 210 EXTRACTOR

Minimum set: Mechanical tools

Note: For removing shaft seal on output shaft

Transmission: GS6-53BZ, GS6-53DZ

Storage location: A50

SI number: 1 11 04 (093)

Order number: 23 3 210

Extractor



Fig. 98: Extractor (23 3 210)

Courtesy of BMW OF NORTH AMERICA, INC.

23 3 220 DRIFT

Minimum set: Mechanical tools

Note: For driving in shaft seal on drive shaft (G - transmission)

Transmission: GS6-53BZ, GS6-53DZ

Storage location: A49

SI number: 1 11 04 (093)

Order number: 23 3 220

Drift



Fig. 99: Drift (23 3 220)

Courtesy of BMW OF NORTH AMERICA, INC.

23 3 230 DRIFT

Minimum set: Mechanical tools

Note: For driving in shaft seal on output shaft (G - transmission)

Transmission: GS6-53BZ, GS6-53DZ

Storage location: A49

SI number: 1 11 04 (093)

Order number: 23 3 230

Drift



Fig. 100: Drift (23 3 230)

Courtesy of BMW OF NORTH AMERICA, INC.

23 4 000 DRIFT SET

Minimum set: Mechanical tools

In conjunction with: 00 5 500

Note: For driving shaft seal into transmission

Transmission: GS6-85BG

Storage location: A49, B84

SI number: 1 02 02(823)

Order number: 23 4 000

Drift set

Consisting of:

1 = 23 4 001 Drift dia. 67 mm

2 = 23 4 002 Drift dia. 53 mm

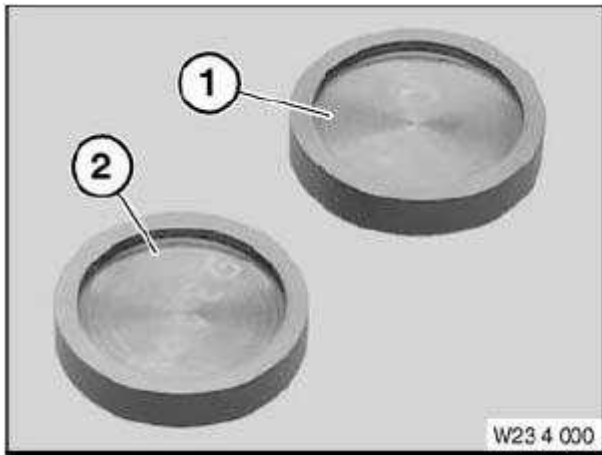


Fig. 101: Drift Set (23 4 000)

Courtesy of BMW OF NORTH AMERICA, INC.

23 4 010 REMOVAL TOOL

Minimum set: Mechanical tools

Note: For pressing connector out of transmission

Transmission: GS6-85BG

Storage location: B83

SI number: 1 02 02 (823)

Order number: 23 4 010

Removal tool



Fig. 102: Removal Tool (23 4 010)

Courtesy of BMW OF NORTH AMERICA, INC.

23 4 030 FIXTURE

In conjunction with: 23 4 040 Grease gun

Note: For removing and installing guide bearing (pilot bearing) in transmission input shaft.

Transmission: GS6-53DZ

SI number: 01 05 06 (248)

Order number: 23 4 030

Fixture

Consisting of:

1 = 23 4 031 Bridge

2 = 23 4 032 M10x120 screws with nuts (2 x)

3 = 23 4 033 Grease cartridge

4 = 23 4 034 Brass adapter

5 = 23 4 035 Pressure spindle

6 = 23 4 036 Thrust member

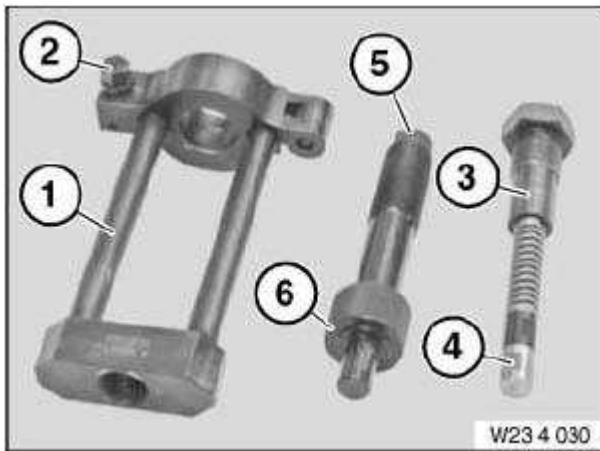


Fig. 103: Fixture (24 4 030)

Courtesy of BMW OF NORTH AMERICA, INC.

23 4 040 GREASE GUN

In conjunction with: 23 4 030

Note: For actuating cartridge 23 4 033.

Transmission: GS6-53DZ

SI number: 01 05 06 (248)

Order number: 23 4 040

Grease gun

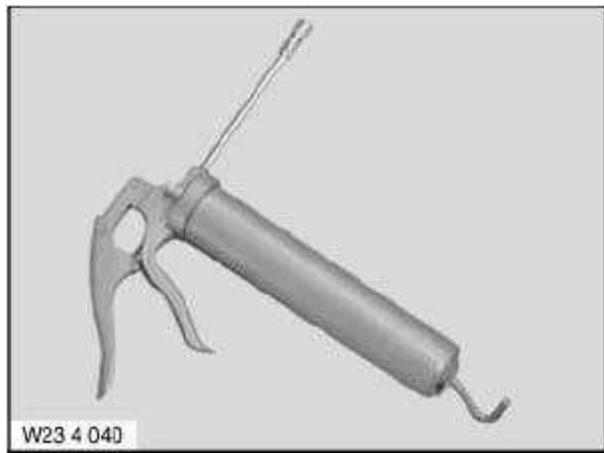


Fig. 104: Grease Gun (23 4 040)

Courtesy of BMW OF NORTH AMERICA, INC.

23 4 150 UNIVERSAL TRANSMISSION BRACKET

In conjunction with: 00 2 030

Note: Bracket for removing and installing manual and automatic transmissions.

Transmission: GA6F21WA, GS6-53BG, GS6-55BG

SI number: 01 23 06 (308)

Order number: 23 4 150

Universal transmission bracket

Consisting of:

1 = 23 4 151 Joint

2 = 23 4 152 Base frame

3 = 23 4 153 Foam inserts (1 set = 4 pcs.)

4 = 23 4 154 Tensioning strap

5 = 23 4 155 Locator for foam material insert

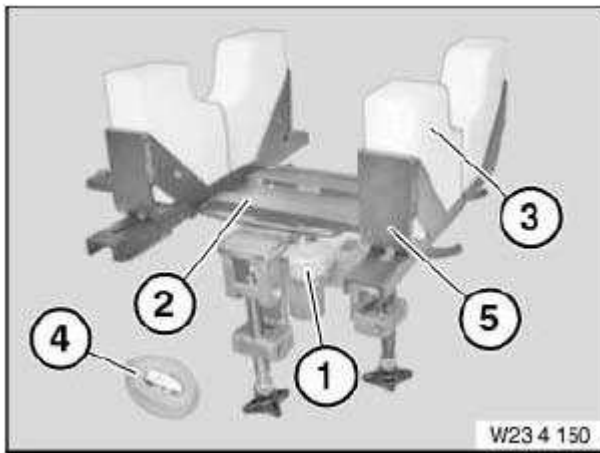


Fig. 105: Universal Transmission Bracket (23 4 150)
Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION

Manual Transmission - Technical Data - X3

00 COMPLETE TRANSMISSION

23 00 TRANSMISSION IN GENERAL GS6-17BG

TECHNICAL DATA - TRANSMISSION GENERAL GS6-17BG

Oil grade refer to appropriate article.		
Oil fill quantity for oil change	Liters	1.3 + 0.1
Oil fill quantity for initial fill or replacement transmission	Liters	1.4 + 0.1

23 00 TRANSMISSION IN GENERAL S5D 200G

TECHNICAL DATA - TRANSMISSION GENERAL S5D 200G

Oil grade: refer to appropriate article.		
Oil volume	Liters	1.0
Oil fill quantity for initial fill or replacement transmission	Liters	1.1

23 00 TRANSMISSION IN GENERAL S5D 250G

TECHNICAL DATA - TRANSMISSION GENERAL S5D 250G

Oil grade: refer to appropriate article.		
Oil volume	Liters	1.0
Oil fill quantity for initial fill or replacement transmission	Liters	1.1

23 00 TRANSMISSION IN GENERAL S5D 280Z

TECHNICAL DATA - TRANSMISSION GENERAL S5D 280Z

Oil grade, refer to appropriate article.		
Oil fill quantity for oil change	Liters	-
Oil fill quantity for initial fill or replacement transmission	Liters	1.3

23 00 TRANSMISSION IN GENERAL S5D 310Z S5D 320Z

TECHNICAL DATA - TRANSMISSION GENERAL S5D 310Z S5D 320Z

Oil grade: refer to appropriate article.		
Oil volume	Liters	1.2
Oil fill quantity for initial fill or replacement transmission	Liters	1.3

23 00 TRANSMISSION IN GENERAL S5D 390Z

TECHNICAL DATA - TRANSMISSION GENERAL S5D 390Z

Oil grade: refer to appropriate article.		
Oil volume	Liters	1.5
Oil fill quantity for initial fill or replacement transmission	Liters	1.55

23 00 TRANSMISSION IN GENERAL S6-37BZ/DZ

TECHNICAL DATA - TRANSMISSION GENERAL S6-37BZ/DZ

Oil grade, refer to appropriate article.		
Oil fill quantity for oil change	Liters	1.5
Oil fill quantity for initial fill or replacement transmission	Liters	1.6

23 00 TRANSMISSION IN GENERAL S6S 420G

TECHNICAL DATA - TRANSMISSION GENERAL S6S 420G

Oil grade: refer to appropriate article.		
Oil volume	Liters	1.7
Oil fill quantity for initial fill or replacement transmission	Liters	1.9

23 00 TRANSMISSION IN GENERAL S6S 560G

TECHNICAL DATA - TRANSMISSION GENERAL S6S 560G

Oil grade: refer to appropriate article.		
Oil volume	Liters	2.3
Oil fill quantity for initial fill or replacement transmission	Liters	2.5

23 00 TRANSMISSION IN GENERAL S7S 47BG

TECHNICAL DATA - TRANSMISSION GENERAL S7S 47BG

Oil grade, refer to appropriate article.		
Oil fill quantity for oil change	Liters	2.55
Oil fill quantity for initial fill or replacement transmission	Liters	2.75

23 00 TRANSMISSION IN GENERAL: 240/5 / MECH OVERDRIVE

TECHNICAL DATA - TRANSMISSION GENERAL 240/5 / MECH OVERDRIVE

Oil grade: refer to appropriate article.		
Oil volume	ltr.	1.05
Oil fill quantity for initial fill or replacement transmission	ltr.	1.15

23 00 TRANSMISSION IN GENERAL: 260/5 / MECH OVERDRIVE

TECHNICAL DATA - TRANSMISSION GENERAL 260/5 / MECH OVERDRIVE

Oil grade: refer to appropriate article.		
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Oil volume	ltr.	1.25
Oil fill quantity for initial fill or replacement transmission	ltr.	1.35

23 00 TRANSMISSION IN GENERAL: 260/5 / MECH SPORT

TECHNICAL DATA - TRANSMISSION GENERAL 260/5 / MECH SPORT

Oil grade: refer to appropriate article.		
Oil volume	ltr.	1.25
Oil fill quantity for initial fill or replacement transmission	ltr.	1.35

23 00 TRANSMISSION IN GENERAL: 260/6 / MECH OVERDRIVE

TECHNICAL DATA - TRANSMISSION GENERAL 260/6 / MECH OVERDRIVE

Oil grade: refer to appropriate article.		
Oil volume	ltr.	1.25
Oil fill quantity for initial fill or repair transmission	ltr.	1.35

23 00 TRANSMISSION IN GENERAL: 265/5 / MECH SPORT

TECHNICAL DATA - TRANSMISSION GENERAL 265/5 / MECH SPORT

Oil grade: refer to appropriate article.		
Oil volume	ltr.	1.5
Oil fill quantity for initial fill or repair transmission	ltr.	1.7

23 00 TRANSMISSION IN GENERAL: 265/6 / MECH OVERDRIVE

TECHNICAL DATA - TRANSMISSION GENERAL 265/6 / MECH OVERDRIVE

Oil grade: refer to appropriate article.		
Oil volume	ltr.	1.5
Oil fill quantity for initial fill or repair transmission	ltr.	1.7

23 00 TRANSMISSION IN GENERAL: 280/5 / MECH SPORT

TECHNICAL DATA - TRANSMISSION GENERAL 280/5 / MECH SPORT

Oil grade: refer to appropriate article.		
Oil volume	ltr.	1.25
Oil fill quantity for initial fill or repair transmission	ltr.	1.35

23 00 TRANSMISSION IN GENERAL: S6-53DZ / MECH

TECHNICAL DATA - TRANSMISSION GENERAL S6-53DZ / MECH

Oil grade: refer to appropriate article.		
Oil volume	ltr.	1.5

Oil fill quantity for initial fill or replacement transmission	ltr.	1.6
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23 00 TRANSMISSION IN GENERAL: ZF-S5-16 / MECH

TECHNICAL DATA - TRANSMISSION GENERAL ZF-S5-16 / MECH

Oil grade: refer to appropriate article.		
Oil volume	ltr.	1.05
Oil fill quantity for initial fill or replacement transmission	ltr.	1.15

23 00 TRANSMISSION, COMPLETE, TRANSMISSION CONFIGURATION B,C,D,E,F,G,H,I,J

TECHNICAL DATA - TRANSMISSION, COMPLETE, TRANSMISSION CONFIGURATION

<p>A letter code is located on the transmission case</p> <ul style="list-style-type: none"> ○ underside of transmission center ○ underside of clutch housing ○ sticker on left side of transmission extension <p>With help of letter code and the appropriate BMW parts microfiche for the vehicle, the transmission model can be established.</p> <p>Example: xxxxxxx = ser. transmission no. AKD = BMW code S 5 D 200 G = transmission variant</p>
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11 HOUSING WITH COVER

23 11 CASE AND COVER 240/5 / MECH OVERDRIVE

TECHNICAL DATA - CASE AND COVER 240/5 / MECH OVERDRIVE

Temperature for installation of bearings	°C	80
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23 11 CASE AND COVER 260/5 / MECH OVERDRIVE

TECHNICAL DATA - CASE AND COVER 260/5 / MECH OVERDRIVE

Temperature for installation of bearings	°C	80
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23 11 CASE AND COVER 260/5 / MECH SPORT

TECHNICAL DATA - CASE AND COVER 260/5 / MECH SPORT

Temperature for installation of bearings	°C	80
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23 11 CASE AND COVER 260/6 / MECH OVERDRIVE

TECHNICAL DATA - CASE AND COVER 260/6 / MECH OVERDRIVE

Temperature for installation of bearings	°C	80
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23 11 CASE AND COVER 265/5 / MECH SPORT**TECHNICAL DATA - CASE AND COVER 265/5 / MECH SPORT**

Temperature for installation of bearings	°C	80
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23 11 CASE AND COVER 265/6 / MECH OVERDRIVE**TECHNICAL DATA - CASE AND COVER 265/6 / MECH OVERDRIVE**

Temperature for installation of bearings	°C	80
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23 11 CASE AND COVER 280/5 / MECH SPORT**TECHNICAL DATA - CASE AND COVER 280/5 / MECH SPORT**

Temperature for installation of bearings	°C	80
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23 11 CASE AND COVER S 5 D 200 G**TECHNICAL DATA - CASE AND COVER S 5 D 200 G**

Temperature for installation of bearings	approx. °C	80
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23 11 CASE AND COVER S 5 D 250 G**TECHNICAL DATA - CASE AND COVER S 5 D 250 G**

Temperature for installation of bearings	approx. °C	80
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23 11 CASE AND COVER S 5 D 310 Z**TECHNICAL DATA - CASE AND COVER S 5 D 310 Z**

Temperature for installation of bearings	approx. °C	80
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23 11 CASE AND COVER S 6 S 420 G**TECHNICAL DATA - CASE AND COVER S 6 S 420 G**

Temperature for installation of bearings	approx. °C	80
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23 11 CASE AND COVER S 6 S 560 G**TECHNICAL DATA - CASE AND COVER S 6 S 560 G**

Temperature for installation of bearings	approx. °C	80
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23 11 CASE AND COVER S 6-53BZ/DZ

TECHNICAL DATA - CASE AND COVER S 6-53BZ/DZ

Temperature for installation of bearings	approx. °C	80
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23 11 CASE AND COVER S6-37BZ/DZ / MECH**TECHNICAL DATA - CASE AND COVER S6-37BZ/DZ / MECH**

Temperature for installation of bearings	°C	80
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23 11 CASE AND COVER ZF-S5-16 / MECH**TECHNICAL DATA - CASE AND COVER ZF-S5-16 / MECH**

Temperature for installation of bearings	°C	80
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21 TRANSMISSION SHAFTS**23 21 TRANSMISSION SHAFTS 240/5 / MECH OVERDRIVE****TECHNICAL DATA - TRANSMISSION SHAFTS 240/5 / MECH OVERDRIVE**

Axial play (axial bearing clearance) of:		
Output shaft	mm	0 ... 0.09
Input shaft	mm	0 ... 0.09
Layshaft	mm	0.1 ... 0.2
Output spigot		
Radial runout	max mm	0.07
Output flange		
Radial runout	max mm	0.07
Axial runout	max mm	0.1

23 21 TRANSMISSION SHAFTS 260/5 / MECH OVERDRIVE**TECHNICAL DATA - TRANSMISSION SHAFTS 260/5 / MECH OVERDRIVE**

Axial play (axial bearing clearance) of:		
Output shaft	mm	0 ... 0.09
Input shaft	mm	0 ... 0.09
Layshaft	mm	0.1 ... 0.2
Output spigot		
Radial runout	max mm	0.07
Output flange		
Radial runout	max mm	0.07
Axial runout	max mm	0.1

23 21 TRANSMISSION SHAFTS 260/5 / MECH SPORT

TECHNICAL DATA - TRANSMISSION SHAFTS 260/5 / MECH SPORT

Axial play (axial bearing clearance) of:		
Output shaft	mm	0 ... 0.09
Input shaft	mm	0 ... 0.09
Layshaft	mm	0.13 ... 0.23
Output spigot		
Radial runout	max mm	0.07
Output flange		
Radial runout	max mm	0.07
Axial runout	max mm	0.1

23 21 TRANSMISSION SHAFTS 260/6 / MECH OVERDRIVE**TECHNICAL DATA - TRANSMISSION SHAFTS 260/6 / MECH OVERDRIVE**

Axial play (axial bearing clearance) of:		
Output shaft	mm	0 ... 0.09
Input shaft	mm	0 ... 0.09
Layshaft	mm	0.1 ... 0.2
Output spigot		
Radial runout	max mm	0.07
Output flange		
Radial runout	max mm	0.07
Axial runout	max mm	0.1

23 21 TRANSMISSION SHAFTS 265/5 / MECH SPORT**TECHNICAL DATA - TRANSMISSION SHAFTS 265/5 / MECH SPORT**

Axial play (axial bearing clearance) of:		
Output shaft	mm	0 ... 0.09
Input shaft	mm	0 ... 0.09
Layshaft	mm	0.1 ... 0.2
Output spigot		
Radial runout	max mm	0.07
Output flange		
Radial runout	max mm	0.07
Axial runout	max mm	0.1

23 21 TRANSMISSION SHAFTS 265/6 / MECH OVERDRIVE**TECHNICAL DATA - TRANSMISSION SHAFTS 265/6 / MECH OVERDRIVE**

Axial play (axial bearing clearance) of:		
Output shaft	mm	0 ... 0.09

Input shaft	mm	0 ... 0.09
Layshaft	mm	0.1 ... 0.2
Output spigot		
Radial runout	max mm	0.07
Output flange		
Radial runout	max mm	0.07
Axial runout	max mm	0.1

23 21 TRANSMISSION SHAFTS 280/5 / MECH SPORT

TECHNICAL DATA - TRANSMISSION SHAFTS 280/5 / MECH SPORT

Axial play (axial bearing clearance) of:		
Output shaft	mm	0 ... 0.09
Input shaft	mm	0 ... 0.09
Output spigot		
Radial runout	max mm	0.07
Output flange		
Radial runout	max mm	0.07
Axial runout	max mm	0.1

23 21 TRANSMISSION SHAFTS GS6-37BZ/DZ

TECHNICAL DATA - TRANSMISSION SHAFTS GS6-37BZ/DZ

Axial play (axial bearing clearance) of:		
Output shaft	mm	0.15 ... 0.19
Output spigot		
Radial runout	Max. mm	0.07
Output flange		
Radial runout	Max. mm	0.07
Axial runout	Max. mm	0.1

23 21 TRANSMISSION SHAFTS GS6-53DZ / MECH

TECHNICAL DATA - TRANSMISSION SHAFTS GS6-53DZ / MECH

Axial play (axial bearing play) of:		
Output shaft	mm	
Input shaft	Max. mm	
Output journal:		
Radial runout	Max. mm	0.15
Output flange		
Radial runout	Max. mm	0.15
Axial runout	Max. mm	0.15

23 21 TRANSMISSION SHAFTS S 5 D 200 G / MECH

TECHNICAL DATA - TRANSMISSION SHAFTS S 5 D 200 G / MECH

Axial play (axial bearing clearance) of:		
Output shaft	mm	0 ... 0.09
Input shaft	Max. mm	0.04
Output spigot		
Radial runout	Max. mm	0.07
Output flange		
Radial runout	Max. mm	0.07
Axial runout	Max. mm	0.1

23 21 TRANSMISSION SHAFTS S 5 D 250 G / MECH

TECHNICAL DATA - TRANSMISSION SHAFTS S 5 D 250 G / MECH

Axial play (axial bearing clearance) of:		
Output shaft	mm	0 ... 0.09
Input shaft	Max. mm	0.04
Output spigot		
Radial runout	Max. mm	0.07
Output flange		
Radial runout	Max. mm	0.07
Axial runout	Max. mm	0.1

23 21 TRANSMISSION SHAFTS S 5 D 310 Z / MECH

TECHNICAL DATA - TRANSMISSION SHAFTS S 5 D 310 Z / MECH

Axial play (axial bearing clearance) of:		
Output shaft	mm	0 ... 0.09
Output spigot		
Radial runout	Max. mm	0.07
Output flange		
Radial runout	Max. mm	0.07
Axial runout	Max. mm	0.1

23 21 TRANSMISSION SHAFTS S 6 S 420 G / MECH

TECHNICAL DATA - TRANSMISSION SHAFTS S 6 S 420 G / MECH

Axial play (axial bearing clearance) of:		
Output shaft	mm	0 ... 0.09
Output spigot		
Radial runout	Max. mm	0.07

Output flange		
Radial runout	Max. mm	0.07
Axial runout	Max. mm	0.1

23 21 TRANSMISSION SHAFTS S 6 S 560 G / MECH

TECHNICAL DATA - TRANSMISSION SHAFTS S 6 S 560 G / MECH

Axial play (axial bearing clearance) of:		
Output shaft	mm	0 ... 0.09
Output spigot		
Radial runout	Max. mm	0.07
Output flange		
Radial runout	Max. mm	0.07
Axial runout	Max. mm	0.1

23 21 TRANSMISSION SHAFTS ZF-S5-16 / MECH

TECHNICAL DATA - TRANSMISSION SHAFTS ZF-S5-16 / MECH

Axial play (axial bearing clearance) of:		
Output shaft	mm	0 ... 0.09
Input shaft	mm	1.1 ... 1.3
Output spigot		
Radial runout	max mm	0.07
Output flange		
Radial runout	max mm	0.07
Axial runout	max mm	0.1

22 GEARS

23 22 GEARS (LAYSHAFT) 240/5 / MECH OVERDRIVE

TECHNICAL DATA - GEARS (LAYSHAFT) 240/5 / MECH OVERDRIVE

Pressing-off force at ambient temperature		
5th gear wheel	t	4.5 ... 5.5
Contact pressure force at warming temperature		
3rd gear wheel	t °C	- -
4th gear wheel	t °C	- -

23 22 GEARS (LAYSHAFT) 260/5 / MECH OVERDRIVE

TECHNICAL DATA - GEARS (LAYSHAFT) 260/5 / MECH OVERDRIVE

Pressing-off force at ambient temperature		
5th gear wheel	t	5.5 ... 6.8
Contact pressure force at warming temperature		
3rd gear wheel	t °C	- -
4th gear wheel	t °C	- -
5th gear wheel	t °C	4.9 ... 6.8approx. 120

23 22 GEARS (LAYSHAFT) 260/5 / MECH SPORT

TECHNICAL DATA - GEARS (LAYSHAFT) 260/5 / MECH SPORT

Pressing-off force at ambient temperature		
5th gear wheel	t	5.5 ... 6.8
Contact pressure force at warming temperature		
3rd gear wheel	t °C	- -
4th gear wheel	t °C	- -
5th gear wheel	t °C	4.9 ... 6.8approx. 120

23 22 GEARS (LAYSHAFT) 260/6 / MECH OVERDRIVE

TECHNICAL DATA - GEARS (LAYSHAFT) 260/6 / MECH OVERDRIVE

Pressing-off force at ambient temperature		
5th gear wheel	t	5.5 ... 6.8
Contact pressure force at warming temperature		
3rd gear wheel	t °C	- -
4th gear wheel	t °C	- -
5th gear wheel	t approx. °C	4.9 ... 6.8 120

23 22 GEARS (LAYSHAFT) 260/6 / MECH OVERDRIVE

TECHNICAL DATA - GEARS (LAYSHAFT) 260/6 / MECH OVERDRIVE

Pressing-off force at ambient temperature		
5th gear wheel	t	5.5 ... 6.8
Contact pressure force at warming temperature		
3rd gear wheel	t °C	- -

4th gear wheel	t °C	- -
5th gear wheel	t approx. °C	4.9 ... 6.8 120

23 22 GEARS (LAYSHAFT) 265/5 / MECH SPORT

TECHNICAL DATA - GEARS (LAYSHAFT) 265/5 / MECH SPORT

Pressing-off force at ambient temperature		
3rd gear wheel	t	5 ... 7
4th gear wheel	t	5 ... 7
5th gear wheel	t	9 ... 10
Contact pressure force at warming temperature		
3rd gear wheel	t °C	- -
4th gear wheel	t °C	- -
5th gear wheel	t approx. °C	5 ... 6150

23 22 GEARS (LAYSHAFT) 265/6 / MECH OVERDRIVE

TECHNICAL DATA - GEARS (LAYSHAFT) 265/6 / MECH OVERDRIVE

Pressing-off force at ambient temperature		
3rd gear wheel	t	5 ... 7
4th gear wheel	t	5 ... 7
5th gear wheel	t	9 ... 10
Contact pressure force at warming temperature		
3rd gear wheel	t °C	- -
4th gear wheel	t °C	- -
5th gear wheel	t approx. °C	5 ... 6150

23 22 GEARS (LAYSHAFT) 280/5 / MECH SPORT

TECHNICAL DATA - GEARS (LAYSHAFT) 280/5 / MECH SPORT

Pressing-off force at ambient temperature		
3rd gear wheel	t	5 ... 7
4th gear wheel	t	5 ... 7
5th gear wheel	t	9 ... 10
Contact pressure force at warming temperature		
3rd gear wheel	t °C	- -

4th gear wheel	t °C	- -
5th gear wheel	t approx. °C	5 ... 6150

23 22 GEARS (LAYSHAFT) 280/5 / MECH SPORT

TECHNICAL DATA - GEARS (LAYSHAFT) 280/5 / MECH SPORT

Pressing-off force at ambient temperature		
3rd gear wheel	t	5 ... 7
4th gear wheel	t	5 ... 7
5th gear wheel	t	9 ... 10
Contact pressure force at warming temperature		
3rd gear wheel	t °C	- -
4th gear wheel	t °C	- -
5th gear wheel	t approx. °C	5 ... 6 150

23 22 GEARS (LAYSHAFT) GS6-53DZ / MECH

TECHNICAL DATA - GEARS (LAYSHAFT) GS6-53DZ / MECH

Press-off and press-on force		
5th gear wheel	kN	50
4th gear wheel	kN	50

23 22 GEARS (LAYSHAFT) S 5 D 200 G / MECH

TECHNICAL DATA - GEARS (LAYSHAFT) S 5 D 200 G / MECH

Press-off and press-on force		
5th gear wheel	kN	50 ... 70
4th gear wheel	kN	

23 22 GEARS (LAYSHAFT) S 5 D 250 G / MECH

TECHNICAL DATA - GEARS (LAYSHAFT) S 5 D 250 G / MECH

Press-off and press-on force		
5th gear wheel	kN	50 ... 70

23 22 GEARS (LAYSHAFT) ZF-S5-16 / MECH OVERDRIVE

TECHNICAL DATA - GEARS (LAYSHAFT) ZF-S5-16 / MECH OVERDRIVE

Pressing-off force at ambient temperature		
3rd gear wheel	t	7.5

4th gear wheel	t	8.0
5th gear wheel	t	8.0
Contact pressure force at warming temperature		
3rd gear wheel	t °C	- -
4th gear wheel	t °C	- -
5th gear wheel	t °C	- -

23 SYNCHRONIZATION

23 23 SYNCHRONIZATION 240/5 / MECH OVERDRIVE

TECHNICAL DATA - SYNCHRONIZATION 240/5 / MECH OVERDRIVE

Distance between synchronizer ring and clutch body		
New condition	mm	1.0 ... 1.3
Max. wear limit size	mm	0.8
Reverse gear		
New condition	mm	0.5 ... 0.6
Max. wear limit size	mm	0.4

23 23 SYNCHRONIZATION 260/5 / MECH OVERDRIVE

TECHNICAL DATA - SYNCHRONIZATION 260/5 / MECH OVERDRIVE

Distance between synchronizer ring and clutch body		
New condition	mm	1.0 ... 1.3
Max. wear limit size	mm	0.8
Reverse gear		
New condition	mm	0.5 ... 0.6
Max. wear limit size	mm	0.4

23 23 SYNCHRONIZATION 260/5 / MECH SPORT

TECHNICAL DATA - SYNCHRONIZATION 260/5 / MECH SPORT

Distance between synchronizer ring and clutch body		
New condition	mm	1.0 ... 1.3
Max. wear limit size	mm	0.8
Reverse gear		
New condition	mm	0.5 ... 0.6
Max. wear limit size	mm	0.4

23 23 SYNCHRONIZATION 260/6 / MECH OVERDRIVE

TECHNICAL DATA - SYNCHRONIZATION 260/6 / MECH OVERDRIVE

Distance between synchronizer ring and clutch body		
New condition	mm	1.0 ... 1.3
Max. wear limit size	mm	0.8
Reverse gear		
New condition	mm	0.5 ... 0.6
Max. wear limit size	mm	0.4

23 23 SYNCHRONIZATION 265/5 / MECH SPORT**TECHNICAL DATA - SYNCHRONIZATION 265/5 / MECH SPORT**

Distance between synchronizer ring and clutch body		
New condition	mm	1.0 ... 1.3
Max. wear limit size	mm	0.8
Reverse gear		
New condition	mm	0.5 ... 0.6
Max. wear limit size	mm	0.4

23 23 SYNCHRONIZATION 265/6 / MECH OVERDRIVE**TECHNICAL DATA - SYNCHRONIZATION 265/6 / MECH OVERDRIVE**

Distance between synchronizer ring and clutch body		
New condition	mm	1.0 ... 1.3
Max. wear limit size	mm	0.8
Reverse gear		
New condition	mm	0.5 ... 0.6
Max. wear limit size	mm	0.4

23 23 SYNCHRONIZATION 280/5 / MECH SPORT**TECHNICAL DATA - SYNCHRONIZATION 280/5 / MECH SPORT**

Distance between synchronizer ring and clutch body		
New condition	mm	1.0 ... 1.3
Max. wear limit size	mm	0.8
Reverse gear		
New condition	mm	0.5 ... 0.6
Max. wear limit size	mm	0.4

23 23 SYNCHRONIZATION GS6-37BZ/DZ / MECH**TECHNICAL DATA - SYNCHRONIZATION GS6-37BZ/DZ / MECH**

Distance between synchronizer ring and clutch body		
New condition		

1st/2nd gear	mm	1.3 ... 2.05
Wear limit size	mm	1.0
3st/4nd gear	mm	0.8 ... 1.40
Wear limit size	mm	0.7
5/6st gear	mm	0.95 ... 1.5
Wear limit size	mm	0.75
Reverse gear		
New condition	mm	0.65 ... 1.25
Max. wear limit size	mm	0.5

23 23 SYNCHRONIZATION GUIDE SLEEVES 240/5 / MECH OVERDRIVE

TECHNICAL DATA - SYNCHRONIZATION GUIDE SLEEVES 240/5 / MECH OVERDRIVE

Pressing-off force		
1st/2nd and 5th/R gear	t max	3.0
3rd/4th gear	t max	2.7
Pressing-on force		
1st/2nd and 5th/R gear	t max	2.1
3rd/4th gear	t max	1.9
Bearing Sleeves	approx. °C	80

23 23 SYNCHRONIZATION GUIDE SLEEVES 260/5 / MECH OVERDRIVE

TECHNICAL DATA - SYNCHRONIZATION GUIDE SLEEVES 260/5 / MECH OVERDRIVE

Pressing-off force		
1st/2nd and 5th/R gear	t max	3.7
3rd/4th gear	t max	3.0
Pressing-on force		
1st/2nd and 5th/R gear	t max	2.5
3rd/4th gear	t max	2.1
Bearing Sleeves	approx. °C	80

23 23 SYNCHRONIZATION GUIDE SLEEVES 260/5 / MECH SPORT

TECHNICAL DATA - SYNCHRONIZATION GUIDE SLEEVES 260/5 / MECH SPORT

Pressing-off force		
1st/2nd and 5th/R gear	t max	3.7
3rd/4th gear	t max	3.0
Pressing-on force		
1st/2nd and 5th/R gear	t max	2.5
3rd/4th gear	t max	2.1
Bearing Sleeves	approx. °C	80

23 23 SYNCHRONIZATION GUIDE SLEEVES 260/6 / MECH OVERDRIVE

TECHNICAL DATA - SYNCHRONIZATION GUIDE SLEEVES 260/6 / MECH OVERDRIVE

Pressing-off force		
1st/2nd and 5th/R gear	t max	3.7
3rd/4th gear	t max	3.0
Pressing-on force		
1st/2nd and 5th/R gear	t max	2.5
3rd/4th gear	t max	2.1
Bearing Sleeves	approx. °C	80

23 23 SYNCHRONIZATION GUIDE SLEEVES 260/6 / MECH OVERDRIVE

TECHNICAL DATA - SYNCHRONIZATION GUIDE SLEEVES 260/6 / MECH OVERDRIVE

Pressing-off force		
1st/2nd and 5th/R gear	t max	3.7
3rd/4th gear	t max	3.0
Pressing-on force		
1st/2nd and 5th/R gear	t max	2.5
3rd/4th gear	t max	2.1
Bearing Sleeves	approx. °C	80

23 23 SYNCHRONIZATION GUIDE SLEEVES 265/5 / MECH SPORT

TECHNICAL DATA - SYNCHRONIZATION GUIDE SLEEVES 265/5 / MECH SPORT

Pressing-off force		
Pressing-on force		
Bearing Sleeves	approx. °C	80

23 23 SYNCHRONIZATION GUIDE SLEEVES 265/6 / MECH OVERDRIVE

TECHNICAL DATA - SYNCHRONIZATION GUIDE SLEEVES 265/6 / MECH OVERDRIVE

Pressing-off force		
Pressing-on force		
Bearing Sleeves	approx. °C	80

23 23 SYNCHRONIZATION GUIDE SLEEVES 280/5 / MECH SPORT

TECHNICAL DATA - SYNCHRONIZATION GUIDE SLEEVES 280/5 / MECH SPORT

Pressing-off force		
Pressing-on force		
Bearing Sleeves	approx. °C	80

23 23 SYNCHRONIZATION GUIDE SLEEVES 280/5 / MECH SPORT

TECHNICAL DATA - SYNCHRONIZATION GUIDE SLEEVES 280/5 / MECH SPORT

Pressing-off force		
Pressing-on force		
Bearing Sleeves	approx. °C	80

23 23 SYNCHRONIZATION GUIDE SLEEVES GS6-37BZ/DZ / MECH

TECHNICAL DATA - SYNCHRONIZATION GUIDE SLEEVES GS6-37BZ/DZ / MECH

1st / 2nd gear	kN	10 ... 36
3rd / 4th gear	kN	20 ... 58
5th / 6th gear	kN	19 ... 55

23 23 SYNCHRONIZATION GUIDE SLEEVES GS6-53DZ / MECH

TECHNICAL DATA - SYNCHRONIZATION GUIDE SLEEVES GS6-53DZ / MECH

Press-off and press-on force	kN	50 / 2
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23 23 SYNCHRONIZATION GUIDE SLEEVES S 5 D 200 G / MECH

TECHNICAL DATA - SYNCHRONIZATION GUIDE SLEEVES S 5 D 200 G / MECH

Press-off and press-on force	kN	10 ... 20
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23 23 SYNCHRONIZATION GUIDE SLEEVES S 5 D 250 G / MECH

TECHNICAL DATA - SYNCHRONIZATION GUIDE SLEEVES S 5 D 250 G / MECH

Press-off and press-on force	kN	10 ... 20
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23 23 SYNCHRONIZATION GUIDE SLEEVES ZF-S5-16 / MECH OVERDRIVE

TECHNICAL DATA - SYNCHRONIZATION GUIDE SLEEVES ZF-S5-16 / MECH OVERDRIVE

Pressing-off force		
Pressing-on force		
1st/2nd and 5th/R gear	t max	0.08
Bearing Sleeves	approx. °C	80

23 23 SYNCHRONIZATION S 5 D 200 G / MECH

TECHNICAL DATA - SYNCHRONIZATION S 5 D 200 G / MECH

Distance between synchronizer ring and clutch body		
New condition		
1st/2nd gear	mm	1.3 ... 2.1
3rd gear	mm	1.1 ... 1.5

4th/5th gear	mm	0.9 ... 1.5
Max. wear limit size	mm	0.8
Reverse gear		
New condition	mm	1.1 ... 1.7
Max. wear limit size	mm	0.5

23 23 SYNCHRONIZATION S 5 D 250 G / MECH

TECHNICAL DATA - SYNCHRONIZATION S 5 D 250 G / MECH

Distance between synchronizer ring and clutch body		
New condition		
1st/2nd gear	mm	1.3 ... 2.1
3rd gear	mm	1.1 ... 1.5
4th/5th gear	mm	0.9 ... 1.5
Max. wear limit size	mm	0.8
Reverse gear		
New condition	mm	1.1 ... 1.7
Max. wear limit size	mm	0.5

23 23 SYNCHRONIZATION S 5 D 310 Z / MECH

TECHNICAL DATA - SYNCHRONIZATION S 5 D 310 Z / MECH

Distance between synchronizer ring and clutch body		
New condition		
1st/2nd gear	mm	1.1 ... 1.6
3rd gear	mm	0.95 ... 1.35
4th/5th gear	mm	0.95 ... 1.35
Max. wear limit size	mm	0.8
Reverse gear		
New condition	mm	0.7 ... 1.15
Max. wear limit size	mm	0.5

23 23 SYNCHRONIZATION S 6 S 420 G / MECH

TECHNICAL DATA - SYNCHRONIZATION S 6 S 420 G / MECH

Distance between synchronizer ring and clutch body		
New condition		
Max. wear limit size	mm	0.8
Reverse gear		
Max. wear limit size	mm	0.5

23 23 SYNCHRONIZATION S 6 S 560 G / MECH

TECHNICAL DATA - SYNCHRONIZATION S 6 S 560 G / MECH

Distance between synchronizer ring and clutch body		
New condition		
Max. wear limit size	mm	0.8
Reverse gear		
Max. wear limit size	mm	0.5

23 23 SYNCHRONIZATION ZF-S5-16 / MECH OVERDRIVE**TECHNICAL DATA - SYNCHRONIZATION ZF-S5-16 / MECH OVERDRIVE**

Distance between synchronizer ring and clutch body		
New condition	mm	1.0 ... 1.3
Max. wear limit size	mm	0.8
Reverse gear		
New condition	mm	0.5 ... 0.6
Max. wear limit size	mm	0.4

31 INTERNAL GEARSHIFT COMPONENT**23 31 INTERNAL SHIFT COMPONENTS 240/5 / MECH OVERDRIVE****TECHNICAL DATA - INTERNAL SHIFT COMPONENTS 240/5 / MECH OVERDRIVE**

Shift fork guide width		
1st ... 5th gear		
Wear limit	mm	4.8

23 31 INTERNAL SHIFT COMPONENTS 260/5 / MECH OVERDRIVE**TECHNICAL DATA - INTERNAL SHIFT COMPONENTS 260/5 / MECH OVERDRIVE**

Shift fork guide width		
1st ... 5th gear		
Wear limit	mm	4.8

23 31 INTERNAL SHIFT COMPONENTS 260/5 / MECH SPORT**TECHNICAL DATA - INTERNAL SHIFT COMPONENTS 260/5 / MECH SPORT**

Shift fork guide width		
1st ... 5th gear		
Wear limit	mm	4.8

23 31 INTERNAL SHIFT COMPONENTS 260/6 / MECH OVERDRIVE**TECHNICAL DATA - INTERNAL SHIFT COMPONENTS 260/6 / MECH OVERDRIVE**

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Shift fork guide width		
1st ... 5th gear		
Wear limit	mm	4.8

23 31 INTERNAL SHIFT COMPONENTS 265/5 / MECH SPORT

TECHNICAL DATA - INTERNAL SHIFT COMPONENTS 265/5 / MECH SPORT

Shift fork guide width		
1st ... 5th gear		
Wear limit	mm	4.8

23 31 INTERNAL SHIFT COMPONENTS 265/6 / MECH OVERDRIVE

TECHNICAL DATA - INTERNAL SHIFT COMPONENTS 265/6 / MECH OVERDRIVE

Shift fork guide width		
1st ... 5th gear		
Wear limit	mm	4.8

23 31 INTERNAL SHIFT COMPONENTS 280/5 / MECH SPORT

TECHNICAL DATA - INTERNAL SHIFT COMPONENTS 280/5 / MECH SPORT

Shift fork guide width		
1st ... 5th gear		
Wear limit	mm	4.8

23 31 INTERNAL SHIFT COMPONENTS ZF-S5-16 / MECH OVERDRIVE

TECHNICAL DATA - INTERNAL SHIFT COMPONENTS ZF-S5-16 / MECH OVERDRIVE

Shift fork guide width		
1st ... 5th gear		
Wear limit	mm	4.8

TRANSMISSION

Manual Transmission - Tightening Torques - X3

00 COMPLETE TRANSMISSION

23 00 TRANSMISSION IN GENERAL

TRANSMISSION IN GENERAL - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
2AZ Transmission to clutch housing	B/C/D/E/F/G/H/I/J-transmission	M12		76 Nm
3AZ Reinforcement plate to transmission	B/C/D/E/F/G/H/I/J-transmission	M8		23 Nm
4AZ Oil drain plug / filler plug	B/C-transmission			50 Nm
	D/E-transmission			52 Nm
	G/H-transmission	M18x1.5 hexagon socket		35 Nm
	H/I-transmission	M12x1.5		25 Nm
	J-transmission			40 Nm
5AZ Transmission extension	g/H transmission	M10		46 Nm

23 00 TRANSMISSION IN GENERAL

TRANSMISSION IN GENERAL - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
Hex screws	B/C/D/E/F/G/H/I/J-transmission	M6		9 Nm
	B/C/D/E/F/G/H/I/J-transmission	M8		25 Nm
	B/C/D/E/F/G/H/I/J-transmission	M10		49 Nm
	B/C/D/E/F/G/H/I/J-transmission	M12		74 Nm
Torx bolt	B/C/D/E/F/G/H/I/J-transmission	M6		9 Nm
	B/C/D/E/F/G/H/I/J-transmission	M8		22 Nm
	B/C/D/E/F/G/H/I/J-transmission	M10		43 Nm
	B/C/D/E/F/G/H/I/J-transmission	M12		72 Nm

	transmission			
	J-transmission	M10x55 8.8		43 Nm
	J-transmission	M10x42 8.8		42 Nm
	H/G-transmission	M12		73 Nm
Steel screws with Torx head N52/N54/N53	I/G/H-transmission	M8		19 Nm
Steel / N53/N46T screws with Torx head N52 / N54	I/G/H-transmission	M12		66 Nm
2AZ Transmission to N52/N52K/N53/N54 aluminium screws marked blue	I/G/H-transmission		Replace screws Jointing torque and angle of rotation must be observed without fail	
	I/G/H-transmission	M10x30	Jointing torque	20 Nm
			Torque angle	90-110°
	I/G/H-transmission	M10x85	Jointing torque	20 Nm
			Torque angle	180- 200°
	G/I/H-transmission only with E9x	M12x91	Jointing torque	34 Nm
			Torque angle	90-110°
	1 / H / G-transmission	M12x91	Jointing torque	25 Nm
			Torque angle	130°
3AZ Cover plate, transmission	1 transmission	M6		6 Nm

11 HOUSING WITH COVER

23 11 CASE AND COVER

CASE AND COVER - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Transmission housing, rear section/front section	B/C/D/E/F/G/H/I/J- transmission			22 Nm
2AZ Cover with guide tube/transmission case	B/C/D/E/F/G/H/I/J- transmission	M8 x 22		18 Nm
	B/C/D/E/F/G/H/I/J- transmission	M8 x 30		25 Nm
	B/C/D/E/F/G/H/I/J- transmission	M6		10 Nm
3AZ Bearing cap/sealing flange	B/C/D/E/F/G/H/I/J- transmission			10.5 Nm
4AZ Reverse gear wheel axle to	B/C/D/E/F/G/H/I/J-			

intermediate housing	transmission			49 Nm
5AZ Retaining plate for reverse gear wheel axle to intermediate housing	B/C/D/E/F/G/H/I/J-transmission			25 Nm
6AZ Transmission closing plate	B/C/D/E/F/G/H/I/J-transmission	M6		8 Nm

23 11 CASE AND COVER

CASE AND COVER - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
6AZ Reverse gear shaft to case	B/C/D/E/F/G/H/I/J-transmission	M8		25 Nm
	S5D 310Z/S5D 320Z	M8		20 Nm
	B/C/D/E/F/G/H/I/J-transmission	M10		45 Nm
7AZ Support for reverse gear shaft	B/C-transmission	M8		25 Nm
8AZ Bearing holder to rear housing section	B/C-transmission	M6		10 Nm
9AZ Retaining tabs for sealing cap	C-transmission	M6		10 Nm
10AZ Bearing on countershaft	B-transmission	M10		90 Nm
	C-transmission	M10		30 Nm
	C-transmission	M10		60 Nm

23 11 CASE AND COVER

CASE AND COVER - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
11AZ Screw plug to rear housing section	B/C/D/E/F/G/H/I/J-transmission	M20		60 Nm
	B-transmission	M16		40 Nm
	B/C-transmission	M22		60 Nm
12AZ Sealing caps to rear housing section	B/C-transmission	M6		10 Nm
13AZ Reversing bolt to reversing lever	ZFS-5-16/C-transmission			43 Nm
14AZ Clamping claw to rear housing section	ZFS-5-16/C-transmission			33 Nm
15AZ Screws on detent plate	ZFS-5-16/C-transmission			9 Nm

23 11 CASE AND COVER

CASE AND COVER - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
16AZ Holder to transfer case	265 / Sport	M6		9 Nm
17AZ Retaining plates for bearings on housing	S5D 310Z/S5D 320Z / S5D 200G / S5D 250G	M6		10 Nm
18AZ Retaining plate to housing	S5D 320Z SMG	M6		5.5 Nm

21 TRANSMISSION SHAFTS

23 21 TRANSMISSION SHAFTS

TRANSMISSION SHAFTS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Output flange	S5D 200G / S5D 250G/ S5D260Z / S5D 310Z/S6S 420G		Collar nut installed with bolt cement	
			Pretension	190 Nm
			Release	
			Tighten down	120 Nm
	S5D 280Z / S5D 320Z		Collar nut installed with bolt cement	
			Pretension	170 Nm
			Release	
			Tighten down	130 Nm
	S5D 390Z		Collar nut installed with bolt cement	
			Pretension	200 Nm
			Release	
			Tighten down	145 Nm
	GS6-37BZ / GS6-17BG		Collar nut installed with bolt cement	
			Pretension	170 Nm
			Release	
			Tighten down	120 Nm
	GS6-53DZ		Collar nut installed with bolt cement	
			Pretension	200 Nm
			Release	
			Tighten down	140 Nm
	GS7S47BG		Collar nut installed with bolt cement	200 Nm
2AZ Gear to countershaft	265 / Sport	M10		60 Nm

31 INTERNAL GEARSHIFT COMPONENT

23 31 INTERIOR SHIFT COMPONENTS

INTERIOR SHIFT COMPONENTS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Shift arms to transmission case	S5D310 Z			45 Nm
2AZ Sealing cap for locking sleeves of gearshift rods	S6S 420G	M6		10 Nm
3AZ Retaining screw, shift actuator / selector shaft	S5D 320Z / S6S37BZ/ S6S53BZ SMG	M6		10 Nm

41 EXTERNAL GEARSHIFT COMPONENT

23 41 EXTERNAL GEARSHIFT COMPONENTS

EXTERNAL GEARSHIFT COMPONENTS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Servomotor / actuator to transmission housing Insert screws with screw securing adhesive	D/G/HSMG transmission	M6		10 Nm
2AZ Switch for gear recognition to servomotor	DSMG transmission	M5		6 Nm
3AZ Hydraulic lines to servomotor	DSMG transmission	M12x1		17 Nm
4AZ Actuator to transmission casing	DSMG transmission	M8		25 Nm
5AZ Reversing light switch	B/C/D/E/F/G/H/I/J-transmission	M12		16 Nm
6AZ Pressure accumulator to valve block	C/G/HSMG transmission			30 Nm
7AZ Protective plate Expansion tank Shift actuator Hydraulic pump Valve block to transmission housing Ground strap to transmission housing	C/G/HSMG transmission	M6		10 Nm
8AZ Protecting plate / valve block to transmission housing /	C/G/HSMG transmission	M8		20 Nm
9AZ Valves to valve block	C/G/HSMG transmission	M4		3.5 Nm
10AZ Pressure sensor to valve block	C/G/HSMG transmission			15 Nm
11AZ Shift/selector sensor to	C/G/HSMG	M4		2.8 Nm

transmission housing	transmission			
12AZ Retaining screw for hydraulic line	C/G/HSMG transmission			18 Nm
13AZ Banjo bolt for hydraulic line	CSMG transmission			16 Nm
14AZ Heat shield to expansion tank/pump bracket	H transmission			6 Nm
15AZ Clutch speed sensor	G/H-transmission			35 Nm
16AZ Transmission oil cooler to transmission	E60 / E63 / E64 / E61	7-speed SMG M6x35		10 Nm
17AZ Transmission oil screen in transmission oil cooler	E60 / E63 / E64 / E61	7-speed SMG M18		25 Nm
18AZ Banjo bolt to transmission oil cooler	E60 / E63 / E64 / E61	7-speed SMG M16x1.5		40 Nm
19AZ Union nut to screwed socket	E60 / E63 / E64 / E61	7-speed SMG		40 Nm
20AZ Oil cooler connection to transmission oil cooler	E60 / E63 / E64 / E61	7-speed SMG		40 Nm
21AZ Oil pump to transmission oil cooler	E60 / E63 / E64 / E61	7-speed SMG M6x20		10 Nm
22AZ Speed sensor to transmission	E60 / E63 / E64 / E61	7-speed SMG M6x16		10 Nm
23AZ Temperature and pressure sensor to hydraulic unit	E60 / E63 / E64 / E61	7-speed SMG		15 Nm
24AZ Clamp, pressure accumulator to transmission	E60 / E63 / E64 / E61	7-speed SMG		22 Nm
25AZ Pressure accumulator to pump block	E60 / E63 / E64 / E61	7-speed SMG		29 Nm
26AZ Pump block to transmission	E60 / E63 / E64 / E61	7-speed SMG		22 Nm
27AZ Banjo bolts, pressure lines clutch actuator and pump block	E60 / E63 / E64 / E61	7-speed SMG		25 Nm
28AZ Screws, actuator block	E60 / E63 / E64 / E61	7-speed SMG		25 Nm
29AZ Union nut, hydraulic line, actuator block	E60 / E63 / E64 / E61	7-speed SMG		11 Nm
30AZ Pump to electric motor	E60 / E63 / E64 / E61	7-speed SMG		5 Nm
31 AZ Electric motor to pump block	E60 / E63 / E64 / E61	7-speed SMG		5 Nm

71 TRANSMISSION SUSPENSION

23 71 TRANSMISSION MOUNTS

TRANSMISSION MOUNTS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Transmission mounts (rubber) to body	B/C/D/E/F/G/H/I/J-transmission	M10		42 Nm
2AZ Transmission cross-member to body	B/C/D/E/F/G/H/I/J-transmission	M10		42 Nm
	B/C/D/E/F/G/H/I/J-transmission	M8		21 Nm
3AZ Mount bracket to transmission	B/C/D/E/F/G/H/I/J-transmission	M8		21 Nm
4AZ Transmission support block to transmission	B/C/D/E/F/G/H/I/J-transmission	M10 ASA screw		38 Nm
	B/C/D/E/F/G/H/I/J-transmission	M10 ISA pan head		48 Nm
5AZ Transmission mount to transmission support bracket/transmission cross-member	B/C/D/E/F/G/H/I/J-transmission	M8		19 Nm

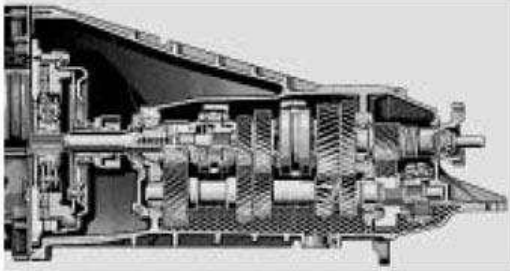
AUTOMATIC TRANSMISSION

Overview - All Models

STANDARD/AUTOMATIC TRANSMISSION

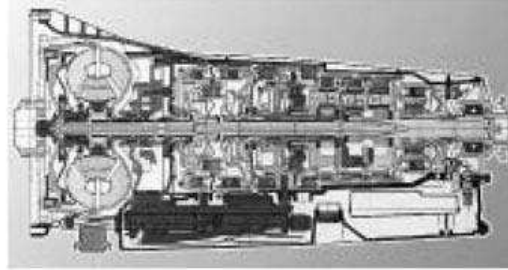
In today's modern vehicles, the automatic transmission has become a vital part of the powertrain. Automatic transmissions provide overall better fuel economy and efficiency while adapting to changing road conditions and driving habits. Standard transmissions offer more driver interaction with the vehicle, however automatic transmissions reduce driver fatigue and increase safety by shifting automatically. Automatic transmissions also offer improved driveability in stop and go traffic. If there is a disadvantage to an automatic transmission, it would be complexity and cost of manufacturing. See **Fig. 1**.

Standard Transmission



- Drive torque must be interrupted to change gears.
- Higher loads on driveline from abrupt clutch application.
- Clutch must be disengaged when vehicle is stopped to prevent stalling.
- High radial loads on housing.
- Gear set design requires more space than planetary type.
- Requires some Maintenance (clutch).
- Requires driver intervention for shifting.

Automatic Transmission



- Gear teeth are in constant mesh due to planetary design.
- Smoother application of drive torque reduces loads on driveline.
- Due to fluid coupling in the torque converter, transmission can stay in gear when vehicle is stopped.
- Minimal radial loads on housing.
- Compact design of gear set. Space requirement is minimized.
- Maintenance free operation. (Lifetime fluid and no clutch).
- Automatic shifting reduces driver fatigue and increases safety.

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Fig. 1: Standard & Automatic Transmission Comparison

Courtesy of BMW OF NORTH AMERICA, INC.

HYDRAULIC TRANSMISSION VS. ELECTRO-HYDRAULIC TRANSMISSION

Since the introduction of the automatic transmission there have been numerous refinements to improve shift comfort as well as fuel economy. Early automatic transmissions used only hydraulic control, there was no electronic intervention. In 1986 BMW introduced their first EH (Electro-Hydraulic) transmission into production vehicles. The acronym EGS is used by BMW for its electronic transmission control system. EGS stands for "Electronic Transmission Control" which comes from the German words "Elektronisch Getriebe Steuerung". In order to comply with SAE terminology we will refer to the EGS control module as the TCM "Transmission Control Module". EH controlled transmissions allow for optimized shift points by closely

monitoring changing conditions. Engine speed, road speed and throttle angle are some of the inputs that are monitored by the TCM to determine optimal shift points. The TCM will then process this information and control shift point via electronic solenoids mounted on the valve body. With the introduction of Adaptive Transmission Control, shift comfort and fuel economy was further improved. The TCM now monitors throttle angle deviations, wheel speeds and CAN Bus information to fine tune shift points. See **Fig. 2**.

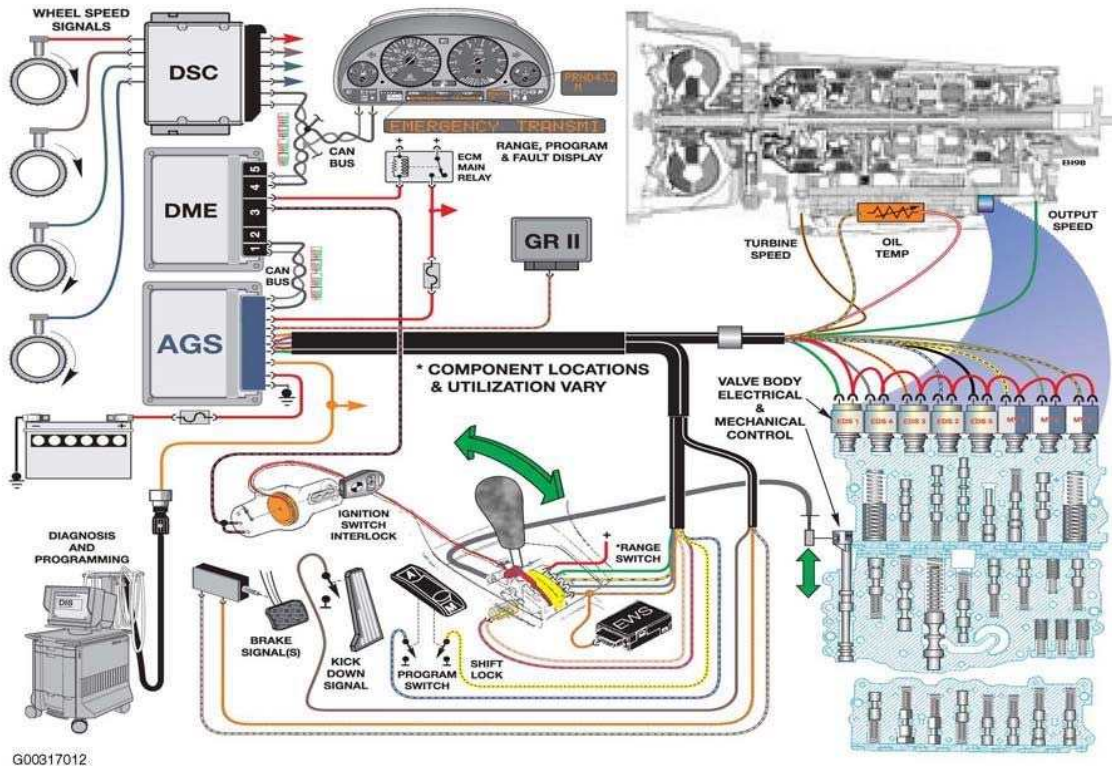


Fig. 2: Electronic Transmission Control System
 Courtesy of BMW OF NORTH AMERICA, INC.

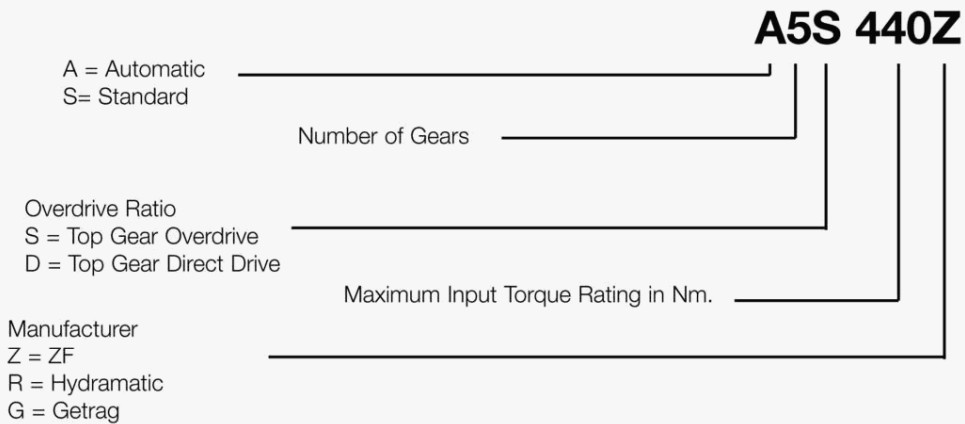
TRANSMISSION IDENTIFICATION

BMW automatic transmissions are manufactured by two suppliers for the US market:

- Zahnradfabrik Friedrichshafen: Commonly referred to as ZF. ZF manufactures both manual and automatic transmissions.
- GM Powertrain - Hydramatic: Hydramatic is a manufacturing division of General Motors located in Strasbourg France. Hydramatic supplies automatic transmissions to BMW for four and six-cylinder vehicles.

BMW has developed an internal numbering system for their transmissions for parts ordering, information research and identification. Also, each manufacturer uses their own internal identification system. Here is a breakdown of these identification codes. See **Fig. 3**.

BMW Identification Code Breakdown



ZF Identification Code Breakdown

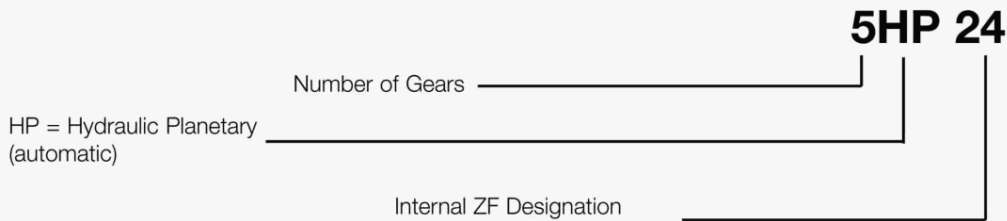


Fig. 3: Transmission Code Breakdown

Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION HYDRAULICS

TRANSMISSION FLUID (OIL)

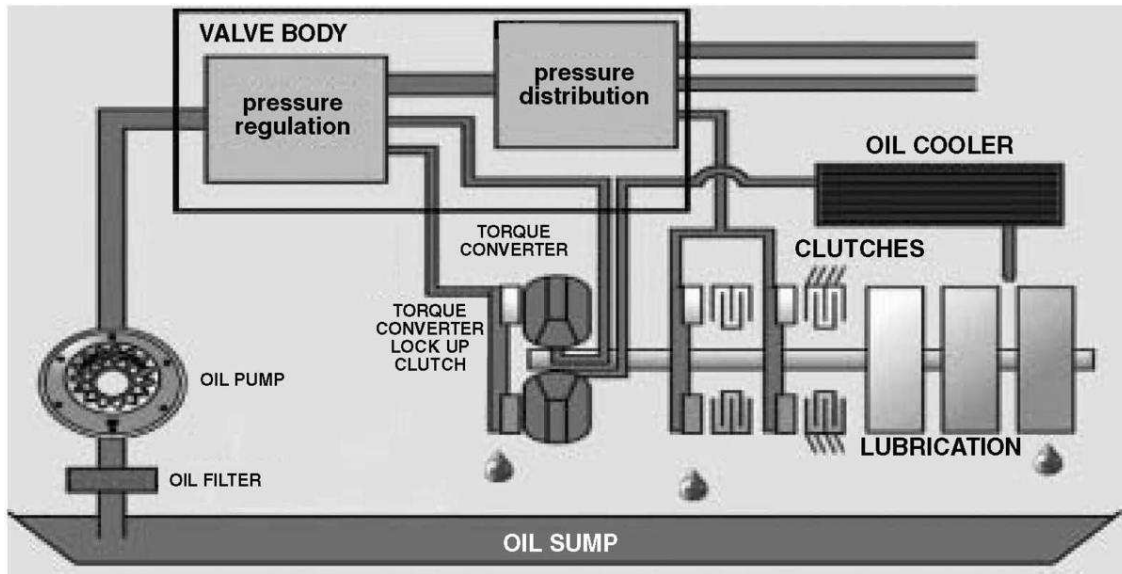
The automatic transmission provides pressure regulated hydraulic fluid which is filtered for all of the transmissions functional requirements. See **Fig. 4**. All BMW automatic transmissions are designed to operate with specific fluids. Use of non-approved oil will cause malfunctions and irreparable transmission damage which is not covered by BMW warranty. The transmission fluid provides the following functions:

- Lubricates mechanical components (planetary gears, bearings etc.).
- Removes heat and transfers heat to transmission cooling system. (heat exchanger).
- Removes debris and contaminants to sump and filter when circulated.
- Provides a transfer of kinetic energy in the torque converter.
- Allows hydraulic operation of mechanical components (clutches, brakes) via control of the valve body.

Also, transmission fluid has various properties to prevent oxidation and breakdown from heat and friction. Each

type of transmission fluid has properties specific for each transmission application. Fluid level is crucial in the proper operation of an automatic transmission. Improper fluid levels will cause improper operation and eventually irreparable transmission damage. Improper fluid level can cause:

- A low fluid level can cause an interruption in oil flow during fast acceleration or hard braking which can cause gear shift malfunctions.
- An excessively high fluid level can cause the rotating mechanical components to paddle in the oil. This produces foam which introduces air into the hydraulic system.
- A low fluid level can also cause transmission overheating causing premature transmission failure.



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Fig. 4: Identifying Transmission Hydraulics
Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION FLUID APPLICATION

There are numerous types of transmission fluid used in BMW transmissions. With the exception of the early transmissions (4HP22/24, A4S310/270R and the A5S310Z) all current BMW transmissions use "Lifetime Fill" transmission fluid. There is no maintenance required for these transmissions. It is important to use the correct fluid. Incorrect use of the transmission fluid can cause non-warrantable transmission damage.

When performing repairs on transmissions with lifetime fluid, it is important to drain the transmission fluid in to a clean container for re-use. New fluid should only be used for transmission replacement and for topping off after repairs.

Also, transmission fluid level is vital to the proper operation of the transmission. See **Fig. 5**.

Transmission	Fluid Type	BMW Part #	Container	SIB Ref.
4HP22 4HP24	Dexron III Mercon	Available Commercially (Castrol or Texaco)	N/A	
A5S310Z 530i/iT (E34)	Dexron III	Available Commercially (Castrol or Texaco)	N/A	
M3 (E36)	ESSO LT 71141	83 22 9 407 807	20 liter container	B 24 03 95
A5S325Z	ESSO LT 71141	83 22 9 407 807	20 liter container	
A5S440Z	ESSO LT 71141	83 22 9 407 807	20 liter container	
A5S560Z 740 (E32), 540 (E34) 840Ci (E31- 6/93-12/94) 740i/iL-750iL (E38)	Shell LA2634	83 22 9 407 765	5 liter container	B 24 11 92
540i (3/96-12/96) 850Ci (10/94-6/97)	ESSO LT 71141	83 22 9 407 807	20 liter container	B 24 02 94
A4S310R A4S270R (THM-R1)	Dexron III Mercon	Available Commercially (Castrol or Texaco)	N/A	
A5S360R	Texaco ETL 7045E	83 22 0 026 922	25 liter container	
A5S390R	Texaco ETL 8072B	83 22 0 024 359	25 liter container	
GA6HP26Z	Shell M1375.4	83 22 0 142 516		

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Fig. 5: Transmission Fluid Application

Courtesy of BMW OF NORTH AMERICA, INC.

TORQUE CONVERTER

In standard transmissions the crankshaft is linked to the transmission input shaft via the clutch assembly. Power flows from the crankshaft through the flywheel. The pressure plate transfers power to the clutch disc which is splined to the transmission input shaft. The pressure plate is used to disconnect (or interrupt) power flow to the transmission input shaft. Because the engine is mechanically connected to the driveline, power flow must be interrupted when the vehicle is stationary. Otherwise the engine would stall. In automatic transmissions, there is a fluid coupling between the engine and transmission. This fluid coupling is more commonly referred to as the torque converter. In the torque converter there is no rigid connection between the engine and transmission (except for lock up clutch). In order to understand the operation of the torque converter, we must first start with the components. The breakdown of the components are as follows:

- The Impeller, which is rigidly connected to the torque converter housing.
- The Turbine, which is splined to the input shaft (turbine shaft) of the transmission.
- The Stator, which has a one-way clutch. The inner race of the one-way clutch is splined to a stationary

shaft attached to the transmission. See **Fig. 6**.

The addition of the stator allows the fluid coupling to be referred to as a torque converter. The stator provides for a multiplication of torque at low speeds. Without the stator there would be no multiplication of torque.

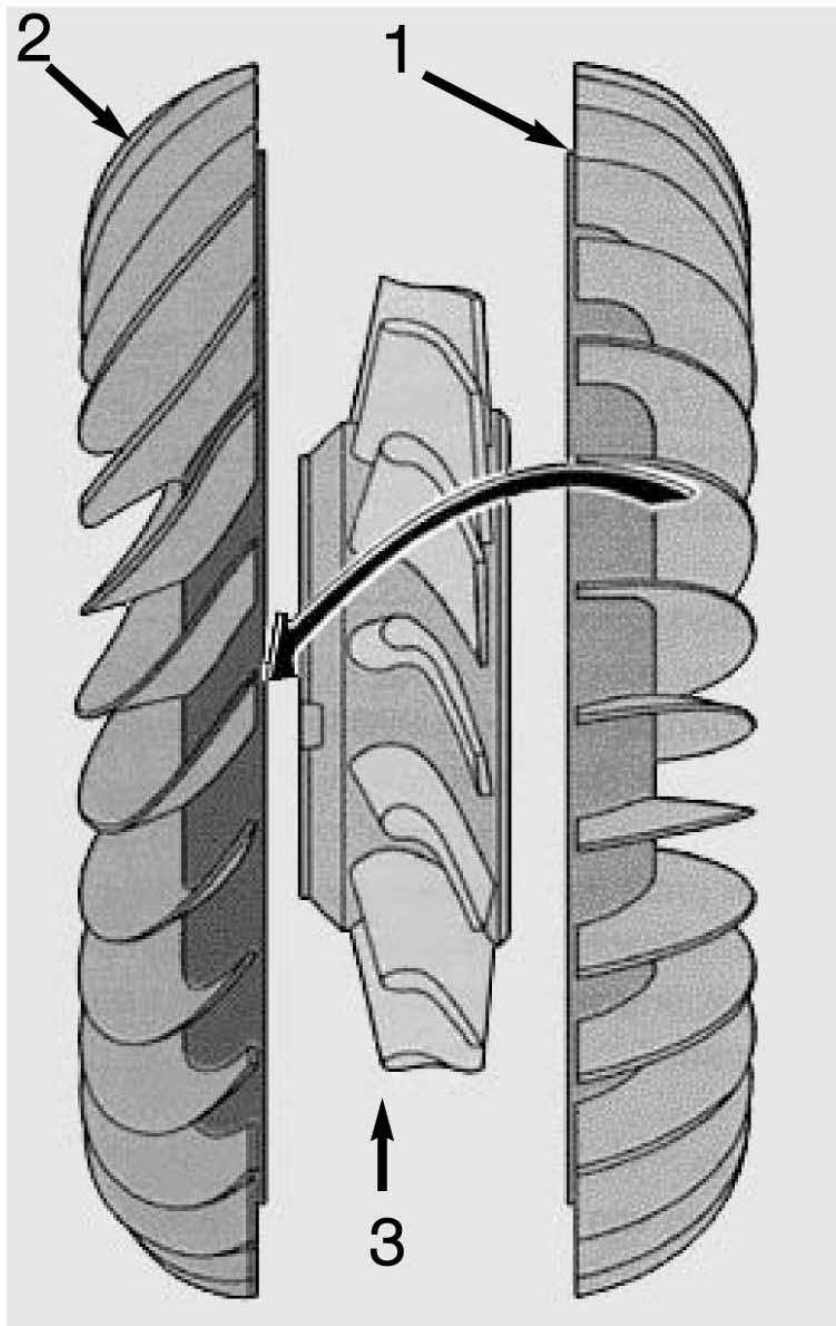
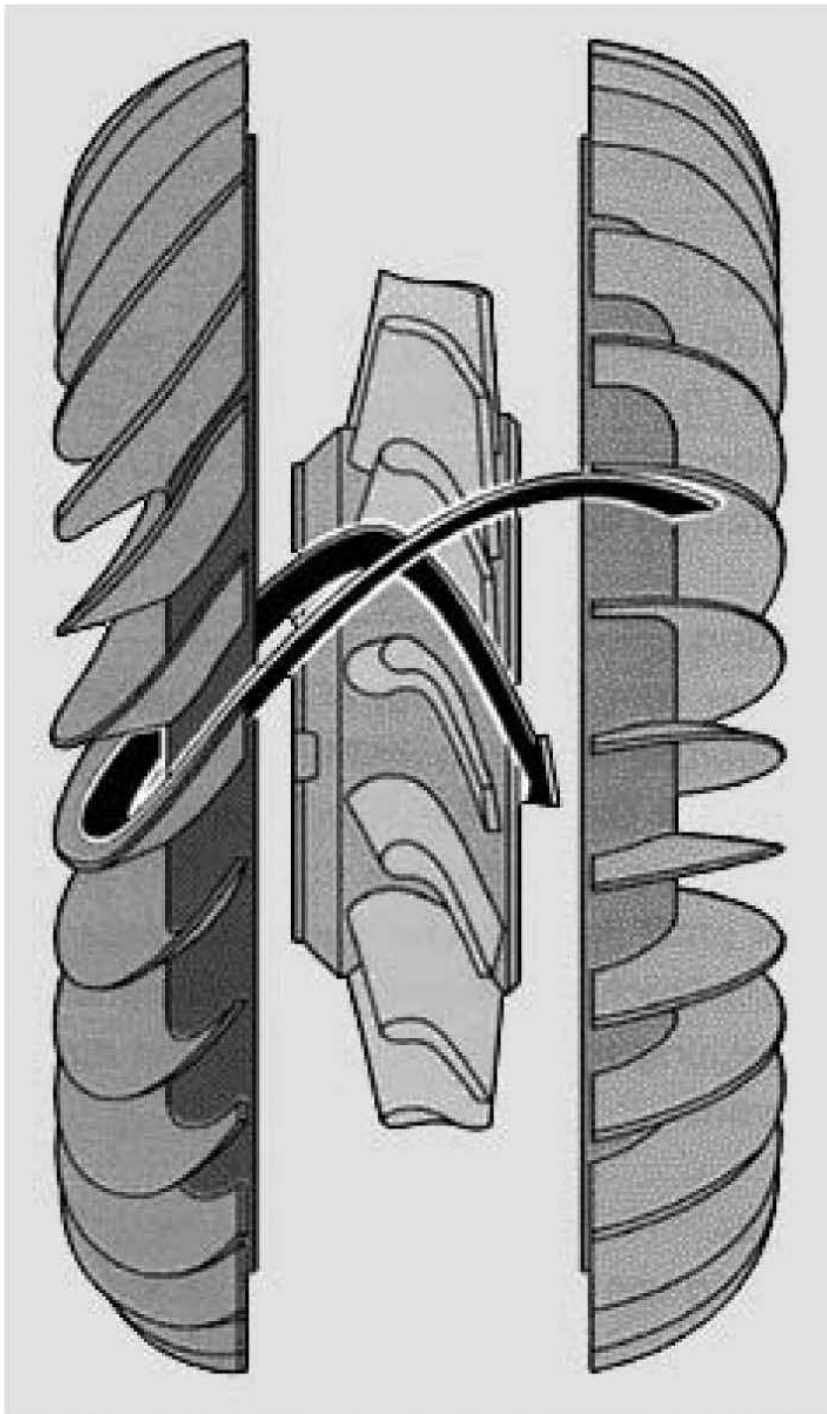


Fig. 6: Identifying Impeller, Turbine & Stator
Courtesy of BMW OF NORTH AMERICA, INC.

When the engine is running, the impeller which is directly connected to the converter housing, rotates at engine speed. Fluid is directed from the impeller blades to the turbine blades. The fluid drives the turbine which is splined to the input (turbine) shaft of the transmission. This functions the same way as a waterfall acting on a paddle wheel. The ratio of the impeller speed to turbine speed is approximately 1.1 to 1. This ratio is improved to 1:1 with the addition of the torque converter clutch which is discussed later.

Torque Converter Operation At Low Speeds

1. At low engine speeds there is a large difference in rotational speed between the impeller and the turbine
2. Fluid flow is directed from the impeller to the turbine. Fluid strikes the vanes of the turbine. The turbine is driven forward in the direction of engine rotation.
3. Fluid flow is then directed back towards the impeller.
4. Before the fluid reaches the impeller, the fluid strikes the vanes of the stator.
5. When the fluid strikes the stator, the one way clutch prevents the stator from rotating.
6. The fluid is then re-directed by the curved vanes of the stator. The fluid is now flowing in the same direction as the impeller.
7. The fluid that is acting on the impeller increases the force on the impeller which multiplies torque. See **Fig. 7.**

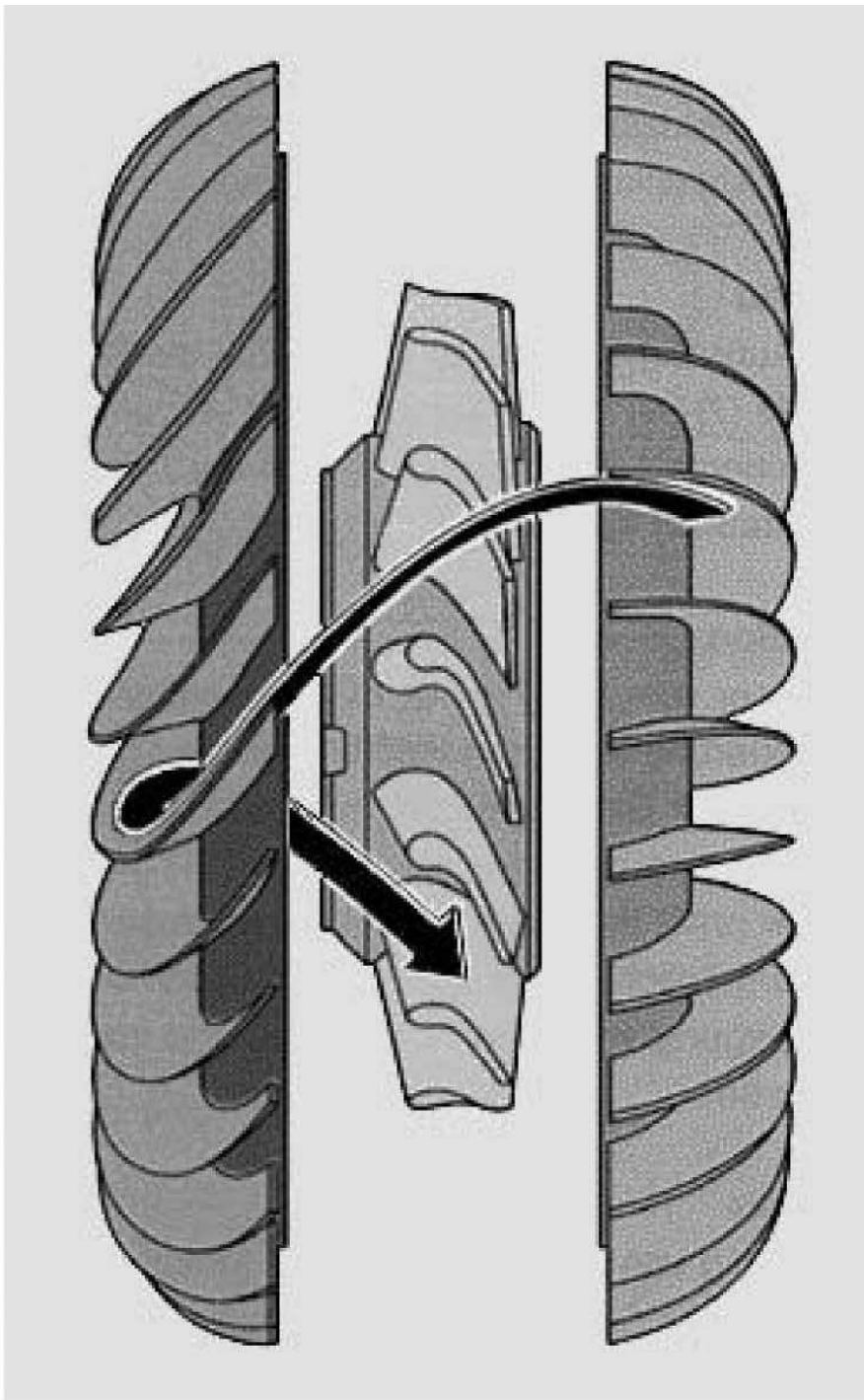


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Fig. 7: Torque Converter Operation At Low Speed
Courtesy of BMW OF NORTH AMERICA, INC.

Torque Converter Operation at High Speed

1. As engine speed increases, the turbine speed approaches the speed of the impeller.
2. The fluid flow is directed from the turbine to the back side of the impeller blades.
3. The one-way clutch in the stator unlocks and the stator blades turn in the direction of engine rotation.
4. Fluid is no longer re-directed and torque multiplication no longer takes place.
5. This is referred to as "Coupling Speed". The turbine never reaches the same speed as the impeller as fluid flow would come to a halt. Ratio is approximately 1.1 to 1. See **Fig. 8**.



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Fig. 8: Torque Converter Operation At High Speed
Courtesy of BMW OF NORTH AMERICA, INC.

Torque Converter Clutch

Since the efficiency of the torque converter at coupling speed is approximately 1.1 to 1, fuel economy is compromised. To offset this a torque converter clutch was added on EH controlled transmissions. The torque converter clutch locks the turbine to the converter housing. This creates a mechanical coupling with a ratio of 1:1. This can only be achieved at higher engine speeds. The torque converter clutch must be disengaged at low engine speeds to prevent stalling. There are two methods for controlling the torque converter clutch on BMW transmissions:

- A4S310/270R, 4HP22/24 EH, A5S310Z - These transmission use an on/off control method to lock and unlock the torque converter. The TCC is either completely engaged or completely disengaged. This method of engagement provides an abrupt sensation when the TCC is locking and unlocking. This abrupt sensation can be unpleasant and undesirable to some drivers.
- A5S560Z, A5S440Z, A5S325Z, GA6HP26Z, A5S360/390R - These transmissions use a gradual approach to TCC control. The TCC is gradually applied and released, this method reduces the abrupt feel of the on/off type TCC. The TCC solenoid is controlled by pulse width modulation. This allows fluid to be gradually introduced and released to the TCC.

The TCC is spring loaded to the engaged position. Pressurized fluid releases the TCC, when the pressurized fluid is released, the TCC is engaged. Depending on transmission application, the TCC can be engaged in 3rd, 4th or 5th gear. The TCC must be disengaged at low speeds to prevent stalling. See **Fig. 9** and **Fig. 10** .

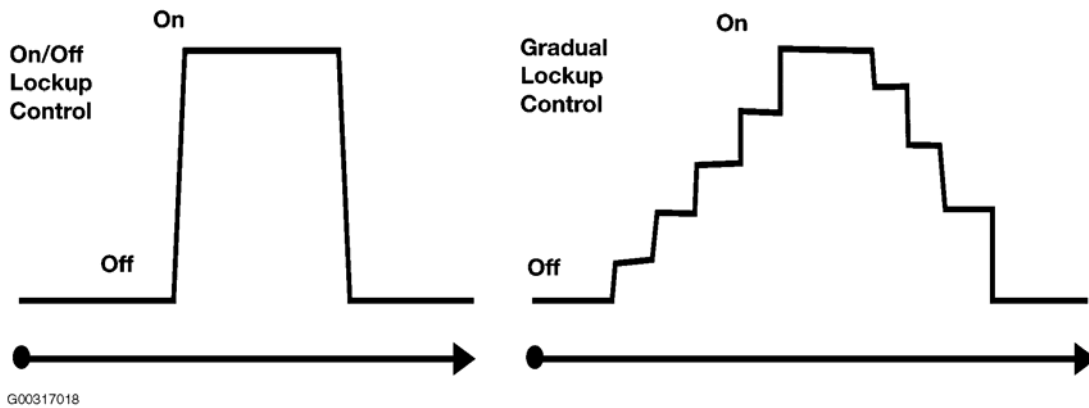
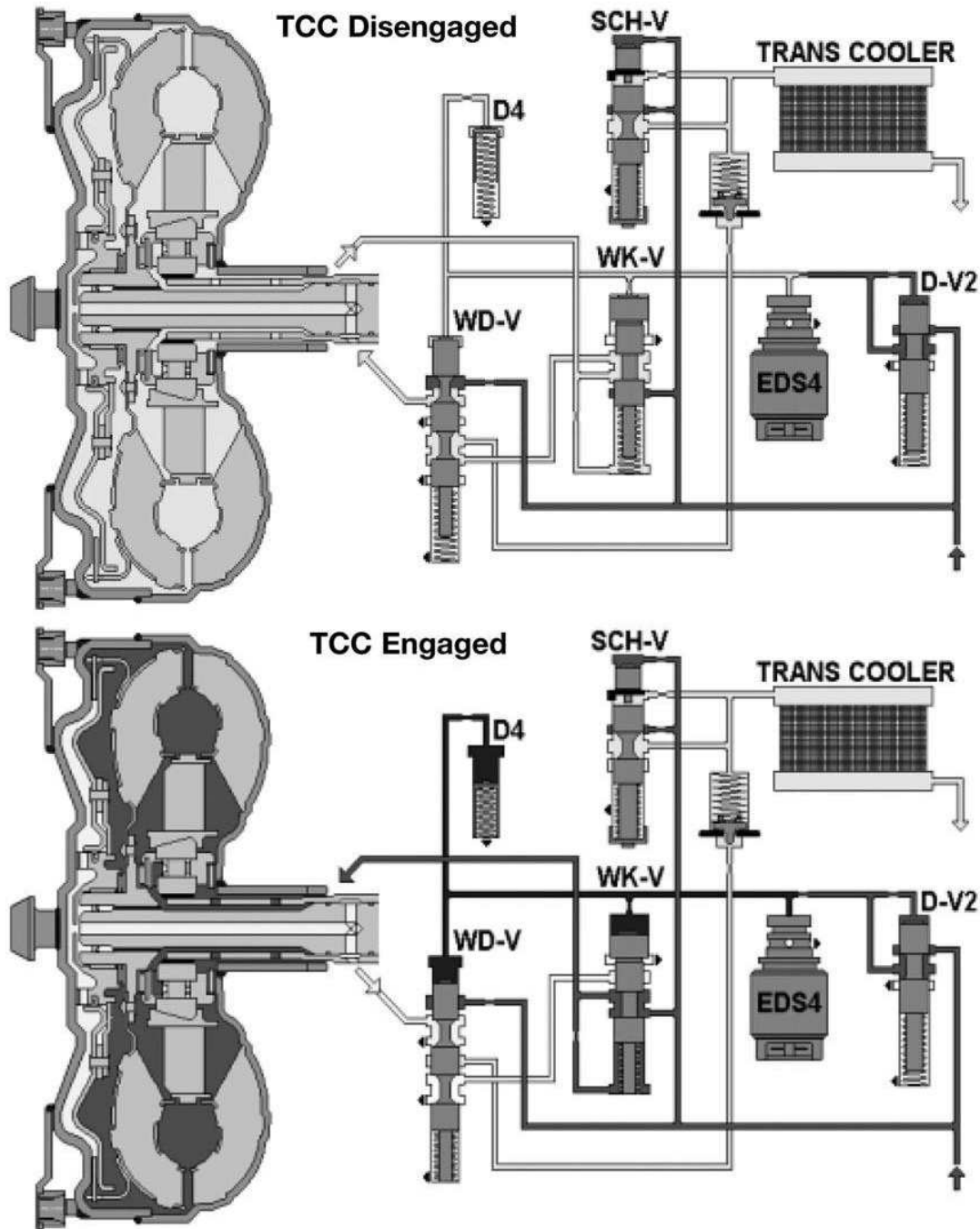


Fig. 9: Identifying TCC Operation

Courtesy of BMW OF NORTH AMERICA, INC.

Example of TCC oil control circuit from the A5S440/560Z transmission.

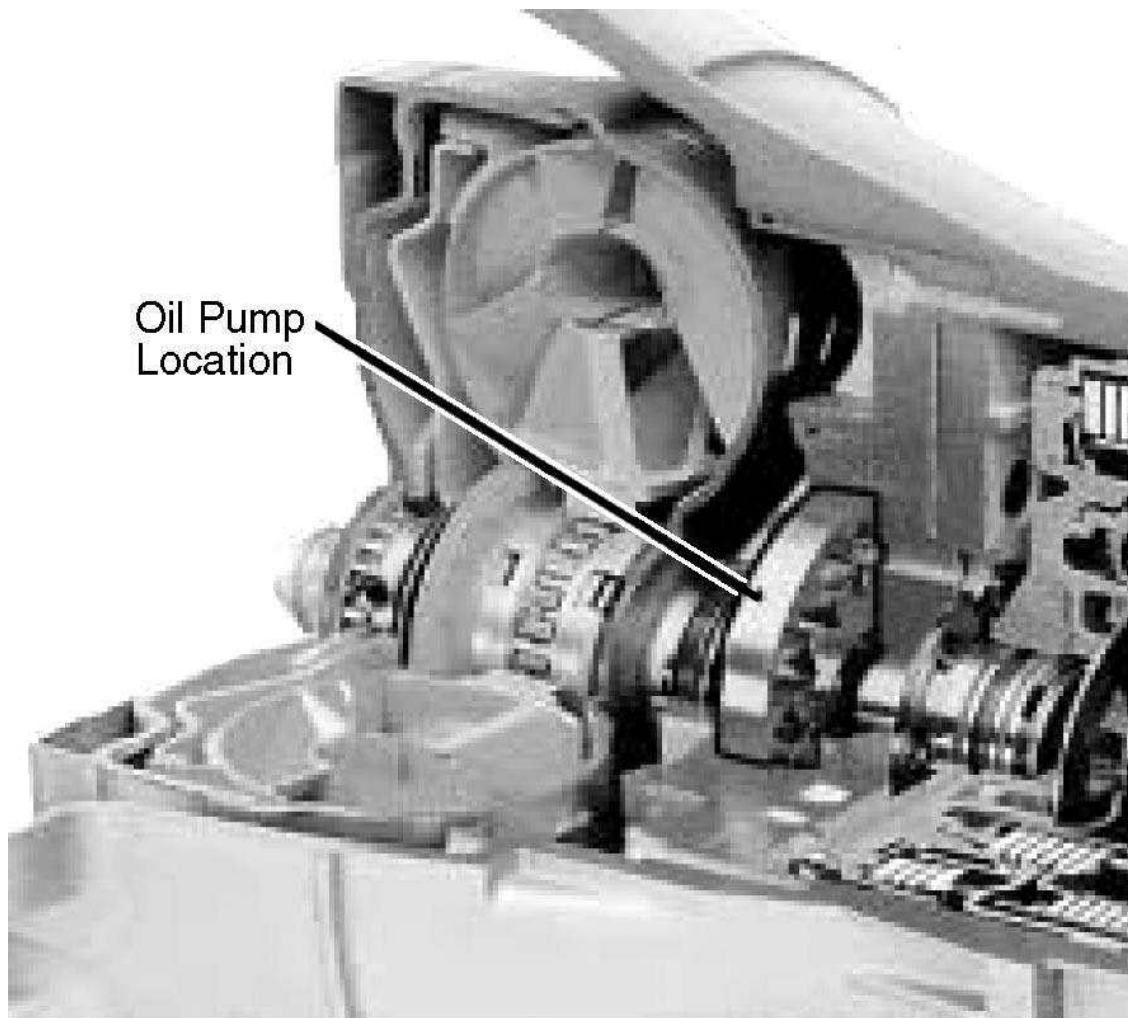


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Fig. 10: TCC Oil Control Circuit
Courtesy of BMW OF NORTH AMERICA, INC.

OIL PUMP

The transmission oil pump is used to circulate oil and provide pressure for hydraulic operation. The pump is driven by the torque converter shell and rotates with engine. Fluid is drawn from the sump through the filter and distributed to the various transmission hydraulic systems. The output pressure is regulated to an operating pressure of approximately 25 bar. Currently there are two types of oil pumps used in BMW transmissions: Crescent type and Vane type. See **Fig. 11**.



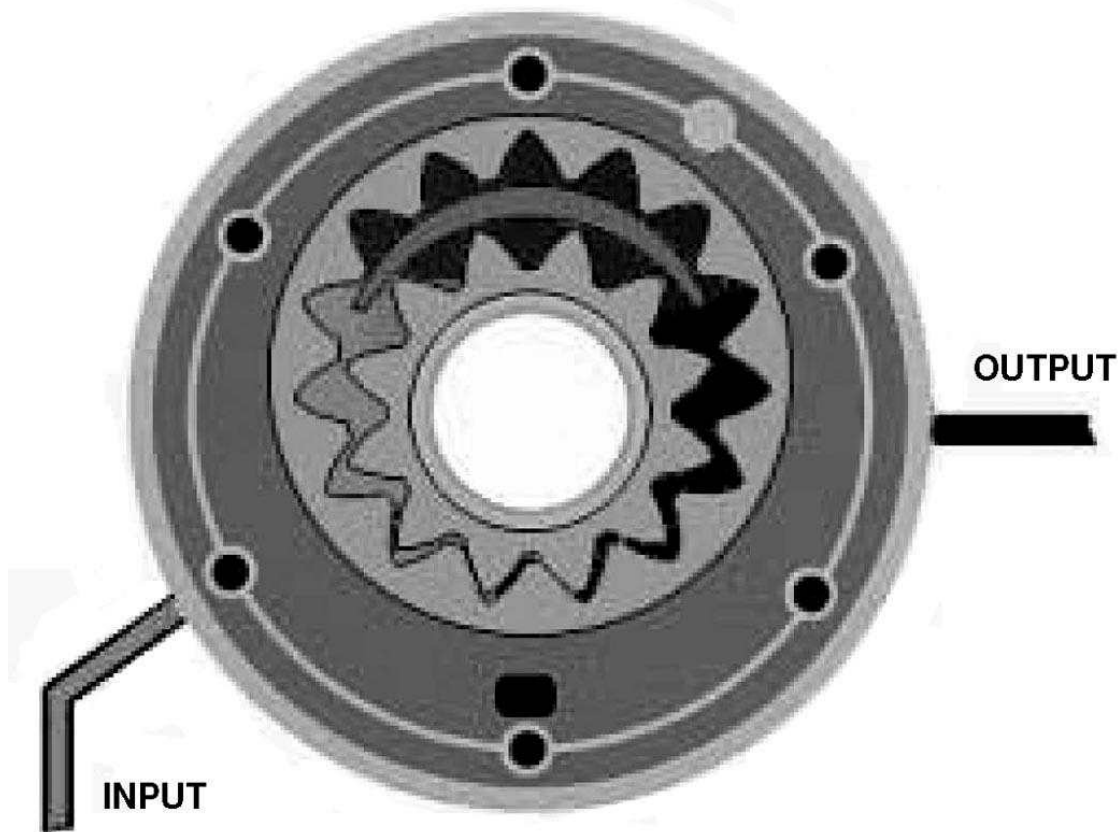
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Fig. 11: Locating Oil Pump
Courtesy of BMW OF NORTH AMERICA, INC.

Crescent Type Oil Pump (All except A5S360/390R)

The crescent type is an internal gear pump containing a drive gear and a driven gear. The inner gear is driven by the torque converter and acts as the impeller. The outer gear is driven by the inner gear. The gap between the teeth varies from the input, through the crescent and to the output of the pump. A low pressure area is created on the input side of the pump by the widening gap between the gear teeth. The oil is drawn to the crescent and transferred to the output side of the pump, where the pressure is increased by the narrowing gap between the

gear teeth. The output pressure of the pump is controlled by spring loaded pressure regulator. See **Fig. 12**.



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Fig. 12: Identifying Crescent Type Oil Pump
Courtesy of BMW OF NORTH AMERICA, INC.

Oil Volume Control

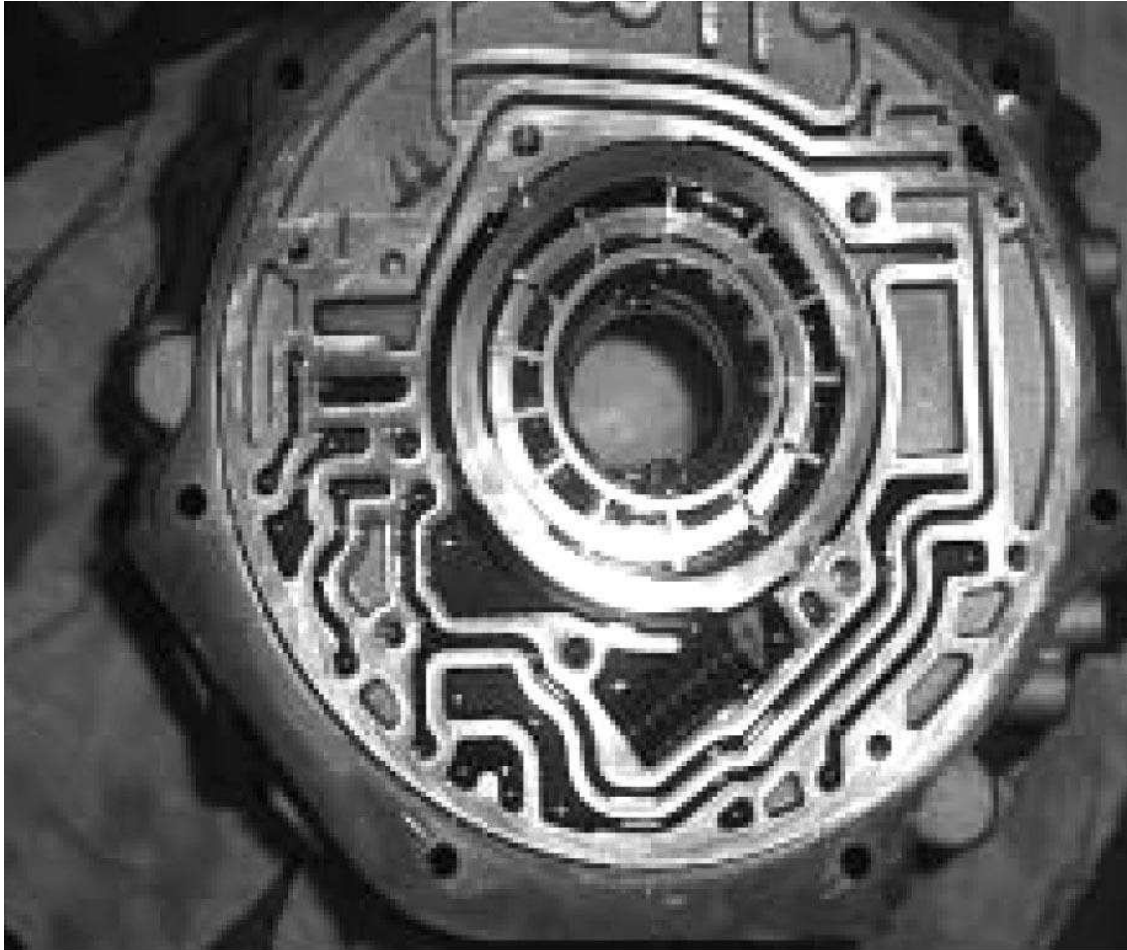
On the A5S440Z transmission, oil pump output volume is controlled based on engine RPM. High oil volume is initially required at start up to quickly fill the transmission requirements. As engine RPM increases, the volume is greater than is required. The Oil Volume Control Damper regulates the pump output volume based on engine RPM. This helps improve fuel economy by reducing the load on the engine at high RPM.

Vane Type Pump (A5S360/390R)

The new A5S360/390R (GM5) transmission uses a vane type pump. See **Fig. 13**. The torque converter drives the pump rotor and 13 vanes. The rotor and vanes are placed inside a slide mechanism. As the rotor spins, the vanes sweep oil from the pump intake to the output along the mating surface on the vane ends and the interior surface of the slide. The slide is mounted on a pivot pin. As it pivots, it changes the eccentricity of the rotor to slide mating surface. This in turn will alter the output oil volume. This provides the same function as the Oil

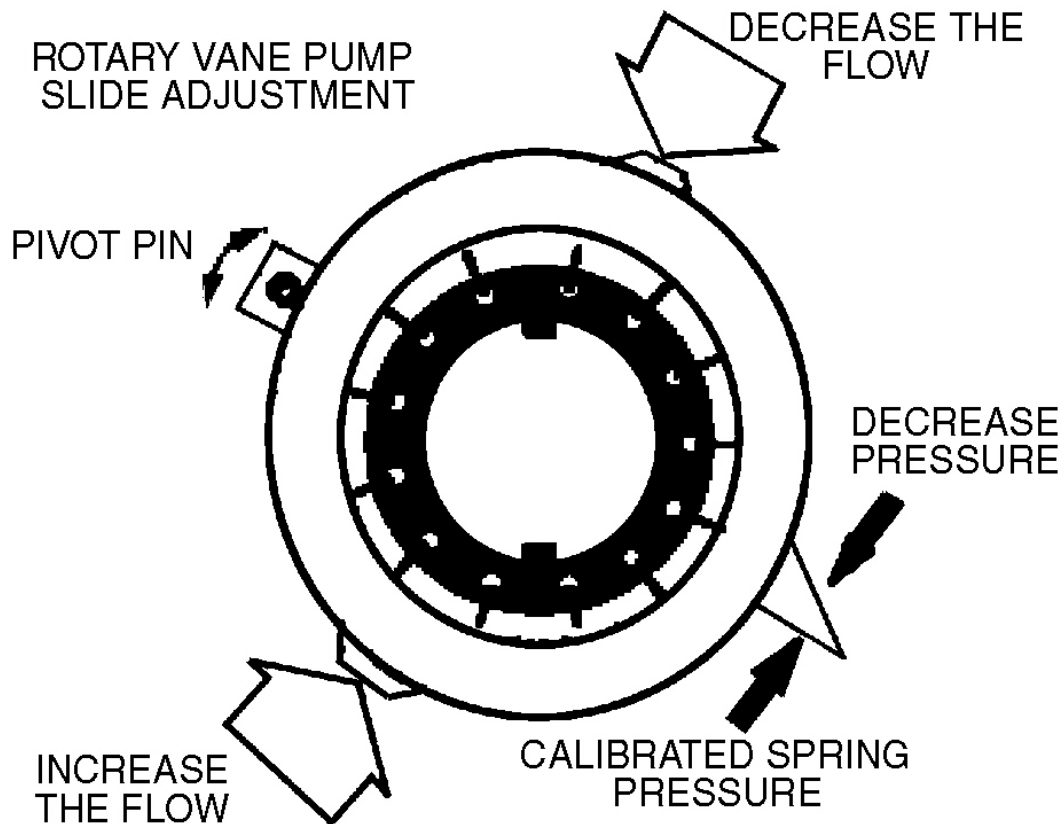
Control Volume Damper on the A5S440Z. The slide's position is influenced by a calibrated spring and hydraulic control pressure from the main pressure regulator solenoid on the valve body. See **Fig. 14**. The benefit of changing the slide position is to optimize pump output volume to meet the following operating conditions:

- Provide maximum volume during engine start-up. This condition provides a fast priming action of the pump for immediate lubrication and for hydraulic pressure operation.
- Regulated output volume at higher engine speeds. Maximum pump volume is not required at all times.



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Fig. 13: Identifying Vane-Type Pump
Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 14: Rotary Vane Pump Slide Adjustment
 Courtesy of BMW OF NORTH AMERICA, INC.

HYDRAULIC CONTROL COMPONENTS

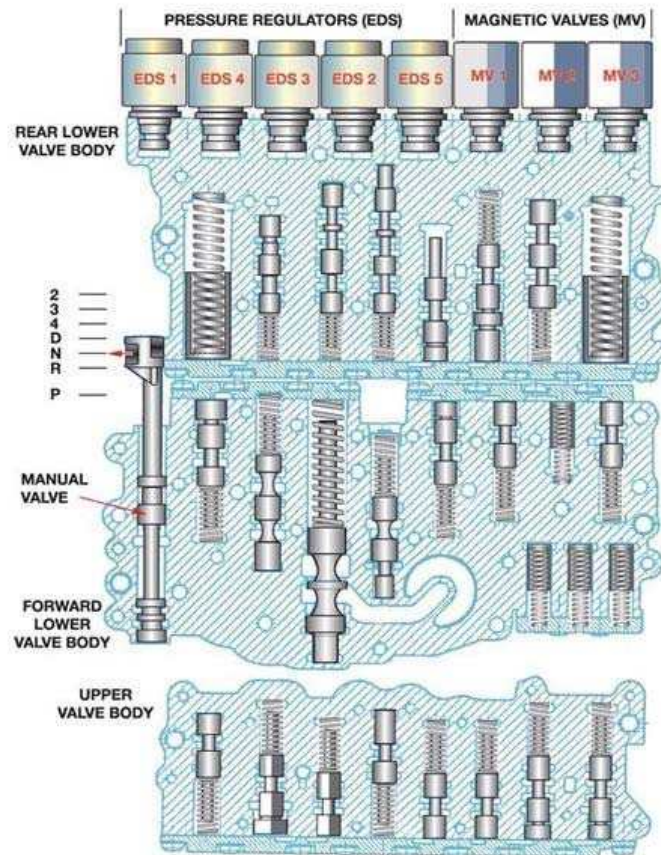
Electro/Hydraulic Valve Body

The valve body assembly is the main shift control element in the transmission. In non-EH transmissions the valve body was only hydraulically controlled. In the current EH (electrohydraulic) transmissions the valve body is similar in design, but now also housing a number of shift solenoids which are controlled by the TCM. The valve body consists of a number of sub-assemblies. Each sub-assembly contains a number of spool valves which are hydraulically controlled. Most spool valves are opposed by spring pressure. The spool valves are used to direct hydraulic fluid flow to the various shift elements in the transmission. There is also a manual valve which is connected to the shift assembly by a cable. The manual valve allows the drivers to select the basic operating mode (or ratio). See **Fig. 15**. The valve body is responsible for the following:

- Regulating main pressure.

- Controlling fluid flow to shift elements for Upshifts and Downshifts.
- Providing for manual operation by driver via manual valve.
- Reverse Lockout.
- Failsafe Operation.
- Shift Comfort through: Overlap Shift Control (ZF) Pressure Accumulators (GM).
- Torque Converter Control.
- Distribution of lubrication.

- Regulating Main Pressure
- Controlling fluid flow to shift elements for Upshifts and Downshifts.
- Providing for manual operation by driver via manual valve.
- Reverse Lockout
- Failsafe Operation
- Shift Comfort through: Overlap Shift Control (ZF) Pressure Accumulators (GM)
- Torque Converter Control
- Distribution of lubrication.



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Fig. 15: Identifying Electro/Hydraulic Valve Body Components
 Courtesy of BMW OF NORTH AMERICA, INC.

Shift Valves

Shift valves are used to direct application pressure to the various shift elements. Shift valves are regulated by spring pressure and control pressure for the shift solenoids. Shift valves come in various configurations depending upon application and transmission type. The most basic is the 3/2 shift valve. The 3/2 shift valve has 2 positions which are switched through one or two control pressures.

With no control pressure from shift solenoid present, the shift valve is moved to its end travel (left) by spring pressure. Operating pressure is blocked to the shift component. Also in this position any application pressure is drained from the shift component. See **Fig. 16**.

Once the control pressure is applied to the 3/2 shift valve, the shift valve moves to the right. This allows operating pressure to reach the shift component. When the control pressure is again reduced, spring pressure returns the 3/2 shift valve to the rest position. This drains and operating pressure from the shift component. See **Fig. 17**.

Operating Pressure to Shift Component. The example shown is a 4/2 shift valve. The operation is similar to the 3/2 valve. The primary difference is that the 4/2 shift valve affects 2 shift components. See **Fig. 18**.

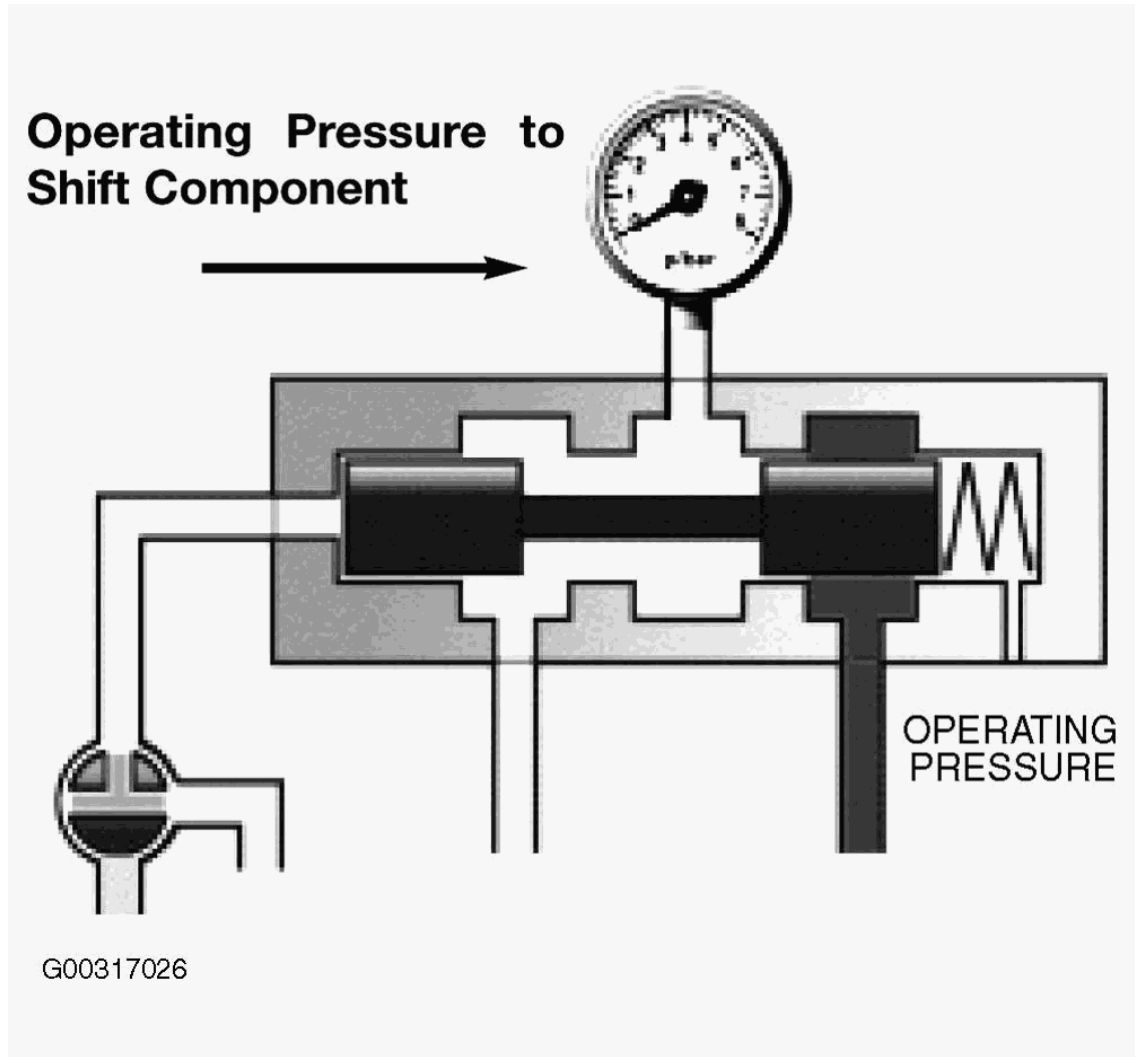


Fig. 16: Shift Valve Operation (1 Of 3)
Courtesy of BMW OF NORTH AMERICA, INC.

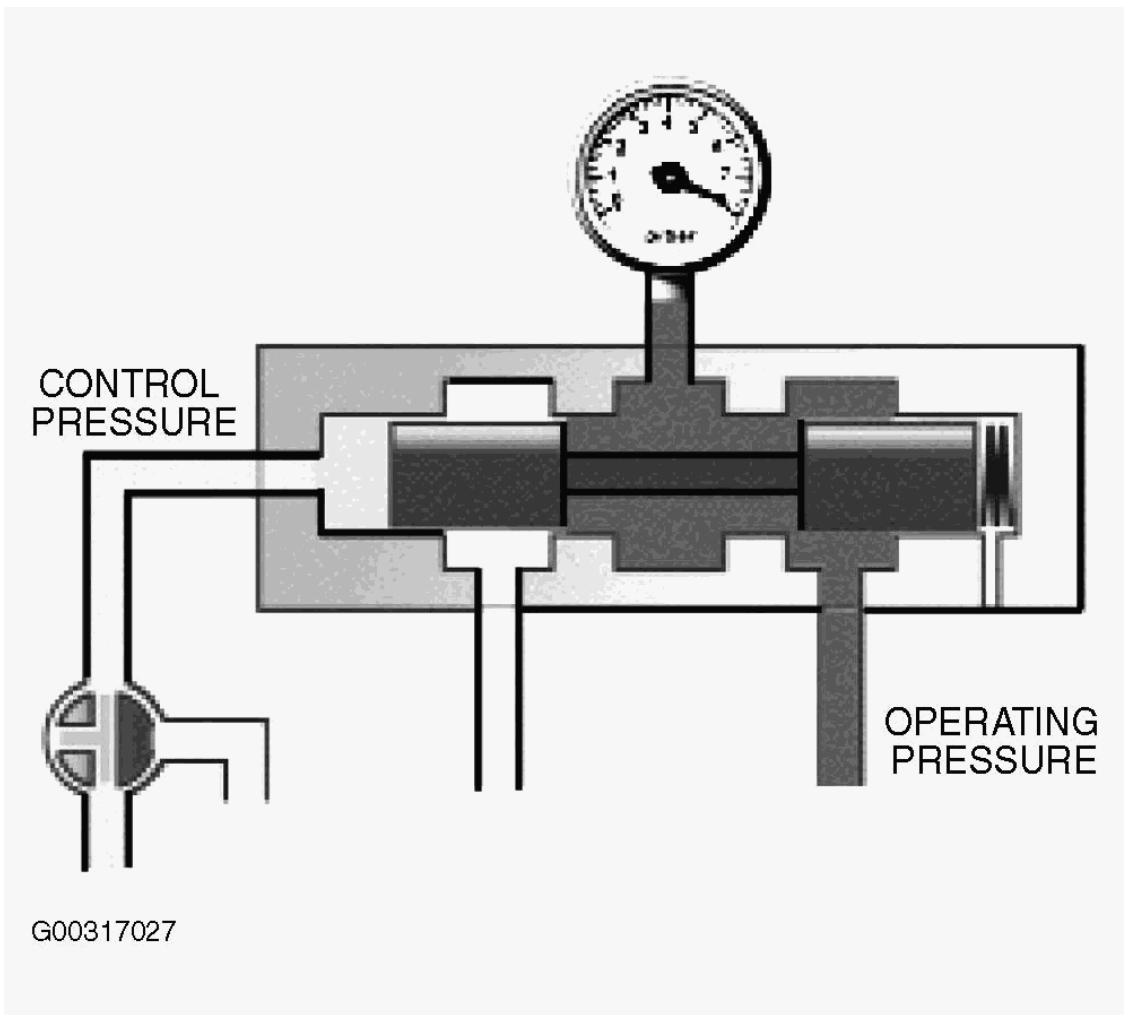


Fig. 17: Shift Valve Operation (2 Of 3)
 Courtesy of BMW OF NORTH AMERICA, INC.

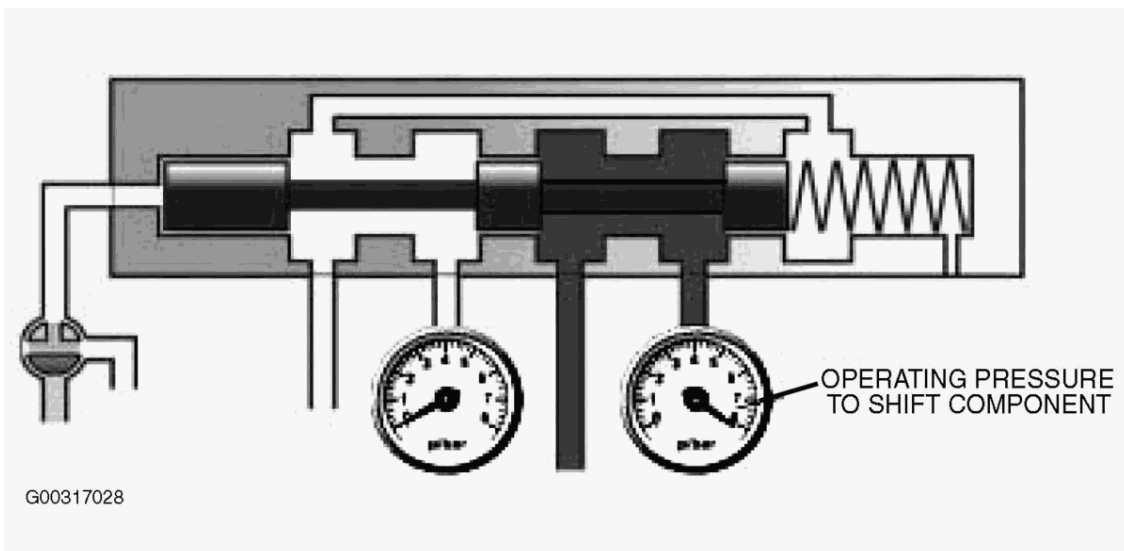


Fig. 18: Shift Valve Operation (3 Of 3)

Courtesy of BMW OF NORTH AMERICA, INC.

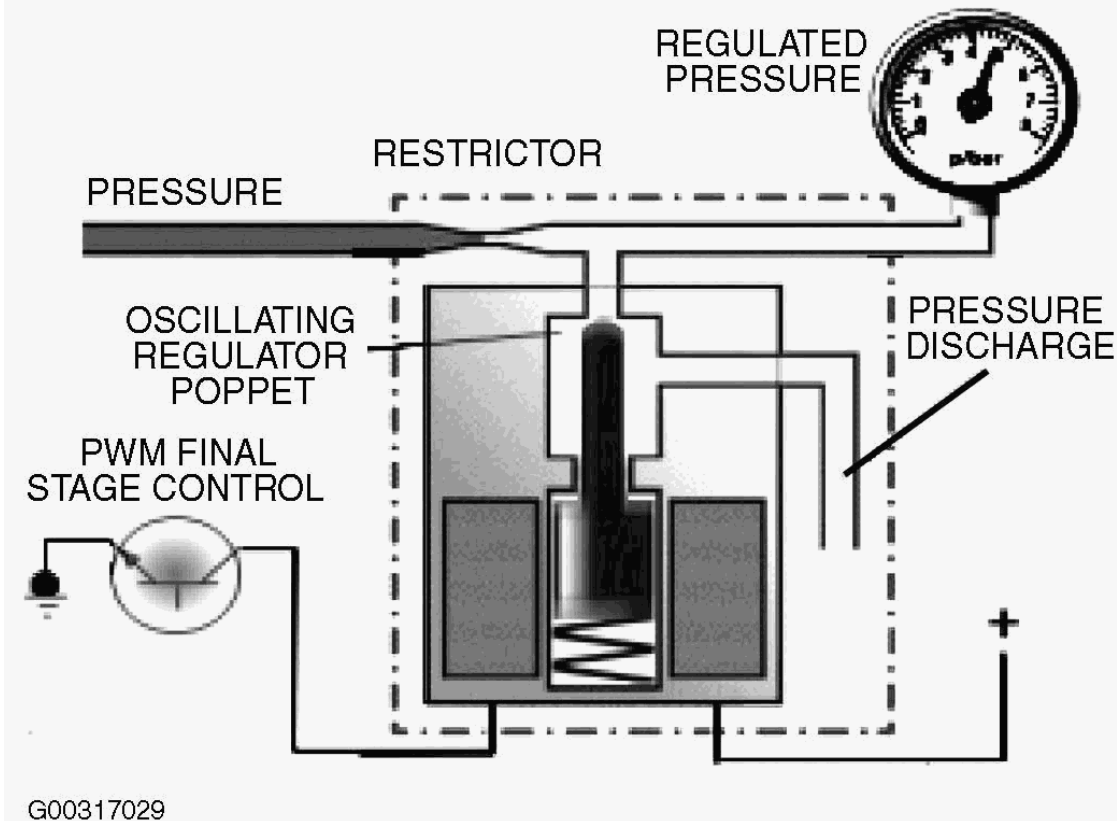
Pressure Regulation

Pressurized oil from the pump must be regulated for use within the transmission. Otherwise, the high pressure directly from the pump would influence shift quality. The shifts would be more abrupt and harsh. In order to "fine tune" the pressures within the transmission, there is a pressure regulating valve and a pressure regulating solenoid. The pressure regulating valve is located in the oil pump housing or the valve body dependent upon transmission type. The pressure regulating solenoid is a pulse width modulated (PWM) solenoid. Current is controlled by the TCM. The pressure regulating solenoid is normally closed, there is maximum line pressure available when minimum (or no) current is applied to the pressure regulating solenoid. Depending upon application, pressure regulating solenoid can be PWM with B- or B+ control. GM transmissions use B+ control with a constant ground supply. ZF transmissions uses B- control with a constant B+ supply.

There are also pressure regulators used in ZF transmissions that are used to control shift pressures. The A5S440Z and A5S560Z both use EDS solenoids for "Overlap Shift Control" this will be explained later in this text. There are a few different names for pressure regulating solenoids depending upon the transmission type and manufacturer:

- ZF transmissions use the following terms - EDS solenoid (valve), or MV (magnetic valve).
- Hydramatic (GM) transmissions use the following terms: DR solenoid, Force Motor Solenoid or Variable Bleed Solenoid.

Transmission operating pressures are regulated based on engine speed, throttle angle and engine load. The regulated pressure from the pressure regulating solenoid is referred to as throttle pressure. This pressure is fed to the main pressure regulating valve. See **Fig. 19**.



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Fig. 19: Identifying Transmission Operating Pressure
 Courtesy of BMW OF NORTH AMERICA, INC.

Pressure Regulation

As the diagram shows, regulating valve pressure is fed to the pressure regulating solenoid. See **Fig. 20**. This pressure is then regulated to create throttle pressure. Throttle pressure is modified based on throttle angle, engine speed and engine load. Throttle pressure is then fed to the pressure regulating valve. As throttle pressure increases, the regulating valve piston is moved to the left (with respect to the diagram). As the regulating valve piston is moved to the left, operating pressure is increased to the 4/2 shift valve. The operating pressure to the 4/2 shift valve will be fed to Shift Component A or Shift Component B depending the position on the 4/2 shift valve. The operating pressure to the shift components will be increased or decreased depending upon the throttle valve pressure. As engine speed and load are increased, the operating pressure will be increased to provide higher clamping forces on the shift components. When there is no electrical power present to the pressure regulator solenoid, throttle pressure will be a maximum. Therefore maximum operating pressure will be available at the 4/2 shift valve. This condition would exist if the transmission was operating in failsafe mode.

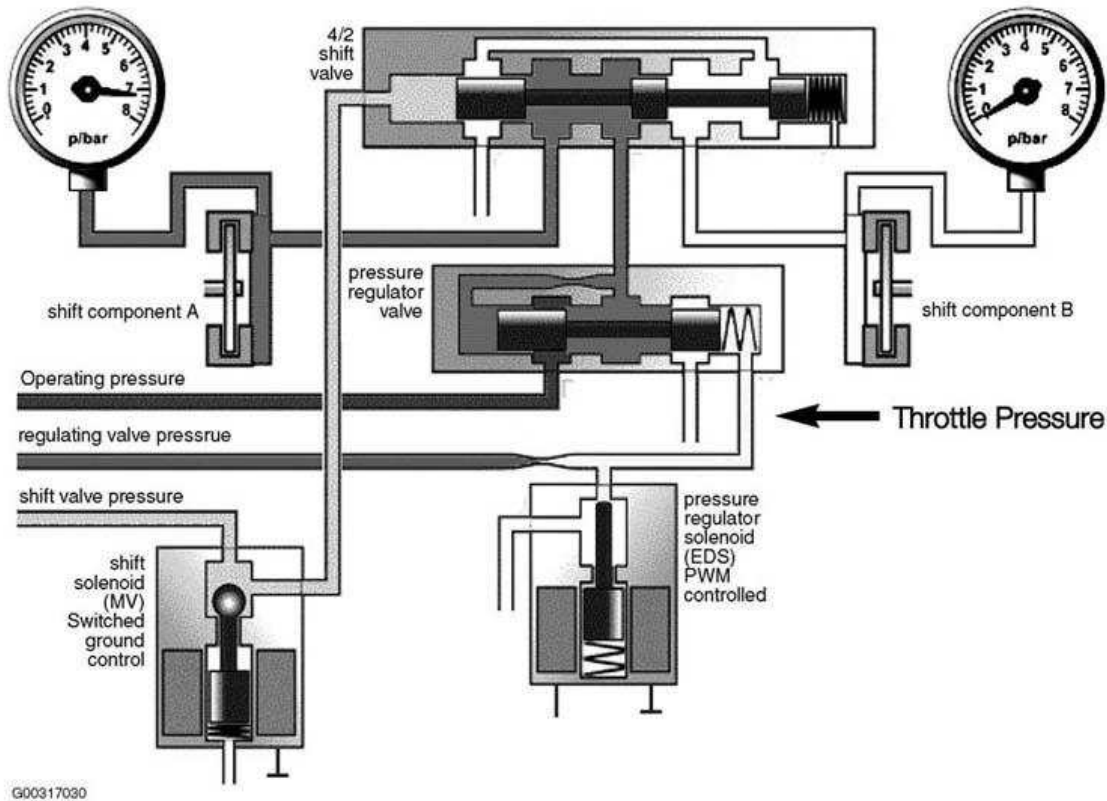


Fig. 20: Identifying Transmission Regulation Pressure
 Courtesy of BMW OF NORTH AMERICA, INC.

APPLY COMPONENTS

Multi - Plate Clutches and Brakes

Multi Plate Clutches and Brakes are used to drive or hold members of the planetary gear set. See **Fig. 21**. As a general rule, Multi Plate Clutches connect one planetary member to another. Multi Plate Brakes connect a planetary member to the case to hold it stationary. The clutches and brakes consist of a number of friction discs and steel discs. The friction discs are coated with a friction material and have engaging lugs (splines) on the inner perimeter. The steel discs are steel on both sides and have engaging lugs located on the outer perimeter. The engaging lugs on the friction discs are usually engaged with a planetary member. The engaging lugs on the steel discs are usually engaged with the clutch piston housing. In addition to the friction and steel discs, there is also an apply piston, housing and return spring. Once hydraulic fluid is applied to the clutch assembly, the friction discs and steel discs will be locked together. Once hydraulic pressure is released, the return spring will cause the clutch piston to return to its rest position which will unlock the clutch assembly. See **Fig. 22**.

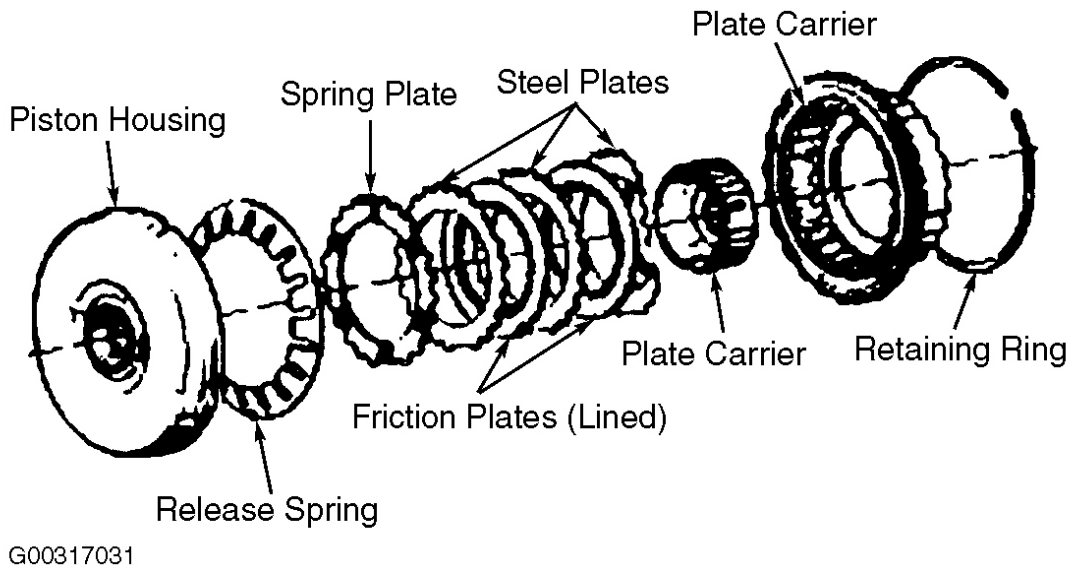


Fig. 21: Identifying Multi-Plate Clutches & Brakes
 Courtesy of BMW OF NORTH AMERICA, INC.

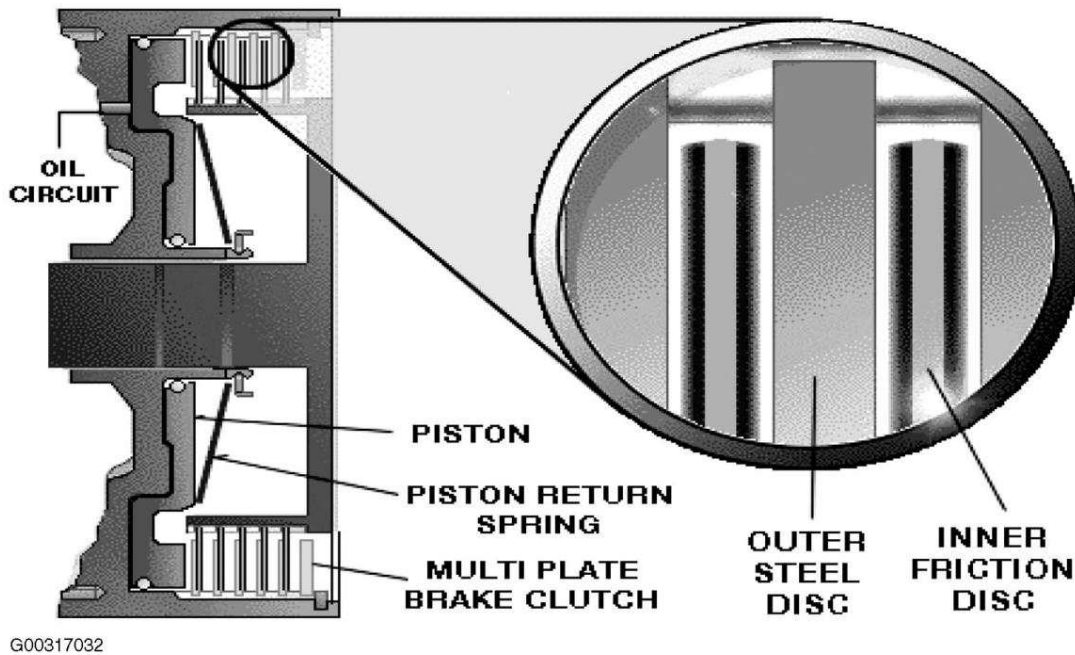


Fig. 22: Multi-Plate Clutch Identification
 Courtesy of BMW OF NORTH AMERICA, INC.

Multi - Plate Clutch Operation

In order to carry out a shift in ratio, fluid needs to be applied or released from the Multi - Plate Clutch (or Brake). As shown in the example at the right, the following sequence occurs:

1. Fluid from a shift valve in the valve body is applied to the clutch assembly.
2. Fluid pressure builds behind the apply piston and overcomes the resistance from the diaphragm spring.
3. The friction and steel discs are compressed together and become locked, preventing any slippage between them.
4. Two planetary members are now locked together.
5. When fluid pressure is released, the steel and friction discs are allowed to unlock.
6. The diaphragm spring pushes against the apply piston and returns the piston back to the rest position.
7. The check ball in the apply piston is unseated by centrifugal force which allows the clutch to drain completely. See **Fig. 23**.

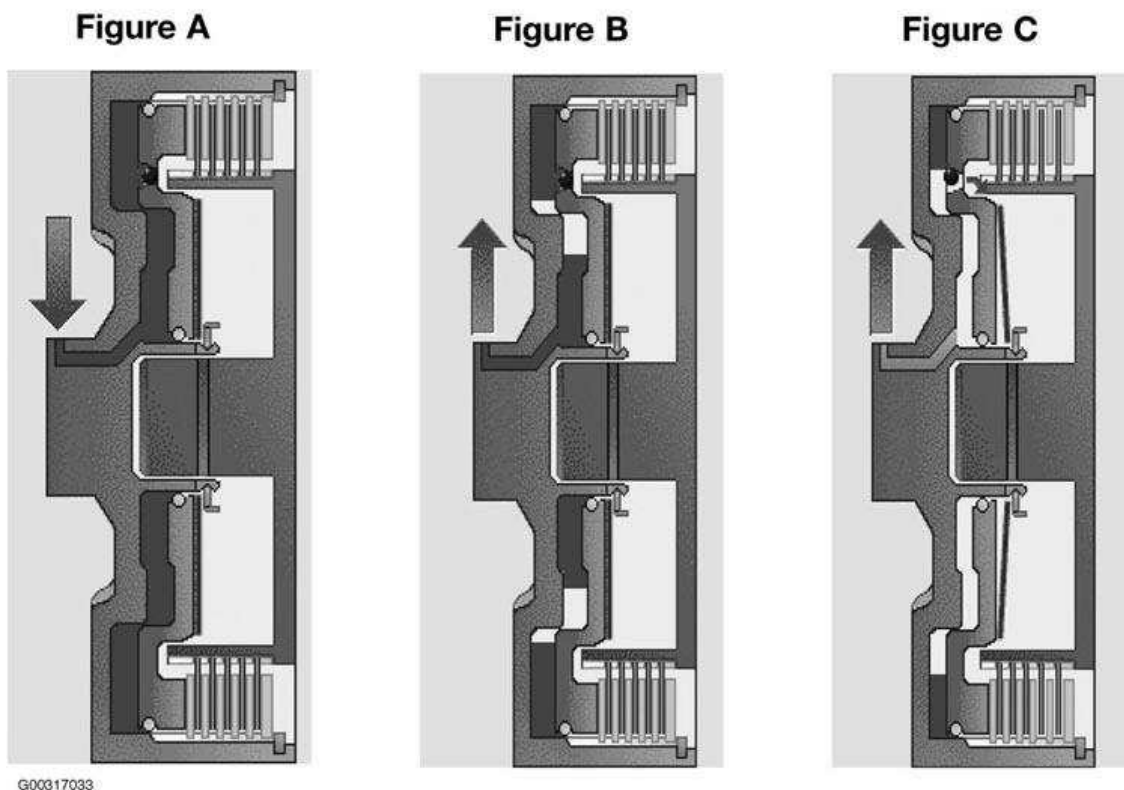


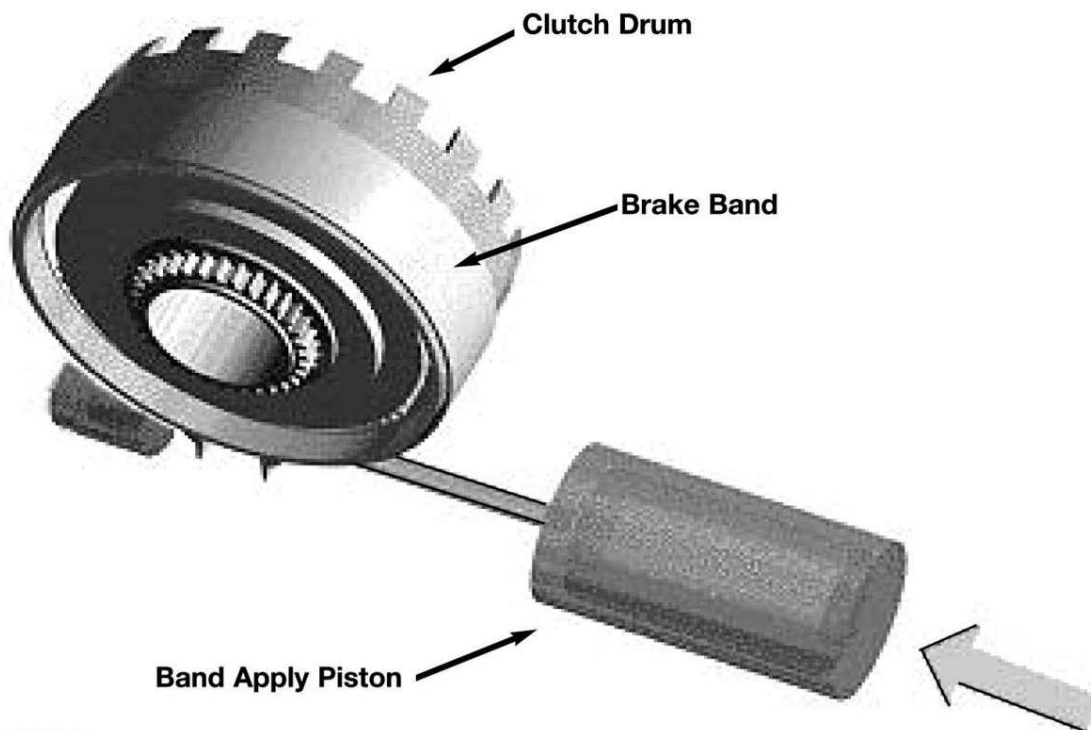
Fig. 23: Multi-Plate Clutch Operation
Courtesy of BMW OF NORTH AMERICA, INC.

BAND BRAKES

On some BMW transmissions there is a band type brake used for some applications. The A4S270/310R and the A5S310Z use a band type brake. The brake band is a circular band with friction material bonded to the inner surface. The band wraps around a particular planetary component (clutch drum) and locks that component to the transmission case. The brake band is applied and released by the clutch apply piston. The brake band is not

adjustable on the A5S310Z, however there is some adjustment allowed when needed on the A4S270/310R. The brake band functions in the following manner on BMW transmissions:

- A4S270/310R - The brake band is active (applied) in first and second gear. The brake band holds the reaction sun drum stationary. The reaction sun drum is splined to the reaction sun gear.
- A5S310Z - The brake band is active (applied) in second, third and fifth gear. The brake band holds the forward sun gear to the case. See **Fig. 24**.



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Fig. 24: Identifying Band Brake Operation
Courtesy of BMW OF NORTH AMERICA, INC.

ONE-WAY CLUTCHES (FREEWHEEL)

The one way clutch consists of an inner and outer ring with a locking device between the two. The one way clutch is designed to lock in one direction and to allow free rotation in the other direction. See **Fig. 25**. Currently there are two types of one way clutches used in BMW transmissions:

- Roller type which consists of spring loaded rollers between the inner and outer race of the one way clutch. (Roller type is also used without springs on some applications).
- Sprag type which consists of asymmetrical shaped wedges located between the inner and outer race of the one way clutch.

In both versions of the one way clutch (freewheel), rotation is only allowed in one direction. Using the diagrams above, imagine that the inner races were locked stationary. The outer race would only be allowed to turn

counter clock wise. In the clock wise direction, the outer race of both versions would be locked. In the roller type, the helper springs would push the rollers up the ramp on the outer race. This would force the rollers in to the smaller area which would cause the outer race to lock, In the sprag type, the asymmetrical wedges would lock between the inner and outer race. The one way clutches are used in the transmission to prevent an interruption of drive torque during certain gear shifts and to allow engine braking during coasting. Also there is a one way clutch in the stator of the torque converter.

Roller Type One Way Clutch



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Sprag Type One Way Clutch



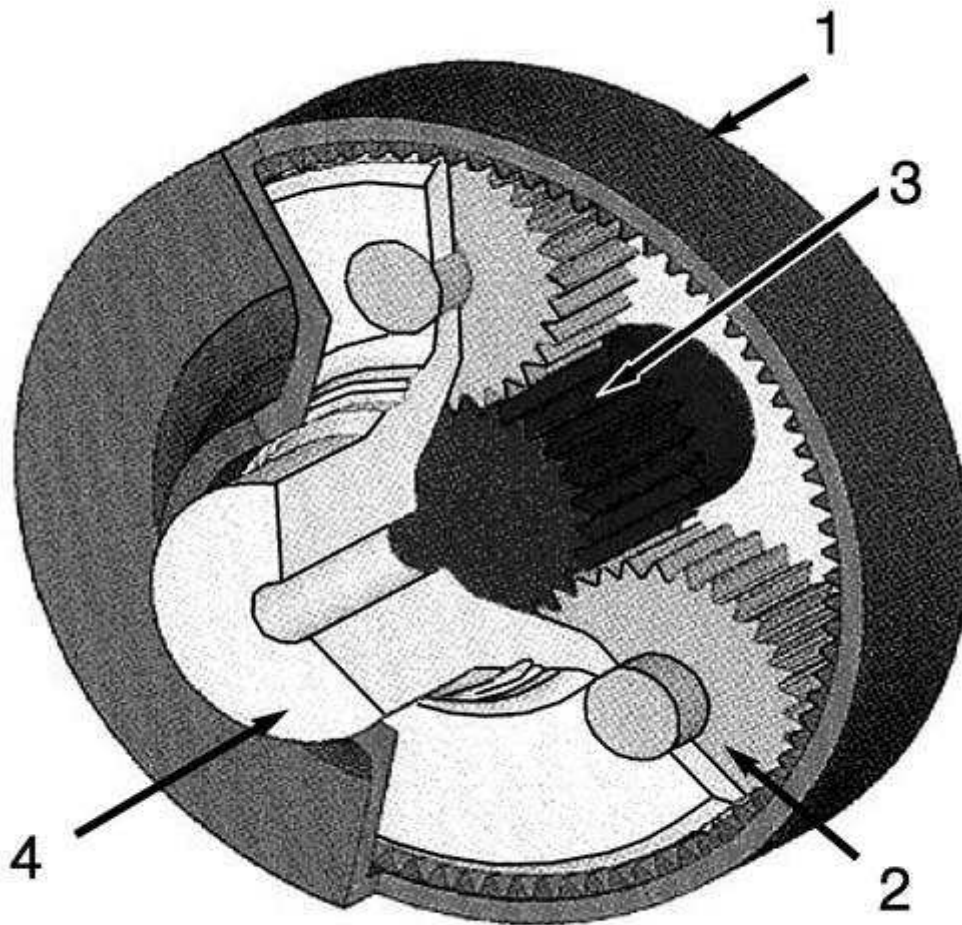
Fig. 25: Identifying One-Way Clutches
Courtesy of BMW OF NORTH AMERICA, INC.

PLANETARY GEAR SET

Planetary gear sets are compact gear units that receive input drive torque and provide the required output ratios for all forward gears and reverse gear. The planetary gear set consists of four main components:

1. Internal ring gear.
2. Planetary gears (pinions).
3. Sun gear.
4. Planetary gear carrier.

Various ratios are obtained by driving or holding different components in the planetary gear set. The example shown is a simple planetary gear set. See **Fig. 26**. Today's modern transmissions use a combination of multiple planetary gear sets referred to as a compound planetary gear set.



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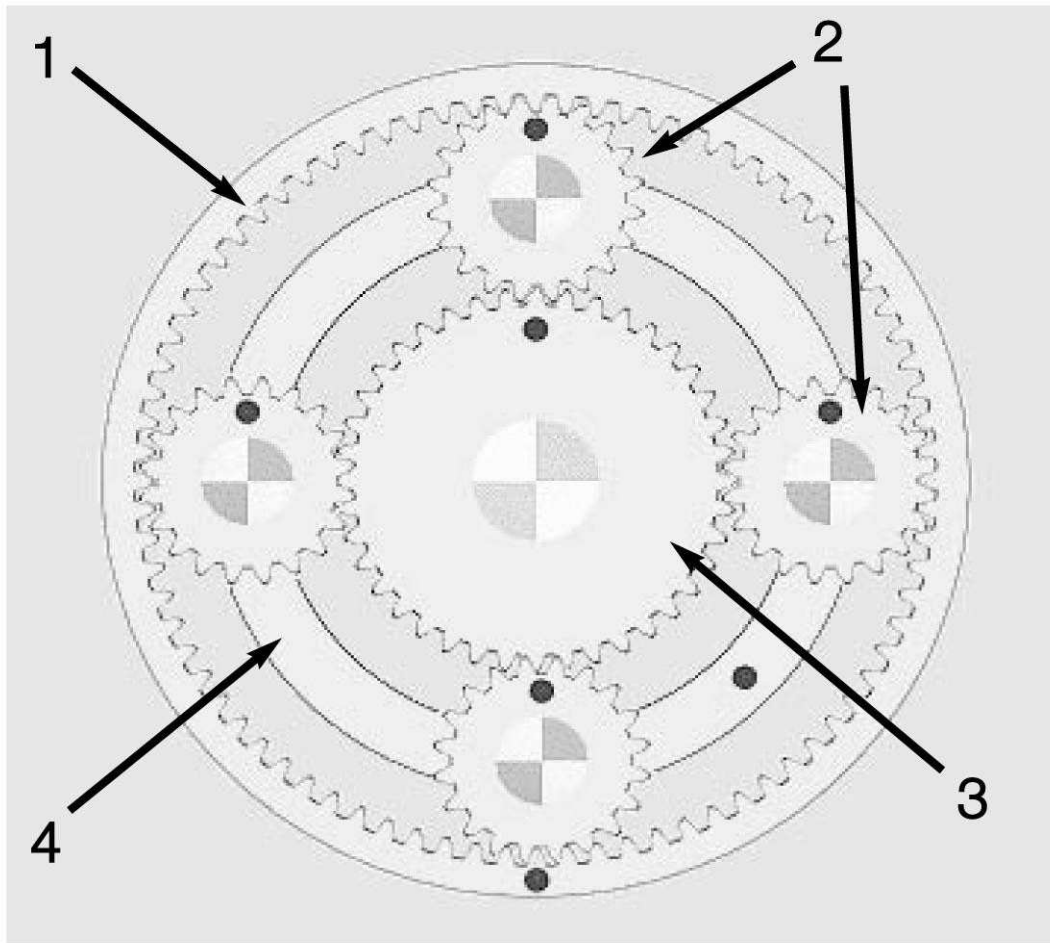
Fig. 26: Identifying Planetary Gear Set
Courtesy of BMW OF NORTH AMERICA, INC.

Advantages of Planetary Design

There are distinct advantages to the planetary gear set in comparison with a standard transmission gear set. Primarily, drive torque does not need to be interrupted to change gears. The planetary members are in constant mesh and there are more teeth engaged in any given ratio. This allows more torque to be transferred through the transmission.

Basic Power Flow Example

As an example of power flow in reverse gear, planetary gear carrier (4) is held stationary. The sun gear (3) is driven in a clockwise direction. The planetary pinions (2) are driven counterclockwise, which in turn drives the internal ring gear (1) counter clockwise as well. See **Fig. 27**.



22

Transmission Fundamentals

Fig. 27: Identifying Basic Power Flow

Courtesy of BMW OF NORTH AMERICA, INC.

Compound Planetary Gear Sets

Compound planetary gear sets use multiple planetary components which are a variation on the simple planetary gear set. Since the inception of the simple planetary gear set, there have been numerous compound gear sets introduced. BMW transmissions use the following gear sets:

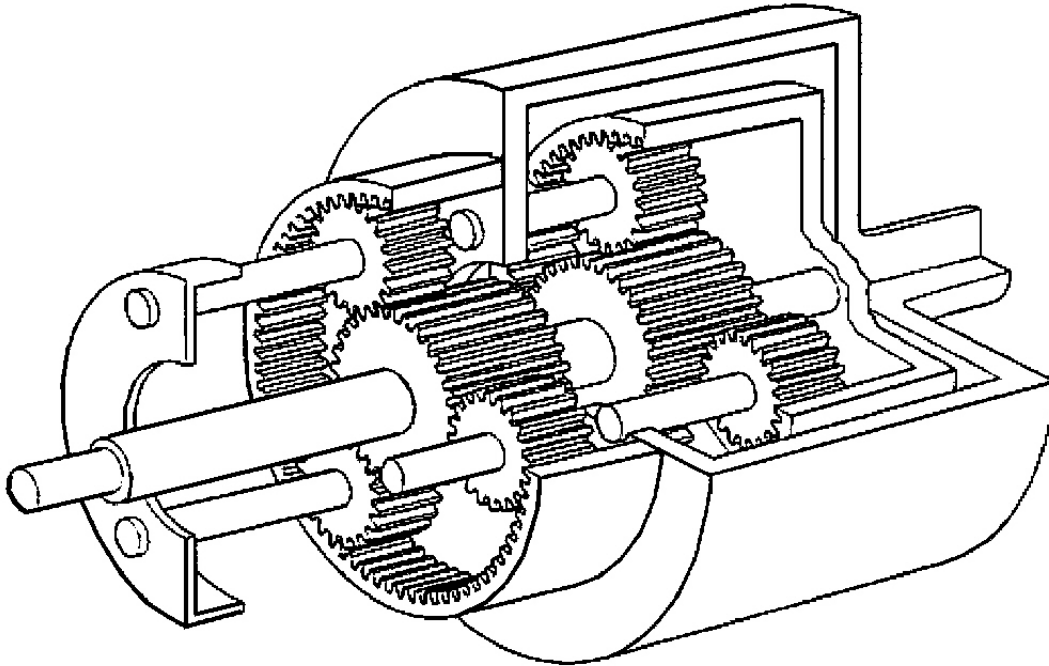
- Simpson Gear Set - used on 4HP22 and 4HP24.
- Ravigneax Gear Set - used on A4S270R, A4S310R, A5S310Z, A5S325Z, A5S360R and A5S390R.
- Wilson Gear Set - used on A5S440Z and A5S560Z.
- Lepelletier Gear Set - used on the GA6HP26Z.

Simpson Gear Set

The Simpson Gear Set is one of the early variations on the simple set. It is capable of 3 forward gears and one

reverse. On BMW transmissions, the Simpson Gear set is used in the 4HP transmission which is a four speed automatic. See **Fig. 28**. Fourth gear (overdrive) is obtained by the addition of an auxiliary gear set (simple). Characteristics of the Simpson Gear set are as follows:

- Two Internal Ring Gears, one rear input ring and one attached to the rear planetary carrier.
- Two Planetary carriers, each containing three planetary pinions.
- One common Sun gear, which meshes with both sets of planetary pinions.



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Fig. 28: Identifying Simpson Gear Set
Courtesy of BMW OF NORTH AMERICA, INC.

Ravigneaux Gear Set

A new version on the planetary design is the Ravigneaux gear set. See **Fig. 29**. This gear set is capable of 4 forward gears and one reverse. However, depending upon application it may be used with an auxiliary gear set. Here are some examples:

- The A4S310/270R uses the Ravigneaux set for 3 forward gears and one reverse. Overdrive is obtained by the auxiliary gear set.
- The A5S310Z uses a combination of the Ravigneaux gear set and the auxiliary gear set to obtain 5 forward gear and one reverse. First, second and reverse gears are achieved by using a combination of both gear sets.

- The A5S360/390R uses a modified version of the Ravigneaux set that provides five forward gears and one reverse. There is no auxiliary gear set used.

Typical Ravigneaux Gear Set

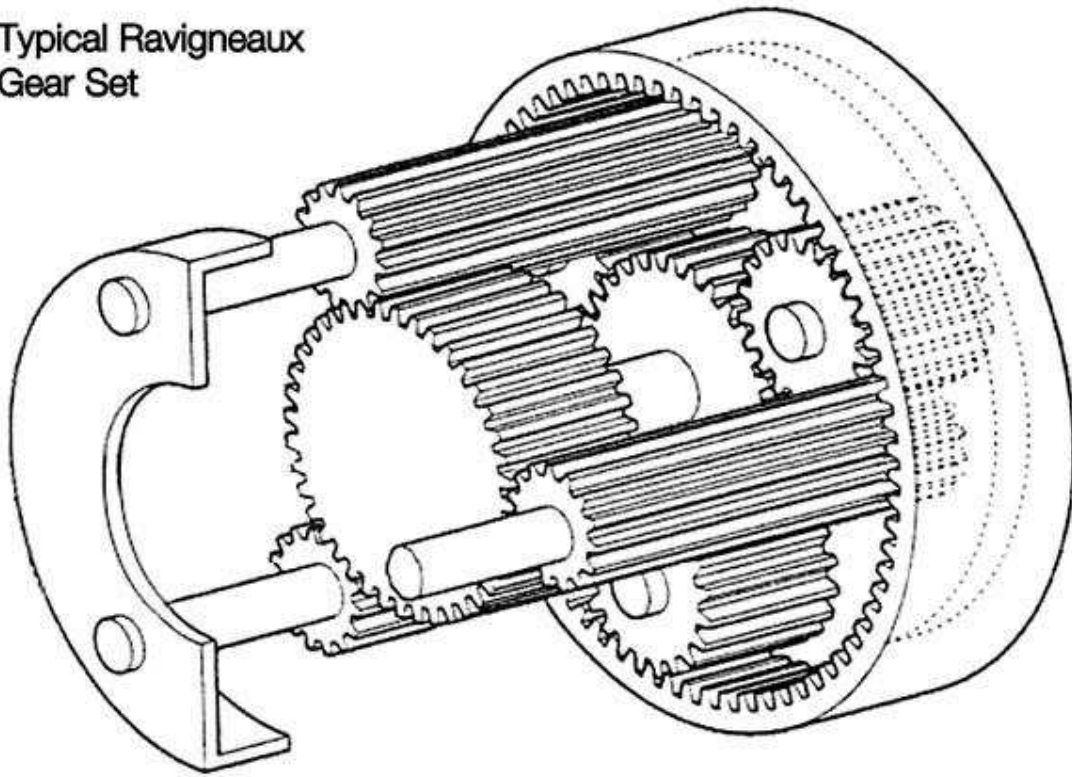


Fig. 29: Identifying Ravigneaux Gear Set
 Courtesy of BMW OF NORTH AMERICA, INC.

Characteristics of the Ravigneaux Gear Set are:

- One planetary carrier which is common to both sets of planetary pinions.
- Two sets of planetary pinions, one long set with small diameter and one short set with large diameter.
- Two sun gears, one input sun gear and one reaction sun gear.
- One common ring gear.

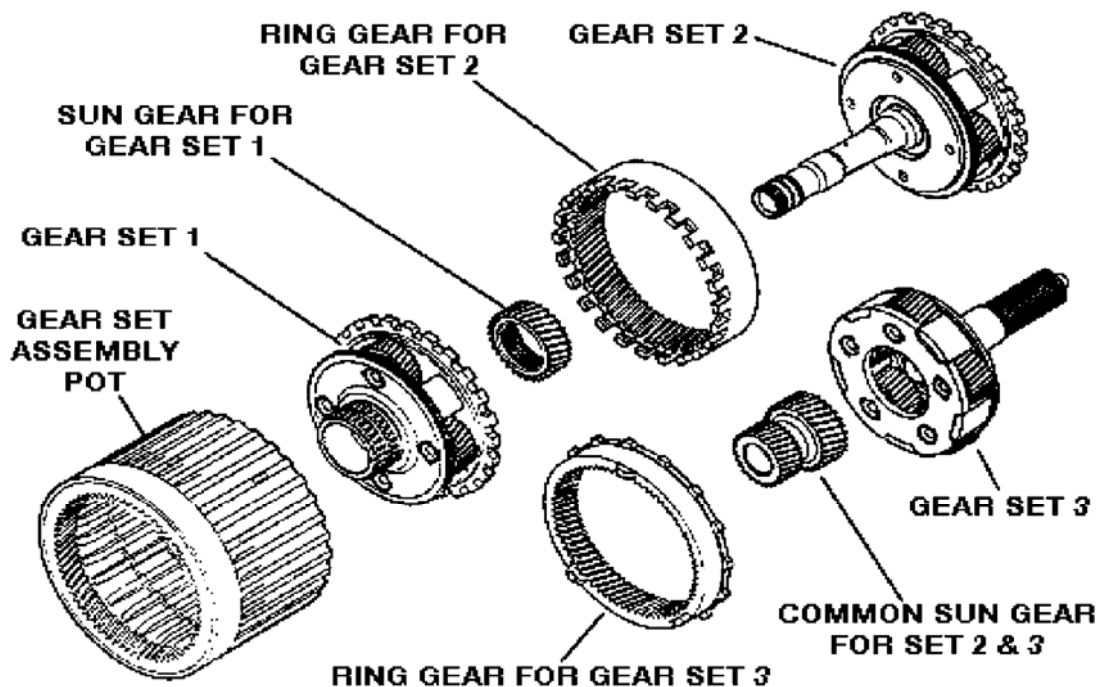
NOTE: **The Ravigneaux Gear Set shown in the figure is a typical representation. There are a few variations of this arrangement used on BMW transmissions.**

Wilson Gear Set

On BMW transmissions, the Wilson gear set is only used on the A5S440Z and A5S560Z. See **Fig. 30**. The Wilson Gear Set consists of three planetary gear sets. The ring gear of the first gear set, the planetary carrier of the second gear set and the ring gear of the third planetary gear set and directly connected to the "Pot". The "Pot" is a cylindrical device that slides over all of the components to unitize the individual gear sets into an

assembly. The characteristics of the Wilson Gear Set are:

- Three planetary carriers.
- Three ring gears, with ring gear 1 and 3 meshed to "Pot" assembly.
- Three sun gears, sun gear 2 and 3 are common (attached). Sun gears 2 and 3 are also referred to as the "Double Sun Gear".



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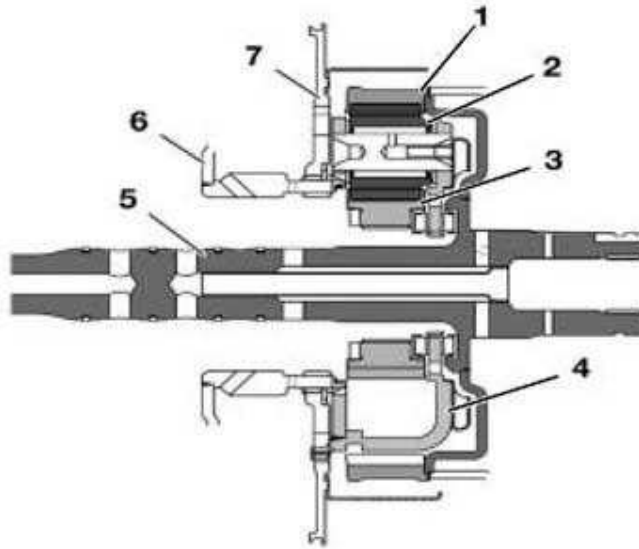
Fig. 30: Identifying Wilson Gear Set
Courtesy of BMW OF NORTH AMERICA, INC.

Lepelletier Gear Set

The Lepelletier Gear Set was introduced to BMW on the ZF GA6HP26Z. See **Fig. 31**. This gear set allows for 6 forward speeds and one reverse gear using a light weight design. The planetary gear train consists of a single carrier planetary gear train and a downstream double planetary gear train.

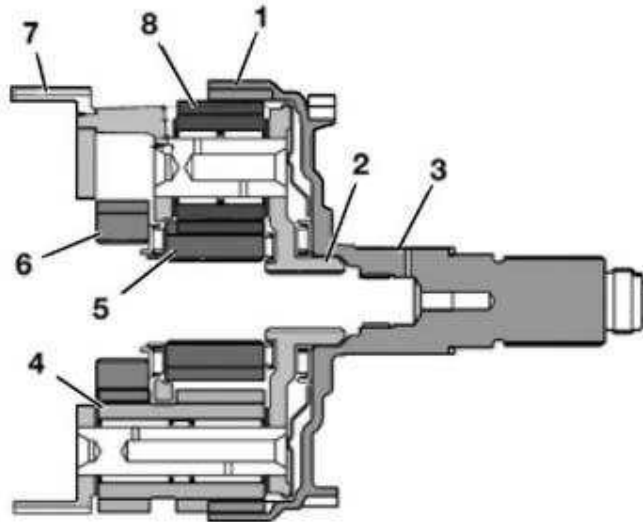
Lepelletier Gear Set

1. Internal Ring Gear 1
2. Planet Gear (pinion)
3. Planet Carrier
4. Planet Carrier
5. Turbine Shaft
6. Cylinder A
7. Pressure Plate A



Double Planetary Set

1. Internal Gear 2
2. Planet Carrier Clutch E
3. Output
4. Double Planet Gear Long
5. Sun Gear 3, Clutch E
6. Sun Gear 2, Clutch A
7. Planer carrier 1
8. Planet Gear (short)



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Fig. 31: Identifying Lepelletier Gear Set
Courtesy of BMW OF NORTH AMERICA, INC.

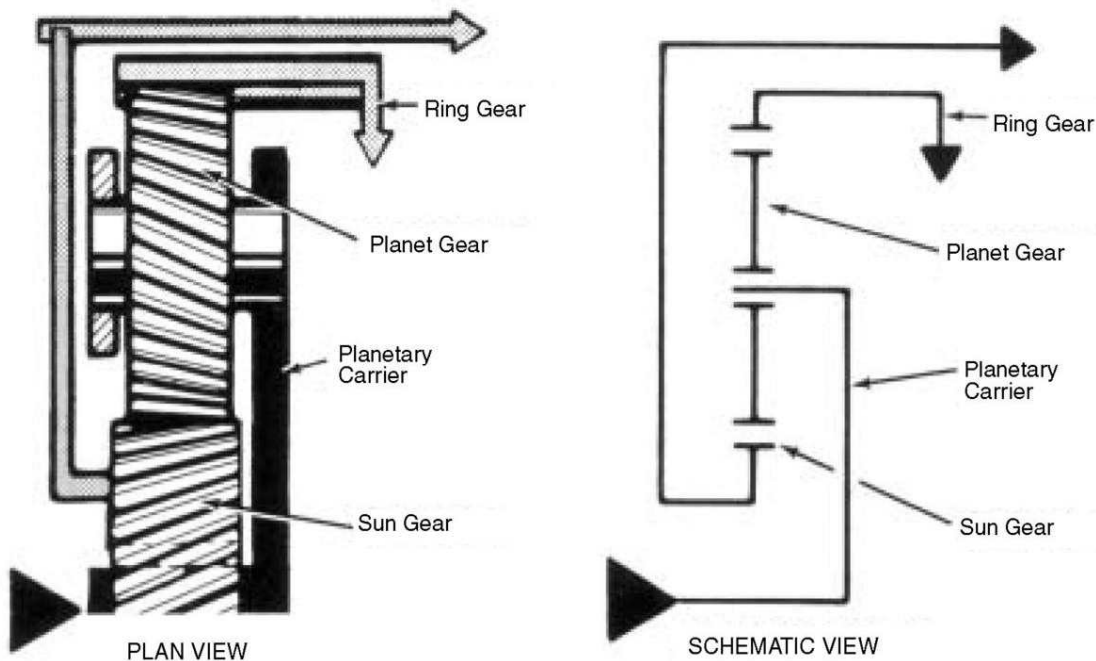
Planetary Gear Set Operation

In order to understand planetary gear set operation, it is important to understand some basic rules of operation:

- It is assumed that engine rotation is clockwise when referring to power flow charts and diagrams.
- Planetary pinions will always rotate in the same direction as the internal ring gear.
- When the sun gear is driven clockwise and the planetary carrier is held stationary the internal ring gear will rotate counter clockwise (reverse gear).

- When two or more planetary members are locked together, the assembly will rotate together. The ratio from input to output is 1:1.
- When the sun gear is held stationary and the planetary carrier is driven clockwise, the ring gear will be driven clockwise in an overdrive ratio (.75:1)

When trying to understand power flow schematics, it is important to be able to draw a comparison between the actual planetary components and the schematic symbols. The diagram below outlines the relationship between these components and the power flow schematic. The schematic is a representation of a cross section of the transmission, but you only see the top half of the cross section. The transmission is shown as though it has been quartered lengthwise. See **Fig. 32**.

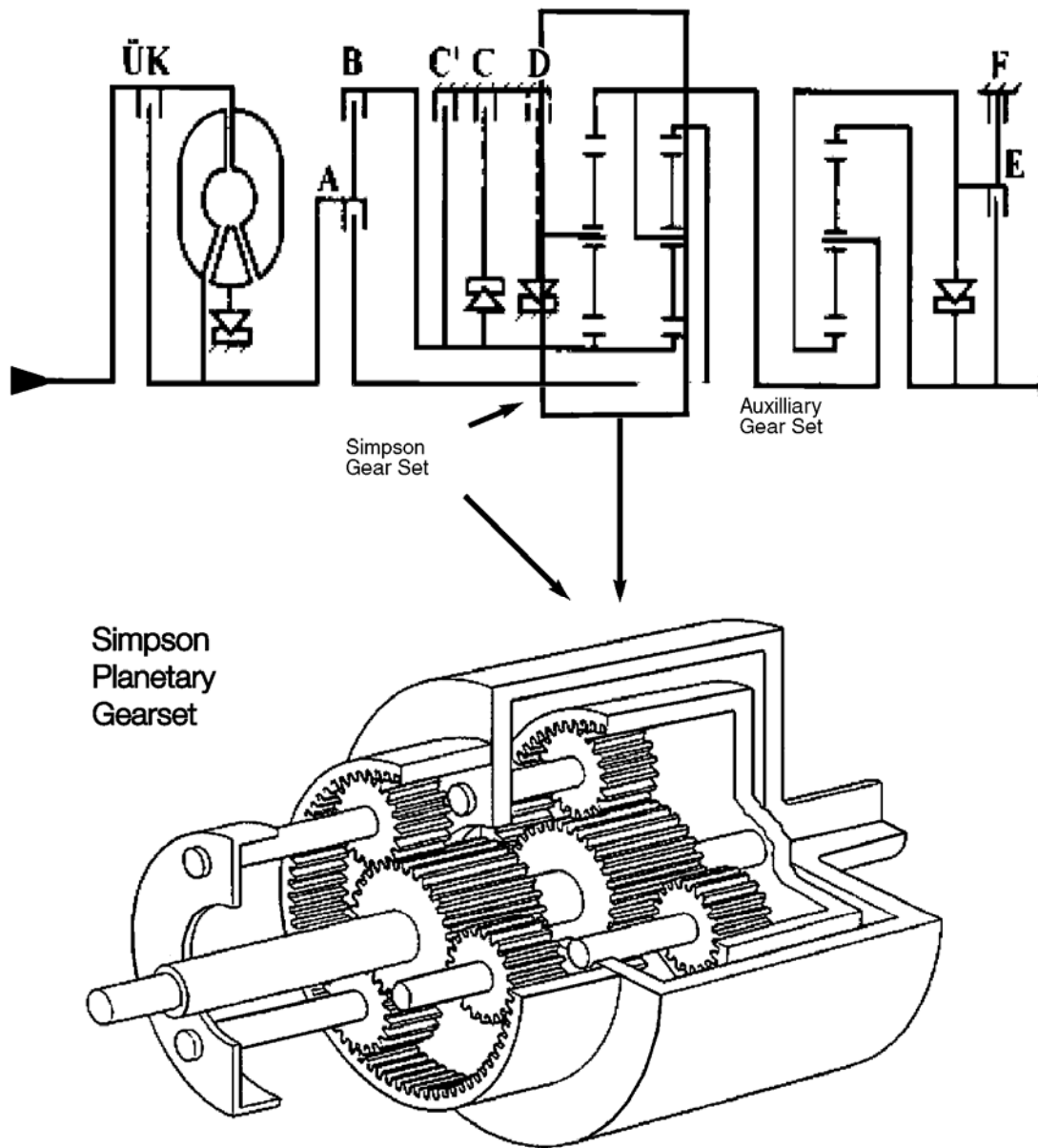


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Fig. 32: Identifying Gear Set Operation
 Courtesy of BMW OF NORTH AMERICA, INC.

POWER FLOW SCHEMATIC

In order to understand power flow schematics, a relationship must be drawn between the actual components and the schematic representation. This example uses the 4HP22/24 power flow schematic. The 4HP22/24 transmission uses a Simpson Planetary Gearset and an auxiliary gearset. The auxiliary gear set is a simple planetary gearset. See **Fig. 33**.



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Fig. 33: Identifying Power Flow Schematic
 Courtesy of BMW OF NORTH AMERICA, INC.

Power Flow In First Gear

Drive torque is applied to the torque converter impeller and transferred to the turbine. The turbine shaft rotates clockwise (CW). The "A" clutch locks the turbine shaft to the rear input ring gear. The rear input ring gear rotates CW driving the rear planet pinions CW. The planetary pinions drive the common sun gear CCW, which in turn drive the front planet pinions CW. The front planetary carrier is held from rotating CCW by one way clutch "J". The front planetary pinions which are rotating CW drive the front ring gear/rear carrier CW. The rear

Fig. 35: Power Flow In First Gear
 Courtesy of BMW OF NORTH AMERICA, INC.

Second Gear

Drive torque is applied to the torque converter impeller and transferred to the turbine. See **Fig. 36**. The turbine shaft rotates clockwise (CW). The "A" clutch locks the turbine shaft to the rear input ring gear. The rear input ring gear rotates CW driving the rear planet pinions CW. The sun gear is held stationary by the C' clutch. The rear planet pinions rotate around the fixed sun gear CW. The rear planetary carrier will rotate CW. The rear planetary carrier will drive the auxiliary gear set and will rotate as a complete unit. The auxiliary gear set is locked in a 1:1 ratio due to the "E" clutch locking the sun and ring gear together. The "C" clutch is locking the outer race of the "H" freewheel to the case. This is used for the 3/2 downshift. Freewheel "J" is not active and Freewheel "K" is locked.

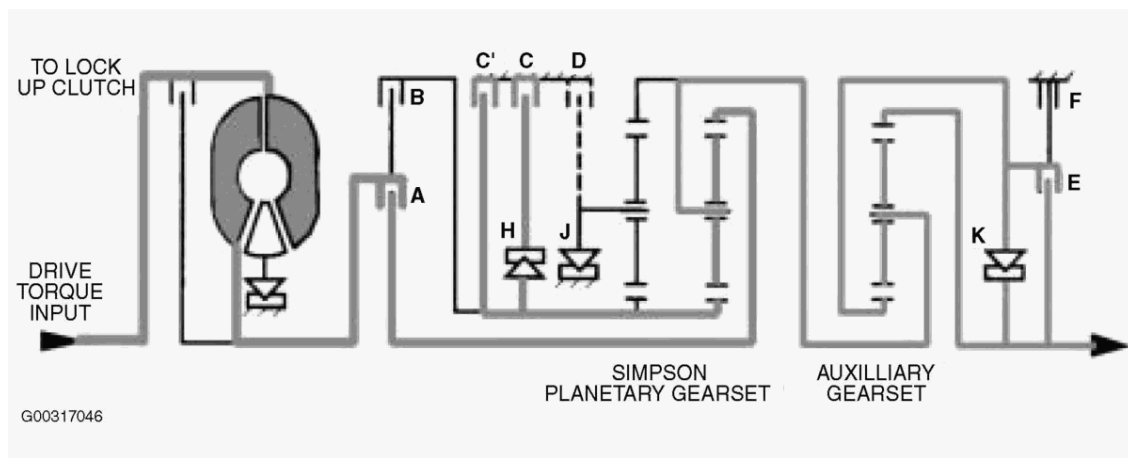


Fig. 36: Power Flow Schematic In Second Gear
 Courtesy of BMW OF NORTH AMERICA, INC.

Third Gear

Drive torque is applied to the torque converter impeller and transferred to the turbine. See **Fig. 37**. The turbine shaft rotates clockwise (CW). The "A" clutch and the "B" clutch are locked, this causes the rear input ring gear to be locked to the sun gear in the Simpson Gear set. The Simpson gear set is locked in a 1:1 ratio. The "E" clutch is locked which locks the ring gear to the sun gear in the Simpson gear set. The entire transmission planetary system is now locked in a 1:1 ratio. Freewheel "H" is overrun and freewheel "J" is not used. Freewheel "K" continues to be locked.

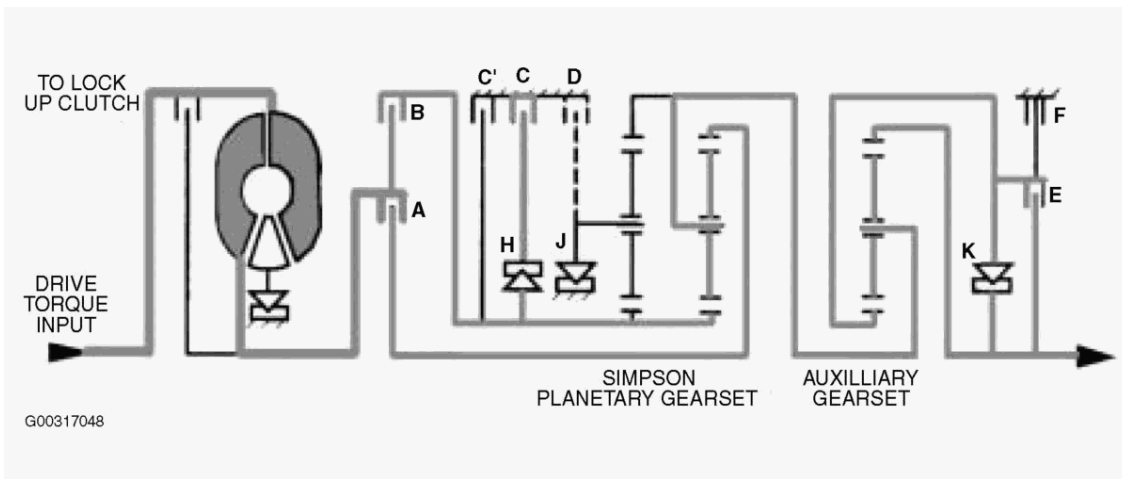


Fig. 37: Power Flow Schematic In Third Gear
 Courtesy of BMW OF NORTH AMERICA, INC.

Fourth Gear

Drive torque is applied to the torque converter impeller and transferred to the turbine. See **Fig. 38**. The turbine shaft rotates clockwise (CW). (The turbine shaft can also be driven by the lock up clutch when engaged). The "A" clutch and the "B" clutch are locked, this causes the rear input ring gear to be locked to the sun gear in the Simpson Gear set. The Simpson gear set is locked in a 1:1 ratio. The "F" clutch is locked which locks the sun gear in the auxiliary gear set to the case. The Simpson gear set drives the planetary carrier CW. The planet pinions walk around the fixed sun gear in a CW direction. This causes the ring gear to rotate CW as well. The ring gear, which is the output of the transmission is driven in an overdrive ratio. Freewheel "H" and "K" are overrun. Freewheel "J" is not used.

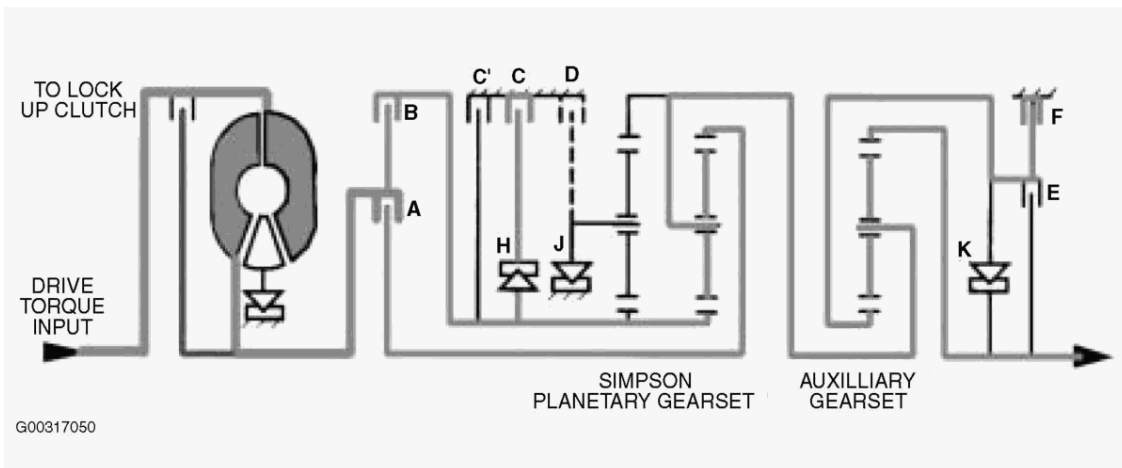


Fig. 38: Power Flow Schematic In Fourth Gear
 Courtesy of BMW OF NORTH AMERICA, INC.

Reverse Gear

Drive torque is applied to the torque converter impeller and transferred to the turbine. See **Fig. 39**. The turbine shaft rotates clockwise (CW). The "B" clutch is locked which drives the sun gear in the Simpson gear set CW.

The sun gear drives the planet pinions CCW. The planetary carrier is held stationary by the "D" clutch. The planet pinions cause the front ring gear to rotate CCW. The front ring gear (and rear carrier) drive the auxiliary gear set CCW which rotates at a ratio of 1:1 due to the "E" clutch locking the sun and ring gear of the auxiliary gear set. Freewheel "H" and "J" are not used. Freewheel "K" is locked.

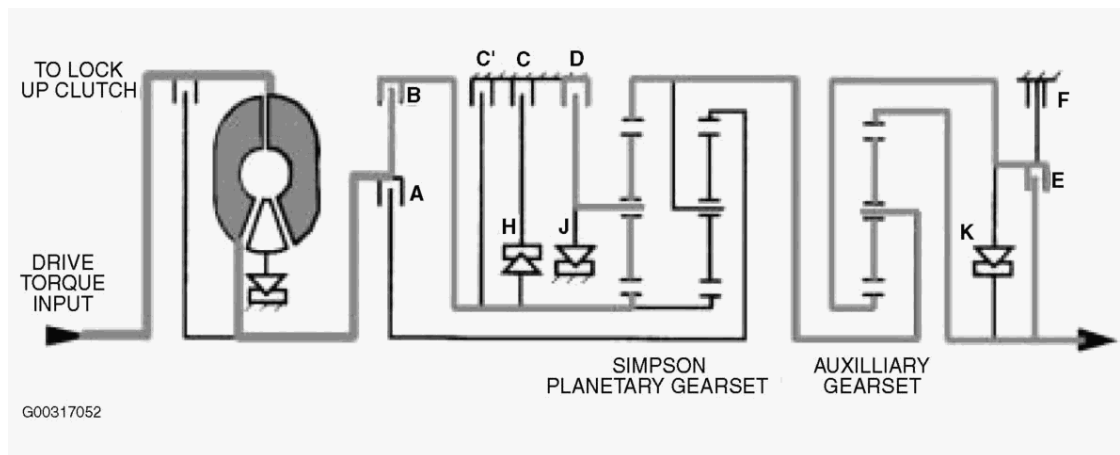


Fig. 39: Power Flow Schematic In Reverse Gear
 Courtesy of BMW OF NORTH AMERICA, INC.

SHIFT CONTROL

Freewheel Shifting

In order to prevent an interruption in power flow, freewheel (One Way Clutches) are used to lock members of the planetary gear set. Certain transmissions such as the 4HP22/24, A4S270/310R and the A5S360R use freewheel shifting on all gear shifts. Transmissions such as A5S310Z, A5S440Z, A5S560Z and GA6HP26Z use freewheel shifting for only specific shifts. Other shifts in these transmissions use overlap shifting technology. To demonstrate how the freewheel is used, the freewheel "H" in the 4HP22/24 transmission will be examined.

In third gear, the sun gear is rotating clockwise. Freewheel "H" is overrun (unlocked) allowing the sun gear to rotate. Clutch "C" is active which locks the outer race of freewheel "H" to the case. During a 3/2 downshift, clutch "B" is released. The sun gear is held from rotating counter clockwise by freewheel "H" and the "C" clutch. Freewheel "H" is used to stop the counter clockwise rotation of the sun gear before the "C" clutch can engage. This prevents an interruption of power flow during the 3/2 downshift. If freewheel "H" fails to operate, there would be an increase in engine RPM from 3rd to 2nd gear. See **Fig. 40** and **Fig. 41** .

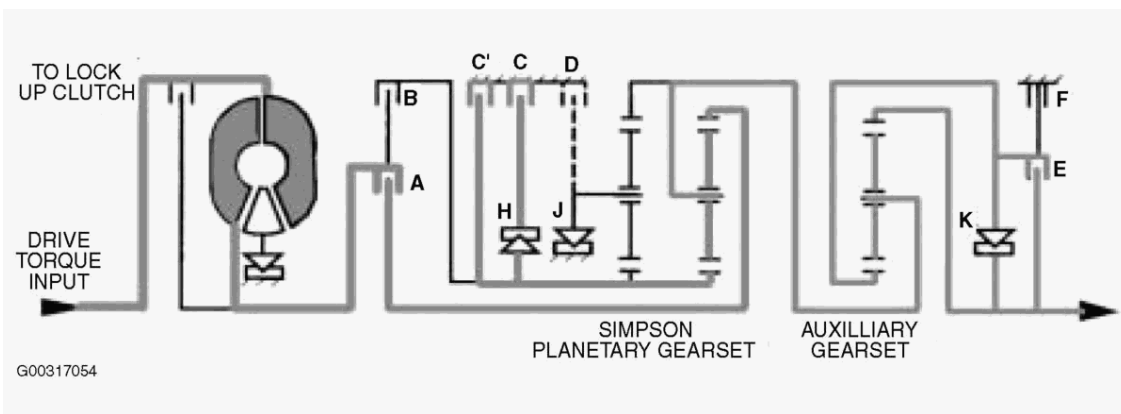


Fig. 40: Freewheel Shifting (Second Gear)
 Courtesy of BMW OF NORTH AMERICA, INC.

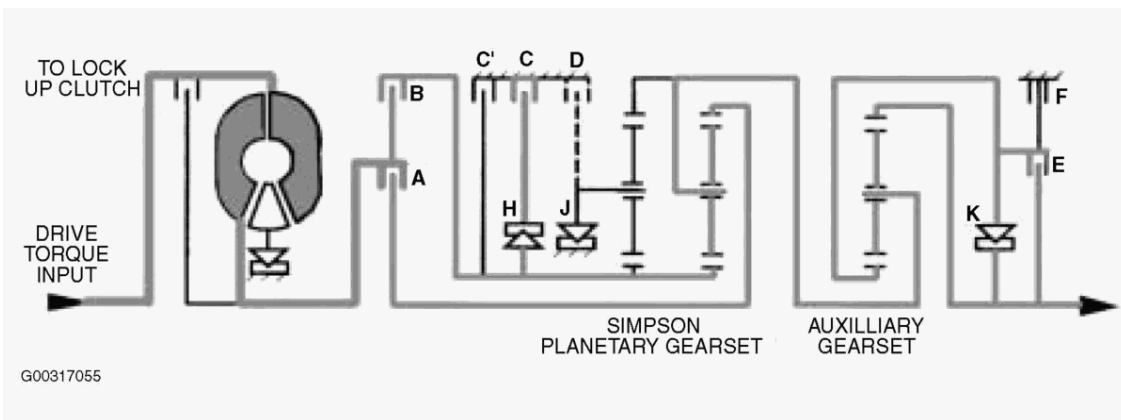
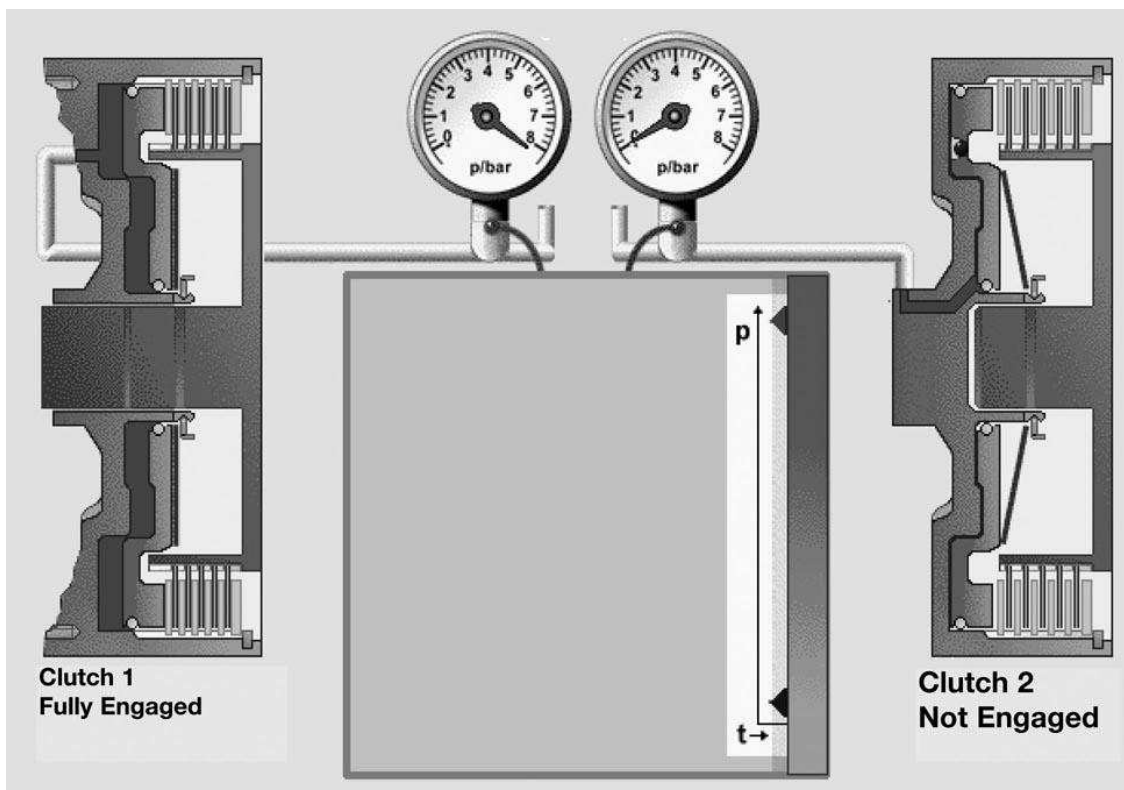


Fig. 41: Freewheel Shifting (Third Gear)
 Courtesy of BMW OF NORTH AMERICA, INC.

Overlap Shift Control

Overlap shift technology is currently used on ZF transmissions. The A5S310Z, A5S440Z, A5S560Z and the GA6HP26Z use overlap shift technology on most gear changes. The advantages of this design allows for the reduction of the use of One Way Clutches (freewheel) and a significant improvement in shift quality. During an overlap shift, the releasing clutch pressure is reduced at the same rate that the engaging clutch pressure is increased. The result is a smooth transfer of torque between gear ratios.

As shown in the diagram, clutch 1 is fully engaged with maximum pressure. Clutch 2 is fully released. During overlap shifting, the TCM closely monitors the rotational speeds of the turbine (input) shaft and output shaft. The TCM then uses the EDS solenoids to control pressures during shifting to provide the optimum shift timing and overlap control. See **Fig. 42**.

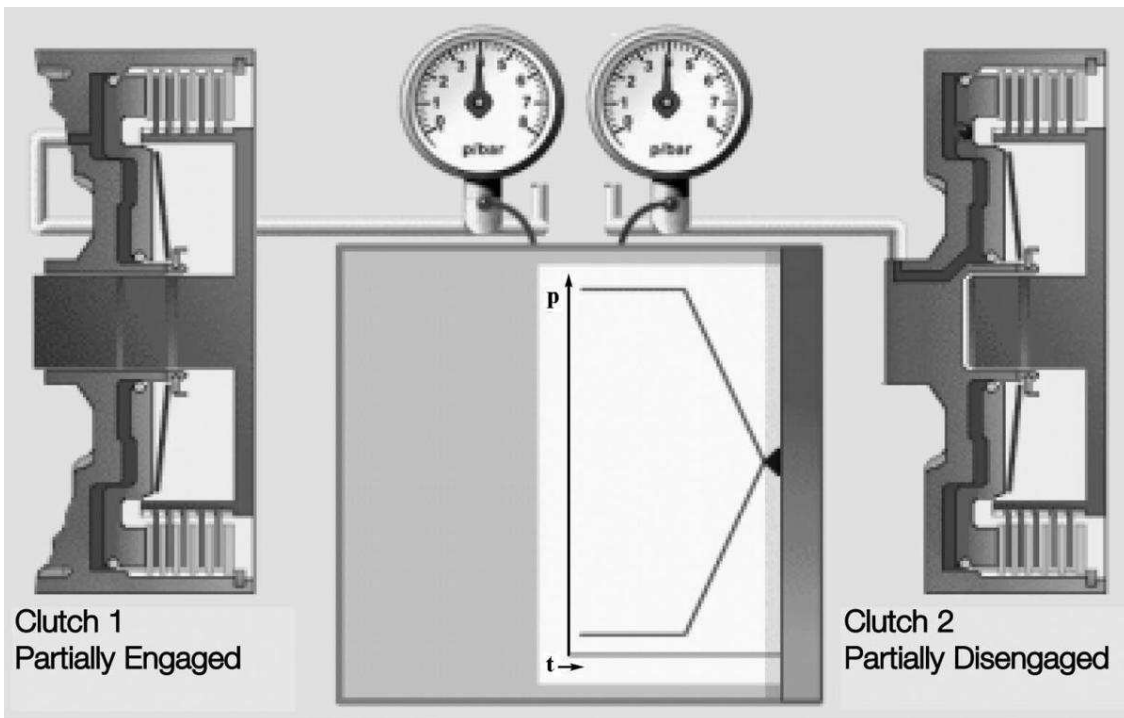


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Fig. 42: Identifying Overlap Shift Control
 Courtesy of BMW OF NORTH AMERICA, INC.

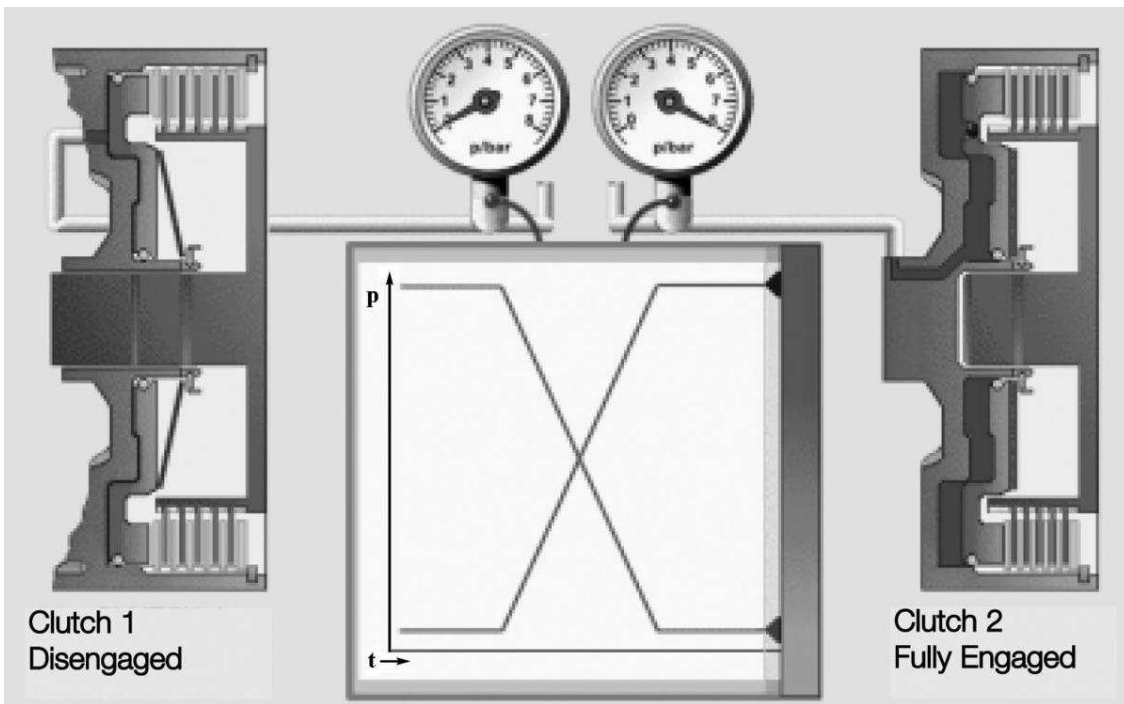
Overlap Shifting

During the transition of overlap, the clutches run through a slip zone. The torque is gradually transferred from the clutch that is releasing to the clutch that is engaging. The new gear engages the moment the torque level exceeds that of the first clutch. This is described as overlap. If the overlap is correct, (zero overlap) the engaging clutch takes over as much torque as the disengaging clutch releases. The result is a seemingly unnoticed shift of the best quality. See [Fig. 43](#) and [Fig. 44](#).



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Fig. 43: Identifying Overlap Shifting (Clutch 1 Engaged)
 Courtesy of BMW OF NORTH AMERICA, INC.

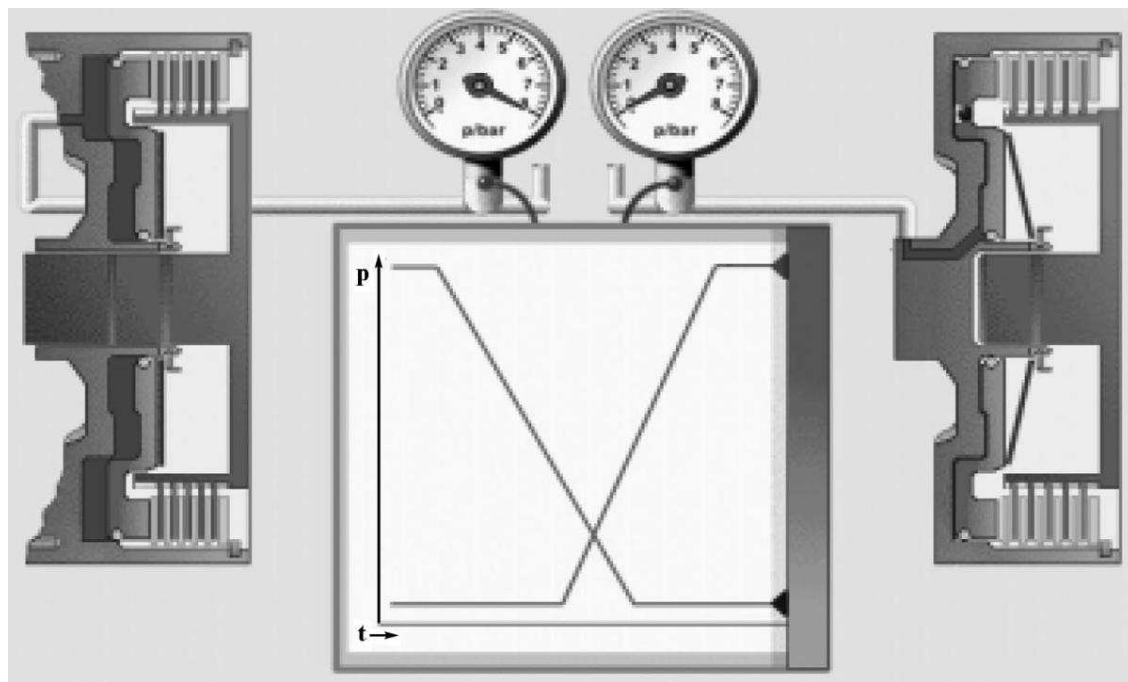


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Fig. 44: Identifying Overlap Shifting (Clutch 1 Disengaged)
Courtesy of BMW OF NORTH AMERICA, INC.

Negative Overlap

Negative overlap occurs when the engaging clutch takes over too late or the releasing clutch drops pressure too early. The result is that the drive torque is briefly interrupted. When the engine is operating under load, the engine speed increases due to the interruption. When coasting the engine speed drops. See **Fig. 45**.

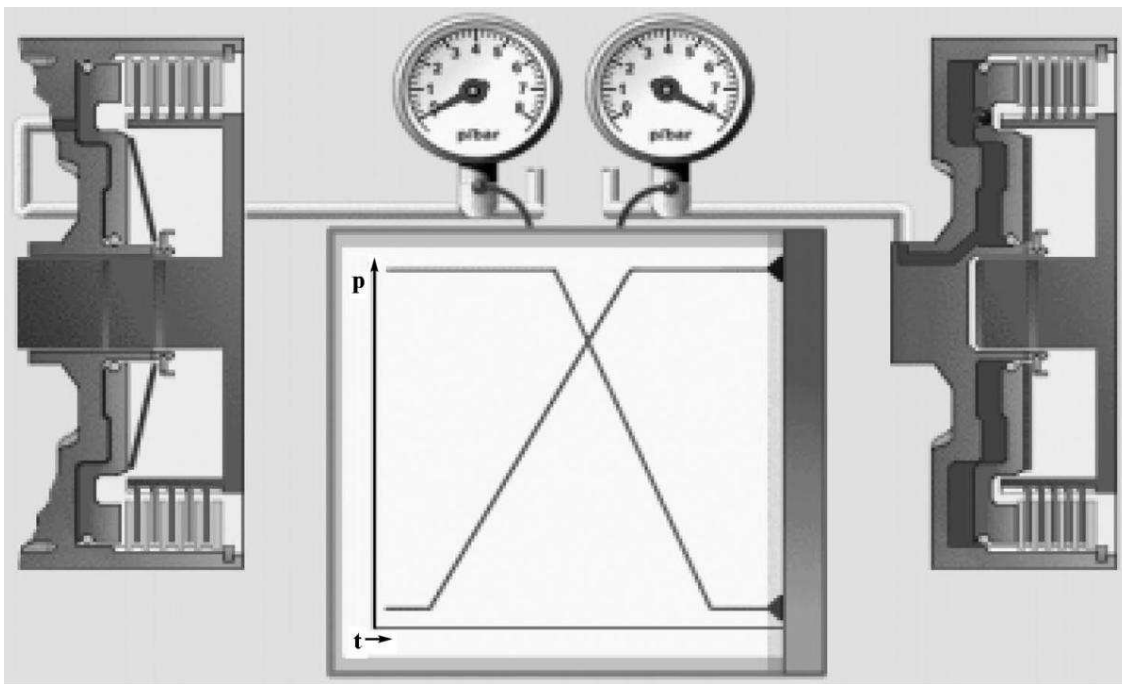


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Fig. 45: Identifying Negative Overlap
Courtesy of BMW OF NORTH AMERICA, INC.

Positive Overlap

If positive overlap occurs, the engaging clutch takes over too early or the releasing clutch pressure drops too late. The gear set would become momentarily blocked if this condition occurs during an upshift. When this occurs the ratio of the gear set becomes 1:1 momentarily. The result is a loss in drive torque during a gear shift. See **Fig. 46**.



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Fig. 46: Identifying Positive Overlap

Courtesy of BMW OF NORTH AMERICA, INC.

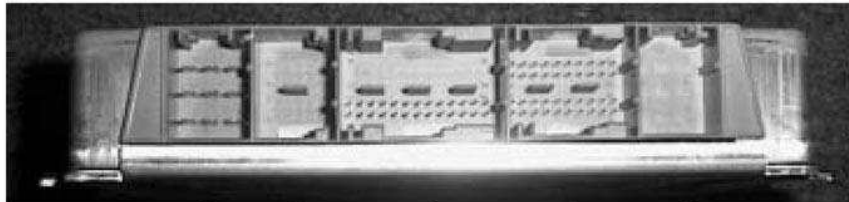
TRANSMISSION CONTROL MODULE

The TCM receives inputs, processes information and actuates the output elements to provide optimal shift points. The TCM is programmed for maximum shift comfort and fuel economy. The TCM on most BMW vehicles is located in the E-Box next to the ECM (DME). There are several types of TCM housings:

- 35 Pin TCM (TCU) - used on the 4HP transmissions.
- 55 Pin TCM used on the A4S310R (THM-R1).
- 88 Pin TCM used on all others up to 98.
- 134 Pin TCM used on all BMW transmission from the 99 model year. (Note- the 134 pin TCM was introduced on the 98 Models equipped with the A5S440Z).

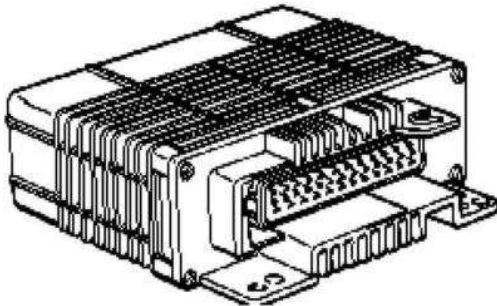
The 134 Pin TCM is also referred to as SKE (Standard Shell Construction). The SKE housing uses 5 separate connectors. On transmission applications only three connectors (1, 3 and 4) are used. Connectors 2 and 5 are blank and are NOT used. The connectors are Blue in color to avoid confusion with the ECM (DME) connectors which are Black. See [Fig. 47](#).

134 Pin TCM
with SKE housing

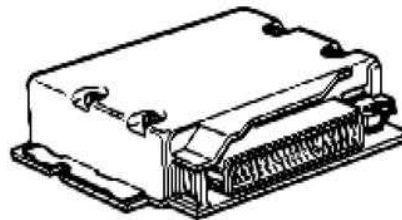


Connectors 1 2 3 4 5

55 Pin TCM



88 Pin TCM



G00317061

Fig. 47: Identifying Transmission Control Modules & Connectors
Courtesy of BMW OF NORTH AMERICA, INC.

2003-05 TRANSFER CASES

Overview - xDrive

DESCRIPTION & OPERATION

XDRIVE

xDrive is a new four-wheel-drive system that delivers continuously variable input torques to the front and rear axles. xDrive comprises Dynamic Stability Control (DSC) and an electronically controlled multi-plate clutch in the transfer case. The DSC triggers the electronically controlled multi-plate clutch to supply continuously variable and power-oriented input torques to the front and rear axles. The rear axle is always powered. All of the input torque is applied to the rear axle when the multi-plate clutch is separated. xDrive communicates permanently with the DSC and receives from it, for instance, the following information:

- Whether the accelerator is pressed or released.
- Whether the engine torque is increasing or decreasing.
- Whether the car is driving straight ahead or in a curve.

xDrive continuously evaluates this information to detect whether the car can respond to the driver's requirements. xDrive intervenes to counter the threat of any tendency for wheelspin, oversteer or understeer. xDrive regulates input torque distribution between the two axles to meet driving demands. DSC only ever engages (by reducing engine power output and selective braking of individual wheels) should xDrive need assistance to keep the car on course. The input torque is delivered to the axle that has better traction when road conditions change, such as on snow, ice or a loose road surface.

TOPPING UP/CHANGING TRANSFER CASE OIL

NOTE: Use only the approved gear oil in the transfer box. See **TRANSFER CASE APPROVED OIL** . Failure to comply with this requirement will result in serious damage to the transfer box. Only change the oil when the transfer box is at normal operating temperature.

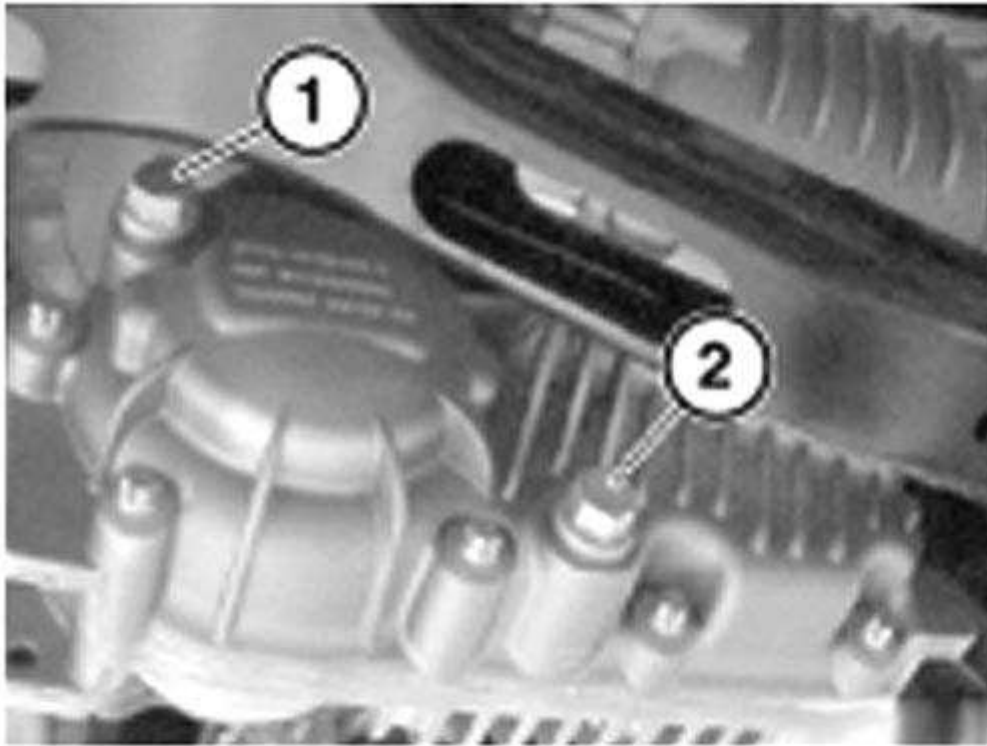
TRANSFER CASE APPROVED OIL

Oil Type	Part Number
Shell Gear Oil	83 220 306 816

CHECKING/CORRECTING TRANSFER CASE OIL LEVEL

NOTE: Numbers in text refer to numbers in figures.

Undo oil filler plug (1). Check transfer case oil level. If necessary, pour in gear oil up to lower edge of opening for oil filler plug (1). See **Fig. 1** . Replace sealing ring.



G00390788

Fig. 1: Identifying Oil Filler Plug & Drain Plug
Courtesy of BMW OF NORTH AMERICA, INC.

CHANGING TRANSFER CASE OIL

NOTE: Numbers in text refer to numbers in figures.

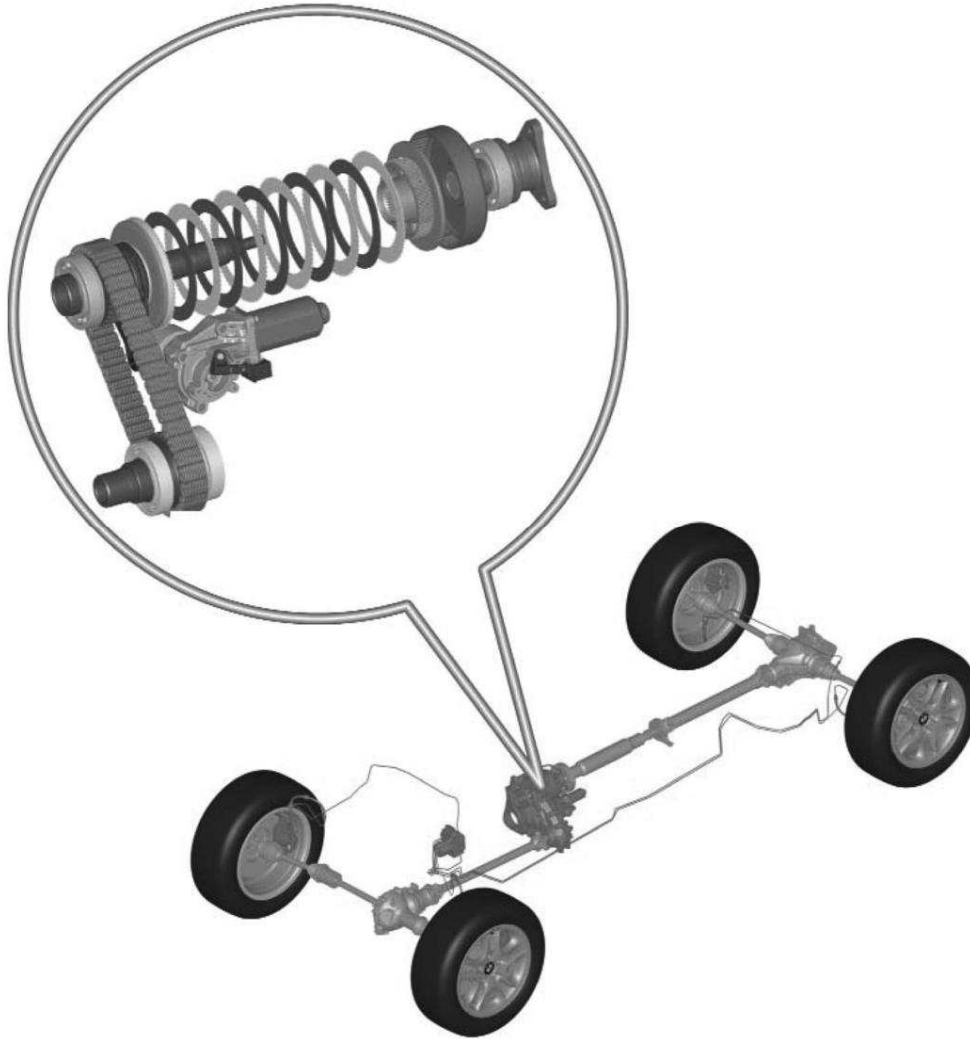
Place oil collecting apparatus underneath. Remove oil drain plug (2). Drain and dispose of gear oil. Replace sealing ring, screw in oil drain plug (2) and tighten down. Undo oil filler plug (1). Pour in gear oil up to lower edge of opening for oil filler plug (1). See **Fig. 1** . Replace sealing ring.

PURPOSE OF SYSTEM

XDRIVE

The innovative xDrive four-wheel drive is a system that controls and regulates the distribution of driving torque to the front and rear axles. The measured variables of DSC are used by xDrive but are also influenced by modified handling performance. The multi-disc clutch is the heart of the xDrive. By using the controlled multi-disc clutch, it is possible to resolve the conflict between traction and handling performance. This is achieved through the fact that torque distribution is not determined by a fixed gear ratio in the xDrive as was the case in the previous systems. Instead, the distribution of driving torque is dependent on the locking torque of the controlled multi-disc clutch in the transfer case and on the transferable torque to the front and rear axles. See

Fig. 2 .



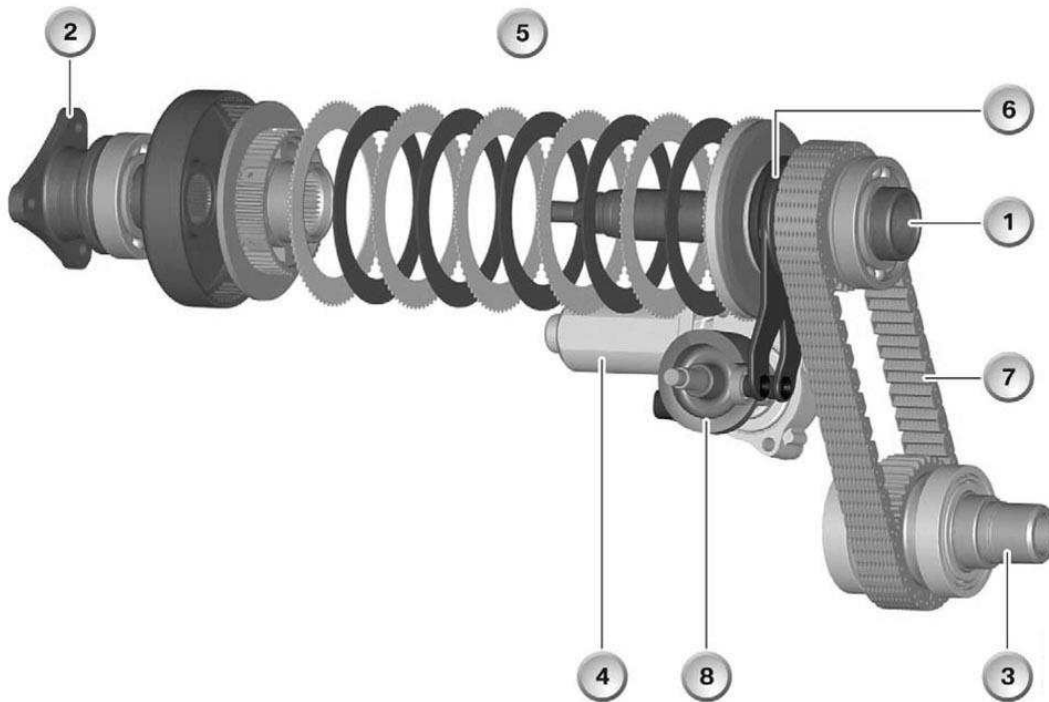
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Fig. 2: Identifying xDrive System
Courtesy of BMW OF NORTH AMERICA, INC.

SYSTEM COMPONENTS

ATC 400/ATC 500 TRANSFER CASE

The ATC 400 is installed in the E83 and the ATC 500 in the E53 MU. They differ in that the ATC 500 is splined to the front propeller shaft and the ATC 400 uses a four bolt flange. In addition, there is one more disc in the multi-disc clutch of the ATC 500 and the distance between the input shaft and the output shaft to the front axle is 19 mm greater than in the ATC 400. See **Fig. 3 .**



- | | |
|---|------------------------------------|
| 1. Input from manual / automatic transmission | 5. Clutch discs |
| 2. Output to rear axle prop. shaft | 6. Adjusting levers with ball ramp |
| 3. Output to front axle prop. shaft | 7. Chain |
| 4. Servomotor | 8. Disc cam |

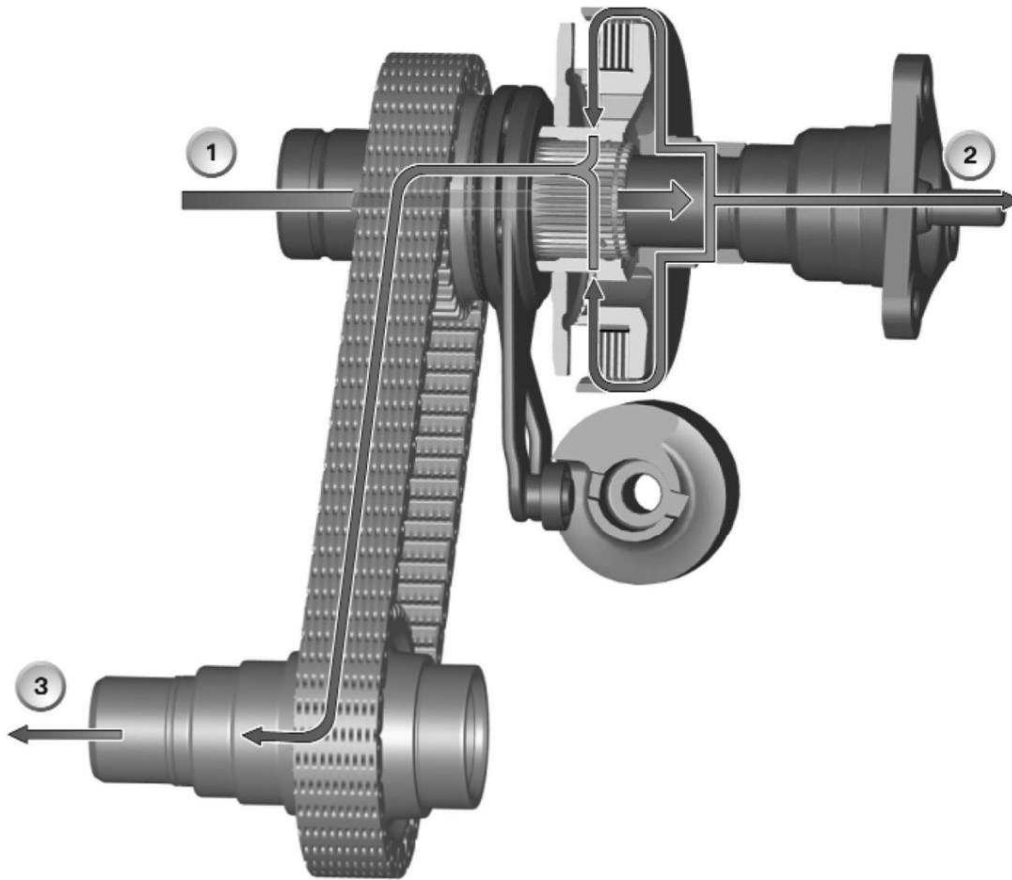
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Fig. 3: Identifying xDrive Transfer Case Components
 Courtesy of BMW OF NORTH AMERICA, INC.

POWER FLOW

When the multi-disc clutch in the transfer case is disengaged, no driving torque is transmitted to the front axle. All of the driving torque is then distributed to the rear axle. This is because the input shaft (1) is splined providing a permanent connection to the rear axle propeller shaft output flange (2). The multi-disc clutch couples the rear axle propeller shaft output flange to the front propeller shaft output (3). The driving torque on the front axle is increased or decreased by regulating the locking pressure of the multi-disc clutch, providing a stepless coupling of the front axle to the drivetrain. This depends on driving situations and road conditions. When the multi-disc clutch is fully engaged, the front and rear axles turn at the same speed. Driving torque distribution (front/rear) is based on available traction at each axle. For example, when traction is identical on the front and rear axles and a driver accelerates from a stop in first gear at full throttle, the rear axle is capable of sustaining greater driving torque as the vehicle weight shifts from the front to the rear. Another example is when the front axle is on a high traction surface and the rear axle is on ice. In this case, virtually all of the available driving torque is transmitted to the front axle. Based on available traction, virtually no driving torque can be supported by the rear axle. Obviously, when more driving torque is transmitted to the front axle, driving

torque on the rear axle is proportionally reduced due to lack of traction. See **Fig. 4** .



- 1. Input from transmission
- 2. Rear propeller shaft output
- 3. Front propeller shaft output

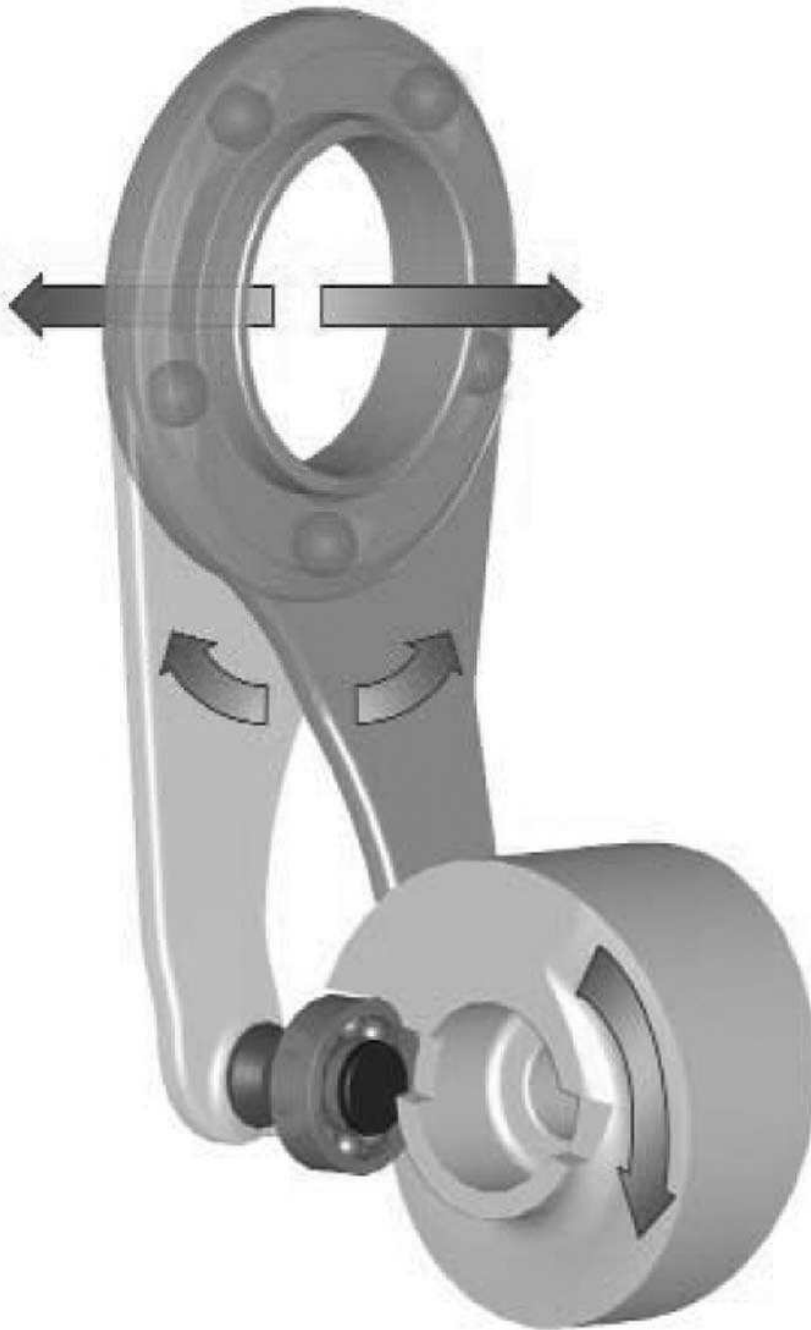
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Fig. 4: Identifying xDrive Power Flow
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: On a vehicle equipped with an automatic transmission, when driving onto brake analyzers, move the selector lever to the "N" position . On a vehicle equipped with a manual transmission, do not press the accelerator pedal once on the brake analyzer. This keeps the transfer case clutch open and the vehicle cannot be pulled off the analyzer.

ADJUSTING LEVERS

When the disc cam is rotated, it forces the adjusting levers apart. The ball ramps create a precision axial movement which compresses and increases pressure on the multi-disc clutch. This is completely variable up to a full lock. See **Fig. 5** .

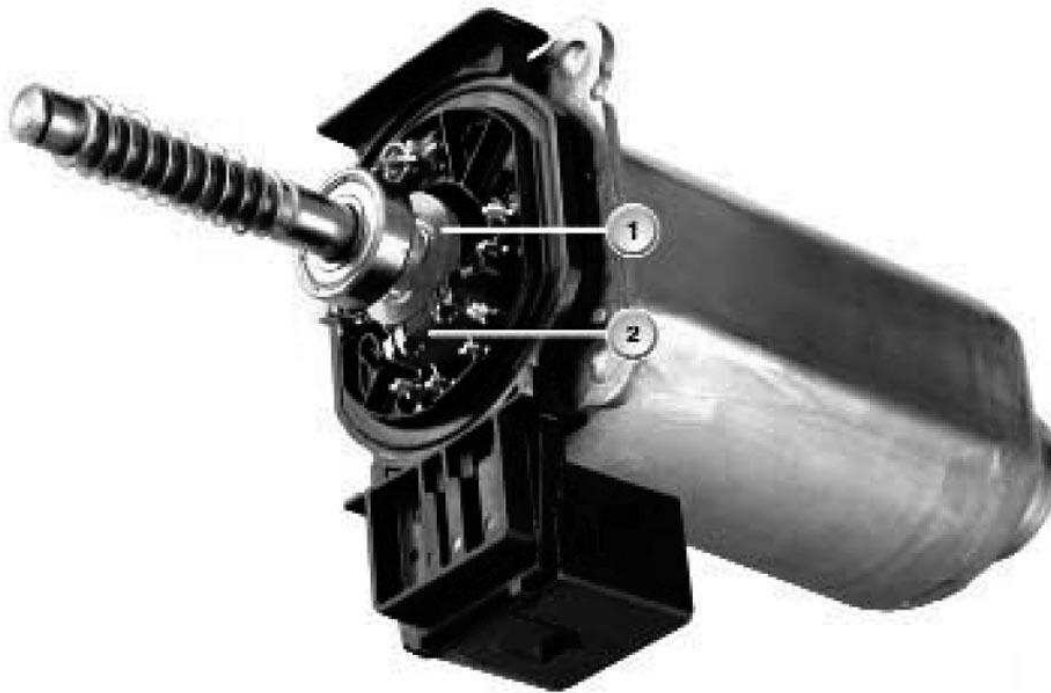


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Fig. 5: Identifying Adjusting Levers
Courtesy of BMW OF NORTH AMERICA, INC.

SERVOMOTOR WITH MOTOR POSITION SENSOR

The servomotor with worm gear are powered to rotate the disc cam. The servomotor is a permanent magnet (1) DC motor which contains a Hall sensor (2) to detect the position and the adjusting speed of the motor shaft. This is proportional to the degree of multi-disc clutch engagement. See **Fig. 6** .

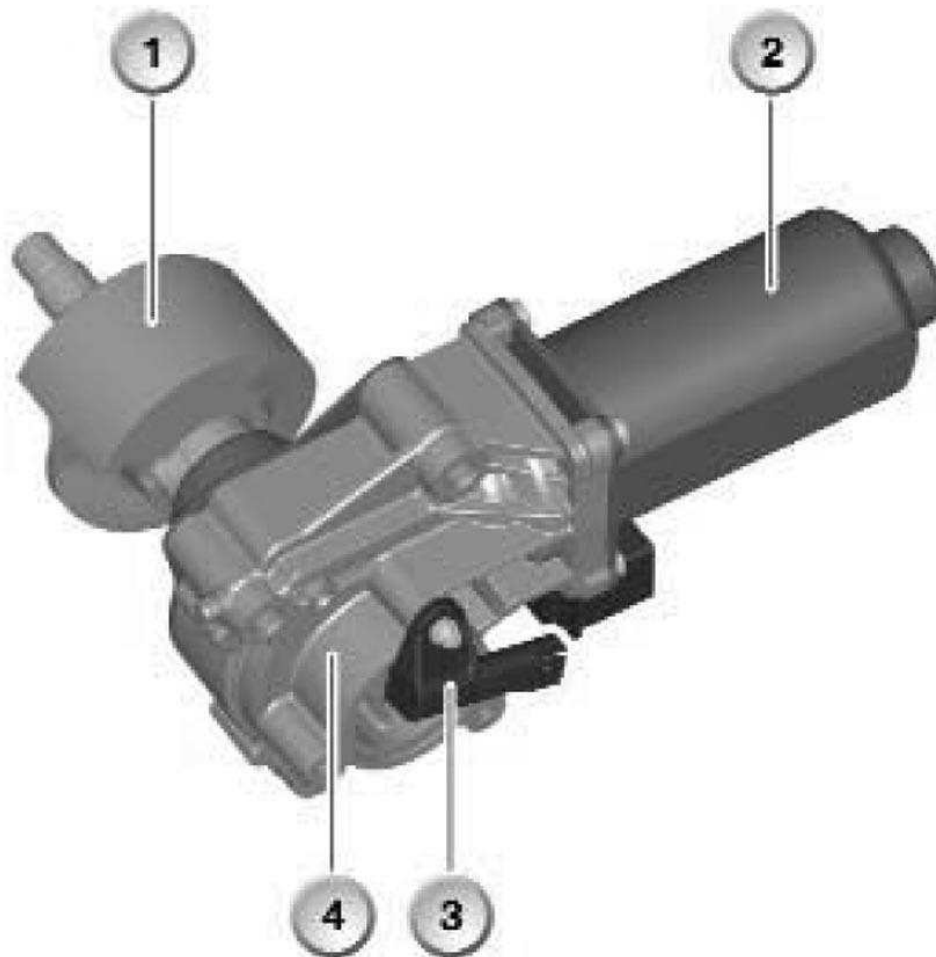


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Fig. 6: Identifying Servomotor With Motor Position Sensor
Courtesy of BMW OF NORTH AMERICA, INC.

CODING RESISTOR

Because of mechanical tolerances in production, the characteristic curve of the multi-disc clutch locking torque varies slightly. Once the actual locking torque has been measured on the clutch test bench, a resistor is attached to the servomotor; the resistor's value is a reference to the locking torque characteristic. Each time the engine is started, the transfer case control unit measures the resistance value once and the optimum program map for the transfer case fitted is selected. See **Fig. 7** .



- | | |
|-------------------|--------------------|
| 1. Disc cam | 3. Coding resistor |
| 2. Electric motor | 4. Worm gear |

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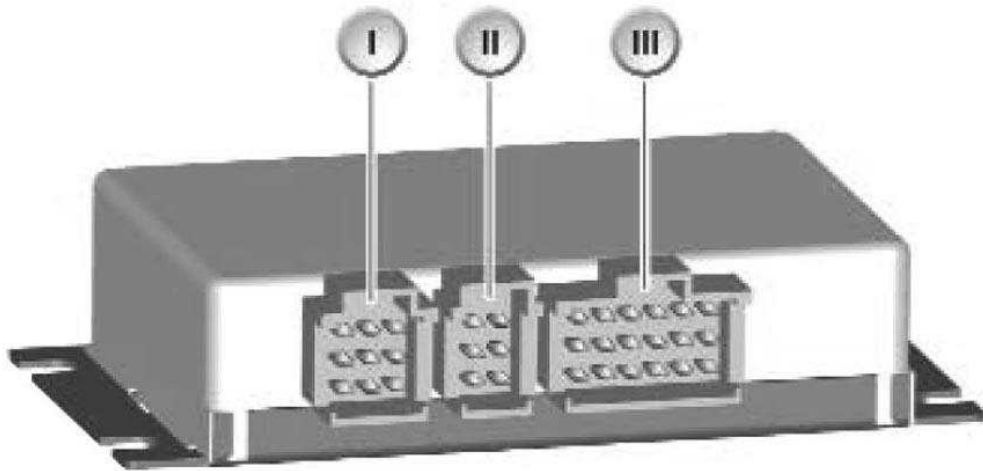
Fig. 7: Identifying Coding Resistor

Courtesy of BMW OF NORTH AMERICA, INC.

TRANSFER CASE ELECTRONIC CONTROL UNIT

The transfer case control unit (VGSG) is installed in the X3 on the rear floor panel under the luggage compartment trim. In X5, it is located underneath the rear bench seat on the left. See **Fig. 8** . The transfer case

control unit (VGSG) is on the PT-CAN Bus. VGSG shares information with DSC for overall xDrive control and has diagnostic communication via the OBD connector. See **Fig. 9** and **Fig. 10**.



- I. 9-pin ELO connector (not used)
- II. 6-pin ELO connector
- III. 18-pin ELO connector

G00390863

Fig. 8: Identifying Transfer Case Electronic Control Unit
Courtesy of BMW OF NORTH AMERICA, INC.

Bus Overview

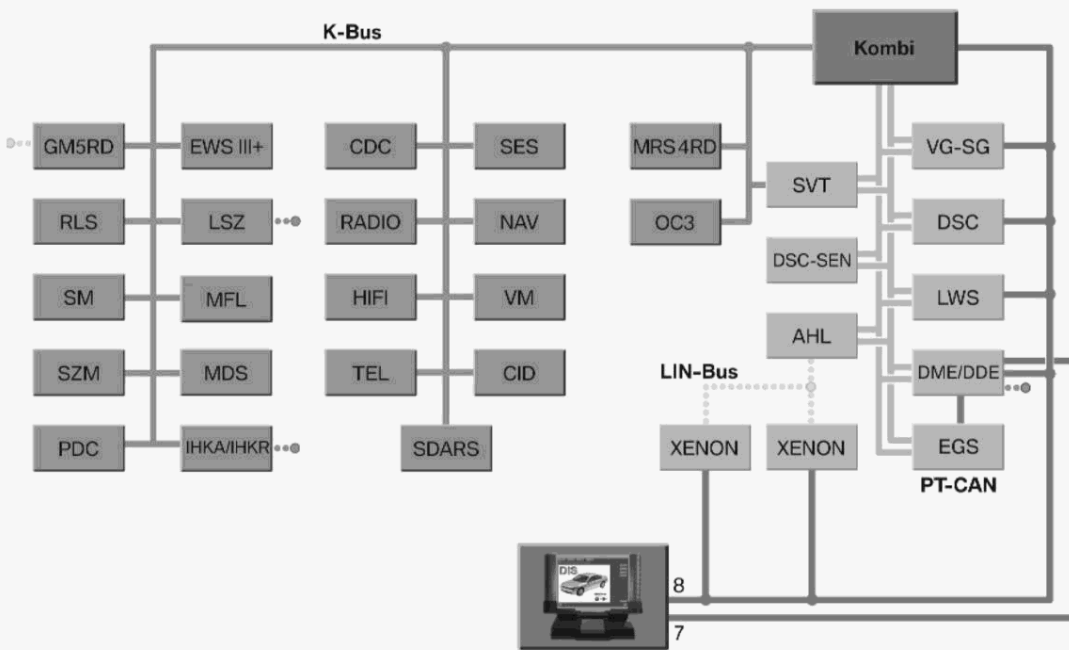
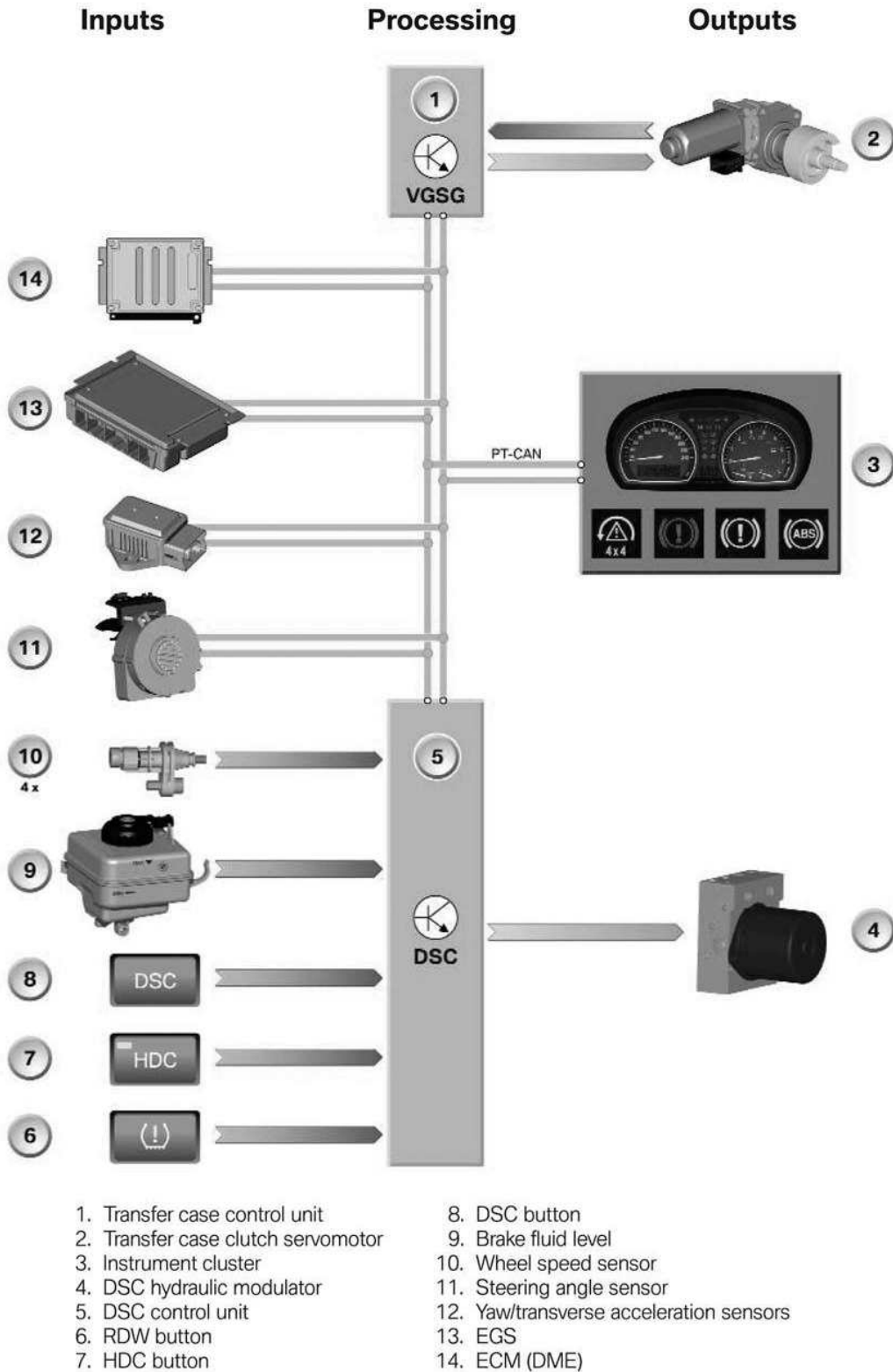


Fig. 9: Transfer Case Bus Overview

Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 10: Transfer Case Inputs, Processing & Outputs

PRINCIPLE OF OPERATION

XDRIVE

The transfer case control unit (VGSG) regulates the locking pressure of the multi-disc clutch in the transfer case. The transfer case control unit receives information on the required clutch locking pressure from the DSC control unit. The processing, control and electronics required for this are integrated in the transfer case control unit. This information is converted and output as a corresponding rotary motion of the servomotor. In order to position the servomotor and compensate for wear, a reference run is carried out each time the ignition is switched off. The servomotor position is determined by a Hall sensor integrated in the servomotor. During the reference run, the clutch is engaged and disengaged completely (once). While the clutch is actuated, the current consumption is measured for the servomotor position. This allows the VGSG to determine the beginning and end of the clutch actuating procedure. A clutch and oil wear calculation is also processed and stored in the VGSG. It increases the locking pressure as necessary in order to reduce friction. In the event of DSC failure, the VGSG incorporates a fallback level (strategy) for activating the transfer case clutch in order to maintain the four-wheel drive function.

TCC

Regulation of the transfer case clutch (TCC) locking pressure allows stepless coupling of the front axle to the drivetrain. The driving torque on the front axle can be increased or decreased depending on the driving situation and road conditions. Obviously, when more driving torque is transmitted to the front axle, driving torque on the rear axle is proportionally reduced due to lack of traction. The advantages of variable distribution of driving torque to the front and rear axles are:

- Optimum utilization of the cornering and longitudinal wheel forces on the front and rear axles.
- DSC brake interventions only become necessary at a significantly later stage, an increase in comfort refinement.
- Compared with an "open" differential transfer case and DSC, xDrive significantly improves driving torque distribution when traction on the front and rear axles is notably different. The DSC control unit influences control of the transfer case clutch. Even when DSC is deactivated, TCC remains active for the purpose of maximum traction and driving dynamics.

Permanent four-wheel drive is only completely deactivated in three control situations:

- During very tight cornering with low engine torque to allow speed compensation between the front and rear axles (e.g. parking).
- At speeds greater than 112 mph.
- When the vehicle dramatically understeers.

The transfer case clutch control logic is described in three main modules:

- Pre-control.
- Traction control/driving dynamics control.

- Tire tolerance logic.

PRE-CONTROL

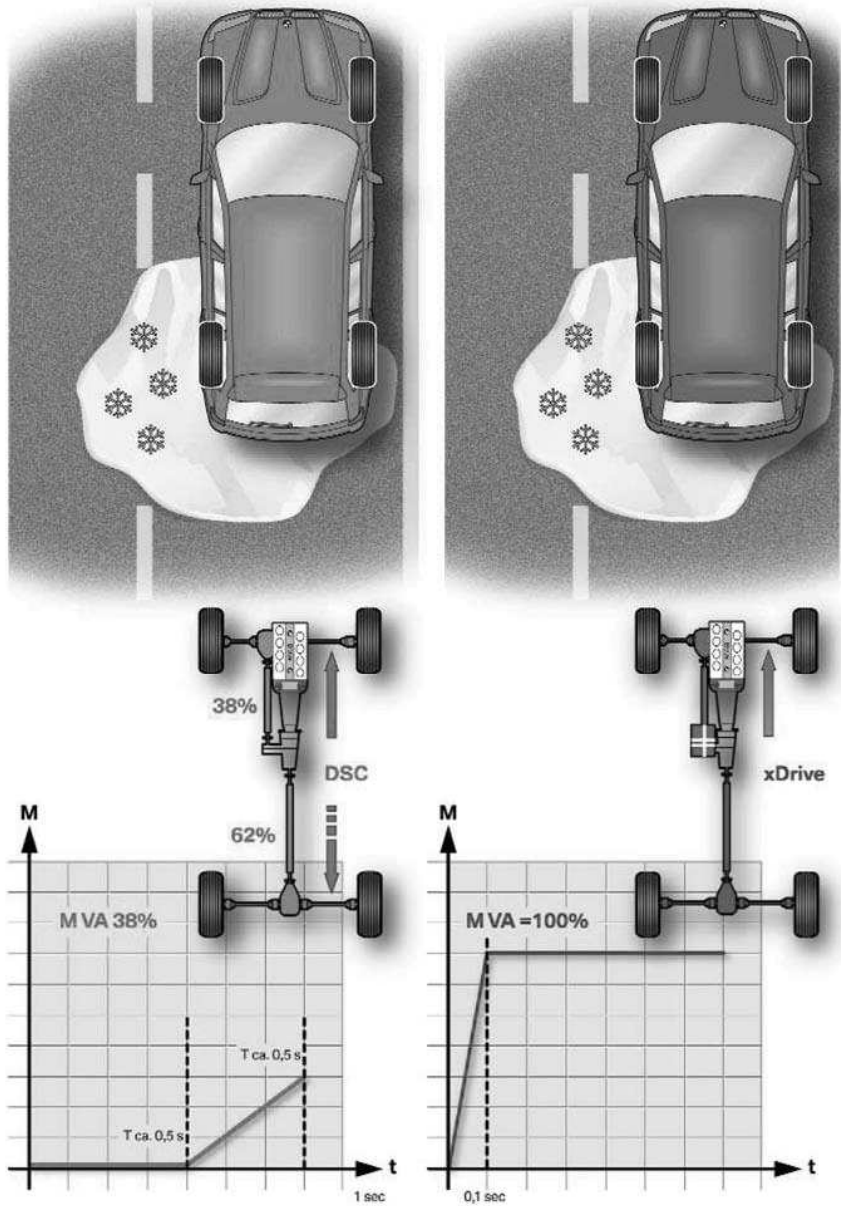
The pre-control logic (shared from DSC) reflects the driver's command and is calculated based on:

- Accelerator Pedal Value
- Engine Torque
- Engine RPM

In normal driving, the clutch is operated with minimum slip so that permanent four-wheel drive with a driving torque distribution of 40 percent on the front axle and 60 percent on the rear axle is available. Even when the traction for the front and rear axles is dramatically different, the pre-control ensures that the system responds very quickly.

In the case of the open transfer case, the brake is applied after slip is detected on the rear axle. This takes approximately one half of a second in reaction time. Sixty-two percent of the driving torque is supported on the two rear brake discs and only 38 percent of the driving torque can be transferred to the front axle. In other words, wheel slip must be sensed first before driving torque is transferred through the transfer case by applying the rear wheel brakes. In contrast to an "open" transfer case (differential), the xDrive does not require brake intervention on the rear axle because no slip can occur (permanent through connection). The transfer case clutch is engaging the front axle as the vehicle is accelerating. This takes significantly less time (approximately 1/10th of a second).

“Open” Transfer Case vs xDrive



M = Driving torque

M VA = Driving torque on front axle

t = Time

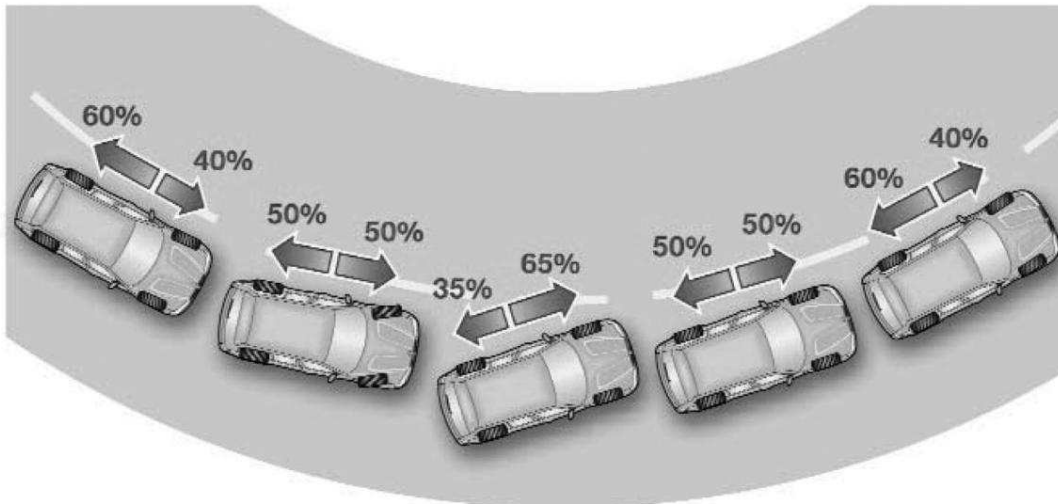
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Fig. 11: Transfer Case & xDrive Usage
 Courtesy of BMW OF NORTH AMERICA, INC.

TRACTION CONTROL/DRIVING DYNAMICS CONTROL

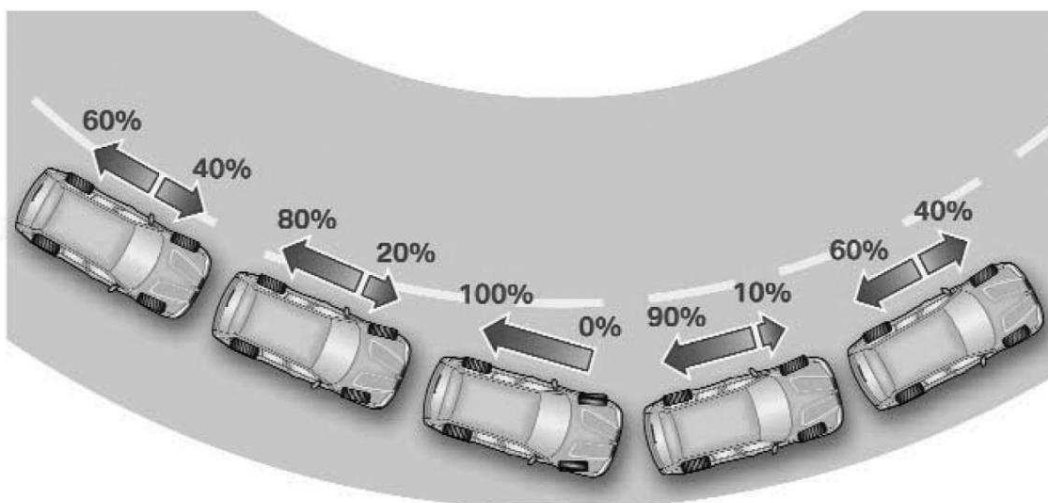
Traction control monitors the slip conditions on the front and rear axles. The wheel speeds, yaw rate and transversal acceleration serve as the input signals. The function of traction control/driving dynamics control is to achieve optimum traction and to keep the vehicle stable. In the event of an oversteer tendency, the transfer case clutch is completely engaged and the maximum supportable driving torque on the front axle is transmitted. This helps to "pull" the front of the vehicle until stability is achieved. See **Fig. 12** .

In the event of an understeer tendency, the clutch can be fully disengaged if necessary. In this example, the front axle is separated from the drivetrain and the driving torque can only be transmitted to the rear axle. This helps to "push" the rear of the vehicle until stability is achieved. See **Fig. 13** .



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Fig. 12: xDrive Oversteer Compensation
Courtesy of BMW OF NORTH AMERICA, INC.



G00390860

Fig. 13: xDrive Understeer Compensation

Courtesy of BMW OF NORTH AMERICA, INC.

TIRE TOLERANCE LOGIC

The tire tolerance logic detects different tread circumferences on the front and rear axles. This occurs when:

- Mixed tires are used.
- Space saving spare tire is installed.
- Tires are used that have been worn down to different levels.

Normally, tire circumference deviations result in drivetrain torque bias (unwanted variations). The tire circumference can fluctuate up to 1 percent or more as a result of mixed tires or wear. The tire tolerance logic decides depending on the driver's command and driving situation whether the slip is to occur in the transfer case clutch or at the contact area between tire and road. If the slip is permitted in the transfer case clutch, the locking pressure set by the pre-control is reduced in order to keep the work loss low. In the driving dynamic control situation, the clutch is locked slightly more than normal, the four wheel drive is always guaranteed when required. For maximum xDrive performance, tires (and wheels) of the same diameter should be installed on the vehicle.

2004-05 MANUAL TRANSMISSION

Removal & Installation - X3 (GS6-37BZ)

REMOVAL & INSTALLATION

MANUAL TRANSMISSION

CAUTION: Use only the approved gear oil in this manual transmission. Failure to comply with this requirement will result in serious damage to the transmission. For further information, see MANUAL TRANSMISSION - SERVICING article.

Removal

1. Disconnect battery. See INSTRUCTIONS FOR DISCONNECTING AND CONNECTING BATTERY.
2. Remove front underbody protection.
3. Remove complete exhaust system. See REMOVING AND INSTALLING COMPLETE EXHAUST SYSTEM (M54).
4. Remove heat shield. Remove front propeller shaft at transfer box and tie to one side. See DRIVE SHAFTS & UNIVERSAL JOINTS article.
5. Install Special Tool (11 0 250) between dome cross-brace and engine suspension eye and secure with dowel pin. See Fig. 1 . Pretension special tool with adjusting screw (1) to measurement "A". Engine secured in installation position. Installation position, measurement "A" = approximately 36 cm.
6. Remove propeller shaft from transmission. Release center bearing. Tie propeller shaft to one side. See DRIVE SHAFTS & UNIVERSAL JOINTS article.
7. Unfasten screws and remove transmission cross-member. See Fig. 2 .
8. Detach plug (1) from reversing light switch. See Fig. 3 . Release cable from mountings and tie to one side.
9. Detach plugs (1) and (2) from servomotor. See Fig. 4 .

NOTE: Pressure line of clutch slave cylinder remains connected. Relieve tension on clutch slave cylinder slowly; otherwise air will be drawn in through sealing sleeve.

10. Release nuts and remove clutch slave cylinder. See Fig. 5 .

CAUTION: Risk of damage: When lowering the transmission, make sure the engine does not rest against the bulkhead.

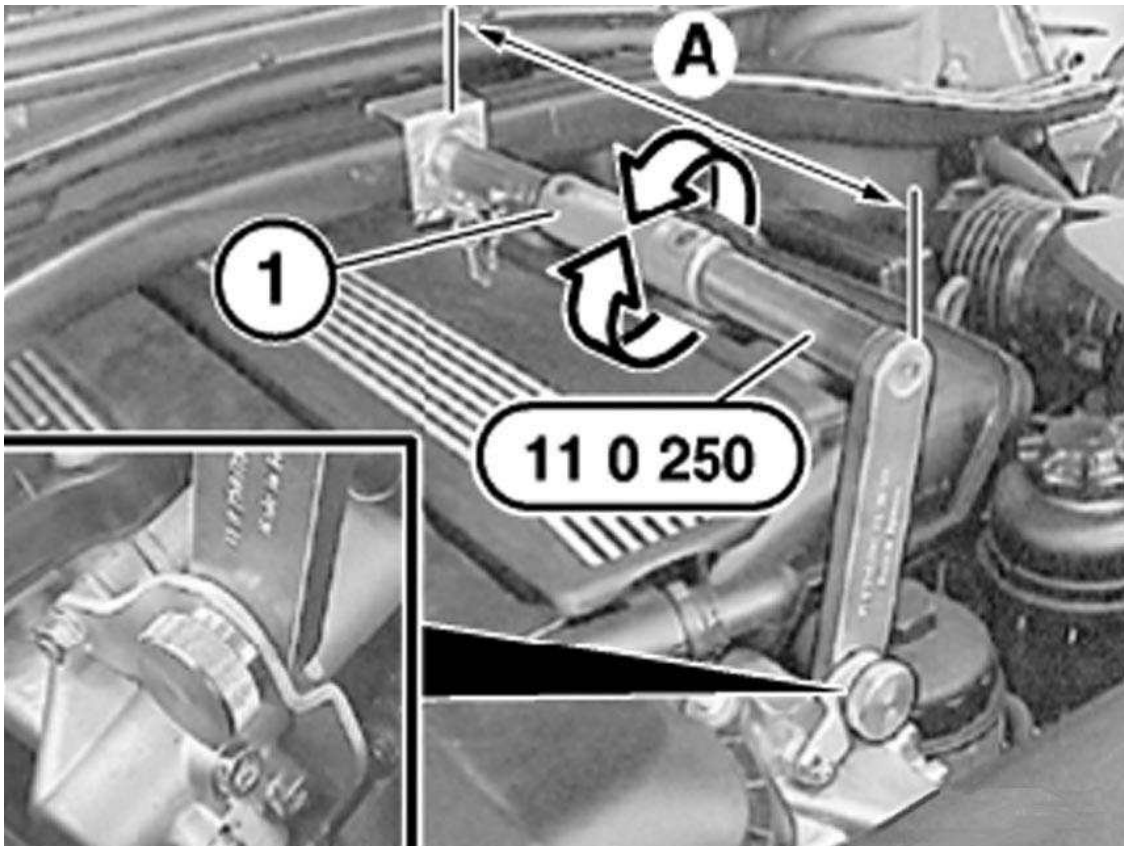
11. Lower transmission: turn Special Tool (11 0 250) back with adjusting screw (1) to measurement "A". See Fig. 1 . Transmission in removal position. Transmission removal position, measurement "A" = approximately 34 cm.

NOTE: Illustrations show E60.

12. Unlock bearing pin (1) in direction of arrow and remove. See **Fig. 6** . Lift out shift arm.
13. Lift off retainer (1). See **Fig. 7** . Disconnect shift rod (2).
14. Unfasten screws. See **Fig. 8** .
15. Unscrew bolt (1). See **Fig. 9** .
16. Support transmission with Special Tools (23 0 134, 23 0 131, 23 0 132, 23 0 112) and (00 2 030). See **Fig. 10** .

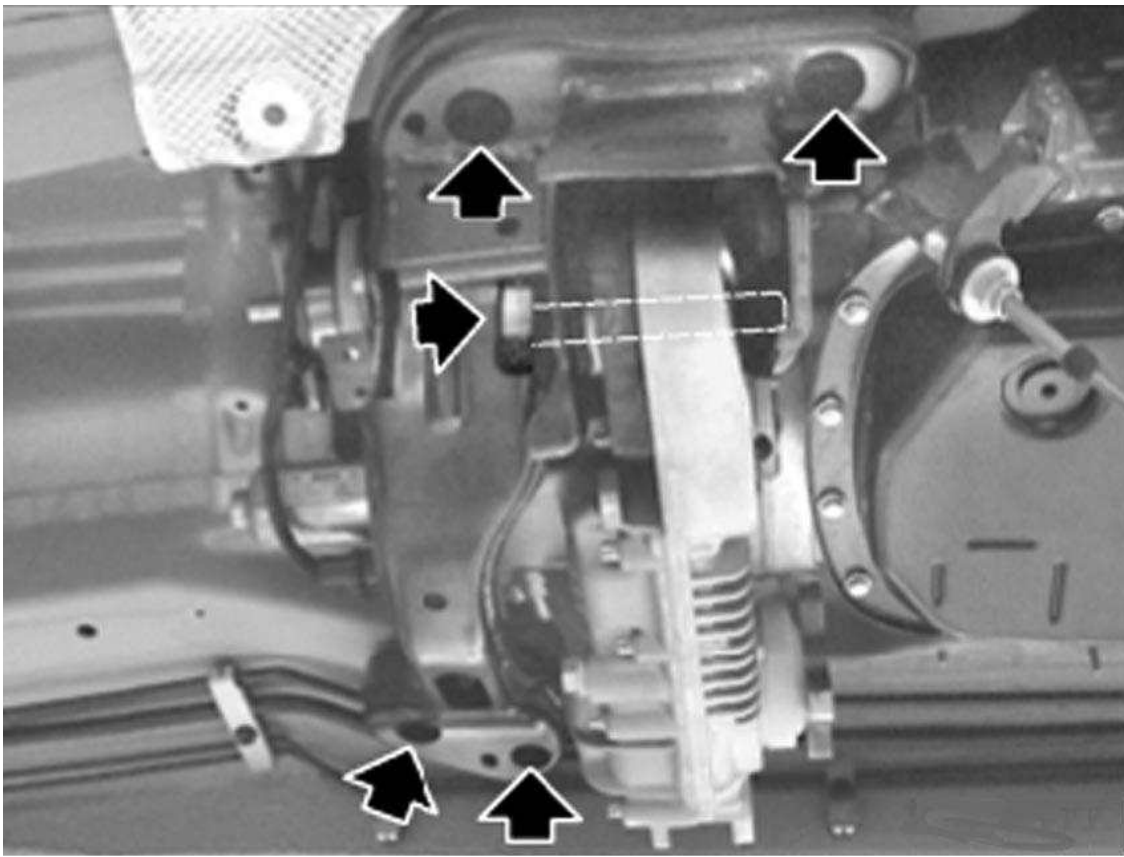
CAUTION: Do not allow transmission to hang from the transmission input shaft when removing and installing, as the clutch disk will be deformed.

17. Unfasten screws. See **Fig. 11** . Pull transmission downwards and remove.



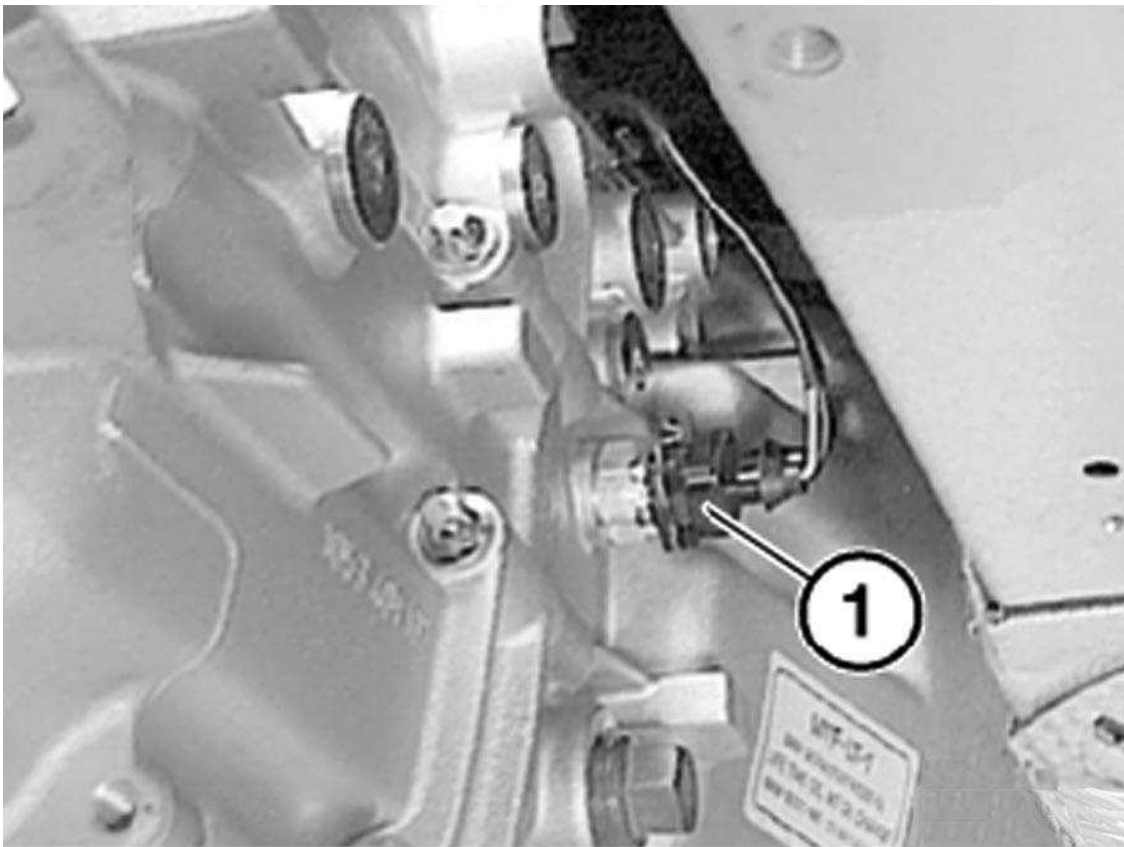
G00382240

Fig. 1: Supporting Engine & Transmission
Courtesy of BMW OF NORTH AMERICA, INC.



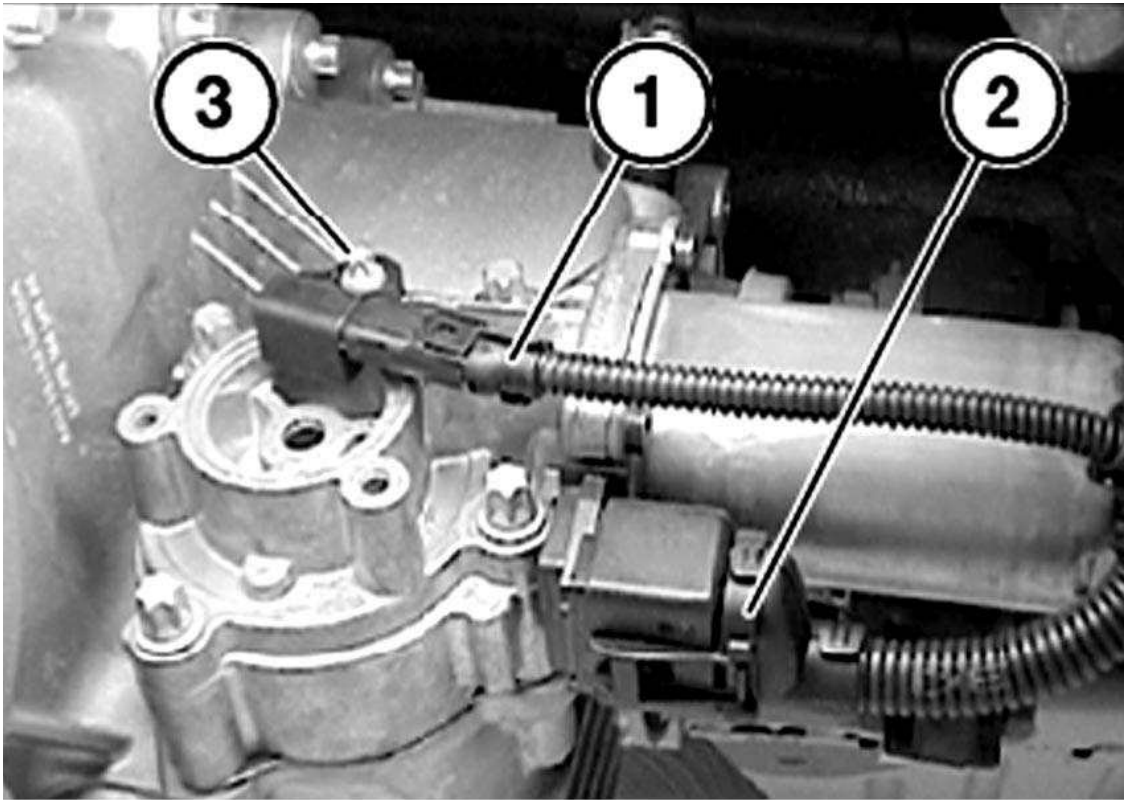
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Fig. 2: Removing Transmission Cross-Member
Courtesy of BMW OF NORTH AMERICA, INC.



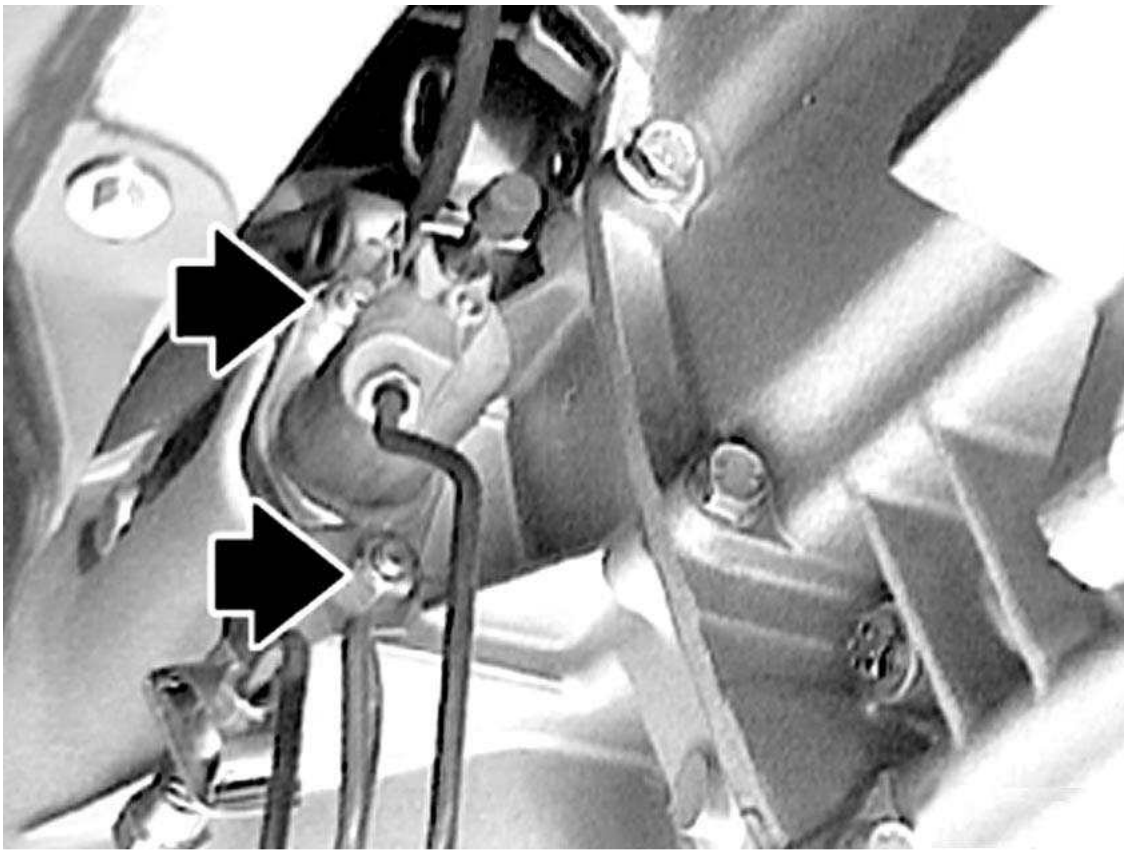
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Fig. 3: Detaching Cable Plug From Reverse Gear Switch
Courtesy of BMW OF NORTH AMERICA, INC.



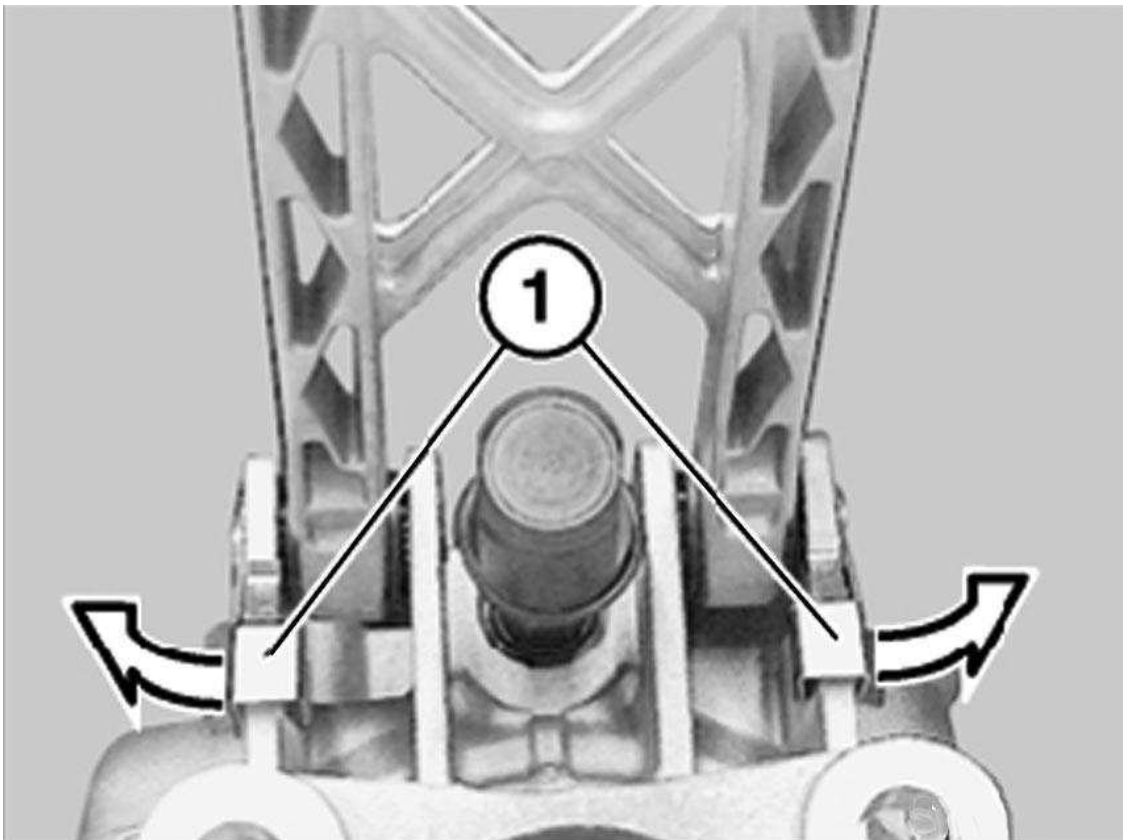
G00382242

Fig. 4: Detaching Plugs From Servomotor
Courtesy of BMW OF NORTH AMERICA, INC.



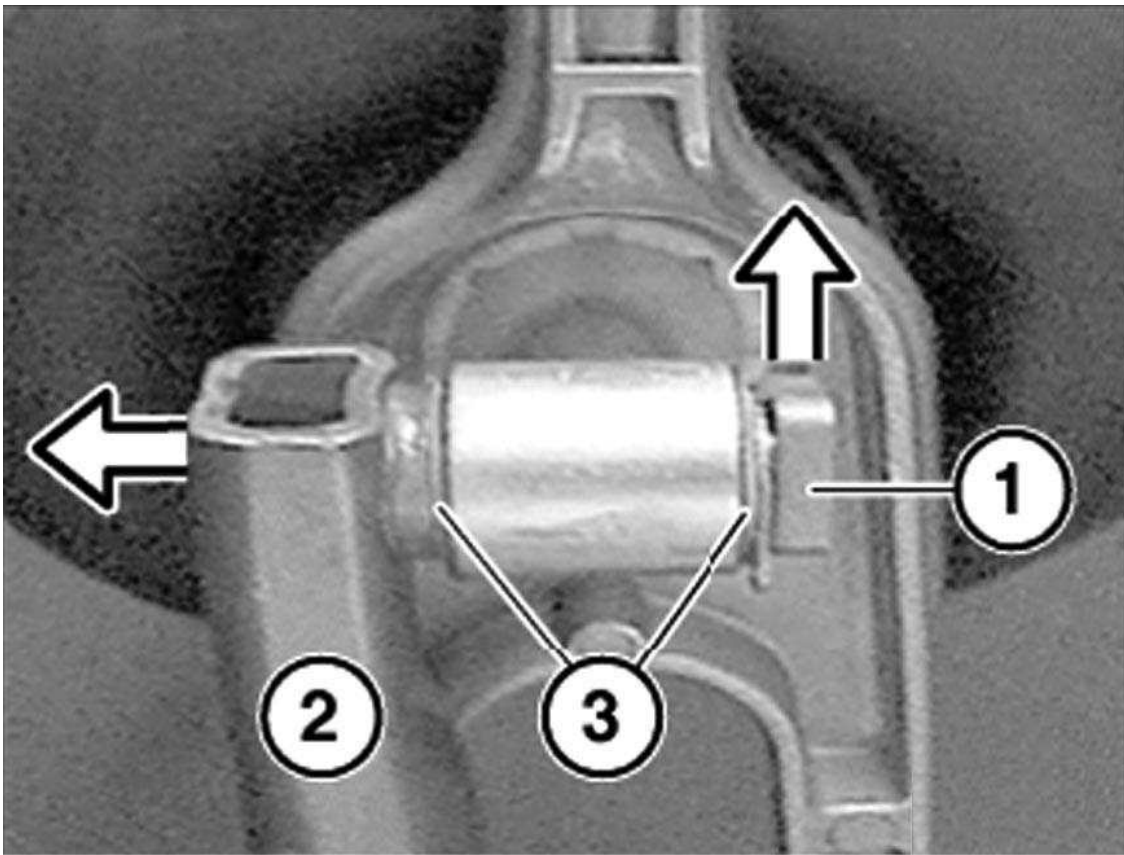
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Fig. 5: Removing Clutch Slave Cylinder
Courtesy of BMW OF NORTH AMERICA, INC.



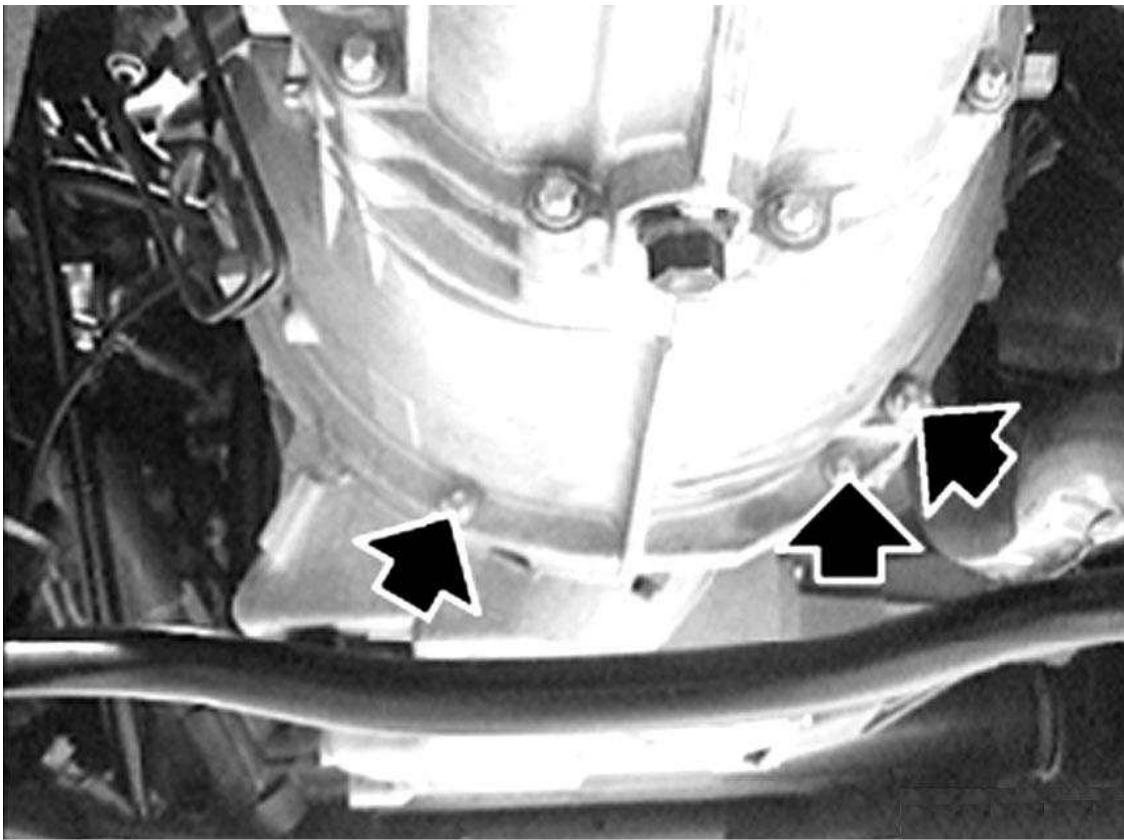
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Fig. 6: Removing Bearing Pin
Courtesy of BMW OF NORTH AMERICA, INC.



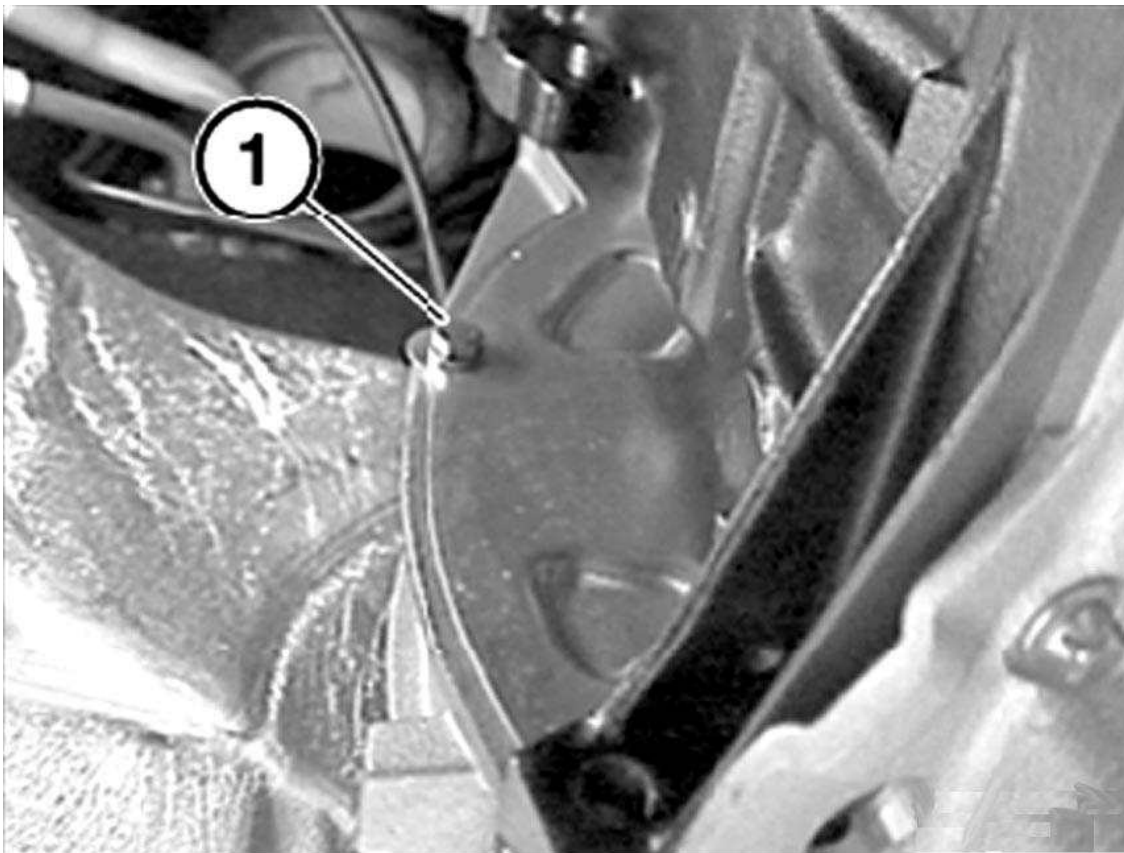
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Fig. 7: Disconnecting Shift Rod
Courtesy of BMW OF NORTH AMERICA, INC.



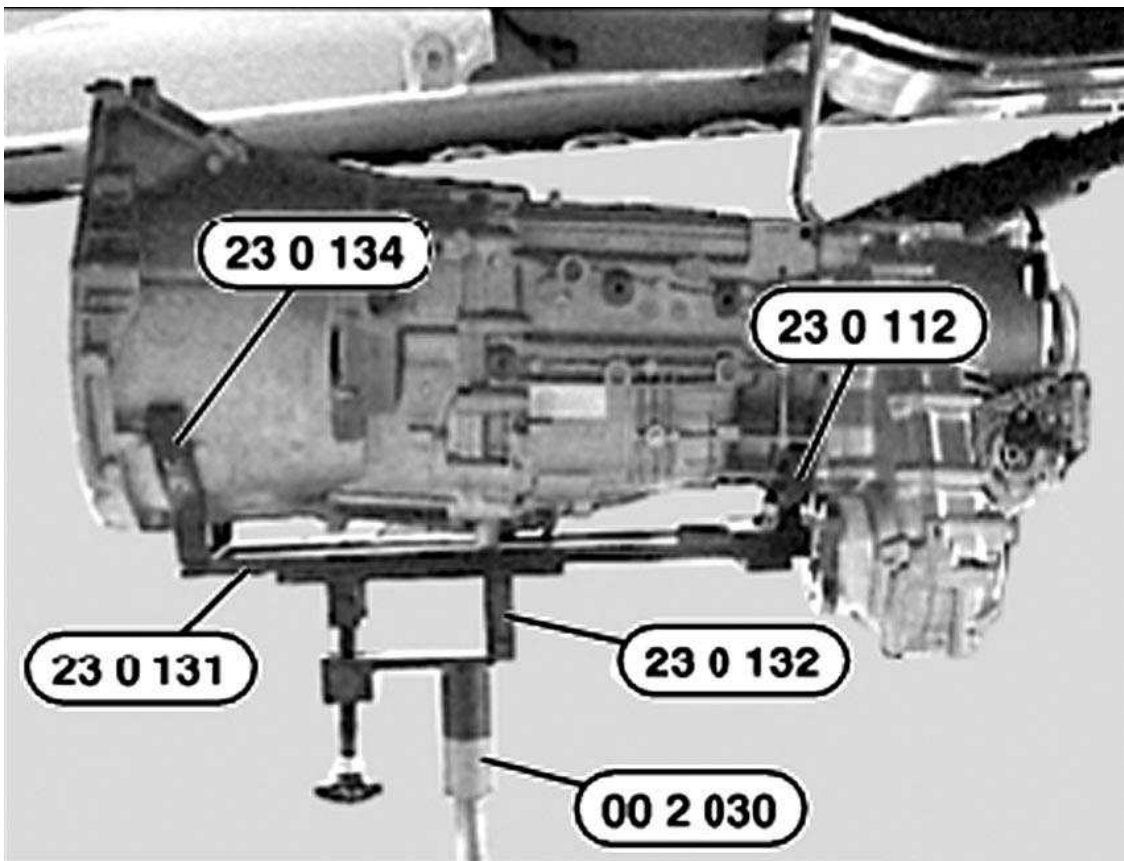
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Fig. 8: Locating Transmission To Engine Screws
Courtesy of BMW OF NORTH AMERICA, INC.



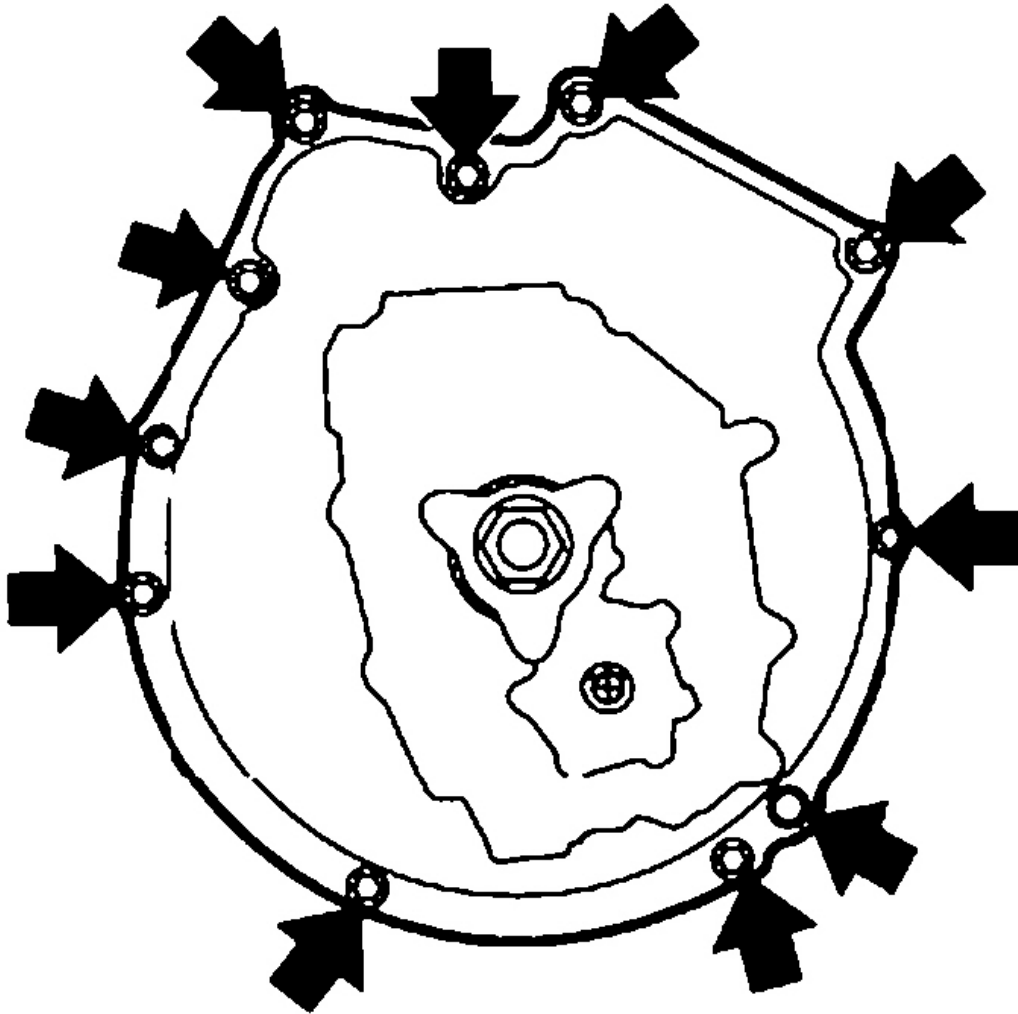
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Fig. 9: Locating Bolt
Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 10: Supporting Transmission
Courtesy of BMW OF NORTH AMERICA, INC.



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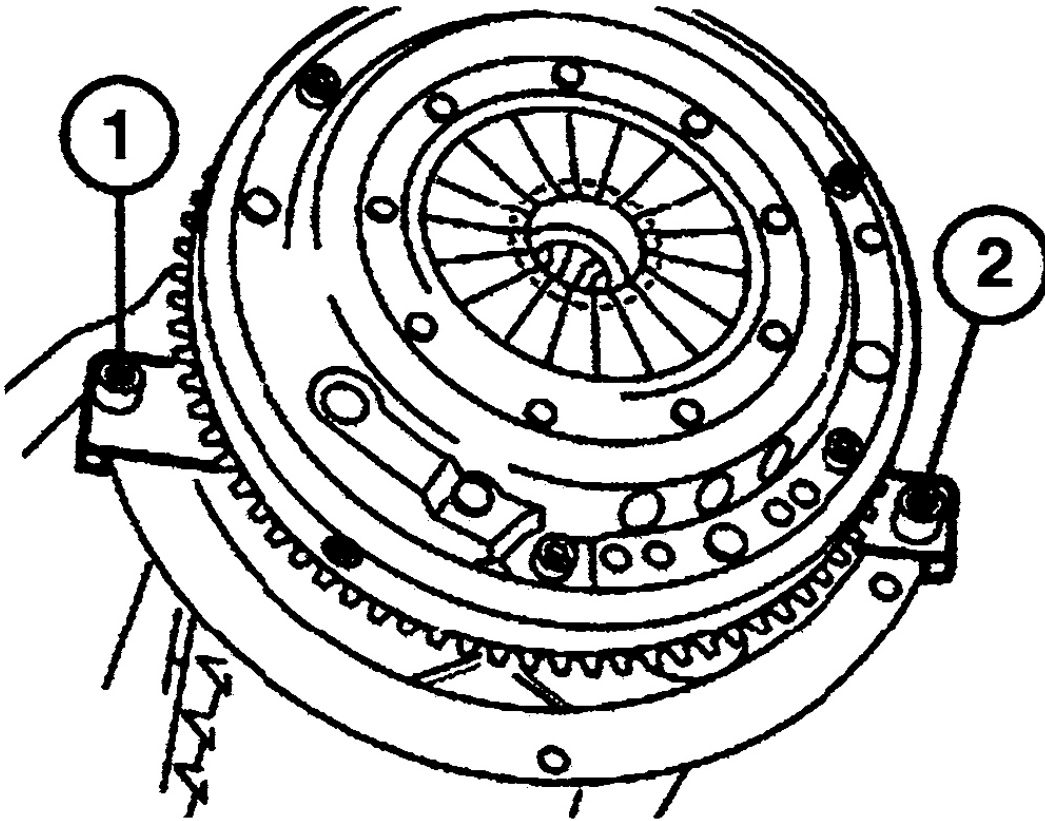
Fig. 11: Removing Transmission (Locating Transmission To Engine Mounting Bolts)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

1. Check that dowel sleeves are correctly seated. See **Fig. 12** . Replace damaged dowel sleeves. Ensure correct position of cover plate.
2. Check lubrication of transmission input shaft for sticky consistency. See **Fig. 13** . If grease is sticky, clean input shaft and replace clutch plate. Check clutch plate for friction rust in splines and replace if necessary. Mechanically remove existing grease and lining abrasion from splines of clutch plate (with a cloth).
3. Remove and clean release bearing and release lever. Push on grease Scraper Ring (21 2 221) as far as it

will go. See **Fig. 14** . Grease splines (1) of input shaft with a brush. Detach grease scraper ring.

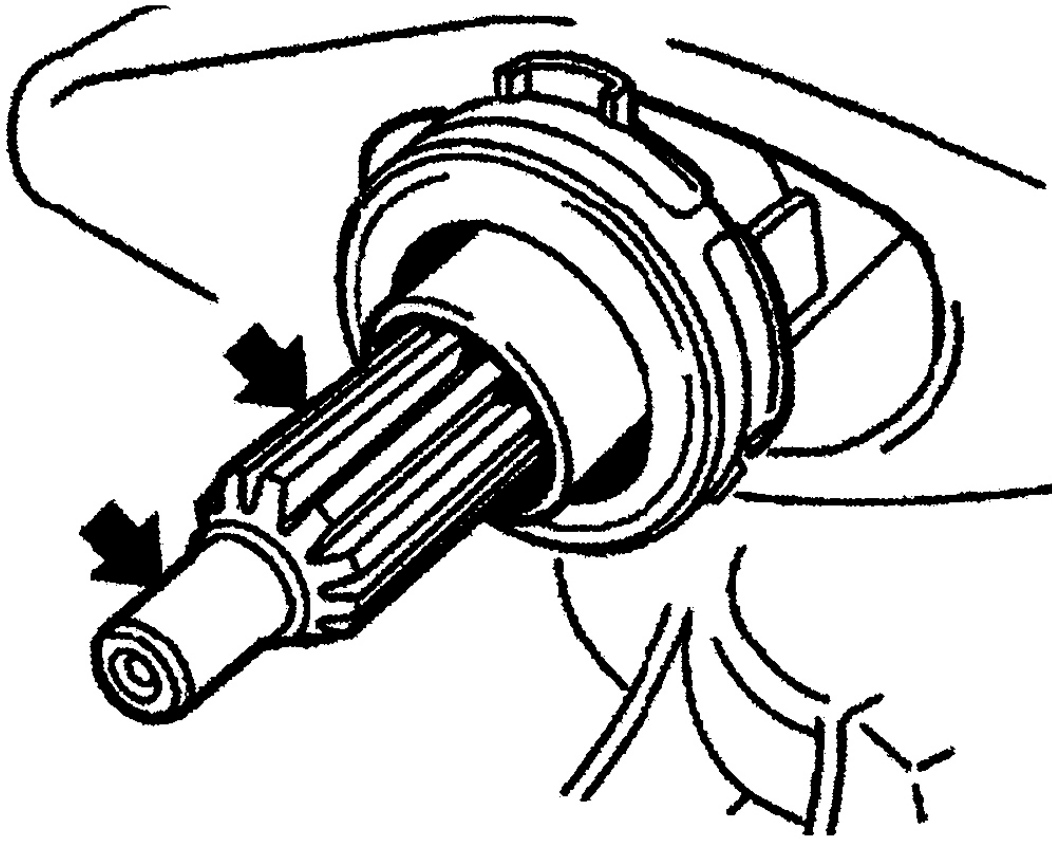
4. To install, reverse removal procedure. Grease shift rod. Make sure shims (3) are in correct position. See **Fig. 7** . Grease bearing pins (1). See **Fig. 6** . Tighten fasteners to specification. See **TORQUE SPECIFICATIONS** . Before installing transmission cross-member, turn Special Tool (11 0 250) back with adjusting screw (1) to measurement "A" (installation position). See **Fig. 1** . Installation position, measurement "A" = 36 cm.



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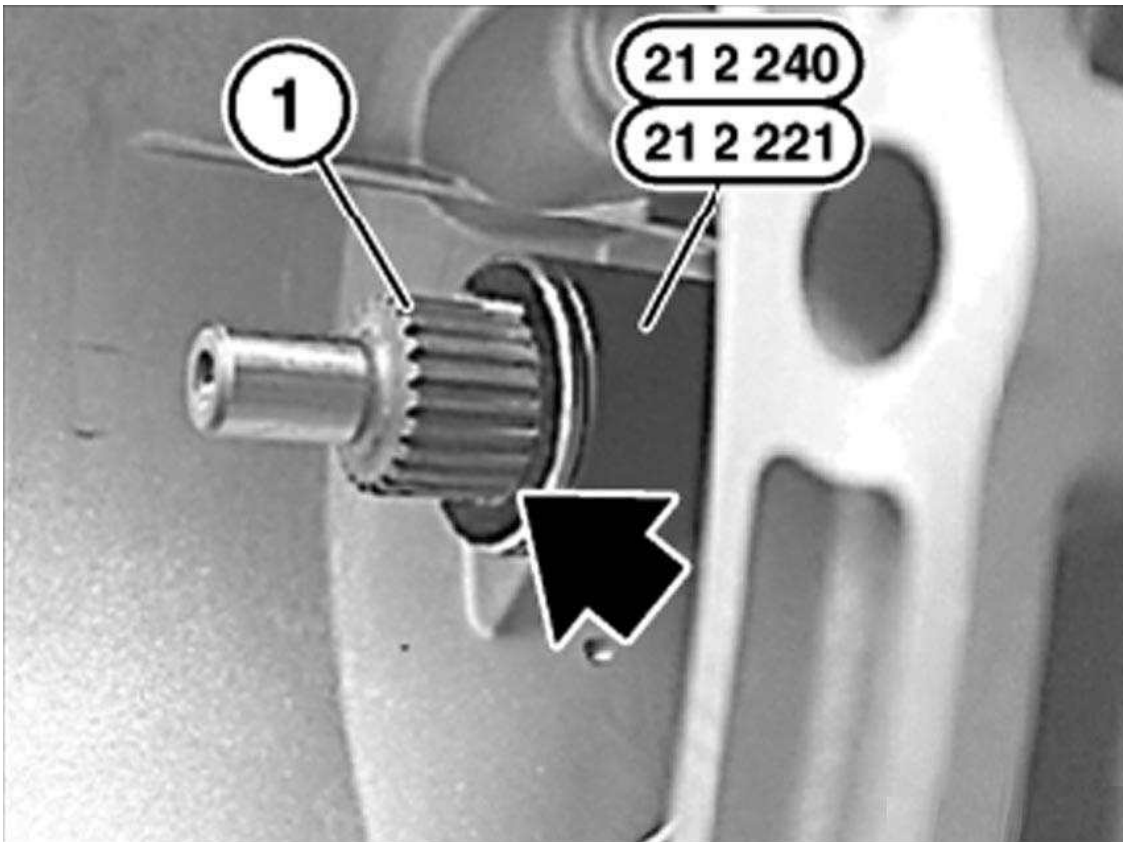
Fig. 12: Checking Dowel Sleeves

Courtesy of BMW OF NORTH AMERICA, INC.



G00374648

Fig. 13: Checking Lubrication Of Transmission Input Shaft
Courtesy of BMW OF NORTH AMERICA, INC.



G00382248

Fig. 14: Locating Grease Scraper Ring
 Courtesy of BMW OF NORTH AMERICA, INC.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Clutch Slave Cylinder-To-Clutch Housing/Transmission Case	16 (22)
Transmission Cross Member-To-Body	15 (21)
Transmission Cross Member-To-Rubber Mounts	55 (74)
Transmission-To-Engine	
Hex Screws	
M8	18 (25)
M10	36 (49)
M12	55 (74)
Screw With Torx Head	
M8	16 (22)
M10	32 (43)

M12	53 (72)
H-Transmission/G Transmission	54 (73)
	INCH Lbs. (N.m)
Transmission-To-Engine M6 Thread	80 (9)

1997-2005 AUTOMATIC TRANSMISSIONS

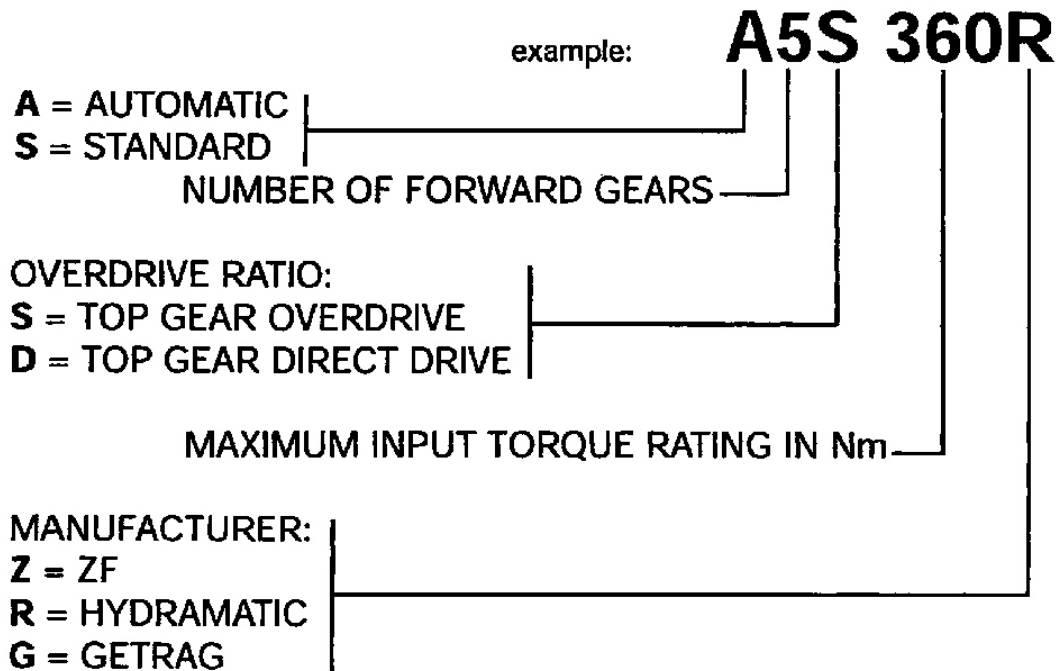
Servicing - A5S 325Z & A5S 360R/390R

APPLICATION

For transmission application, see **AUTOMATIC TRANSMISSION APPLICATION** table. For transmission application and oil recommendation, see **Fig. 1 -Fig. 5** . Also see **LUBRICATION** .

AUTOMATIC TRANSMISSION APPLICATION

Application	Transmission Model
3-Series (E46)	A5S 325Z (5HP19), A5S 360R/390R (GM5)
525i (E39)	A5S 325Z (5HP19)
528i (E39)	A5S 360R/390R (GM5)
530i (E39)	A5S 325Z (5HP19)
X3 (E83)	A5S 360R/390R (GM5)
X5 3.0L (E53)	A5S 360R/390R (GM5)
Z4 (E85)	A5S 325Z (5HP19)



Each manufacturer has it's own internal identification for it's products. For example: the A5S 360R is the GM 5L40E, and the A5S 325Z is the ZF 5HP 19.

G00214241

Fig. 1: BMW Transmission Identification Code (1 Of 2)
 Courtesy of BMW OF NORTH AMERICA, INC.

5HP19

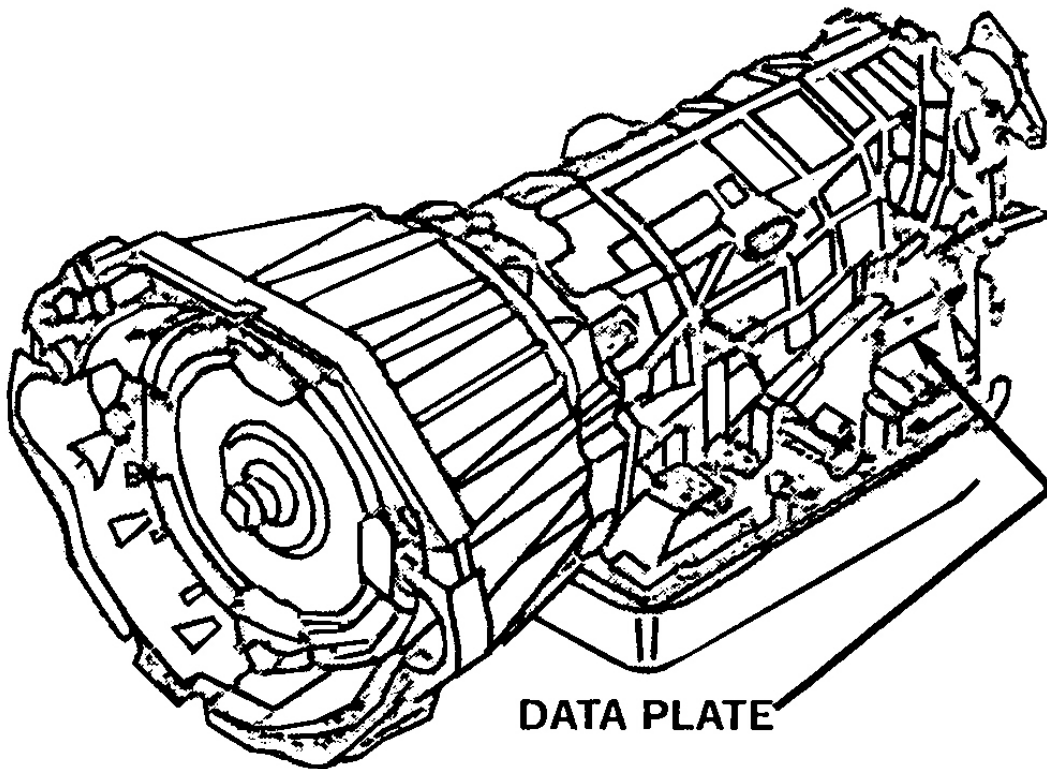
NUMBER OF GEARS

HYDRAULIC PLANETARY

ENGINEERING DESIGNATION

G00214242

Fig. 2: BMW Transmission Identification Code (2 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.



G00214249

Fig. 3: BMW Transmission Specification Plate
Courtesy of BMW OF NORTH AMERICA, INC.

GM TRANSMISSION AND OIL APPLICATION CHART (2000-2002)

	2000	2001	2002
E46 323i/Ci	GM5 (A5S360R) 7/98 3/00		
E46 328i/Ci	GM5 (A5S 360R) 6/99 5/00		
E46 325xi/xiT		GM5 (A5S 390R) 8/00	
E46 325iT		GM5 (A5S 390R) 8/00 3/01	
E46 330xi		GM5 (A5S 390R) 8/00	
E39 528i/iT	GM5 (A5S 360R) 9/99 8/00		
E39 525i/iT		GM5 (A5S 390R) 9/00 3/01	
E39 530i		GM5 (A5S 390R) 9/00 3/01	
E53 X5 (3.0i)		GM5 (A5S 390R) 4/00	
E36 Z3 (2.3i / 2.8i / coupe)	THM-R1 (A4S 270R) 10/95 & (A4S 310R) 6/00		
E36 Z3 (2.5i / 3.0i / coupe)		GM5 (A5S 390R) 8/00	

USE OF ANY OTHER OIL WILL CAUSE A NON-WARRANTABLE TRANSMISSION FAILURE !

APPROVED OILS:	UNICAL DEXRON III - D - "MULTI - PURPOSE ATF" CASTROL DEXRON III - MERCON TEXACO ATF MERCON - DEXRON III LIFETIME FILL AS OF 9/95 VEHICLE PRODUCTION	USE ONLY TEXACO ETL 7045E (REPLACES TEXACO ETL 7045) BMW PART NUMBER 83 22 0 026 922 25 LITER CONTAINER LIFETIME FILL	USE ONLY TEXACO ETL 8072 B BMW PART NUMBER 83 22 0 024 359 25 LITER CONTAINER LIFETIME FILL

FILL CAPACITY:	<u>TRANSMISSION MODEL</u>	<u>WITH TORQUE CONVERTER</u>	<u>WITHOUT TORQUE CONVERTER</u>
	THM-R1 (A4S 270R) THM-R1 (A4S 310R) 5L40-E/GM5 (A5S 360R) 5L40-E/GM5 (A5S 390R) 5L40-E/GM5 (A5S 390R) FOR X5	8.8 LITERS 8.8 LITERS 9.0 LITERS 9.0 LITERS 9.6 LITERS	7.8 LITERS 7.8 LITERS 8.0 LITERS 8.0 LITERS 8.6 LITERS

G00317000

Fig. 4: BMW GM Transmission & Oil Application Chart (2000-02)
Courtesy of BMW OF NORTH AMERICA, INC.

ZF TRANSMISSION AND OIL APPLICATION CHART (2000-2002)

	2000	2001	2002
E46 323i/Ci	5HP19 (A5S 325Z) 9/00 8/00		
E46 325i/Ci/Cic		8/00	5HP19 (A5S 325Z)
E46 325iT		3/01	5HP19 (A5S 325Z)
E46 330i/Ci/Cic	8/00		5HP19 (A5S 325Z)
E39 525i/iT		3/01	5HP19 (A5S 325Z)
E39 530i		3/01	5HP19 (A5S 325Z)
E39 540i/iT	1/97		5HP24 (A5S 440Z)
E53 X5 (4.4i)	11/99		5HP24 (A5S 440Z)
E53 X5 HP (4.6i)		9/01	5HP24 (A5S 440Z)
E38 740i/iL	1/97	5HP24 (A5S 440Z)	2/02
E38 750iL	1/95	5HP30 (A5S 560Z)	2/02

USE OF ANY OTHER OIL WILL CAUSE A NON-WARRANTABLE TRANSMISSION FAILURE !

APPROVED OILS:	UNICAL DEXRON III "MULTI-PURPOSE ATF" CASTROL DEXRON III - MERCON TEXACO ATF MERCON - DEXRON III	USE ONLY SHELL LA 2834 BMW PART NUMBER 83 22 9 407 785 5 LITER BLACK - LIFETIME FILL	USE ONLY ESSO ATF LT 71141 BMW PART NUMBER 83 22 9 407 807 20 LITER BLUE - LIFETIME FILL

FILL CAPACITY:	TRANSMISSION MODEL	WITH TORQUE CONVERTER	WITHOUT TORQUE CONVERTER
	4HP22	7.5 LITERS	3.0 LITERS
	4HP24	8.1 LITERS	3.1 LITERS
	5HP18 (A5S 310Z)	7.8 LITERS	3.2 LITERS
	5HP19 (A5S 325Z) FOR 2.5 L	8.9 LITERS	6.2 LITERS
	5HP19 (A5S 325Z) FOR 3.0 L	8.7 LITERS	6.1 LITERS
	5HP24 (A5S 440Z) FOR 4.4 L	9.0 LITERS	5.35 LITERS
	5HP24 (A5S 440Z) FOR 4.6 L	9.9 LITERS	5.35 LITERS
	5HP30 (A5S 560Z)	13.1 LITERS	5.5 LITERS

G00317001

Fig. 5: BMW ZF Transmission & Oil Application Chart (2000-02)
Courtesy of BMW OF NORTH AMERICA, INC.

LUBRICATION

NOTE: Transmission is sealed at factory for life of transmission. If any leaks are found, factory recommends replacing transmission assembly.

SERVICE INTERVALS

Transmission fluid replacement is not necessary, except for some newer model vehicles with Condition Based Service. See **AUTOMATIC TRANSMISSION** overview article.

CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (A5S 325Z)

CAUTION: It is absolutely essential to use the approved automatic transmission fluid in this automatic transmission. Failure to comply with this requirement will result in serious damage to the automatic transmission. See **RECOMMENDED FLUID** .

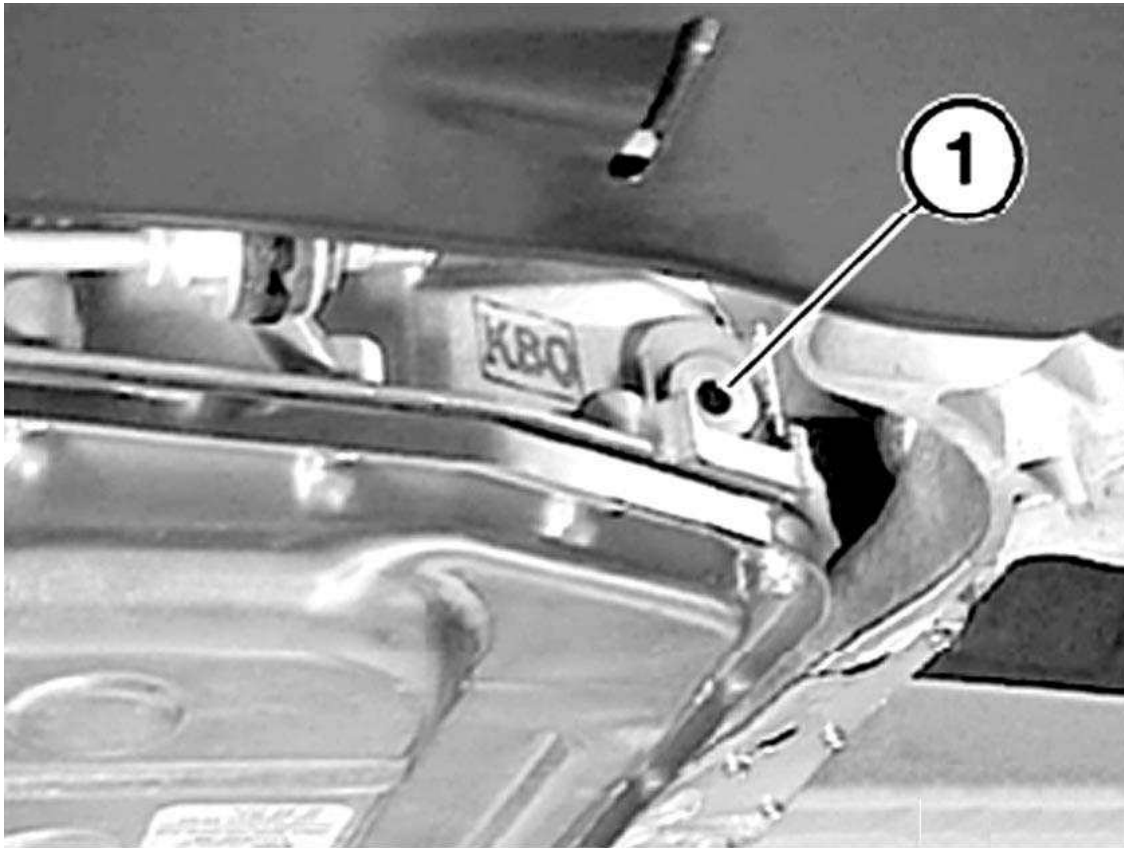
NOTE: Before releasing filler plug (1), make sure temperature of automatic transmission fluid is at least 30 °C.

NOTE: Numbers in text refer to numbers in figures.

Add ATF After Repairs

Selector lever to setting "P". The vehicle must be horizontal and should be secured to prevent it from rolling away. Connect BMW Diagnosis and Information System (DIS) or BMW MoDiC to car.

Release filler plug (1). See **Fig. 6** . Top up automatic transmission fluid until it flows over. Screw in filler plug (1) by hand. Start engine and run at idle speed. Operate brake and shift through all gears at idle speed several times (hold gears for 3 sec. in each case).



G00382297

Fig. 6: Locating Filler Plug

Courtesy of BMW OF NORTH AMERICA, INC.

Release filler plug (1) again. Top up automatic transmission fluid until it flows over. Increase temperature of automatic transmission fluid to 40-50°C. Check temperature of automatic transmission fluid with MoDiC or DIS. Screw in filler plug (1).

Installation: replace filler plug (1). Tighten to specification. See **TORQUE SPECIFICATIONS** .

Check Fluid Level

Connect BMW Diagnosis and Information System (DIS) and/or BMW MoDiC to vehicle and perform fluid level check in accordance with instructions.

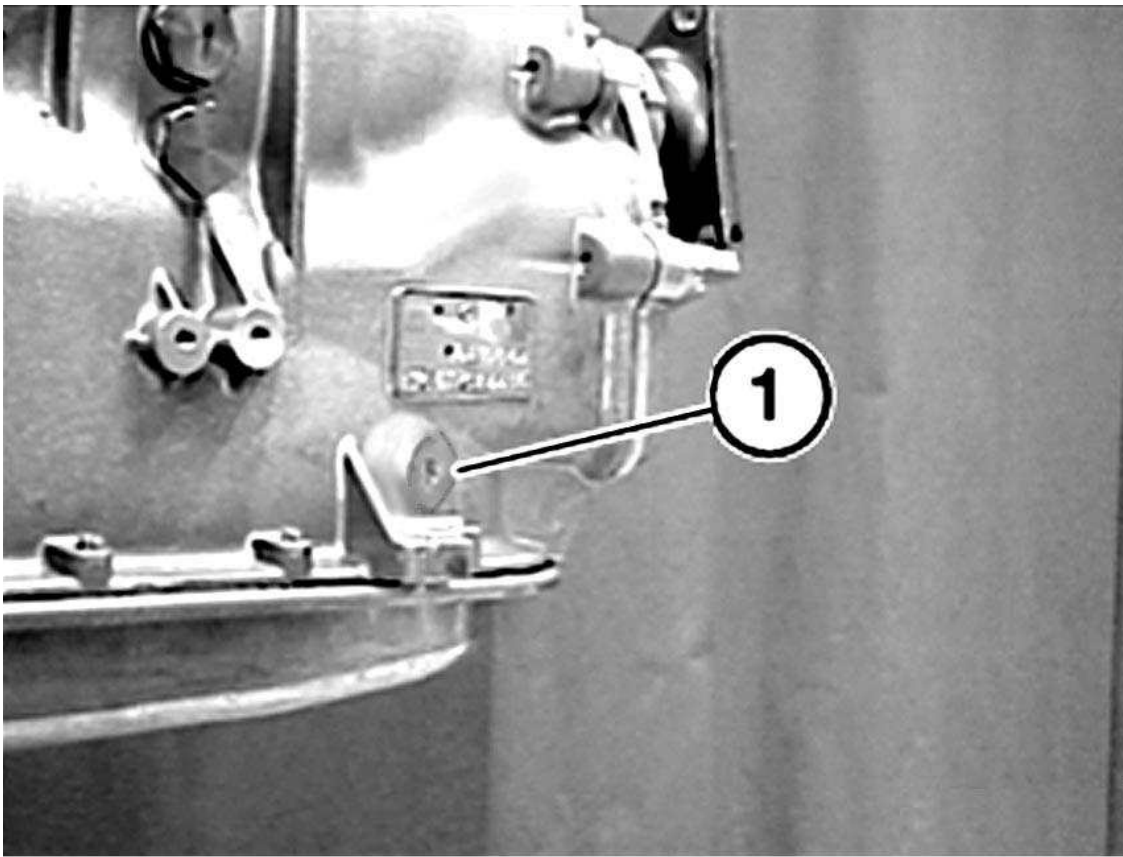
CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (A5S 360R/390R, A4S 200R/310R)

NOTE: Numbers in text refer to numbers in figures.

CAUTION: Use only the approved transmission fluid in this automatic transmission. See RECOMMENDED FLUID . Failure to comply with this requirement will result in serious damage to the automatic transmission. Refer also to adhesive label on transmission fluid sump.

Move selector lever to park position "P". The vehicle must be horizontal and secured against rolling off.

Connect BMW Diagnosis and Information System (DIS) or BMW MoDiC to vehicle. Release filler plug (1). See **Fig. 7** . Top up automatic transmission fluid until overflowing. Screw in filler plug (1) by hand. Start engine and run at idle speed. Actuate brake and shift through all gears at idle speed. Open filler plug (1) again. Increase temperature of transmission fluid to 30-50°C. Interrogate temperature of transmission fluid with MoDiC or DIS. Top up automatic transmission fluid until overflowing. Screw in filler plug (1).



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Fig. 7: Removing Filler Plug

Courtesy of BMW OF NORTH AMERICA, INC.

Installation: check sealing ring on filler plug (1) for damage and, if necessary, replace sealing ring and filler plug. Tighten to specification. See **TORQUE SPECIFICATIONS** .

RECOMMENDED FLUID

A5S 360R/390R (GM5)

330xi (6/00 To Present)

The transmission oil pan will be labeled with either Texaco ETL-7045 or Dexron III. Fill or top off with the proper fluid only. Do not mix Texaco ETL-7045 and Dexron fluids.

A5S 325Z (5HP19)

330i & 330Ci (6/00 To Present) & 325i & 325Ci (9/00 To Present)

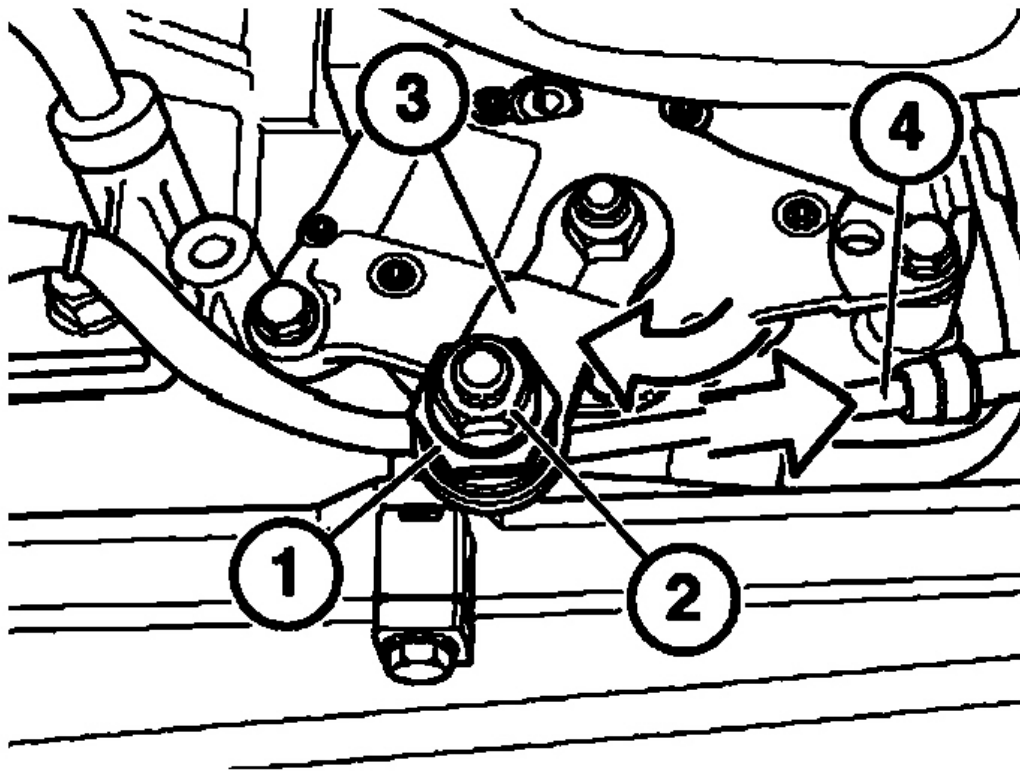
No fluid changes are necessary. Never mix any other oil with this transmission when doing repair or when topping off. Use ESSO (LT 711441) BMW part No. (83 22 9 407 807).

ADJUSTMENTS

GEARSHIFT SELECTOR LEVER CABLE (A5S 325Z)

NOTE: Numbers in text refer to numbers in figures.

Check cable for ease of movement. Move selector lever to "P" setting. Grip clamp bushing (1). Loosen nut (2). Press selector lever (3) forward (park position). Press cable (4) in direction of arrow and release again. Grip clamping piece (1). Tighten nut (2) to 88 INCH lbs. (10 N.m). See **Fig. 8**. Move selector lever to "P" position. Check whether parking lock is engaged by rotating shaft or pushing car.



1. Clamp Bushing
2. Nut
3. Selector Lever
4. Cable

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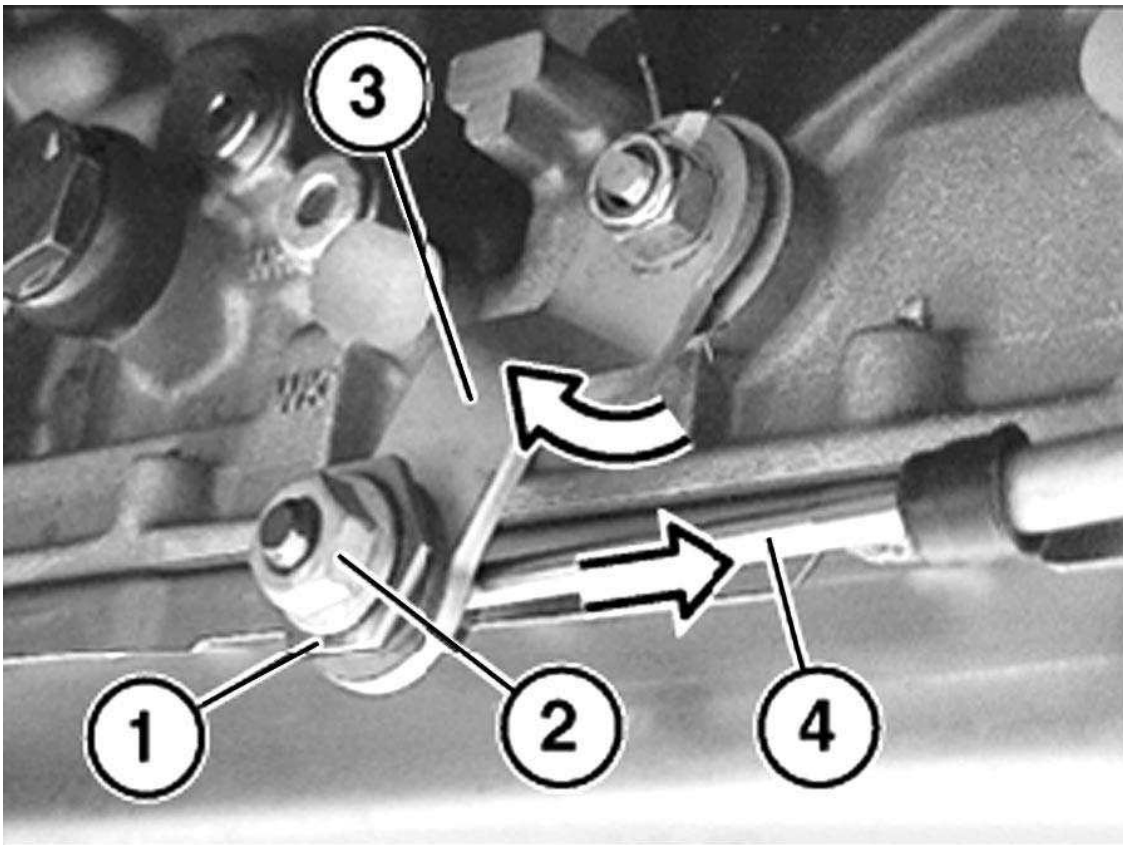
Fig. 8: Adjusting Selector Lever Cable (A5S 325Z)
Courtesy of BMW OF NORTH AMERICA, INC.

ADJUSTING SELECTOR LEVER (A5S 360R/390R, A4S 200R, 6HP26Z/19Z)

NOTE: Numbers in text refer to numbers in figures.

Check cable for ease of movement. Move selector lever to "P" position.

Grip clamping sleeve (1). See **Fig. 9** . Slacken nut (2). Press selector lever (3) forwards into park position. Press cable (4) in direction of arrow and release again. Grip clamping sleeve (1). Tighten down nut (2) to specification. See **TORQUE SPECIFICATIONS** .



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Fig. 9: Adjusting Selector Lever

Courtesy of BMW OF NORTH AMERICA, INC.

Installation: move selector lever to "P" position. Check whether parking gear is engaged by turning propeller shaft.

PROGRAMMING

CONTROL UNIT

Turn off ignition. Connect MoDiC or DIS Tester. Turn on ignition. Select "Programming". For subsequent procedure, follow MoDiC or DIS instructions. Installation location of control unit, refer to DIS Tester.

REMOVAL & INSTALLATION

CAUTION: It is absolutely essential to use the approved automatic transmission fluid in this automatic transmission. Failure to comply with this requirement will result in serious damage to the automatic transmission.

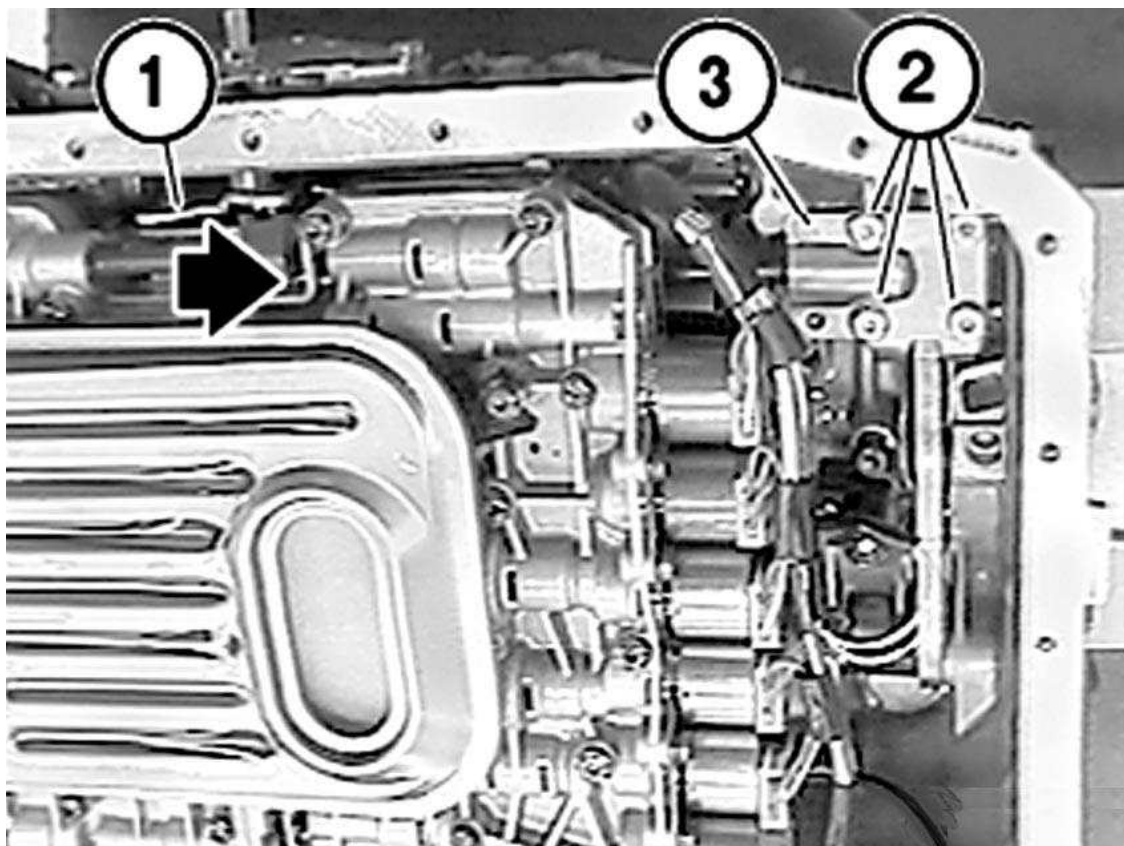
REMOVING AND INSTALLING OR REPLACING PARKING LOCK (A5S 325Z)

NOTE: Numbers in text refer to numbers in figures.

NOTE: After completing work, top up ATF level. Check/top up fluid level in automatic transmission. See CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (A5S 325Z) .

Remove and install transmission oil sump. See REMOVING AND INSTALLING/SEALING OR REPLACING TRANSMISSION OIL SUMP (A5S 325Z) .

Push in detent disk (1) in direction of arrow up to stop. See **Fig. 10** . Unfasten screws (2). Remove guide bracket (3). Upon installation, tighten fasteners to specification. See TORQUE SPECIFICATIONS .

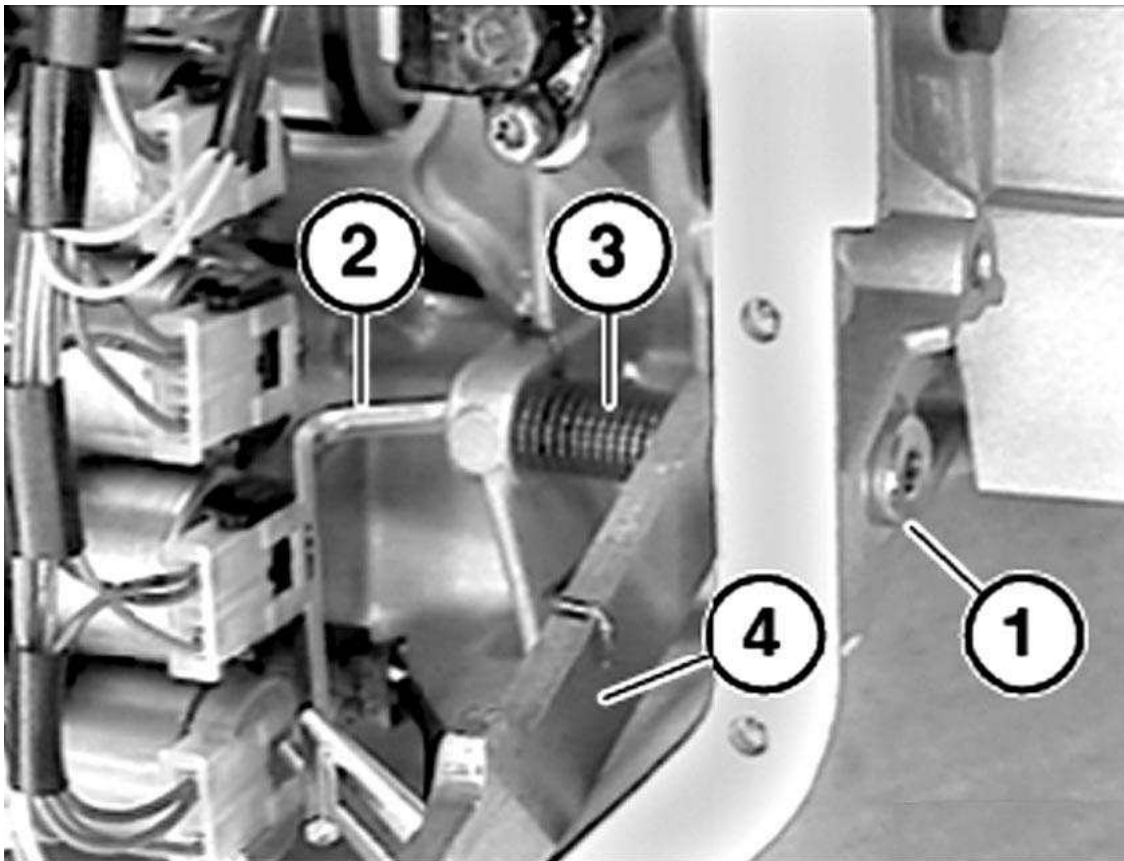


G00382298

Fig. 10: Removing Guide Bracket
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew bolt (1). See **Fig. 11** . With an offset tool (2) (e.g. hexagon socket screw key 5 A/F), push out guide pin of locking pawl (4). Remove spring (3) and locking pawl (4). Upon installation, tighten fasteners to

specification. See **TORQUE SPECIFICATIONS** .



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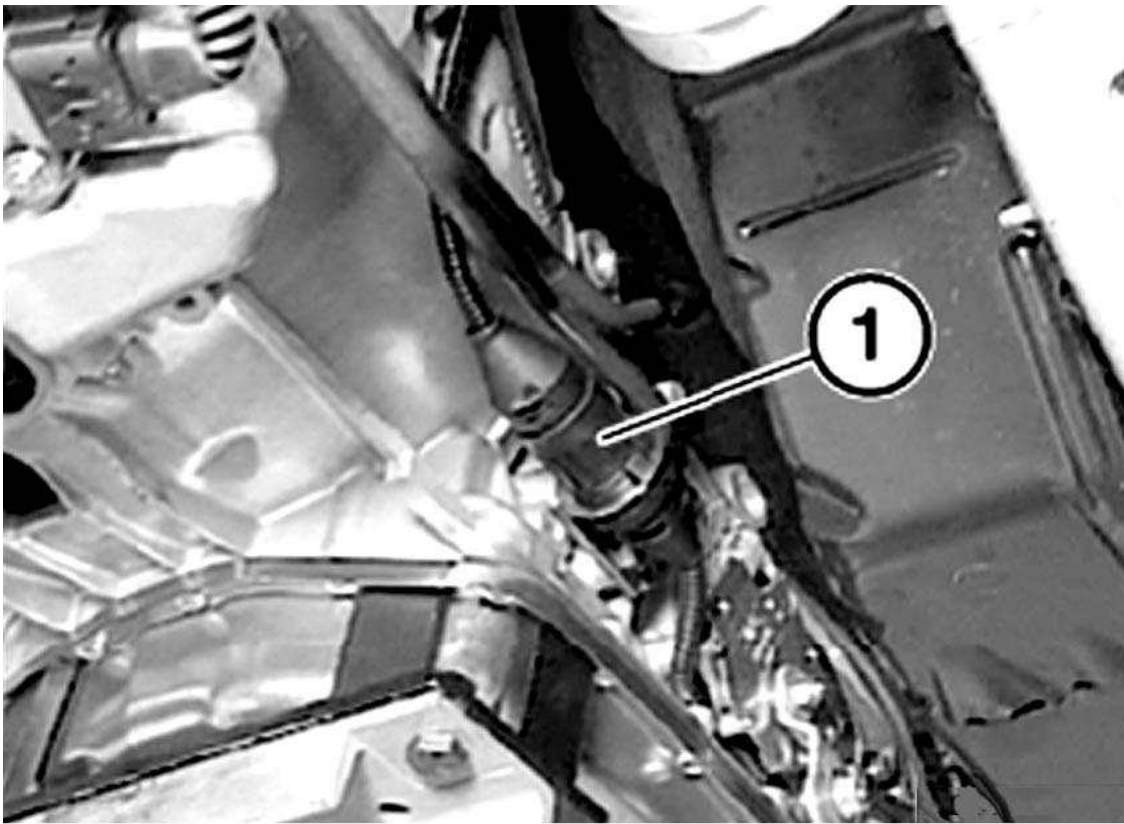
Fig. 11: Removing Spring & Locking Pawl
Courtesy of BMW OF NORTH AMERICA, INC.

Installation: check function of parking lock. Move selector lever into "P" setting. Check whether parking lock is engaged by rotating Cardan shaft or by pushing car.

REMOVING AND INSTALLING/REPLACING POSITION SWITCH (A5S 325Z)

NOTE: Numbers in text refer to numbers in figures.

Move selector lever into "P" setting. Unlock cable plug (1) and disconnect. See **Fig. 12** .

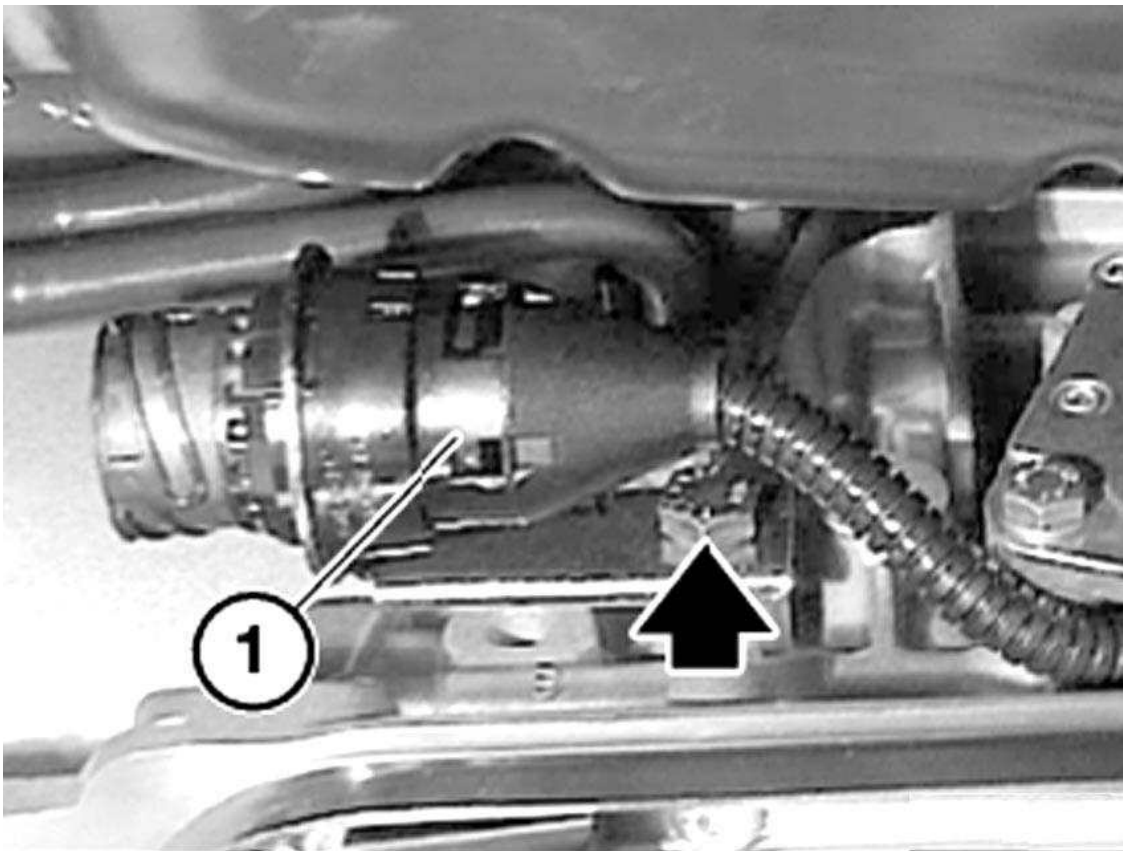


G00382316

Fig. 12: Locating Cable Plug

Courtesy of BMW OF NORTH AMERICA, INC.

Release screw. Remove cable plug (1) with retaining bracket. See **Fig. 13** .

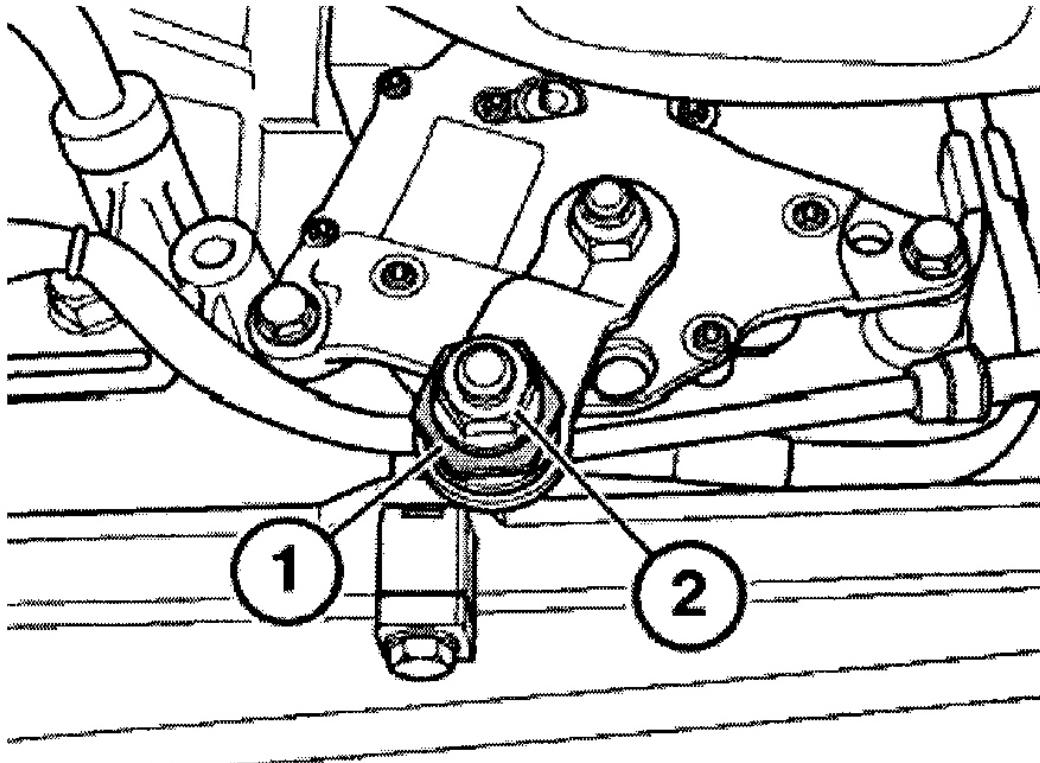


G00382317

Fig. 13: Removing Cable Plug

Courtesy of BMW OF NORTH AMERICA, INC.

Grip clamping sleeve (1). See Fig. 14 . Loosen nut (2). Installation: adjust selector lever. See GEARSHIFT SELECTOR LEVER CABLE .

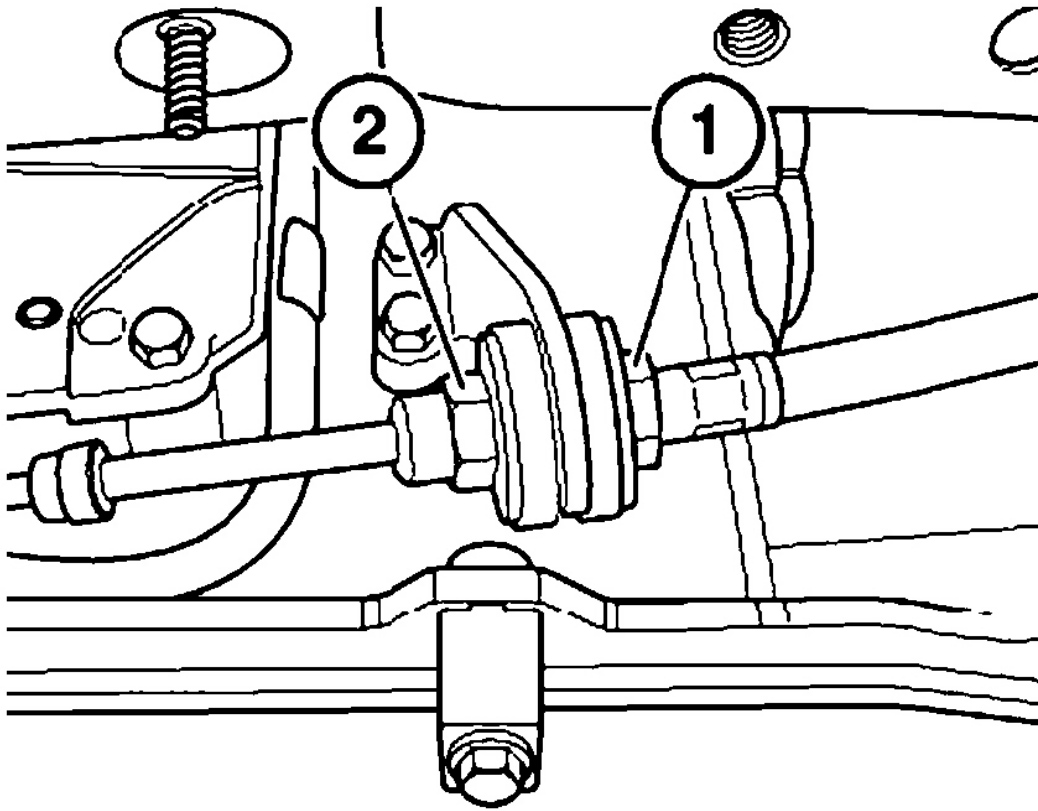


G00367875

Fig. 14: Locating Shift Lever Nut

Courtesy of BMW OF NORTH AMERICA, INC.

Grip cable at hexagon head (1). Unscrew nut (2). See **Fig. 15** . Remove cable from bracket. Upon installation, tighten to specification. See **TORQUE SPECIFICATIONS** .

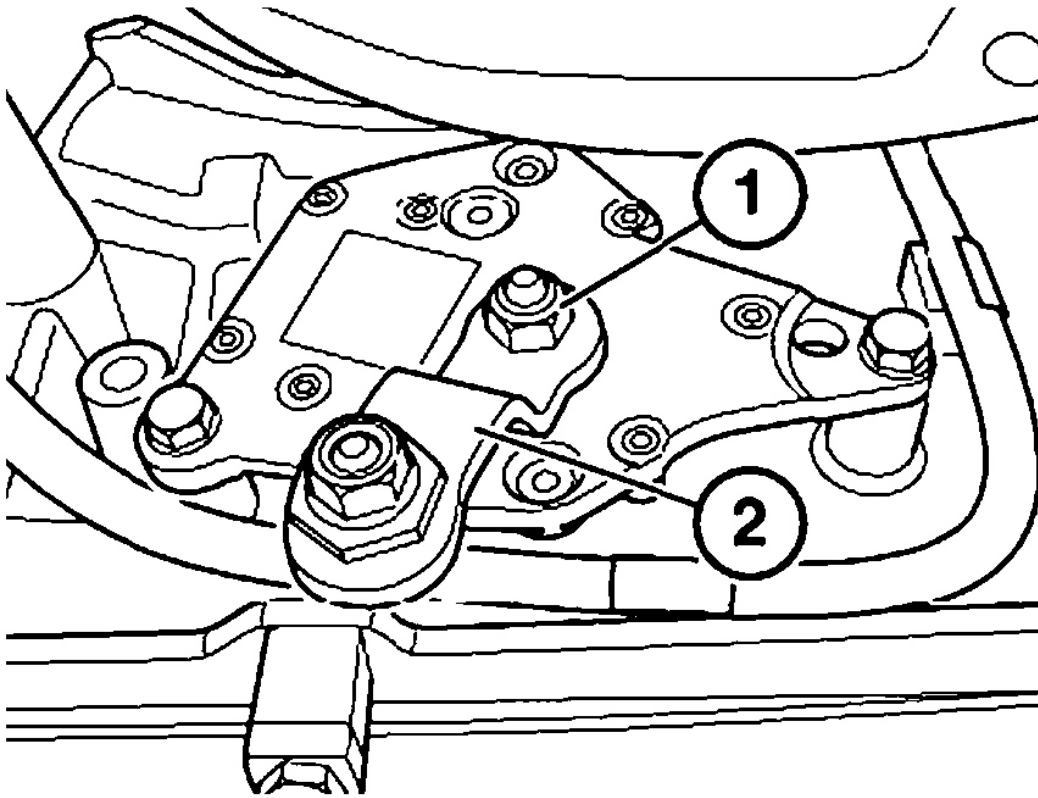


G00382318

Fig. 15: Removing Cable From Bracket

Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew nut (1). See **Fig. 16** . Remove gearshift lever (2). Upon installation, tighten to specification. See **TORQUE SPECIFICATIONS** .

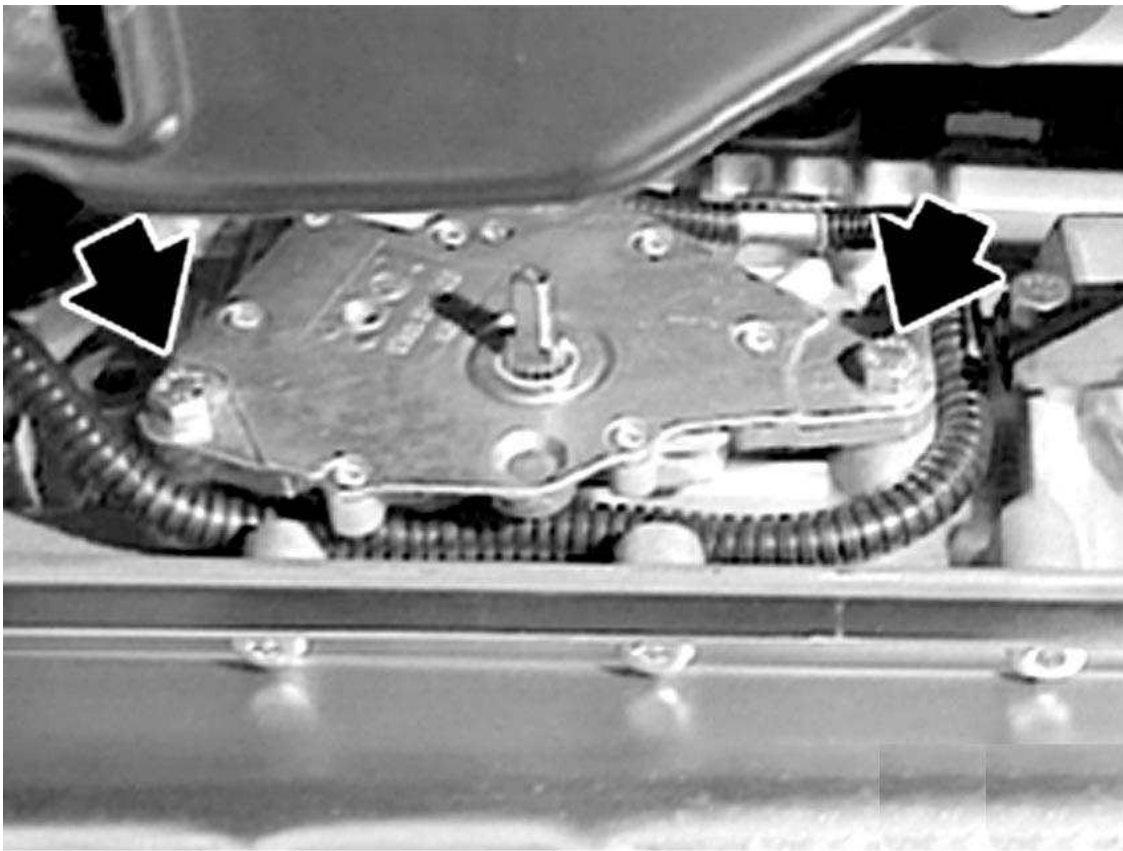


G00382319

Fig. 16: Removing Gearshift Lever

Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws. Detach position switch from manual shift valve shaft. See **Fig. 17** . Upon installation, pay attention to locating pin and cable routing.



G00382320

Fig. 17: Detaching Position Switch

Courtesy of BMW OF NORTH AMERICA, INC.

To install, reverse removal procedure.

REMOVING AND INSTALLING/REPLACING SHIFT UNIT (A5S 325Z)

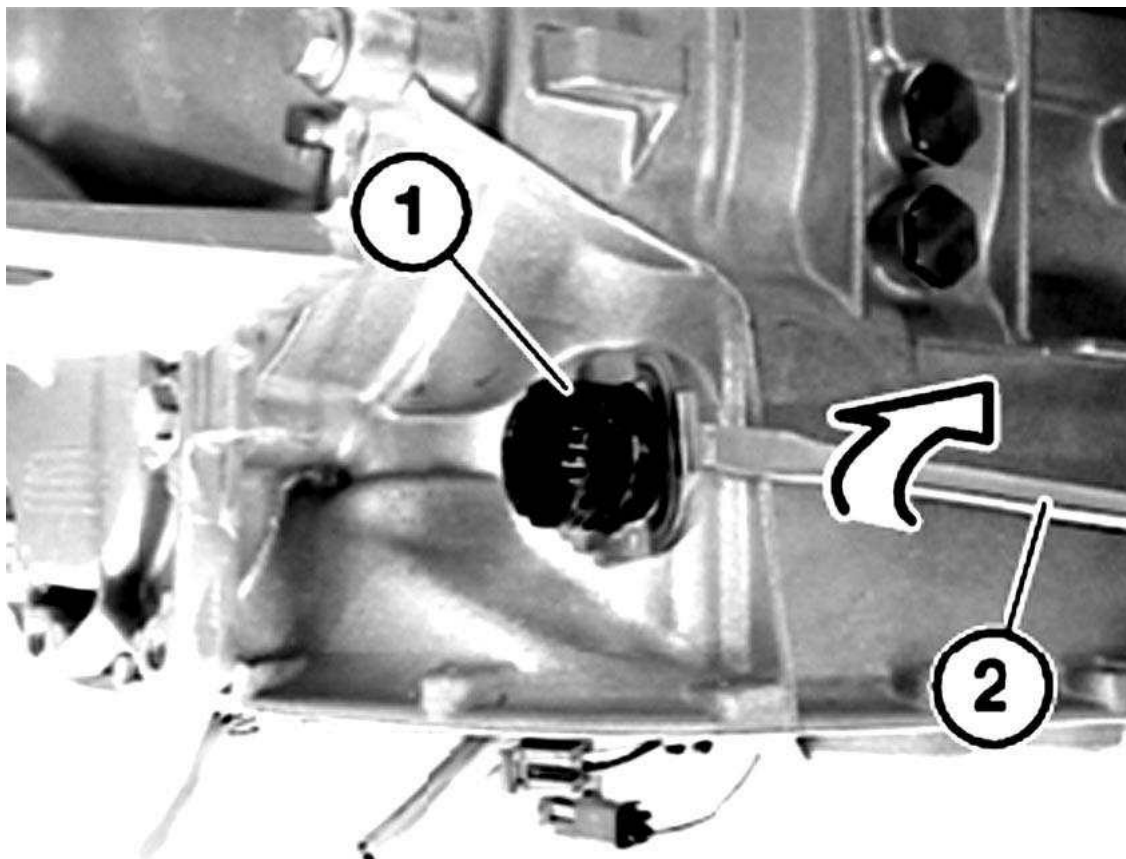
NOTE: Numbers in text refer to numbers in figures.

NOTE: After completing work, top up ATF level. Check/top up fluid level in automatic transmission. See **CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (A5S 325Z)** .

Remove and install transmission sump. See **REMOVING AND INSTALLING/SEALING OR REPLACING TRANSMISSION OIL SUMP (A5S 325Z)** .

Remove and install/replace transmission fluid screen. See **REMOVING AND INSTALLING/REPLACING TRANSMISSION OIL SCREEN (A5S 325Z)** .

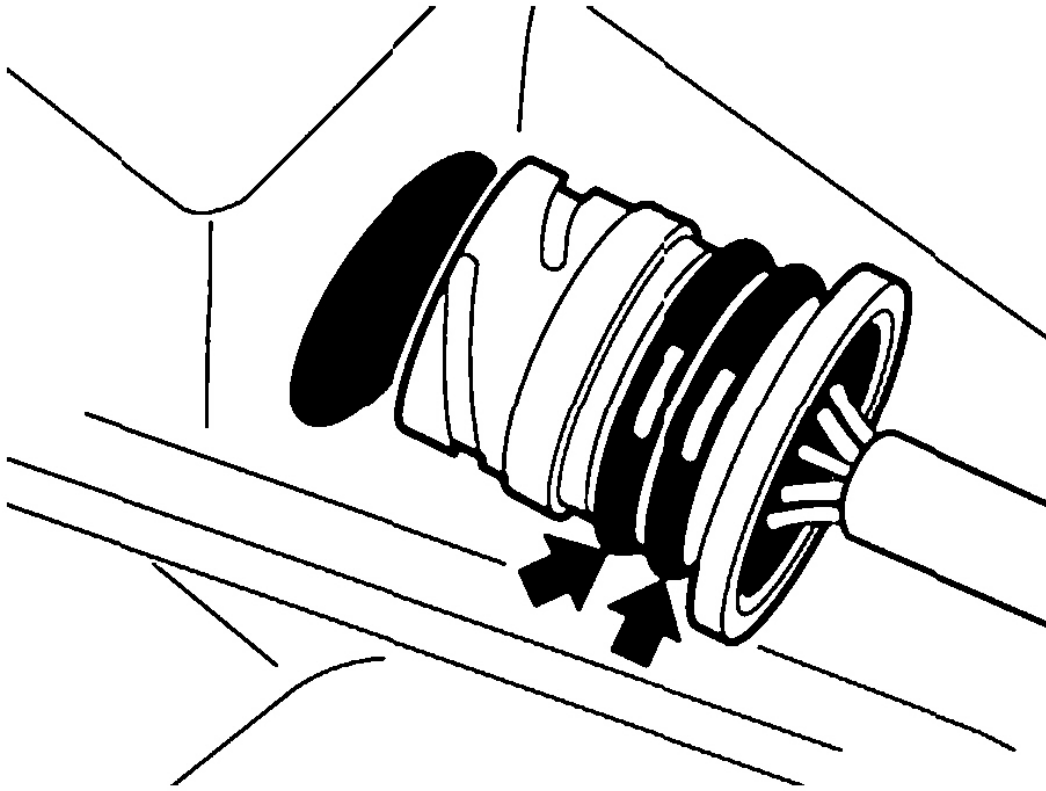
Remove retaining clip with screwdriver (2). See **Fig. 18** . Insert transmission plug (1) in transmission. Upon installation: to facilitate assembly, coat O-ring with Vaseline. See **Fig. 19** .



G00382322

Fig. 18: Removing Retaining Clip

Courtesy of BMW OF NORTH AMERICA, INC.

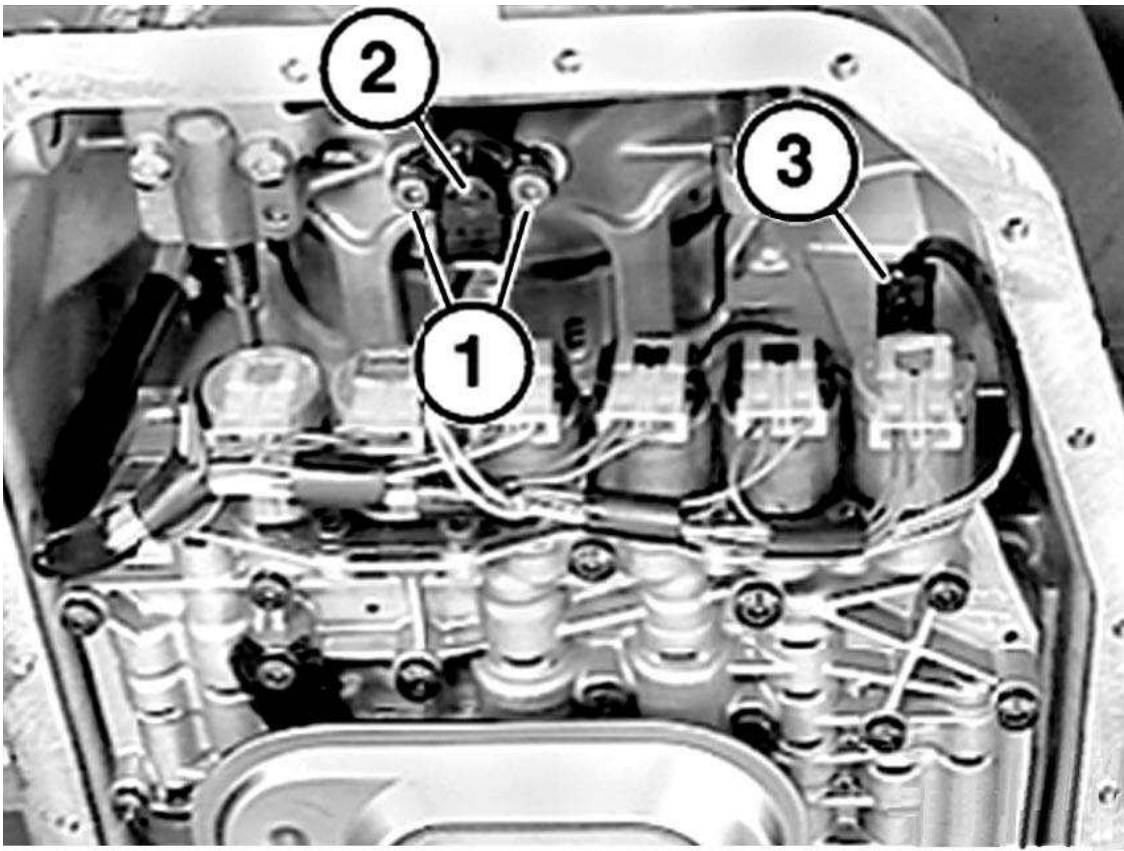


G00382323

Fig. 19: Locating O-Ring

Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1). See **Fig. 20** . Remove pulse generator (2). Pull off connector (3).

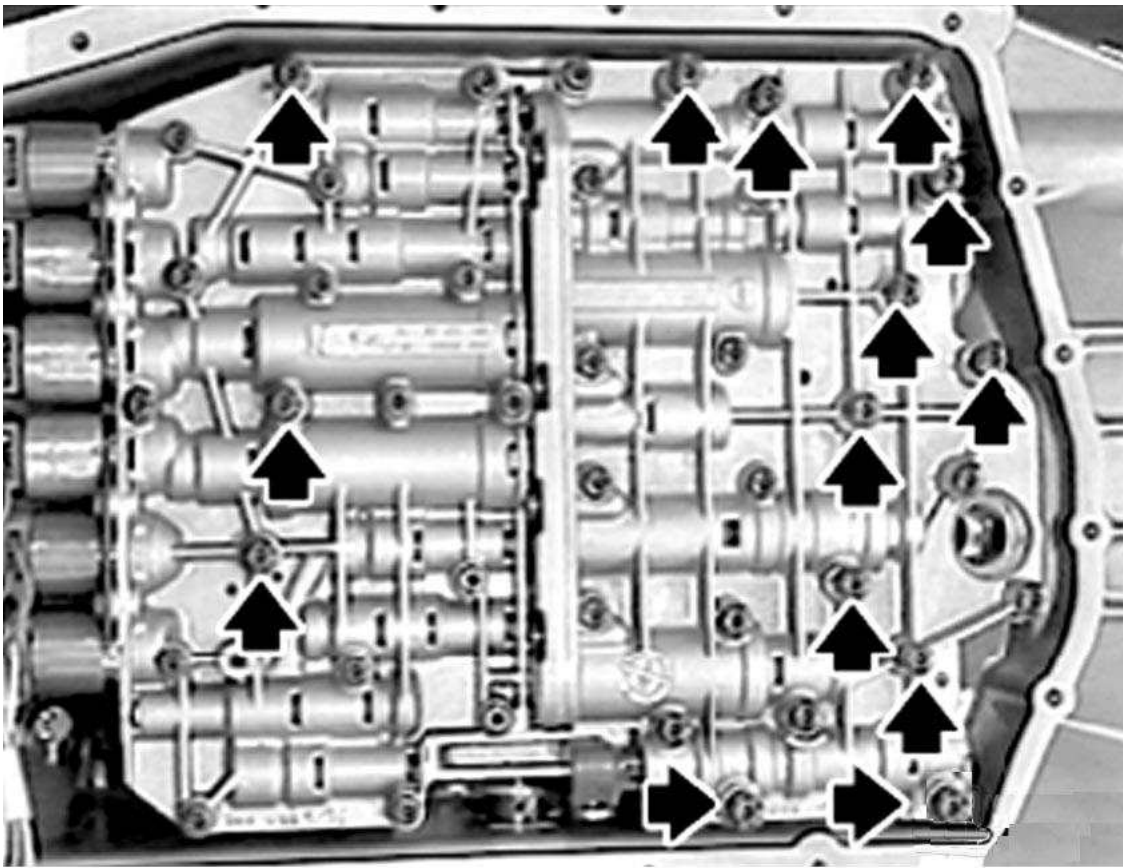


G00382324

Fig. 20: Removing Pulse Generator

Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws. See **Fig. 21** . Take off valve body. Upon installation, tighten fasteners to specification. See **TORQUE SPECIFICATIONS** .

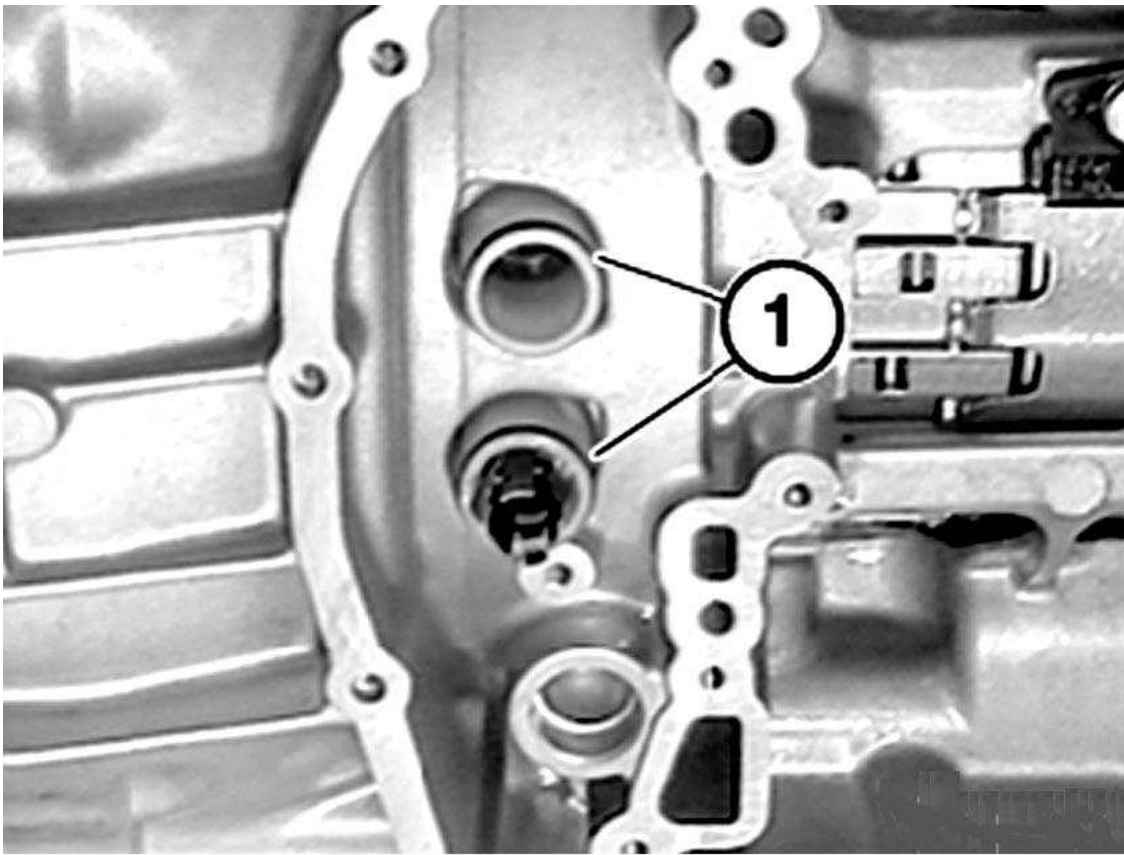


G00382325

Fig. 21: Removing Valve Body
Courtesy of BMW OF NORTH AMERICA, INC.

Installation: coat O-rings (1) with automatic transmission fluid. See **Fig. 22** .

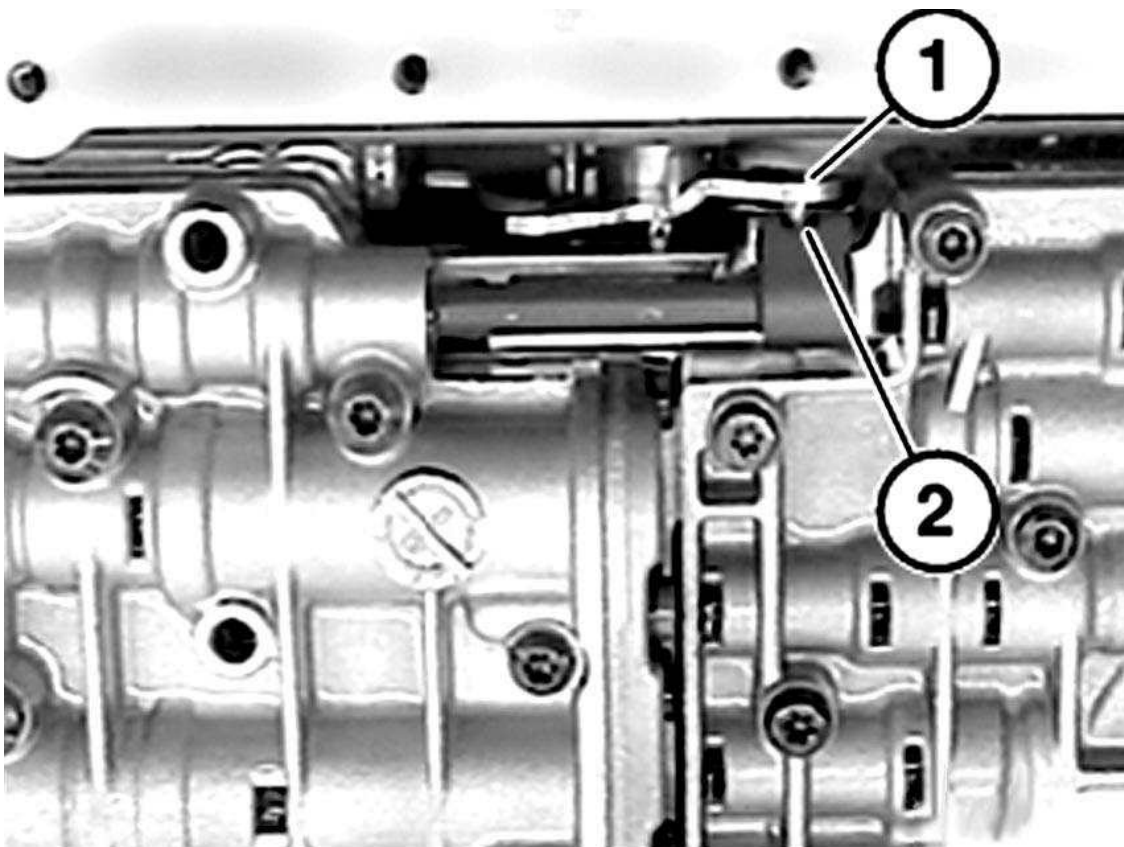
CAUTION: Journal (1) of detent disk must be located in groove (2) of slide valve. See **Fig. 23** .



G00382326

Fig. 22: Locating O-Rings

Courtesy of BMW OF NORTH AMERICA, INC.



G00382327

Fig. 23: Locating Detent Disk

Courtesy of BMW OF NORTH AMERICA, INC.

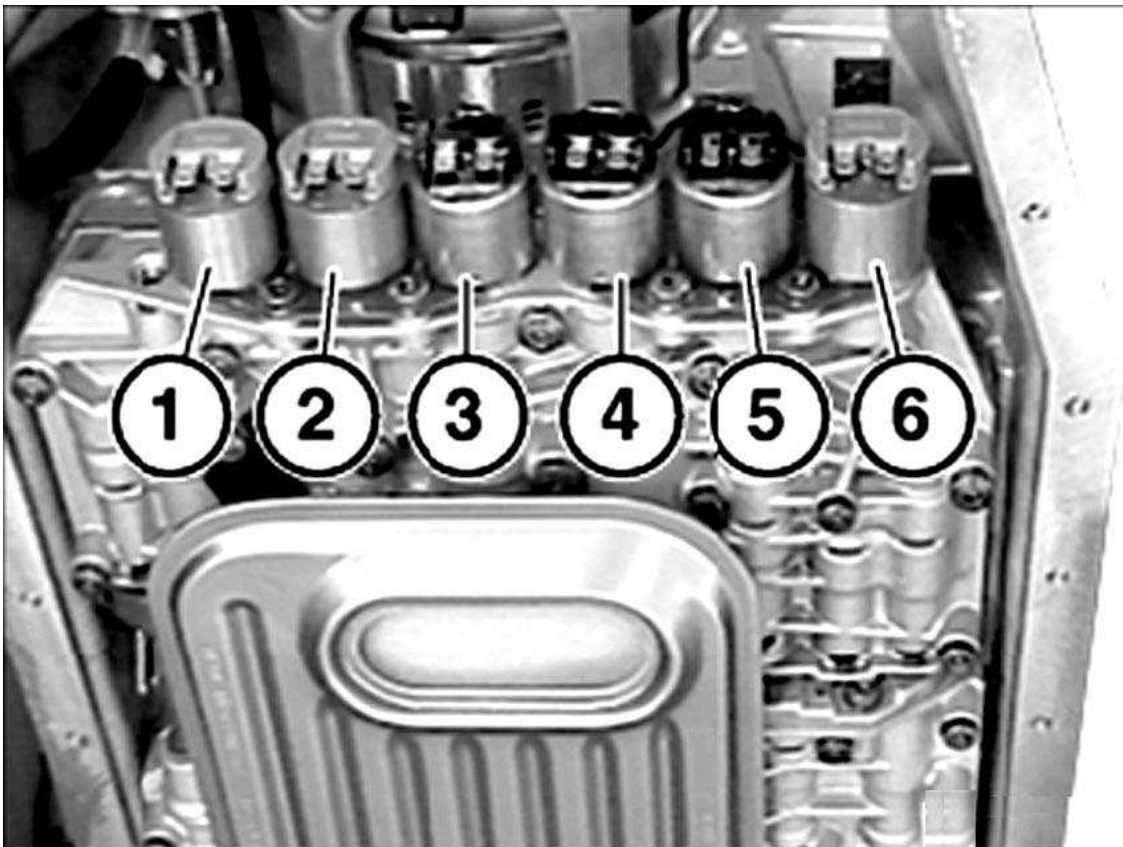
REPLACING SOLENOID VALVE OR PRESSURE REGULATOR (A5S 325Z)

NOTE: Numbers in text refer to numbers in figures.

NOTE: After completing work, top up ATF level. Check/top up fluid level in automatic transmission. See **CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (A5S 325Z)** .

Remove and install transmission oil sump. See **REMOVING AND INSTALLING/SEALING OR REPLACING TRANSMISSION OIL SUMP (A5S 325Z)** .

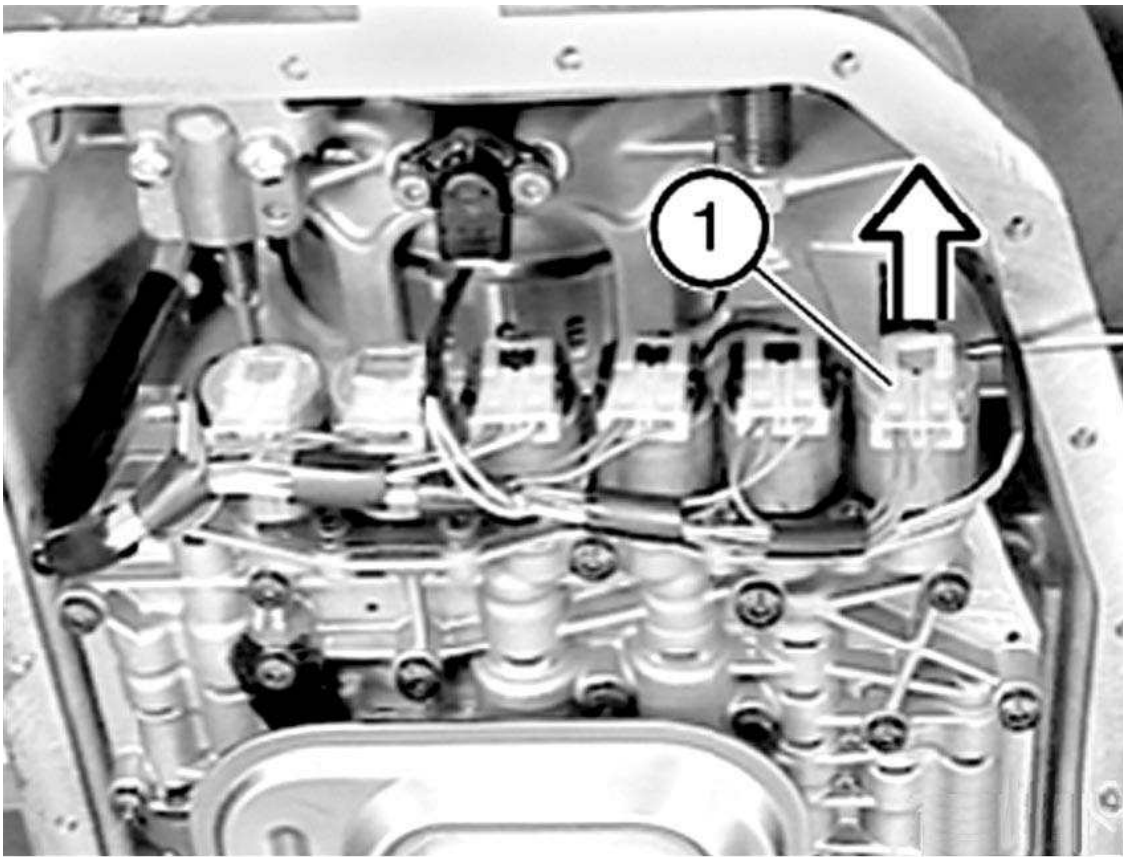
To locate solenoid valve and pressure regulator components, see **Fig. 24** .



G00382328

Fig. 24: Locating Solenoid Valve & Pressure Regulator Valve Components
Courtesy of BMW OF NORTH AMERICA, INC.

Detach plug (1) from solenoid valve or pressure regulator. See **Fig. 25** .

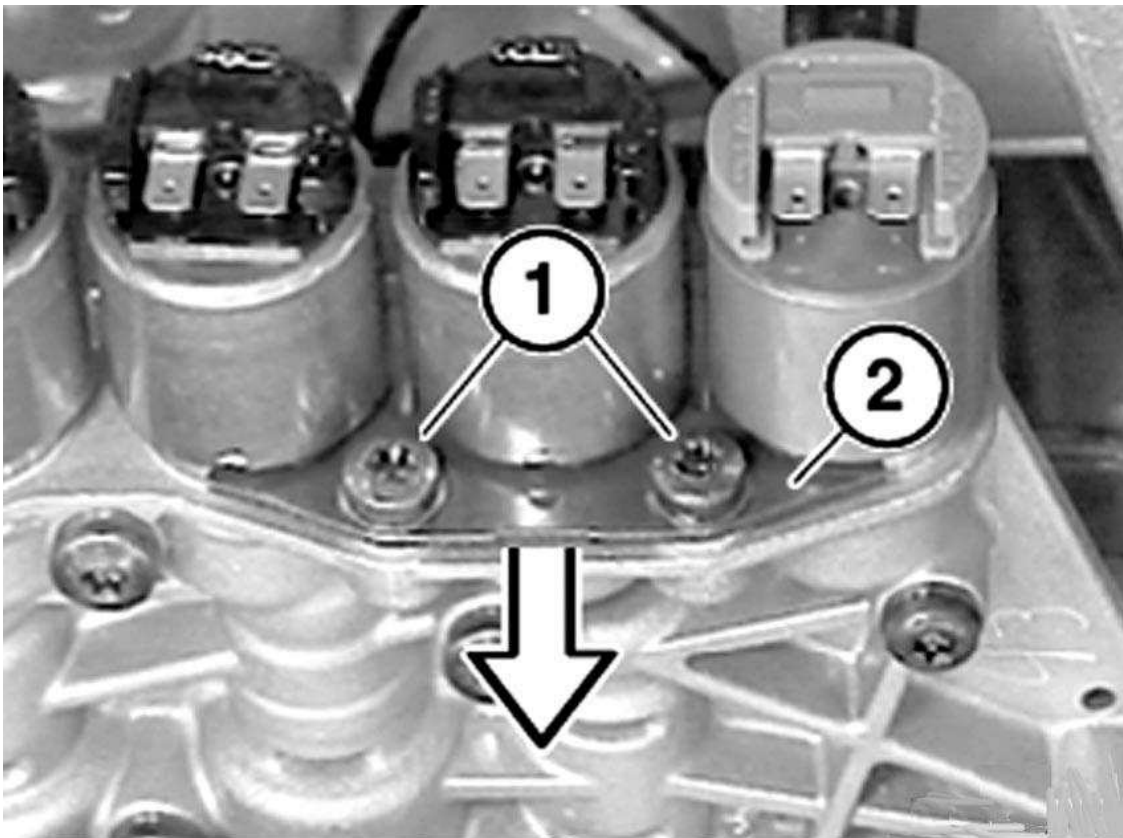


G00382329

Fig. 25: Detaching Plug

Courtesy of BMW OF NORTH AMERICA, INC.

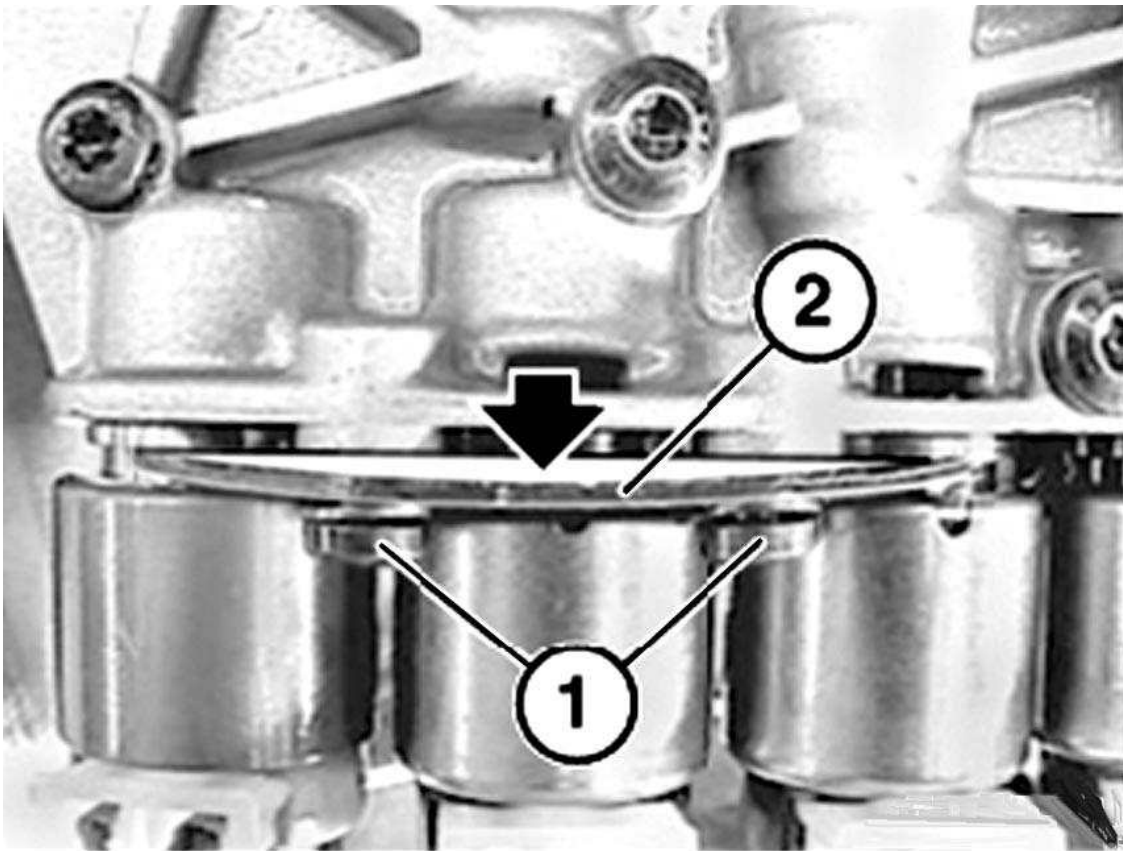
Release screws (1). See **Fig. 26** . Remove retaining plate (2). Withdraw solenoid valve (1, 2 or 3) or pressure regulator (2, 3 or 4). Upon installation: coat new solenoid valve with ATF.



G00382330

Fig. 26: Removing Solenoid Valve Or Pressure Regulator
Courtesy of BMW OF NORTH AMERICA, INC.

Installation: note installation position of retaining plate (2). See **Fig. 27** . Curved surface of retaining plate (2) must point to solenoid valve or pressure regulator. Install screws (1). Tighten to specification. See **TORQUE SPECIFICATIONS** .



G00382331

Fig. 27: Installing Retaining Plate

Courtesy of BMW OF NORTH AMERICA, INC.

REMOVING AND INSTALLING/REPLACING SELECTOR UNIT (A5S 360R/390R, A4S 200R)

NOTE: Numbers in text refer to numbers in figures.

NOTE: After completing work, top up ATF level. Check/top up fluid level in automatic transmission. See CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (A5S 360R / 390R, A4S 200R / 310R) .

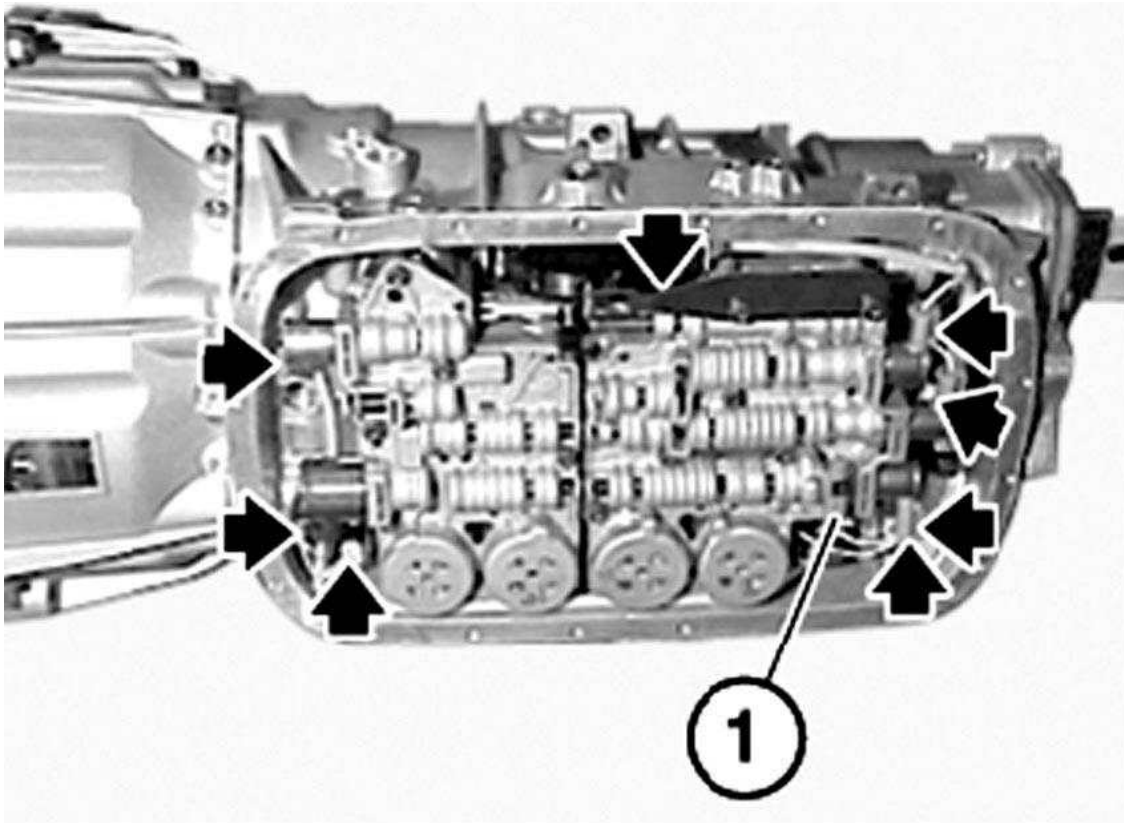
Remove and install transmission fluid sump. See REMOVING AND INSTALLING/SEALING OR REPLACING TRANSMISSION FLUID SUMP (A5S 360R / 390R, A4S 200R) .

Remove and install/replace transmission fluid screen. See REMOVING AND INSTALLING/REPLACING TRANSMISSION SCREEN (A5S 360R / 390R, A4S 200R) .

NOTE: As of model year 2001 (04/2000), the temperature sensor is integrated in the

wiring harness.

Disconnect all plug connections on shift unit. See **Fig. 28** . Unclip temperature sensor (1) from holder.

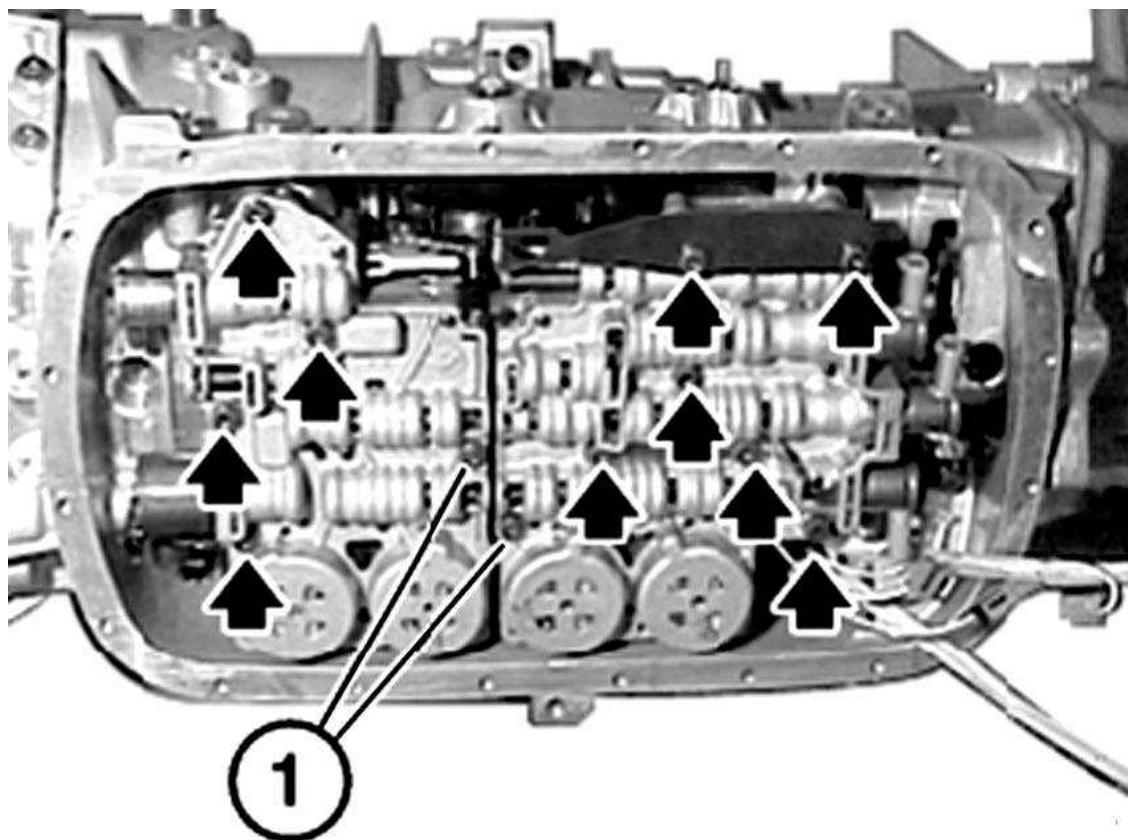


G00382349

Fig. 28: Locating Plug Connections & Temperature Sensor
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE:

DO NOT release screws (1). See **Fig. 29** . Release all other screws, with outside Torx E8, on shift unit and remove shift unit.

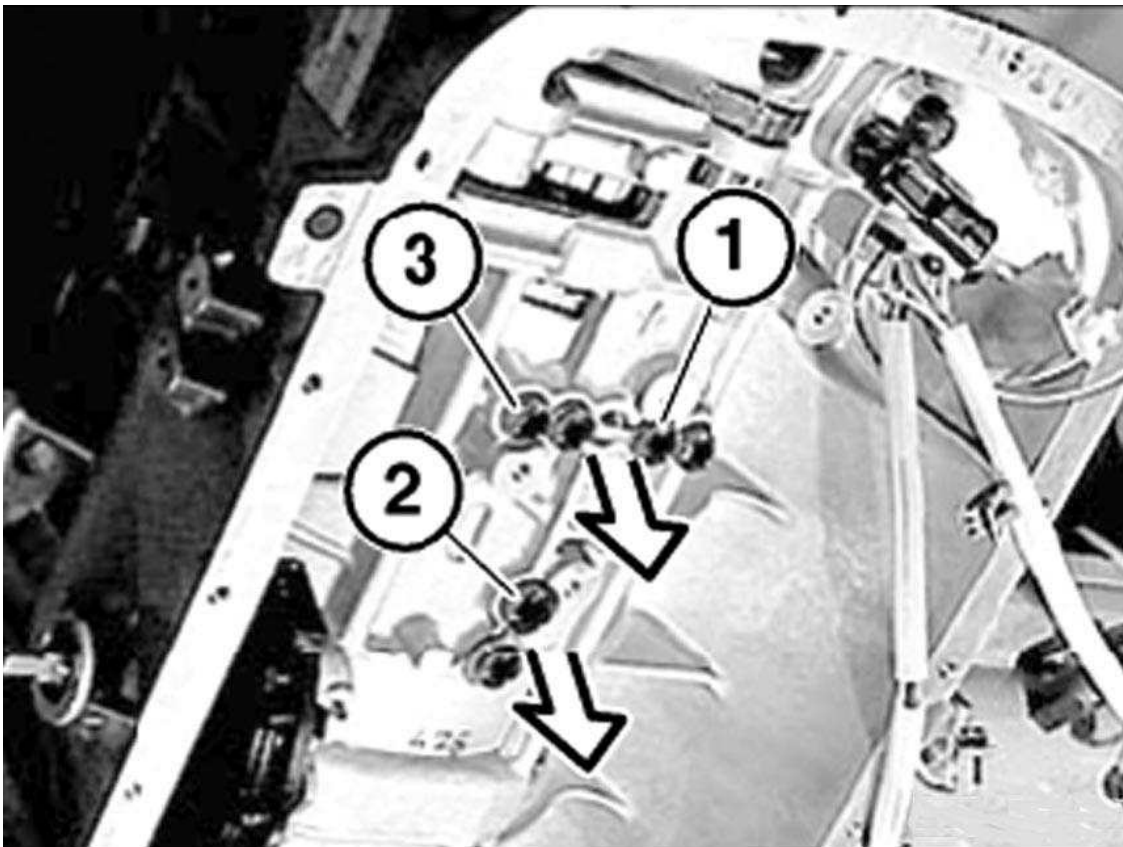


G00382350

Fig. 29: Removing Shift Unit

Courtesy of BMW OF NORTH AMERICA, INC.

Pull out seals (1), (2) and (3). See **Fig. 30** . Coat new seals with automatic transmission fluid and install.



G00382351

Fig. 30: Locating Seals

Courtesy of BMW OF NORTH AMERICA, INC.

Installation: blow out tapped holes with compressed air gun. Insert set screws (1) from seal set into tapped holes. See Fig. 31 .

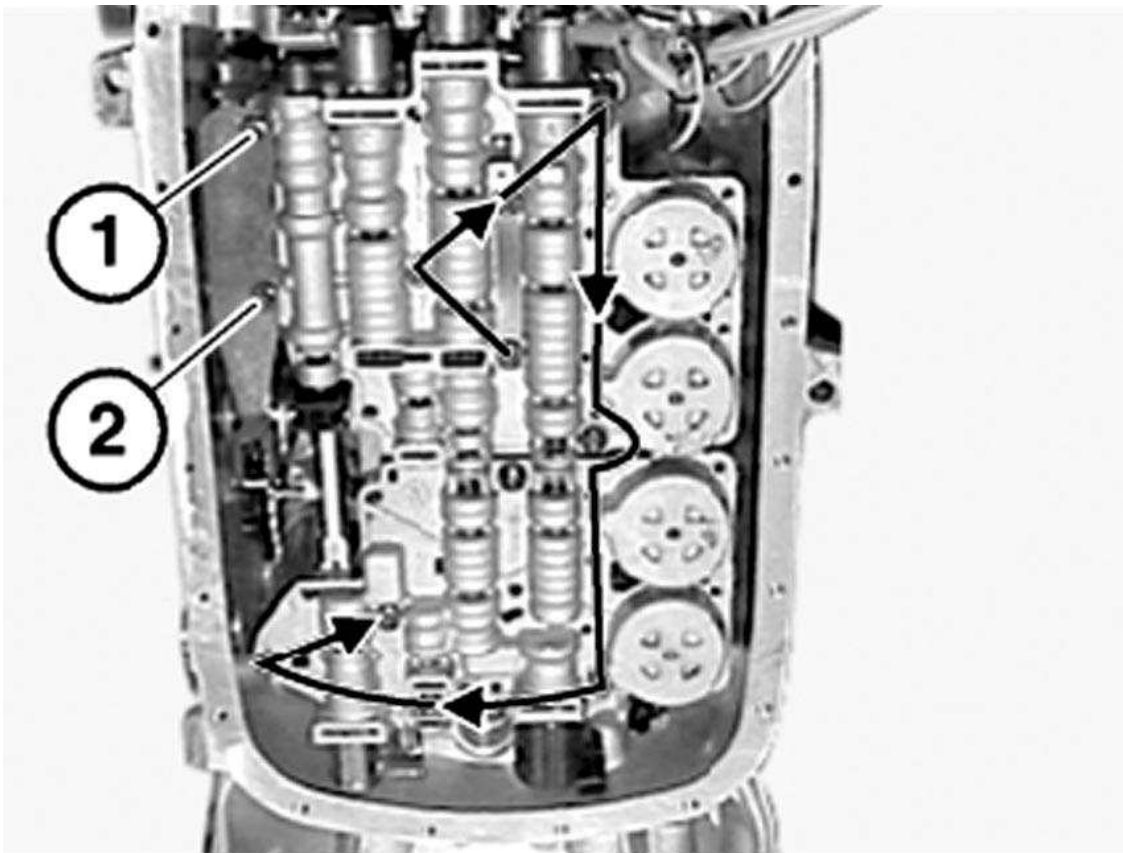


G00382352

Fig. 31: Inserting Set Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Length of screws: (1) = (2) = 68 mm, all others = 58 mm. Install shift unit with aid of both set screws and secure in place with screws. See **Fig. 32** . Remove both set screws. Tighten all screws until hand-tight. When tightening screws: follow sequence without fail. Tighten to specification. See **TORQUE SPECIFICATIONS** . Do not tighten screws (1) and (2) yet.

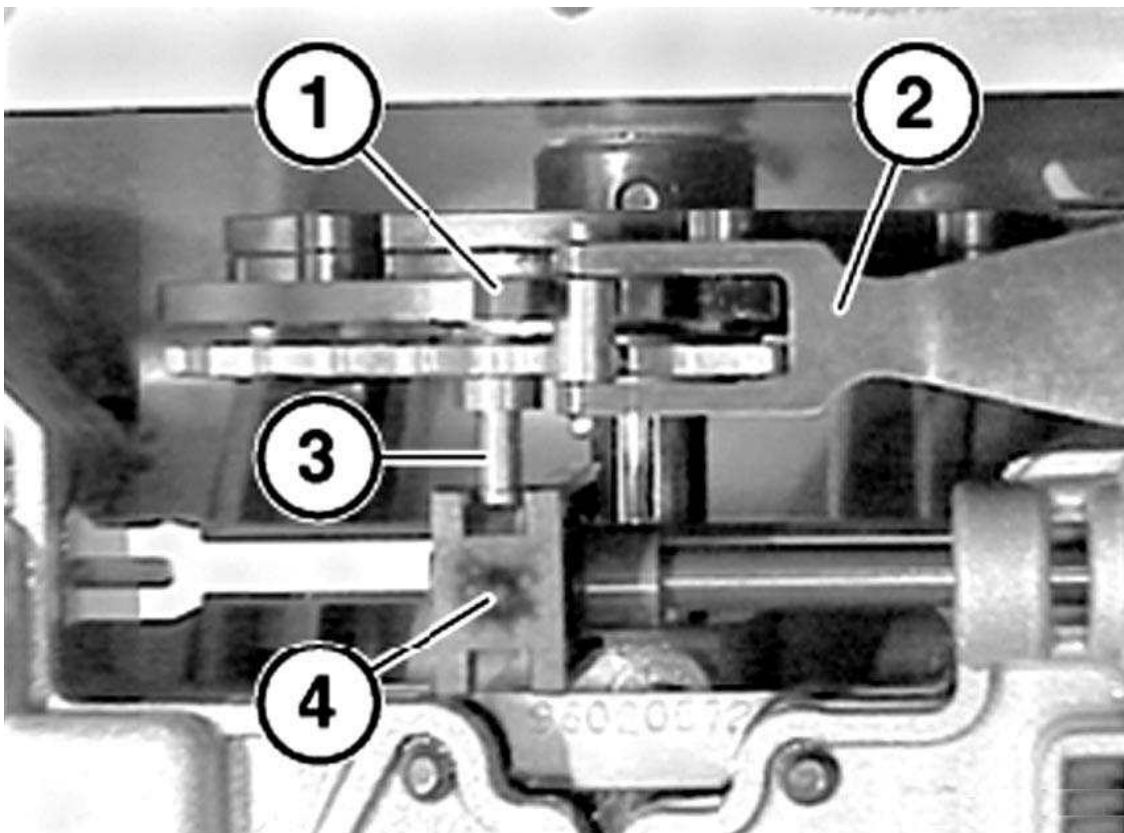


G00382353

Fig. 32: Locating Set Screws

Courtesy of BMW OF NORTH AMERICA, INC.

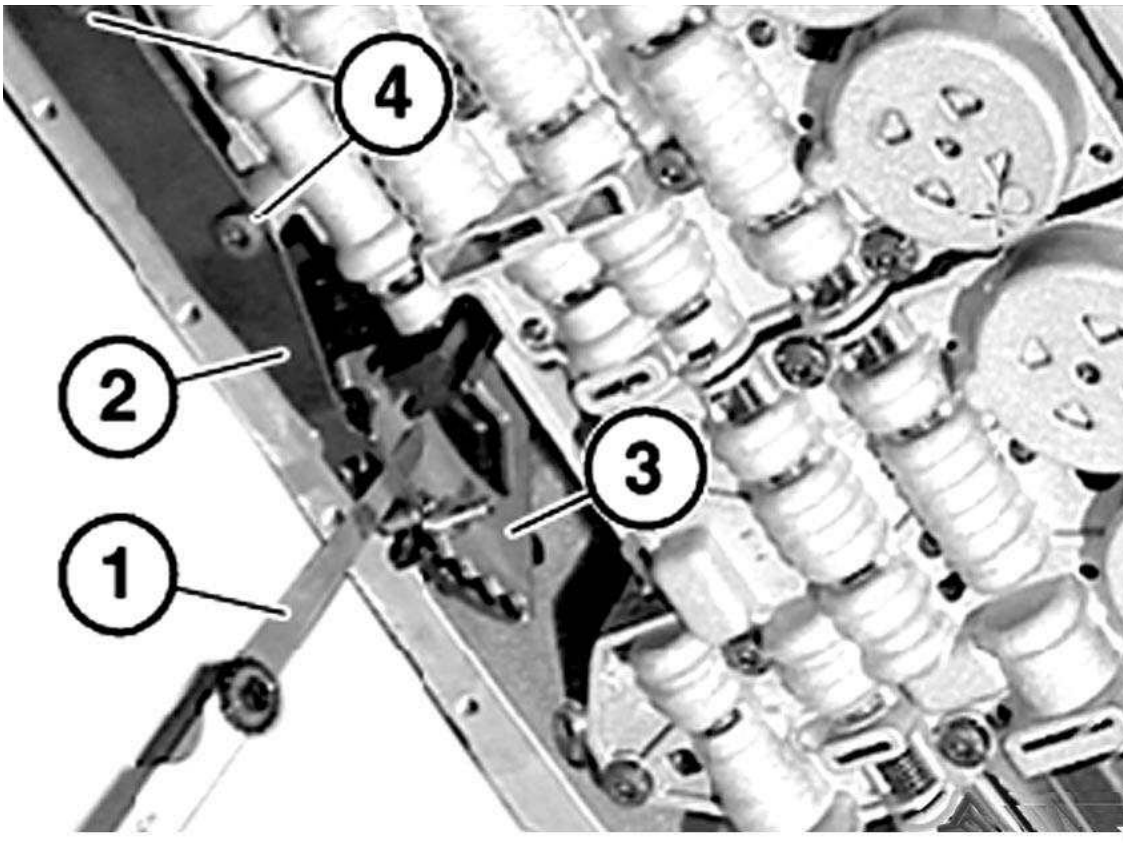
Suspend guide (1) of transmission switch in detent spring (2). See **Fig. 33** . Journal (3) of detent disk must be located in groove (4) of slide valve.



G00382354

Fig. 33: Suspending Guide Of Transmission Switch In Detent Spring
Courtesy of BMW OF NORTH AMERICA, INC.

Insert feeler gauge (1) between detent spring (2) and detent disk (3) and set gap of 0.80 mm by moving detent spring (2). See **Fig. 34** . Tighten down screws (4). See **TORQUE SPECIFICATIONS** .



G00382355

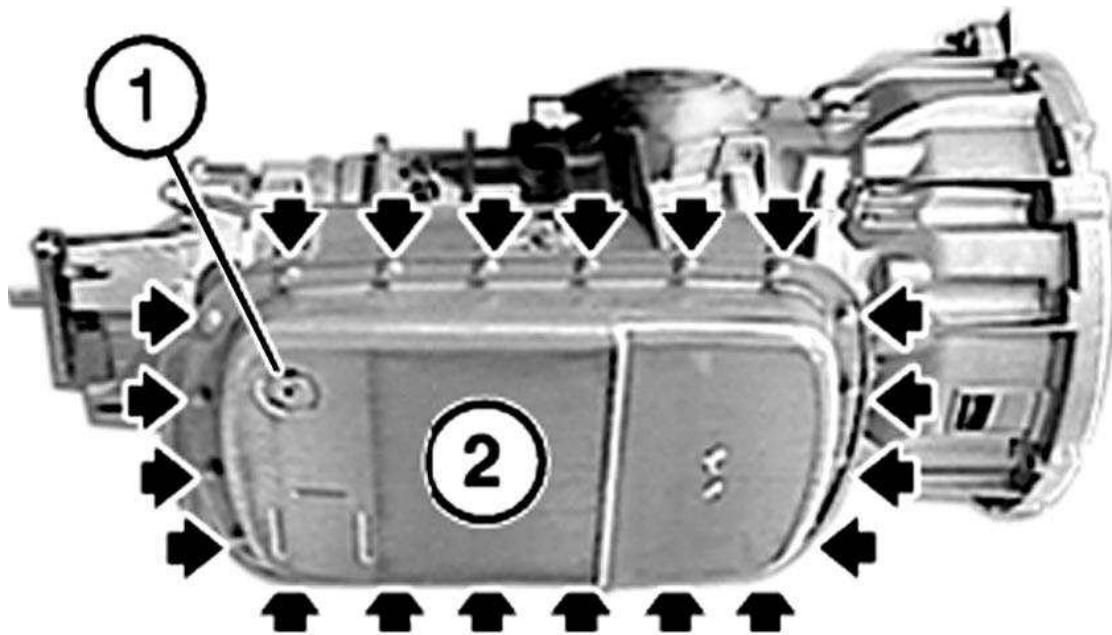
Fig. 34: Setting Gap Between Detent Spring & Detent Disk
Courtesy of BMW OF NORTH AMERICA, INC.

REMOVING AND INSTALLING/SEALING OR REPLACING TRANSMISSION FLUID SUMP (A5S 360R / 390R, A4S 200R)

NOTE: Numbers in text refer to numbers in figures.

NOTE: After completing work, top up ATF level. Check/top up fluid level in automatic transmission. See **CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (A5S 360R / 390R, A4S 200R / 310R)** .

Open drain plug (1). See **Fig. 35** . Drain off automatic transmission fluid. Unscrew all bolts. Remove oil sump (2). Detach gasket from oil sump (2). Clean sealing faces. Upon installation, replace sealing ring on drain plug. Tighten drain plug to specification. See **TORQUE SPECIFICATIONS** .



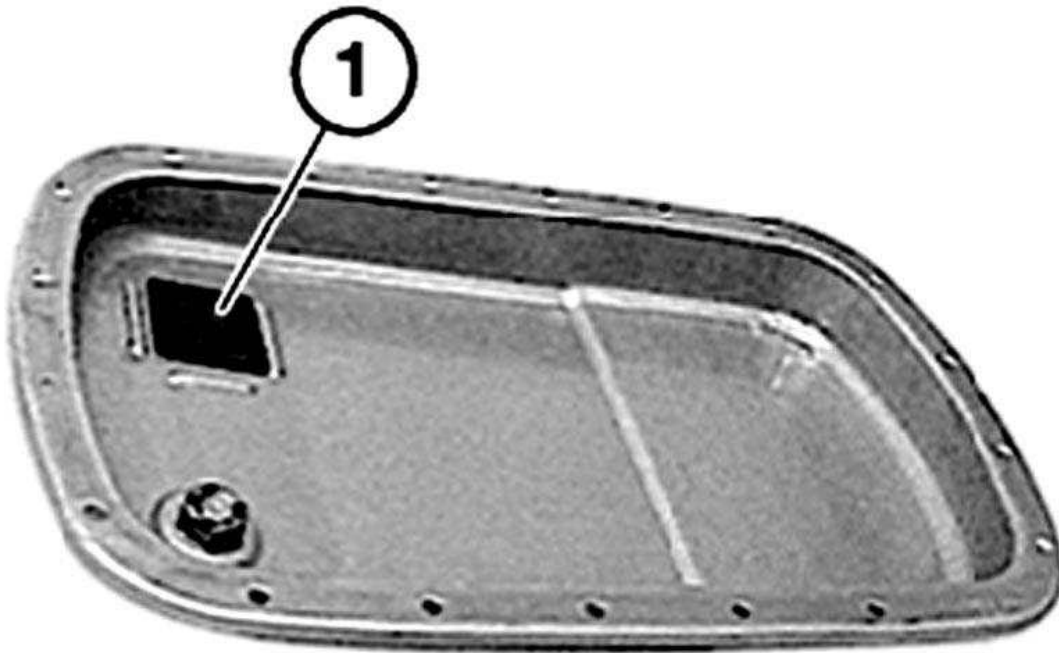
G00382344

Fig. 35: Locating Drain Plug

Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Tighten down screws, not in diagonal sequence but rather in order, one time to specified torque.

Fit new gasket on oil sump. Clean magnets (1) and reinstall in oil sump. See **Fig. 36** . Install oil sump. Insert all screws until contact is made with screw head in each case. Tighten to specification. See **TORQUE SPECIFICATIONS** .



G00382345

Fig. 36: Installing Oil Sump

Courtesy of BMW OF NORTH AMERICA, INC.

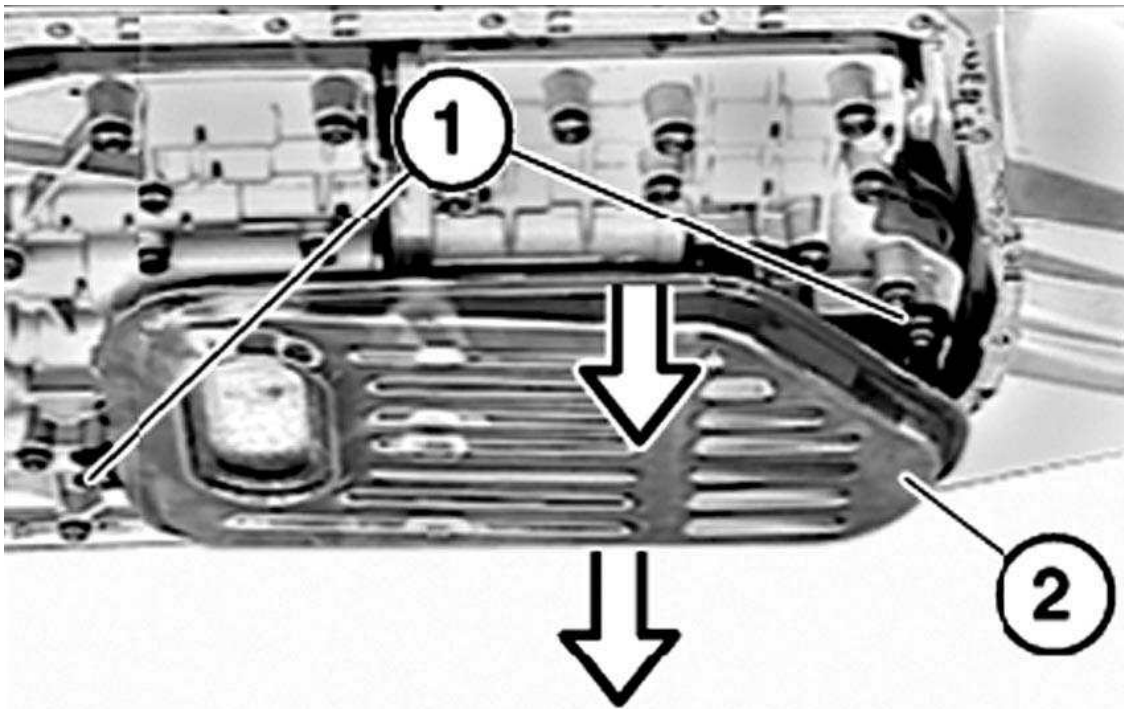
REMOVING AND INSTALLING/REPLACING TRANSMISSION OIL SCREEN (A5S 325Z)

NOTE: Numbers in text refer to numbers in figures.

NOTE: After completing work, top up ATF level. Check/top up fluid level in automatic transmission. See **CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (A5S 325Z)** .

Remove and install transmission oil sump. See **REMOVING AND INSTALLING/SEALING OR REPLACING TRANSMISSION OIL SUMP (A5S 325Z)** .

Release screws (1). See **Fig. 37** . Pull transmission oil screen (2) towards bottom and remove.



G00382321

Fig. 37: Removing Transmission Oil Screen
Courtesy of BMW OF NORTH AMERICA, INC.

Installation: coat sealing ring with ATF. Tighten fasteners to specification. See **TORQUE SPECIFICATIONS** .

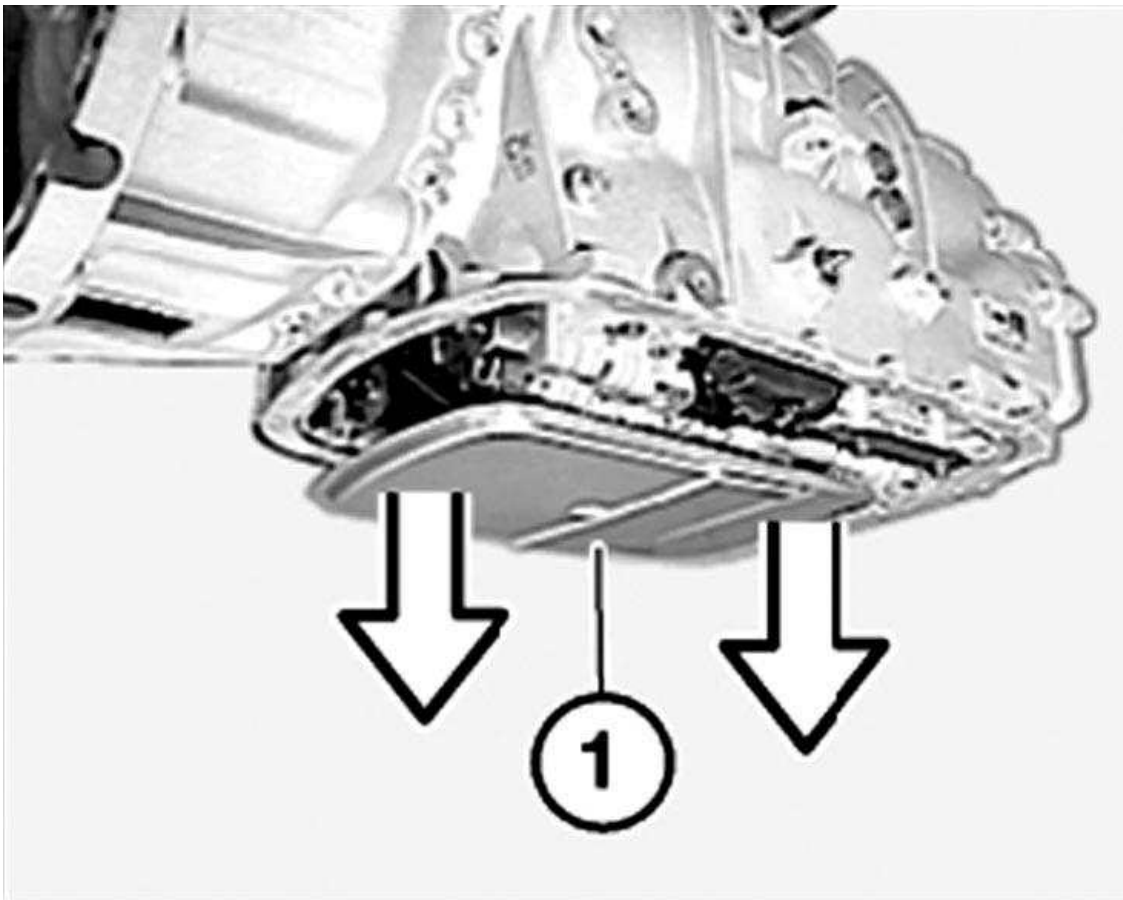
REMOVING AND INSTALLING/REPLACING TRANSMISSION SCREEN (A5S 360R / 390R, A4S 200R)

NOTE: Numbers in text refer to numbers in figures.

NOTE: After completing work, top up ATF level. Check/top up fluid level in automatic transmission. See **CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (A5S 360R / 390R, A4S 200R / 310R)** .

Remove transmission oil sump. See **REMOVING AND INSTALLING/SEALING OR REPLACING TRANSMISSION FLUID SUMP (A5S 360R / 390R, A4S 200R)** .

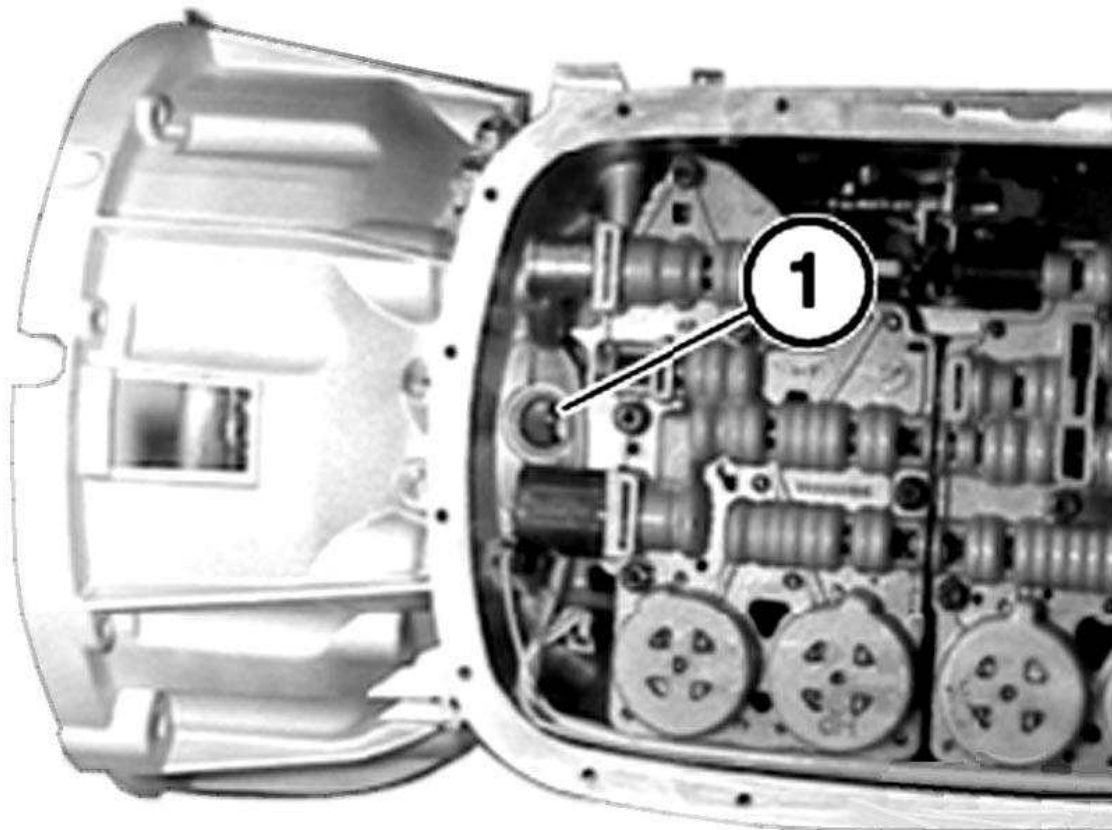
Pull off transmission fluid screen (1) towards bottom and remove. See **Fig. 38** .



G00382346

Fig. 38: Pulling Off Transmission Fluid Screen
Courtesy of BMW OF NORTH AMERICA, INC.

If the sealing ring (1) has remained in the pump housing, it must be removed and the transmission fluid screen replaced. See **Fig. 39** .



G00382347

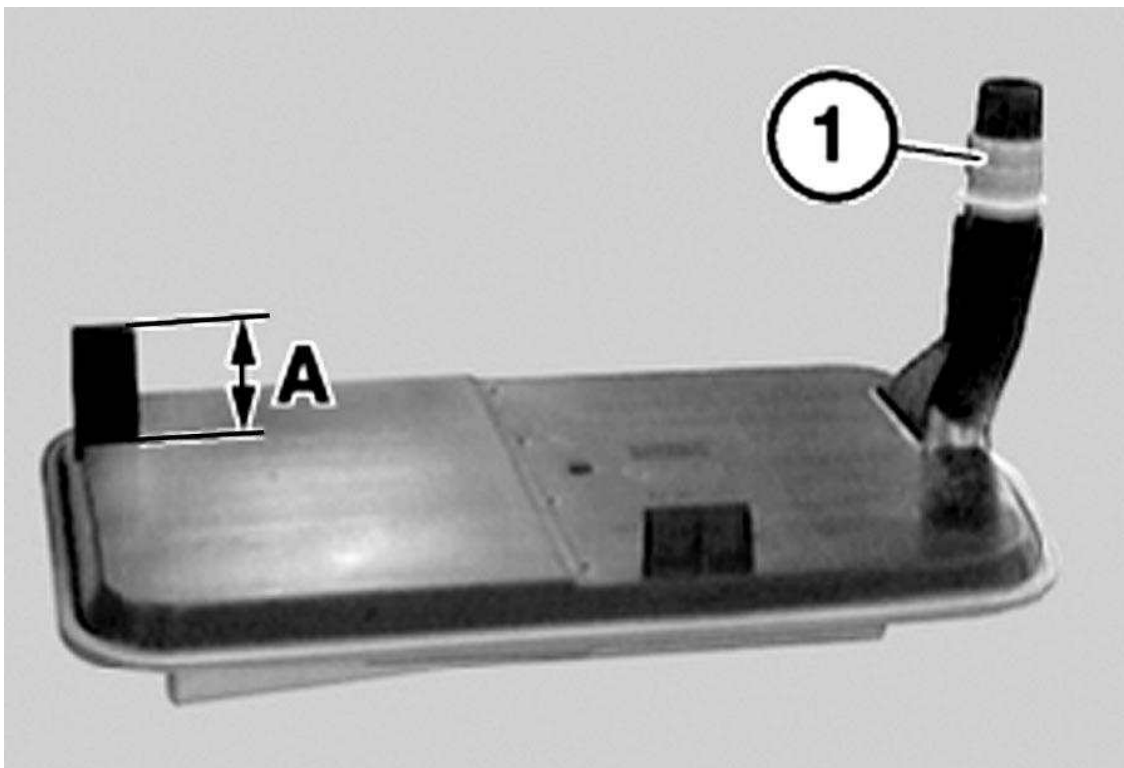
Fig. 39: Locating Sealing Ring

Courtesy of BMW OF NORTH AMERICA, INC.

Installation: different transmission fluid screens are used in petrol/gasoline and diesel engines. Therefore check specified measurement A prior to installation. See **Fig. 40** . Measurement A: Gasoline engine:

- M52TU = 38-40 mm
- M43TU = 29-31 mm

Diesel engine: M57 = 29-31 mm. Position (1): Two gaskets are fitted.



G00382348

Fig. 40: Identifying Transmission Screen

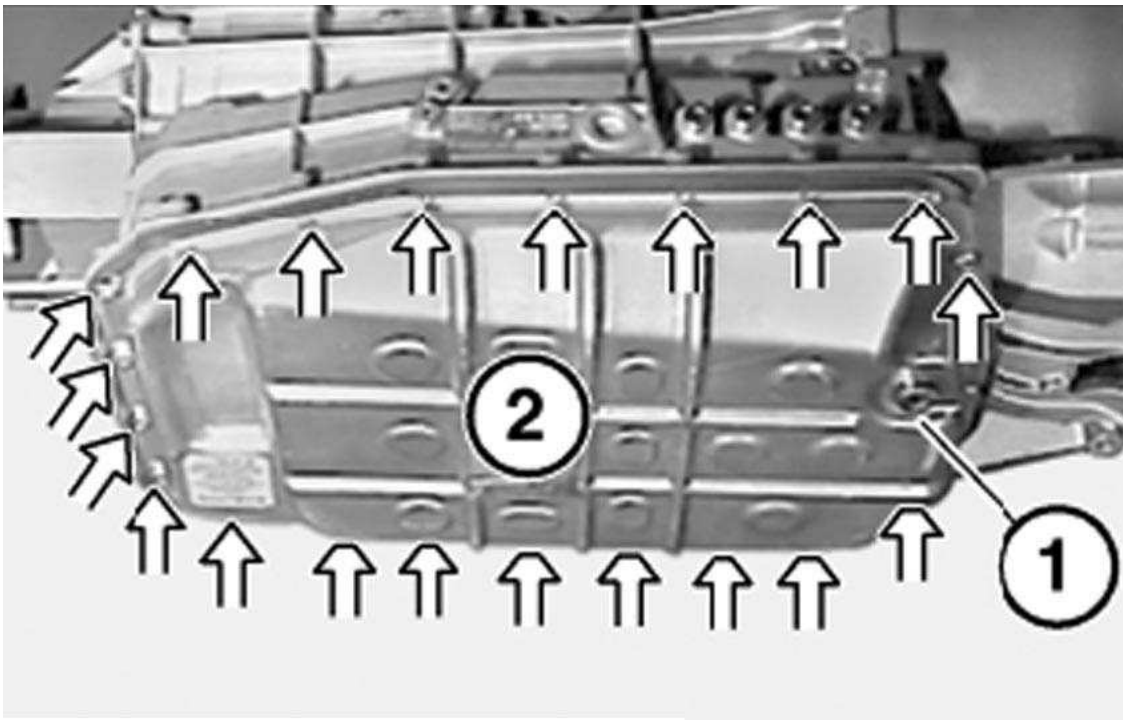
Courtesy of BMW OF NORTH AMERICA, INC.

REMOVING AND INSTALLING/SEALING OR REPLACING TRANSMISSION OIL SUMP (A5S 325Z)

NOTE: Numbers in text refer to numbers in figures.

CAUTION: It is absolutely essential to use the approved automatic transmission fluid in this automatic transmission. Failure to comply with this requirement will result in serious damage to the automatic transmission.

Release drain plug (1). See **Fig. 41** . Drain automatic transmission fluid. Unscrew all bolts. Remove oil sump (2). Upon installation, tighten fasteners to specification. See **TORQUE SPECIFICATIONS** .

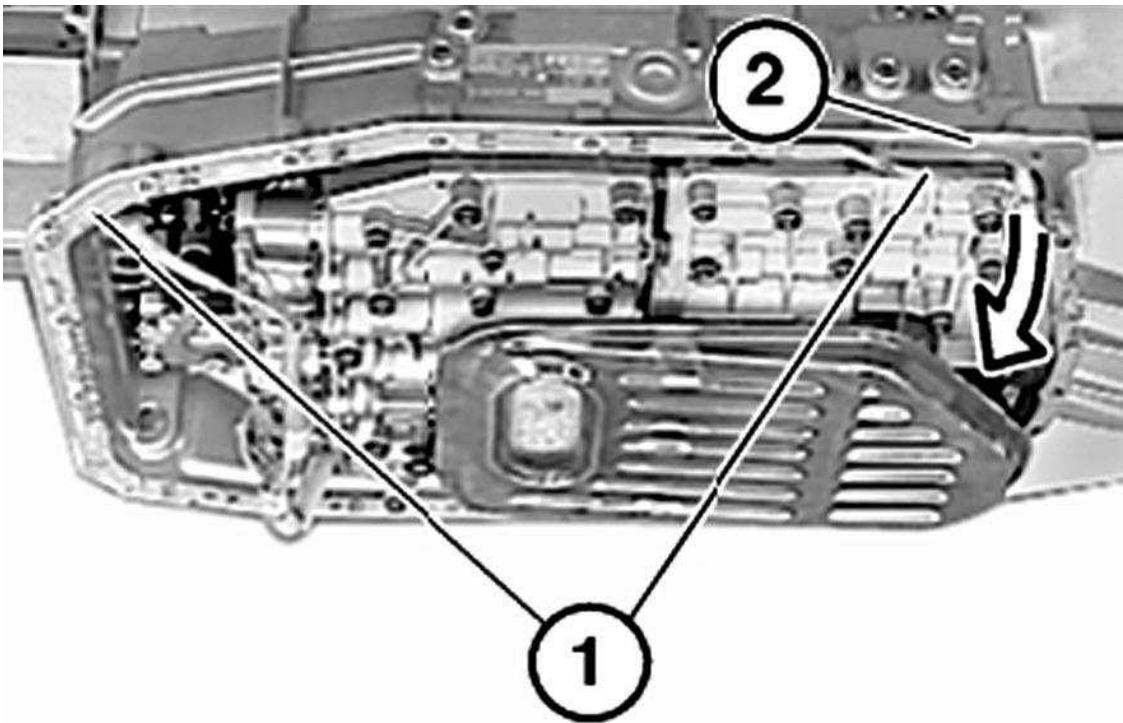


G00382300

Fig. 41: Removing Oil Sump

Courtesy of BMW OF NORTH AMERICA, INC.

Remove gasket (1). See Fig. 42 . Clean sealing surface (2). Upon installation, replace seal.



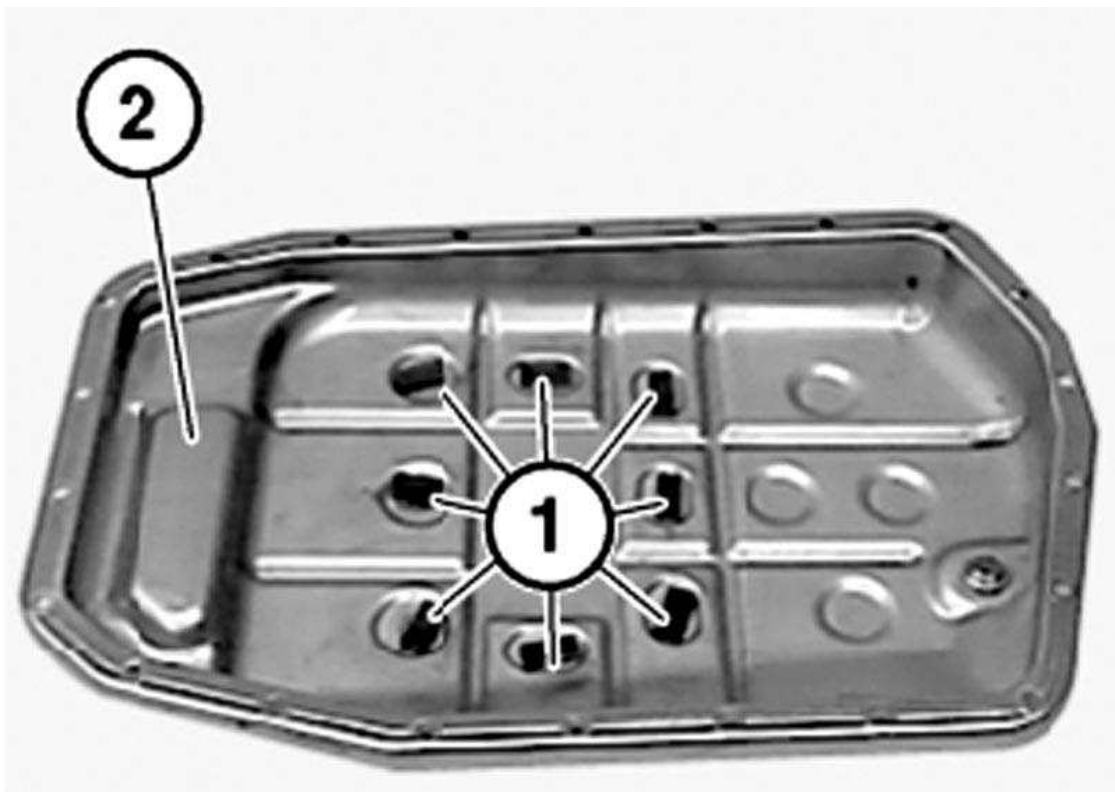
G00382301

Fig. 42: Locating Gasket

Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Using torque wrench, do not tighten screws diagonally but once one after the other. DO NOT tighten screws further.

Clean magnets (1) and insert in oil sump again (2). See **Fig. 43** . Install oil sump (2). Insert all screws until contact is made with screw head in each case. Tighten to specification. See **TORQUE SPECIFICATIONS** .



G00382302

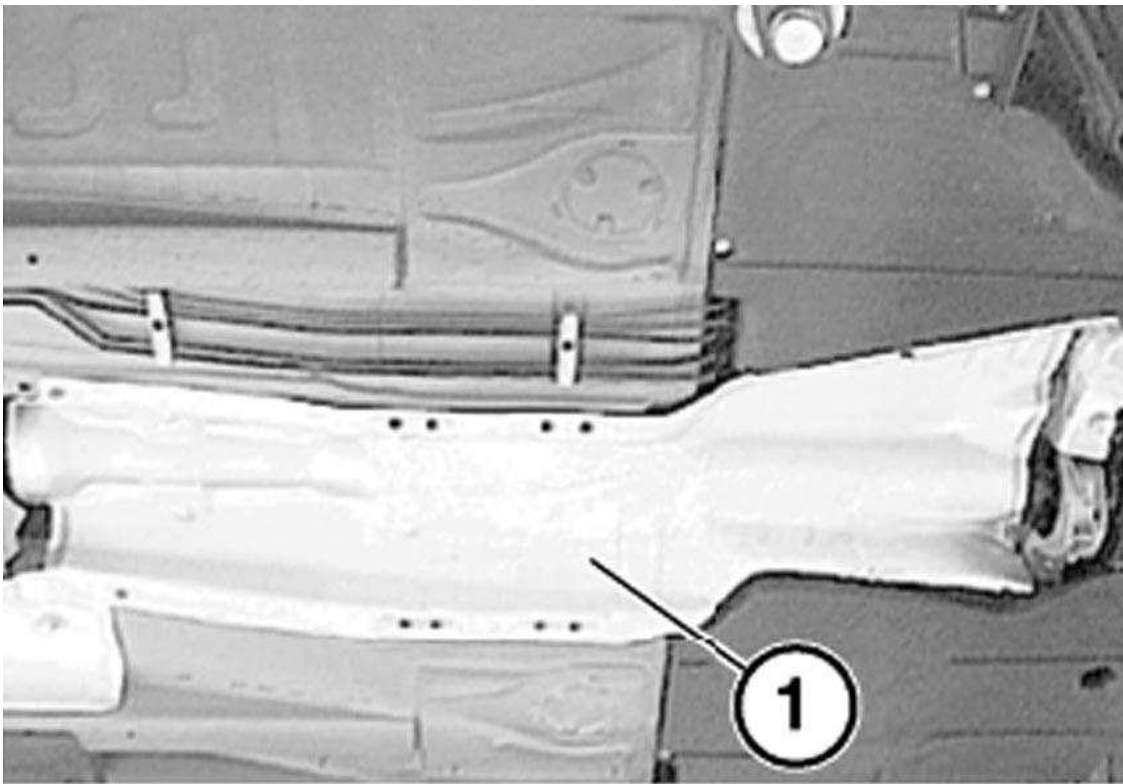
Fig. 43: Locating Magnets

Courtesy of BMW OF NORTH AMERICA, INC.

REMOVING & INSTALLING TRANSMISSION EXTENSION (A5S 325Z)

NOTE: Numbers in text refer to numbers in figures.

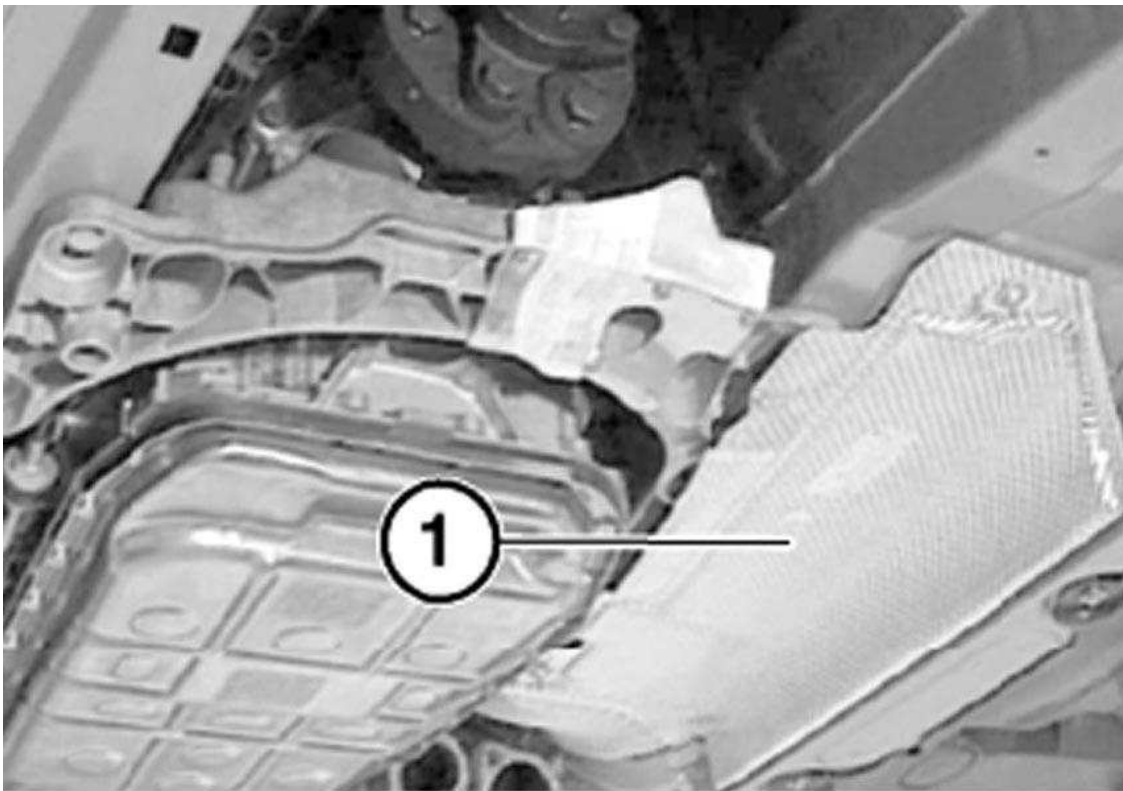
Remove heat shield (1). See **Fig. 44** .



G00367851

Fig. 44: Removing First Heat Shield
Courtesy of BMW OF NORTH AMERICA, INC.

Remove heat shield (1). See **Fig. 45** .

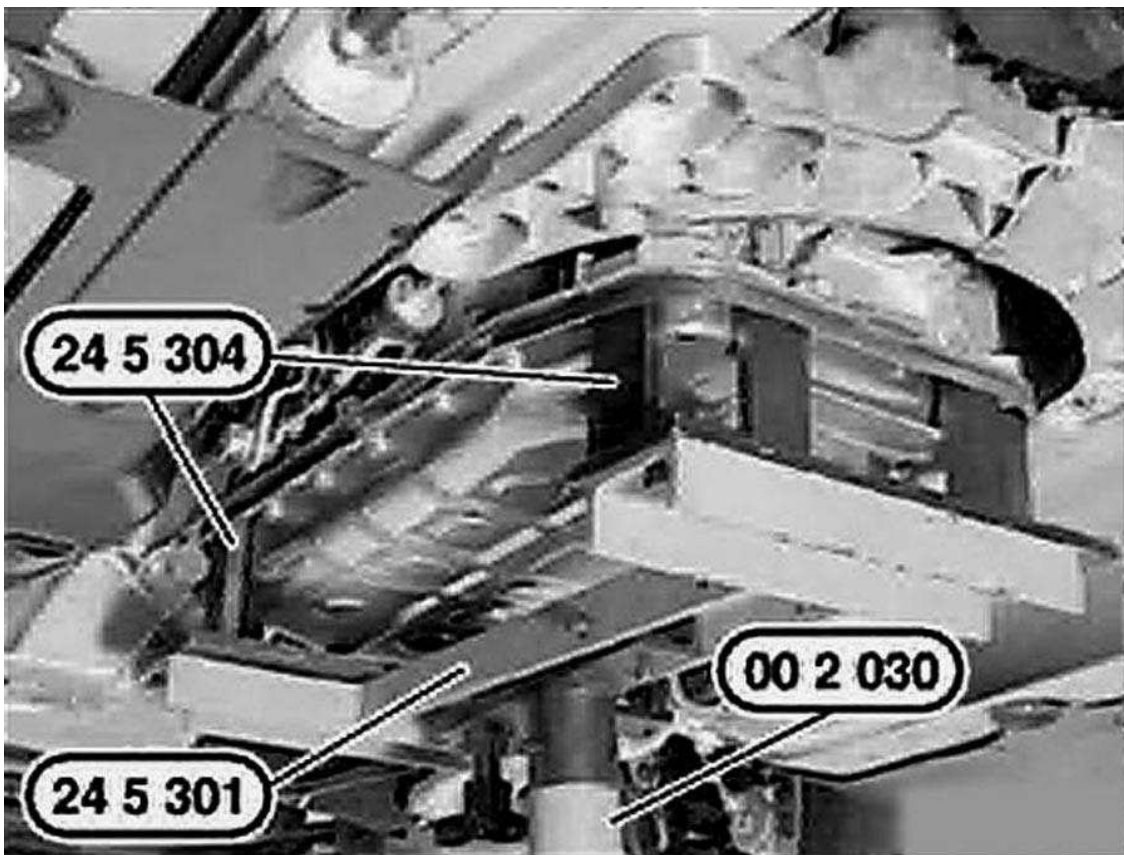


G00367852

Fig. 45: Removing Second Heat Shield

Courtesy of BMW OF NORTH AMERICA, INC.

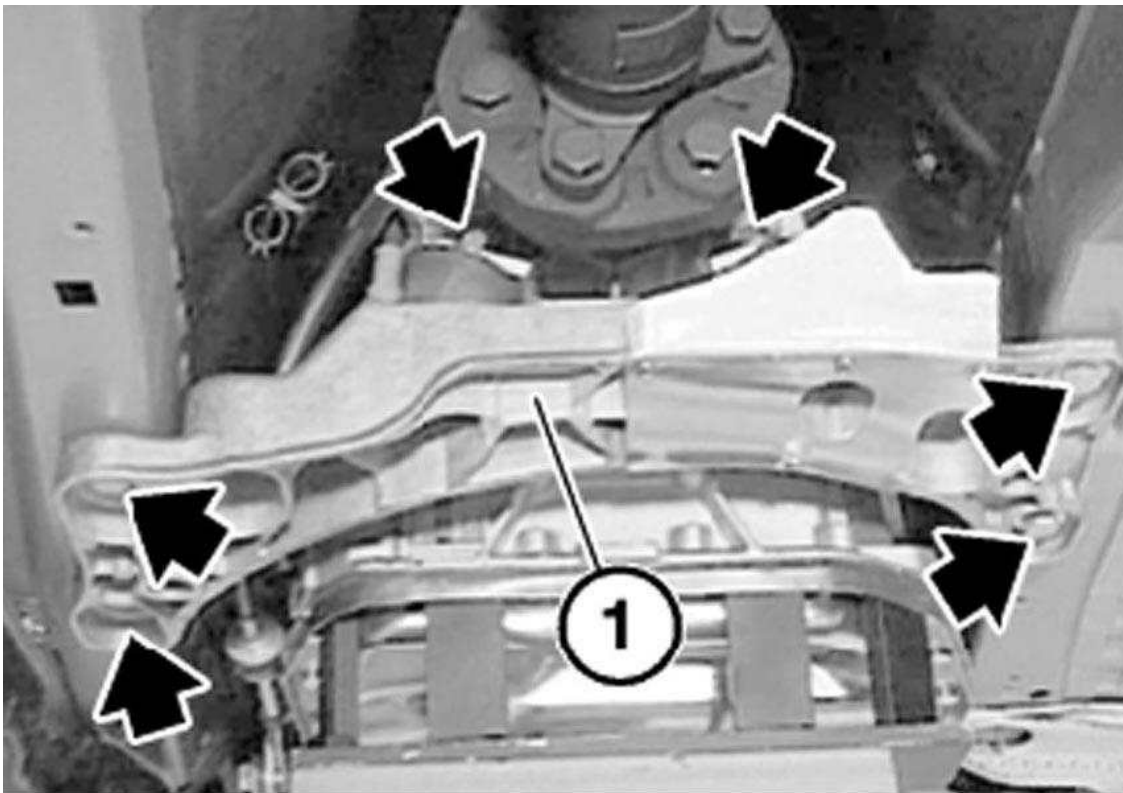
Support transmission with Special Tool (00 2 030 / 24 5 301 / 24 5 304). See **Fig. 46** .



G00367901

Fig. 46: Supporting Transmission With Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws and remove cross-member (1). See **Fig. 47** . Upon installation, tighten screws to specification. See **TORQUE SPECIFICATIONS** .

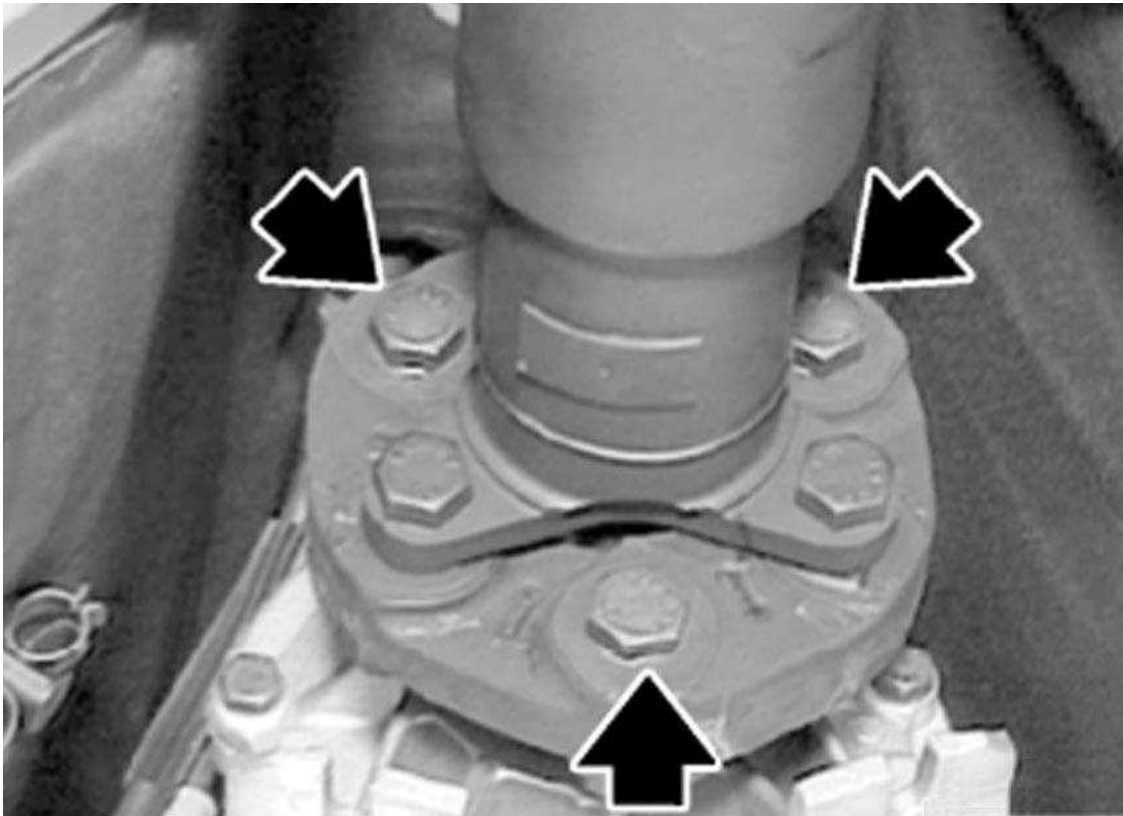


G00367856

Fig. 47: Removing Cross-Member

Courtesy of BMW OF NORTH AMERICA, INC.

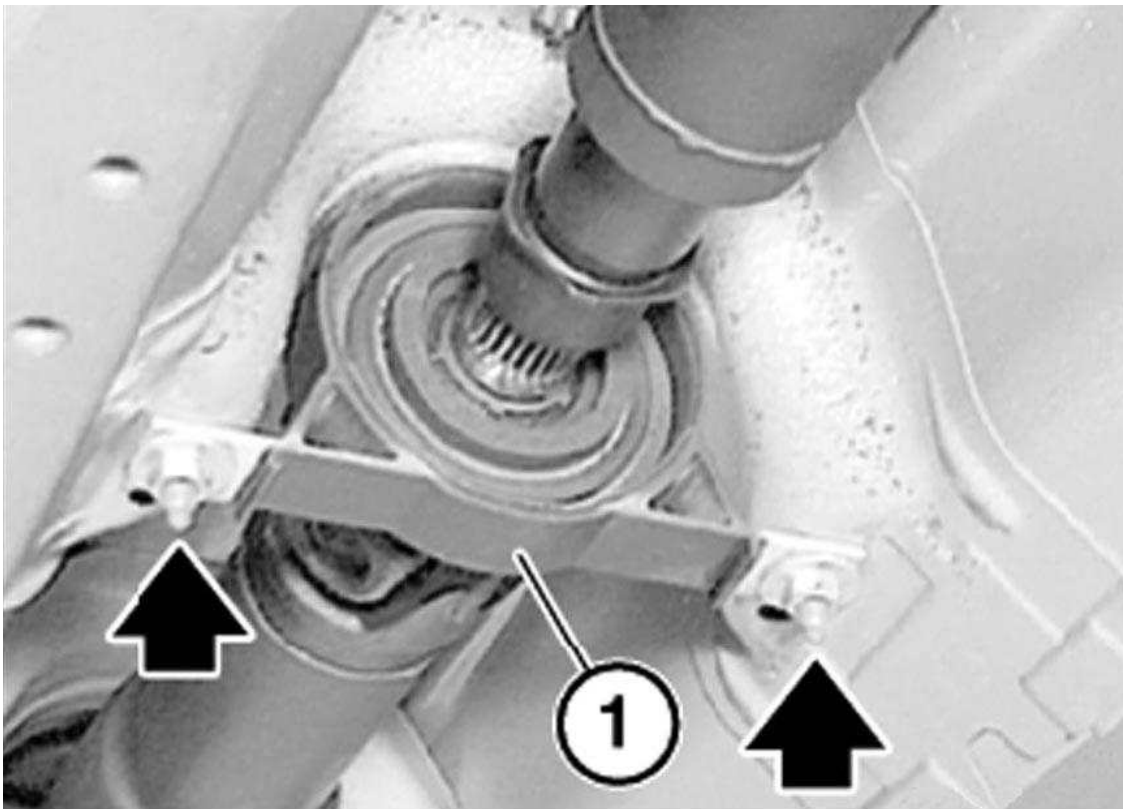
Unfasten screws. See **Fig. 48** . Upon installation, replace self-locking nuts. Tighten to specification. See **TORQUE SPECIFICATIONS** .



G00367857

Fig. 48: Locating Flexible Disk To Propeller Shaft Screws
Courtesy of BMW OF NORTH AMERICA, INC.

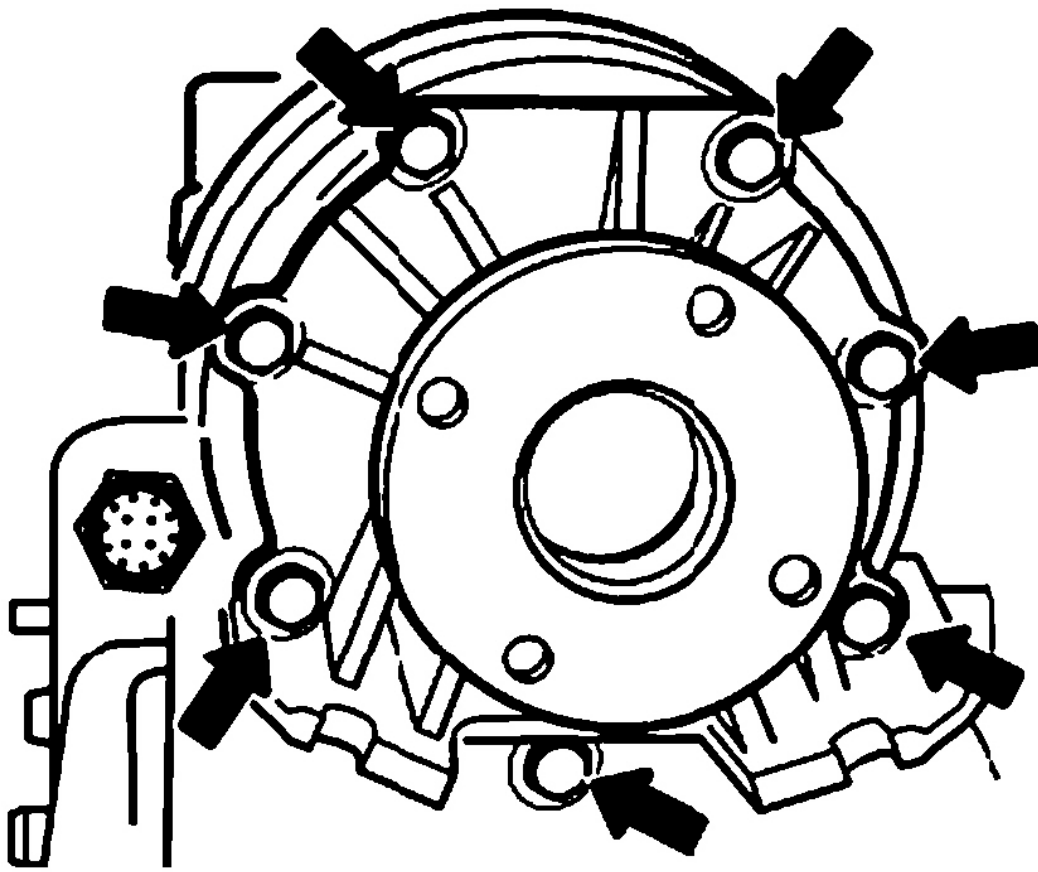
Grip propeller shaft and release nuts. See **Fig. 49** . Bend propeller shaft downwards at center mount (1), detach from transmission output flange and tie back to one side on underbody of vehicle. Upon installation, tighten screws to specification. See **TORQUE SPECIFICATIONS** .



G00367858

Fig. 49: Detaching Propeller Shaft From Transmission Output Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

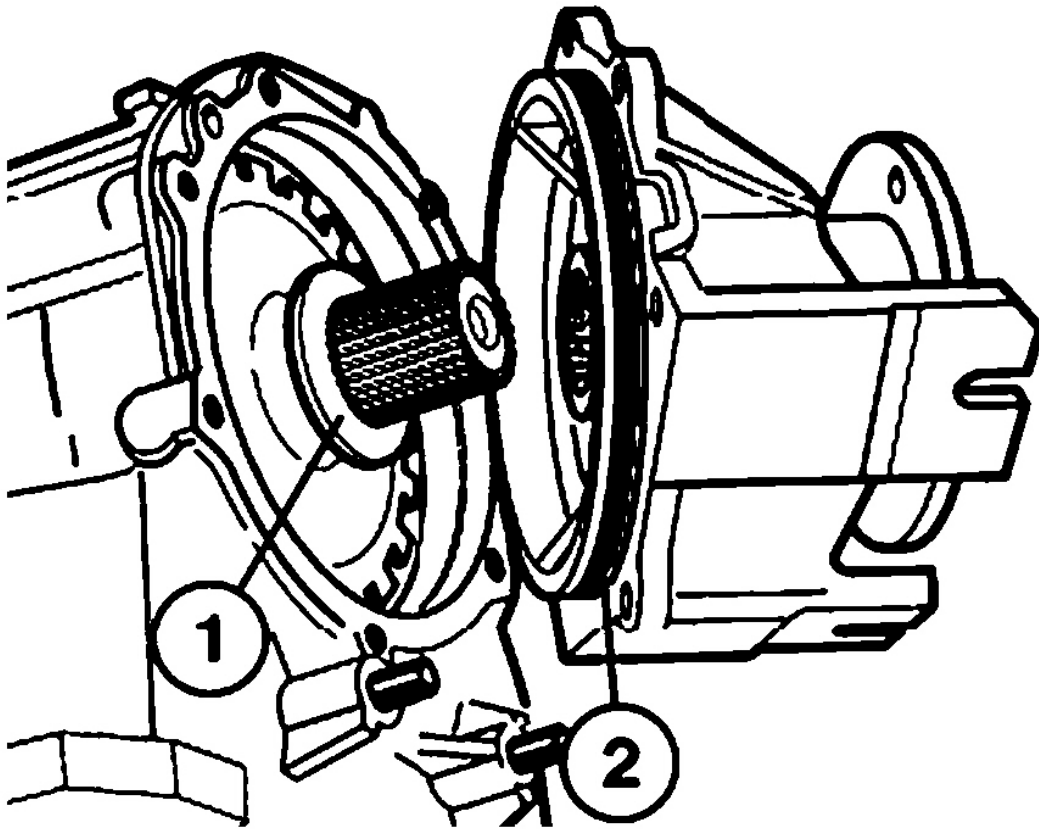
Unfasten screws. See **Fig. 50** . Upon installation, tighten screws to specification. See **TORQUE SPECIFICATIONS** .



G00382303

Fig. 50: Locating Transmission Extension Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Remove transmission extension. Upon installation, install shim (1). Replace O-ring (2). See **Fig. 51** .



G00382304

Fig. 51: Locating Shim & O-Ring
Courtesy of BMW OF NORTH AMERICA, INC.

To install, reverse removal procedure.

REMOVING AND INSTALLING OR REPLACING TRANSMISSION EXTENSION HOUSING (A5S 360R / 390R)

NOTE: Numbers in text refer to numbers in figures.

NOTE: After completing work, top up ATF level. Check/top up fluid level in automatic transmission. See CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (A5S 360R / 390R, A4S 200R / 310R) .

Remove complete exhaust system.

Remove heat shields. See Fig. 44 and Fig. 45 .

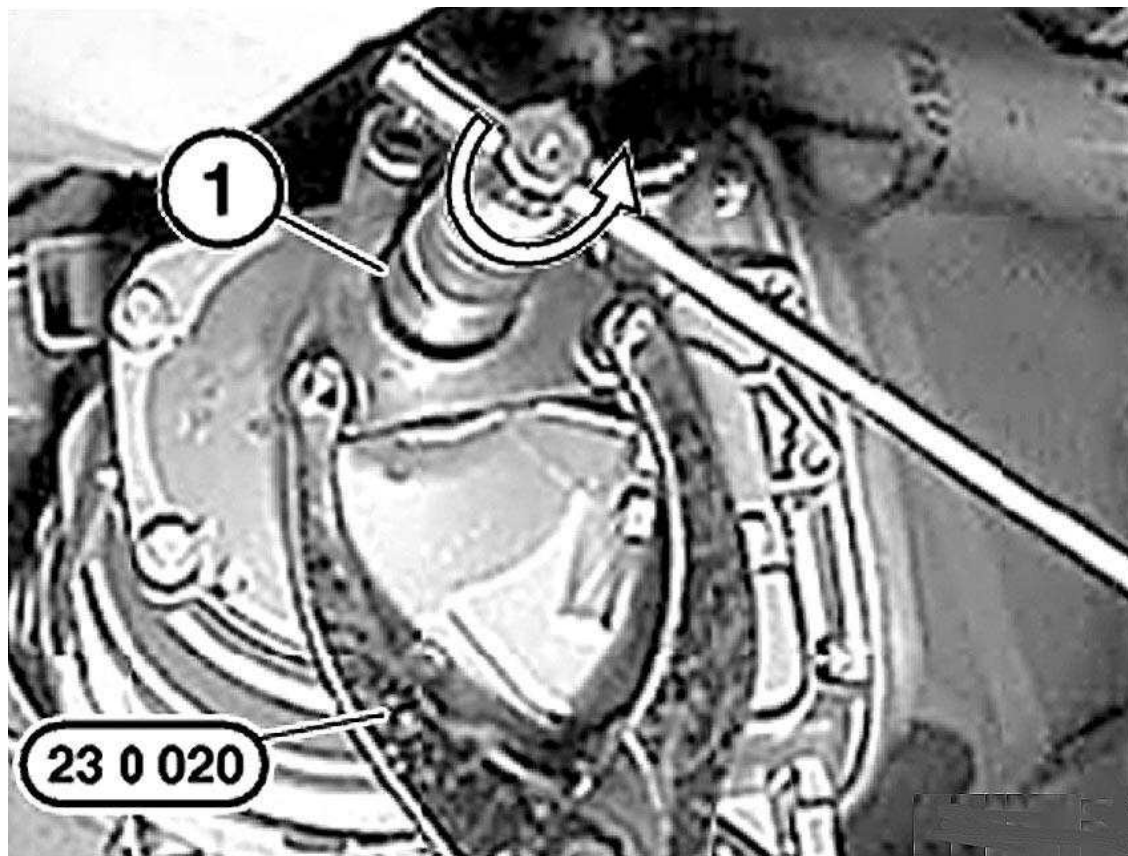
Support transmission with special tools 00 2 030 / 24 5 301 / 24 5 305. See **Fig. 46** .

Release screws. Remove cross-member (1). See **Fig. 47** . Upon installation, tighten screws to specification. See **TORQUE SPECIFICATIONS** .

Release screws. See **Fig. 48** . Upon installation, replace self-locking nuts. Tighten to specification. See **TORQUE SPECIFICATIONS** .

Grip propeller shaft and release nuts. See **Fig. 49** . Bend propeller shaft downwards at center bearing (1). Detach propeller shaft from transmission output flange and tie back to side on vehicle underbody. Upon installation, tighten nuts to specification. See **TORQUE SPECIFICATIONS** .

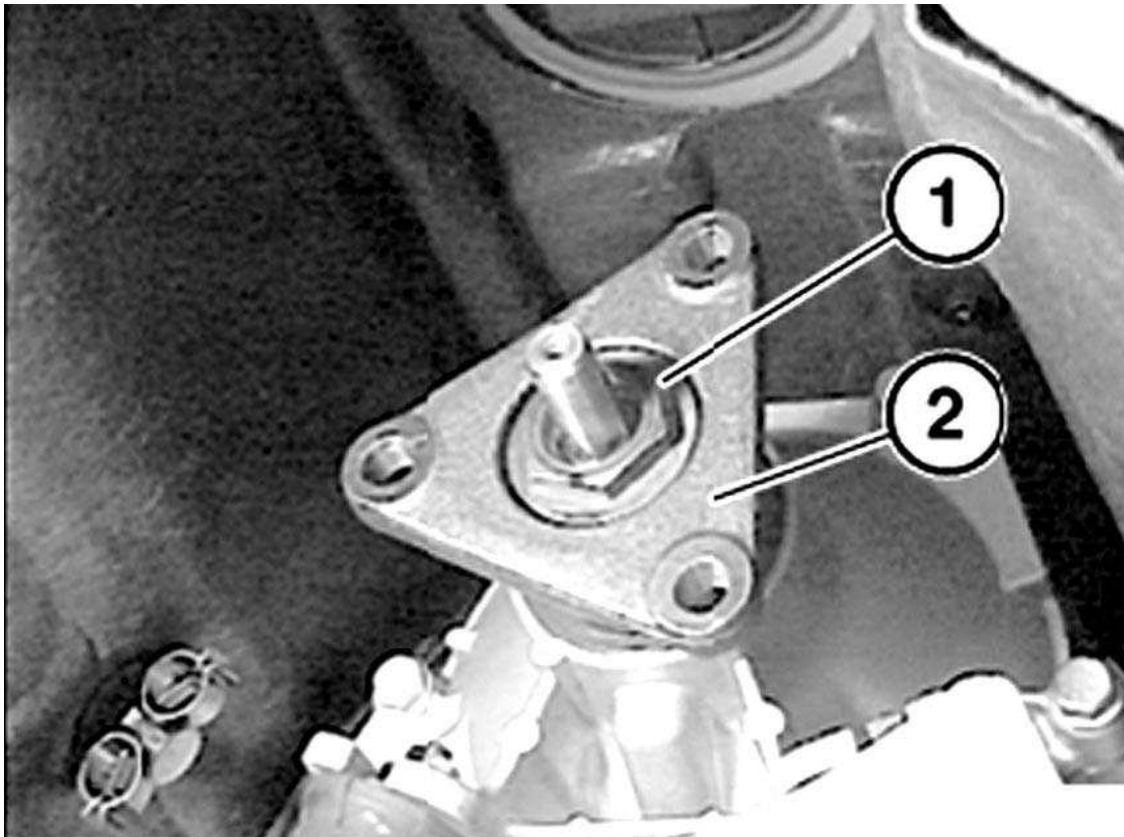
Version 1 without spring washer: grip output flange (1) with Special Tool (23 0 020). See **Fig. 52** . Release hexagon nut. Detach output flange (1). Upon installation, replace sealing ring in output flange (1). Install hexagon nut with screw retaining compound. Tighten to specification. See **TORQUE SPECIFICATIONS** .



G00382356

Fig. 52: Detaching Output Flange (Version 1)
Courtesy of BMW OF NORTH AMERICA, INC.

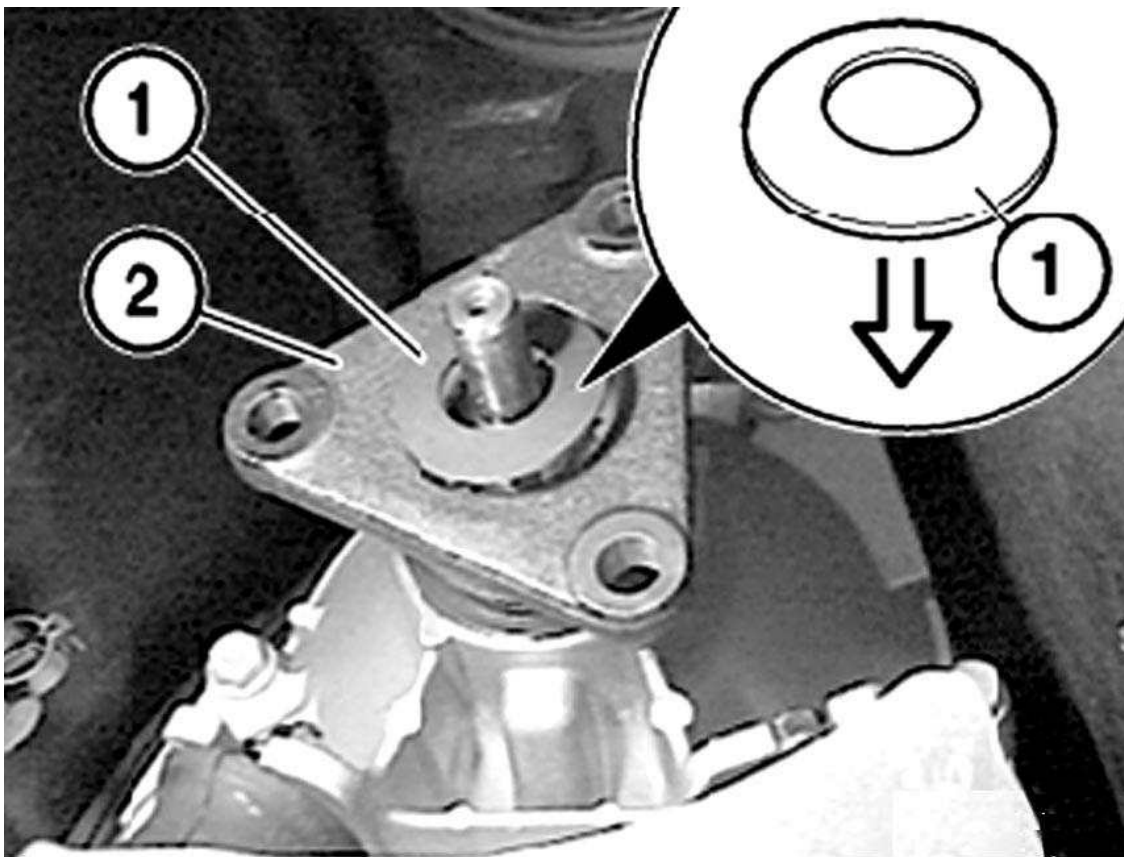
Version 2 with spring washer: release hexagon nut (1) on output flange (2). See **Fig. 53** . Upon installation, install hexagon nut with screw retaining compound and tighten to specification. See **TORQUE SPECIFICATIONS** .



G00382357

Fig. 53: Releasing Hexagon Nut On Output Flange
Courtesy of BMW OF NORTH AMERICA, INC.

Version 2 with spring washer: remove spring washer (1). See **Fig. 54** . Remove output flange (2). Upon installation: note installation direction of spring washer (1). Replace sealing ring in output flange (2).

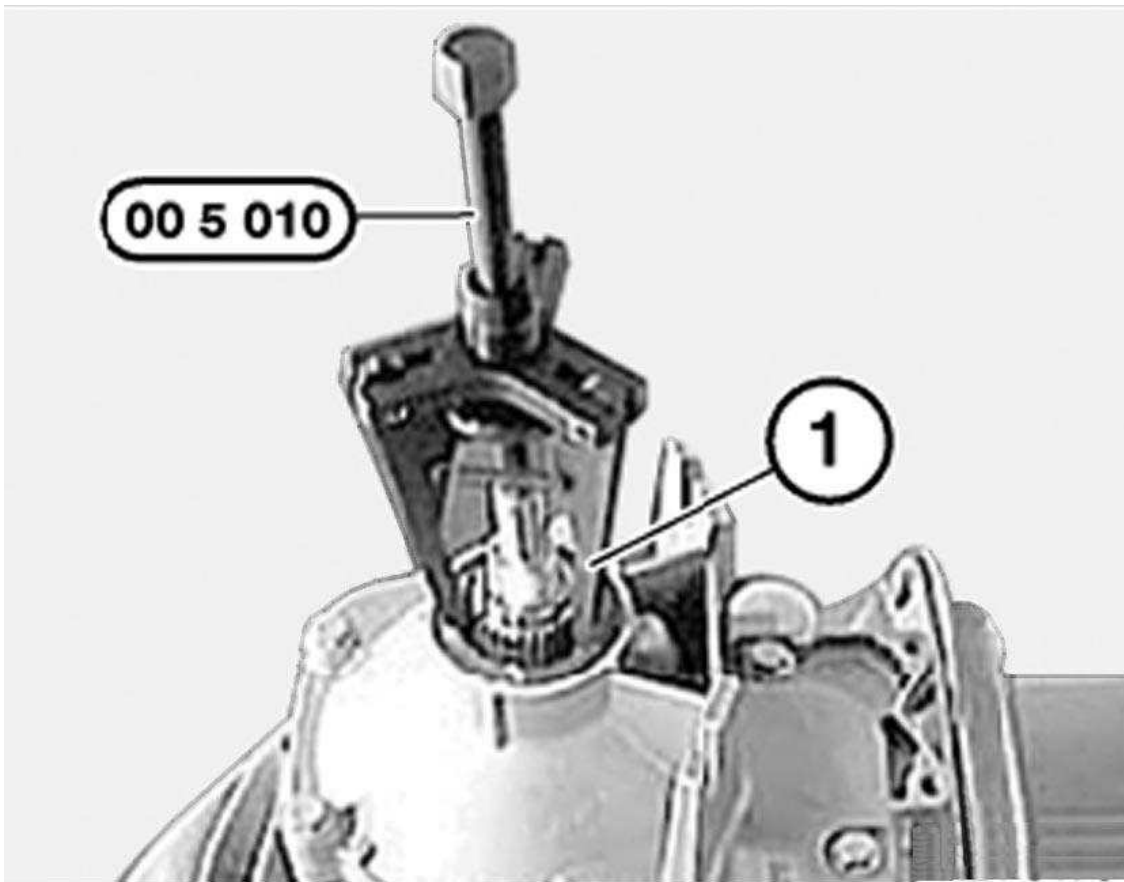


G00382358

Fig. 54: Removing Output Flange (Version 2)

Courtesy of BMW OF NORTH AMERICA, INC.

Withdraw radial seal (1) with Special Tool (00 5 010). See **Fig. 55** .

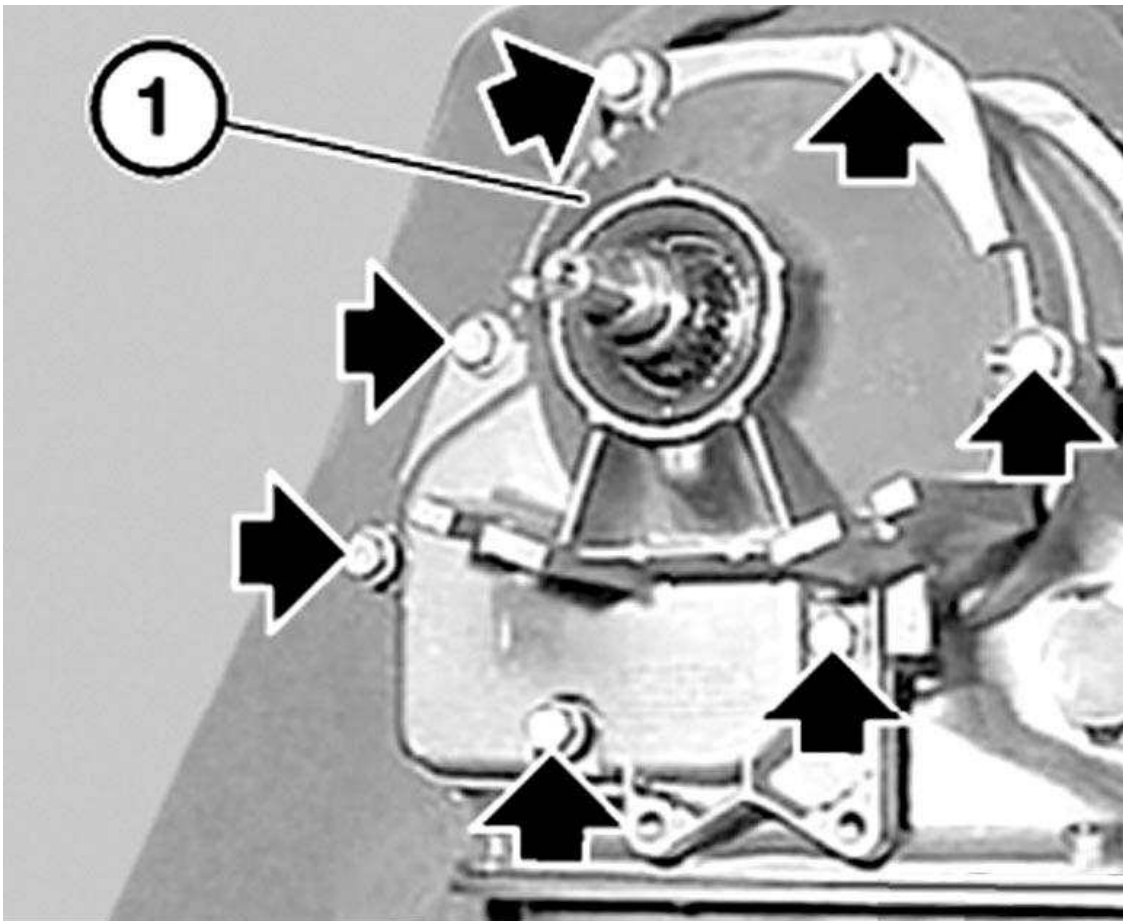


G00382359

Fig. 55: Removing Radial Seal

Courtesy of BMW OF NORTH AMERICA, INC.

Release screws on transmission extension housing (1). See **Fig. 56** . Carefully pull off transmission extension housing (1). Upon installation, tighten screws to specification. See **TORQUE SPECIFICATIONS** .

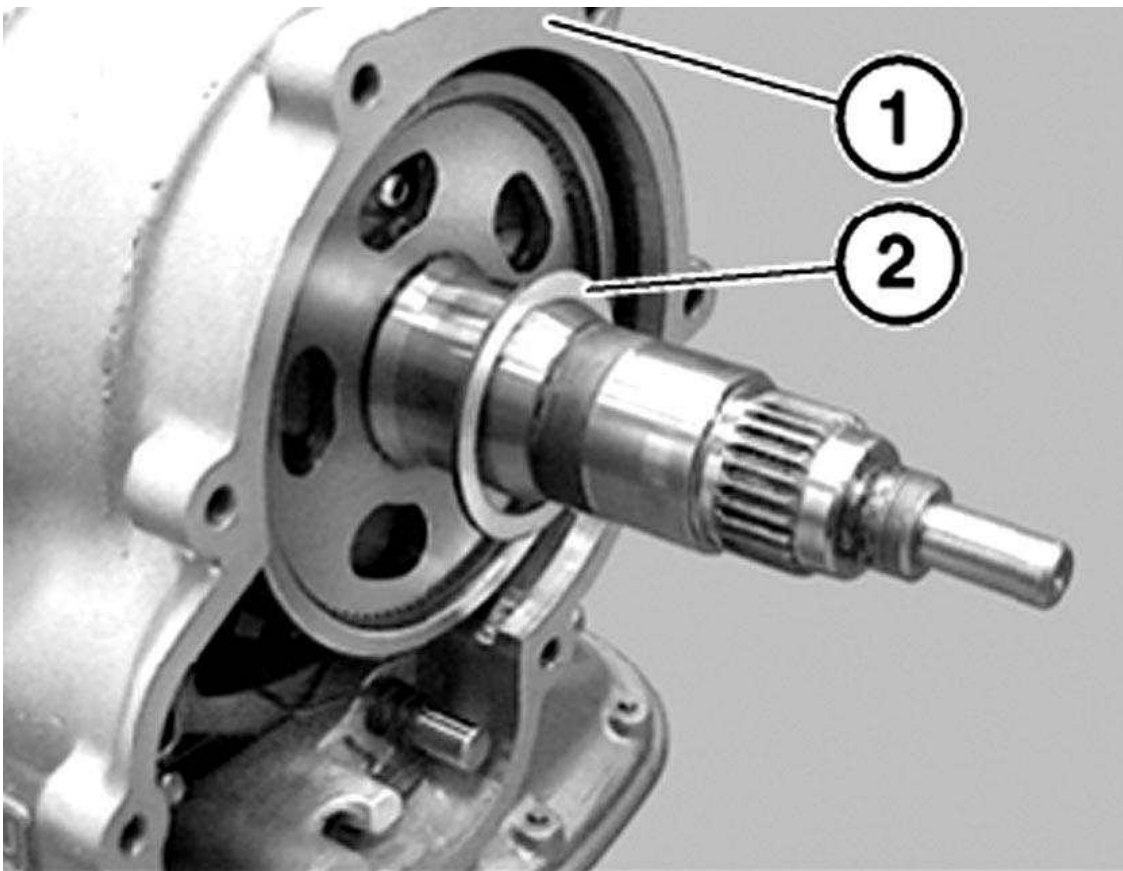


G00382360

Fig. 56: Locating Screws On Transmission Extension Housing
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Existing shim (2) remains fitted and is not recalculated.

Replace gasket between transmission housing (1) and end cover. See **Fig. 57** .

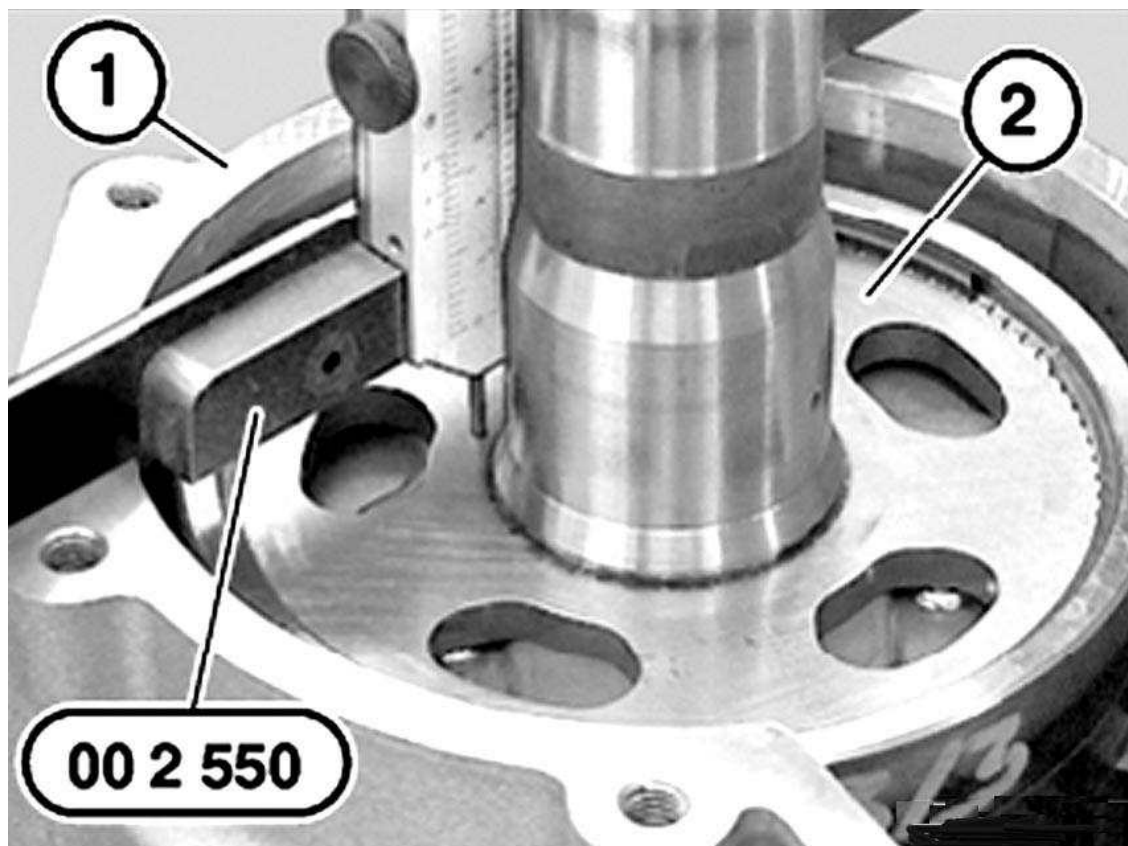


G00382361

Fig. 57: Replacing Gasket Between Transmission Housing & End Cover
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: If shim is lost: Calculate new shim.

Calculate measurement between contact face (1) and parking gear (2) with Special Tool (00 2 550). See **Fig. 58** . Calculate the new shim with this measurement from the following figure. See **Fig. 59** .



G00382362

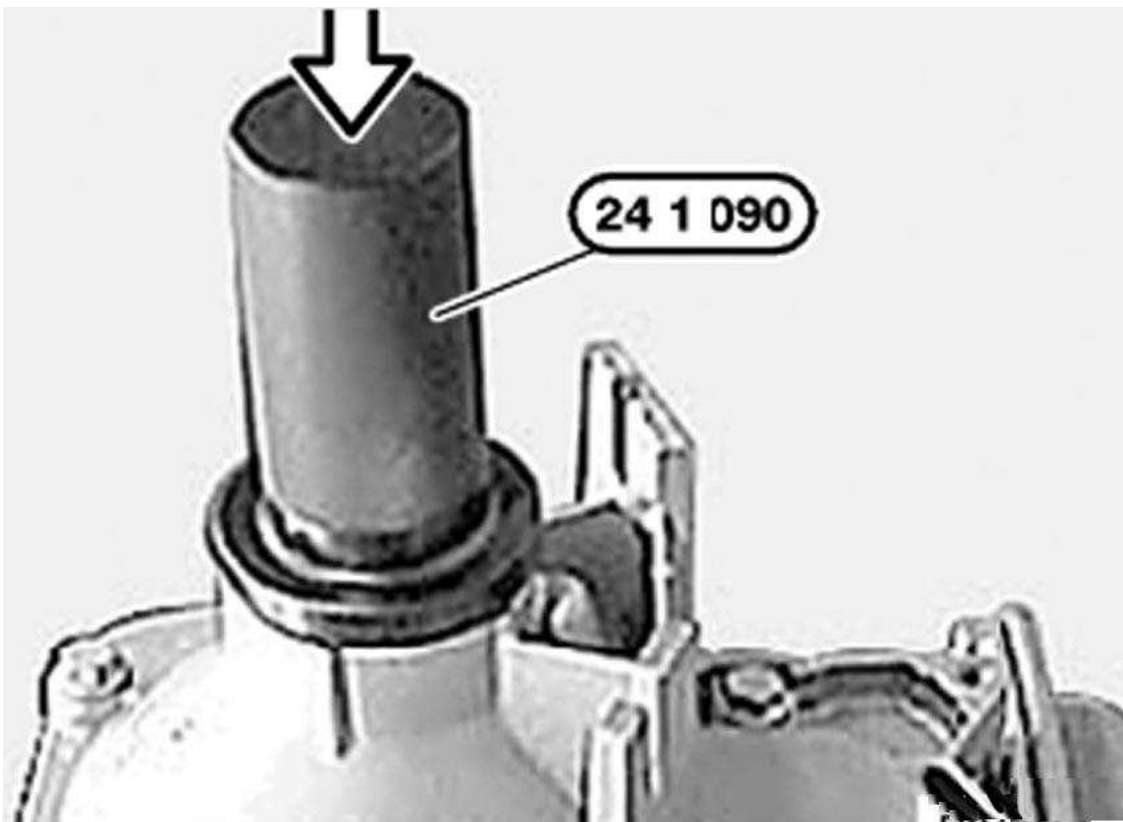
Fig. 58: Measuring Between Contact Face & Parking Gear
Courtesy of BMW OF NORTH AMERICA, INC.

Calculated measurement in mm	Shim
15,99 - 16,27	0.95/1.05
16,27 - 16,47	1.15/1.25
16,47 - 16,67	1.35/1.45
16,67 - 16,87	1.55/1.65
16,87 - 17,07	1.75/1.85
17,07 - 17,27	1.95/2.05
17,27 - 17,47	2.15/2.25
17,47 - 17,67	2.35/2.45
17,67 - 17,87	2.55/2.65
17,87 - 18,07	2.75/2.85

G00382363

Fig. 59: Calculating Shim Measurement
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation: coat sealing lips of new radial seal with automatic transmission fluid. Drive in radial seal with Special Tool (24 1 090) until flush. See **Fig. 60** .



G00382364

Fig. 60: Driving In Radial Seal

Courtesy of BMW OF NORTH AMERICA, INC.

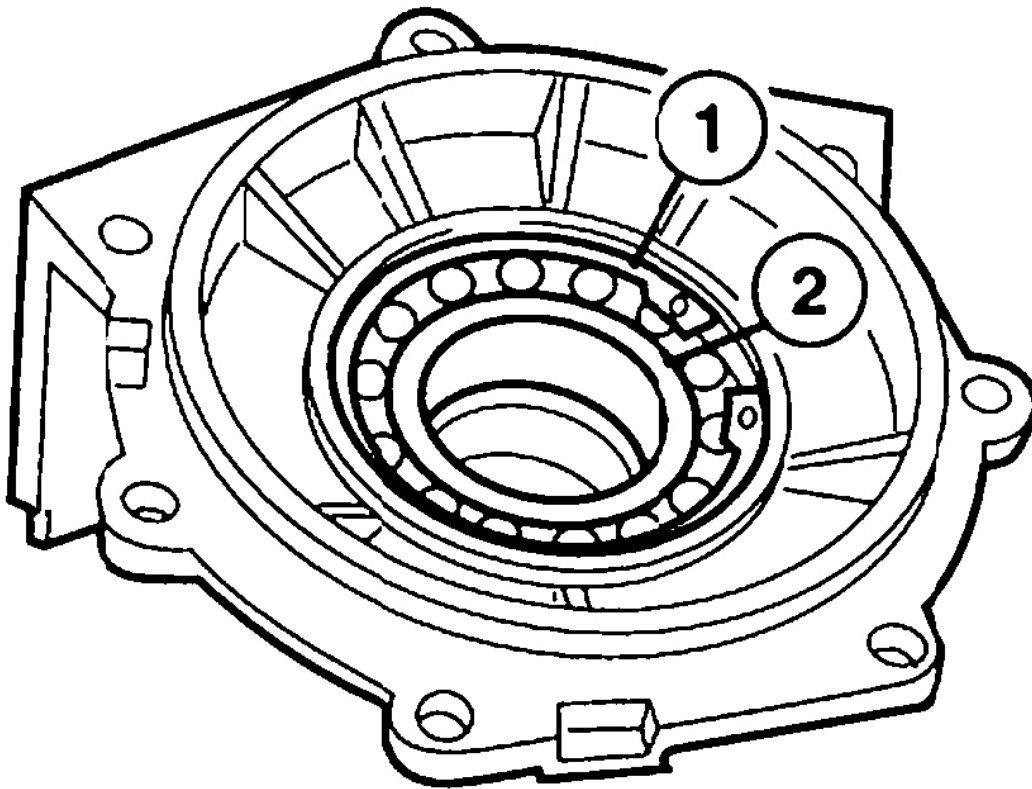
REPLACING BEARING ON TRANSMISSION EXTENSION (A5S 325Z)

NOTE: Numbers in text refer to numbers in figures.

CAUTION: After completion of work, check transmission oil level. Use only approved transmission fluid. Failure to comply with this instruction will result in serious damage to the transmission. End play must be checked and, if necessary, adjusted. See REPLACING OUTPUT FLANGE (A5S 325Z) .

Remove output flange. See REMOVING & INSTALLING TRANSMISSION EXTENSION (A5S 325Z) .

Lift out circlip (1). See Fig. 61 . Remove ball ring (2).

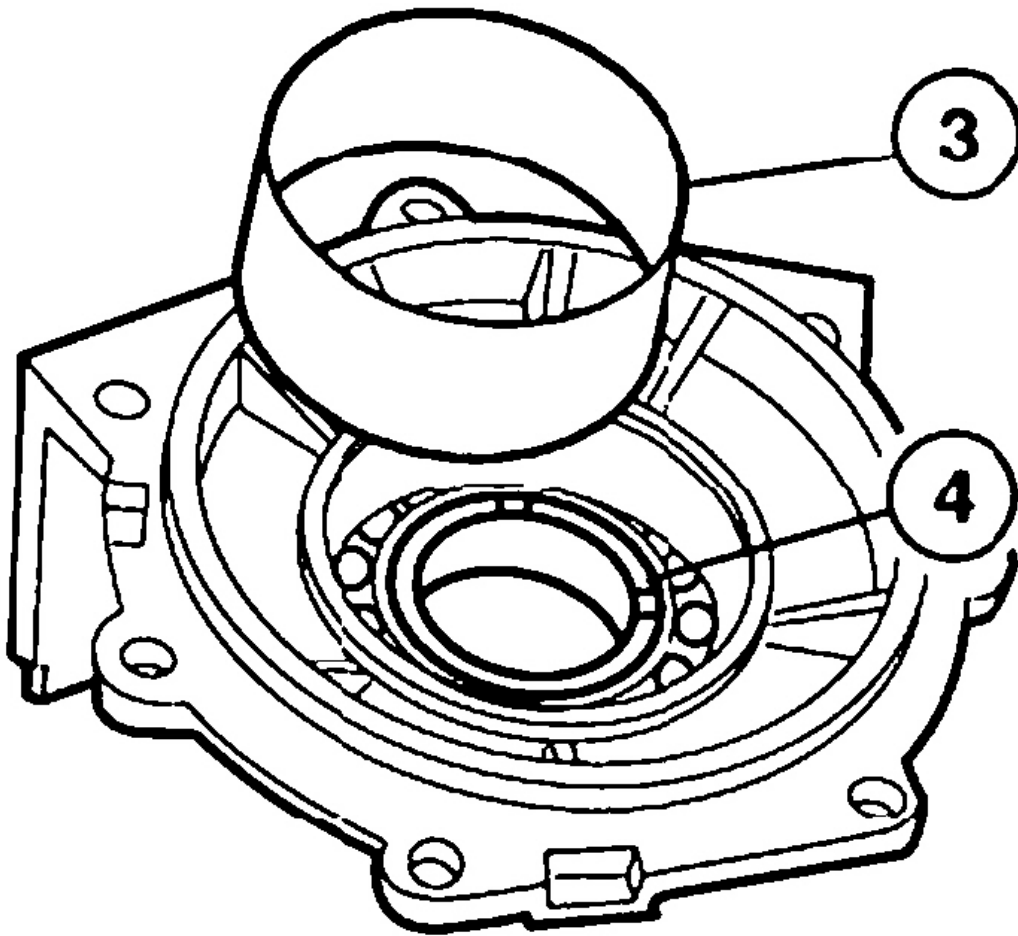


G00382311

Fig. 61: Locating Circlip

Courtesy of BMW OF NORTH AMERICA, INC.

Heat transmission extension in area of bearing race to approx. 80°C (hot air blower). See **Fig. 62** . Remove bearing race (3). Installation: install first ball ring (4), then bearing race.



G00382312

Fig. 62: Removing Bearing Race

Courtesy of BMW OF NORTH AMERICA, INC.

REPLACING OUTPUT FLANGE (A5S 325Z)

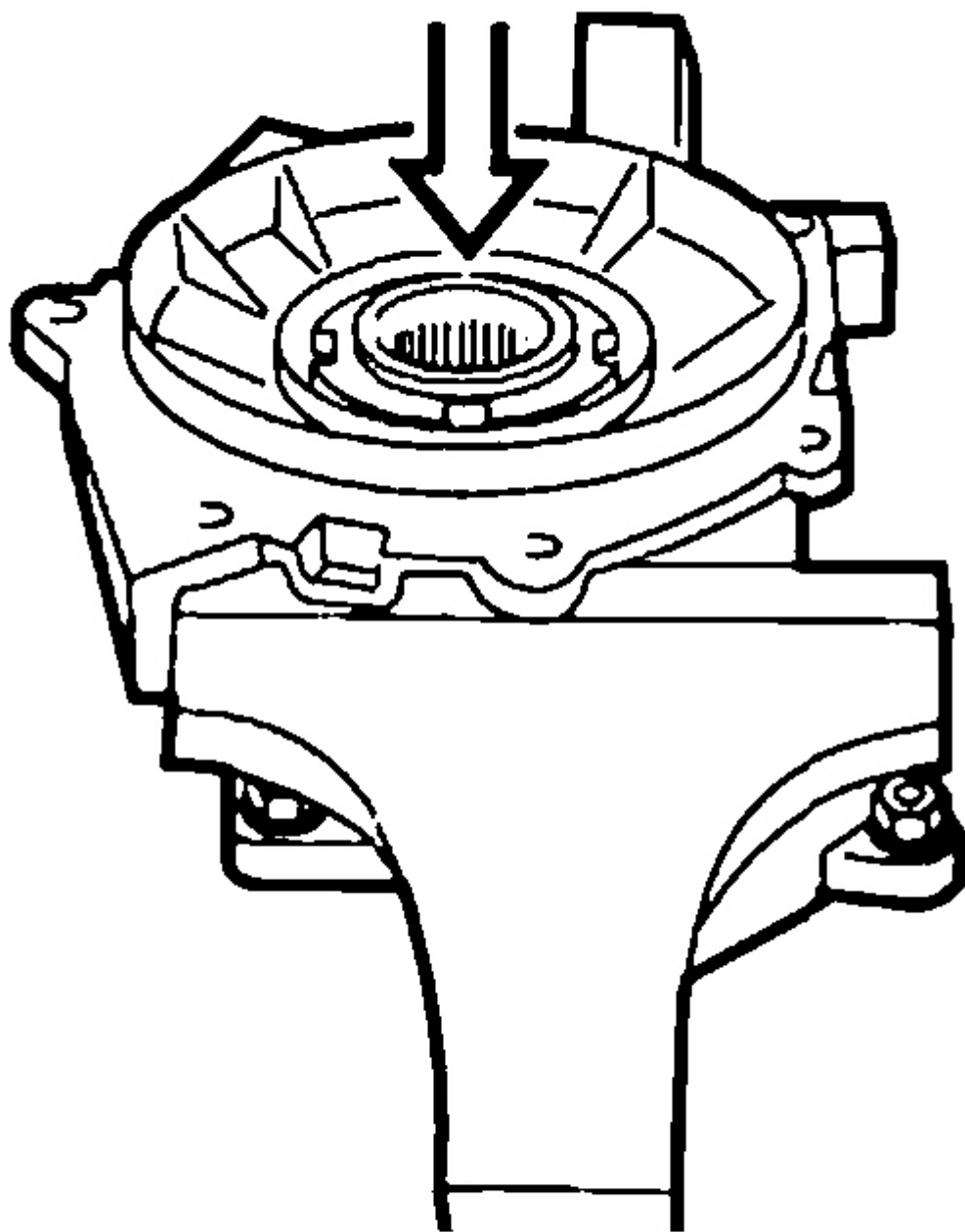
NOTE: Numbers in text refer to numbers in figures.

Remove output flange from mounting. See **REPLACING RADIAL SEAL FOR OUTPUT FLANGE (A5S 325Z)** . Installation: coat sealing lip of radial seal and sealing surface of output flange with ATF.

Installation: an end float of 0.15 - 0.35 mm is required between parking interlock gear and end face of output flange. End play is adjusted with shim (1). See **Fig. 92** . Replace sealing ring.

NOTE: Output flange must be free.

Determining thickness of shim: clamp transmission extension in a vise. Press output flange in direction of arrow. See **Fig. 63** .

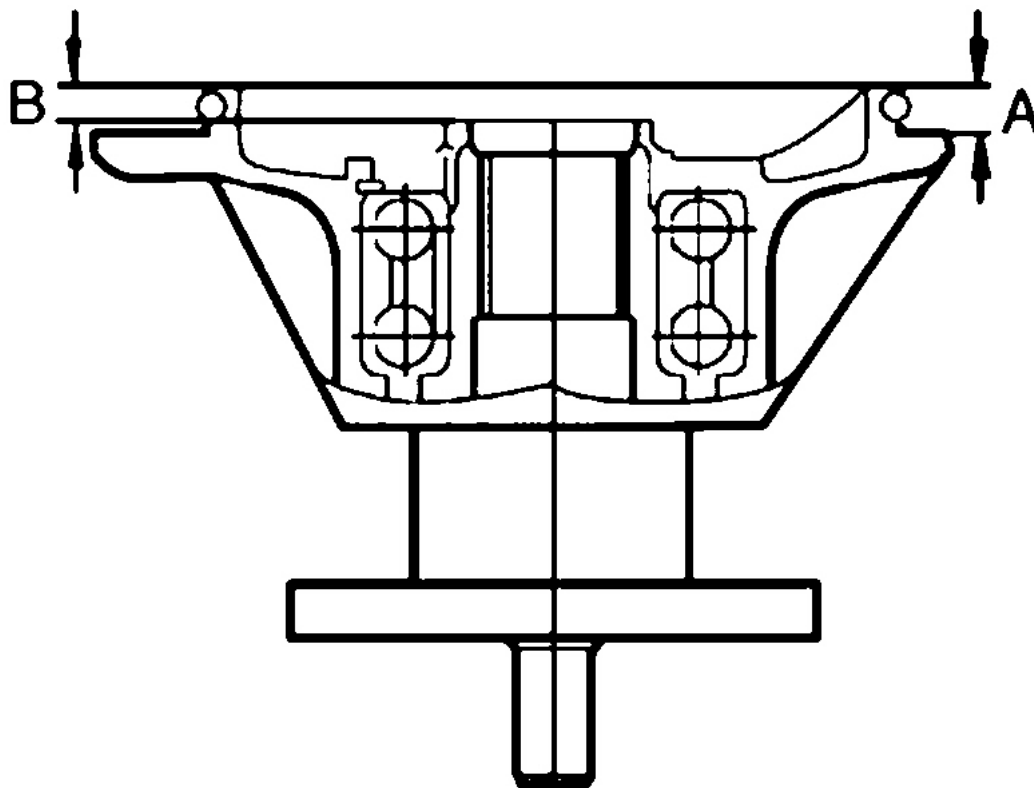


G00382313

Fig. 63: Pressing Output Flange
Courtesy of BMW OF NORTH AMERICA, INC.

Determine distance (A) from shoulder to sealing surface and distance (B) from shoulder to end face of output flange. See **Fig. 64** . Example:

- A = 10.00 mm
- B = 7.50 mm

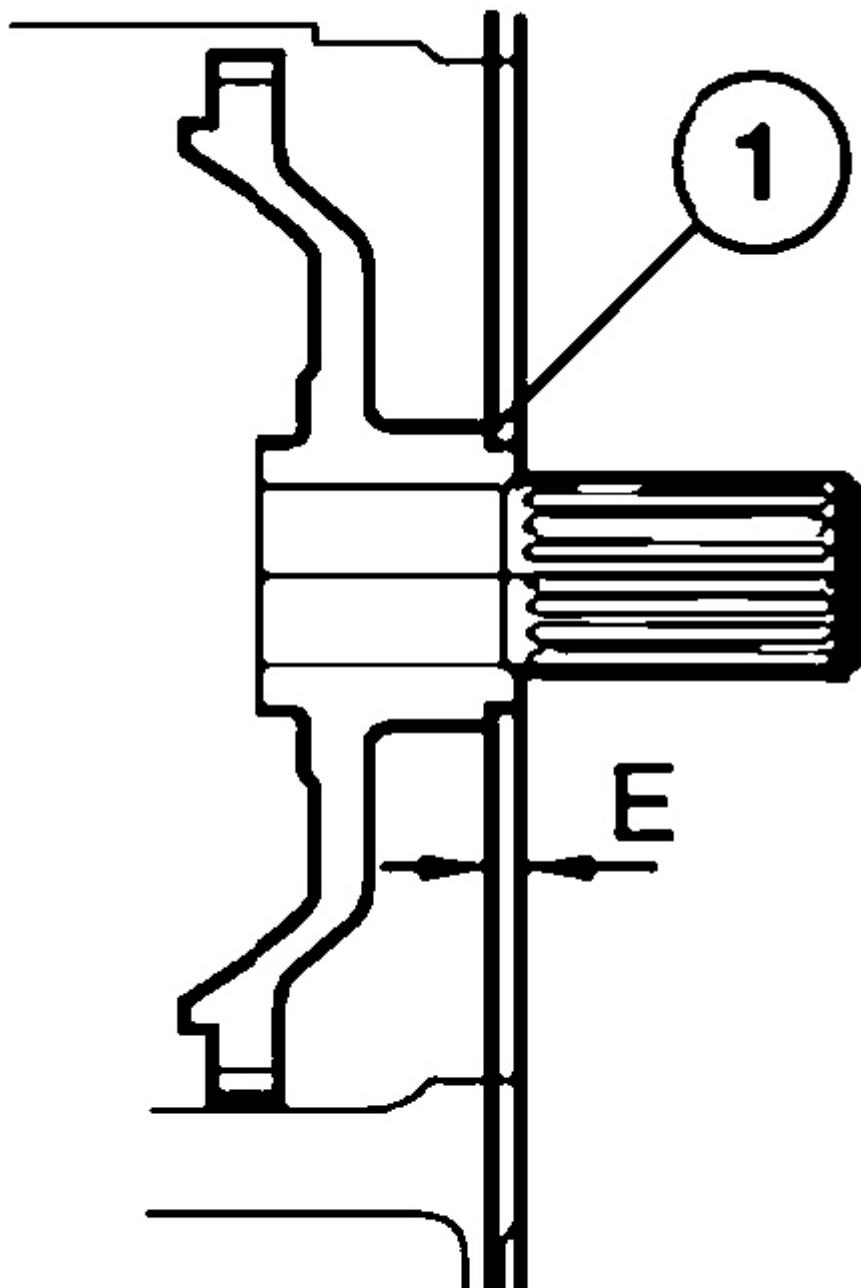


G00382314

Fig. 64: Locating Distance A & B

Courtesy of BMW OF NORTH AMERICA, INC.

Remove shim from sprag wheel. Press sprag wheel inwards. Determine distance (E) from sealing surface on transmission housing to shoulder (1) on parking lock gear. See **Fig. 65** . Example: E = 4.00 mm.



G00382315

Fig. 65: Locating Distance E

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Shims are available in 0.2 mm increments from 0.8 to 2.8 mm.

Calculate shim thickness:

1. $A - B = C$
2. $E - C$ - end play = shim thickness
3. If necessary: round distance to an amount divisible by 2. Pay attention to distance for end play (0.15 - 0.35 mm) in so doing. Example:
 - $10 - 7.5 = 2.5$
 - $4 - 2.5 - 0.25 = 1.15$ 3. 1.2

Install shim (example: 1.20 mm).

REPLACING OUTPUT FLANGE (A5S 360R / 390R)

NOTE: Numbers in text refer to numbers in figures.

NOTE: After completing work, top up ATF level. Check/top up fluid level in automatic transmission. See CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (A5S 360R / 390R, A4S 200R / 310R) .

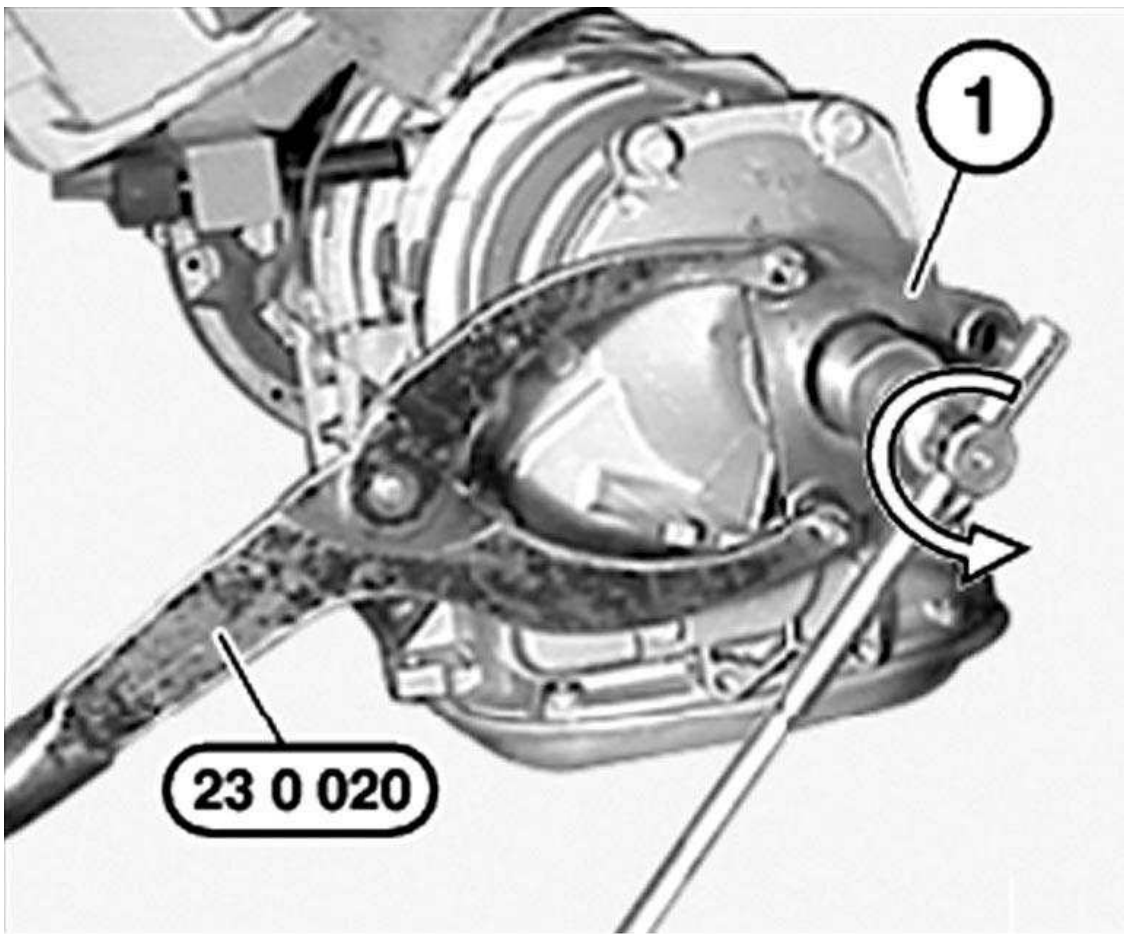
Remove complete exhaust system.

Remove heat shield (1). See Fig. 44 .

Release screws. See Fig. 48 . Upon installation: replace self-locking nuts and tighten to specification. See TORQUE SPECIFICATIONS .

Grip propeller shaft. Release nuts. See Fig. 49 . Bend propeller shaft downwards at center bearing (1). Detach propeller shaft from transmission output flange and tie back to side on vehicle underbody. Upon installation, tighten nuts to specification. See TORQUE SPECIFICATIONS .

Grip output flange (1) with Special Tool (23 0 020). See Fig. 66 . Release hexagon nut. Detach output flange (1). Upon installation, install hexagon nut with screw retaining compound and tighten to specification. See TORQUE SPECIFICATIONS .

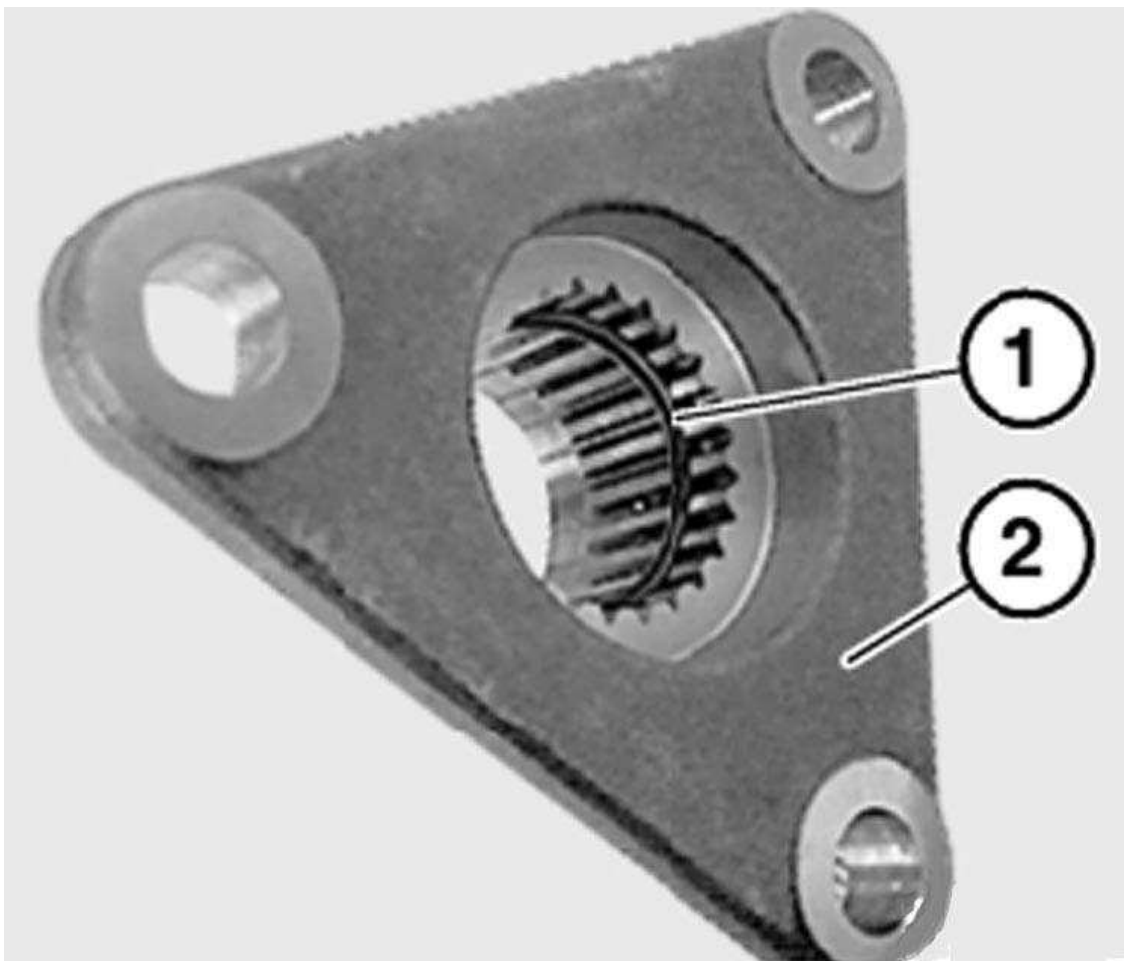


G00382365

Fig. 66: Detaching Output Flange

Courtesy of BMW OF NORTH AMERICA, INC.

Installation: replace inner sealing ring (1) on output flange (2). See **Fig. 67** .



G00382366

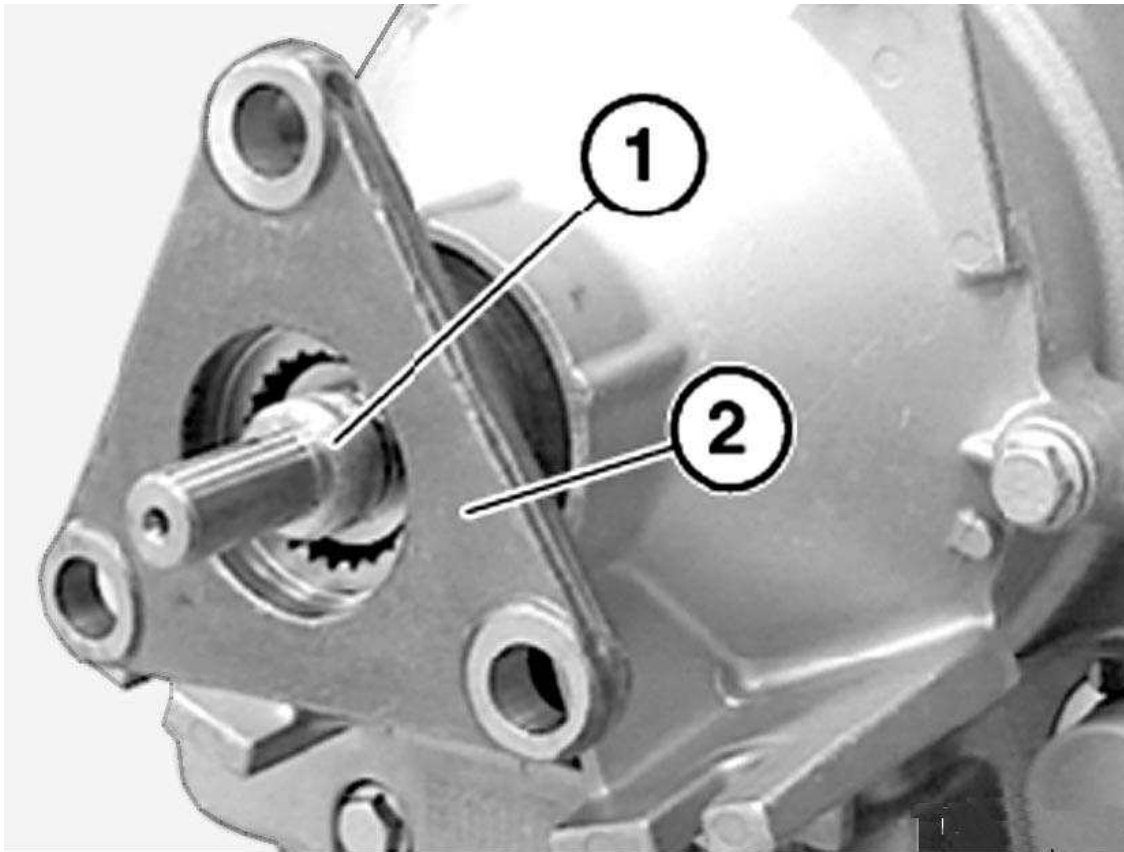
Fig. 67: Replacing Inner Sealing Ring
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: There are two different output flanges; DO NOT mix them up.

Version 1 (without spring washer) Identifying features:

- There is no spring washer fitted between the flange nut and output flange to secure the output flange (2) on the flange nut (1). See **Fig. 68** .
- When this output flange is replaced, the add-on kit detailed below must be retrofitted.

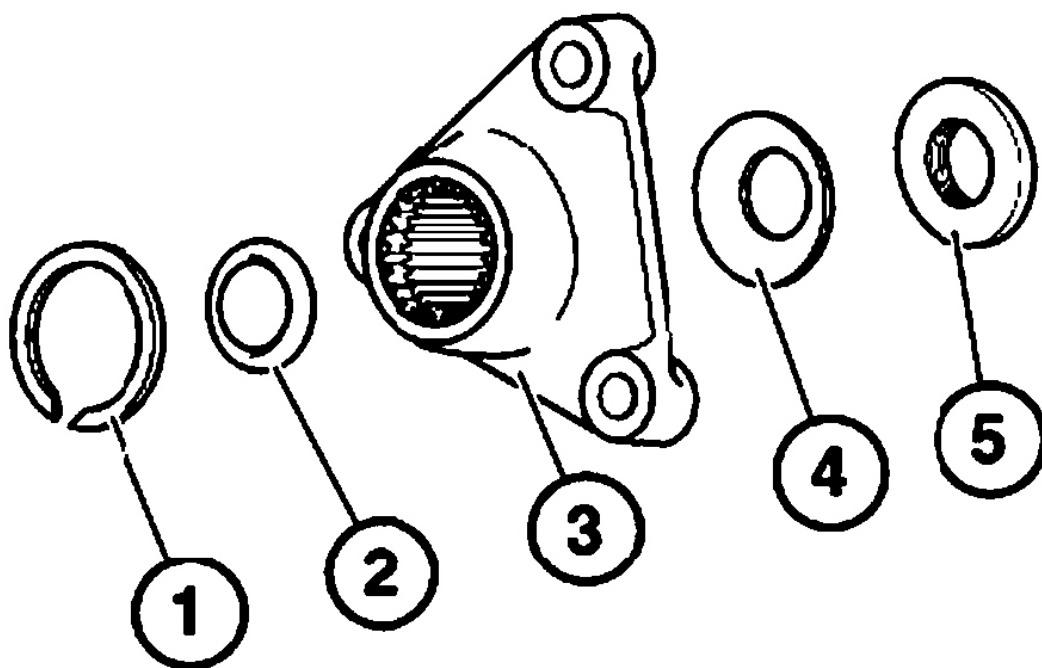
CAUTION: Only the modified version (Version 2) is still available as a replacement.



G00382367

Fig. 68: Identifying Version 1
Courtesy of BMW OF NORTH AMERICA, INC.

For retrofit kit, see **Fig. 69** . Install add-on kit for output flange.



- 1 Snap ring
- 2 Sealing ring
- 3 Output flange
- 4 Spring washer
- 5 Flange nut

G00382368

Fig. 69: Identifying Retrofit Kit

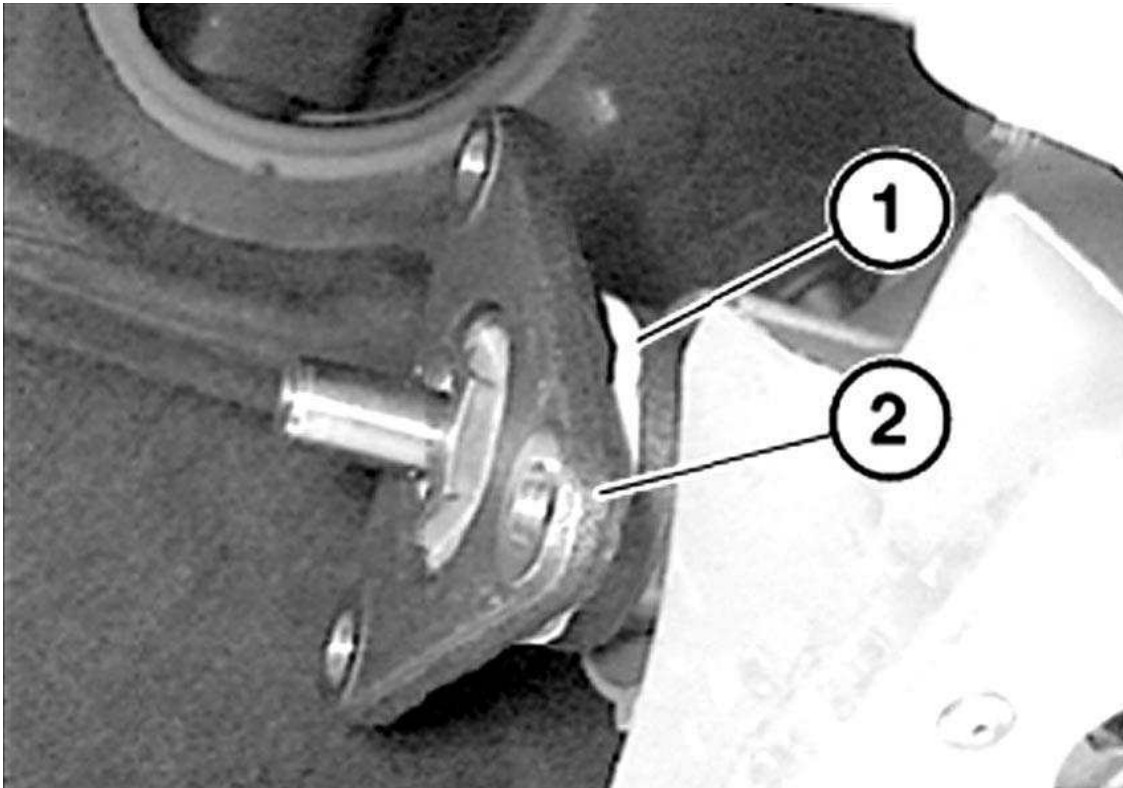
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: If the version 2 output flange is replaced by a version 2 model, the snap ring supplied in the add-on kit must not be replaced because the fitted snap ring is difficult to remove. See [Fig. 69](#) The fitted snap ring must be left in the transmission

NOTE: In series production, the output flange with spring washer is fitted from transmission serial number 7912 and has no color marking.

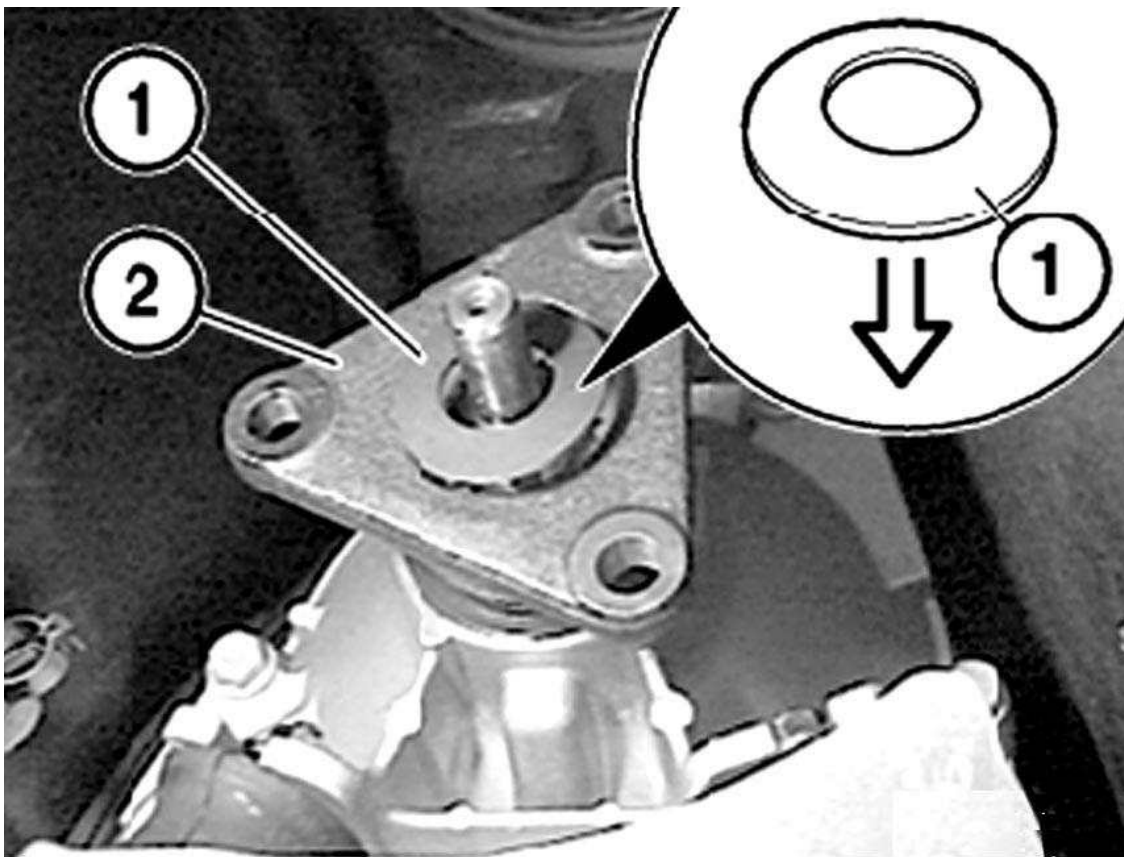
Version 2 (with spring washer) Identifying features:

1. As the substitute, the output flange with spring washer (2) is identified with a white marking (1) around its circumference. See **Fig. 70** .
2. The spring washer (1) is fitted between flange nut and output flange (2). See **Fig. 71** .



G00382369

Fig. 70: Identifying Version 2
Courtesy of BMW OF NORTH AMERICA, INC.



G00382370

Fig. 71: Locating Spring Washer

Courtesy of BMW OF NORTH AMERICA, INC.

REPLACING PRESSURE REGULATOR FOR CONVERTER LOCKUP CLUTCH (A5S 360R / 390R, A4S 200R)

NOTE: After completing work, top up ATF level. Check/top up fluid level in automatic transmission. See CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (A5S 360R / 390R, A4S 200R / 310R) .

Remove shift unit. See REMOVING AND INSTALLING/REPLACING SELECTOR UNIT (A5S 360R / 390R, A4S 200R) .

Remove retaining spring. Pull out pressure regulator (1) for converter lockup clutch. See Fig. 72 .



G00382371

Fig. 72: Removing Pressure Regulator
Courtesy of BMW OF NORTH AMERICA, INC.

Installation: coat new pressure regulator (1) for converter lockup clutch with automatic transmission fluid.

REPLACING PRESSURE REGULATOR FOR MAIN PRESSURE (A5S 360R/390R, A4S 200R)

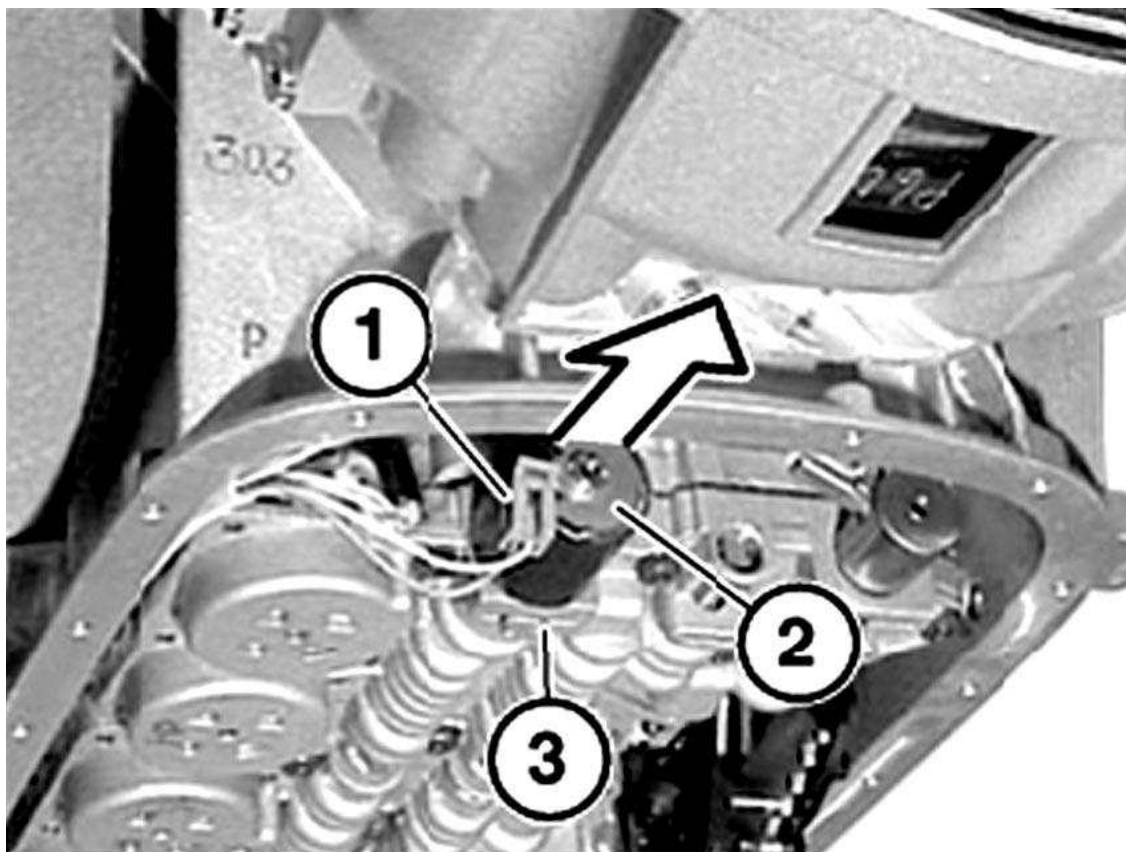
NOTE: Numbers in text refer to numbers in figures.

NOTE: After completing work, top up ATF level. Check/top up fluid level in automatic transmission. See **CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (A5S 360R / 390R, A4S 200R / 310R)** .

Remove transmission sump. See **REMOVING AND INSTALLING/SEALING OR REPLACING TRANSMISSION FLUID SUMP (A5S 360R / 390R, A4S 200R)** .

Remove transmission fluid screen. See **REMOVING AND INSTALLING/REPLACING TRANSMISSION SCREEN (A5S 360R / 390R, A4S 200R)** .

Disconnect plug (1) from pressure regulator (2) for main pressure. See **Fig. 73** . Remove retaining spring (3). Remove pressure regulator (2) for main pressure. Upon installation: coat new pressure regulator (2) for main pressure with automatic transmission fluid.



G00382372

Fig. 73: Removing Pressure Regulator For Main Pressure
Courtesy of BMW OF NORTH AMERICA, INC.

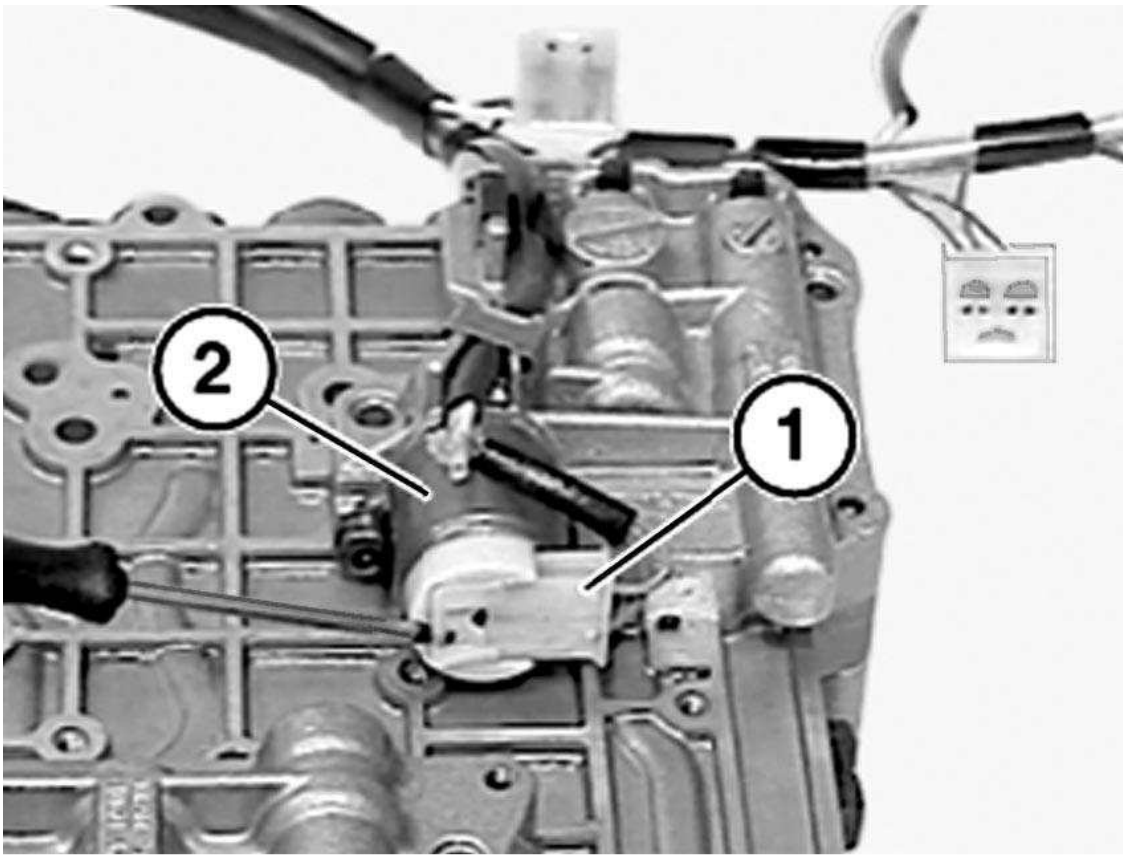
REPLACING PRESSURE REGULATOR FOR SYSTEM PRESSURE (A5S 325Z)

NOTE: Numbers in text refer to numbers in figures.

NOTE: After completing work, top up ATF level. Check/top up fluid level in automatic transmission. See **CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (A5S 325Z)** .

Remove and install shift unit. See **REMOVING AND INSTALLING/REPLACING SHIFT UNIT (A5S 325Z)** .

Disconnect plug (1) from pressure regulator (2) for system pressure. See **Fig. 74** .



G00382332

Fig. 74: Disconnecting Plug From Pressure Regulator
Courtesy of BMW OF NORTH AMERICA, INC.

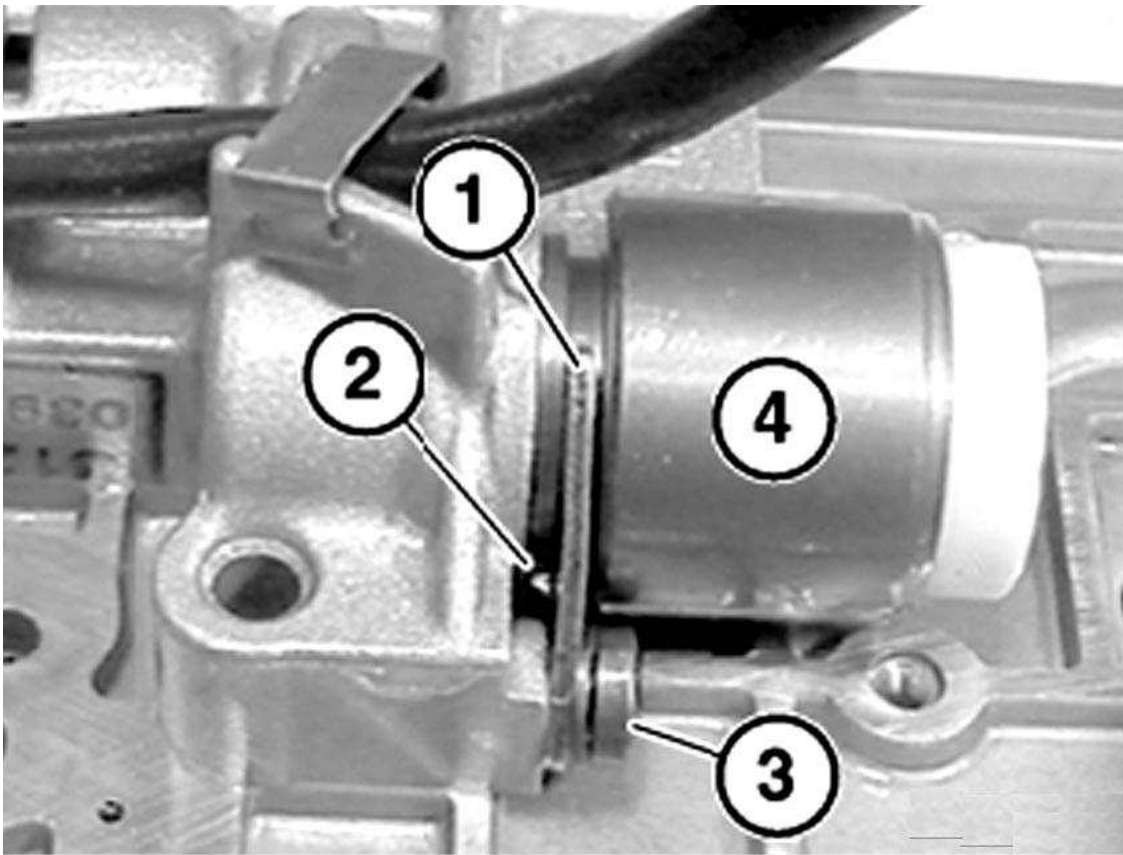
Unscrew bolt (1). See **Fig. 75** . Remove retaining plate (2). Remove pressure regulator (3) for system pressure. Upon installation: coat new pressure regulator (3) for system pressure with ATF.



G00382333

Fig. 75: Removing Pressure Regulator For System Pressure
Courtesy of BMW OF NORTH AMERICA, INC.

Slide in pressure regulator (4). See **Fig. 76** . Install retaining plate (1) with lug (2) as illustrated. Install screw (3). Tighten fasteners to specification. See **TORQUE SPECIFICATIONS** .



G00382334

Fig. 76: Installing Pressure Regulator
Courtesy of BMW OF NORTH AMERICA, INC.

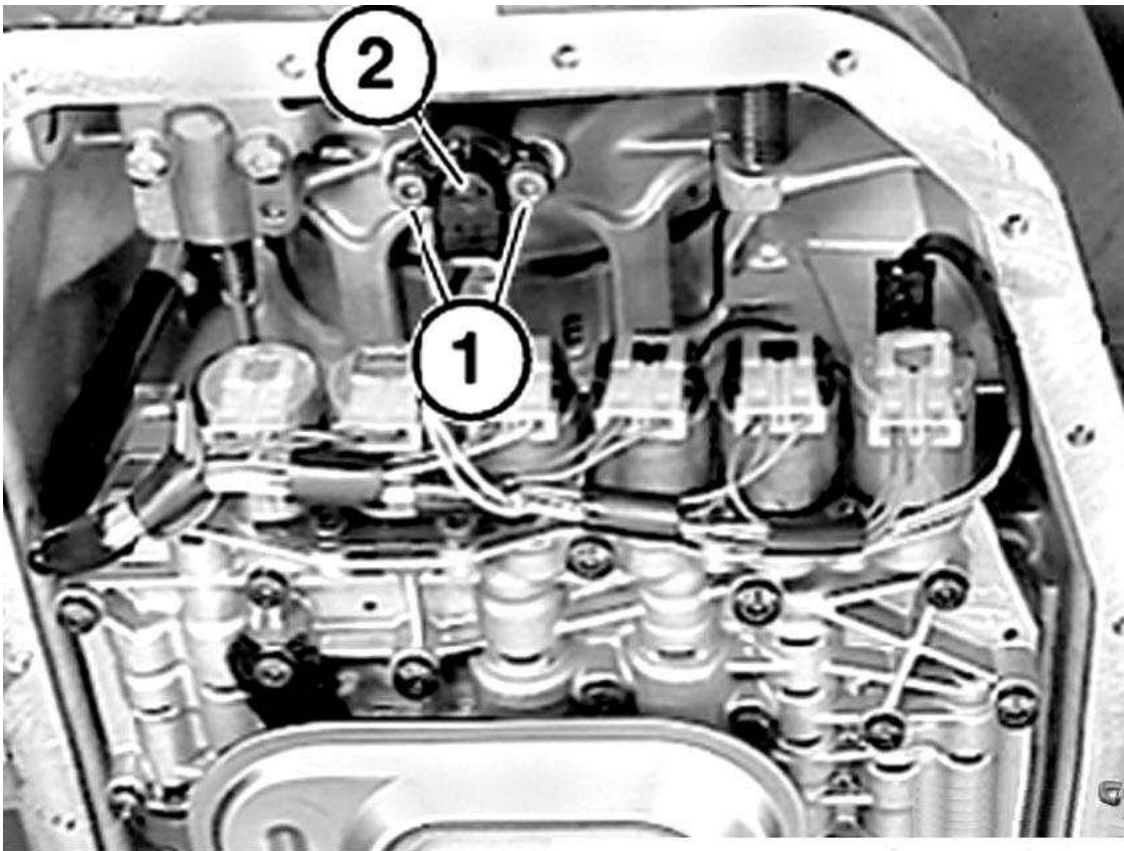
REPLACING PULSE GENERATOR (OUTPUT SPEED) (A5S 325Z)

NOTE: Numbers in text refer to numbers in figures.

NOTE: After completing work, top up ATF level. Check/top up fluid level in automatic transmission. See **CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (A5S 325Z)** .

Remove and install transmission oil sump. See **REMOVING AND INSTALLING/SEALING OR REPLACING TRANSMISSION OIL SUMP (A5S 325Z)** .

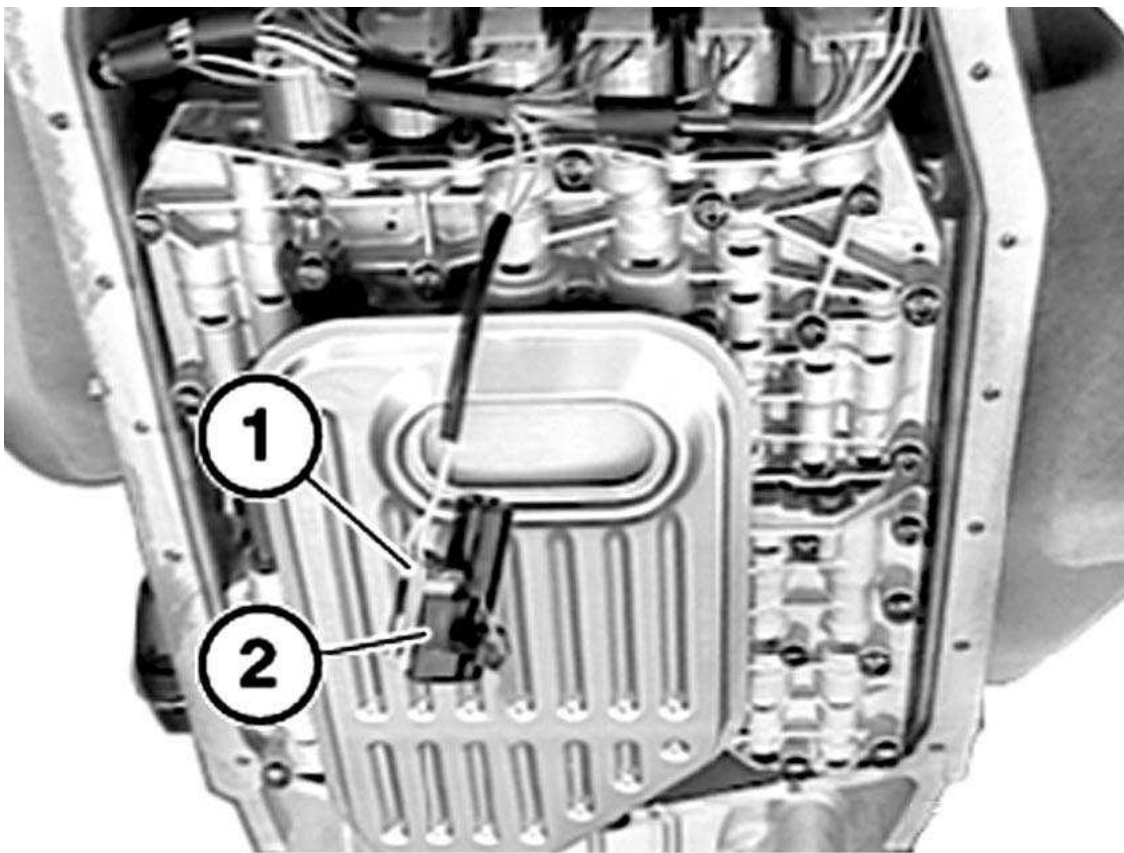
Unscrew bolt (1). See **Fig. 77** . Remove pulse generator (2). Upon installation, tighten bolt to specification. See **TORQUE SPECIFICATIONS** .



G00382335

Fig. 77: Removing Pulse Generator
Courtesy of BMW OF NORTH AMERICA, INC.

Detach plug (1) from pulse generator (2). See **Fig. 78** .



G00382336

Fig. 78: Detaching Plug From Pulse Generator
Courtesy of BMW OF NORTH AMERICA, INC.

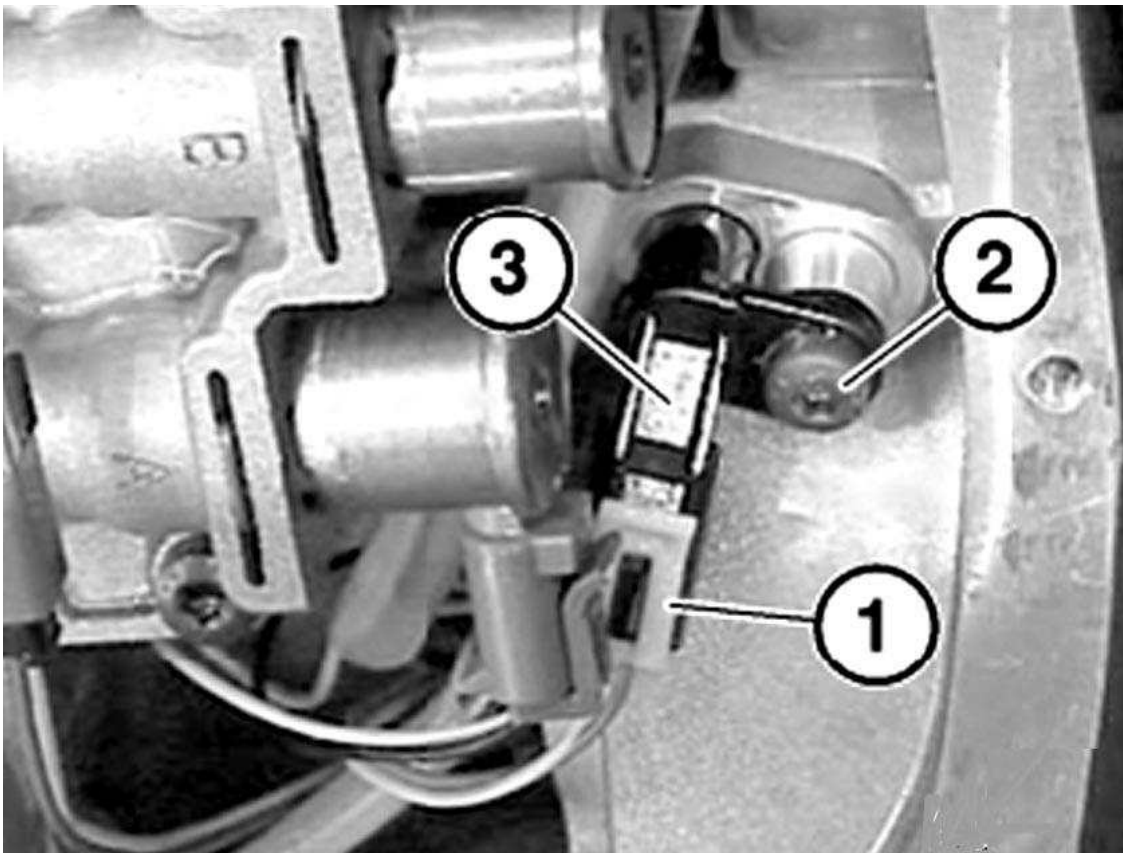
REPLACING PULSE GENERATOR (OUTPUT SPEED) (A5S 360R / 390R, A4S 200R)

NOTE: Numbers in text refer to numbers in figures.

NOTE: After completing work, top up ATF level. Check/top up fluid level in automatic transmission. See **CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (A5S 360R / 390R, A4S 200R / 310R)** .

Remove transmission oil sump. See **REMOVING AND INSTALLING/SEALING OR REPLACING TRANSMISSION OIL SUMP (A5S 325Z)** .

Pull off plug (1). See **Fig. 79** . Unscrew bolt (2). Withdraw pulse generator (3). Upon installation, tighten bolt to specification. See **TORQUE SPECIFICATIONS** . Read out fault memory of EGS control unit. Check stored fault messages, eliminate faults and then clear fault memory.



G00382375

Fig. 79: Removing Output Speed Pulse Generator
Courtesy of BMW OF NORTH AMERICA, INC.

REPLACING PULSE GENERATOR (TURBINE SPEED) (A5S 325Z)

NOTE: Numbers in text refer to numbers in figures.

NOTE: After completing work, top up ATF level. Check/top up fluid level in automatic transmission. See **CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (A5S 325Z)** .

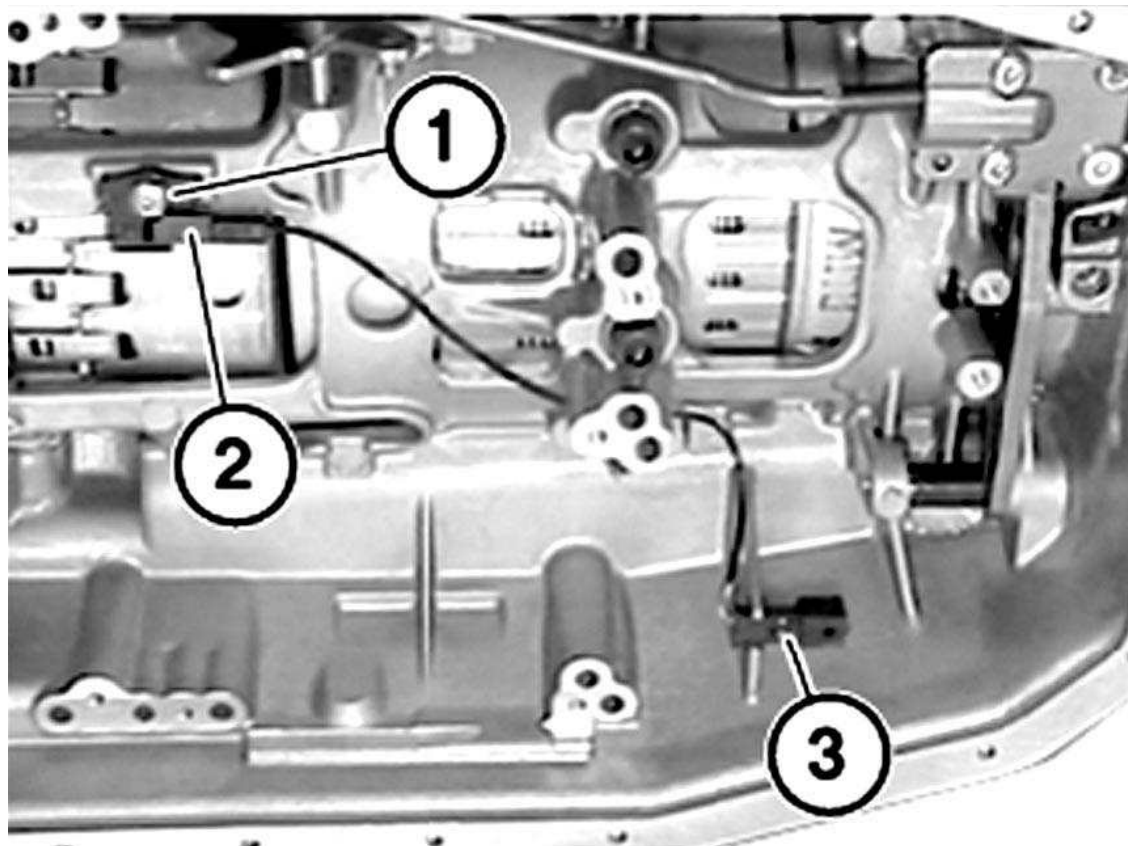
Remove and install transmission oil sump. See **REMOVING AND INSTALLING/SEALING OR REPLACING TRANSMISSION OIL SUMP (A5S 325Z)** .

Remove and install transmission oil screen. See **REMOVING AND INSTALLING/SEALING OR REPLACING TRANSMISSION OIL SUMP (A5S 325Z)** .

Remove and install shift unit. See **REMOVING AND INSTALLING/REPLACING SHIFT UNIT (A5S**

325Z .

Unscrew bolt (1). See **Fig. 80** . Withdraw pulse generator (2). Pull off connector (3). Upon installation, tighten bolt to specification. See **TORQUE SPECIFICATIONS** .



G00382337

Fig. 80: Removing Pulse Generator

Courtesy of BMW OF NORTH AMERICA, INC.

REPLACING PULSE GENERATOR (TURBINE SPEED) (A5S 360R / 390R, A4S 200R)

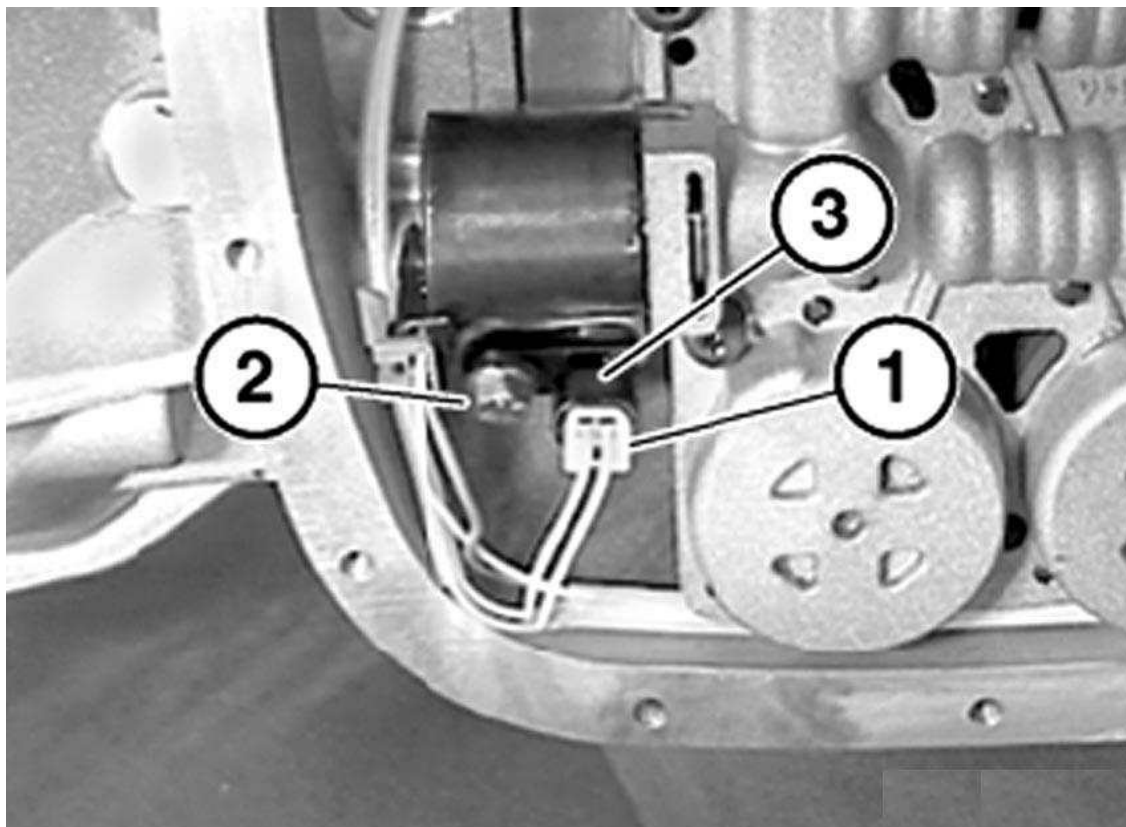
NOTE: Numbers in text refer to numbers in figures.

NOTE: After completing work, top up ATF level. Check/top up fluid level in automatic transmission. See **CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (A5S 360R / 390R, A4S 200R / 310R)** .

Remove transmission oil sump. See **REMOVING AND INSTALLING/SEALING OR REPLACING TRANSMISSION FLUID SUMP (A5S 360R / 390R, A4S 200R)** .

Pull off plug (1). See **Fig. 81** . Release screw (2). Withdraw pulse generator (3). Upon installation, tighten screw

to specification. See **TORQUE SPECIFICATIONS** . Read out fault memory of EGS control unit. Check stored fault messages, eliminate faults and then clear fault memory.



G00382374

Fig. 81: Removing Turbine Speed Pulse Generator
Courtesy of BMW OF NORTH AMERICA, INC.

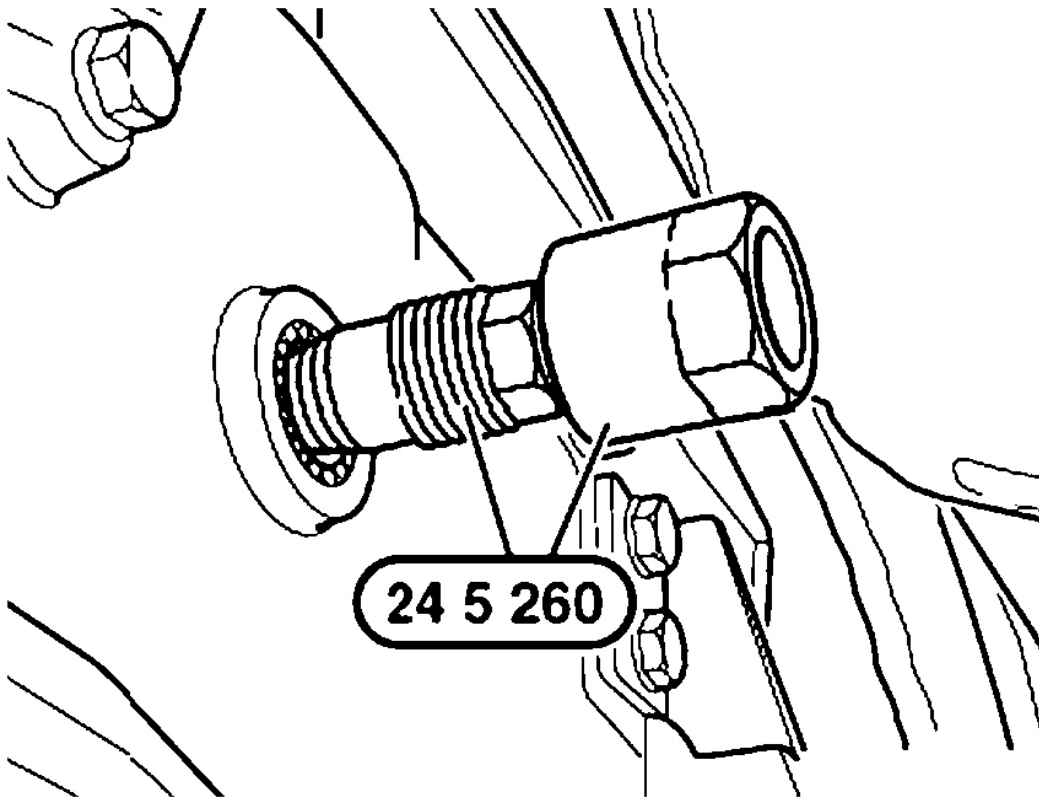
REPLACING RADIAL SEAL ON MANUAL SHIFT VALVE SHAFT (A5S 325Z)

NOTE: Numbers in text refer to numbers in figures.

NOTE: After completing work, top up ATF level. Check/top up fluid level in automatic transmission. See **CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (A5S 325Z)** .

Remove position switch from the manual shift valve shaft. See **REMOVING AND INSTALLING/REPLACING POSITION SWITCH (A5S 325Z)** .

Remove radial seal with Special Tool (24 5 260) from transmission housing. See **Fig. 82** .

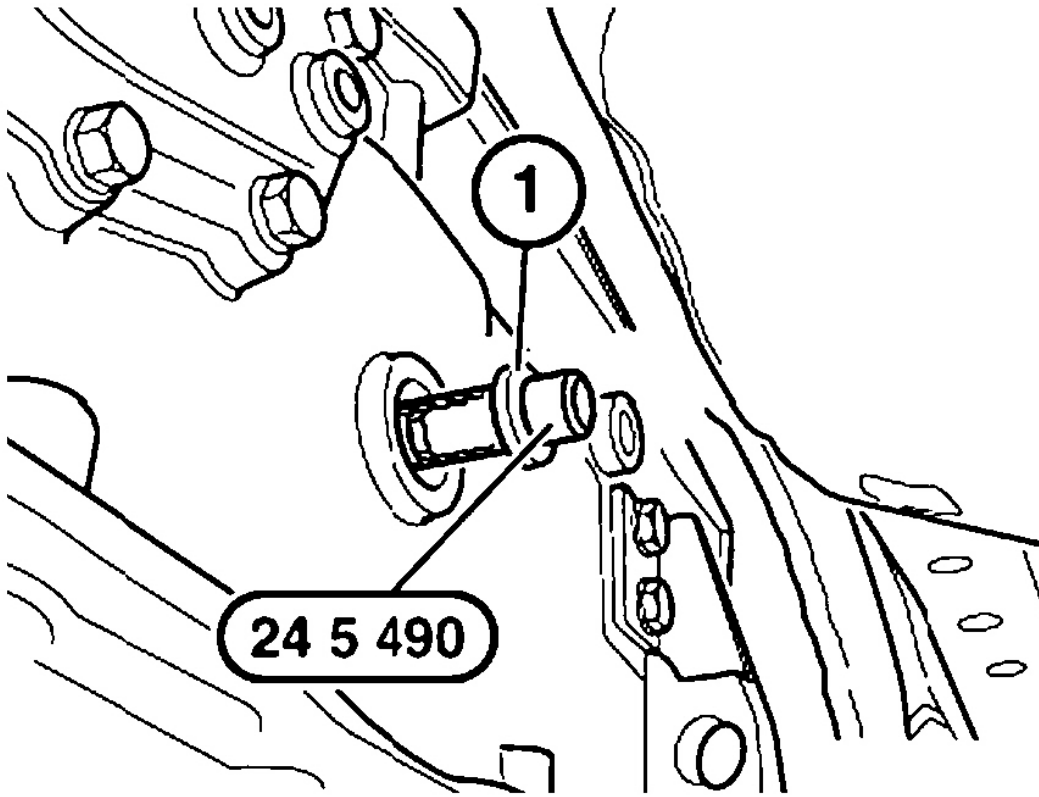


G00382340

Fig. 82: Removing Radial Seal

Courtesy of BMW OF NORTH AMERICA, INC.

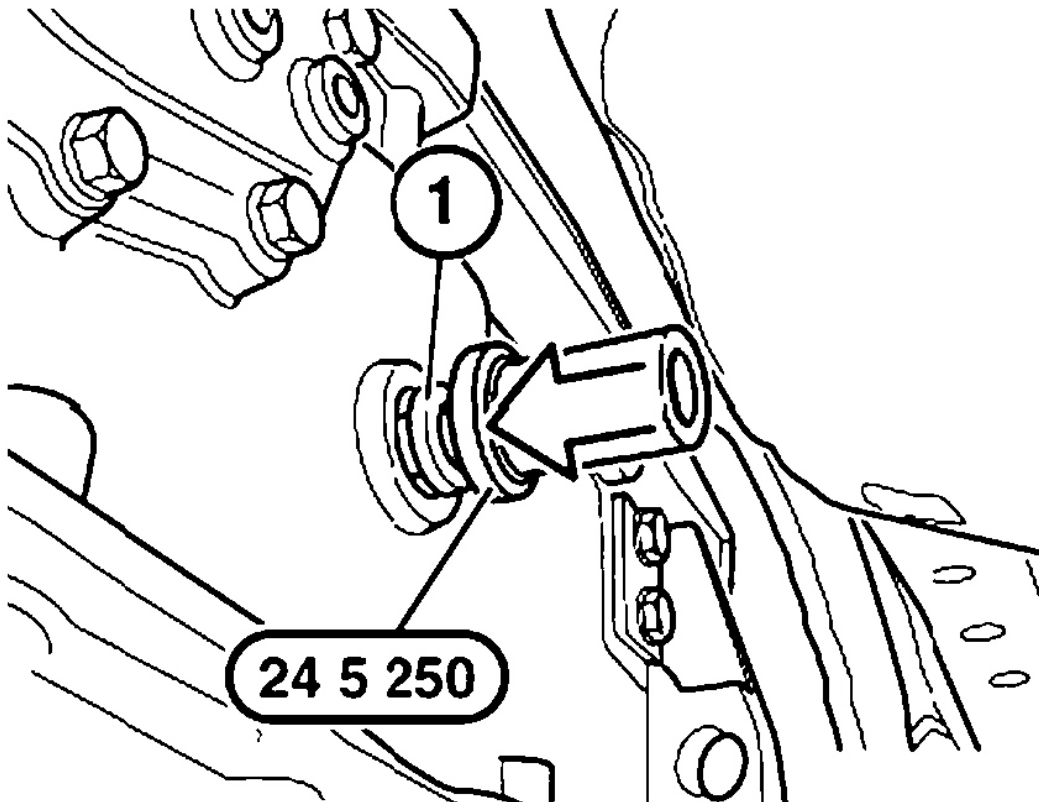
Installation: fit Special Tool (24 5 490) to the manual shift valve shaft. See **Fig. 83** . Coat sealing lip of new radial seal (1) with transmission oil. Slide radial seal onto manual shift valve shaft.



G00382341

Fig. 83: Sliding Radial Seal Onto Manual Shift Valve Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Installation: press radial seal into transmission case with Special Tool (24 5 250). See **Fig. 84** . Pull Special Tool (24 5 490) off manual shift valve shaft.



G00382342

Fig. 84: Pressing Radial Seal Into Transmission Case
Courtesy of BMW OF NORTH AMERICA, INC.

REPLACING RADIAL SHAFT SEAL FOR MANUAL SHIFT VALVE SHAFT (A5S 360R / 390R, A4S 200R)

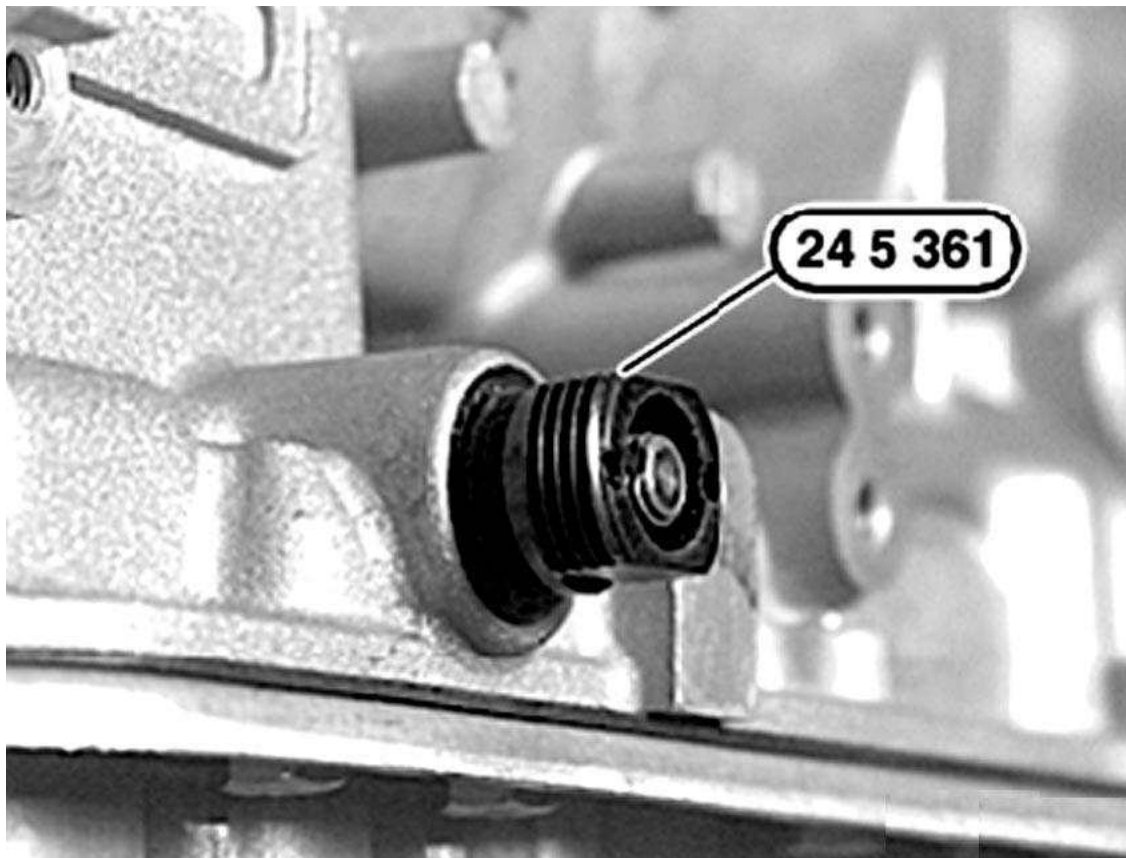
NOTE: Numbers in text refer to numbers in figures.

NOTE: After completing work, top up ATF level. Check/top up fluid level in automatic transmission. See **CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (A5S 360R / 390R, A4S 200R / 310R)** .

Grip clamping sleeve (1). Loosen nut (2). See **Fig. 99** . Upon installation, tighten nut to specification. See **TORQUE SPECIFICATIONS** .

Unscrew nut (1). Remove selector lever (2). See **Fig. 100** . Upon installation, tighten nut to specification. See **TORQUE SPECIFICATIONS** .

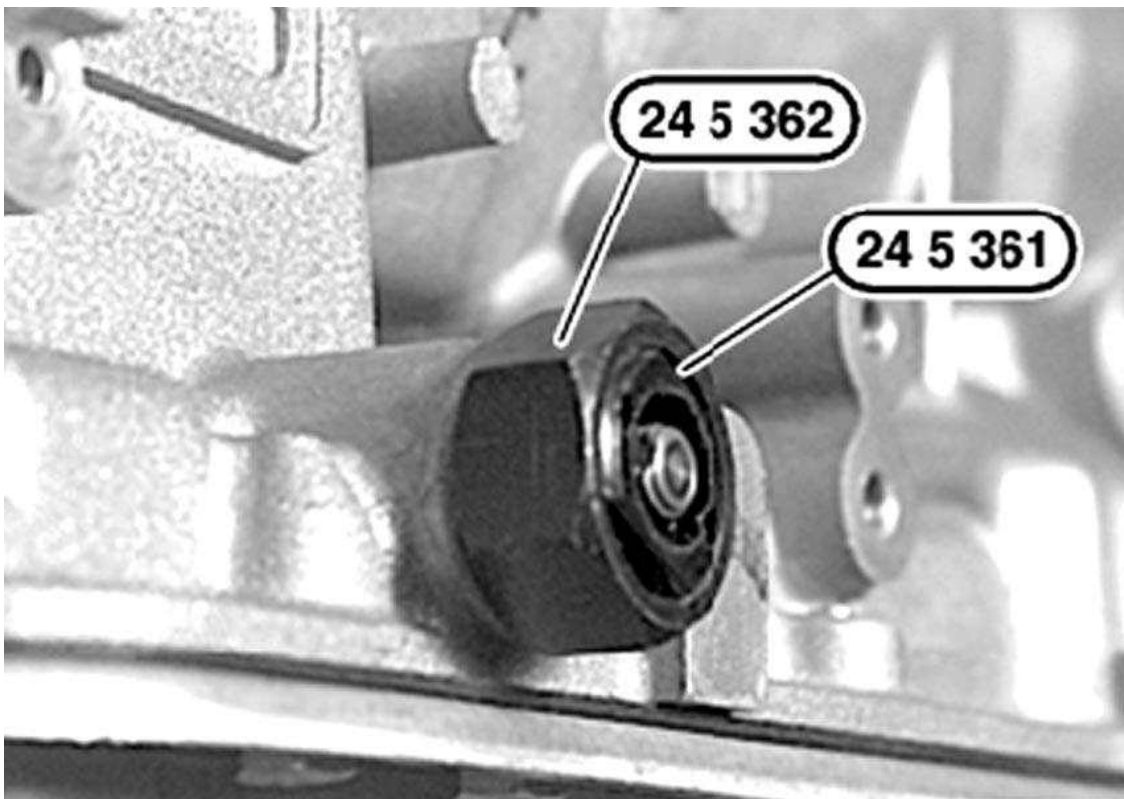
Screw Special Tool (24 5 361) into radial shaft seal. See **Fig. 85** .



G00382381

Fig. 85: Screwing Special Tool Into Radial Shaft Seal
Courtesy of BMW OF NORTH AMERICA, INC.

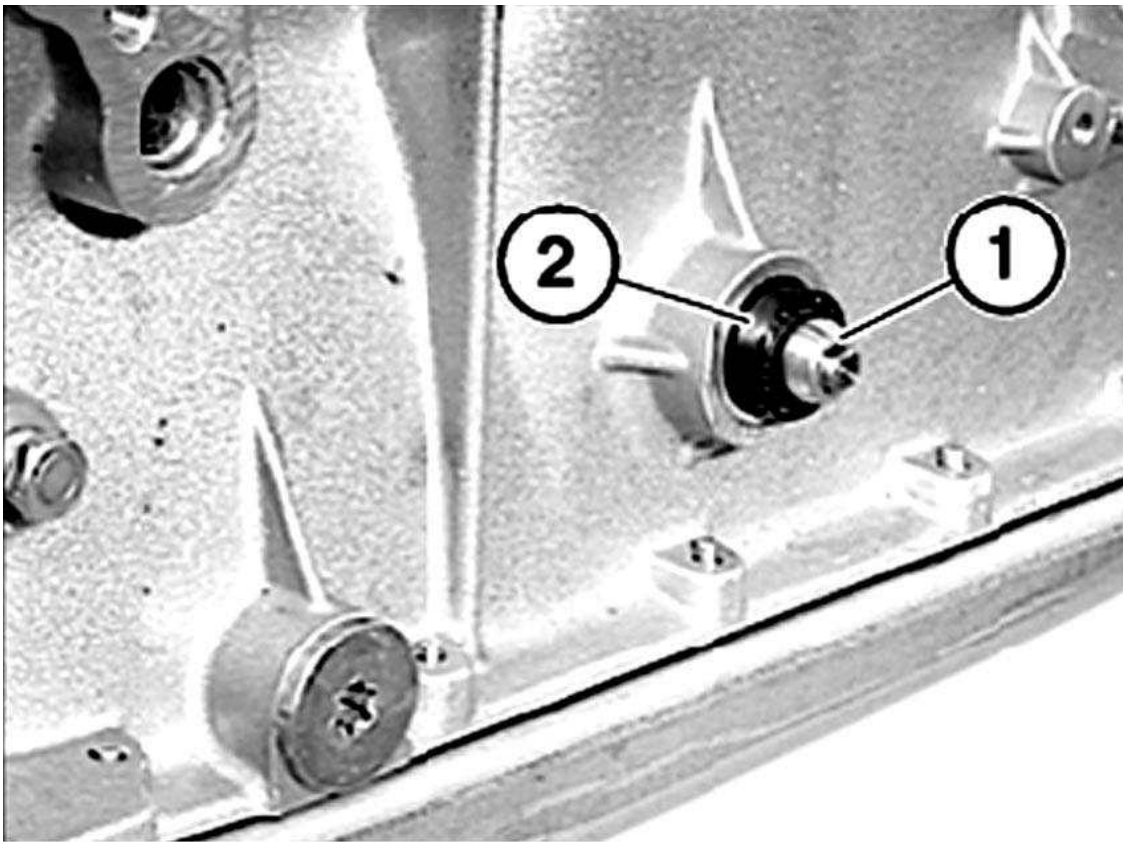
Screw Special Tool (24 5 362) onto Special Tool (24 5 361) and tighten down. See **Fig. 86** . This pulls the radial shaft seal out of the transmission housing.



G00382382

Fig. 86: Removing Radial Shaft From Transmission Housing
Courtesy of BMW OF NORTH AMERICA, INC.

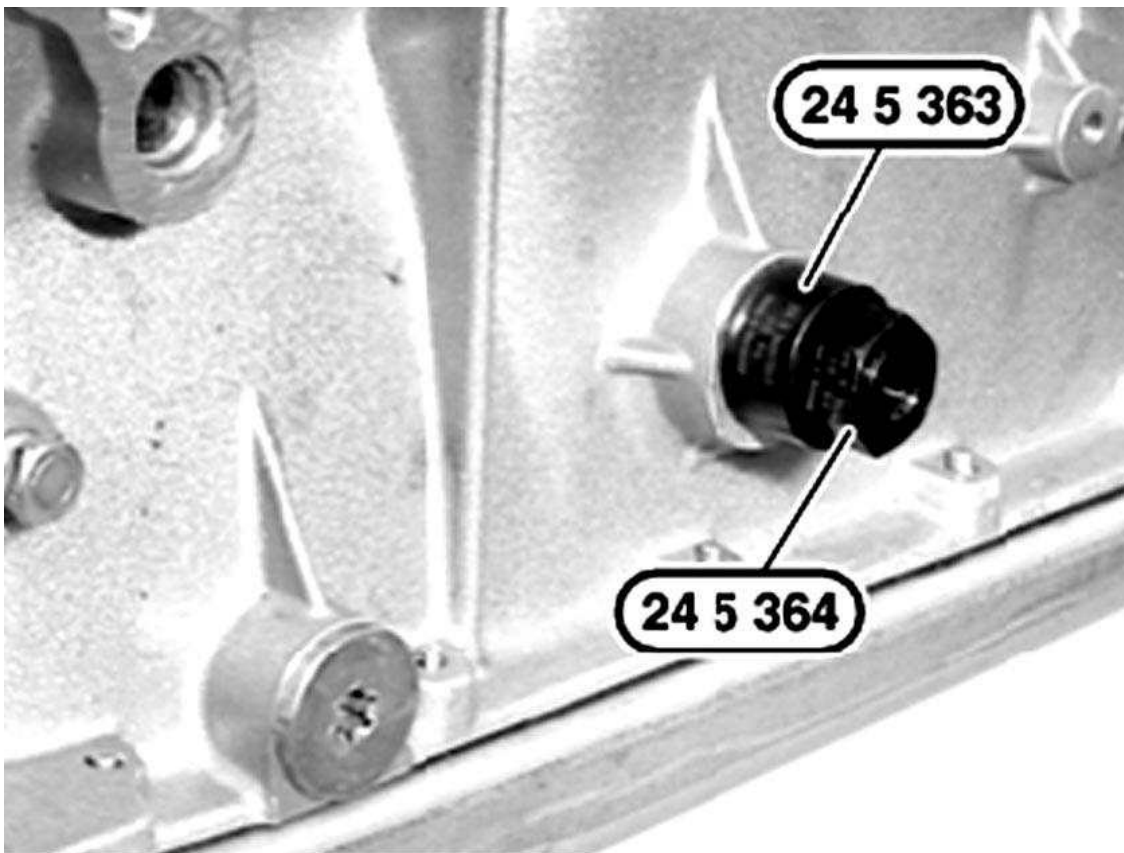
Screw adapter sleeve (1) from seal set onto manual shift valve shaft. See **Fig. 87** . Moisten sealing lips of radial shaft seal (2) with automatic transmission fluid. Push radial shaft seal (2) onto manual shift valve shaft. Press radial shaft seal (2) as far as possible into transmission housing. Grip radial shaft seal (2) firmly. Unscrew adapter sleeve (1) from manual shift valve shaft.



G00382383

Fig. 87: Removing Adapter Sleeve From Manual Shift Valve Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Pull radial shaft seal into transmission housing up to stop with Special Tools (24 5 363) and (24 5 364). See **Fig. 88** . Upon installation, adjust selector lever. See **ADJUSTING SELECTOR LEVER (A5S 360R / 390R, A4S 200R, 6HP26Z/19Z)** .

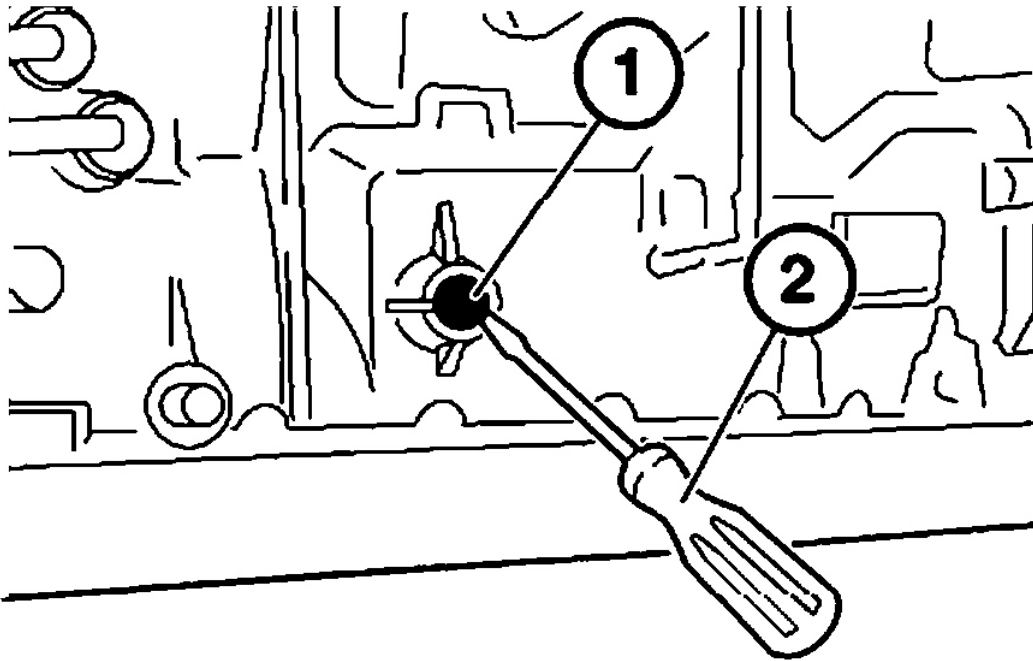


G00382384

Fig. 88: Pulling Radial Shaft Seal Into Transmission H
Courtesy of BMW OF NORTH AMERICA, INC.

E46 4WD: Selector Shaft Sealing Cap On Left Transmission Side Leaking

Lever out sealing cap (1) with a screwdriver (2). See **Fig. 89** .



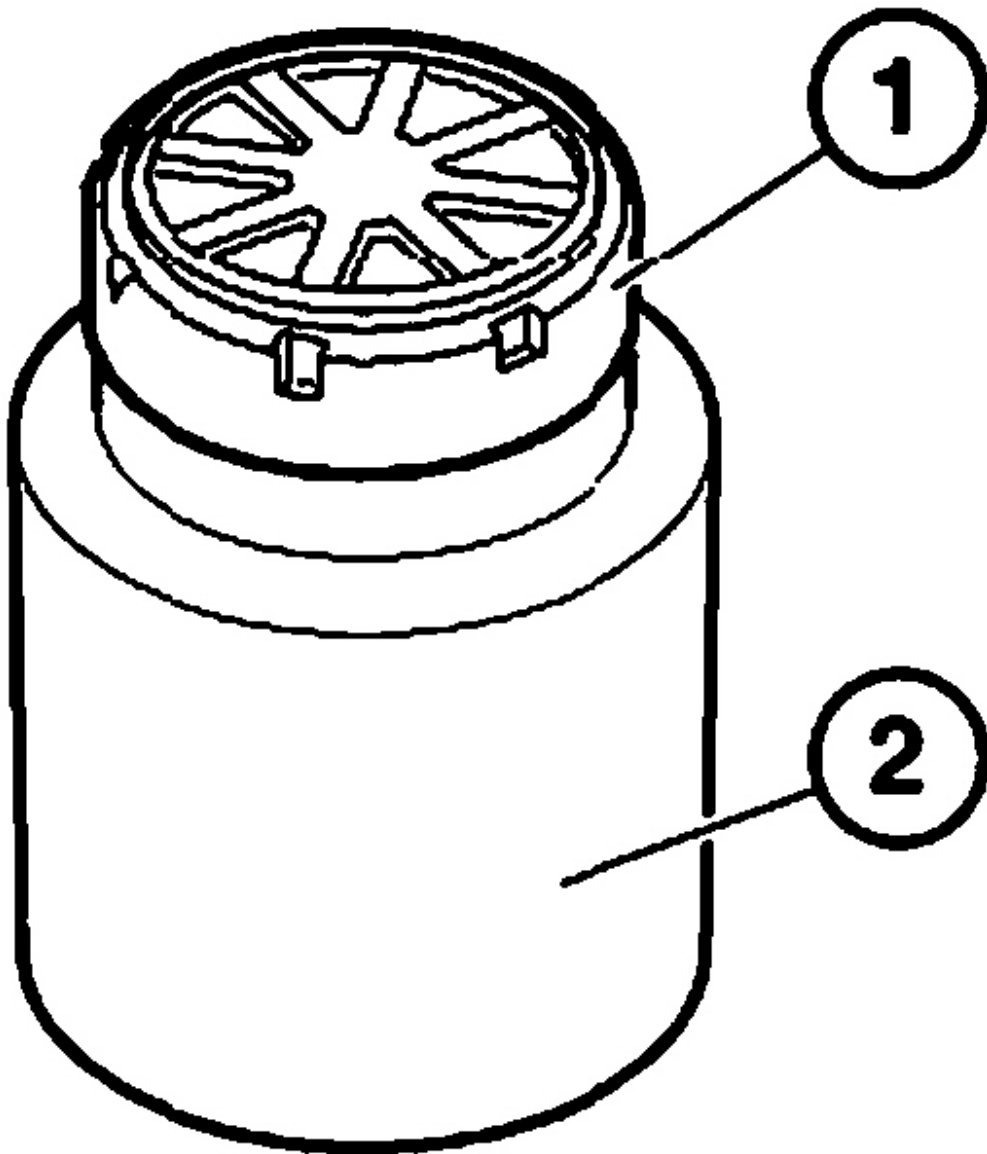
G00382385

Fig. 89: Levering Out Sealing Cap

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Drift (2) for driving in sealing cap is contained in repair kit.

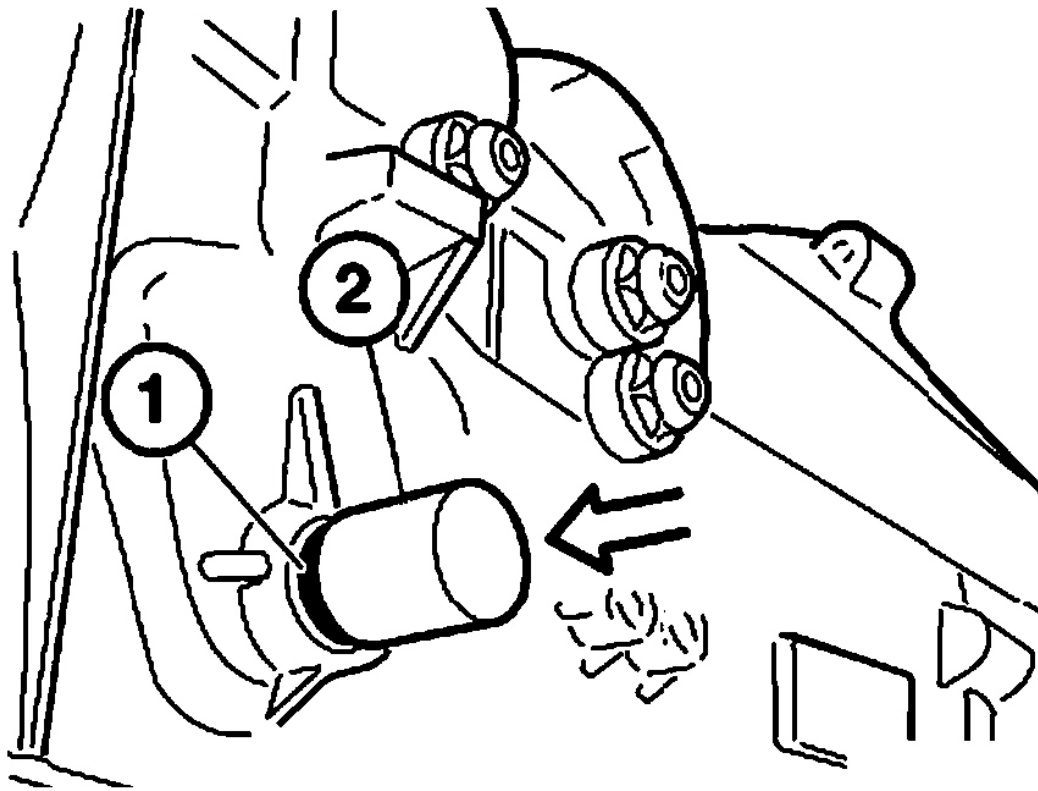
Place new sealing cap (1) on drift (2). See **Fig. 90** .



G00382386

Fig. 90: Placing New Sealing Cap On Drift
Courtesy of BMW OF NORTH AMERICA, INC.

Drive in new sealing cap (1) with drift (2) as far as it will go. See **Fig. 91** .



G00382387

Fig. 91: Driving In New Sealing Cap

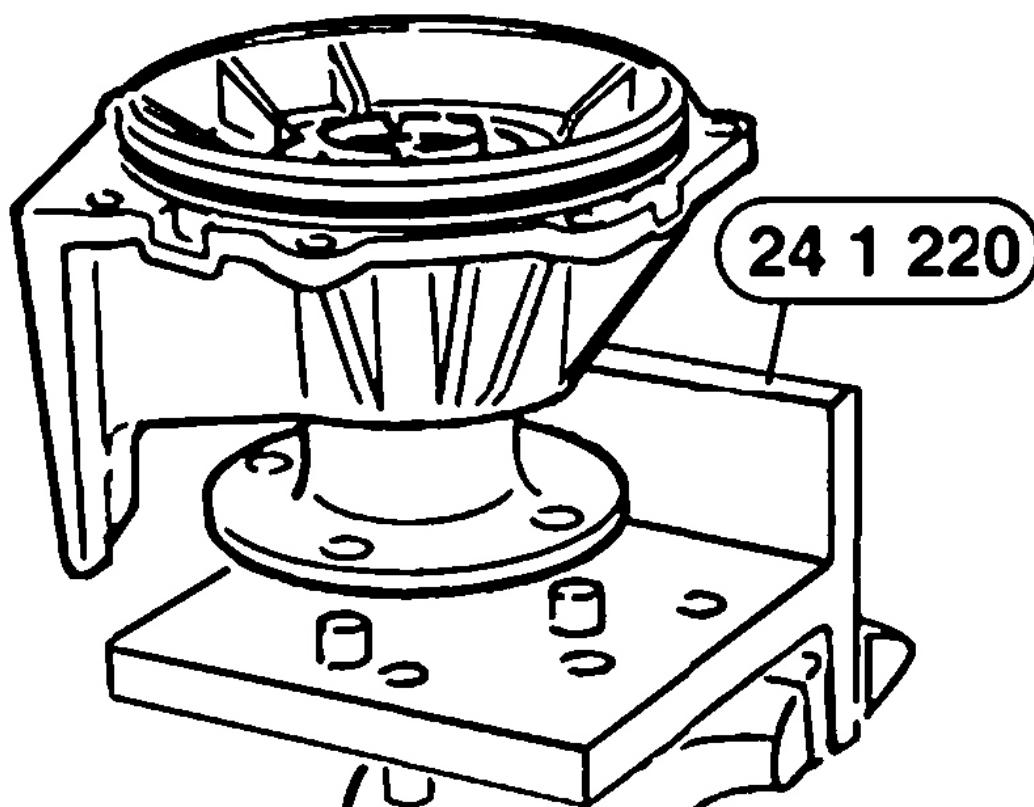
Courtesy of BMW OF NORTH AMERICA, INC.

REPLACING RADIAL SEAL FOR OUTPUT FLANGE (A5S 325Z)

NOTE: Numbers in text refer to numbers in figures.

Remove transmission extension. See **REMOVING & INSTALLING TRANSMISSION EXTENSION (A5S 325Z)** .

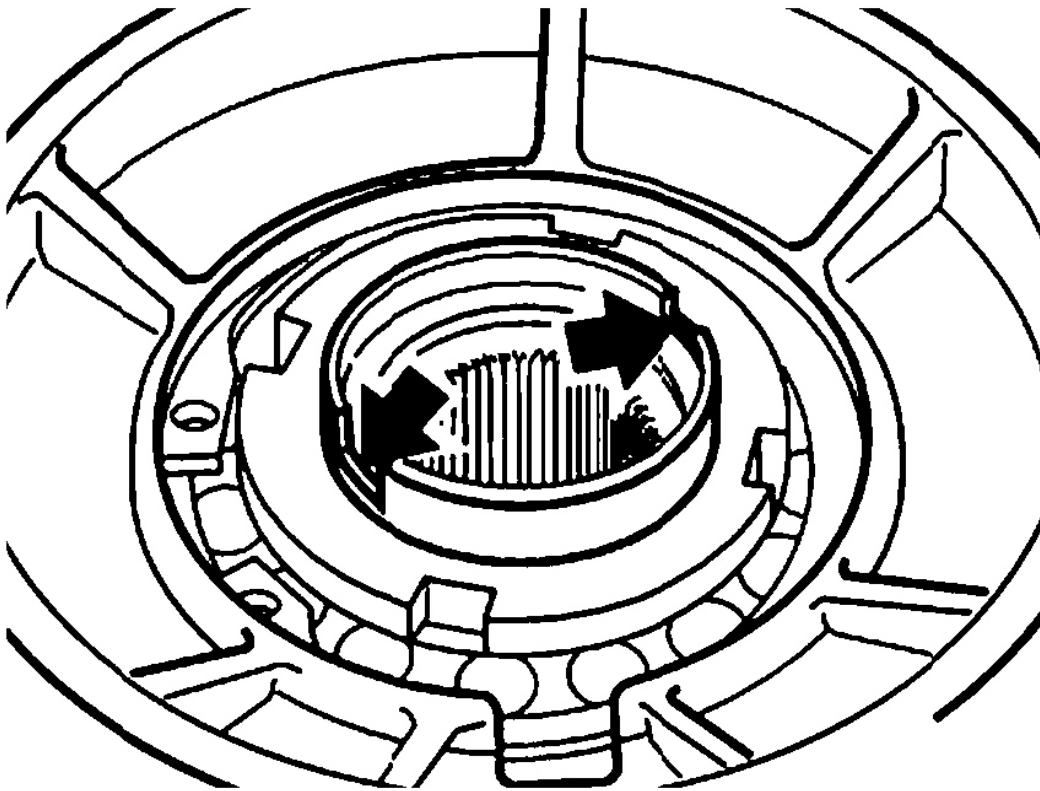
Clamp Special Tool (24 1 220) in vise. Fit transmission extension to the special tool. See **Fig. 92** .



G00382305

Fig. 92: Fitting Transmission Extension To Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Knock back cotter pin in grooved nut. See **Fig. 93** . Upon installation, peen grooved nut to secure.

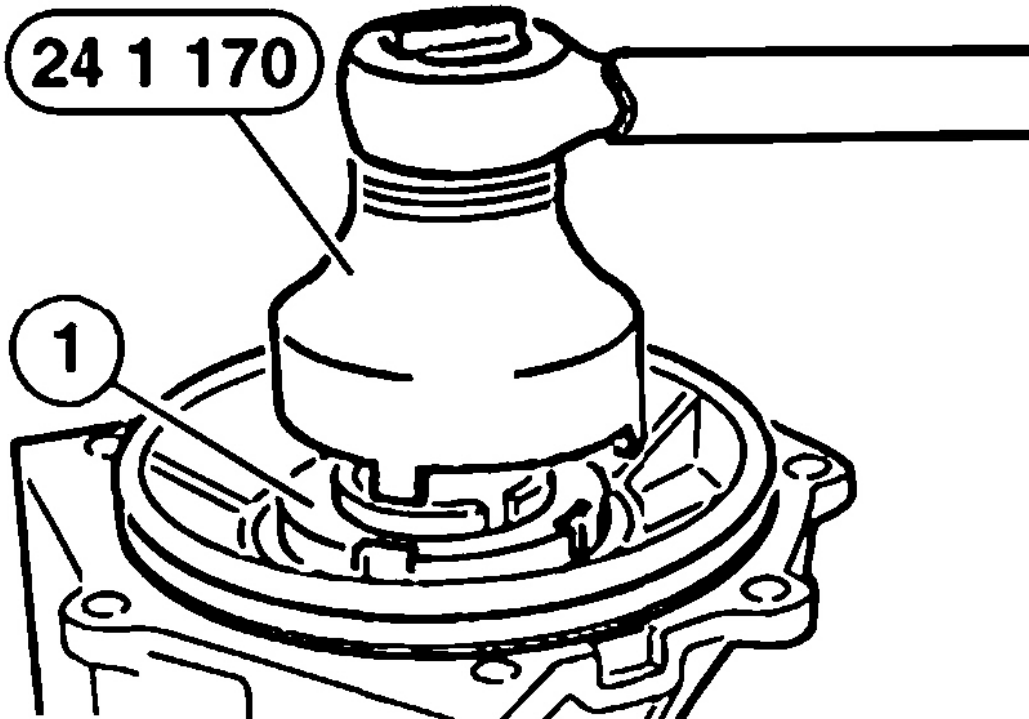


G00382306

Fig. 93: Knocking Back Cotter Pin

Courtesy of BMW OF NORTH AMERICA, INC.

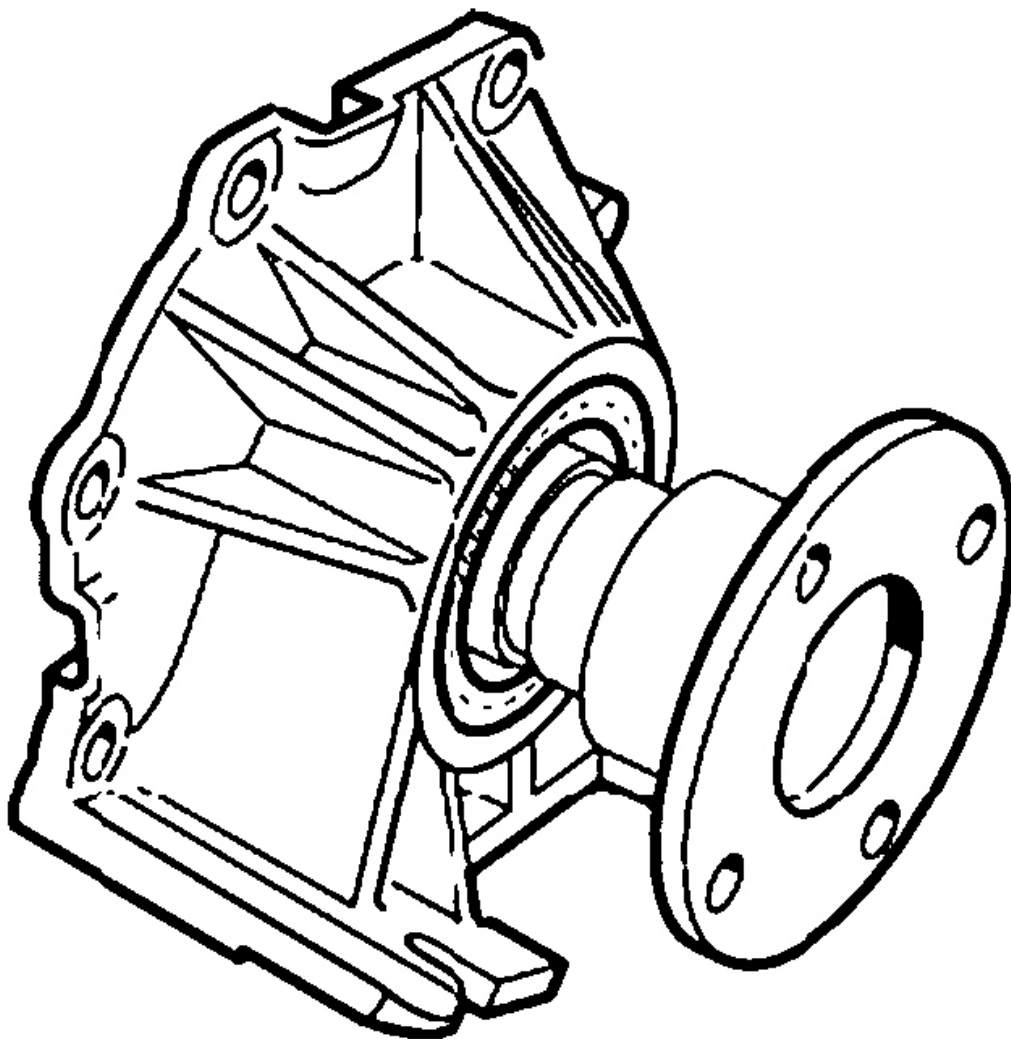
Unfasten grooved nut (1) with Special Tool (24 1 170). See **Fig. 94** . Upon installation, tighten to specification. See **TORQUE SPECIFICATIONS** .



G00382307

Fig. 94: Unfastening Grooved Nut
Courtesy of BMW OF NORTH AMERICA, INC.

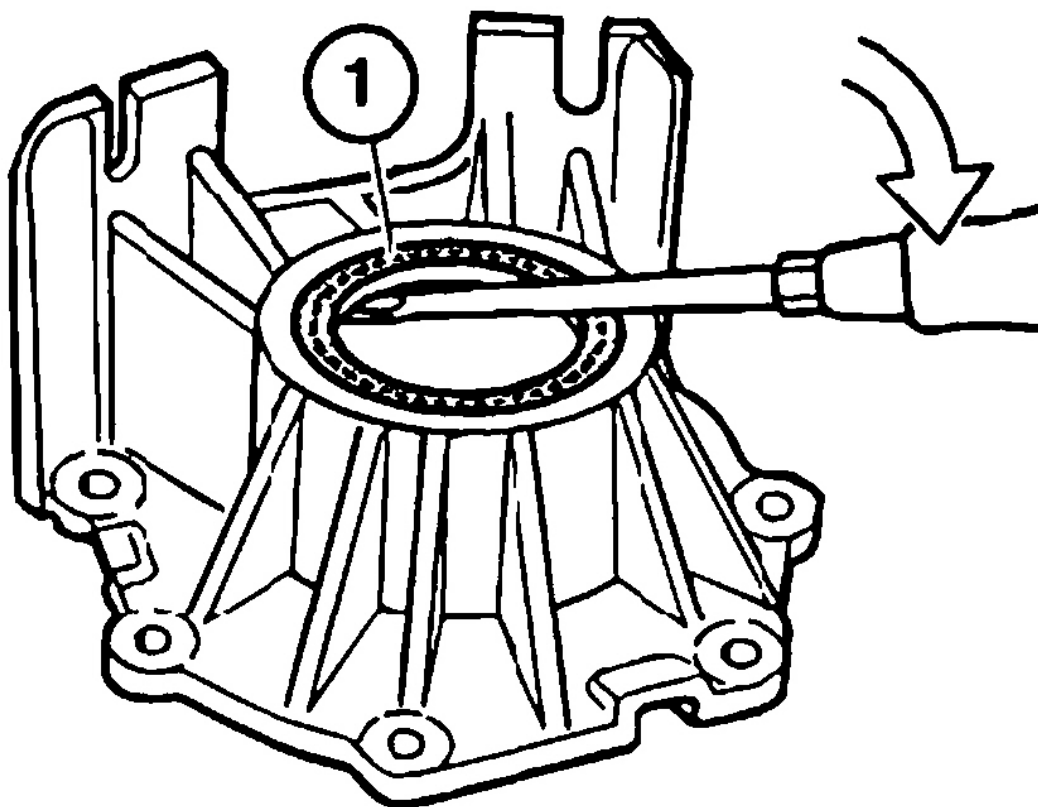
Remove transmission extension from special tool. Remove output flange from mounting. See **Fig. 95** .
Installation: coat sealing lip of radial seal and sealing surface of output flange with transmission oil.



G00382308

Fig. 95: Removing Output Flange From Mounting
Courtesy of BMW OF NORTH AMERICA, INC.

Lift out radial seal (1). See **Fig. 96** .

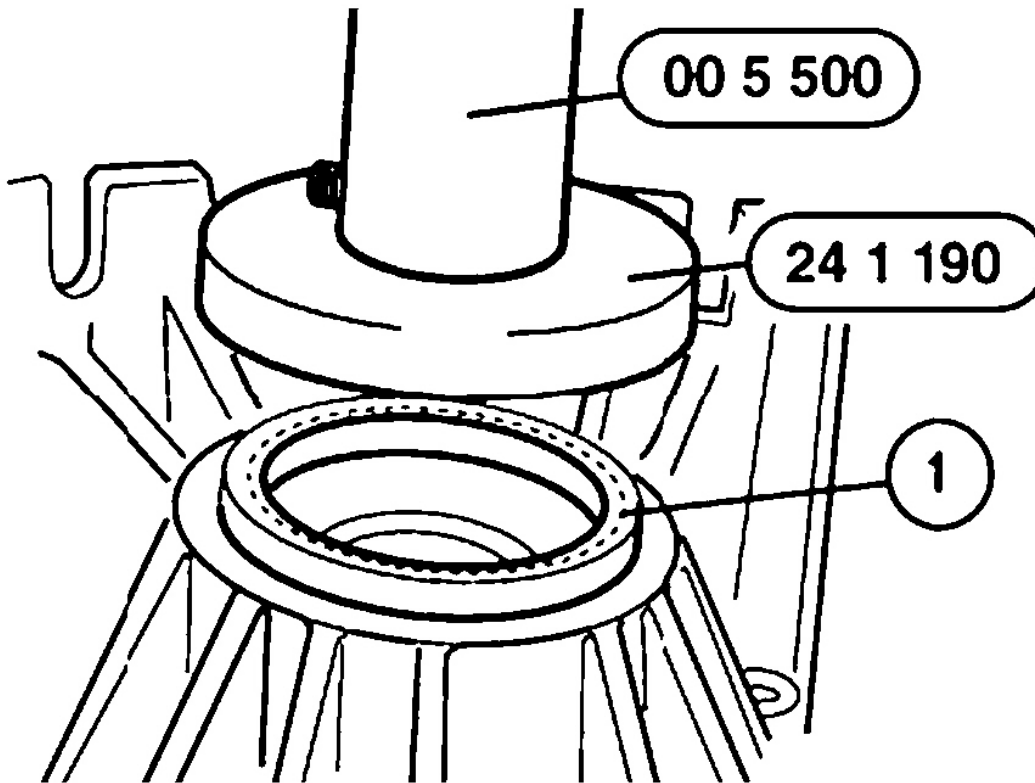


G00382309

Fig. 96: Lifting Out Radial Seal

Courtesy of BMW OF NORTH AMERICA, INC.

Installation: drive in new radial seal (1) flush using Special Tool (00 5 500 / 24 1 190). See **Fig. 97** .



G00382310

Fig. 97: Driving In Radial Seal

Courtesy of BMW OF NORTH AMERICA, INC.

REPLACING RADIAL SEAL FOR OUTPUT FLANGE (A5S 360R / 390R)

To replace radial seal for output flange, see **REMOVING AND INSTALLING OR REPLACING TRANSMISSION EXTENSION HOUSING (A5S 360R / 390R)** .

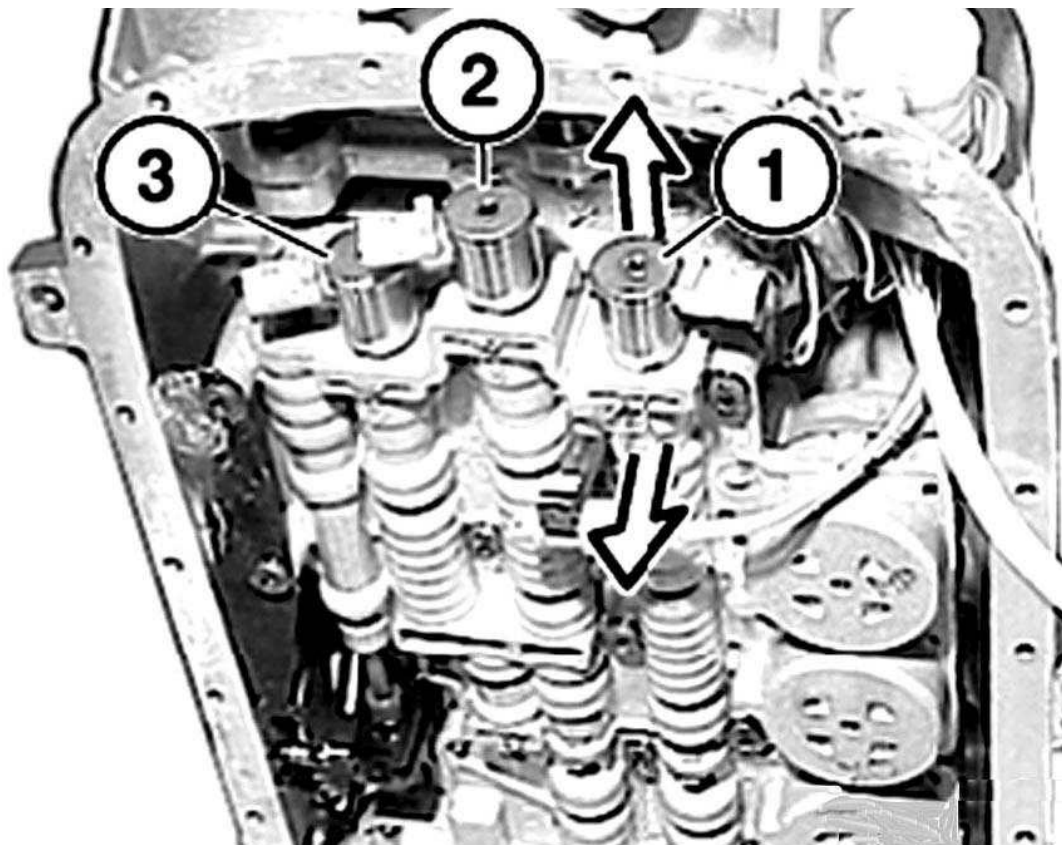
REPLACING SOLENOID VALVE 1, 2 OR 3 (A5S 360R / 390R, A4S 200R)

NOTE: After completing work, top up ATF level. Check/top up fluid level in automatic transmission. See **CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (A5S 360R / 390R, A4S 200R / 310R)** .

Remove transmission oil sump. See **REMOVING AND INSTALLING/SEALING OR REPLACING TRANSMISSION FLUID SUMP (A5S 360R / 390R, A4S 200R)** .

CAUTION: Note position of wiring harness.

Disconnect plug from solenoid valve. Remove retaining spring and withdraw solenoid valve (1, 2 or 3). See **Fig. 98** . Upon installation: coat new solenoid valve with automatic transmission fluid.



Allocation of solenoid valves (SV):

- | | |
|---|------------------|
| 1 | SV switching 1-2 |
| 2 | SV switching 2-3 |
| 3 | SV switching 4-5 |

G00382373

Fig. 98: Removing Solenoid Valve (1, 2 Or 3)
Courtesy of BMW OF NORTH AMERICA, INC.

REPLACING TRANSMISSION SWITCH (A5S 360R / 390R, A4S 200R)

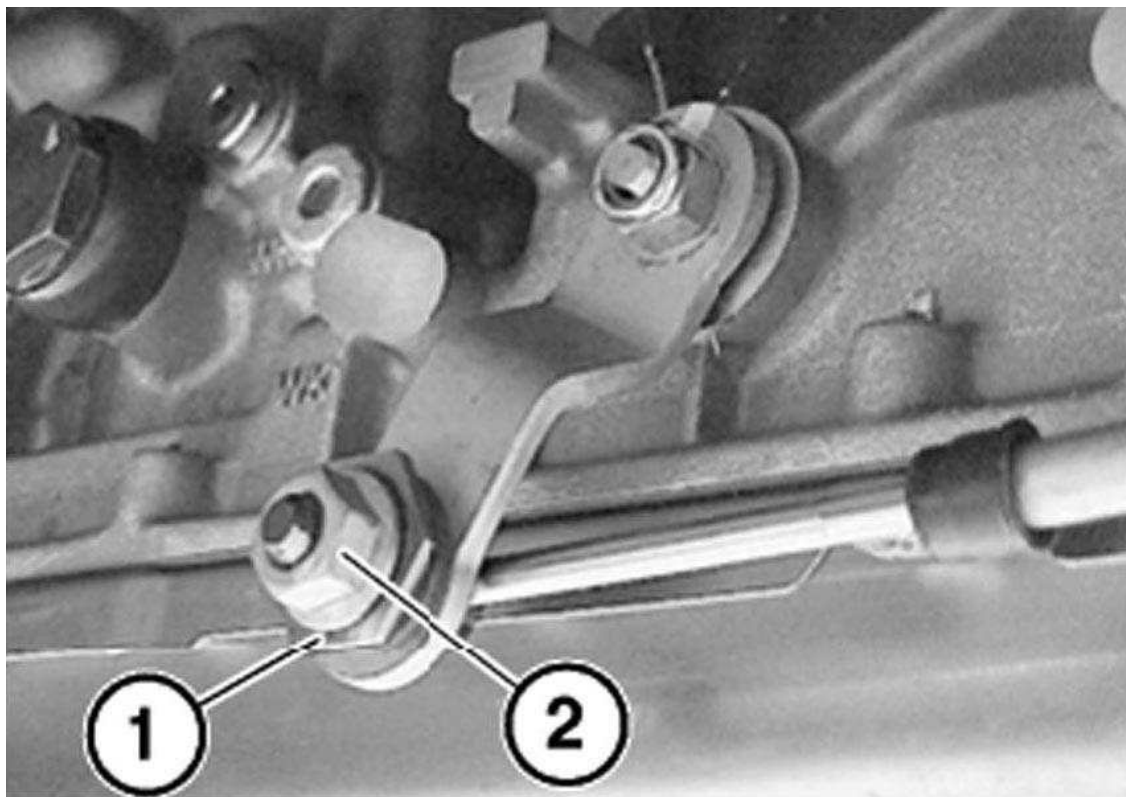
NOTE: Numbers in text refer to numbers in figures.

NOTE: After completing work, top up ATF level. Check/top up fluid level in automatic transmission. See CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (A5S 360R / 390R, A4S 200R / 310R) .

Move selector lever to position "D". Remove transmission oil sump. See REMOVING AND INSTALLING/SEALING OR REPLACING TRANSMISSION FLUID SUMP (A5S 360R / 390R, A4S 200R) .

Remove and install selector unit. See REMOVING AND INSTALLING/REPLACING SELECTOR UNIT (A5S 360R / 390R, A4S 200R) .

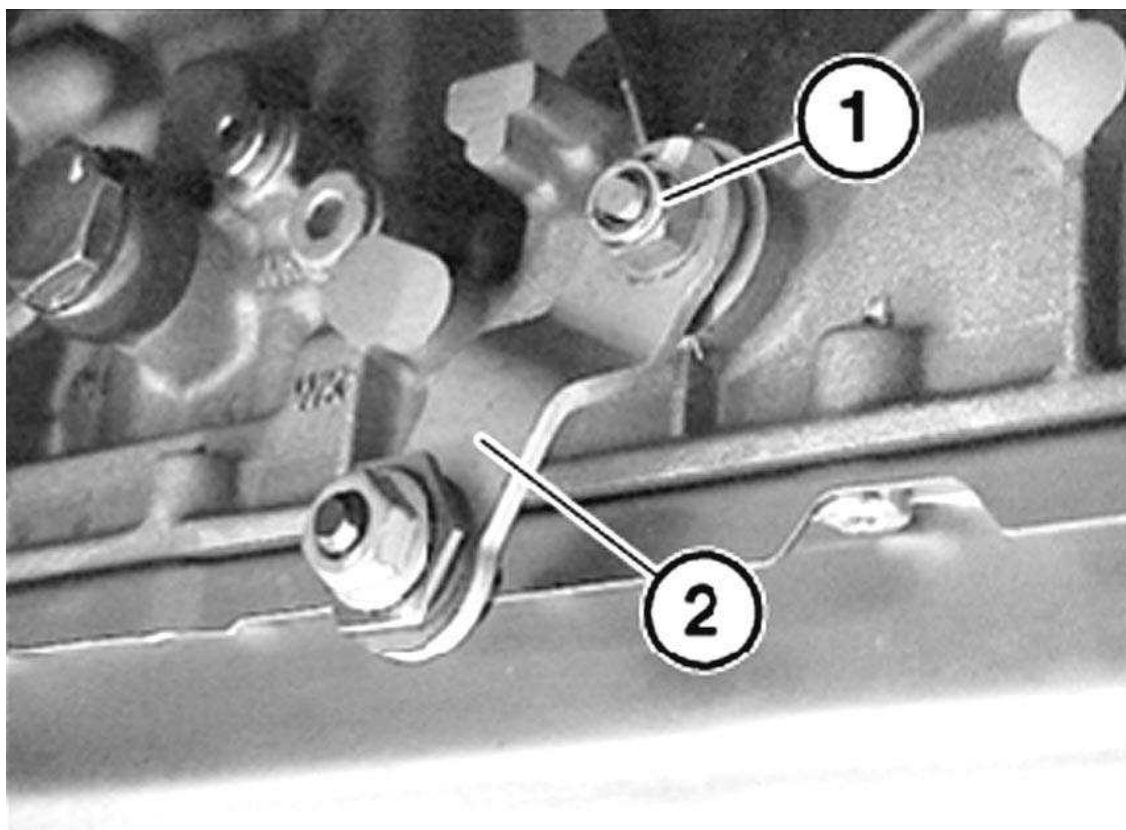
Grip clamping sleeve (1). Slacken nut (2). See Fig. 99 .



G00367853

Fig. 99: Releasing Selector Lever Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Release nut (1). See **Fig. 100** . Remove selector lever (2). Upon installation, tighten fasteners to specification. See **TORQUE SPECIFICATIONS** . Adjust selector lever. See **ADJUSTING SELECTOR LEVER (A5S 360R / 390R, A4S 200R, 6HP26Z/19Z)** .

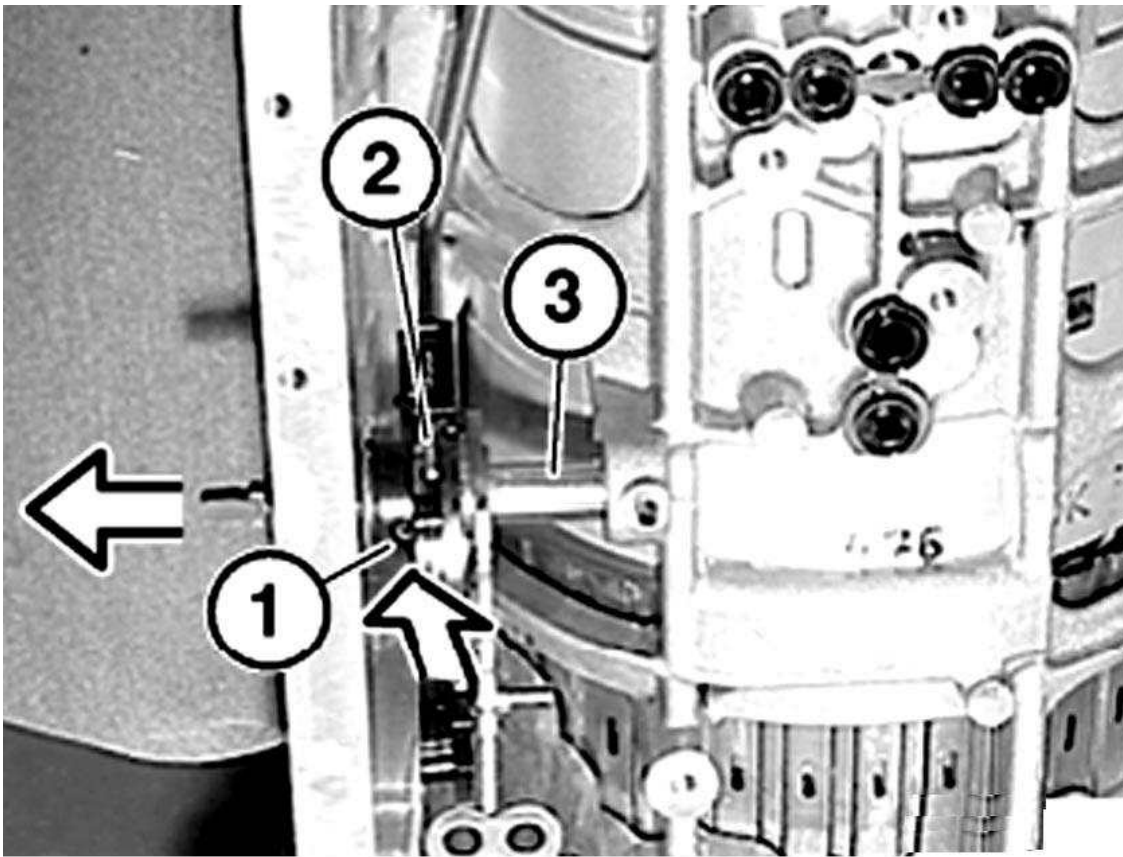


G00382377

Fig. 100: Removing Selector Lever

Courtesy of BMW OF NORTH AMERICA, INC.

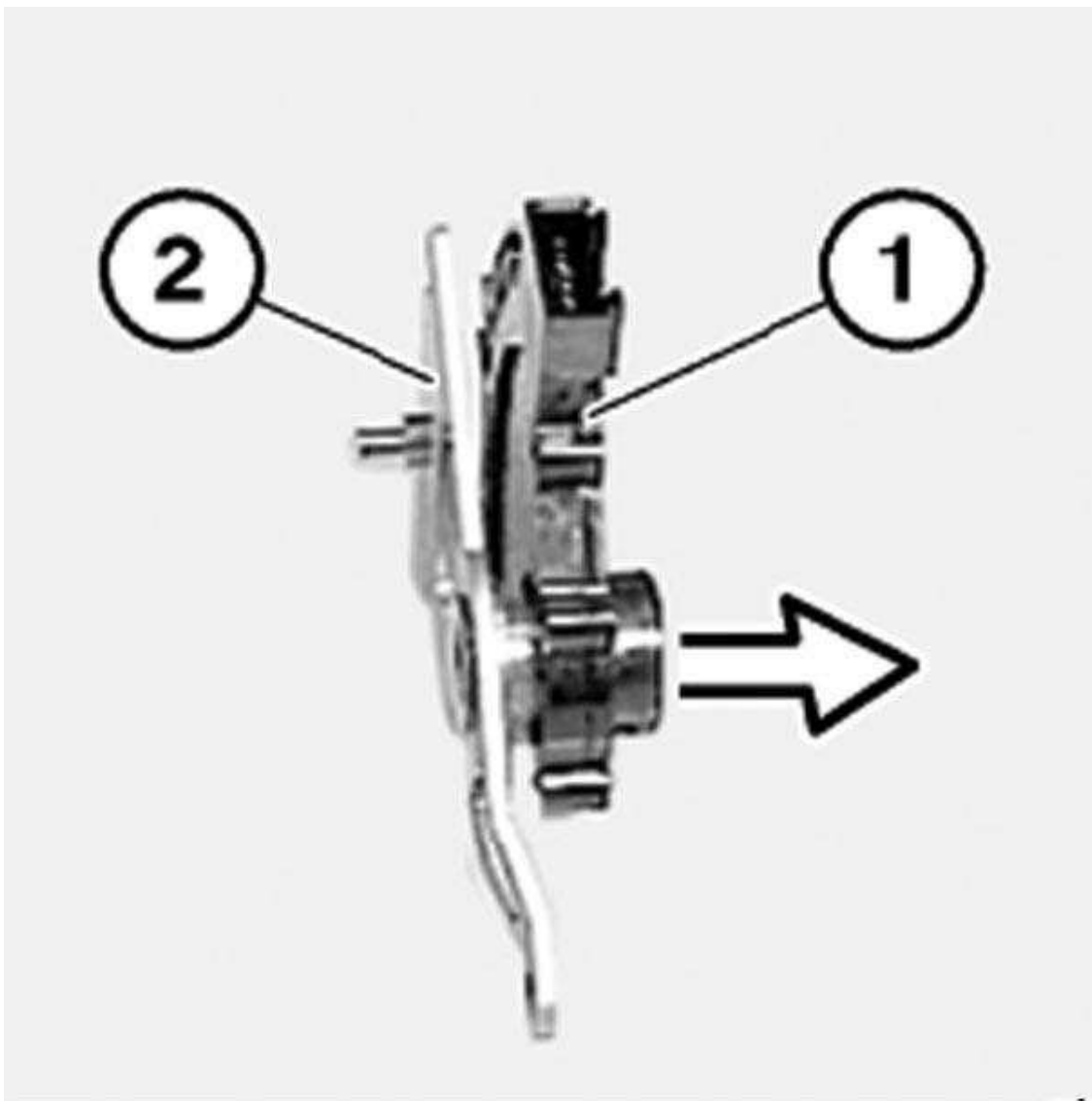
Drive spring pin (1) out of transmission switch (2). See **Fig. 101** . Withdraw manual shift valve shaft (3) from transmission only so far that transmission switch (2) can be removed. DO NOT remove parking gear rack. DO NOT move parking gear rack more than 10 mm; if necessary, secure with pointed pliers. Release notched disk on parking gear rack. Remove transmission switch (2) with detent disk.



G00382378

Fig. 101: Removing Transmission Switch
Courtesy of BMW OF NORTH AMERICA, INC.

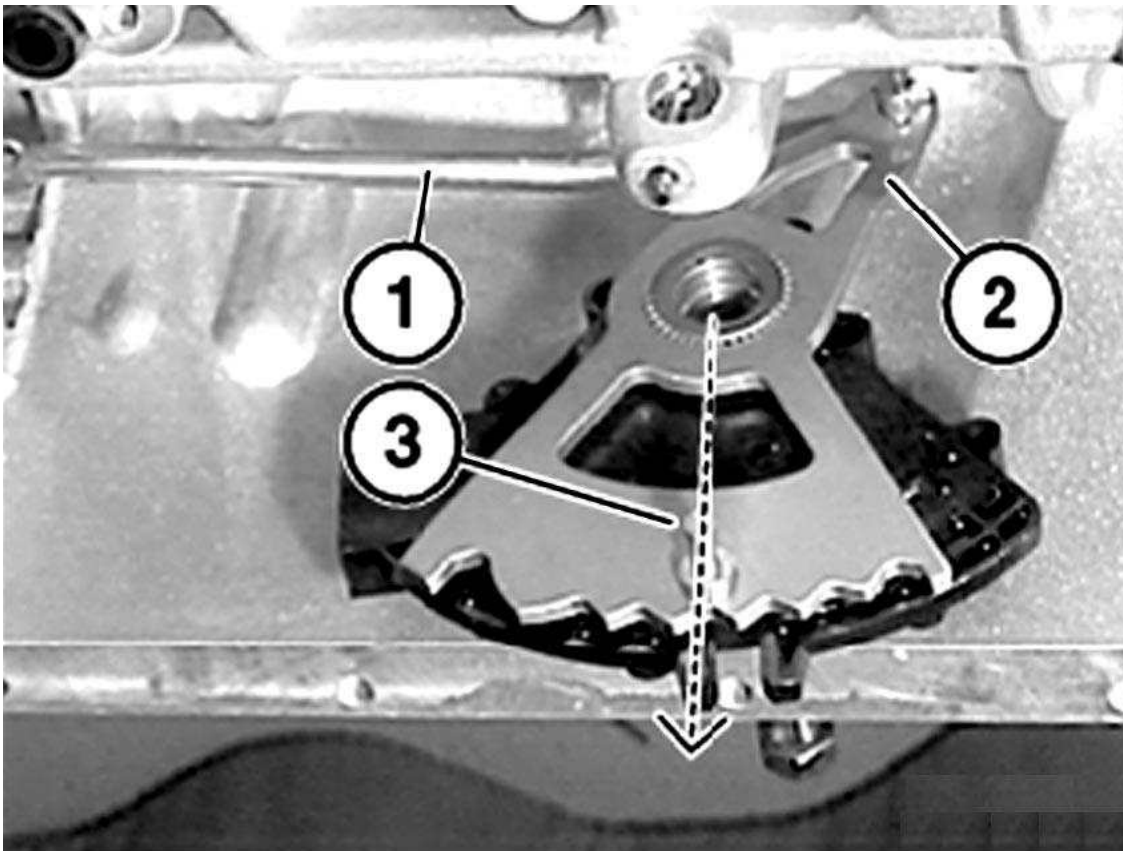
Remove transmission switch (1) from detent disk (2). See **Fig. 102** . Upon installation: bore holes for spring pin in transmission switch (1) must overlap with bore holes of detent disk (2) and manual shift valve shaft.



G00382379

Fig. 102: Removing Transmission Switch From Detent Disk
Courtesy of BMW OF NORTH AMERICA, INC.

Installation: attach parking gear rack (1) from rear in detent disk (2). See **Fig. 103** . Slide in manual shift valve shaft. Drive in spring pin. During entire installation work, journal (3) must be aligned vertically to manual shift valve shaft. After installation of detent spring, ensure that parking lock functions correctly. Press journal (3) forwards into "P" position, rotate propeller shaft and check that locking pawl engages.



G00382380

Fig. 103: Installing Parking Gear Rack In Detent Disk
Courtesy of BMW OF NORTH AMERICA, INC.

REPLACING WIRING HARNESS IN AUTOMATIC TRANSMISSION (A5S 325Z)

NOTE: Numbers in text refer to numbers in figures.

NOTE: After completing work, top up ATF level. Check/top up fluid level in automatic transmission. See **CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (A5S 325Z)** .

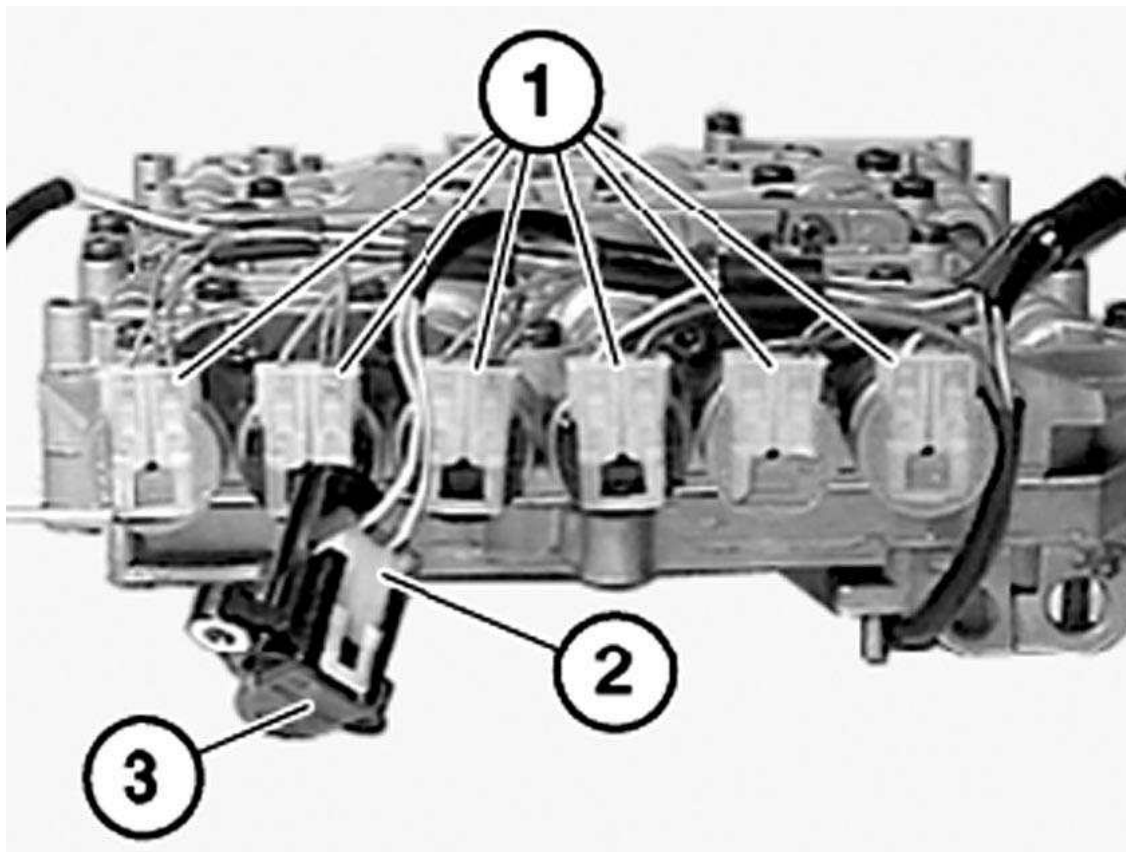
Remove and install transmission oil sump. See **REMOVING AND INSTALLING/SEALING OR REPLACING TRANSMISSION OIL SUMP (A5S 325Z)** .

Remove and install transmission oil screen. See **REMOVING AND INSTALLING/REPLACING TRANSMISSION OIL SCREEN (A5S 325Z)** .

Remove and install shift unit. See **REMOVING AND INSTALLING/REPLACING SHIFT UNIT (A5S**

325Z .

Disconnect plug (1) from solenoid valve. See **Fig. 104** . Detach plug (2) from pulse generator (3).

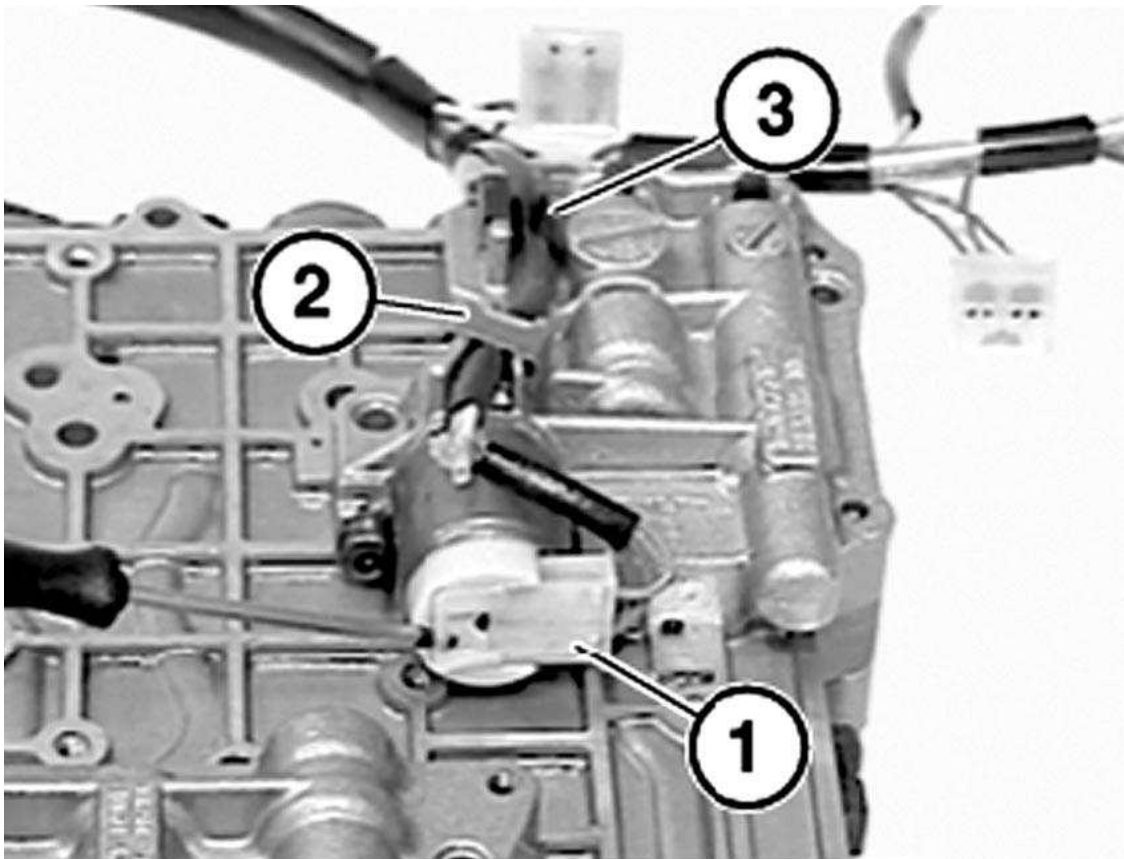


G00382338

Fig. 104: Disconnecting Plugs

Courtesy of BMW OF NORTH AMERICA, INC.

Remove connector (1). See **Fig. 105** . Remove retaining clip (2). Remove wiring harness from cable guide (3).



G00382339

Fig. 105: Removing Wiring Harness

Courtesy of BMW OF NORTH AMERICA, INC.

REPLACING WIRING HARNESS IN AUTOMATIC TRANSMISSION (A5S 360R/390R, A4S 200R)

NOTE: Numbers in text refer to numbers in figures.

NOTE: After completing work, top up ATF level. Check/top up fluid level in automatic transmission. See **CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION (A5S 360R / 390R, A4S 200R / 310R)** .

Remove transmission oil sump. See **REMOVING AND INSTALLING/SEALING OR REPLACING TRANSMISSION FLUID SUMP (A5S 360R / 390R, A4S 200R)** .

Remove transmission plug at rear right.

Pull off transmission fluid screen (1) towards bottom and remove. See **Fig. 38** .

NOTE: If the sealing ring (1) has remained in the pump housing, it must be removed and the transmission fluid screen replaced. See Fig. 39 .

Disconnect all plug connections on shift unit. Unclip temperature sensor (1) from holder. See Fig. 28 .

NOTE: As of model year 2001 (04/2000), the temperature sensor is integrated in the wiring harness.

Remove retaining clip with screwdriver (2). See Fig. 18 . Insert transmission plug (1) in transmission. Remove wiring harness from automatic transmission.

Installation: to facilitate installation, coat sealing rings with petroleum jelly. See Fig. 19 . Make sure transmission plug is in correct position.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Bowden Cable On Shift Tower/Transmission	11 (15)
Center Mount-To-Body	15 (21)
Cross Member-To-Body	15 (21)
Flange Nut, Output Flange Without Spring Washer	22 (30)
Flange Nut, Output Flange With Spring Washer	44 (60)
Flexible Disk-To-Propeller Shaft & Transmission Output Flange	
M10 8.8 Thread	35 (48)
M10 10.9 Thread	47 (64)
M14 Thread	103 (140)
M12 10.9 Thread	74 (100)
Flexible Disk-To-Transmission Output Flange (Screw With Rolled-On Shim Only)	
Stage 1	37 (50)
Stage 2	Additional 90°
Oil Filler Plug	
A5S 360R	13 (18)
A5S 325Z	22 (30)
Oil Drain Plug (A5S 325Z)	26 (35)
Plug	15 (20)
Rubber Mounts-To-Cross Member Or Transmission	15 (21)
Slotted Nut/Output Flange	89 (120)
Transmission Extension	
A5S 325Z	18 (25)
A5S 360R	16 (22)
	INCH Lbs. (N.m)

Clamping Screw On Shift Lever	89 (10)
Guide Plate/Parking Lock Mechanism	89 (10)
Oil Strainer	53 (6)
Pulse Generator, Output Speed	53 (6)
Pulse Generator, Turbine Speed	71 (8)
Pulse Sender	97 (11)
Retaining Plate For Solenoid Valves & Pressure Regulator On Shift Unit	53 (6)
Selector Lever On Transmission	89 (10)
Transmission Oil Sump	
A5S 325Z	53 (6)
A5S 360R	89 (10)
Valve Body-To-Transmission	
A5S 325Z	71 (8)
A5S 360R	97 (11)

2004-05 MANUAL TRANSMISSIONS

Servicing - GS6-37BZ

APPLICATION

MANUAL TRANSMISSION APPLICATION

Application	Transmission Model
X3 (E83)	
2004-05	GS6-37BZ

LUBRICATION

SERVICE INTERVALS

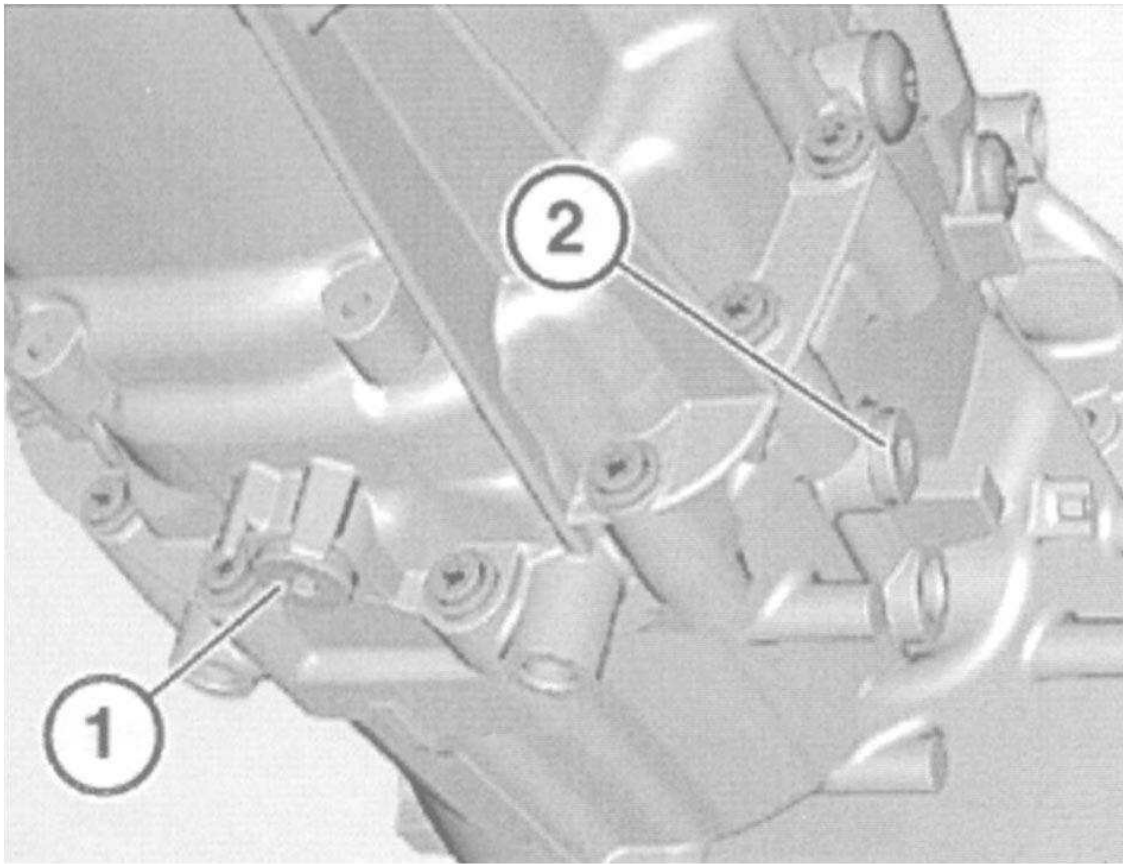
Inspect fluid level when vehicle is serviced. DO NOT drain fluid.

DRAINING/TOPPING UP GEAR OIL IN MANUAL TRANSMISSION

NOTE: Numbers in text refer to numbers in figures.

NOTE: Gearbox must be at normal operating temperature.

Draining gear oil: release oil drain plug (1) and filler plug (2). See **Fig. 1** . Clean oil drain plug (1) and screw in. Tighten to specification. See **TORQUE SPECIFICATIONS** . Fill transmission with gear oil. Pour in gear oil until overflowing. Tighten in filler screw (2) to specification. See **TORQUE SPECIFICATIONS** .



G00388586

Fig. 1: Locating Transmission Oil Drain & Filler Plug
Courtesy of BMW OF NORTH AMERICA, INC.

RECOMMENDED FLUID

From model year 2004, some manual transmissions are filled with Castrol MTF-LT-2 lifetime fluid. This fluid has the same properties as the MTF-LT-1 fluid. The MTF-LT-1 fluid may be mixed or substituted for the MTF-LT-2 manual transmission fluid.

FLUID CAPACITIES

Fluid capacity is approximately 1.4 qts. (1.3L). Transmission should be filled to bottom of filler plug hole.

ADJUSTMENTS

GEARSHIFT LINKAGE

No external adjustment is necessary.

REMOVAL & INSTALLATION

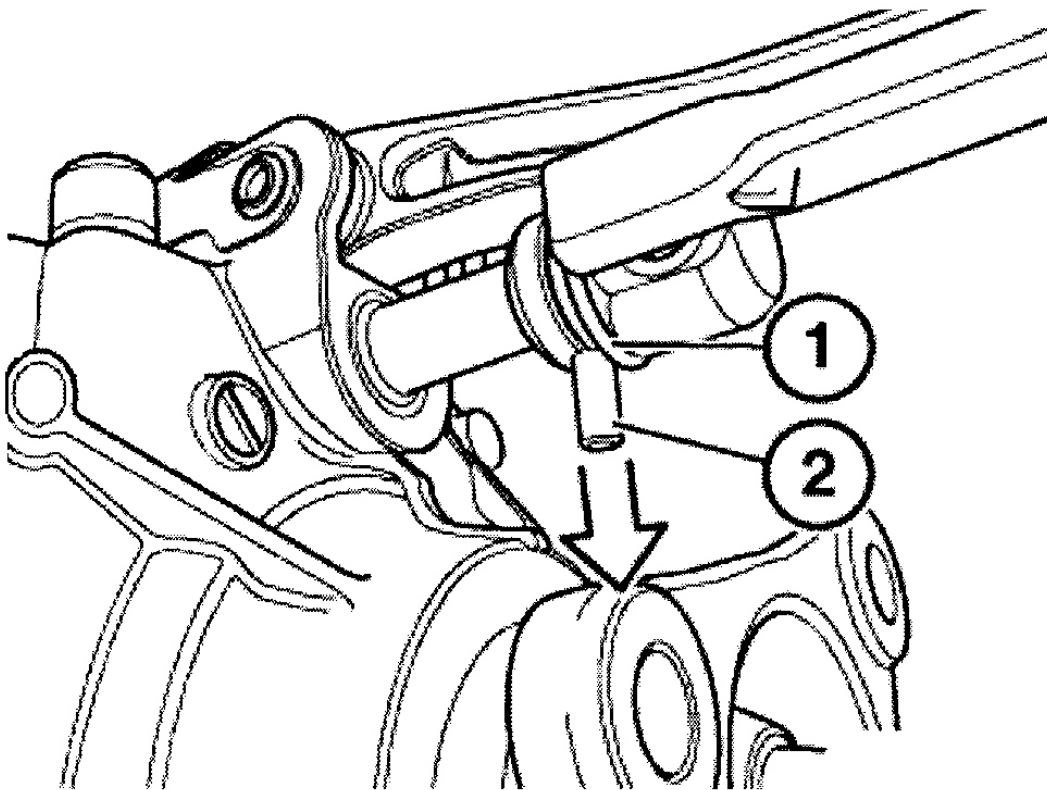
REPLACING RADIAL SEAL FOR SELECTOR SHAFT (GS6-37BZ)

NOTE: Numbers in text refer to numbers in figures.

CAUTION: After completion of work, check transmission fluid level. See DRAINING/TOPPING UP GEAR OIL IN MANUAL TRANSMISSION . Use only approved transmission fluid. See RECOMMENDED FLUID . Failure to comply with this instruction will result in serious damage to the transmission.

Remove transfer box. See REMOVING AND INSTALLING TRANSFER BOX (ATC 400 X-DRIVE) . Shift transmission into 2nd gear.

Lever retaining ring (1) out of groove with a small screwdriver. See Fig. 2 . Slide locking ring (1) towards rear. Drive out cylinder pin (2).

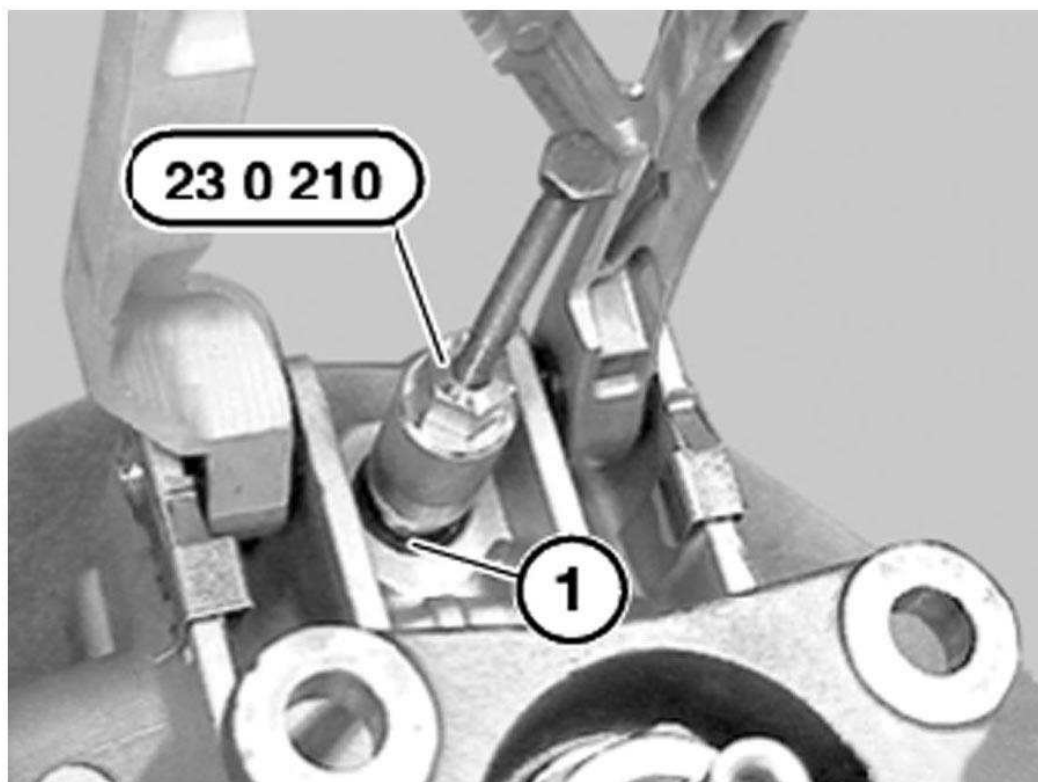


G00388558

Fig. 2: Removing Retaining Ring

Courtesy of BMW OF NORTH AMERICA, INC.

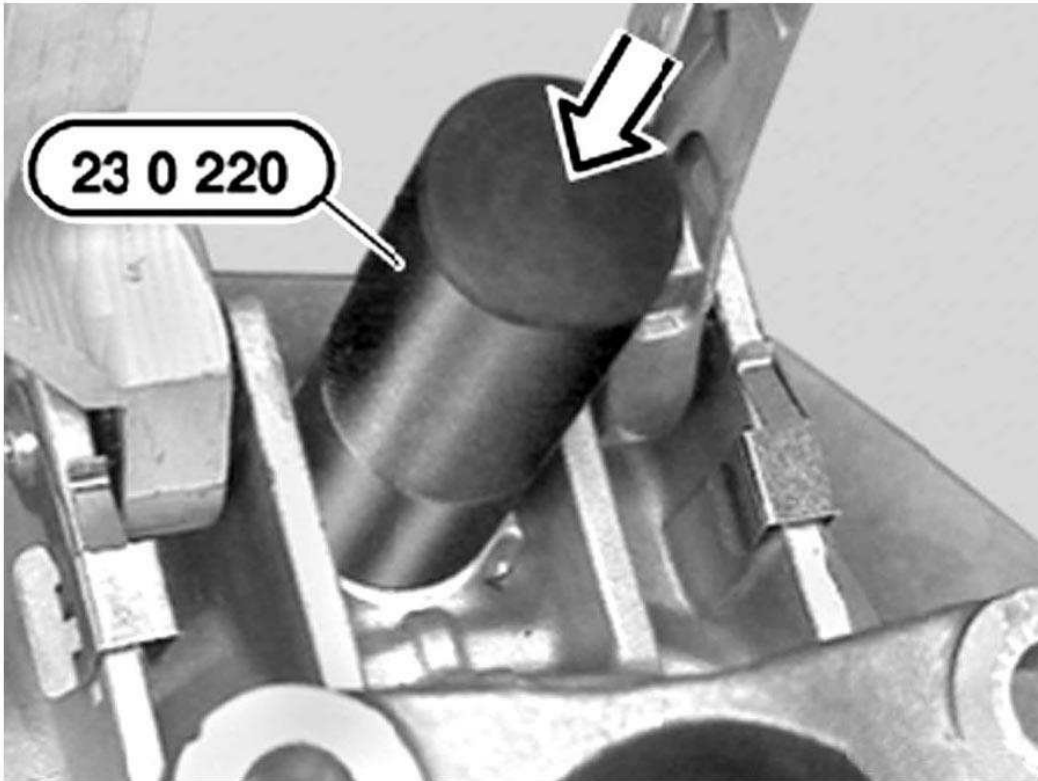
Screw in Special Tool (23 0 210) until it is firmly connected with radial seal (1). See **Fig. 3** . Pull out radial seal with Special Tool (23 0 210).



G00388559

Fig. 3: Pulling Out Radial Seal For Selector Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Coat sealing lips of radial seal and selector shaft with gear oil. Drive in radial seal with Special Tool (23 0 220). See **Fig. 4** .



G00388560

Fig. 4: Driving In Radial Seal For Selector Shaft
 Courtesy of BMW OF NORTH AMERICA, INC.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Drain & Fill Plug	
M18x1.5 Thread Hexagon Socket	26 (35)
M12x1.5 Thread	18 (25)

TRANSMISSION

Transfer Box - SI Techniques - X3

XDRIVE

VS-42 je

Baugruppe/Group: 27

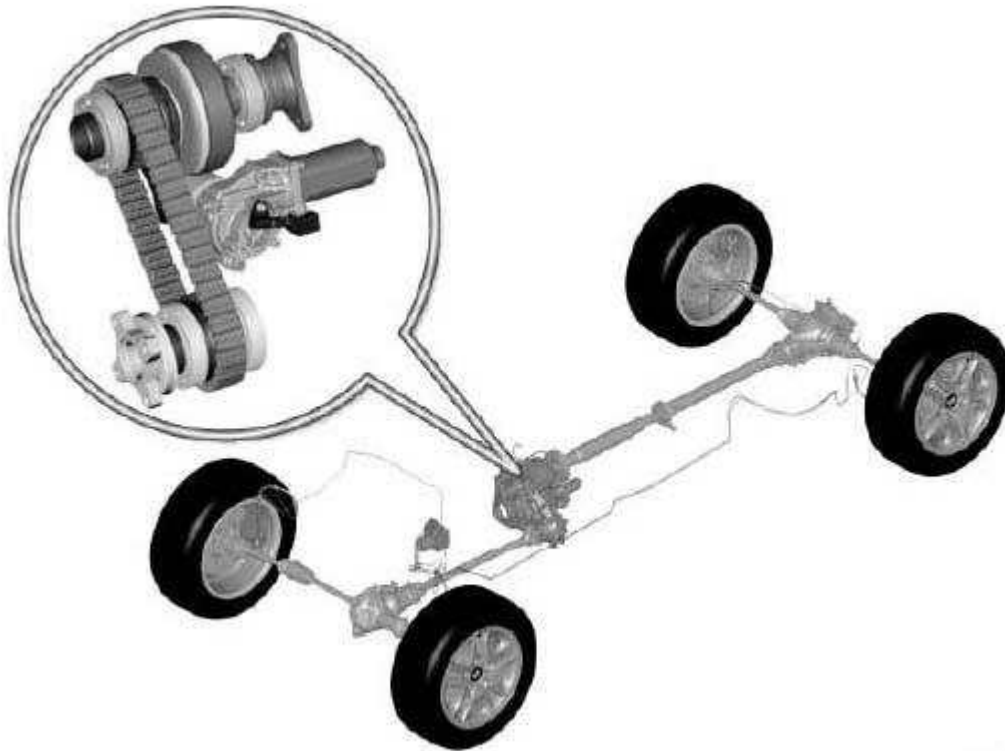
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Datum/Date: 11/2003

27 01 03 (048)

Update: 02/2007

E53, E70, E83



12703002

Fig. 1: Xdrive
Courtesy of BMW OF NORTH AMERICA, INC.

INTRODUCTION

xDrive is an all-wheel drive system that links Dynamic Stability Control (DSC) system to an electronically controlled multi-plate clutch in the transfer box.

The electronically controlled multi-plate clutch smoothly distributes the drive torque as required to the front axle. The rear axle is always powered.

All of the drive torque is applied to the rear axle when the multi-plate clutch is separated.

- > E53, E83
- > E70

xDrive constantly communicates with the DSC. The drive-dynamic input information is computed in the DSC control unit.

Important information is:

- Accelerator pedal position
- Engine torque
- Drive-dynamic state

The DSC calculates the necessary locking torque. The locking torque is communicated to xDrive. This allows xDrive to register whether the vehicle is able to follow the driver's commands. xDrive intervenes to counter the threat of any tendency for wheel spin, oversteer or understeer. xDrive regulates drive torque distribution between the two axles to meet driving demands.

Only if xDrive cannot maintain the vehicle's course on its own will DSC also intervene. Engine output is reduced and individual wheels are specifically braked.

The drive torque is delivered to the axle that has better traction when road conditions change, such as on snow, ice or a loose road surface.

The transfer cases are matched to vehicles as follows:

- E53: ATC 500 transfer case
(ATC = Active Torque Control)
- E70: ATC 700 transfer case
- E83: ATC 400 transfer case

The transfer cases differ in the following points:

- Different number of plates in the multi-plate clutches
- Different clearance between the input and output shafts to the front axle
- Propeller shaft inserted into the front axle differential on the E53, E70, and flange-mounted on the E83

The transfer case is designed to be stronger on the E53, E70 in order to match the higher engine torques.

The advantages:

xDrive delivers the following advantages through demand-oriented drive torque distribution:

- Outstanding driving stability fully up to the limit range
- Optimal forward momentum
- Excellent traction in all road situations

xDrive is standard equipment on the E70, E83 and on the E53 from October 2003 with the new model version.

BRIEF DESCRIPTION OF COMPONENTS

xDrive consists of the following components:

- **Transfer case with multi-plate clutch**

The electronically controlled multi-plate clutch is housed in the transfer case. The multi-plate clutch distributes the drive torque **smoothly and as required** between the front and rear axles.

- **VTG actuator motor with incremental sensor and classification resistor**

The VTG actuator motor (VTG: transfer case) opens and closes the multi-plate clutch. The location of the actuator motor shaft and the adjustment rate are detected by the incremental sensor.

The classification resistor ensures that mechanical tolerances in the transfer case are considered. Optimum function is thus ensured.

- **Actuator lever**

The actuator lever converts the rotational motion of the VTG actuator motor into an axial motion.

- **VTG control unit**

The VTG control unit regulates the locking torque at the multi-plate clutch in the transfer case in response to the following factors:

- Demand for required locking torque (comes from the DSC control unit)
- Condition of the transmission oil (calculated in the VTG control unit)
- Multi-plate clutch wear (calculated in the VTG control unit)
- Load on VTG actuator motor (calculated in the VTG control unit)
- Transmission oil temperature (calculated in the VTG control unit)

The VTG control unit supplies the following information to the DSC control unit:

- The locking torque currently set
- All calculated data

The locking torque is limited whenever needed in order to reduce the frictional work.

- > E53, E83
- > E70

○ **DSC: Dynamic Stability Control**

With xDrive, DSC includes the following functions:

- All-wheel control
- Automatic Differential Brake (ADB-X)
- Hill Descent Control (HDC)

All-wheel control

Dynamic Stability Control (DSC) specifies the nominal value for xDrive all-wheel control. The nominal value depends on the vehicle's tendency to oversteer or understeer and wheel slip. The nominal value is transmitted to the VTG control unit.

Automatic differential brake

The automatic differential brake (ADB-X) simulates the function of conventional limited-slip differentials by selectively applying brakes on individual wheels (known from the E53 and the E46 All-wheel drive).

Whenever a wheel displays a tendency to spin the ADB-X automatically brakes it down to a preset slip. This effect of this is to increase the drive torque on those wheels that have a higher friction coefficient on a lining.

Hill Descent Control

Hill Decent Control (HDC) is a cruise control on four-wheel drive cars for driving downhill (known from the E53 and the E46 All-wheel drive).

HDC can be activated and deactivated with a separate button.

When the HDC button is pressed, HDC automatically reduces road speed. The brakes are applied on all four wheels to reduce road speed to just above walking pace. HDC holds this speed constant (all DSC functions remain active).

The car's road speed can be freely varied within fixed values by pressing down on the accelerator pedal, brake pedal or the buttons for the cruise-control system.

The following control units and switches are incorporated in xDrive functions:

- **DME or DDE: Digital engine electronics or digital diesel electronics**

The DME or DDE modifies the engine response as required by the DSC control unit (such as power reduction to prevent the driven wheels from spinning).

○ **Instrument cluster display**

System states are displayed as follows:

- DSC/xDrive telltale and warning lights light up:

DSC/xDrive not activated

- DSC/xDrive telltale and warning lights light up and acoustic signal:

DSC defective, ABS not affected, VTG control unit OK

or

DSC OK, VTG control unit defective

- > All-wheel drive in emergency mode

- DSC/xDrive telltale and warning lights, ABS telltale and warning lights and general brake warning lamp light up and acoustic signal:

Total failure of the DSC and/or malfunction of the VTG control unit

- > All-wheel drive in emergency mode
- > E53, E83

The instrument cluster is the data interface (= gateway) between the K-bus and the PT-CAN.

- **JBE: Junction box electronics**

- > E70

The JBE is the data interface (= gateway) between the K-CAN and PT-CAN.

The junction box comprises the JBE and the power distributor.

SYSTEM FUNCTIONS

xDrive comprises the following functions:

- Control of the locking torque for the multi-plate clutch
- Emergency operation

Control of the locking torque for the multi-plate clutch

The locking torque for the multi-plate clutch in the transfer case can be regulated. This means that the front axle can be smoothly coupled to the drive train. The drive torque at the front axle can be increased or reduced in response to the road situation and conditions.

The DSC control unit calculates the locking torque for the multi-plate clutch as follows:

- Pre-activation = driver's command
- Driving dynamic control
- Detection of different tire rolling circumferences

Pre-activation

The pre-activation circuit reflects the driver's wishes. In other words, the pre-activation circuit is used to calculate the necessary locking torque.

The evaluation criteria below are taken into account to in determining the driver's command:

- Accelerator-pedal value
- Engine torque
- Engine speed
- Vehicle road speed
- Gear engaged
- Steering angle

Driving dynamic control

Driving dynamic control monitors the slip on the front and rear axles. Driving dynamic control has the task of achieving optimum traction and keeping the car stable or to stabilize it.

The following evaluation criteria are taken into account by the monitoring system:

- Wheel speeds
- Yaw rate
- Lateral acceleration
- Steering angle

The drive torque is distributed as follows in normal driving with all-wheel drive:

- 40 % to the front axle
- 60 % to the rear axle

Distribution of the drive torque is oriented upon the torque that can be supported by each axle. For instance, if the car is fully accelerated in 1st gear from a standing start the distribution of the dynamic axle-load creates a higher axle load on the rear axle. Therefore, the rear axle can convey a higher drive torque.

Example: The front wheels are on a high-traction surface. The rear wheels are on, e.g. sheet ice (low traction). In this case, almost 100 % of the available drive torque would be transmitted to the front axle. The rear axle is under hardly any load any can support only a low drive torque.

When driving in a curve, the lateral acceleration causes centrifugal force that forces the car to the outside. The car leaves the stable driving condition when the centrifugal force is stronger than the maximum possible wheel lateral guiding forces. "Understeer" is the phrase used when the car presses outwards over the front wheels. Oversteer, on the other hand, is when the rear wheel adhesion becomes lower. The rear of the car presses outwards.

xDrive minimizes the tendency to understeer or oversteer by optimally distributing the driving power between the rear axle and front axle.

[more -]

Detection of different tire rolling circumferences

If the tire rolling circumferences are not the same the drive train twists due to different rotary speeds (when the multi-plate clutch is closed).

Differences in rotational speed can occur as a result of the following influences:

- When tires of different makes and types are fitted:

The tire rolling circumference may fluctuate by up to 1 % due to tires of different makes and types being fitted or the tires are worn very differently.

- When an emergency wheel is fitted
- When the tires are worn very differently

Slip in the multi-plate clutch may compensate for differences in rotary speed when different tire rolling circumferences are detected.

Compensation is produced by reducing the locking torque in situations that do not have great driving dynamic control.

Emergency operation

Driving dynamic control and the ADB-X function are not possible in emergency operation.

The VTG control unit has an integral regulator for emergency control. The regulator provides redundancy for controlling the multi-plate clutch in the DSC control units.

The regulator is used to attempt to maintain all-wheel drive for as long as possible when the DSC control unit malfunctions or important sensor signals drop out.

Substitute values are calculated when individual sensor signals drop out. Functions are operated by using the

substitute values until it is no longer possible to control the all-wheel drive effectively. This can lead to the complete loss of all-wheel drive.

TRANSMISSION

Transfer Box - Special Tools - X3

27 TRANSFER BOX

27 1 390 DRIFT

Minimum set: Mechanical tools

Note: For driving in shaft seal of drive shaft Transfer box: ATC400

Series: E53, E83

Storage location: B48

SI number: 1 24 03 (040)

Order number: 27 1 390

Drift



Fig. 1: Drift (27 1 390)

Courtesy of BMW OF NORTH AMERICA, INC.

27 1 400 DRIFT

Minimum set: Mechanical tools

Note: For driving in shaft seal of output shaft to rear differential Transfer box: ATC400

Series: E53, E83

Storage location: B48

SI number: 1 24 03 (040)

Order number: 27 1 400

Drift



Fig. 2: Drift (27 1 400)

Courtesy of BMW OF NORTH AMERICA, INC.

27 1 410 DRIFT

Minimum set: Mechanical tools

Note: For driving in shaft seal of output shaft to front differential Transfer box: ATC400

Series: E83

Storage location: B48

SI number: 1 24 03 (040)

Order number: 27 1 410

Drift



Fig. 3: Drift (27 1 410)

Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION

Transfer Box - Technical Data - X3

00 TRANSFER CASE, GENERAL

27 00 TRANSFER BOX IN GENERAL E83

TECHNICAL DATA - TRANSFER BOX GENERAL E83

Designation/Type	(X-Drive)	ATC 400 (X-Drive)
Oil grade: see operating instructions		
Oil change volume	ltr.	0.69
New oil filling volume	ltr.	0.8

2007 TRANSMISSION

Transfer Box - Tightening Torques - X3

00 TRANSFER CASE GENERAL

27 00 TRANSFER BOX IN GENERAL

TRANSFER BOX IN GENERAL TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
7AZ Plug	E30 / E34	M24 x 1.5		33 Nm
	E30 / E34	M14 x 1.5		33 Nm
	E30 / E34	M18 x 1.5		23 Nm
8AZ Transmission cross member to rubber mounts	E30 / E34	M12		80 Nm
Transmission cross member to body	E30 / E34	M8		24 Nm
9AZ Transfer box to transmission	E53 / E46 / E83 / E60 / E61 / E90 / E91 / E92 / E70	M10		43 Nm
10AZ Transmission cross member to rubber mounts	E46 / E53 / E83	M12		74 Nm
Transmission cross member to rubber mounts	E60 / E61 / E90 / E91 / E92	M12		68 Nm
Transmission cross-member to body	E53	M10		41 Nm
Transmission cross-member to body	E46 / E83	M8		21 Nm
Transmission cross-member to body	E60 / E61 / E90 / E91 / E92	M8		19 Nm
11AZ Plug	E53 / E46 / E83	M18		33 Nm
Oil filler and drain plugs	E60 / E61 / E90 / E91 / E92 / E70	M22		60 Nm
12AZ Vibration damper to transfer box	E53	M8		23 Nm
Vibration damper to transfer box	E83	M8		20.5 Nm
13AZ Servomotor to transfer box	E53 / E83 / E60 / E61 / E90 / E91 / E92 / E70	M8		22 Nm
14AZ Resistor to transfer case	E53 / E83 / E60 / E61 / E90 / E91 / E92 / E70	M5		5 Nm
15AZ Control unit holder to	E60 / E61 / E90 / E91 / E92	M6		8 Nm

floorpan



TRANSMISSION

Transfer Case - Operating Fluids

1.0 TRANSFER CASE OPERATING FLUIDS

TRANSFER CASE OPERATING FLUIDS SPECIFICATION

Model:	Fluid:	BMW Part Number:
E30 325iX	ATF Dexron® III formulation	
E46/16 325xi/xiT, 330xi	MTF-LT-1	83 22 9 408 942 (MTF-LT-2 = 5 Liters)
E53 All models produced up to 2/2005 with NV125 transfer case	ATF Dexron® III formulation	
E53 All models with X-Drive transfer case	TF0870	83 22 0 397 244 (1 Liter)
E60 All models	TF0870	83 22 0 397 244 (1 Liter)
E61 All models	TF0870	83 22 0 397 244 (1 Liter)
E70 All models	TF0870	83 22 0 397 244 (1 Liter)
E83 All models with X-Drive transfer case	TF0870	83 22 0 397 244 (1 Liter)
E90, E91 and E92 All models	TF0870	83 22 0 397 244 (1 Liter)

NOTE: Before opening the container, shake the container to evenly mix the additives with the oil.

TRANSMISSION

Transfer Case - Repair Instructions - X3

00 TRANSFER CASE, GENERAL

00 DANGER OF POISONING IF OIL IS INGESTED/ABSORBED THROUGH THE SKIN

Danger of poisoning!

Ingesting oil or absorbing through the skin may cause poisoning!

Possible symptoms are:

- Headaches
- Dizziness
- Stomach aches
- Vomiting
- Diarrhoea
- Cramps/fits
- Unconsciousness

Protective measures/rules of conduct:

- Pour oil only into appropriately marked containers
- Do not pour oil into drinking vessels (drinks bottles, glasses, cups or mugs)
- Observe country-specific safety regulations

First aid measures:

- Do not induce vomiting.

If the person affected is still conscious, he/she must rinse out their mouth with water, drink plenty of water and consult a doctor immediately.

If the person affected is unconscious, do not administer anything by mouth, place the person in the recovery position and seek immediate medical attention.

00 RISK OF INJURY IF OIL COMES INTO CONTACT WITH EYES AND SKIN

Danger of injury!

Contact with eyes or skin may result in injury!

Possible symptoms are:

- Impaired sight
- Irritation of the eyes
- Reddening of the skin
- Rough and cracked skin

Protective measures/rules of conduct:

- Wear protective goggles
- Wear oil-resistant protective gloves
- Observe country-specific safety regulations

First aid measures:

- Eye contact: Rinse eyes immediately with plenty of water for at least 15 minutes; if available, use an eye-rinsing bottle. If irritation of the eyes persists, consult a doctor.
- Skin contact: Wash off with soap and water immediately. If irritation persists, consult a doctor.

NOTE: Do not use solvents/thinners.

00 SAFETY INSTRUCTIONS FOR HANDLING OIL

WARNING: 00 DANGER OF POISONING IF OIL IS INGESTED/ABSORBED THROUGH THE SKIN .
00 RISK OF INJURY IF OIL COMES INTO CONTACT WITH EYES AND SKIN .

Recycling:

Observe country-specific waste-disposal regulations.

Measures if oil is unintentionally released:

- Personal precautionary measures: Danger of slipping! Keep non-involved persons away from the work area. Wear personal protective clothing/equipment.
- Environmental protection measures: Prevent oil from draining into drain channels, sewerage systems, pits, cellars, water and the ground.
- Limiting spread: Use oil blocks to prevent the surface spread of oil.
- Cleaning procedure: Bind and dispose of escaped oil with nonflammable absorbents.

NOTE: Do not flush oil away with water or aqueous cleaning agents.

27 00 ... TOPPING UP/CHANGING TRANSFER CASE OIL

IMPORTANT: Use only the approved gear oil in the transfer box.
Failure to comply with this requirement will result in serious damage to the transfer box!

NOTE: Only change the oil when the transfer box is at normal operating temperature.

Checking/correcting transfer case oil level:

Undo oil filler plug (1).

Check transfer case oil level.

If necessary, pour in gear oil up to lower edge of opening for oil filler plug (1).

Installation:

Tightening torque: 27 00 11AZ, see 27 00 TRANSFER BOX IN GENERAL .

Replace sealing ring.

Place oil collecting apparatus underneath.

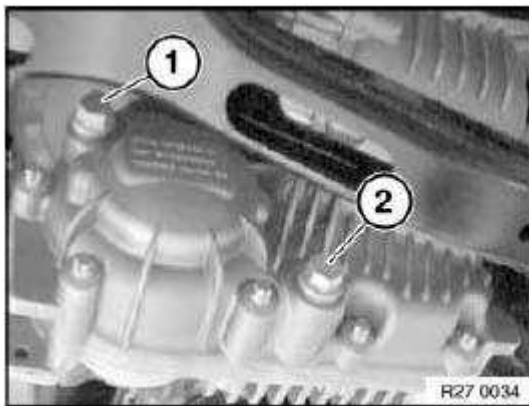


Fig. 1: Oil Filler Plug And Oil Drain Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Remove oil drain plug (2).

Drain and dispose of gear oil.

NOTE: Observe country-specific waste-disposal regulations

Replace sealing ring, screw in oil drain plug (2) and tighten down.

Tightening torque: 27 00 11AZ, see 27 00 TRANSFER BOX IN GENERAL .

Undo oil filler plug (1).

Pour in gear oil up to lower edge of opening for oil filler plug (1).

Tightening torque: 27 00 11AZ, see 27 00 TRANSFER BOX IN GENERAL .

Replace sealing ring.

10 TRANSFER CASE

27 10 ... CHECKING FUNCTION OF FRONT DIFFERENTIAL AND TRANSFER CASE

NOTE: **Fault diagnosis with DIS Tester.**
 Adhere to specified repair sequence in DIS.

27 10 010 REMOVING AND INSTALLING TRANSFER CASE (ATC 400 X-DRIVE)

Special tools required:

- 00 2 030
- 24 5 301
- 24 5 305

IMPORTANT: After replacement, the "Repair" service function must be carried out with GT1.

IMPORTANT: After completing work, check gear oil level and top up if necessary.

Filler plug (1):

Tightening torque: 27 00 11AZ, see 27 00 TRANSFER BOX IN GENERAL .

Gear oil level up to filler edge of filler plug (1).

Use only the approved gear oil.

Failure to comply with this requirement will result in serious damage to the transfer case!

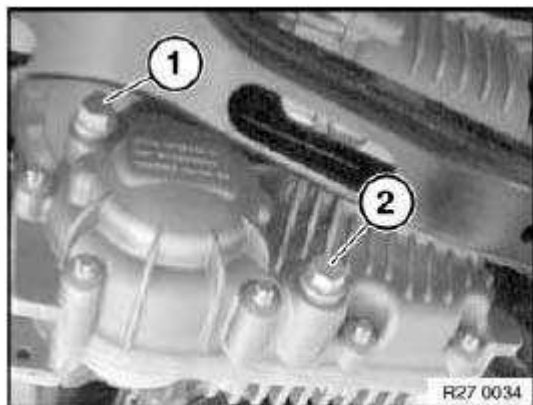


Fig. 2: Oil Filler Plug And Oil Drain Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Necessary preliminary tasks:

- Remove complete exhaust system, see **18 00 020 REMOVING AND INSTALLING COMPLETE EXHAUST SYSTEM (M54)** .
- Remove heat shield.

Unfasten screws.

Tightening torque: 26 11 9AZ, see **26 11 PROPELLER SHAFT, COMPLETE** .

Remove front propeller shaft at output flange of transfer case and tie to one side.

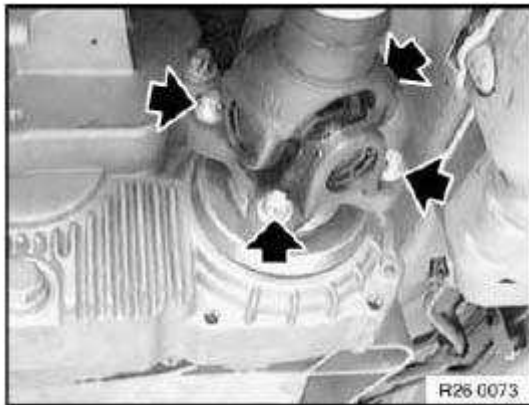


Fig. 3: Front Propeller Flange Shaft Screws
Courtesy of BMW OF NORTH AMERICA, INC.

- Remove propeller shaft from transmission.
- Release center bearing.
- Tie propeller shaft to one side.

Tasks are described in **26 11 000 REMOVING AND INSTALLING PROPELLER SHAFT (CARDAN UNIVERSAL JOINT) COMPLETELY** .

NOTE:

Automatic transmission:

Support transmission with special tools 00 2 030 / 24 5 301 / 24 5 305.

Manual transmission:

Support manual transmission with hydraulic lifter.

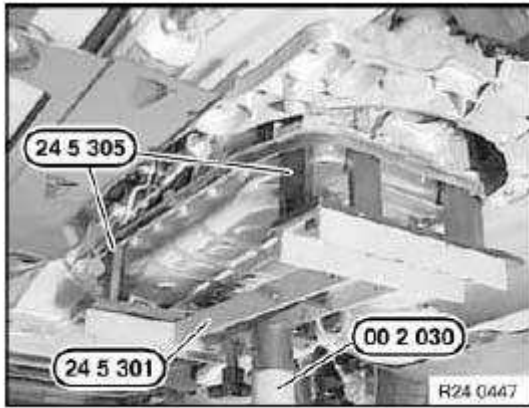


Fig. 4: Special Tools (00 2 030), (24 5 301) And (24 5 305)
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws and remove transmission cross-member.

Tightening torque: 27 00 10AZ, see **27 00 TRANSFER BOX IN GENERAL** .

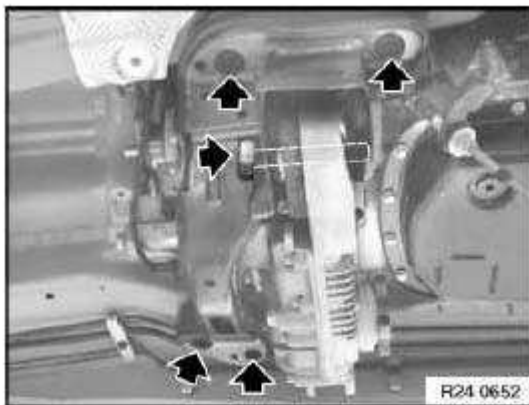


Fig. 5: Transmission Cross-Member Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Detach plugs (1) and (2) from servomotor.

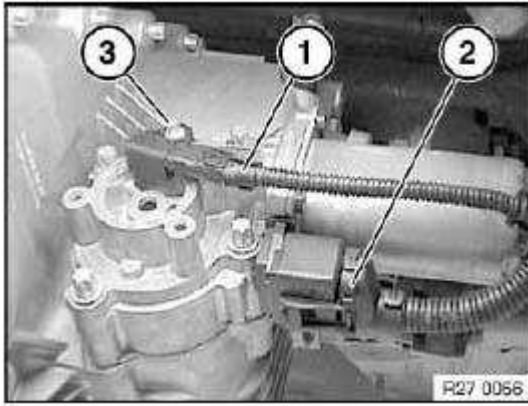


Fig. 6: Plugs And Servomotor
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw connection of transfer case.

Tightening torque: 27 00 9AZ, see **27 00 TRANSFER BOX IN GENERAL** .

Remove transfer case.

Installation:

Pay attention to dowel pin (1).

Grease dowel pin (1).

Apply a thin coat of grease to splines.

Grease: WEICON ANTI-SEIZE.

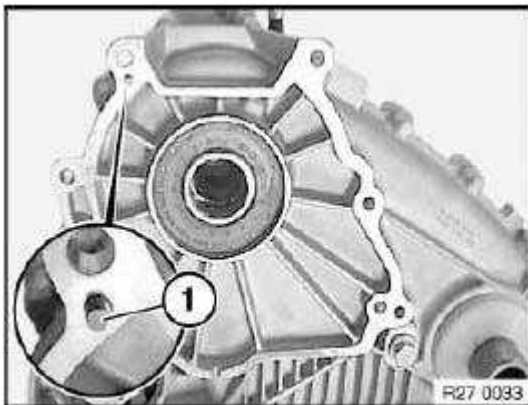


Fig. 7: Dowel Pin
Courtesy of BMW OF NORTH AMERICA, INC.

27 10 020 INSTALLING REPLACEMENT TRANSFER CASE (ATC 400 X-DRIVE)

IMPORTANT: After replacement, the "Repair" service function must be carried out with GT1.

Recycling:

Catch and dispose of escaping transmission oil. Observe country-specific waste-disposal regulations.

IMPORTANT: After completing work, check gear oil level and top up if necessary.

Filler plug (1):

Tightening torque: 27 2 7AZ, see 27 00 TRANSFER BOX IN GENERAL .

Gear oil level to lower edge of filler plug (1).

Use only the approved transmission oil.

Failure to comply with this requirement will result in serious damage to the transfer case!

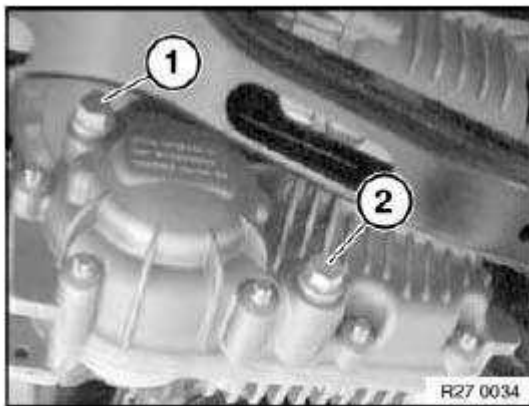


Fig. 8: Oil Filler Plug And Oil Drain Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Necessary preliminary tasks:

- Drain gear oil at oil drain plug, see 00 11 572 CHANGING OIL IN TRANSFER BOX (ATC 400/500) .

Tightening torque: 27 2 11AZ, see 27 00 TRANSFER BOX IN GENERAL .

- Remove transfer case, see 27 10 020 Installing replacement transfer case (ATC 400 X-Drive).

Convert following parts from previous transfer case to new transfer case.

- Covers and protective caps.
- Drive shaft transportation lock.
- Vent hose of transfer case.
- Vibration damper (M47T2).

Tightening torque: 27 2 12AZ, see 27 00 TRANSFER BOX IN GENERAL

- Rubber mount for transfer case mounting, replace if necessary, see **22 31 001 REPLACING RUBBER MOUNT FOR TRANSMISSION MOUNTING**

27 10 020 INSTALLING REPLACEMENT TRANSFER BOX (ATC 350)

Special tools required:

- 22 1 044
- 22 1 046
- 33 4 460

IMPORTANT: Before and after replacement, execute the "Repair" service function with the BMW diagnosis system.

NOTE: Recycling: Catch and dispose of escaping transmission oil. Observe country-specific waste disposal regulations.

Necessary preliminary tasks:

- Drain transmission oil at oil drain plug
- Tightening torque, 27 10 2AZ
- Remove transfer box

Modify following parts:

- Covers and protective caps
- Drive shaft transportation retainer
- Vent hose of transfer box

Bolt special tool 22 1 044 to transfer box. Insert special tool 22 1 046 with pins into opening of rubber mount. Draw in rubber mount with special tool 33 4 460.

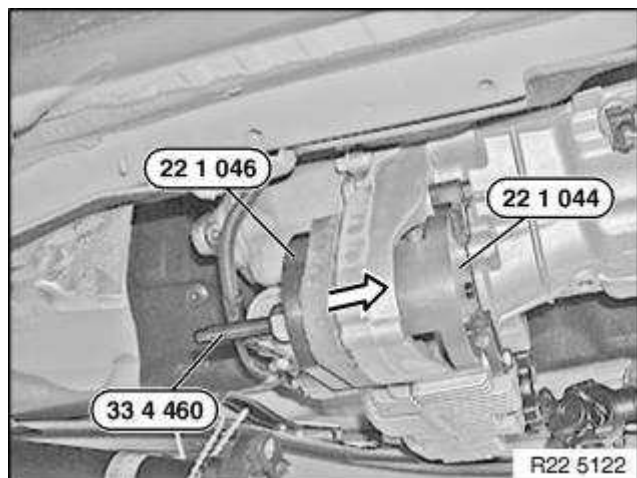


Fig. 9: Bolt Special Tool 22 1 044 To Transfer Box
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note: Pay attention to installation position of rubber mount (1).

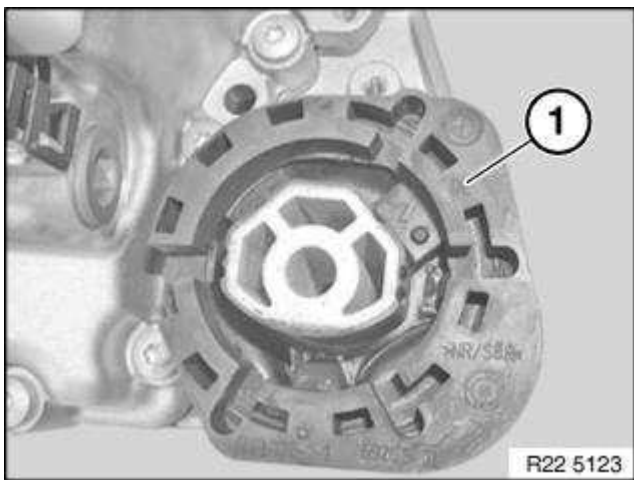


Fig. 10: Installation Position Of Rubber Mount (1)
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT:

- After completing work, check transmission oil level and top up if necessary.
- Release filler plug (1).
- Check oil level.
- Tightening torque, see 27 10 11AZ in 27 00 TRANSFER BOX IN GENERAL .
- Pour in transmission oil up to lower edge of opening for filler plug (1).
- Use only the approved TRANSFER CASE OPERATING FLUIDS .

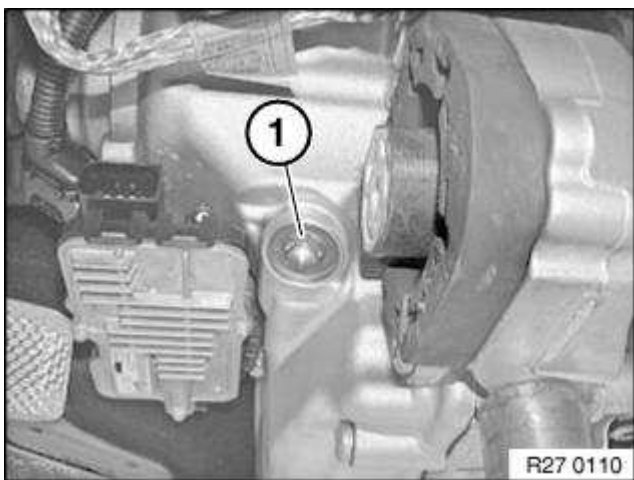


Fig. 11: Pour In Transmission Oil Up To Lower Edge Of Opening For Filler Plug (1)
Courtesy of BMW OF NORTH AMERICA, INC.

Failure to comply with this requirement will result in serious damage to the transfer box!

27 10 050 REPLACING OUTPUT FLANGE FOR FRONT AXLE OUTPUT (ATC 400/500 X-DRIVE)

IMPORTANT: Do not move vehicle with engine power once propeller shaft has been removed.

Replace output flange only in conjunction with a new radial shaft seal.

After completion of work, check transmission oil level, see 00 11 572

CHANGING OIL IN TRANSFER BOX (ATC 400/500)

Use only approved transmission oil.

Failure to comply with this requirement will result in serious damage to the transfer box!

Operation is identical to Replacing radial shaft seal for front axle output, see 27 21 030 Replacing radial shaft seal for front axle output (ATC 400/500 X-Drive).

27 10 700 REMOVING AND INSTALLING / REPLACING CONTROL UNIT FOR TRANSFER CASE

IMPORTANT: Read and comply with 61 35 ... NOTES ON ESD PROTECTION (ELECTRO STATIC DISCHARGE)

After installation:

- After replacement, the "Repair" service function must be carried out with GT1.
- Replacement only: Carry out programming/coding

In vehicles before 03/05 the old diagnosis algorithm and in vehicles after 03/05 the new diagnosis algorithm must always be activated by way of coding!

Necessary preliminary tasks:

- Remove front panel for luggage compartment floor, see 51 47 131 REPLACING FRONT TRIM FOR LUGGAGE COMPARTMENT FLOOR .

Unscrew nuts (1).

Unfasten plug connection and disconnect.

Remove control unit (2).

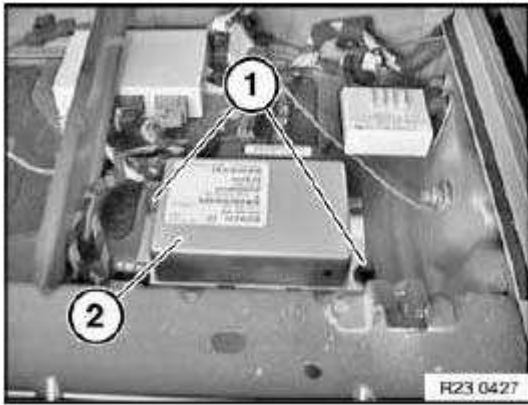


Fig. 12: Nuts And Control Unit

Courtesy of BMW OF NORTH AMERICA, INC.

27 10 710 REPLACING RESISTOR FOR SERVOMOTOR (ATC 400 X-DRIVE)

IMPORTANT: Delete previous resistance values when replacing the resistor.
Using BMW diagnosis system, work through test program in accordance with instructions.

Release screws and remove transmission cross-member.

Tightening torque: 27 00 10AZ, see **27 00 TRANSFER BOX IN GENERAL** .

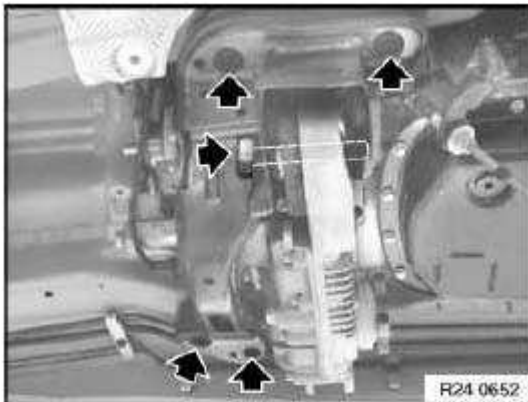


Fig. 13: Transmission Cross-Member Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Detach plug (1) from resistor.

Release screw (3) and remove resistor.

Tightening torque: 27 00 14AZ, see **27 00 TRANSFER BOX IN GENERAL** .

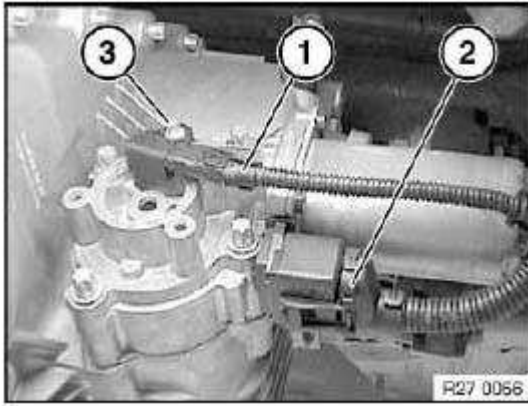


Fig. 14: Plugs And Servomotor

Courtesy of BMW OF NORTH AMERICA, INC.

27 10 720 REPLACING SERVOMOTOR (ATC 400 X-DRIVE)

IMPORTANT: After replacement, the "Repair" service function must be carried out with GT1.

Necessary preliminary tasks:

- Remove complete exhaust system, see **18 00 020 REMOVING AND INSTALLING COMPLETE EXHAUST SYSTEM (M54)** .
- Remove heat shield.

Release screws and remove transmission cross-member.

Tightening torque: 27 00 10AZ, see **27 00 TRANSFER BOX IN GENERAL** .

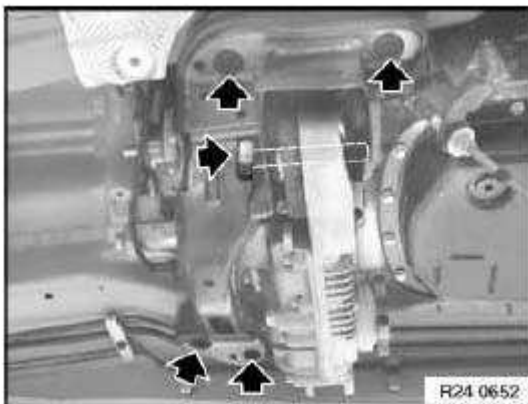


Fig. 15: Transmission Cross-Member Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plugs (1 and 2).

Release screws and remove servomotor from transfer case.

Tightening torque: 27 00 13AZ, see 27 00 TRANSFER BOX IN GENERAL .

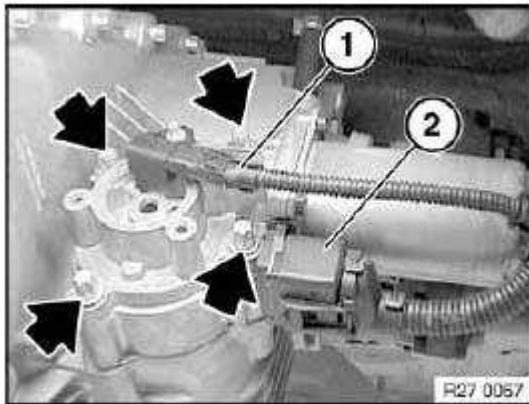


Fig. 16: Servomotor Plug And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

21 TRANSMISSION SHAFTS

27 21 010 REPLACING RADIAL SHAFT SEAL FOR DRIVE FLANGE (ATC 400/500 X-DRIVE)

Special tools required:

- 23 0 490 EXTRACTOR
- 27 1 390 DRIFT

IMPORTANT: After completion of work, check gear oil level and top up if necessary, see 00 11 572 CHANGING OIL IN TRANSFER BOX (ATC 400/500) and top up if necessary.
Use only approved gear oil in this transfer box.

Necessary preliminary tasks:

- Remove transfer box, see 27 10 010 Removing and installing transfer case (ATC 400 X-Drive).

Drive a hole into radial shaft seal (2) using a center punch (1).

IMPORTANT: Do not use a drill as drillings may result in transmission malfunction.

NOTE: Illustration shows NV125 transmission

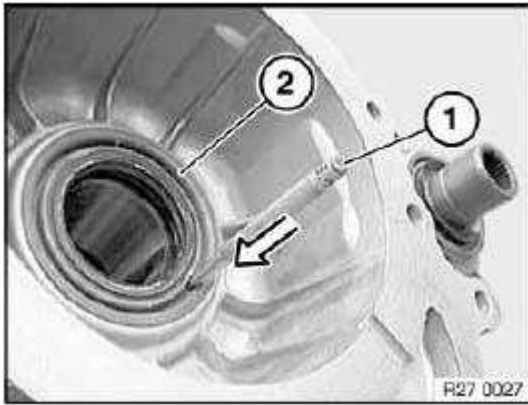


Fig. 17: Driving A Hole Into Radial Shaft Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Screw in special tool 23 0 490.

Drive out radial shaft seal (1) with impact weight (2).

NOTE: Illustration shows NV125 transmission

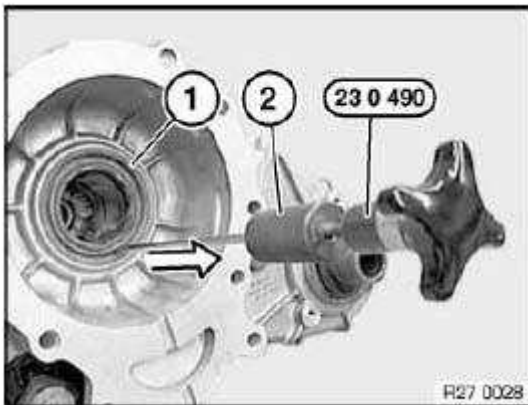


Fig. 18: Driving Out Radial Shaft Seal With Impact Weight
Courtesy of BMW OF NORTH AMERICA, INC.

Drive in radial shaft seal with special tool 27 1 390.

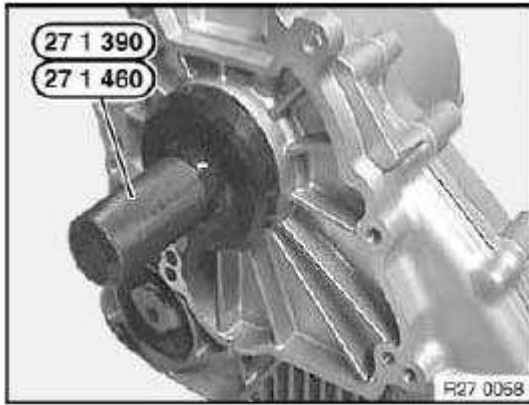


Fig. 19: Driving In Radial Shaft Seal With Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Add final details to vehicle.

Check oil level.

Check transmission for leaks.

27 21 020 REPLACING RADIAL SHAFT SEAL FOR OUTPUT FLANGE (ATC 400/500 X-DRIVE)

Special tools required:

- **23 0 490 EXTRACTOR**
- **27 1 400 DRIFT**
- **33 1 150 FIXTURE**

**IMPORTANT: After completing tasks, check gear oil level and top up if necessary, see 00 11 572 CHANGING OIL IN TRANSFER BOX (ATC 400/500) .
Use only approved gear oil in this transfer box.**

Necessary preliminary tasks:

- Remove transfer box, see **27 10 010 Removing and installing transfer case (ATC 400 X-Drive)**.

Release retaining ring (1).

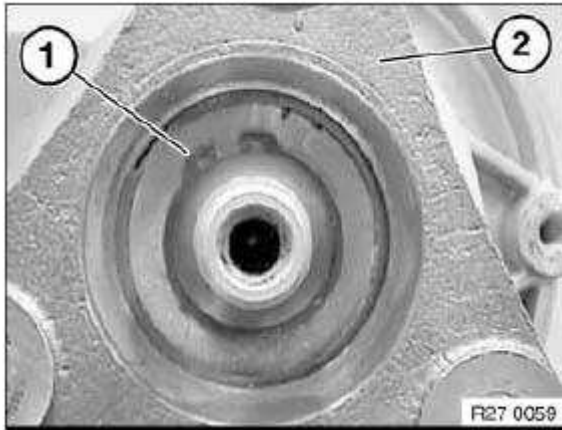


Fig. 20: Retaining Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Remove drive flange with special tool 33 1 150.

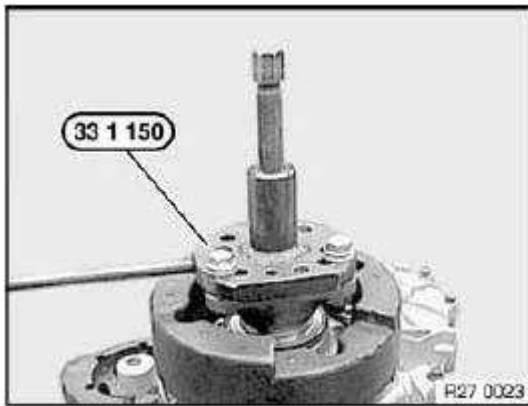


Fig. 21: Drive Flange And Special Tool (33 1 150)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace O-ring in output flange.

Check that O-ring is in correct position.

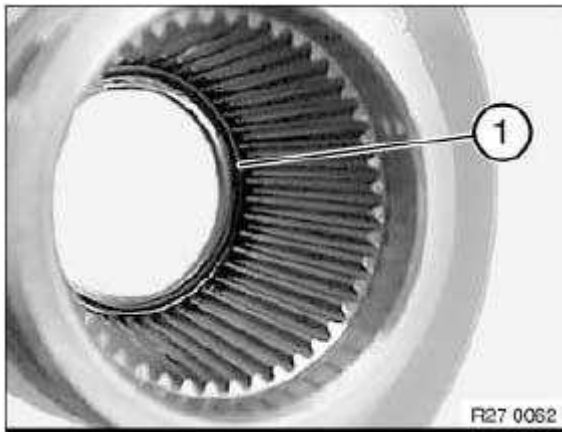


Fig. 22: O-Ring

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: The propeller shaft may move when the output flange is pushed on. The retaining ring can thus no longer be fitted.

Installation:

Version: output shaft with mounting groove (1):

- Push on output flange
- Using 2 screwdrivers, press output flange downwards or output shaft (2) upwards until groove for retaining ring is completely visible.
- Fit retaining ring.

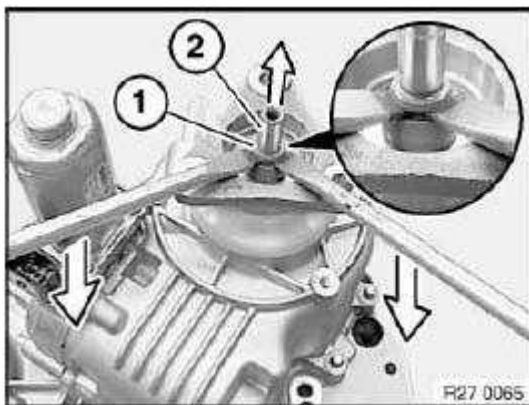


Fig. 23: Pressing Output Flange Downwards Or Output Shaft Upwards

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Version: transmission output shaft without mounting groove:

- Support transfer box with a suitable sleeve (1) on transmission input shaft (2).
- Push on output flange
- Fit retaining ring.

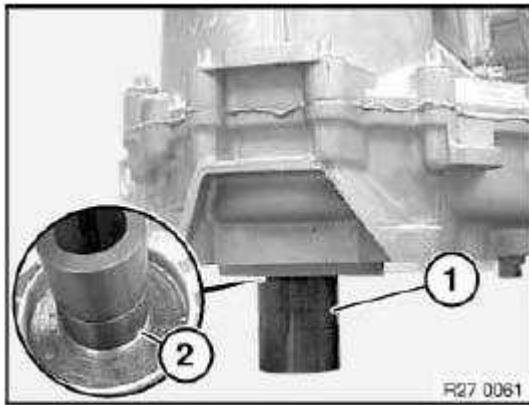


Fig. 24: Sleeve And Transmission Input Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Drive a hole into radial shaft seal (2) using a center punch (1).

See illustration.

IMPORTANT: Do not use a drill as drillings may result in transmission malfunction.

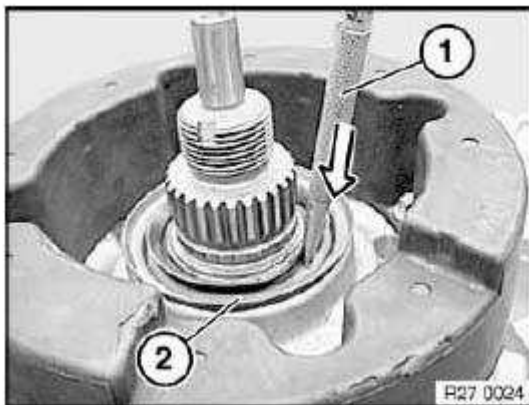


Fig. 25: Radial Shaft Seal And Center Punch
Courtesy of BMW OF NORTH AMERICA, INC.

Screw in special tool 23 0 490.

Drive out radial shaft seal (1) with impact weight (2).

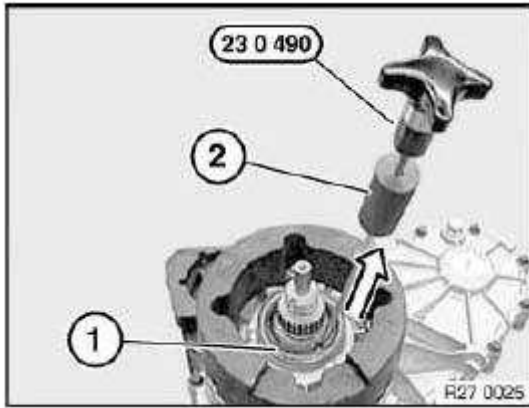


Fig. 26: Radial Shaft Seal, Impact Weight And Special Tool (23 0 490)
Courtesy of BMW OF NORTH AMERICA, INC.

Drive in radial shaft seal with special tool 27 1 400.

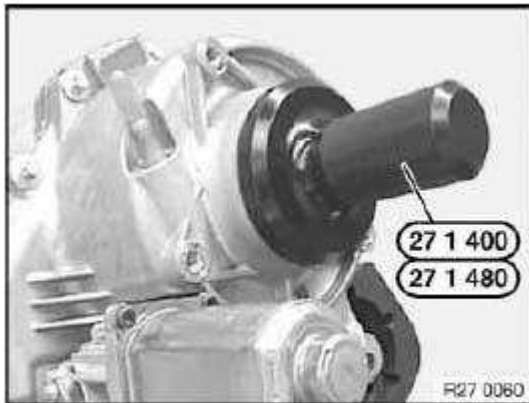


Fig. 27: Special Tool (27 1 400)
Courtesy of BMW OF NORTH AMERICA, INC.

Add final details to vehicle.

Check oil level.

Check transmission for leaks.

27 21 030 REPLACING RADIAL SHAFT SEAL FOR FRONT AXLE OUTPUT (ATC 400/500 X-DRIVE)

Special tools required:

- **23 0 490 EXTRACTOR**
- **27 1 410 DRIFT**
- 27 1 420

IMPORTANT: After completion of work check transmission oil level, see 00 11 572 CHANGING OIL IN TRANSFER BOX (ATC 400/500)
Use only the approved gear oil in this transfer box.

Necessary preliminary tasks:

- Remove reinforcement plate (E53 only), see 31 10 010 REMOVING AND INSTALLING/REPLACING REINFORCEMENT PLATE .
- Remove front propeller shaft, see REMOVAL & INSTALLATION .

Press out output flange (1) with a suitable tool (2) in direction of arrow.

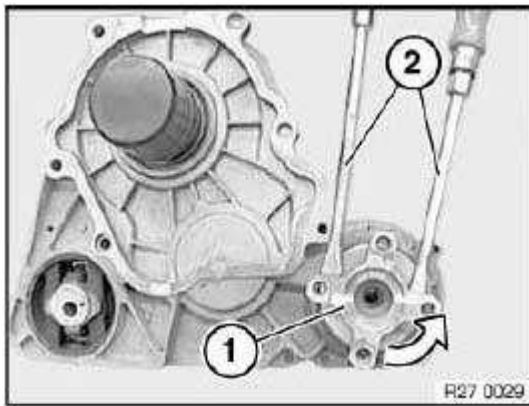


Fig. 28: Pressing Out Output Flange With Suitable Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Remove protective cap (1) with a screwdriver.

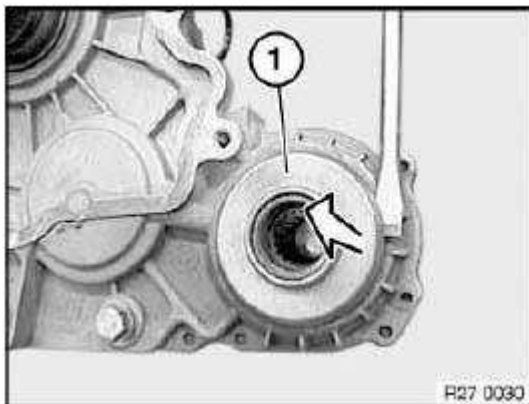


Fig. 29: Removing Protective Cap With Screwdriver
Courtesy of BMW OF NORTH AMERICA, INC.

Drive a hole into radial shaft seal (2) using a center punch (1).

See illustration.

IMPORTANT: Do not use a drill as drillings may result in transmission malfunction.

NOTE: Illustration shows E46 drive flange.

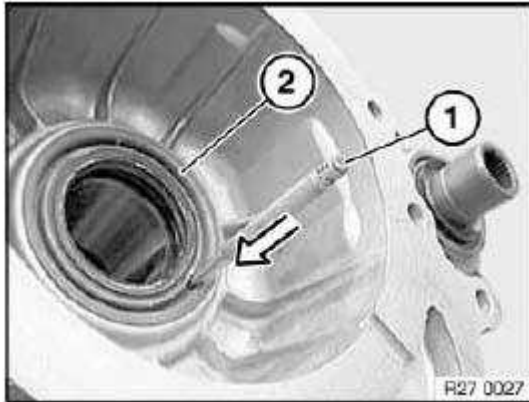


Fig. 30: Driving A Hole Into Radial Shaft Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Screw in special tool 23 0 490.

Drive out radial shaft seal (1) with impact weight (2).

NOTE: Illustration shows E46 drive flange.

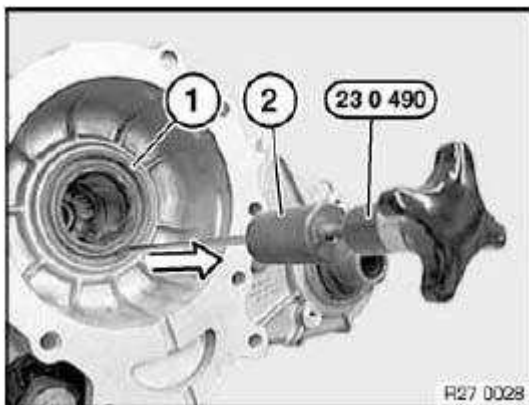


Fig. 31: Driving Out Radial Shaft Seal With Impact Weight
Courtesy of BMW OF NORTH AMERICA, INC.

Drive in radial shaft seal with a suitable special tool.

Special tool for E53 27 1 420

Special tool for E83 27 1 410

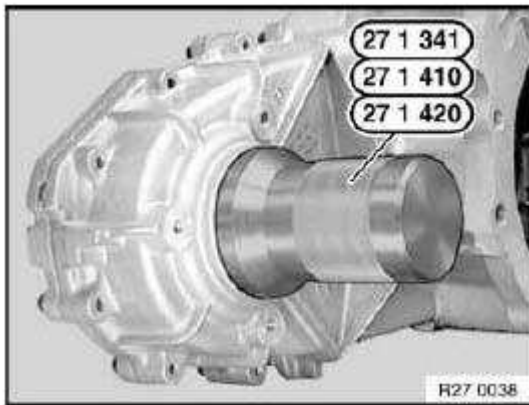


Fig. 32: Special Tools (27 1 410), (27 1 420) And (27 1 341)
Courtesy of BMW OF NORTH AMERICA, INC.

Add final details to vehicle.

Check oil level.

Check transmission for leaks.

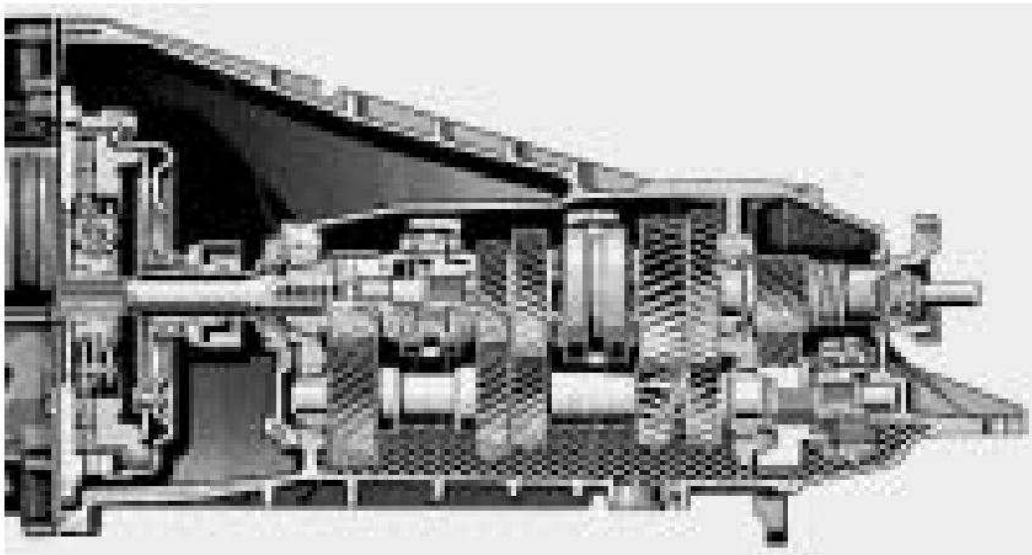
GENERAL INFORMATION

Transmission Fundamentals - Overview

TRANSMISSION FUNDAMENTALS

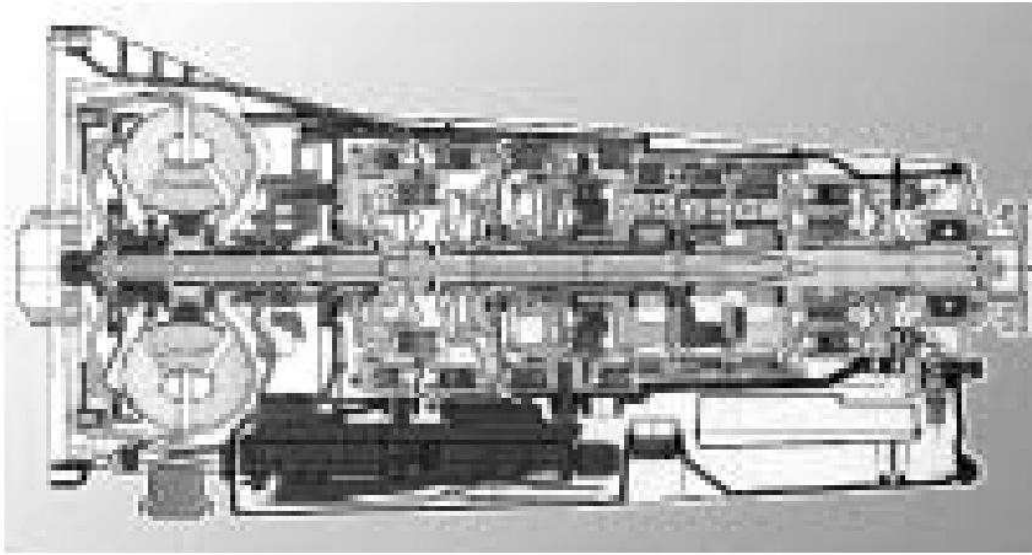
STANDARD/AUTOMATIC TRANSMISSION COMPARISON

In today's modern vehicles, the automatic transmission has become a vital part of the powertrain. Automatic transmissions provide overall better fuel economy and efficiency while adapting to changing road conditions and driving habits. Standard transmissions offer more driver interaction with the vehicle, however automatic transmissions reduce driver fatigue and increase safety by shifting automatically. Automatic transmissions also offer improved driveability in stop and go traffic. If there is a disadvantage to an automatic transmission, it would be complexity and cost of manufacturing.



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Fig. 1: Identifying Standard Transmission
Courtesy of BMW OF NORTH AMERICA, INC.



G03403721

Fig. 2: Identifying Automatic Transmission
Courtesy of BMW OF NORTH AMERICA, INC.

- Drive torque must be interrupted to change gears.
- Higher loads on driveline from abrupt clutch application.
- Clutch must be disengaged when vehicle is stopped to prevent stalling.
- High radial loads on housing.
- Gear set design requires more space than planetary type.
- Requires some Maintenance (clutch).
- Requires driver intervention for shifting.
- Gear teeth are in constant mesh due to planetary design.
- Smoother application of drive torque reduces loads on driveline.
- Due to fluid coupling in the torque converter, transmission can stay in gear when vehicle is stopped.
- Minimal radial loads on housing.
- Compact design of gear set. Space requirement is minimized.
- Maintenance free operation. (Lifetime fluid and no clutch).
- Automatic shifting reduces driver fatigue and increases safety.

HYDRAULIC TRANSMISSION VS. ELECTRO-HYDRAULIC TRANSMISSION

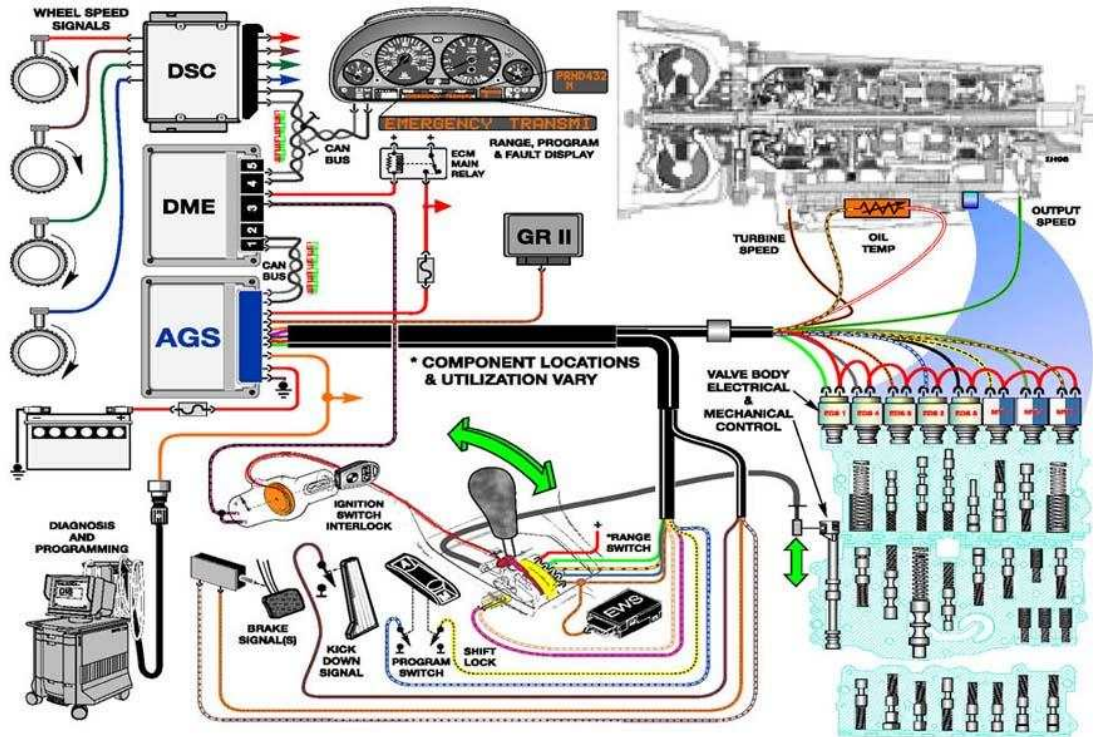
Since the introduction of the automatic transmission there have been numerous refinements to improve shift comfort as well as fuel economy. Early automatic transmissions used only hydraulic control, there was no

electronic intervention. In 1986 BMW introduced their first EH (Electro-Hydraulic) transmission into production vehicles.

The acronym EGS is used by BMW for its electronic transmission control system. EGS stands for "Electronic Transmission Control" which comes from the German words "Elektronisch Getriebe Steuerung". In order to comply with SAE terminology we will refer to the EGS control module as the TCM "Transmission Control Module".

EH controlled transmissions allow for optimized shift points by closely monitoring changing conditions. Engine speed, road speed and throttle angle are some of the inputs that are monitored by the TCM to determine optimal shift points. The TCM will then process this information and control shift point via electronic solenoids mounted on the valve body.

With the introduction of Adaptive Transmission Control, shift comfort and fuel economy was further improved. The TCM now monitors throttle angle deviations, wheel speeds and CAN Bus information to fine tune shift points.



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Fig. 3: Identifying Electro-Hydraulic Transmission Inputs/Outputs
Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION IDENTIFICATION

BMW automatic transmission are manufactured by two suppliers for the US market:

- **Zahnradfabrik Friedrichshafen:** Commonly referred to as ZF. ZF manufactures both manual and automatic transmissions.

- **GM Powertrain - Hydramatic:** Hydramatic is a manufacturing division of General Motors located in Strasbourg France. Hydramatic supplies automatic transmissions to BMW for four and six-cylinder vehicles.

BMW has developed an internal numbering system for their transmissions for parts ordering, information research and identification. Also each manufacturer uses their own internal identification system. Here is a breakdown of these identification codes:

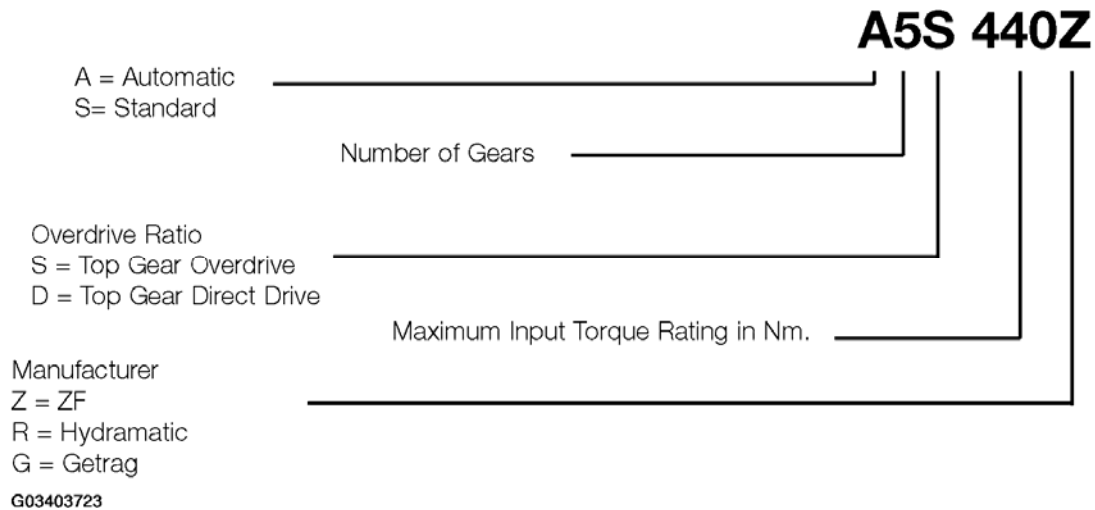


Fig. 4: Identifying BMW Identification Code Breakdown
Courtesy of BMW OF NORTH AMERICA, INC.

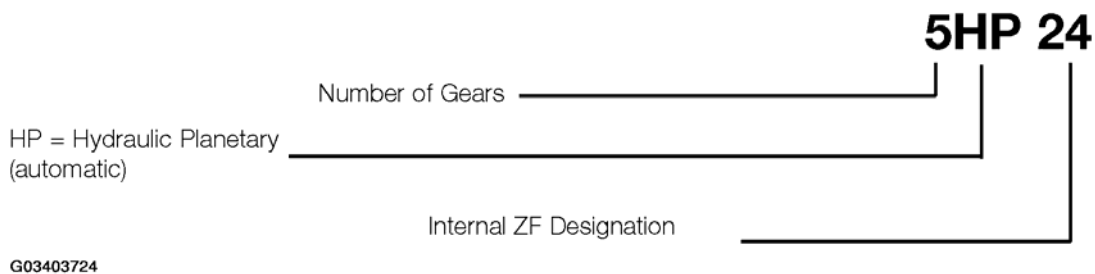


Fig. 5: Identifying ZF Identification Code Breakdown
Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION HYDRAULICS

Transmission Fluid (Oil)

The automatic transmission provides pressure regulated hydraulic fluid which is filtered for all of the transmissions functional requirements. All BMW automatic transmissions are designed to operate with specific

fluids. Use of non-approved oil will cause malfunctions and irreparable transmission damage which is not covered by BMW warranty.

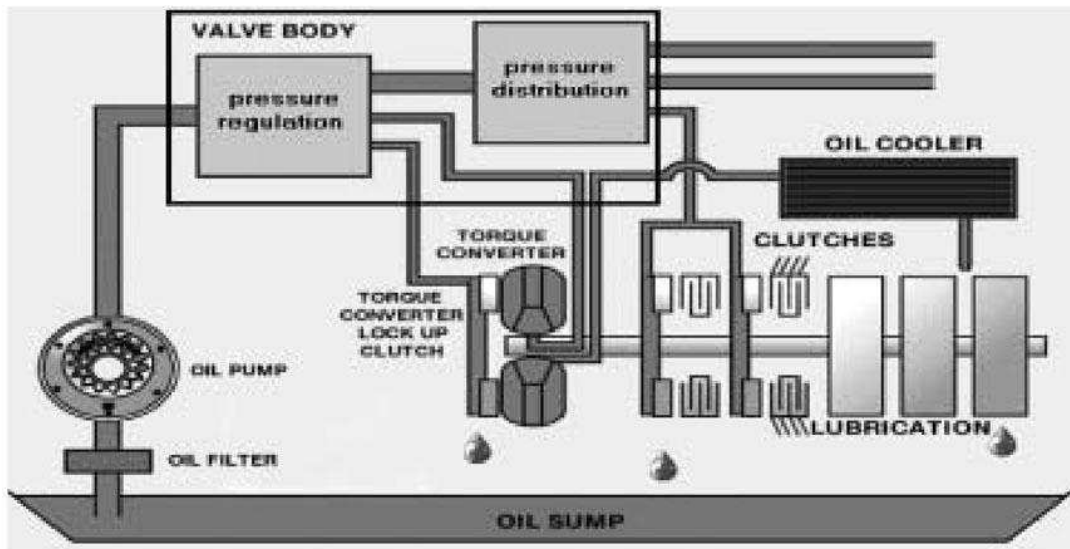
The transmission fluid provides the following functions:

- Lubricates mechanical components (planetary gears, bearings etc.).
- Removes heat and transfers heat to transmission cooling system. (Heat Exchanger).
- Removes debris and contaminants to sump and filter when circulated.
- Provides a transfer of kinetic energy in the torque converter.
- Allows hydraulic operation of mechanical components (clutches, brakes) via control of the valve body.

Also, transmission fluid has various properties to prevent oxidation and breakdown from heat and friction. Each type of transmission fluid has properties specific for each transmission application.

Fluid level is crucial in the proper operation of an automatic transmission. Improper fluid levels will cause improper operation and eventually irreparable transmission damage. Improper fluid level can cause:

- A low fluid level can cause an interruption in oil flow during fast acceleration or hard braking which can cause gear shift malfunctions.
- An excessively high fluid level can cause the rotating mechanical components to paddle in the oil. This produces foam which introduces air into the hydraulic system.
- A low fluid level can also cause transmission overheating causing premature transmission failure.



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Fig. 6: Identifying Transmission Fluid Flow
Courtesy of BMW OF NORTH AMERICA, INC.

There are numerous types of transmission fluid used in BMW transmissions. With the exception of the early transmissions (4HP22/24, A4S310/270R and the A5S310Z) all current BMW transmissions use "Lifetime Fill" transmission fluid. There is no maintenance required for these transmissions. It is important to use the correct fluid. Incorrect use of the transmission fluid can cause non-warrantable transmission damage.

When performing repairs on transmissions with lifetime fluid, it is important to drain the transmission fluid in to a clean container for re-use. New fluid should only be used for transmission replacement and for topping off after repairs.

Also, transmission fluid level is vital to the proper operation of the transmission.

BMW AUTOMATIC TRANSMISSIONS FLUID SPECIFICATIONS

Transmission	Fluid Type	BMW Part #	Container	SIB Ref.
4HP22 4HP24	Dexron III Mercon	Available Commercially (Castrol or Texaco)	N/A	
A5S310Z 530i/iT (E34)	Dexron III	Available Commercially (Castrol or Texaco)	N/A	
M3 (E36)	ESSO LT 71141	83 22 9 407 807	20 liter container	B 24 03 95
A5S325Z	ESSO LT 71141	83 22 9 407 807	20 liter container	
A5S440Z	ESSO LT 71141	83 22 9 407 807	20 liter container	
A5S560Z 740 (E32), 540 (E34) 840Ci (E31- 6/93- 12/94) 740i/iL-750iL (E38)	Shell LA2634	83 22 9 407 765	5 liter container	B 24 11 92
540i (3/96-12/96) 850Ci (10/94-6/97)	ESSO LT 71141	83 22 9 407 807	20 liter container	B 24 02 94
A4S310R A4S270R (THM-R1)	Dexron III Mercon	Available Commercially (Castrol or Texaco)	N/A	
A5S360R	Texaco ETL 7045E	83 22 0 026 922	25 liter container	
A5S390R	Texaco ETL 8072B	83 22 0 024 359	25 liter container	
GA6HP26Z	Shell M1375.4	83 22 0 142 516		

TORQUE CONVERTER

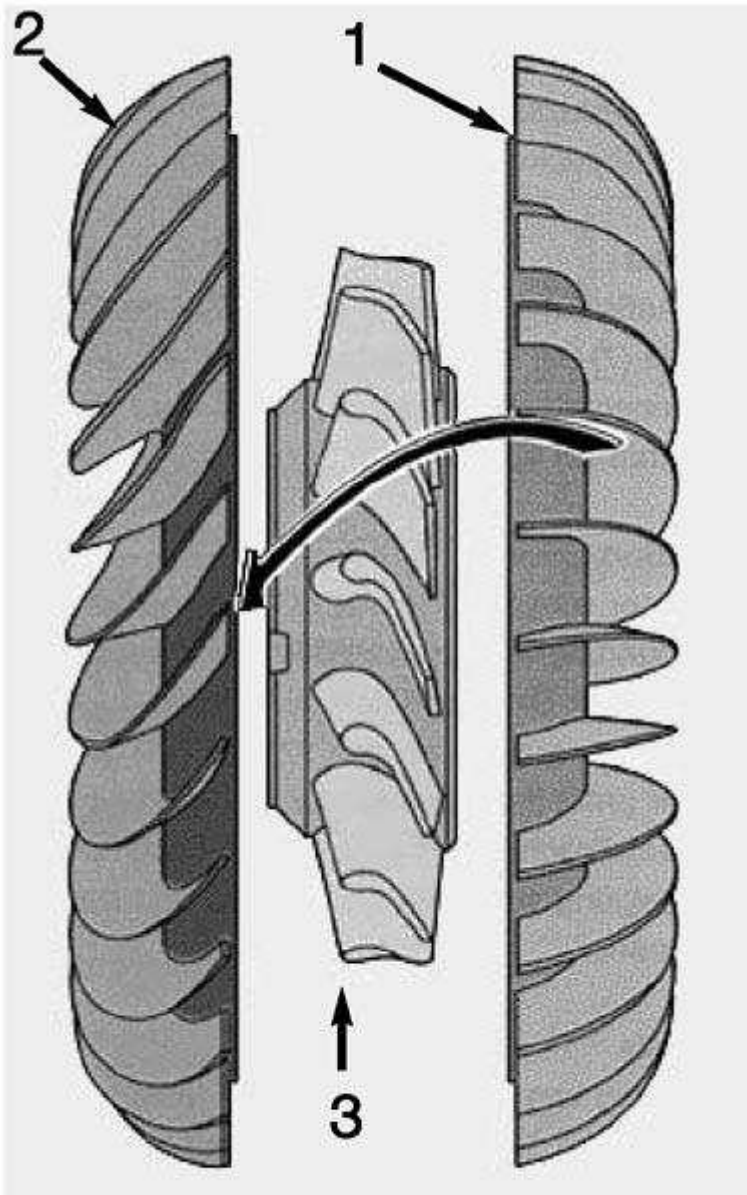
In standard transmissions the crankshaft is linked to the transmission input shaft via the clutch assembly. Power flows from the crankshaft through the flywheel. The pressure plate transfers power to the clutch disc which is splined to the transmission input shaft. The pressure plate is used to disconnect (or interrupt) power flow to the transmission input shaft. Because the engine is mechanically connected to the driveline, power flow must be interrupted when the vehicle is stationary. Otherwise the engine would stall.

In automatic transmissions, there is a fluid coupling between the engine and transmission. This fluid coupling is more commonly referred to as the torque converter. In the torque converter there is no rigid connection between

the engine and transmission (Except for lock up clutch). In order to understand the operation of the torque converter, we must first start with the components.

The breakdown of the components are as follows:

- The Impeller (1), which is rigidly connected to the torque converter housing.
- The Turbine (2) which is splined to the input shaft (turbine shaft) of the transmission.
- The Stator (3) which has a one-way clutch. The inner race of the one-way clutch is splined to a stationary shaft attached to the transmission.



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Fig. 7: Identifying Torque Converter Components
Courtesy of BMW OF NORTH AMERICA, INC.

The addition of the stator allows the fluid coupling to be referred to as a torque converter. The stator provides for a multiplication of torque at low speeds. Without the stator there would be no multiplication of torque.

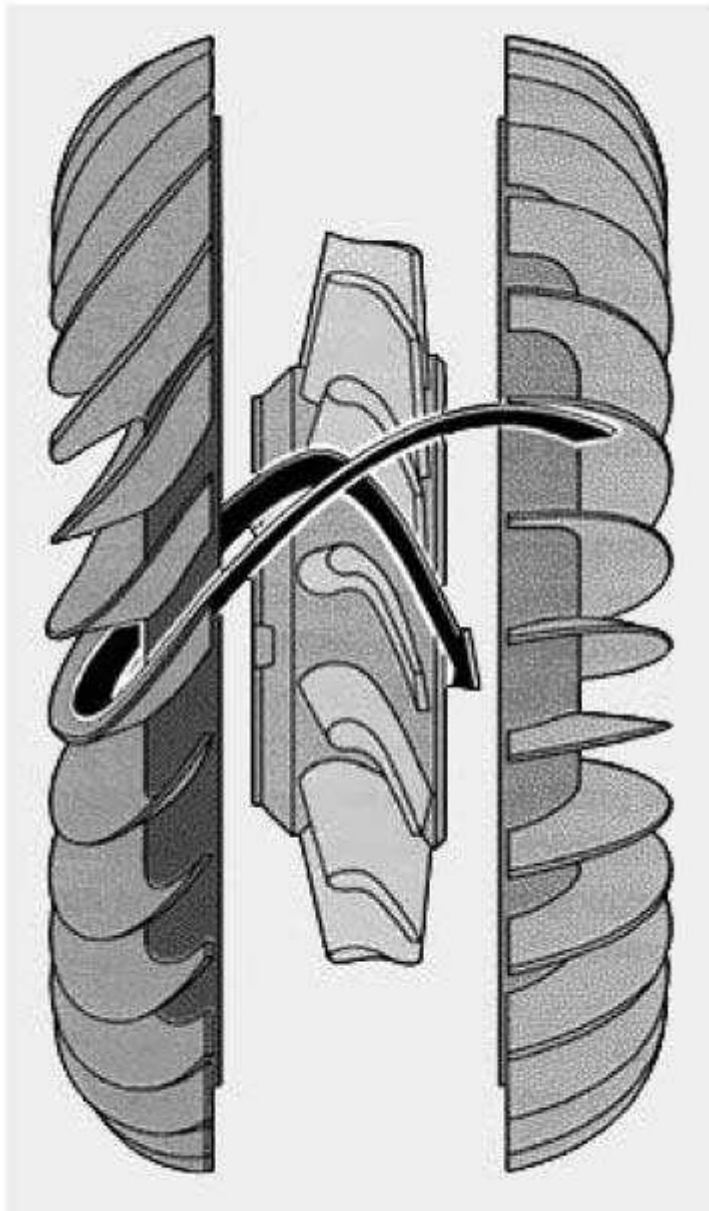
When the engine is running, the impeller which is directly connected to the converter housing, rotates at engine speed. Fluid is directed from the impeller blades to the turbine blades. The fluid drives the turbine which is splined to the input (turbine) shaft of the transmission. This functions the same way as a waterfall acting on a

paddle wheel. The ratio of the impeller speed to turbine speed is approximately 1.1 to 1. This ratio is improved to 1:1 with the addition of the torque converter clutch which is discussed later.

Torque Converter

Torque Converter Operation At Low Speeds

1. At low engine speeds there is a large difference in rotational speed between the impeller and the turbine
2. Fluid flow is directed from the impeller to the turbine. Fluid strikes the vanes of the turbine. The turbine is driven forward in the direction of engine rotation.
3. Fluid flow is then directed back towards the impeller.
4. Before the fluid reaches the impeller, the fluid strikes the vanes of the stator.
5. When the fluid strikes the stator, the one way clutch prevents the stator from rotating.
6. The fluid is then re-directed by the curved vanes of the stator. The fluid is now flowing in the same direction as the impeller.
7. The fluid that is acting on the impeller increases the force on the impeller which multiplies torque.



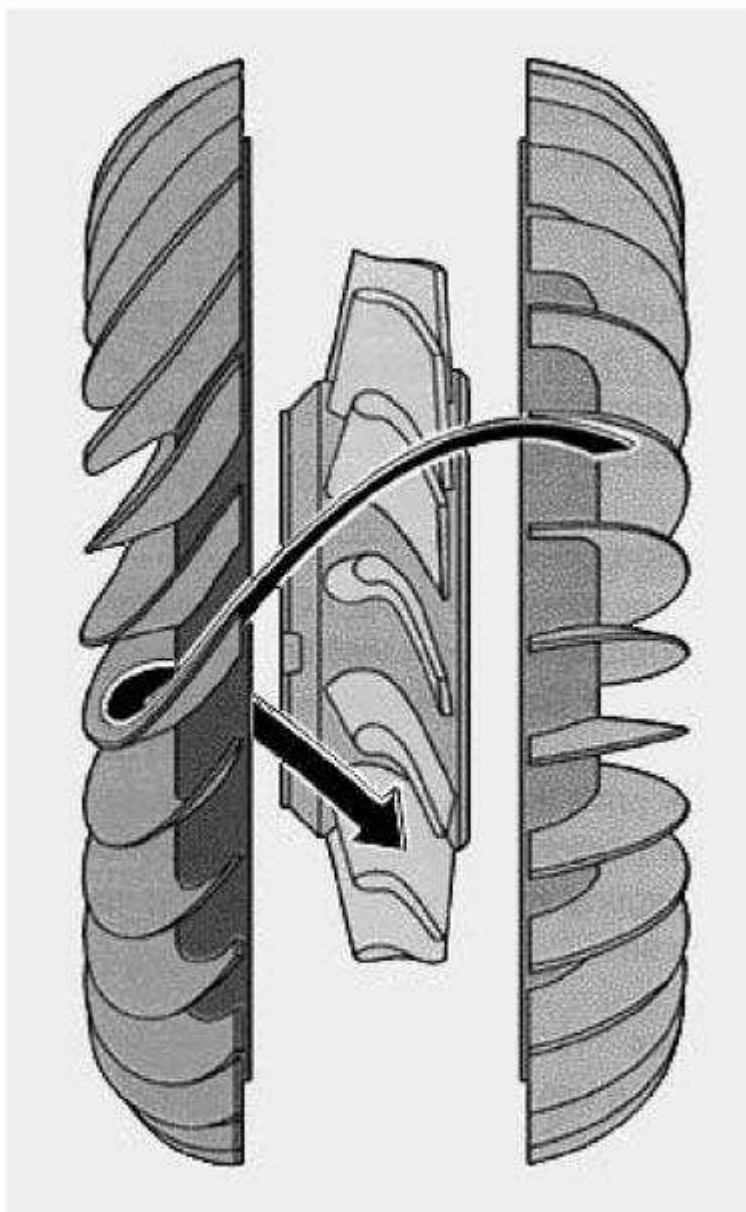
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Fig. 8: Identifying Torque Converter Operation At Low Speeds
Courtesy of BMW OF NORTH AMERICA, INC.

Torque Converter Operation At High Speed

1. As engine speed increases, the turbine speed approaches the speed of the impeller.
2. The fluid flow is directed from the turbine to the back side of the impeller blades.
3. The one-way clutch in the stator unlocks and the stator blades turn in the direction of engine rotation.

4. Fluid is no longer re-directed and torque multiplication no longer takes place.
5. This is referred to as "Coupling Speed". The turbine never reaches the same speed as the impeller as fluid flow would come to a halt. Ratio is approximately 1.1 to 1.



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Fig. 9: Identifying Torque Converter Operation At High Speed
Courtesy of BMW OF NORTH AMERICA, INC.

TORQUE CONVERTER CLUTCH

Since the efficiency of the torque converter at coupling speed is approximately 1.1 to 1, fuel economy is compromised. To offset this a torque converter clutch was added on EH controlled transmissions. The torque converter clutch locks the turbine to the converter housing. This creates a mechanical coupling with a ratio of 1:1. This can only be achieved at higher engine speeds, the torque converter clutch must be disengaged at low engine speeds to prevent stalling.

There are two methods for controlling the torque converter clutch on BMW transmissions:

- **A4S310/270R, 4HP22/24 EH, A5S310Z** - These transmission use an on/off control method to lock and unlock the torque converter. The TCC is either completely engaged or completely disengaged. This method of engagement provides an abrupt sensation when the TCC is locking and unlocking. This abrupt sensation can be unpleasant and undesirable to some drivers.
- **A5S560Z, A5S440Z, A5S325Z, GA6HP26Z, A5S360/390R** - These transmissions use a gradual approach to TCC control. The TCC is gradually applied and released, this method reduces the abrupt feel of the on/off type TCC. The TCC solenoid is controlled by pulse width modulation. This allows fluid to be gradually introduced and released to the TCC.

The TCC is spring loaded to the engaged position. Pressurized fluid releases the TCC, when the pressurized fluid is released, the TCC is engaged. Depending on transmission application, the TCC can be engaged in 3rd, 4th or 5th gear. The TCC must be disengaged at low speeds to prevent stalling.

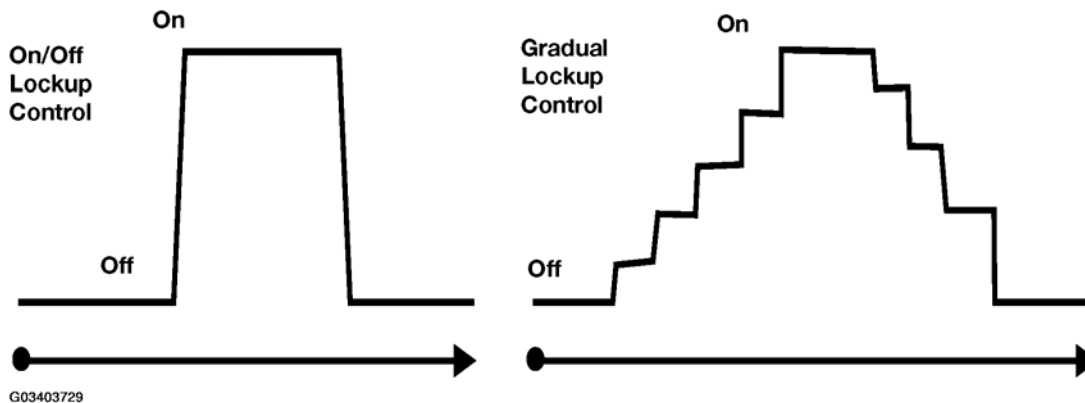


Fig. 10: Identifying Two Methods For Controlling Torque Converter Clutch On BMW Transmissions
Courtesy of BMW OF NORTH AMERICA, INC.

Example Of TCC Oil Control Circuit From The A5S440/560Z Transmission.

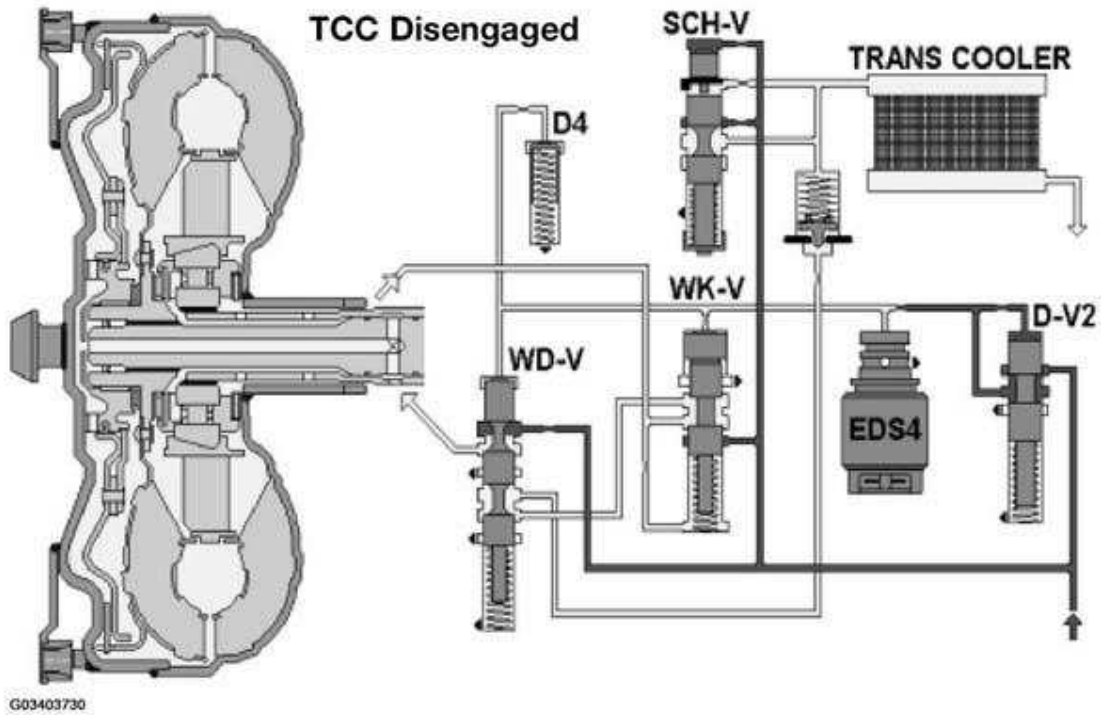


Fig. 11: Identifying TCC Oil Control Circuit From A5S440/560Z Transmission (TCC Disengaged)
 Courtesy of BMW OF NORTH AMERICA, INC.

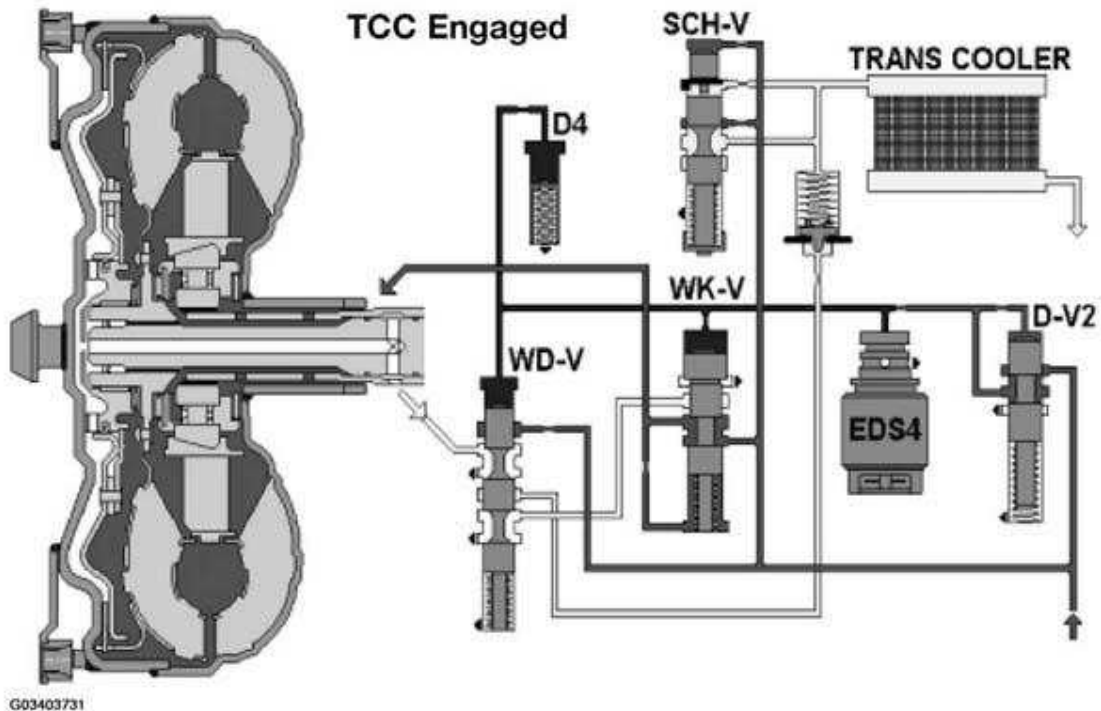


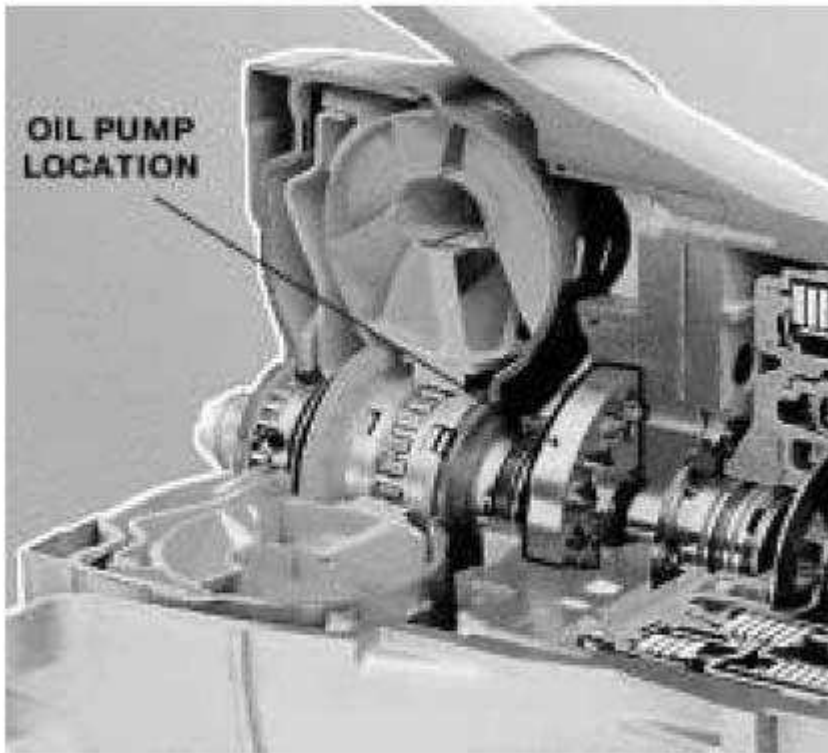
Fig. 12: Identifying TCC Oil Control Circuit From A5S440/560Z Transmission (TCC Engaged)
Courtesy of BMW OF NORTH AMERICA, INC.

OIL PUMP

The transmission oil pump is used to circulate oil and provide pressure for hydraulic operation.

The pump is driven by the torque converter shell and rotates with engine. Fluid is drawn from the sump through the filter and distributed to the various transmission hydraulic systems.

The output pressure is regulated to an operating pressure of approximately 25 bar.



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Fig. 13: Identifying Transmission Oil Pump Location
Courtesy of BMW OF NORTH AMERICA, INC.

Currently there are two types of oil pumps used in BMW transmissions; Crescent type and Vane type.

Crescent Type Oil Pump (All Except A5S360/390R)

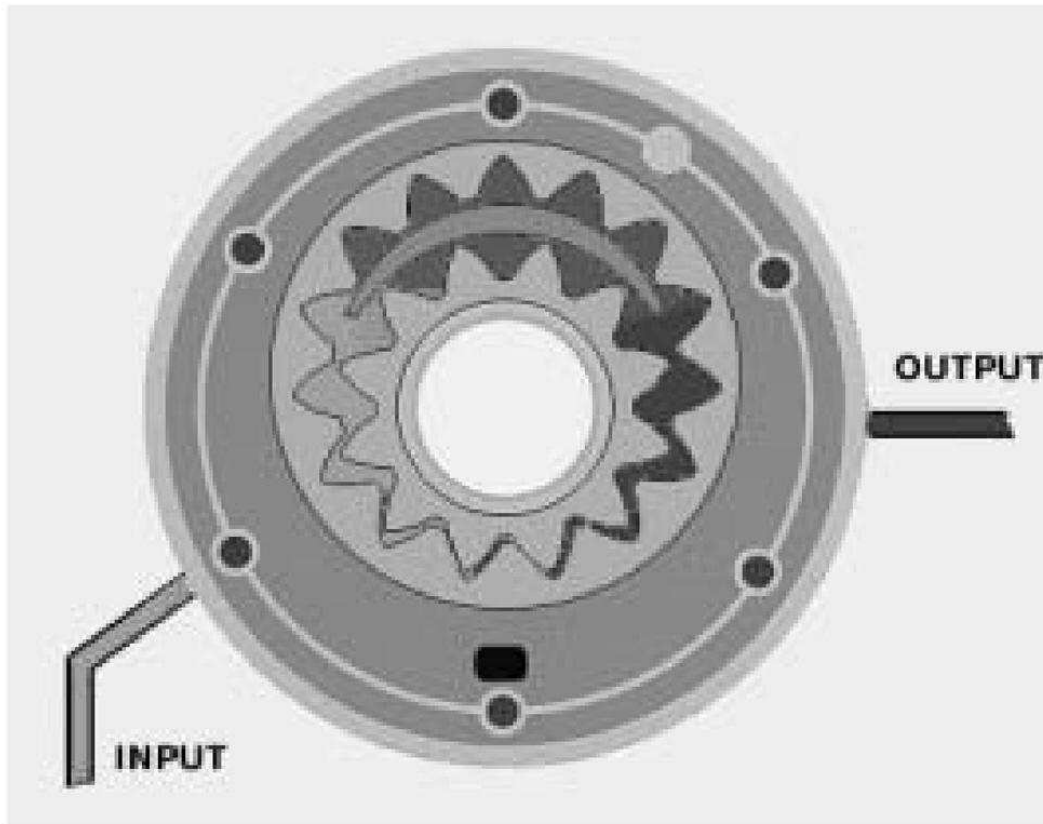
The crescent type is an internal gear pump containing a drive gear and a driven gear. The inner gear is driven by the torque converter and acts as the impeller. The outer gear is driven by the inner gear.

The gap between the teeth varies from the input, through the crescent and to the output of the pump.

A low pressure area is created on the input side of the pump by the widening gap between the gear teeth.

The oil is drawn to the crescent and transferred to the output side of the pump, where the pressure is increased by the narrowing gap between the gear teeth.

The output pressure of the pump is controlled by spring loaded pressure regulator.



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Fig. 14: Identifying Crescent Type Oil Pump (All Except A5S360/390R)
Courtesy of BMW OF NORTH AMERICA, INC.

Oil Volume Control

On the A5S440Z transmission, oil pump output volume is controlled based on engine RPM. High oil volume is initially required at start up to quickly fill the transmission requirements. As engine RPM increases, the volume is greater than is required. The Oil Volume Control Damper regulates the pump output volume based on engine RPM. This helps improve fuel economy by reducing the load on the engine at high RPM.

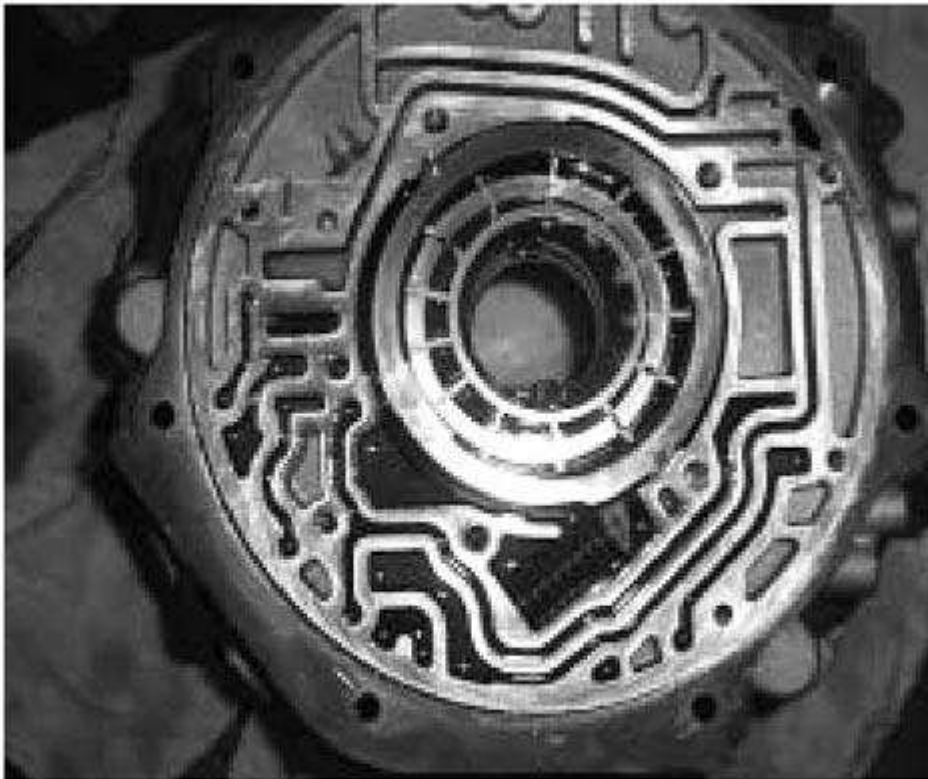
Vane Type Pump (A5S360/390R)

The new A5S360/390R (GM5) transmission uses a vane type pump. The torque converter drives the pump rotor and 13 vanes.

The rotor and vanes are placed inside a slide mechanism. As the rotor spins, the vanes sweep oil from the pump intake to the output along the mating surface on the vane ends and the interior surface of the slide.

The slide is mounted on a pivot pin. As it pivots, it changes the eccentricity of the rotor to slide mating surface. This in turn will alter the output oil volume. This provides the same function as the Oil Control Volume Damper on the A5S440Z.

The slide's position is influenced by a calibrated spring and hydraulic control pressure from the main pressure regulator solenoid on the valve body.



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Fig. 15: Identifying Vane Type Pump (A5S360/390R)
Courtesy of BMW OF NORTH AMERICA, INC.

The benefit of changing the slide position is to optimize pump output volume to meet the following operating conditions:

- Provide maximum volume during engine start-up. This condition provides a fast priming action of the pump for immediate lubrication and for hydraulic pressure operation.
- Regulated output volume at higher engine speeds. Maximum pump volume is not required at all times.

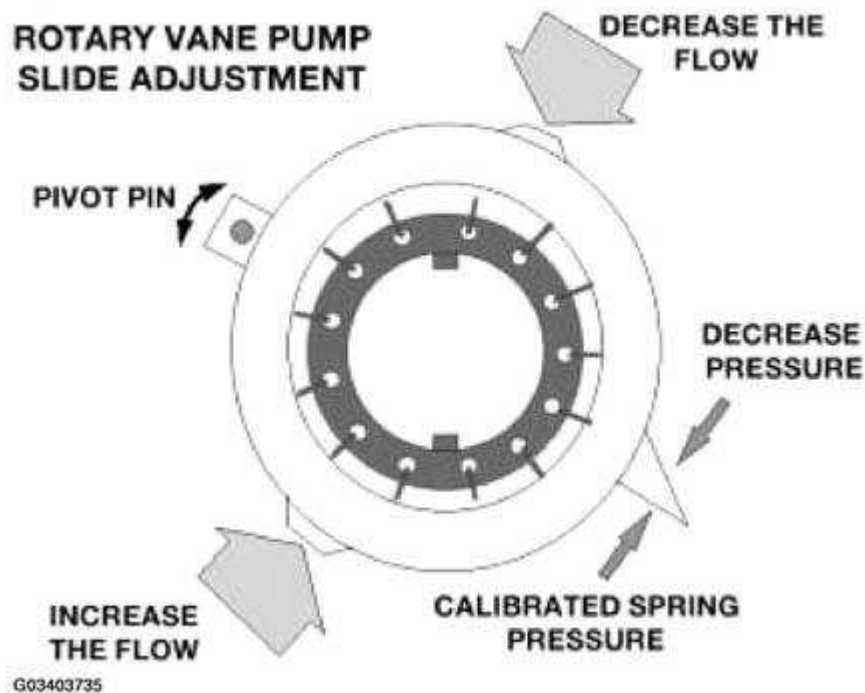


Fig. 16: Identifying Rotary Vane Pump
 Courtesy of BMW OF NORTH AMERICA, INC.

HYDRAULIC CONTROL COMPONENTS

Electro/Hydraulic Valve Body

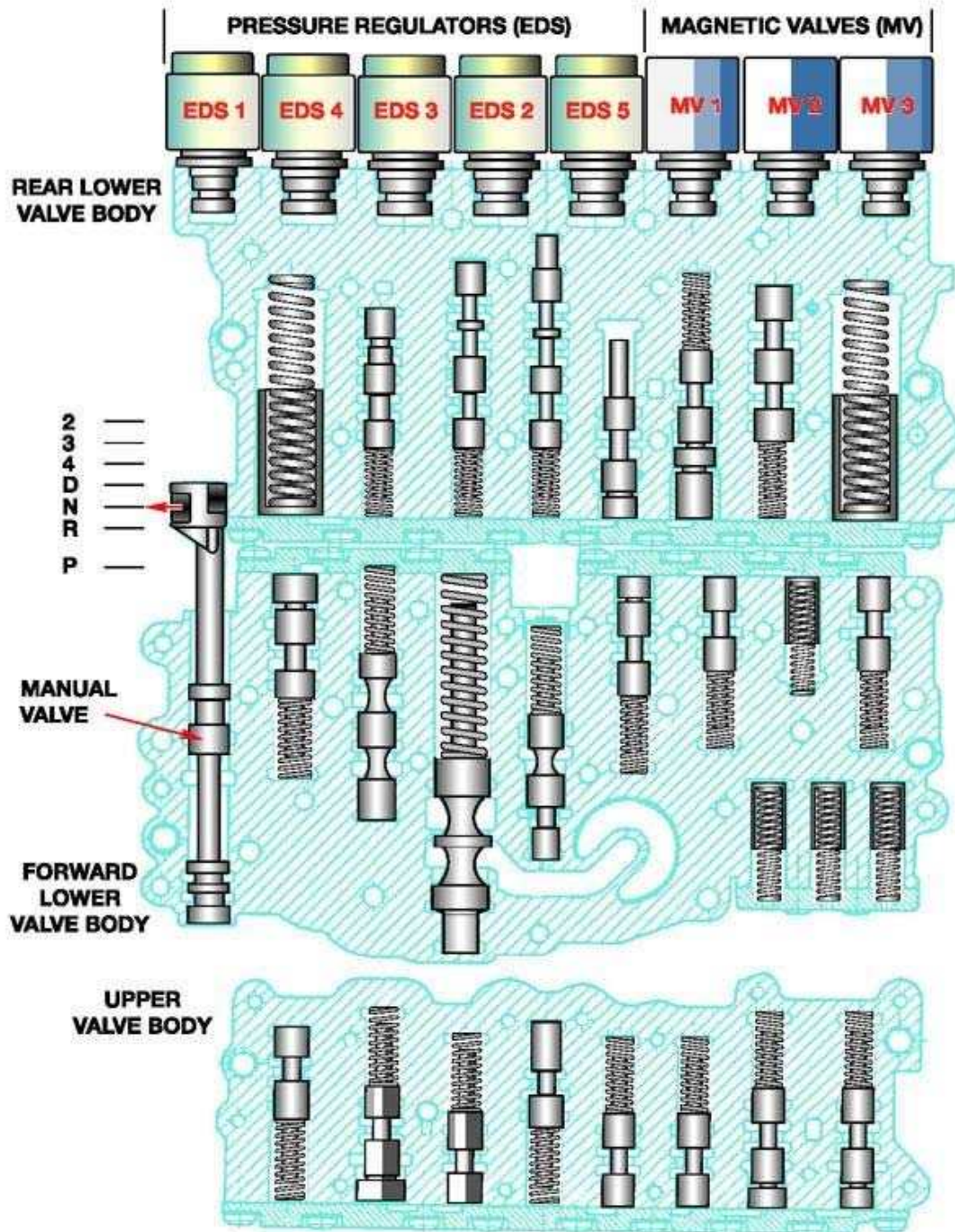
The valve body assembly is the main shift control element in the transmission. In non-EH transmissions the valve body was only hydraulically controlled. In the current EH (electrohydraulic) transmissions the valve body is similar in design, but now also housing a number of shift solenoids which are controlled by the TCM.

The valve body consists of a number of sub-assemblies. Each sub-assembly contains a number of spool valves which are hydraulically controlled. Most spool valves are opposed by spring pressure. The spool valves are used to direct hydraulic fluid flow to the various shift elements in the transmission. There is also a manual valve which is connected to the shift assembly by a cable. The manual valve allows the drivers to select the basic operating mode (or ratio).

The valve body is responsible for the following:

- Regulating Main Pressure
- Controlling fluid flow to shift elements for Upshifts and Downshifts.

- Providing for manual operation by driver via manual valve.
- Reverse Lockout
- Fail-safe Operation
- Shift Comfort through: Overlap Shift Control (ZF) Pressure Accumulators (GM)
- Torque Converter Control
- Distribution of lubrication.



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Fig. 17: Identifying Electro/Hydraulic Valve Body
 Courtesy of BMW OF NORTH AMERICA, INC.

Shift valves are used to direct application pressure to the various shift elements. Shift valves are regulated by spring pressure and control pressure for the shift solenoids. Shift valves come in various configurations depending upon application and transmission type. The most basic is the 3/2 shift valve. The 3/2 shift valve has 2 positions which are switched through one or two control pressures.

With no control pressure from shift solenoid present, the shift valve is moved to its end travel (left) by spring pressure.

Operating pressure is blocked to the shift component. Also in this position any application pressure is drained from the shift component.

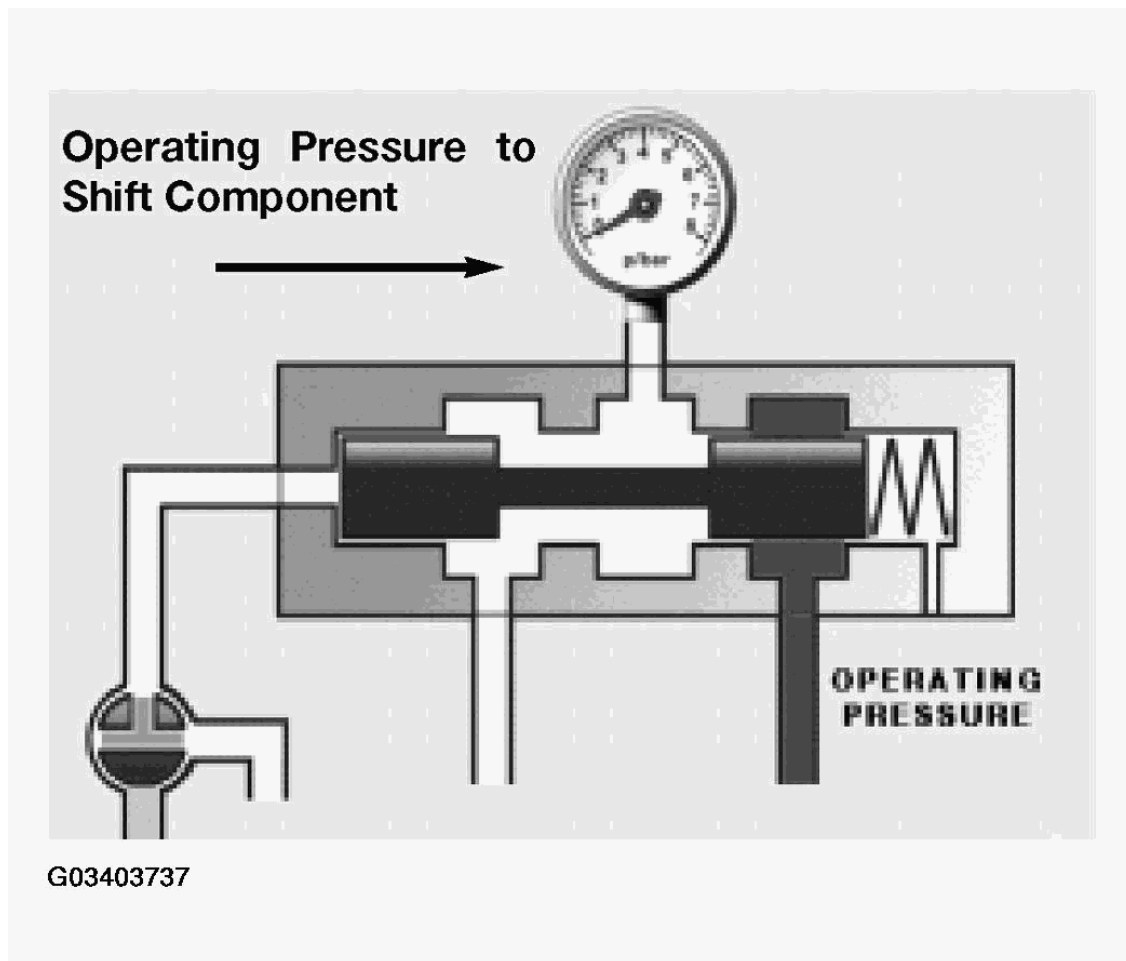
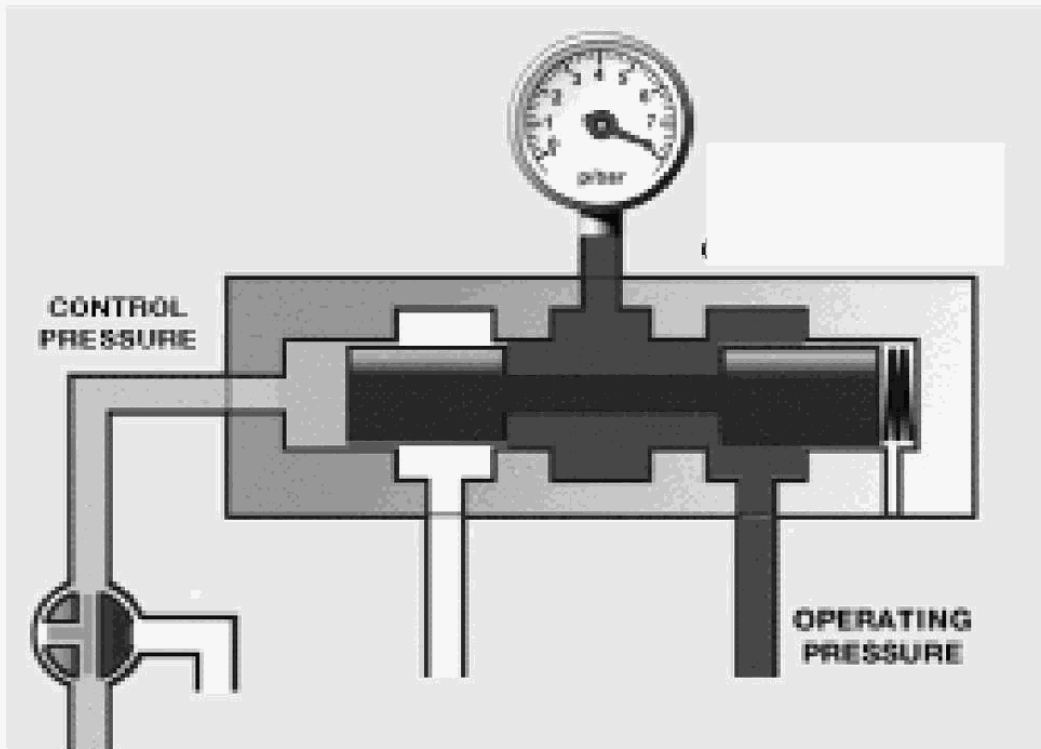


Fig. 18: Identifying Blocked Operating Pressure To Shift Component
Courtesy of BMW OF NORTH AMERICA, INC.

Once the control pressure is applied to the 3/2 shift valve, the shift valve moves to the right.

This allows operating pressure to reach the shift component.

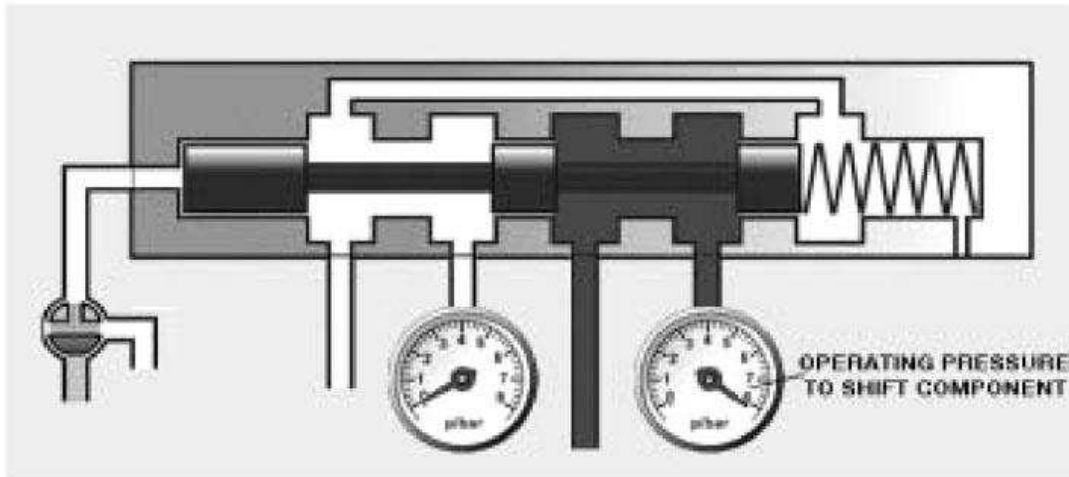
When the control pressure is again reduced, spring pressure returns the 3/2 shift valve to the rest position. This drains and operating pressure from the shift component.



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Fig. 19: Identifying Operating Pressure To Reach Shift Component
 Courtesy of BMW OF NORTH AMERICA, INC.

The example shown at right is a 4/2 shift valve. The operation is similar to the 3/2 valve. The primary difference is that the 4/2 shift valve affects 2 shift components.



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Fig. 20: Identifying Primary Difference 4/2 Shift Valve Affects 2 Shift Components
 Courtesy of BMW OF NORTH AMERICA, INC.

PRESSURE REGULATION

Pressurized oil from the pump must be regulated for use within the transmission. Otherwise, the high pressure directly from the pump would influence shift quality. The shifts would be more abrupt and harsh. In order to "fine tune" the pressures within the transmission, there is a pressure regulating valve and a pressure regulating solenoid. The pressure regulating valve is located in the oil pump housing or the valve body dependent upon transmission type.

The pressure regulating solenoid is a pulse width modulated (PWM) solenoid. Current is controlled by the TCM. The pressure regulating solenoid is normally closed, there is maximum line pressure available when minimum (or no) current is applied to the pressure regulating solenoid. Depending upon application, pressure regulating solenoid can be PWM with B- or B+ control. GM transmissions use B+ control with a constant ground supply. ZF transmissions uses B- control with a constant B+ supply.

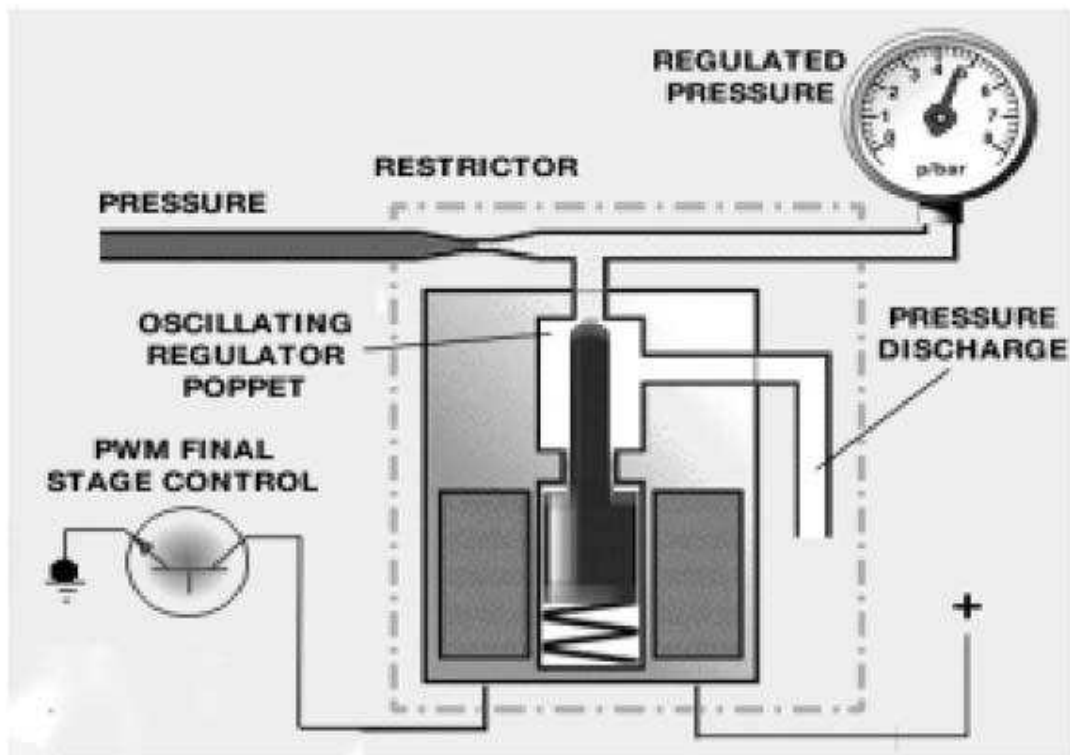
There are also pressure regulators used in ZF transmissions that are used to control shift pressures. The A5S440Z and A5S560Z both use EDS solenoids for "Overlap Shift Control" this will be explained later in this text.

There are a few different names for pressure regulating solenoids depending upon the transmission type and manufacturer:

- ZF transmissions use the following terms - EDS solenoid (valve), or MV (magnetic valve).
- Hydramatic (GM) transmissions use the following terms: DR solenoid, Force Motor Solenoid or Variable Bleed Solenoid.

Transmission operating pressures are regulated based on engine speed, throttle angle and engine load. The regulated pressure from the pressure regulating solenoid is referred to as throttle pressure. This pressure is fed to

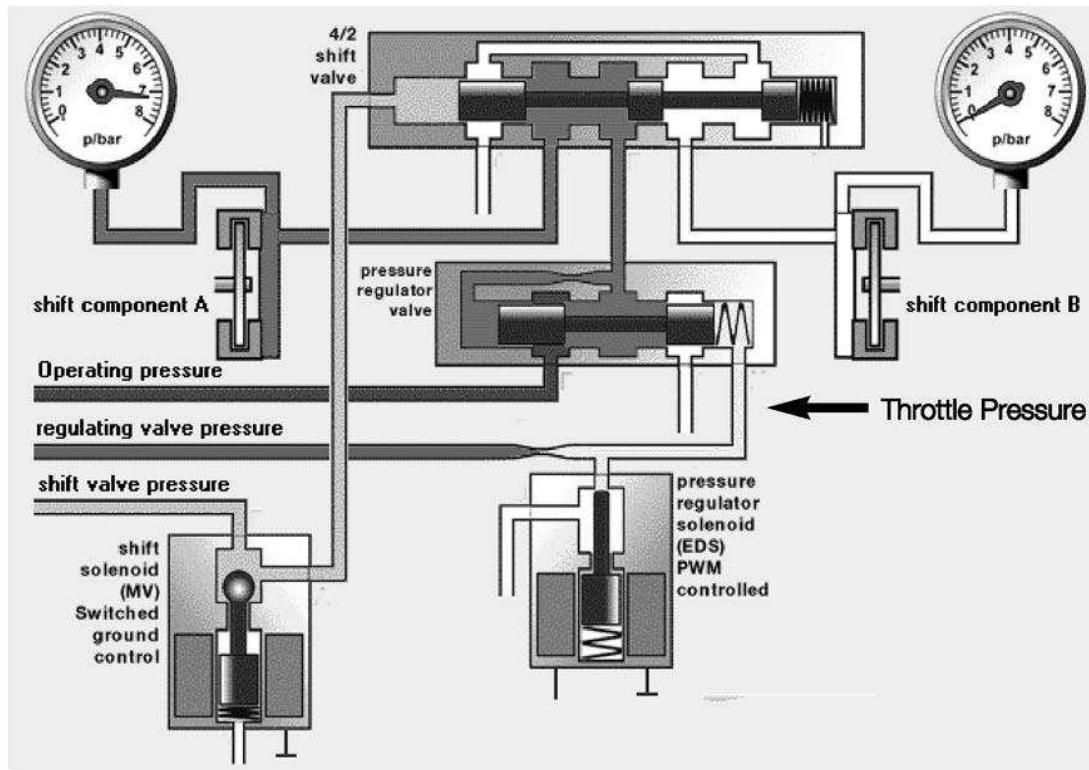
the main pressure regulating valve.



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Fig. 21: Identifying Transmission Operating Pressures
Courtesy of BMW OF NORTH AMERICA, INC.

Pressure Regulation



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Fig. 22: Identifying Pressure Regulation
 Courtesy of BMW OF NORTH AMERICA, INC.

As the diagram shows, regulating valve pressure is fed to the pressure regulating solenoid. This pressure is then regulated to create throttle pressure. Throttle pressure is modified based on throttle angle, engine speed and engine load. Throttle pressure is then fed to the pressure regulating valve. As throttle pressure increases, the regulating valve piston is moved to the left (with respect to the diagram). As the regulating valve piston is moved to the left, operating pressure is increased to the 4/2 shift valve. The operating pressure to the 4/2 shift valve will be fed to Shift Component A or Shift Component B depending the position on the 4/2 shift valve. The operating pressure to the shift components will be increased or decreased depending upon the throttle valve pressure. As engine speed and load are increased, the operating pressure will be increased to provide higher clamping forces on the shift components.

When there is no electrical power present to the pressure regulator solenoid, throttle pressure will be a maximum. Therefore maximum operating pressure will be available at the 4/2 shift valve. This condition would exist if the transmission was operating in fail-safe mode.

APPLY COMPONENTS

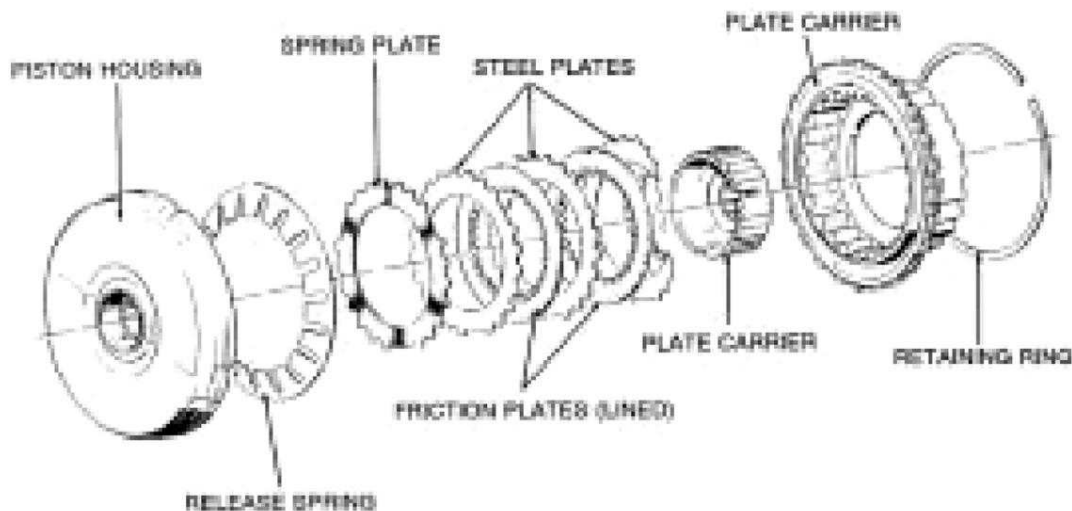
Multi - Plate Clutches And Brakes

Multi Plate Clutches and Brakes are used to drive or hold members of the planetary gear set. As a general rule, Multi Plate Clutches connect one planetary member to another. Multi Plate Brakes connect a planetary member

to the case to hold it stationary.

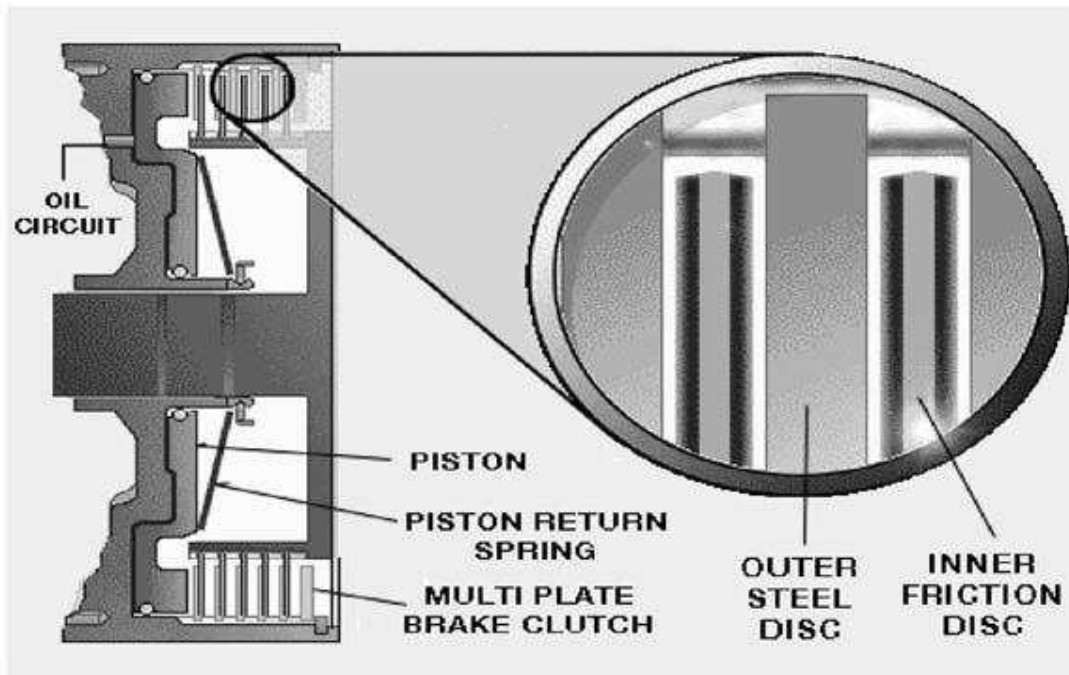
The clutches and brakes consist of a number of friction discs and steel discs. The friction discs are coated with a friction material and have engaging lugs (splines) on the inner perimeter. The steel discs are steel on both sides and have engaging lugs located on the outer perimeter. The engaging lugs on the friction discs are usually engaged with a planetary member. The engaging lugs on the steel discs are usually engaged with the clutch piston housing.

In addition to the friction and steel discs, there is also an apply piston, housing and return spring. Once hydraulic fluid is applied to the clutch assembly, the friction discs and steel discs will be locked together. Once hydraulic pressure is released, the return spring will cause the clutch piston to return to its rest position which will unlock the clutch assembly.



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Fig. 23: Exploded View Of Multi - Plate Clutches
Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 24: Identifying Friction Discs And Steel Discs
 Courtesy of BMW OF NORTH AMERICA, INC.

Multi - Plate Clutch Operation

In order to carry out a shift in ratio, fluid needs to be applied or released from the Multi - Plate Clutch (or Brake). As shown in the example , the following sequence occurs:

1. Fluid from a shift valve in the valve body is applied to the clutch assembly. (Figure A, see **Fig. 25.**)
2. Fluid pressure builds behind the apply piston and overcomes the resistance from the diaphragm spring. (Figure A, see **Fig. 25.**)
3. The friction and steel discs are compressed together and become locked, preventing any slippage between them. (Figure A, see **Fig. 25.**)
4. Two planetary members are now locked together.
5. When fluid pressure is released, the steel and friction discs are allowed to unlock. (Figure B, see **Fig. 25.**)
6. The diaphragm spring pushes against the apply piston and returns the piston back to the rest position. (Figure C, see **Fig. 25.**)
7. The check ball in the apply piston is unseated by centrifugal force which allows the clutch to drain completely.

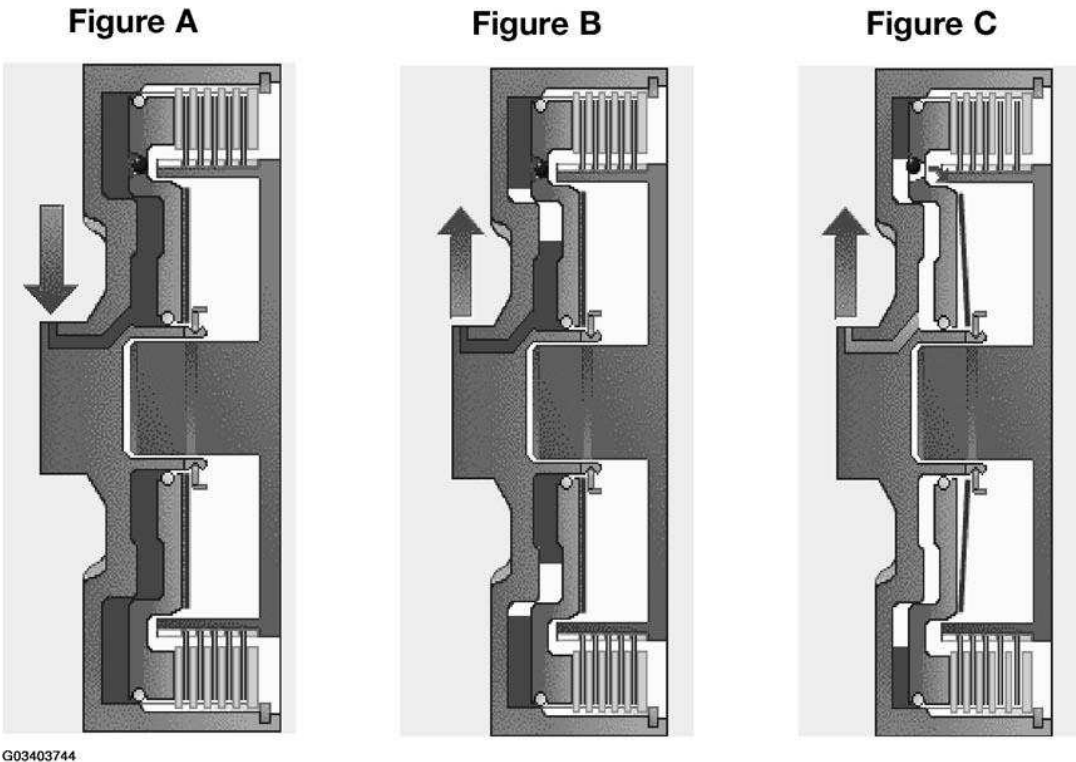


Fig. 25: Identifying Multi - Plate Clutch Operation
Courtesy of BMW OF NORTH AMERICA, INC.

Band Brakes

On some BMW transmissions there is a band type brake used for some applications. The A4S270/310R and the A5S310Z use a band type brake. The brake band is a circular band with friction material bonded to the inner surface. The band wraps around a particular planetary component (clutch drum) and locks that component to the transmission case. The brake band is applied and released by the clutch apply piston.

The brake band is not adjustable on the A5S310Z, however there is some adjustment allowed when needed on the A4S270/310R.

The brake band functions in the following manner on BMW transmissions:

- **A4S270/310R** - The brake band is active (applied) in first and second gear. The brake band holds the reaction sun drum stationary. The reaction sun drum is splined to the reaction sun gear.
- **A5S310Z** - The brake band is active (applied) in second, third and fifth gear. The brake band holds the forward sun gear to the case.

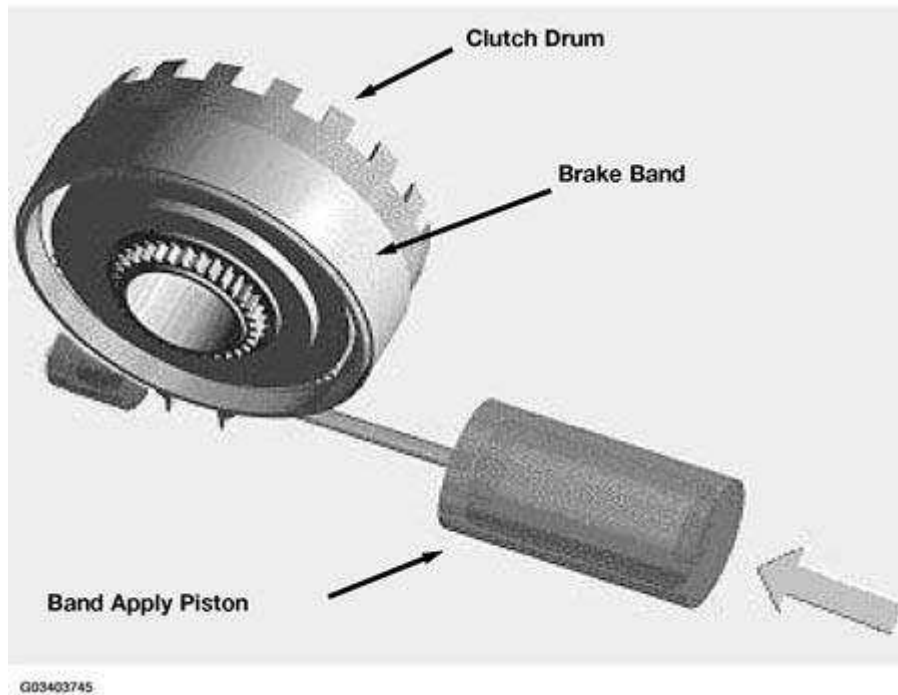


Fig. 26: Identifying Band Brakes
Courtesy of BMW OF NORTH AMERICA, INC.

One-Way Clutches (Freewheel)

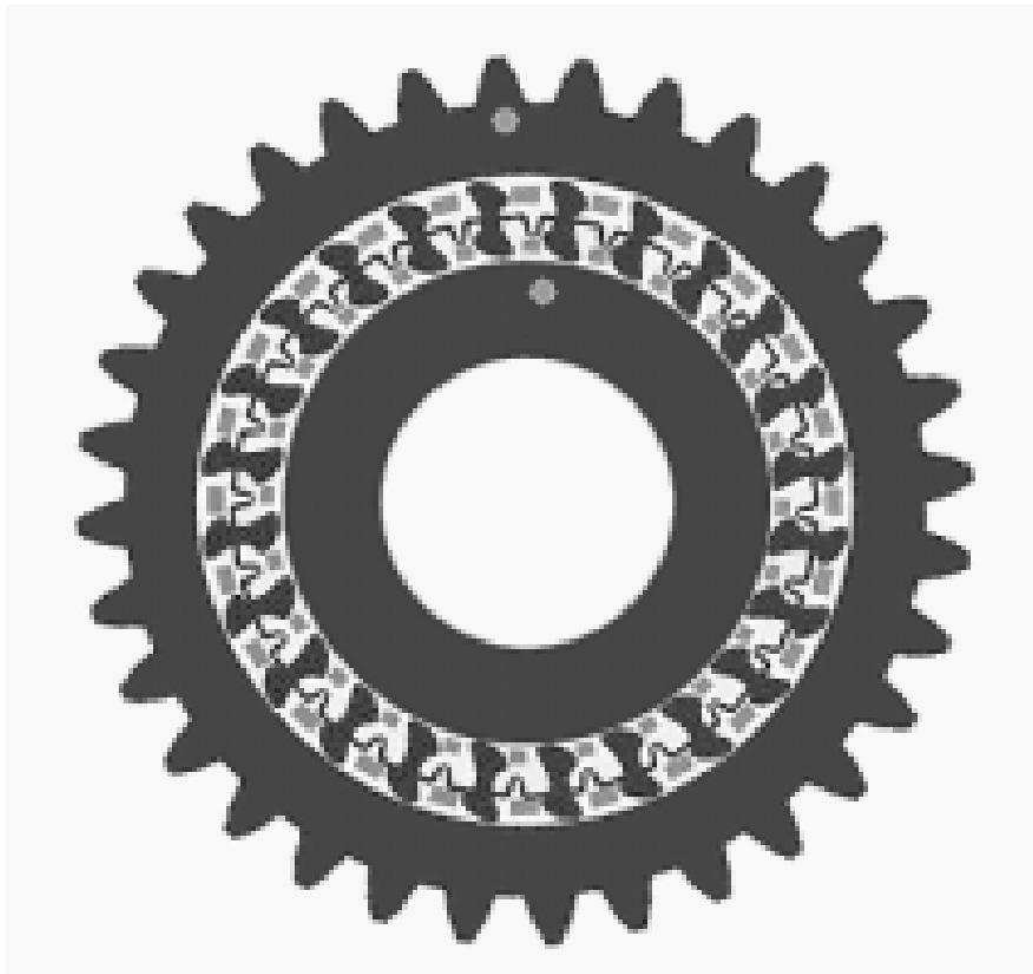
The one way clutch consists of an inner and outer ring with a locking device between the two. The one way clutch is designed to lock in one direction and to allow free rotation in the other direction. Currently there are two types of one way clutches used in BMW transmissions:

- Roller type which consists of spring loaded rollers between the inner and outer race of the one way clutch. (Roller type is also used without springs on some applications)
- Sprag type which consists of asymmetrically shaped wedges located between the inner and outer race of the one way clutch.



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Fig. 27: Identifying Roller Type One Way Clutch
Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 28: Identifying Sprag Type One Way Clutch
Courtesy of BMW OF NORTH AMERICA, INC.

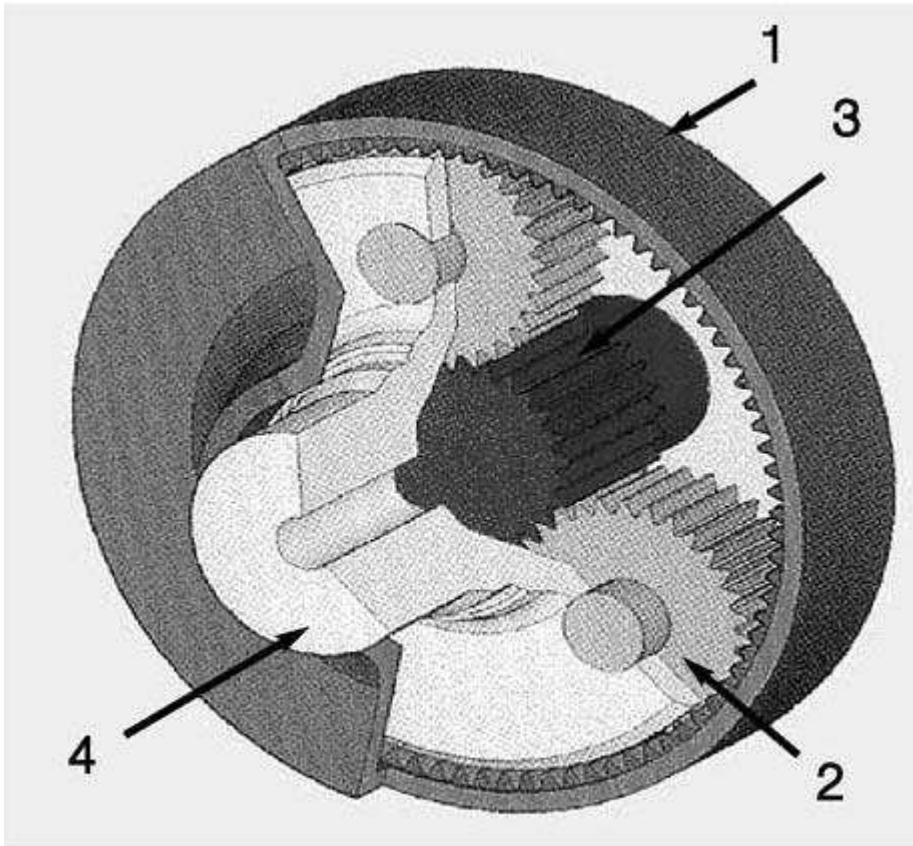
In both versions of the one way clutch (freewheel), rotation is only allowed in one direction. Using the diagrams above, imagine that the inner races were locked stationary. The outer race would only be allowed to turn counter clock wise. In the clock wise direction, the outer race of both versions would be locked. In the roller type, the helper springs would push the rollers up the ramp on the outer race. This would force the rollers in to the smaller area which would cause the outer race to lock, In the sprag type, the asymmetrical wedges would lock between the inner and outer race.

The one way clutches are used in the transmission to prevent an interruption of drive torque during certain gear shifts and to allow engine braking during coasting. Also there is a one way clutch in the stator of the torque converter.

PLANETARY GEAR SET

Planetary gear sets are compact gear units that receive input drive torque and provide the required output ratios for all forward gears and reverse gear. The planetary gear set consists of four main components:

1. Internal Ring Gear
2. Planetary Gears (pinions)
3. Sun Gear
4. Planetary Gear Carrier



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Fig. 29: Identifying Planetary Gear Set
Courtesy of BMW OF NORTH AMERICA, INC.

Various ratios are obtained by driving or holding different components in the planetary gear set. The example shown at right is a simple planetary gear set. Today's modern transmissions use a combination of multiple planetary gear sets referred to as a compound planetary gear set.

Advantages Of Planetary Design

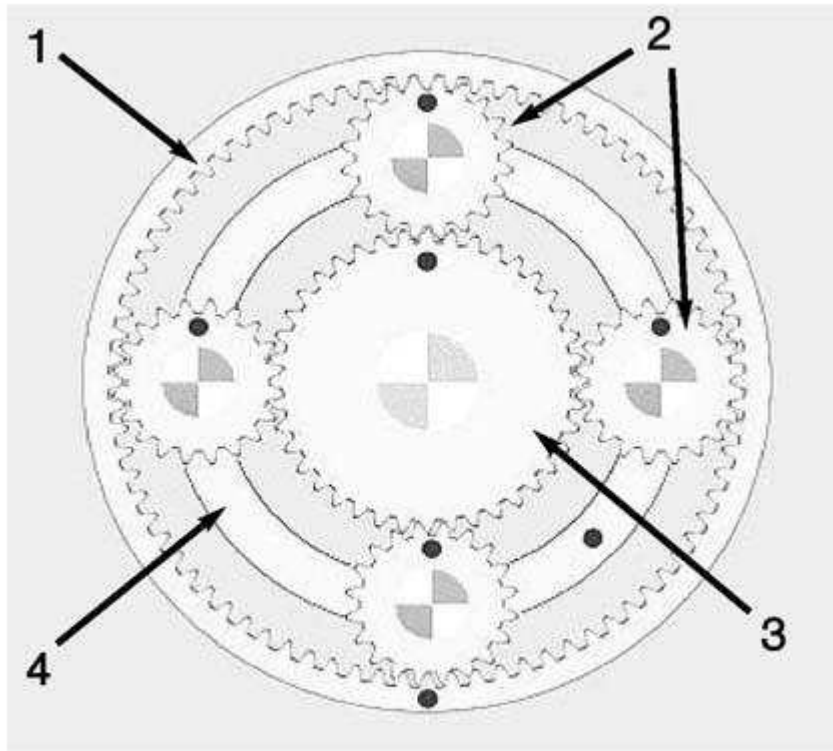
There are distinct advantages to the planetary gear set in comparison with a standard transmission gear set.

Primarily, drive torque does not need to be interrupted to change gears. The planetary members are in constant mesh and there are more teeth engaged in any given ratio. This allows more torque to be transferred through the transmission.

Basic Power Flow

In the example shown at left, let's follow through an example of power flow in reverse gear:

The Planetary gear carrier (4) is held stationary. The sun gear (3) is driven in a clockwise direction. The planetary pinions (2) are driven counterclockwise, which in turn drives the internal ring gear (1) counterclockwise as well.



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Fig. 30: Identifying Basic Power Flow
Courtesy of BMW OF NORTH AMERICA, INC.

COMPOUND PLANETARY GEAR SETS

Compound planetary gear sets use multiple planetary components which are a variation on the simple planetary gear set. Since the inception of the simple planetary gear set, there have been numerous compound gear sets introduced. BMW transmissions use the following gear sets:

- Simpson Gear Set - used on 4HP22 and 4HP24

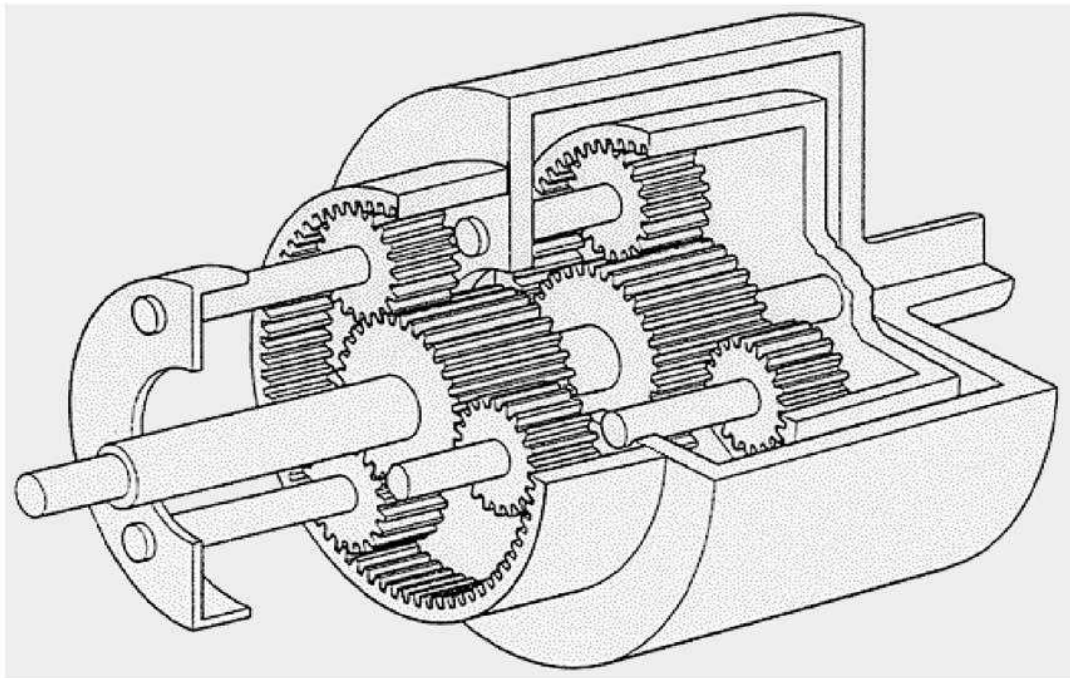
- Ravigneaux Gear Set - used on A4S270R, A4S310R, A5S310Z, A5S325Z, A5S360R and A5S390R.
- Wilson Gear Set - used on A5S440Z and A5S560Z
- Lepelletier Gear Set - used on the GA6HP26Z.

Simpson Gear Set

The Simpson Gear Set is one of the early variations on the simple set. It is capable of 3 forward gears and one reverse. On BMW transmissions, the Simpson Gear set is used in the 4HP transmission which is a four speed automatic. Fourth gear (overdrive) is obtained by the addition of an auxiliary gear set (simple).

Characteristics of the Simpson Gear set are as follows:

- Two Internal Ring Gears, one rear input ring and one attached to the rear planetary carrier.
- Two Planetary carriers, each containing three planetary pinions.
- One common Sun gear, which meshes with both sets of planetary pinions.



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Fig. 31: Identifying Simpson Gear Set
Courtesy of BMW OF NORTH AMERICA, INC.

Ravigneaux Gear Set

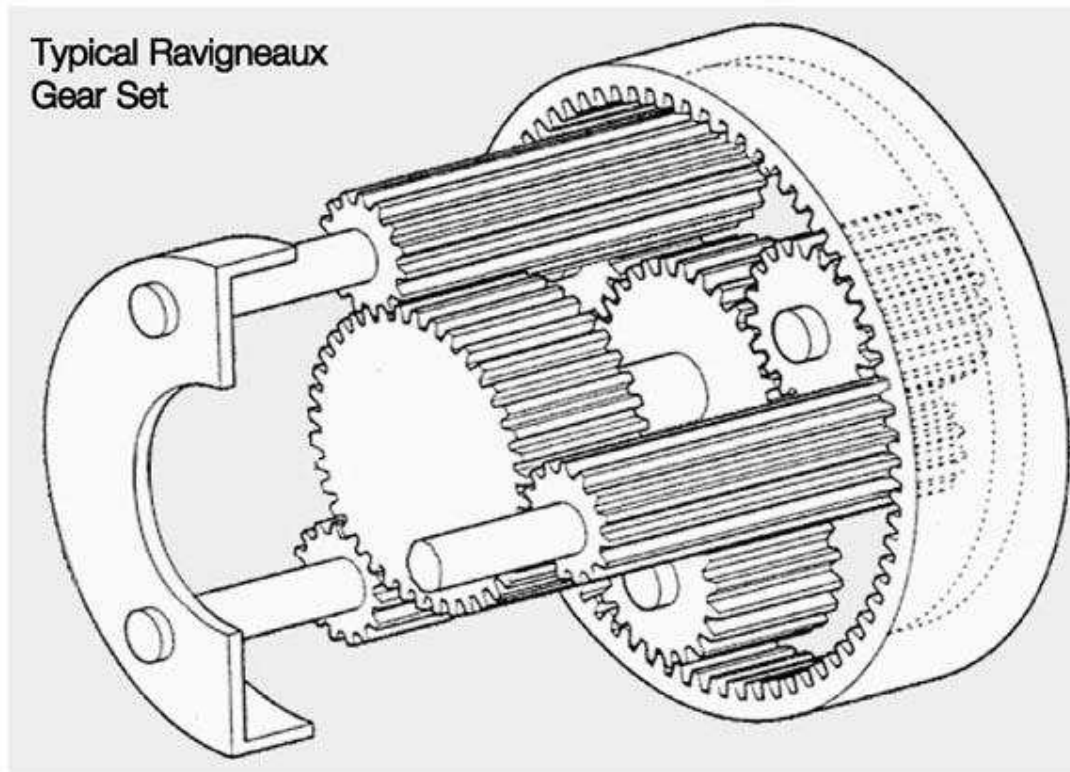
A new variation on the planetary design is the Ravigneaux gear set. This gear set is capable of 4 forward gears and one reverse. However, depending upon application it may be used with an auxiliary gear set. Here are some examples:

- A4S310/270R uses the Ravigneaux set for 3 forward gears and one reverse. Overdrive is obtained by the auxiliary gear set.
- A5S310Z uses a combination of the Ravigneaux gear set and the auxiliary gear set to obtain 5 forward gear and one reverse. First, second and reverse gears are achieved by using a combination of both gear sets.
- The A5S360/390R uses a modified version of the ravigneaux set that provides five forward gears and one reverse. There is no auxiliary gear set used.

Characteristics of the Ravigneaux Gear Set are:

NOTE: **The Ravigneaux Gear Set shown below is a typical representation, refer to Fig. 32. There are a few variations of this arrangement used on BMW transmissions.**

- One planetary carrier which is common to both sets of planetary pinions.
- Two sets of planetary pinions, one long set with small diameter and one short set with large diameter.
- Two sun gears, one input sun gear and one reaction sun gear.
- One common ring gear.



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Fig. 32: Identifying Ravigneaux Gear Set
Courtesy of BMW OF NORTH AMERICA, INC.

Wilson Gear Set

On BMW transmissions, the Wilson gear set is only used on the A5S440Z and A5S560Z. The Wilson Gear Set consists of three planetary gear sets.

The ring gear of the first gear set, the planetary carrier of the second gear set and the ring gear of the third planetary gear set and directly connected to the "Pot". The "Pot" is a cylindrical device that slides over all of the components to unitize the individual gear sets into an assembly.

The characteristics of the Wilson Gear Set are:

- Three planetary carriers.
- Three ring gears, with ring gear 1 and 3 meshed to "Pot" assembly.
- Three sun gears, sun gear 2 and 3 are common. (Attached). Sun gears 2 and 3 are also referred to as the "Double Sun Gear"

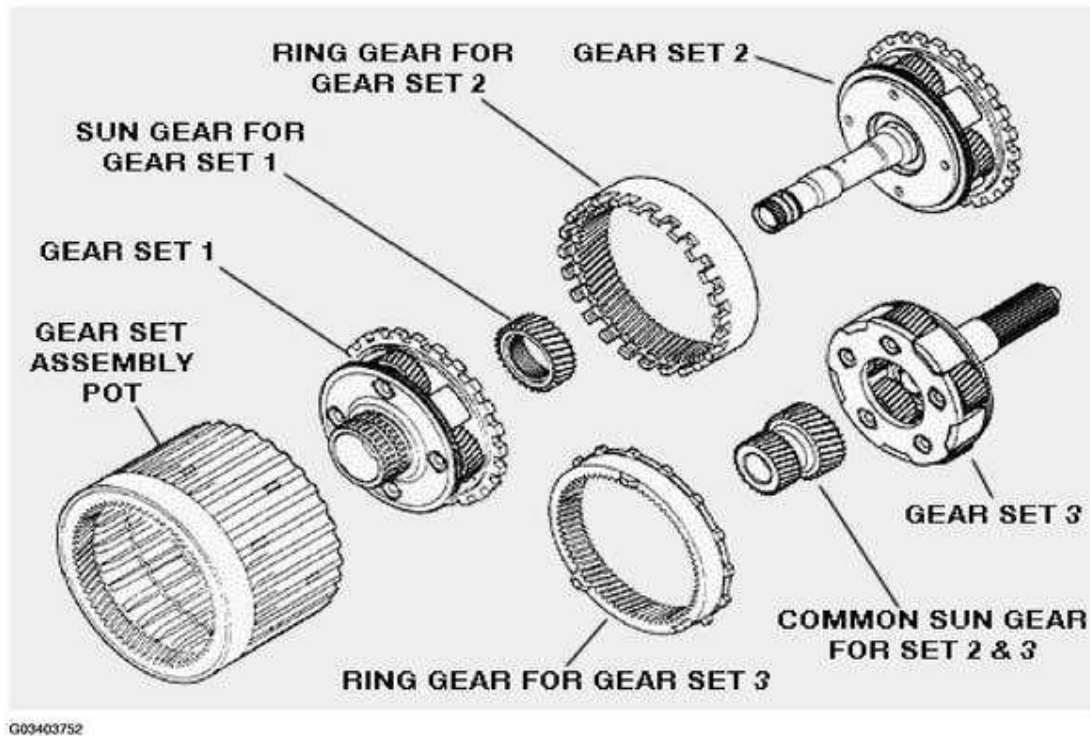
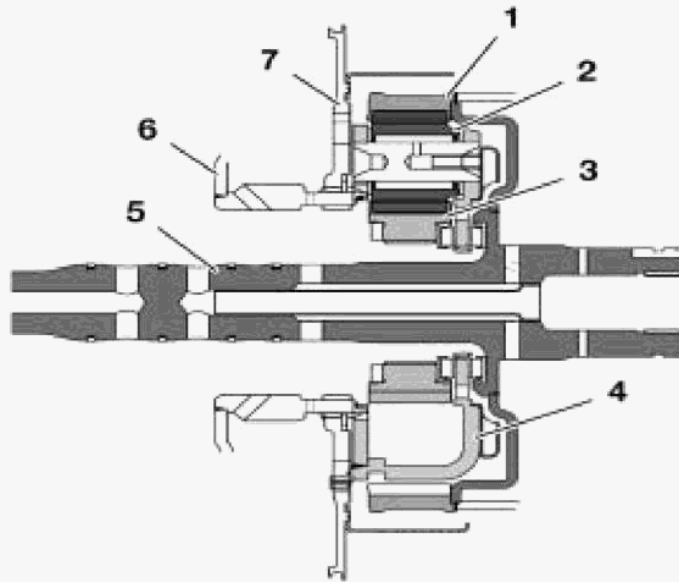


Fig. 33: Exploded View Of Wilson Gear Set
Courtesy of BMW OF NORTH AMERICA, INC.

Lepelletier Gear Set

The Lepelletier Gear Set was introduced to BMW on the ZF GA6HP26Z. This gear set allows for 6 forward speeds and one reverse gear using a light weight design. The planetary gear train consists of a single carrier planetary gear train and a downstream double planetary gear train.

1. Internal Ring Gear 1
2. Planet Gear (pinion)
3. Planet Carrier
4. Planet Carrier
5. Turbine Shaft
6. Cylinder A
7. Pressure Plate A

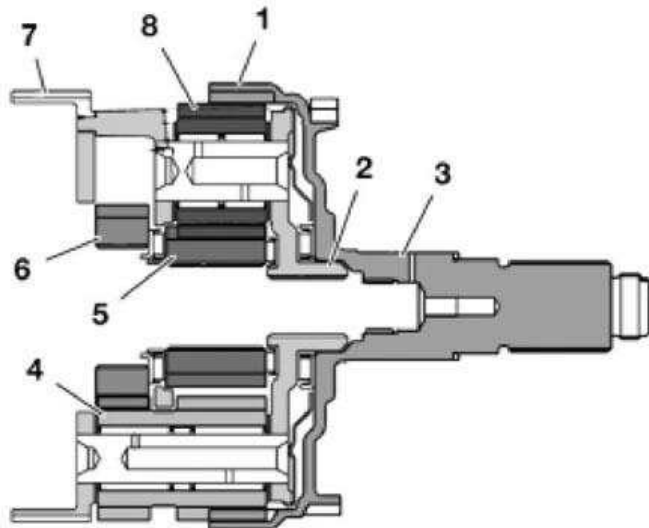


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Fig. 34: Identifying Cross Section View Of Lepelletier Gear Set
 Courtesy of BMW OF NORTH AMERICA, INC.

Double Planetary Set

1. Internal Gear 2
2. Planet Carrier Clutch E
3. Output
4. Double Planet Gear Long
5. Sun Gear 3, Clutch E
6. Sun Gear 2, Clutch A
7. Planer carrier 1
8. Planet Gear (short)



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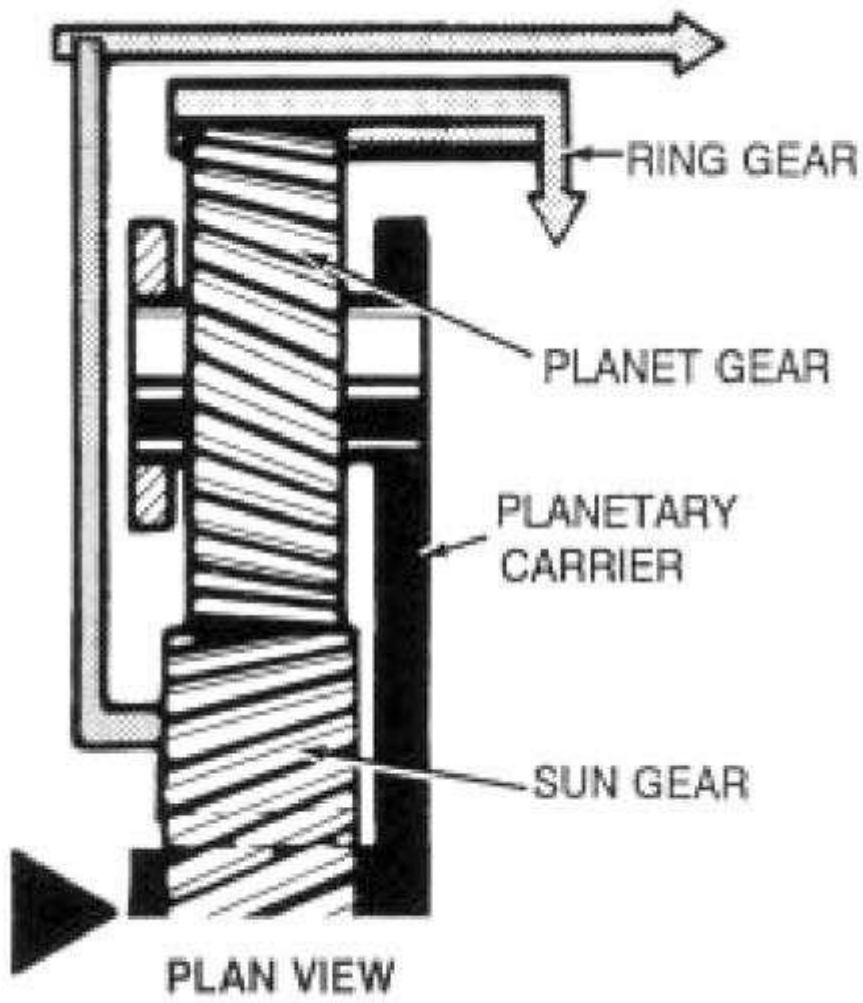
Fig. 35: Identifying Cross Section View Of Double Planetary Set
 Courtesy of BMW OF NORTH AMERICA, INC.

PLANETARY GEAR SET OPERATION

In order to understand planetary gear set operation, it is important to understand some basic rules of operation.

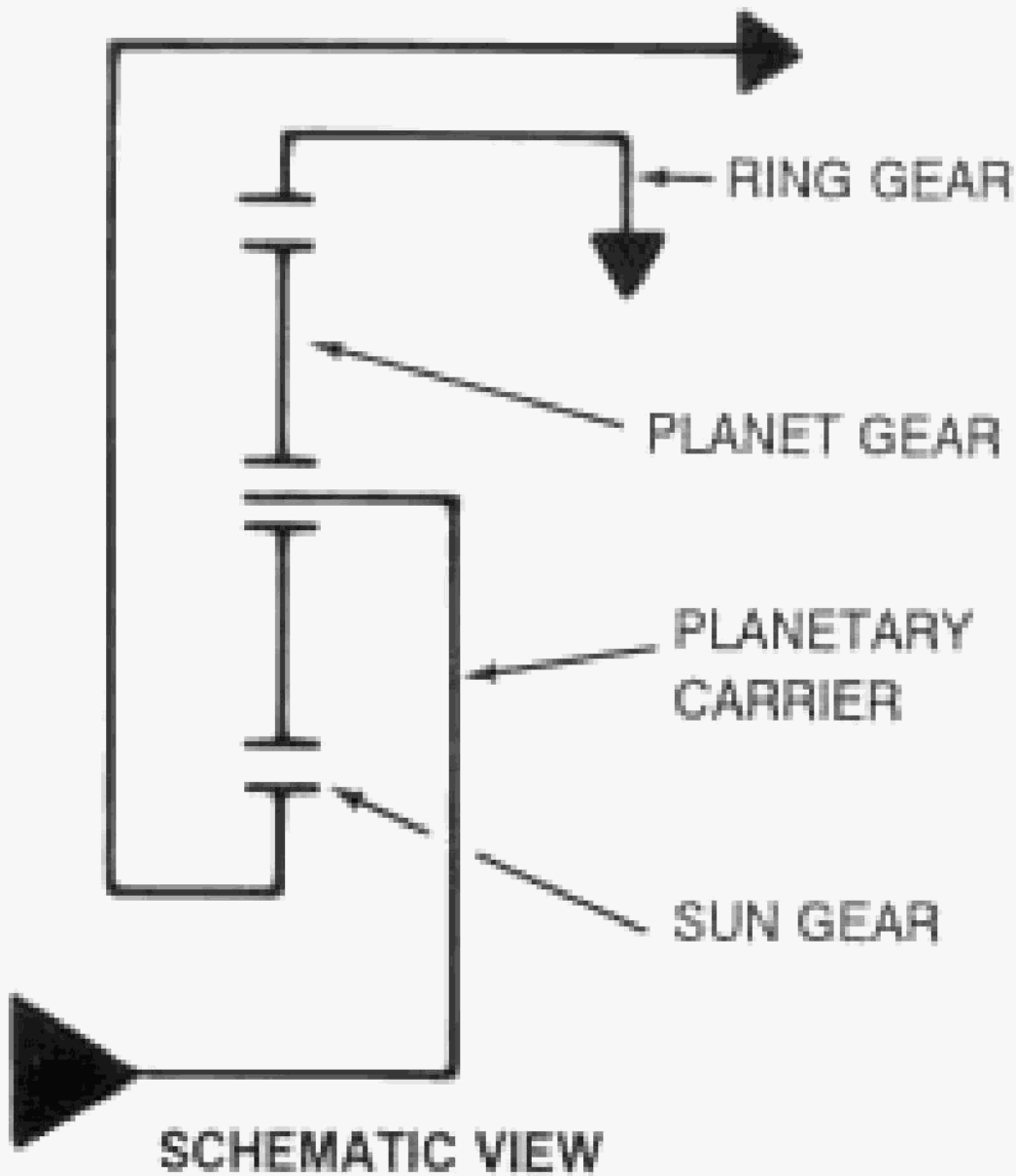
- It is assumed that engine rotation is clockwise when referring to power flow charts and diagrams.
- Planetary pinions will always rotate in the same direction as the internal ring gear.
- When the sun gear is driven clockwise and the planetary carrier is held stationary the internal ring gear will rotate counter clockwise (reverse gear).
- When two or more planetary members are locked together, the assembly will rotate together. The ratio from input to output is 1:1.
- When the sun gear is held stationary and the planetary carrier is driven clockwise, the ring gear will be driven clockwise in an overdrive ratio. (i.e. .75:1)

When trying to understand power flow schematics, it is important to be able to draw a comparison between the actual planetary components and the schematic symbols. The diagram below outlines the relationship between these components and the power flow schematic. The schematic is a representation of a cross section of the transmission, but you only see the top half of the cross section. The transmission is shown as though it has been quartered lengthwise.



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Fig. 36: Identifying Planetary Gear Set Power Flow - Plan View
Courtesy of BMW OF NORTH AMERICA, INC.



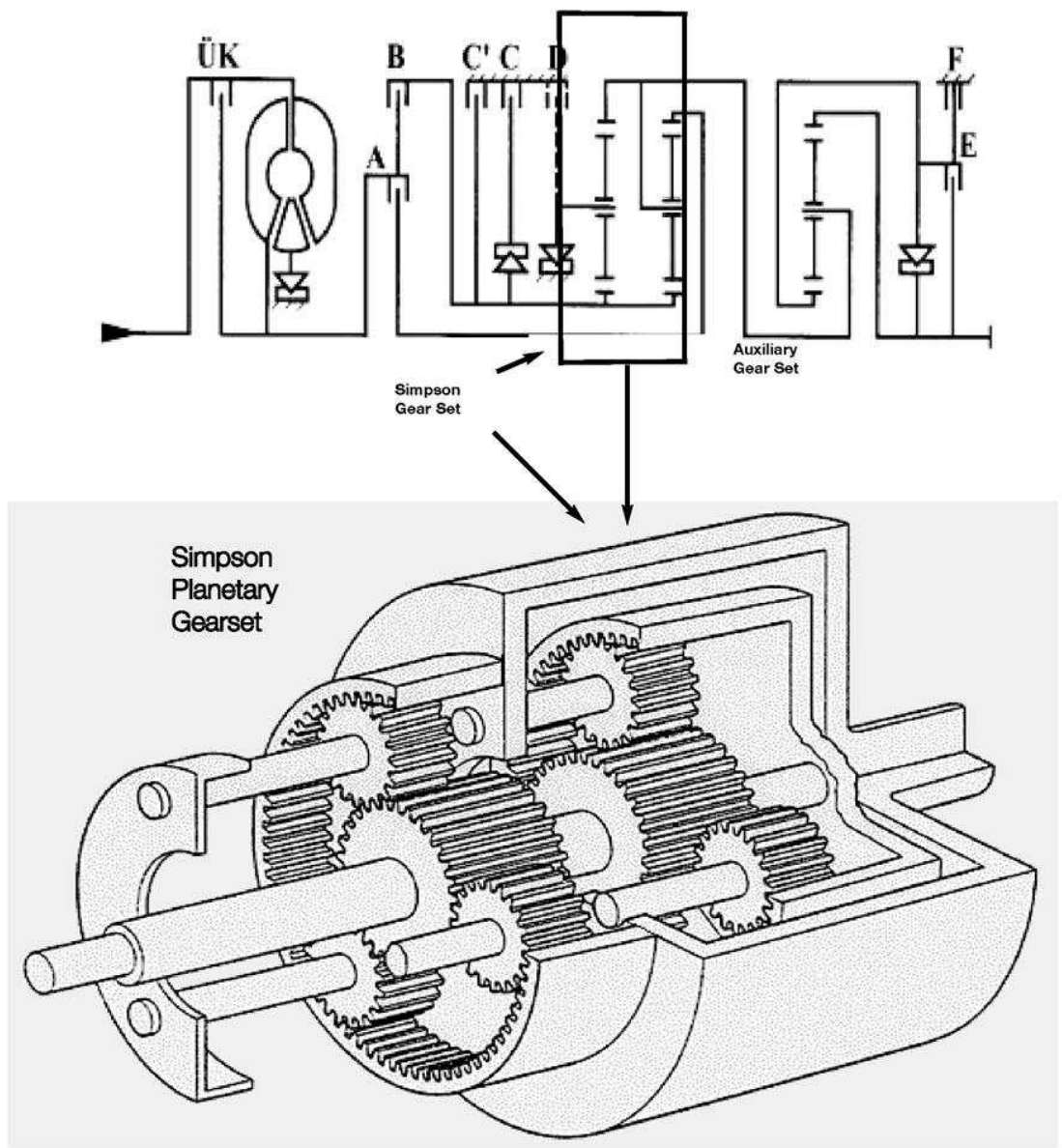
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Fig. 37: Identifying Planetary Gear Set Power Flow - Schematic View
 Courtesy of BMW OF NORTH AMERICA, INC.

Power Flow Schematic

In order to understand power flow schematics, a relationship must be drawn between the actual components and the schematic representation. In our example, we are going to use the 4HP22/24 power flow schematic. The

4HP22/24 transmission uses a Simpson Planetary Gearset and an auxiliary gearset. The auxiliary gear set is a simple planetary gearset.



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Fig. 38: Identifying Power Flow Schematic
Courtesy of BMW OF NORTH AMERICA, INC.

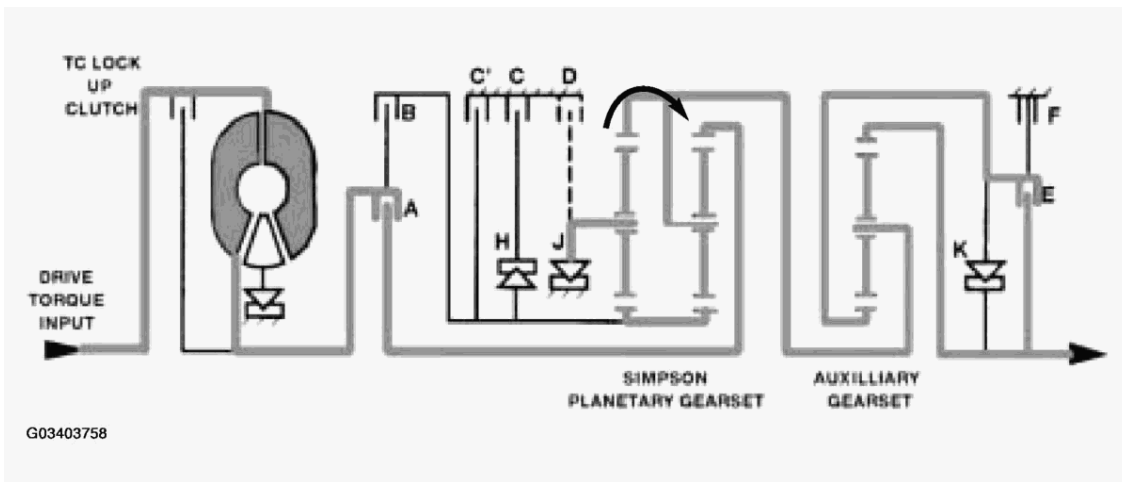


Fig. 39: Identifying Power Flow Schematic - First Gear
 Courtesy of BMW OF NORTH AMERICA, INC.

Power flow in first gear - Drive torque is applied to the torque converter impeller and transferred to the turbine. The turbine shaft rotates clockwise (CW). The "A" clutch locks the turbine shaft to the rear input ring gear. The rear input ring gear rotates CW driving the rear planet pinions CW. The planetary pinions drive the common sun gear CCW, which in turn drive the front planet pinions CW. The front planetary carrier is held from rotating CCW by one way clutch "J". The front planetary pinions which are rotating CW drive the front ring gear/rear carrier CW. The rear planetary carrier is rotating CW and is driving the planetary carrier from the auxiliary gear set. The "E" clutch in the auxiliary gear set is holding the Sun gear and the ring gear together. Therefore the auxiliary gear set is locked in a 1:1 ratio.

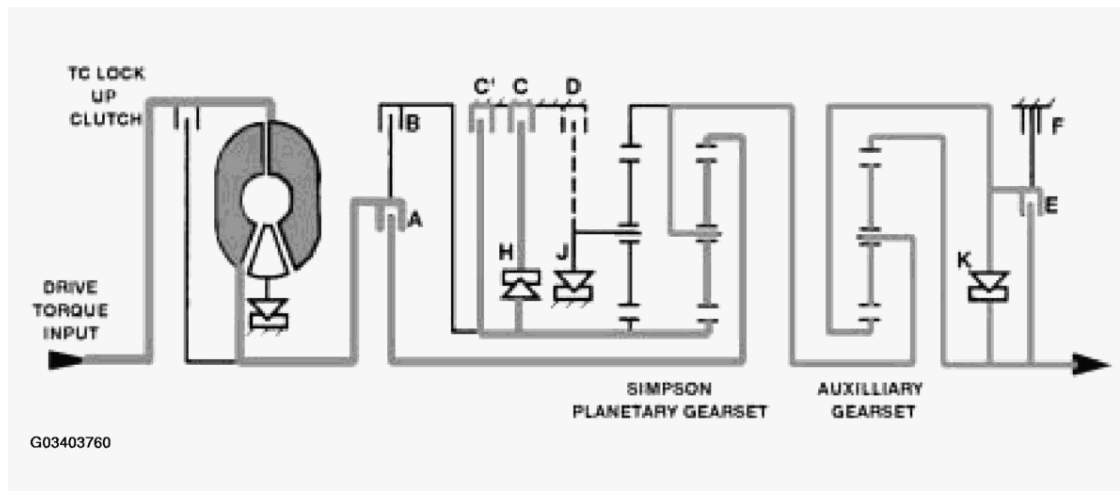
One Way Clutch "J" is locked prevent the front planetary carrier from rotating CCW. One Way Clutch "H" is not used and One Way Clutch "K" is locked. One way clutch "K" is used to prevent an interruption in power flow before the "E" clutch is locked during the 4-3 shift.

POSITION GEAR	D				3				2			1	R
	1	2	3	4	1	2	3	1	2	1		R	
Clutch A	X	X	X	X	X	X	X	X	X	X			
Clutch B			X	X			X						X
Clutch C'		X				X			X				
Clutch C		X	X	X		X	X		X				
One Way Clutch H		X				X			X				
Clutch D										X	X		
One Way Clutch J	X				X			X		X			
Clutch E	X	X	X		X	X	X	X	X	X	X	X	X
One Way Clutch K	X	X	X		X	X	X	X	X	X	X	X	X
Clutch F				X									

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Fig. 40: Gear Position Chart - First Gear
 Courtesy of BMW OF NORTH AMERICA, INC.

Second Gear



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Fig. 41: Identifying Power Flow Schematic - Second Gear
 Courtesy of BMW OF NORTH AMERICA, INC.

Second Gear - Drive torque is applied to the torque converter impeller and transferred to the turbine. The turbine shaft rotates clockwise (CW). The "A" clutch locks the turbine shaft to the rear input ring gear. The rear

input ring gear rotates CW driving the rear planet pinions CW. The sun gear is held stationary by the C' clutch. The rear planet pinions rotate around the fixed sun gear CW. The rear planetary carrier will rotate CW. The rear planetary carrier will drive the auxiliary gear set will rotate as a complete unit. The auxiliary gear set is locked in a 1:1 ratio due to the "E" clutch locking the sun and ring gear together.

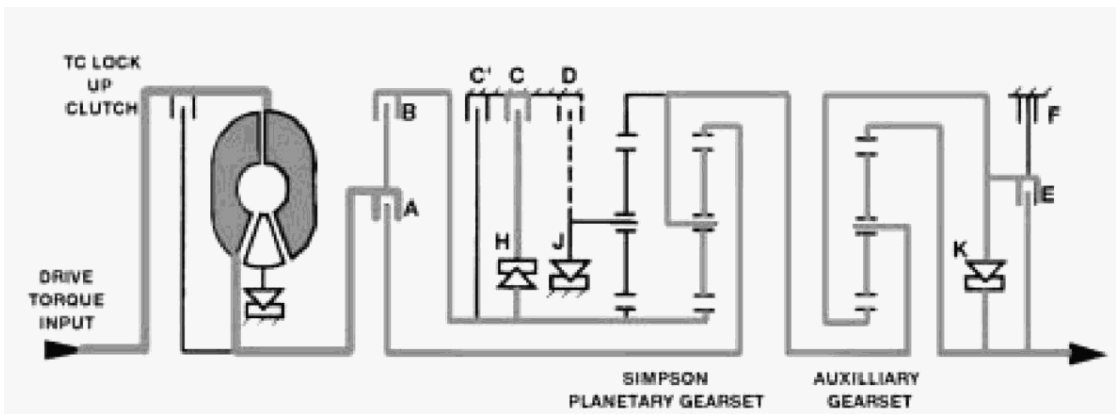
The "C" clutch is locking the outer race of the "H" freewheel to the case. This is used for the 3/2 downshift. Freewheel "J" is not active and Freewheel "K" is locked.

POSITION GEAR	D				3			2			1	R
	1	2	3	4	1	2	3	1	2	1	R	
Clutch A	X	X	X	X	X	X	X	X	X	X		
Clutch B			X	X			X					X
Clutch C'		X				X			X			
Clutch C		X	X	X		X	X		X			
One Way Clutch H		X				X			X			
Clutch D										X	X	
One Way Clutch J	X				X			X		X		
Clutch E	X	X	X		X	X	X	X	X	X	X	X
One Way Clutch K	X	X	X		X	X	X	X	X	X	X	X
Clutch F				X								

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Fig. 42: Gear Position Chart - Second Gear
 Courtesy of BMW OF NORTH AMERICA, INC.

Third Gear



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Fig. 43: Identifying Power Flow Schematic - Third Gear
 Courtesy of BMW OF NORTH AMERICA, INC.

Third Gear - Drive torque is applied to the torque converter impeller and transferred to the turbine. The turbine shaft rotates clockwise (CW). The "A" clutch and the "B" clutch are locked, this causes the rear input ring gear to be locked to the sun gear in the Simpson Gear set. The Simpson gear set is locked in a 1:1 ratio. The "E" clutch is locked which locks the ring gear to the sun gear in the Simpson gear set. The entire transmission planetary system is now locked in a 1:1 ratio.

Freewheel "H" is overrun and freewheel "J" is not used. Freewheel "K" continues to be locked.

POSITION GEAR	D				3				2			1	R
	1	2	3	4	1	2	3	1	2	1			R
Clutch A	X	X	X	X	X	X	X	X	X	X			
Clutch B			X	X			X						X
Clutch C'		X				X			X				
Clutch C		X	X	X		X	X		X				
One Way Clutch H		X				X			X				
Clutch D											X	X	
One Way Clutch J	X				X			X		X			
Clutch E	X	X	X		X	X	X	X	X	X	X	X	X
One Way Clutch K	X	X	X		X	X	X	X	X	X	X	X	X
Clutch F				X									

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Fig. 44: Gear Position Chart - Third Gear
 Courtesy of BMW OF NORTH AMERICA, INC.

Fourth Gear

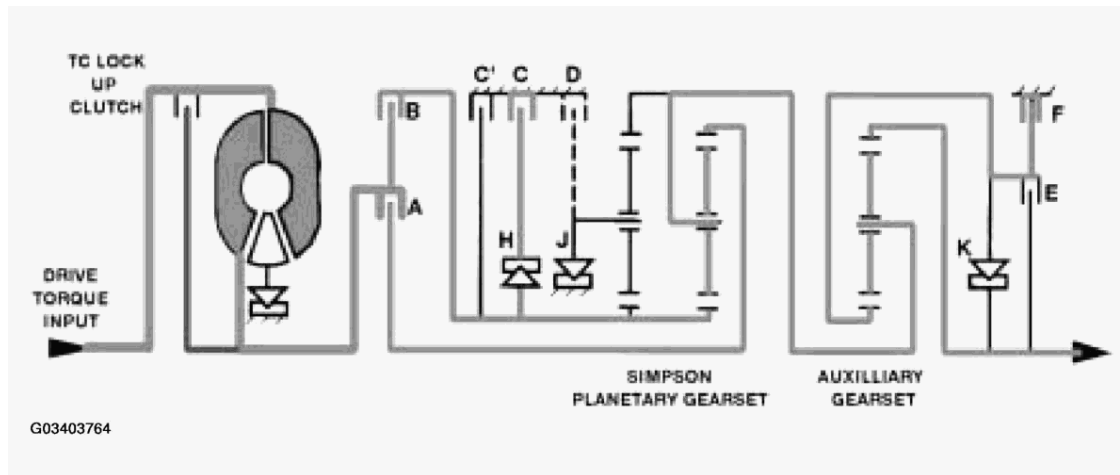


Fig. 45: Identifying Power Flow Schematic - Fourth Gear
Courtesy of BMW OF NORTH AMERICA, INC.

Fourth Gear - Drive torque is applied to the torque converter impeller and transferred to the turbine. The turbine shaft rotates clockwise (CW). (The turbine shaft can also be driven by the lock up clutch when engaged). The "A" clutch and the "B" clutch are locked, this causes the rear input ring gear to be locked to the sun gear in the Simpson Gear set. The Simpson gear set is locked in a 1:1 ratio. The "F" clutch is locked which locks the sun gear in the auxiliary gear set to the case. The Simpson gear set drives the planetary carrier CW. The planet pinions walk around the fixed sun gear in a CW direction. This causes the ring gear to rotate CW as well. The ring gear, which is the output of the transmission is driven in a overdrive ratio.

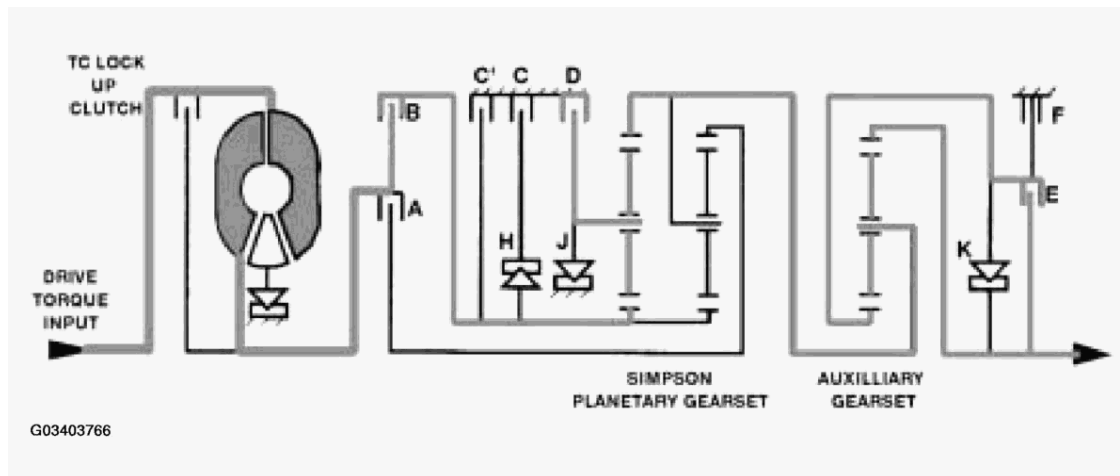
Freewheel "H" and "K" are overrun. Freewheel "J" is not used.

POSITION GEAR	D				3			2		1	R
	1	2	3	4	1	2	3	1	2	1	R
Clutch A	X	X	X	X	X	X	X	X	X	X	
Clutch B			X	X			X				X
Clutch C'		X				X			X		
Clutch C		X	X	X		X	X		X		
One Way Clutch H		X				X			X		
Clutch D										X	X
One Way Clutch J	X				X			X		X	
Clutch E	X	X	X		X	X	X	X	X	X	X
One Way Clutch K	X	X	X		X	X	X	X	X	X	X
Clutch F				X							

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Fig. 46: Gear Position Chart - Fourth Gear
Courtesy of BMW OF NORTH AMERICA, INC.

Reverse Gear



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Fig. 47: Identifying Power Flow Schematic - Reverse Gear
Courtesy of BMW OF NORTH AMERICA, INC.

Reverse Gear - Drive torque is applied to the torque converter impeller and transferred to the turbine. The turbine shaft rotates clockwise (CW). The "B" clutch is locked which drives the sun gear in the Simpson gear set CW. The sun gear drives the planet pinions CCW. The planetary carrier is held stationary by the "D" clutch. The planet pinions cause the front ring gear to rotate CCW. The front ring gear (and rear carrier) drive the

auxiliary gear set CCW which rotates at a ratio of 1:1 due to the "E" clutch locking the sun and ring gear of the auxiliary gear set.

Freewheel "H" and "J" are not used. Freewheel "K" is locked.

POSITION GEAR	D				3			2			1	R
	1	2	3	4	1	2	3	1	2	1	R	
Clutch A	X	X	X	X	X	X	X	X	X	X		
Clutch B			X	X			X					X
Clutch C'		X				X			X			
Clutch C		X	X	X		X	X		X			
One Way Clutch H		X				X			X			
Clutch D										X	X	
One Way Clutch J	X				X			X		X		
Clutch E	X	X	X		X	X	X	X	X	X	X	X
One Way Clutch K	X	X	X		X	X	X	X	X	X	X	X
Clutch F				X								

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Fig. 48: Gear Position Chart - Reverse Gear
 Courtesy of BMW OF NORTH AMERICA, INC.

SHIFT CONTROL

Freewheel Shifting

In order to prevent an interruption in power flow, freewheel (One Way Clutches) are used to lock members of the planetary gear set. Certain transmissions such as the 4HP22/24, A4S270/310R and the A5S360R use freewheel shifting on all gear shifts. Transmissions such as A5S310Z, A5S440Z, A5S560Z and GA6HP26Z use freewheel shifting for only specific shifts. Other shifts in these transmissions use overlap shifting technology.

To demonstrate how the freewheel is used, we will examine freewheel "H" in the 4HP22/24 transmission.

In third gear, the sun gear is rotating clockwise. Freewheel "H" is overrun (unlocked) allowing the sun gear to rotate. Clutch "C" is active which locks the outer race of freewheel "H" to the case. During a 3/2 downshift, clutch "B" is released. The sun gear is held from rotating counter clockwise by freewheel "H" and the C' clutch. Freewheel "H" is used to stop the counter clockwise rotation of the sun gear before the C' clutch can engage. This prevents an interruption of power flow during the 3/2 downshift. If freewheel "H" fails to operate, there would be an increase in engine RPM from 3rd to 2nd gear.

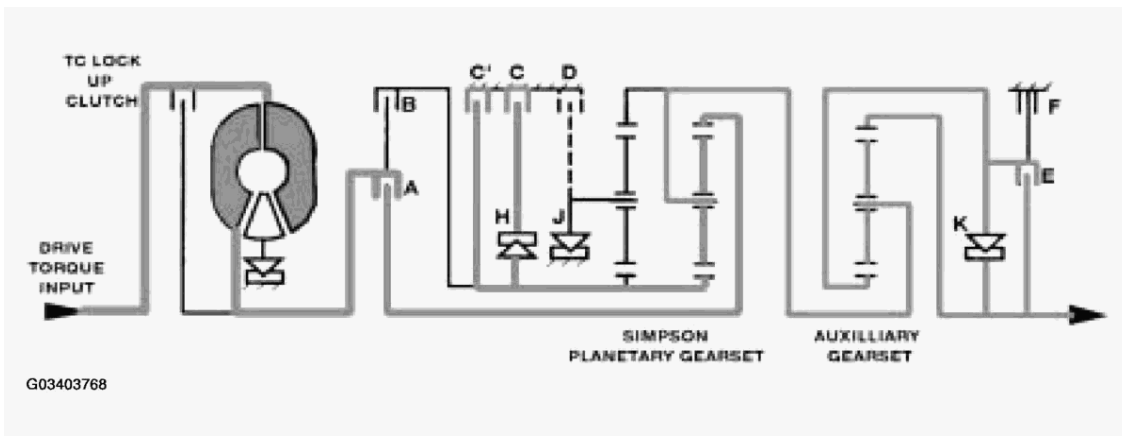


Fig. 49: Identifying Power Flow Freewheel Shifting Schematic - Second Gear
 Courtesy of BMW OF NORTH AMERICA, INC.

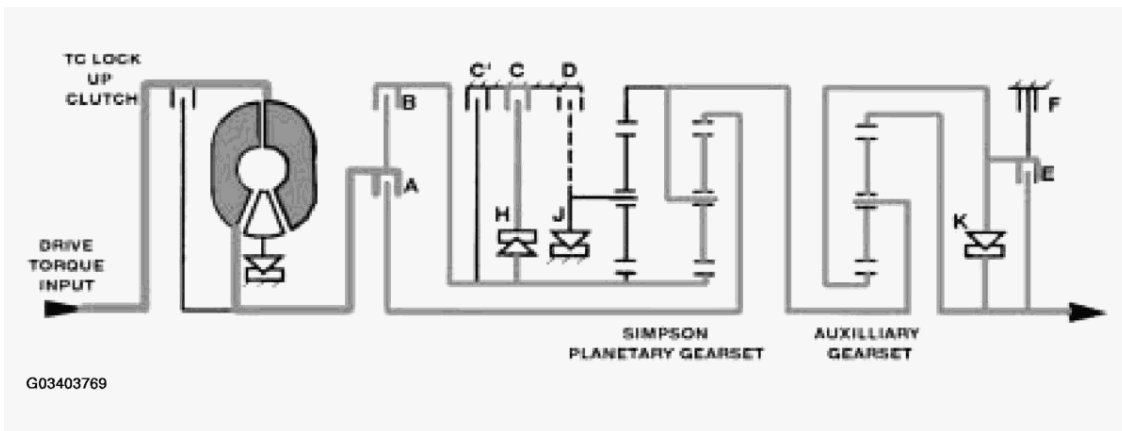


Fig. 50: Identifying Power Flow Freewheel Shifting Schematic - Third Gear
 Courtesy of BMW OF NORTH AMERICA, INC.

Overlap Shift Control

Overlap shift technology is currently used on ZF transmissions. The A5S310Z, A5S440Z, A5S560Z and the GA6HP26Z use overlap shift technology on most gear changes. The advantages of this design allows for the reduction of the use of One Way Clutches (freewheel) and a significant improvement in shift quality.

During an overlap shift, the releasing clutch pressure is reduced at the same rate that the engaging clutch pressure is increased. The result is a smooth transfer or torque between gear ratios.

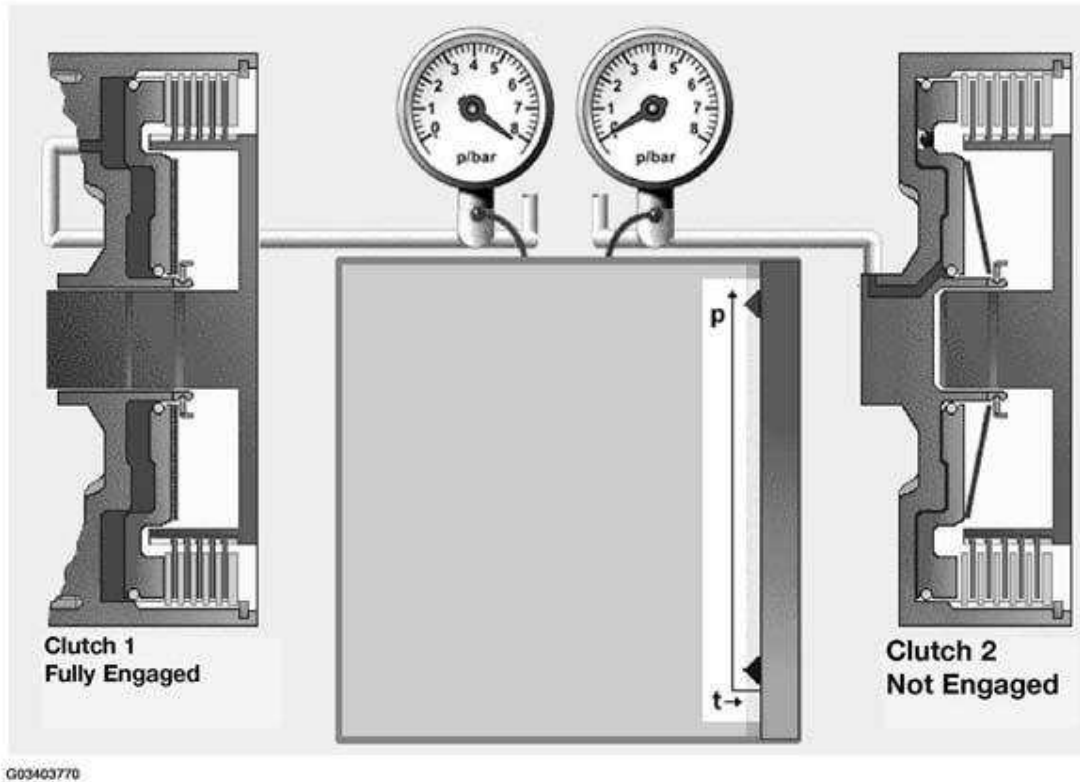


Fig. 51: Identifying Overlap Shift Technology
 Courtesy of BMW OF NORTH AMERICA, INC.

As shown in the diagram above, Clutch 1 is fully engaged with maximum pressure. Clutch 2 is fully released.

During overlap shifting, the TCM closely monitors the rotational speeds of the turbine (input) shaft and output shaft. The TCM then uses the EDS solenoids to control pressures during shifting to provide the optimum shift timing and overlap control.

Overlap Shifting

During the transition of overlap, the clutches run through a slip zone. The torque is gradually transferred from the clutch that is releasing to the clutch that is engaging.

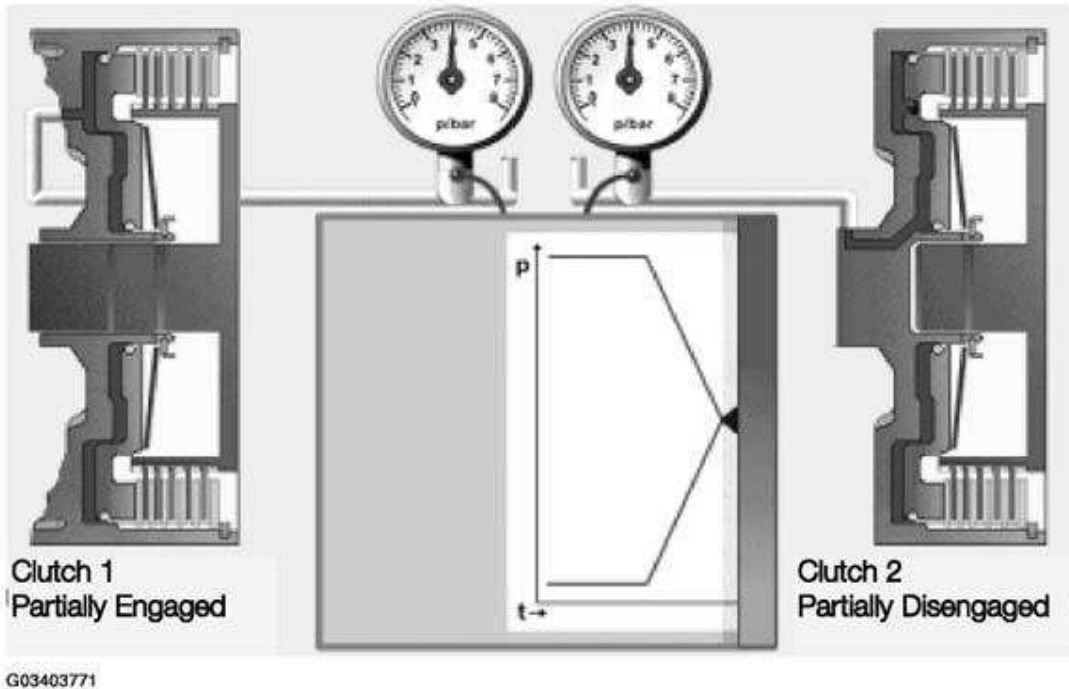
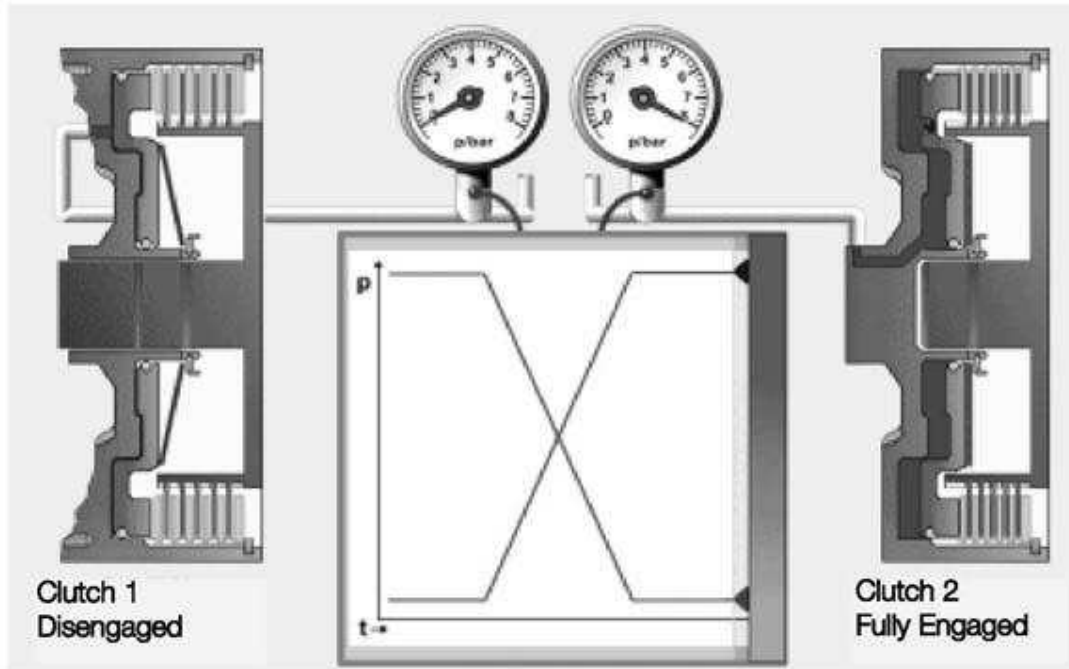


Fig. 52: Identifying Overlap Shifting (Clutch 1 Partially Engaged And Clutch 2 Partially Disengaged)
 Courtesy of BMW OF NORTH AMERICA, INC.

The new gear engages the moment the torque level exceeds that of the first clutch. This is described as overlap. If the overlap is correct, (zero overlap) the engaging clutch takes over as much torque as the disengaging clutch releases. The result is a seemingly unnoticed shift of the best quality.



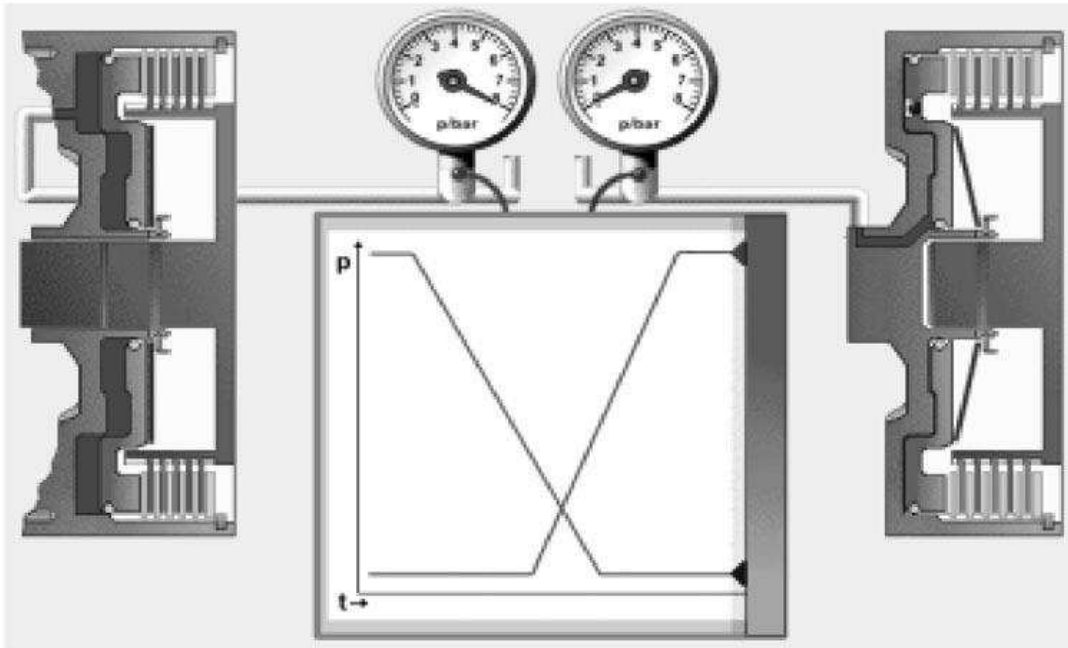
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Fig. 53: Identifying Overlap Shifting (Clutch 1 Disengaged And Clutch 2 Fully Engaged)
 Courtesy of BMW OF NORTH AMERICA, INC.

Negative Overlap

Negative overlap occurs when the engaging clutch takes over too late or the releasing clutch drops pressure too early.

The result is that the drive torque is briefly interrupted. When the engine is operating under load, the engine speed increases due to the interruption. When coasting the engine speed drops.

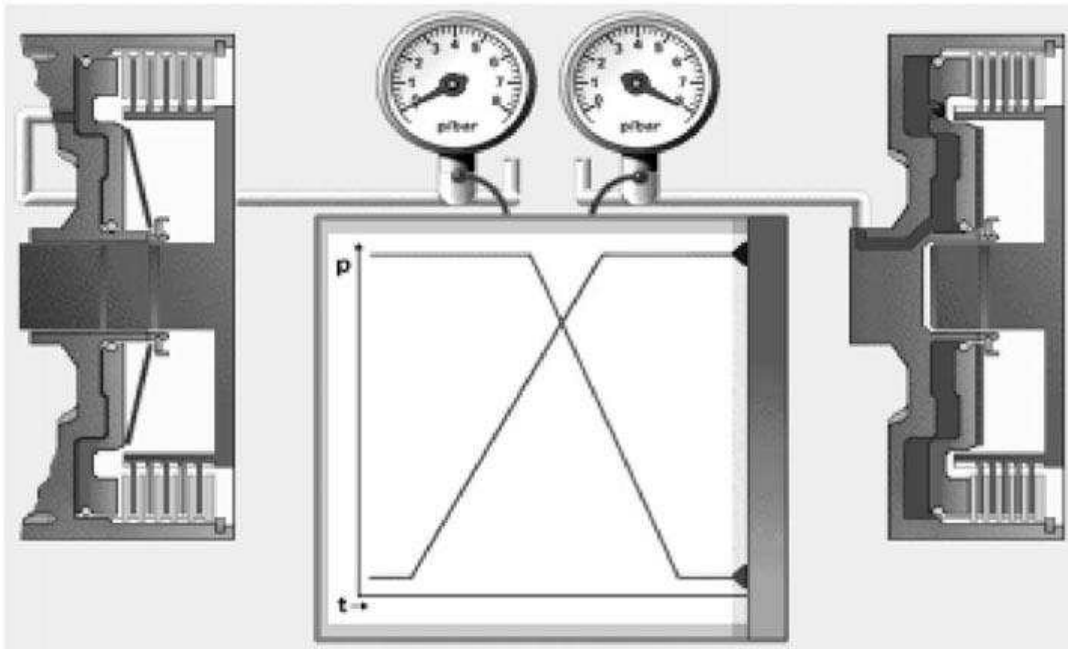


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Fig. 54: Identifying Negative Overlap
 Courtesy of BMW OF NORTH AMERICA, INC.

Positive Overlap

If positive overlap occurs, the engaging clutch takes over too early or the releasing clutch pressure drops too late. The gear set would become momentarily blocked if this condition occurs during an upshift. When this occurs the ratio of the gear set becomes 1:1 momentarily. The result is a loss in drive torque during a gear shift.



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Fig. 55: Identifying Positive Overlap
 Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION CONTROL MODULE

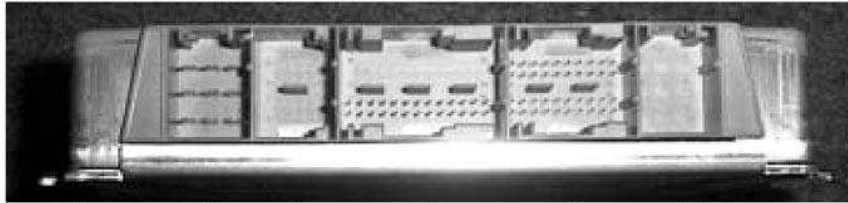
The TCM receives inputs, processes information and actuates the output elements to provide optimal shift points. The TCM is programmed for maximum shift comfort and fuel economy. The TCM on most BMW vehicles is located in the E-Box next to the ECM (DME).

There are several types of TCM housings:

- 35 Pin TCM (TCU) - used on the 4HP transmissions
- 55 Pin TCM used on the A4S310R (THM-R1)
- 88 Pin TCM used on all others up to 98
- 134 Pin TCM used on all BMW transmission from the 99 model year. (Note- the 134 pin TCM was introduced on the 98 Models equipped with the A5S440Z).

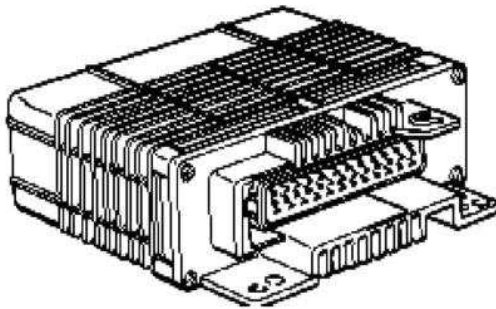
The 134 Pin TCM is also referred to as SKE (Standard Shell Construction). The SKE housing uses 5 separate connectors. On transmission applications only three connectors 1, 3 and 4) are used. Connectors 2 and 5 are blank and are NOT used. The connectors are blue in color to avoid confusion with the ECM (DME) connectors which are black.

134 Pin TCM
with SKE housing

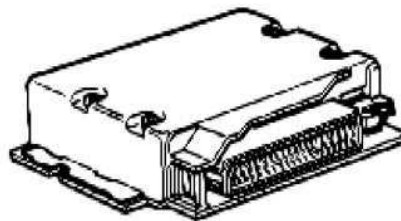


Connectors 1 2 3 4 5

55 Pin TCM



88 Pin TCM



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Fig. 56: Identifying Transmission Control Module
Courtesy of BMW OF NORTH AMERICA, INC.